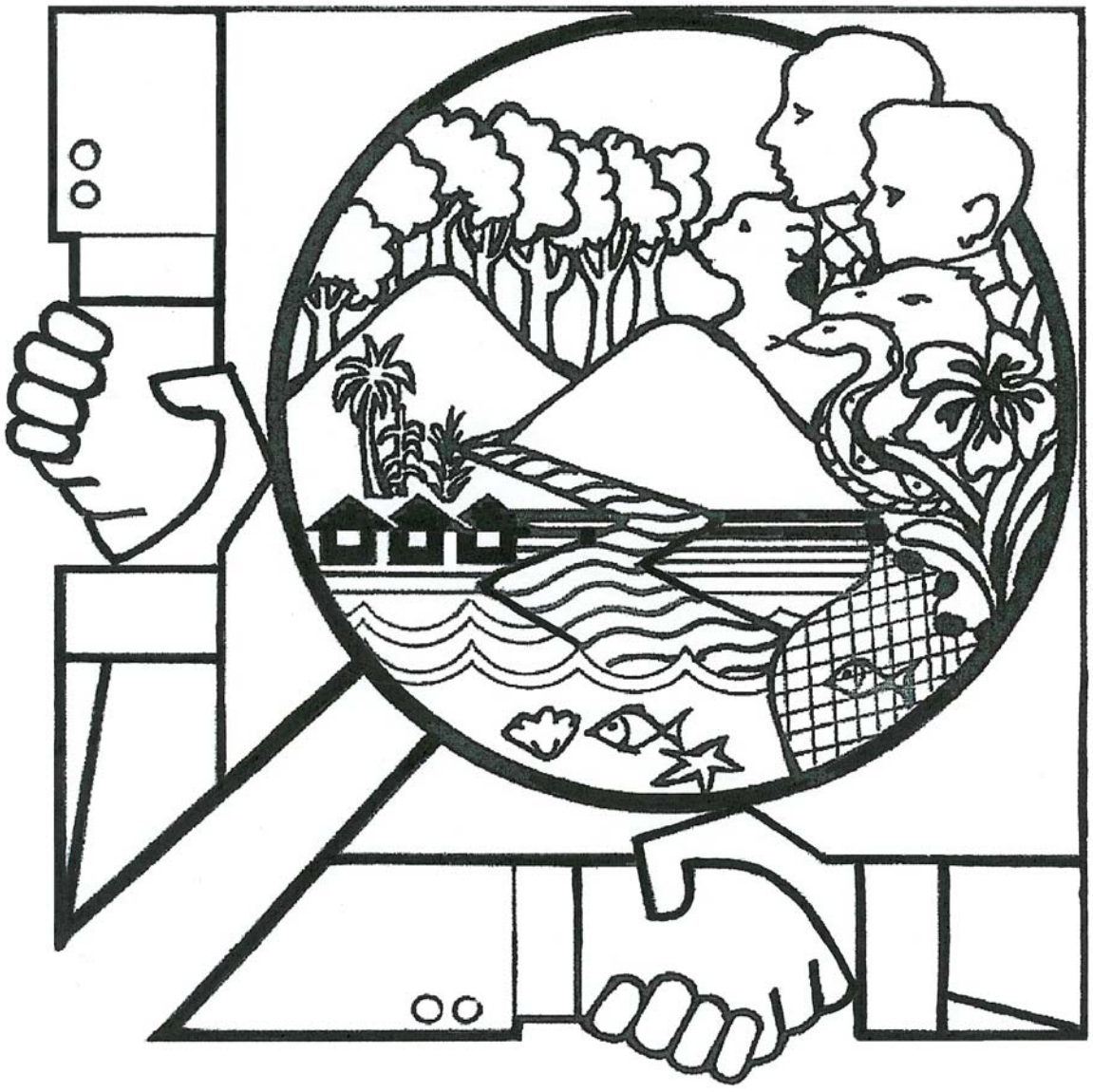
Participatory Rural Appraisal in the Coastal Ecosystem of Mt. Malindang, Misamis Occidental, Philippines



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under the

Biodiversity Research Programme (BRP) for Development in Mindanao:
Focus on Mt. Malindang and Environs

The Biodiversity Research Programme (BRP) for Development in Mindanao is a collaborative research programme on biodiversity management and conservation jointly undertaken by Filipino and Dutch researchers in Mt. Malindang and its environs, Misamis Occidental, Philippines. It is committed to undertake and promote participatory and interdisciplinary research that will promote sustainable use of biological resources, and effective decision-making on biodiversity conservation to improve livelihood and cultural opportunities.

BRP aims to make biodiversity research more responsive to real-life problems and development needs of the local communities, by introducing a new mode of knowledge generation for biodiversity management and conservation, and to strengthen capacity for biodiversity research and decision-making by empowering the local research partners and other local stakeholders.

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Acknowledgments

We write this report bearing in mind the confluence of factors that created the seemingly formidable atmosphere which researchers faced – the novelty, for most of them, of community-based approaches, the multi-institutional and inter-disciplinary constitution of the research team, the unfamiliarity with the research area, the brevity of the research period – and several other challenges confronting them throughout the research processes. That the arduous circumstances under which the different activities were done requisite to achieving the research objectives had gradually unfolded itself and became surmountable. Transcending the impediments had been realized largely because of the sheer kindness, love, helpfulness, trust and understanding of many people and organizations: informants, officials of local government units, academic institutions, colleagues, nongovernment groups, people's organizations, friends and families.

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The Writers

Executive Summary

The Biodiversity Research Programme in Mindanao: Focus on Mount Malindang stands on a solid foundation in embarking on an endeavor that uses a new approach to address the crucial global issue of environmental degradation and loss of biodiversity. This comprehensive approach involves bottom-up, cross-sectoral and interdisciplinary efforts in addressing the complexity of problems associated with the loss of biodiversity. The programme has two phases, namely, the pre-implementation phase and the implementation phase. It is guided by the major goals of supporting biodiversity research that is need-based and relevant for development, strengthening capacity for research at the local level, and promoting genuine partnership which involves the local communities in the Philippines. In the programme's pre-implementation phase, the participatory approach was adopted in recognition of the necessity of determining with the people the needs, problems, opportunities and threats in biodiversity research for development. Thus, three ecosystem groups (upland, lowland and coastal) were tasked to conduct a participatory rural appraisal (PRA) in the northern bioregions of Mount Malindang. The PRA aimed to generate information on the biodiversity of these areas and the various factors underlying the dynamics of the population-environment interactions; among the expected outputs being the identification of areas of research and action for inclusion in the biodiversity research programme. Below is an overview of the activities undertaken in order to achieve such aims.

The coastal ecosystem group (CEG) conducted the PRA in six different coastal barangays located in three selected municipalities in the province of Misamis Occidental: barangays Manla and Caluya in the municipality of Sapang Dalaga, barangays Punta Sulong and Punta Miray in the municipality of Baliangao, and barangays Danao and Panalsalan in the municipality of Plaridel.

The methods used may be characterized as participatory, consultative, non-intrusive, friendly, adaptive and iterative with site-specific modifications, among others. Certain procedures were resorted to in each of the three major phases of the research, briefly described here.

Prefieldwork Phase. Prior to the conduct of the fieldwork, the coastal ecosystem group underwent several activities to pave the way for the conduct of primary data gathering in the various barangays selected for the purpose. The prefieldwork phase consisted of the following activities: secondary data collection, processing and gaps analysis; entry protocols and preliminary preparation of communities; reconnaissance survey; processing and analysis of data gathered during the reconnaissance and preliminary preparation of communities; seminar/ workshop on PRA tools and participatory site identification together with invited key informants (KIs) and contact persons; participatory checklist preparation, and identification of PRA tools and preparation of fieldwork. The main criteria for the choice of fieldwork sites were contiguity and heterogeneity. Seven other criteria were considered, namely, interconnectivity with the lowland and upland ecosystems, acceptability to local government units, accessibility, biodiversity (cultural, human, natural resources, function, and structure), existence of problematic issues and threats concerning biodiversity conservation, security, and interest from the local community.

Fieldwork Phase. For more than two weeks (1-17 May 1999), a smaller team was constituted from the CEG to conduct the preliminary data gathering activities together with the identified key informants who became members of the PRA team. Two days were spent for each barangay with maximum participation of and

consultation with the members of the community. Triangulation methods were used during the whole process of data collection. The team's focus was directed at identifying the various floral and faunal compositions of the coastal communities, structure and functions thereof and the human interactions with them. Of particular concern was the effect of these human interactions on the environment.

Specific methods used in the fieldwork were: the quick walk along the coast; resource, social and land use mapping; resource seasonal calendar and resource flow charting; transecting; nonstructured interviews; focus group discussions; ocular observations; and data crosschecking.

Preliminary processing was done with the gathered data highlighting features of each barangay and related problems. Also, a preliminary identification was done of researchable areas derived from the related problems.

Post-fieldwork Phase. Activities conducted after the primary data gathering were: processing, analysis and barangay profile development; preparation for community validation; community validation; additional processing which included the results of community validations; analysis; and report writing. The PRE (population, resource, and environment) was adopted as analytical framework. Then, an analysis of the SWOT (strengths, weaknesses, opportunities and threats) derived from the PRE analysis preceded identification of the researchable areas and action needs of the communities. In the community validation, prior arrangements and schedules had to be carefully made in advance since it involved the general assembly of barangay residents.

The following is a presentation of the status and trends of key coastal biological resources, and the patterns of use of various stakeholders, as well as the impact of the use patterns on the resources. A description of the researchable areas and action needs perceived by the communities and the researchers ends this presentation.

The four barangays (Manla, Caluya, Punta Sulong, and Punta Miray) located in the western part of the first district of the province were estuarine barangays influenced by the Dioyo River; while the barangays of Danao and Panalsalan were part of the estuaries of Ducaling, Itusan, Inamucan and Langaran Rivers. Manla and Caluya had hilly physiographies with very narrow coastal plains, while the rest of the barangays were flat or nearly flat. All barangays had clay to sandy loam types of soil, except for Danao which had seaward areas of the sandy and clay (water logged) types. Punta Miray and Panalsalan had rocky coralline cliffs that extended towards the sea as fringing coral reefs. These two barangays had white sand beaches and chains of coralline islets called Cabgan Islands in Punta Miray and Baobaon Islands in Panalsalan. Manla, Caluya, Punta Sulong and Punta Miray, being part of Murcielagos Bay, were influenced by mixed tidal patterns; Danao and Panalsalan were mainly of the diurnal type. All barangays experienced a Type IV climate, and northeast (January to June) and southwest (July to December) monsoons. Air temperature in the areas ranged from 29ºC to 30ºC.

Dominated by species of Family Rhizophoraceae and Family Avicenniaceae, the mangrove areas in the research sites ranged from 3 to 140 hectares, with Manla having the smallest area and Danao, the largest. These mangrove areas were mainly occupied by secondary growth with sparse primary growth remaining in Punta Sulong, Punta Miray, and Panalsalan. Danao was unique because a dense primary growth was still present. Eight to 15 species were observed with the biggest number found in Punta Sulong, Punta Miray, and Panalsalan. Dominance shifted from prop roots-bearing in Manla and Caluya to pneumatophore-bearing in Punta Miray, Danao and Panalsalan. Up to 12 species of shellfish, 12 species of birds, four species of reptiles, 10

species of plants and 12 species of fish associated with mangroves were identified.

A range of 20% to 80% cover of seagrass was observed in the coastline and island fringing reefs in the areas studied. Dense seagrass beds of mixed *Enhalus acoroides* and *Thalassia hemprichii* were found in all barangays, but the largest terms of area was found in Punta Sulong. These beds were disturbed, as suggested by the dense epibionts on the leaf blades. Single species of *T. hemprichii* beds were found in Punta Miray, Danao and Panalsalan. The people identified siganids (*Siganus fuscescens* or *danggit*) as the dominant fish that utilized seagrass beds for feeding and shelter.

Also found occurring in patches in the reef flats and amongst coral communities are various species of marine algae, but they are dominated by *Sargassum* spp. Another siganid (*Siganus guttatus* or *kitong*) was associated with the *Sargassum* spp. beds. Fifteen other algal species were observed including the coralline *Halimeda* sp. and *Amphiroa* sp.

The status of coral communities ranged from poor to fair. Those in Manla, Caluya, and Punta Sulong were poor, except for the shoal (*takot*) shared by Manla and Caluya with coral communities that may have been considered fair. Other areas were poor to fair in status, but small patches in Punta Miray and Panalsalan were good and those in Danao were excellent. Corals found in the reefs of the latter three areas were mainly the tabulate and branching *Acropora* species. There were also 12 or more other branching, massive and solitary hard coral species, and three other species of soft corals. The major threats to coral communities were the dense crown-of-thorns sea star and suspended silt in overlying waters.

Up to 142 kinds of fish belonging to 52 families were named by the local residents. People from Manla, Caluya, Punta Sulong, and Punta Miray, coastal communities that live along the Mucielagos Bay, had identified species of the Family *Siganidae* as the dominant fish in their coastal waters. Sixteen species of reef fishes were recorded, four of these were indicators of good health of the reefs. Small pelagic and large offshore pelagic species and demersal species were also mentioned by the people of Punta Miray, Danao, and Panalsalan. Unique to Danao was the *bangus* (*Chanos chanos*) fry collection in the Ducaling estuary. Up to 52 species of shellfishes were known to have been collected in areas with extensive reef flats – Punta Sulong, Punta Miray, Danao, and Panalsalan.

In the terrestrial part of the communities, the coconut (*Cocos nucifera*) was the dominant terrestrial crop. Among the minor crops were bananas, corn, cassava, sweet potatoes, coffee, and cacao. Up to 29 kinds of fruit trees, 58 timber, 38 ornamental, and 54 medicinal plant species had been identified by the local people.

An overview of the relationships between population, resources and environment underscores the compelling fact that is rendered all the more significant by the PRA: the pressures on the various sub-ecosystems of the coastal area had made extremely difficult natural regeneration to catch up with human demands. An examination of the character of various groups of stakeholders in the area revealed the relative weight of stakes that each group claimed on the coastal ecosystem and the pressure brought on the environment by the interplay of their activities: the fishers and shellfish gatherers who had to earn a living and used methods that may or may not be environment friendly; farmers who may have used inputs that prove destructive to soil and water, or *compradors* (middle persons) and traders who profited from the catch of fishers or harvest of farmers, while acting as their informal financiers; national government agencies that carried out policies or launched programs that may or may not be appropriate to the area; or local government units which, until recently, did not have devolved powers nor owned revenue for project development; and the women and children who took part in

resource use for subsistence and for augmentation of household income, and others.

For the past decades, in-migration and population increase had occurred; and through time, patterns in resource use and resource management had changed. Institutional (formal and informal) arrangements among stakeholders in the use of the resources had been arrived at. Many factors had interplayed and continued to exert pressure on the resource base.

Some activities of these stakeholders served as examples of the heavy pressures exerted on the resources. Among these activities were: cutting of mangroves for fuelwood or for constructing the *bungsod*, a type of fishing gear; the burning of mangroves for big-time charcoal making; conversion of mangrove areas to fishpond areas; trampling of seagrass while gathering shellfish, use of destructive fishing methods and fishing gear, indiscriminate use of agrochemicals that pollute the coastal waters, implementation of inappropriate policies and irrelevant programs, inadequate knowledge of skills on biodiversity conservation; and many more, which all contributed to the destruction of several parts of the coastal ecosystem.

But all is not lost. There is strength in the assertiveness of the people to rehabilitate the devastated sub-ecosystems, to restore lost species and to rebuild damaged structures. There is strength in the resolute position of some local government officials to set in place rational policies and implement programs that not only conserve biodiversity, but are also sensitive to the immediate needs of the people. There are still opportunities in the trainings and workshops that certain nongovernment units conducted to raise environmental awareness and enhancing skills in biodiversity conservation. Finally, local government units in the area were determined to discuss jurisdictional authority and arrive at inter-municipal agreements on the use and conservation of a common resource.

The most generalized conclusion that can be formed is that in all six communities studied, there had been glaring testimonies on the different degrees of environmental degradation in many parts of the coastal subecosystems. On the other hand, the different subecosystems studied displayed various levels of preservation and rehabilitation in several parts. But since the dynamics involved in resource use and resource management change over time, a serious investigation of research gaps in areas identified by the people in these communities, as well as, by the research team should be done. These community concerns may be categorized into areas of research and areas of action. Cognizant of the integrated nature of the problematic situations occurring in the coastal communities and conscious of the relatedness of the issues that derive from the problems, some recommendations are also forwarded by the coastal ecosystem group.

Many of the recommendation advanced by the researchers find congruence with those that had been identified by the communities themselves. It calls upon us to provide appropriate and timely response to the action needs and concerns of the people.

Without doubt, all communities acknowledged the urgency of generating alternative sources of livelihood in order to ease the pressure on the resources. They also expressed the need to seek means of heightening the community level of awareness for biodiversity, and enhance skills in conservation and environmental regeneration.

Among the researchable areas identified by the communities were the feasibility of establishing marine sanctuaries, of regenerating important but disappearing species and restoration of lost ones, both marine and terrestrial. Other areas suggested were related to marine algal research, biology of rare floral and faunal species, both terrestrial and marine, and disease research. Other suggestions were to conduct a study of site suitability of

mangrove species for reforestation, diversified mariculture, contamination effects of mining effluents, status of agrochemical flushings to the waters.

Yet, other areas identified pertained to land tenure, soil analysis and rehabilitation, water research, appropriate technology, use of crushed shell as add-on to animal feed, feasibility of fruit preservation, cold storage facilities, child and maternal health problems, and improving fishpond management.

Even the study of the dynamics of the interaction across barangays, municipalities and sectors with regard to biodiversity conservation, research into the *bun-og* characteristics, salinity intrusion to rice paddies and an examination of the organizational development needs of community organizations toward institutionalizing efforts at biodiversity conservation had been recommended.

The researchers' perspectives of the researchable areas, almost in totality, reiterated those concerns articulated by a good number of communities' constituents. Among these are:

1. Inventory of flora and fauna of the coastal areas
2. The massive siltation that occurred due to a geophysical occurrence, *bun-og*, or flash flood through the large rivers (Dioyo and Langaran)
3. Agrochemical and fertilizers that threaten the rivers, estuaries and seas
4. Salinity intrusion in farmlands
5. Establishment of location and designing of marine reserves and sanctuaries
6. Movement of effluents from PHILLEX and small-scale mining
7. Impact of livelihood activities and market structures on coastal and marine biodiversity
8. Compatibility and appropriateness of alternative sources of livelihood
9. Gender roles in conservation of biodiversity in the coastal and marine areas
10. Control over and access to resources including specific practices; tenurial issues; time use and income flows of farming and fishing activities
11. Ethnoecology and ethnobiology of terrestrial, coastal and marine resources
12. Factors affecting organization development of community associations in institutionalizing efforts toward biodiversity conservation
13. Informal rules and formal institutional arrangements that affect resource use over time
14. Power structures and the political economic impact on biodiversity resources/conservation in coastal municipalities
15. Developing intermunicipality agreements on resource use
16. Policy formulation regarding mining impact on coastal and marine resources
17. Evaluation of policies for marine fisheries conservation in terms of implementation, acceptance, and effectiveness.

Upon closer scrutiny, the concerns stated above, including those articulated by the communities, may fall under any of the categories of Methods and Knowledge and Policy.

The coastal ecosystem group asserts these recommendations be implemented in an integrated manner.

Finally, it is prudent to state here that this exercise had reaped accomplishments even beyond the stated objectives.

Abbreviations and Acronyms

asl	above sea level
AUC	American Union Carbide
BFAR	Bureau of Fisheries and Aquatic Resources
BGO	Barangay Government Office
BHW	Barangay Health Worker
CEG	Coastal Ecosystem Group of the Pre-Implementation Phase (PIP)
CEP	Coastal Environmental Program of the DENR
CFA	Caluya Fisherfolks Association
CIDSS	Comprehensive and Integrated Development of Social Services of the DSWD
CSC	Certificate of Stewardship Contract
CPUE	Catch Per Unit Effort
DA	Department of Agriculture
DACOSDA	Danao Coastal Dwellers Association
DBH	Diameter at Breast Height
DECS	Department of Education, Culture and Sports
DENR	Department of Environment and Natural Resources
DILG	Department of Interior and Local Government
DOH	Department of Health
DSWD	Department of Social Welfare and Development
DTI	Department of Trade and Industry
FARMC	Fisheries and Agricultural Management Council
FGD	Focus Group Discussion
HRD	Human Resource Development
IEC	Information, Education and Communication
IRI	Index of Relative Importance for Mangrove Species Abundance
ISFP	Integrated Social Forestry Program of the DENR
KI	Key Informant
MAO	Municipal Agriculture Office/Officer
MATCO	Malindang Timber Company
MFA	Manla Fisherfolks Association
MGO	Municipal Government Office
MPDO	Municipal Planning and Development Office
MOELCI	Misamis Occidental Electric Company, Incorporated
MOFECO	Misamis Occidental Federation of Cooperatives
NGO	Nongovernment Organization
NGA	National Government Agency
NIA	National Irrigation Administration
PAGMASDAN	Paghiusa og Pagtambayayong sa mga Mangingisda sa Danao (United Fisherfolks of Danao, a People's Organization)
PCA	Philippine Coconut Authority
PGO	Provincial Government Office
PIP	Pre-Implementation Phase of the Philippines-Netherlands Biodiversity Research Programme
PNP	Philippine National Police
PO	People's Organization
PRA	Participatory Rural Appraisal
PRE	People-Resource-Environment Framework of Analysis
PUMICODA	Punta Miray Coastal Dwellers Association
PUNSUWACO	Punta Sulong Water Cooperative
PUPLABI	Punta Sulong, Plaza, Bigaan Coastal Dwellers Association
RAWOO	The Netherlands Development Assistance Research Council
SEAKA	Self-Employment Assistance Kaunlaran Association of DSWD
SEAMEO	Southeast Asian Ministers of Education Organization
SEARCA	Southeast Asian Regional Center for Graduate Study and Research in Agriculture
SK	Sangguniang Kabataan
SWOT	Strengths-Weaknesses-Opportunities-Threats
WO	Women's Organization

Units of measurement:

cm	centimeter
g	gram
ha	hectare
kg	kilogram
km^2	square kilometer
L	liter
m	meter
mm	millimeter
m^2	square meter
$^o/_{oo}$	parts per thousand (salinity)
ppt	parts per thousand (salinity)
pH	acidity/basicity
^oC	degree Celsius
mg/L	milligram per liter
pc	piece
pcs	pieces

Introduction

Background and Rationale

The Biodiversity Research Programme (BRP) in Mindanao: Focus on the Mount Malindang bioregion, was conceived to address crucial global issues on environmental degradation and loss of biodiversity that affect the Philippines.

Working on the premises that global environmental management does not succeed with a piece-meal approach, and that people form the foundation for the sustainable use of biological resources, the research programme operates on a framework that considers comprehensive, landscape, and participatory approaches. These approaches involve bottom-up, cross-sectoral, and interdisciplinary efforts in addressing the complexity of problems associated with the loss of biodiversity.

In particular, the programme supports biodiversity research that is need-based and relevant for development, strengthening capacity for research at the local level, and promoting genuine partnership involving local communities in the Philippines. The programme has two phases: the pre-implementation phase (PIP) and the implementation phase. The PIP was carried out, recognizing that to be relevant to the communities, biodiversity research for development must identify the needs, problems, opportunities and threats in the communities. It was initiated to identify researchable areas and to develop a biodiversity research framework/agenda for the upland, lowland, and coastal bioregions of Mount Malindang. Participatory rural appraisal (PRA) generated relevant data from these ecosystems.

Concepts and Principles of PRA

Participatory rural appraisal is a method of site assessment that provides better understanding of rural situations. It is characterized as participatory, rapid, flexible, iterative, systems oriented, cost-effective, and interdisciplinary. It is a diagnostic and evaluative tool for identifying problems and opportunities as entry points for project designs and implementation (RAWOO-SEARCA 1999). It can also be used to provide the bases for developing research agenda for a community following a description of its socioeconomic and biophysical conditions; and an assessment of the needs, problems/issues, threats, and opportunities in the community.

PRA of Coastal Communities

The appraisal of rural coastal communities promotes understanding of the existing socioeconomic conditions of the area, its biological and physical characteristics, and the patterns of resource use of population. The PRA ascertains the needs, problems/issues, opportunities and threats emerging from the patterns of resource use and the impact of these patterns on the resource base and on biodiversity. Informed by such assessment, identification can be made of possible researches and associated action needs. As PRA encourages local community participation in the process, it paves the way for the outsiders and villagers to engage in a joint undertaking that allows them to observe the conditions together, interact with each other and share analysis that ultimately redounds to the benefit of the communities.

Location of PRA Sites

The PRA sites of the coastal communities of Mount Malindang were located in the municipalities of Sapang Dalaga, Baliangao and Plaridel of the province of Misamis Occidental (Fig. 1). In particular, these sites included the coastal barangays of Manla and Caluya in Sapang Dalaga, barangays Punta Sulong and Punta Miray in Baliangao and barangays Danao and Panalsalan in Plaridel. The coastal barangays in the municipality of Lopez Jaena were also seriously considered as research sites but actual fieldwork had to be set another time.

Objectives

Generally, the PRA in the coastal barangays of the three municipalities was aimed at generating relevant data on socioeconomic, cultural, political, and biophysical conditions as these influence biodiversity and its conservation.

Specifically, the objectives of the PRA in the six coastal barangays were:

1. to describe the socioeconomic, cultural, political, biophysical features of each barangay and the extent of biodiversity in each;
2. to identify issues/problems, opportunities and threats relevant to the people's use of the resources and their concern for biodiversity and conservation;
3. to develop PRA methods that are encompassing but which can be tailored to suit each barangay in consideration of its unique features;
4. to ascertain the capabilities and constraints of local community members in participating in the PRA process; and
5. to develop a biodiversity research framework/agenda for the coastal bioregion.

Significance of the Study

Apart from providing a description of prevailing socioeconomic, cultural, political and environmental conditions of each barangay and a formulation of a research framework/agenda, the PRA also facilitated the design of the barangay profile. It also brought out relevant insights in designing the barangay development plans and other programs which were directed towards the progress of the barangay. The views and inputs regarding biodiversity conservation and sustainable management can also be extracted to model certain efforts for local initiatives, i.e., awareness building, campaign for species protection, etc. Moreover, the PRA undertaken in these coastal barangays could provide concrete bases for guiding similar undertakings in other coastal areas in the province and even in other provinces, without losing sight of the strengths and weaknesses of the methodologies and the need to make the tool sensitive to the peculiarities of the area.

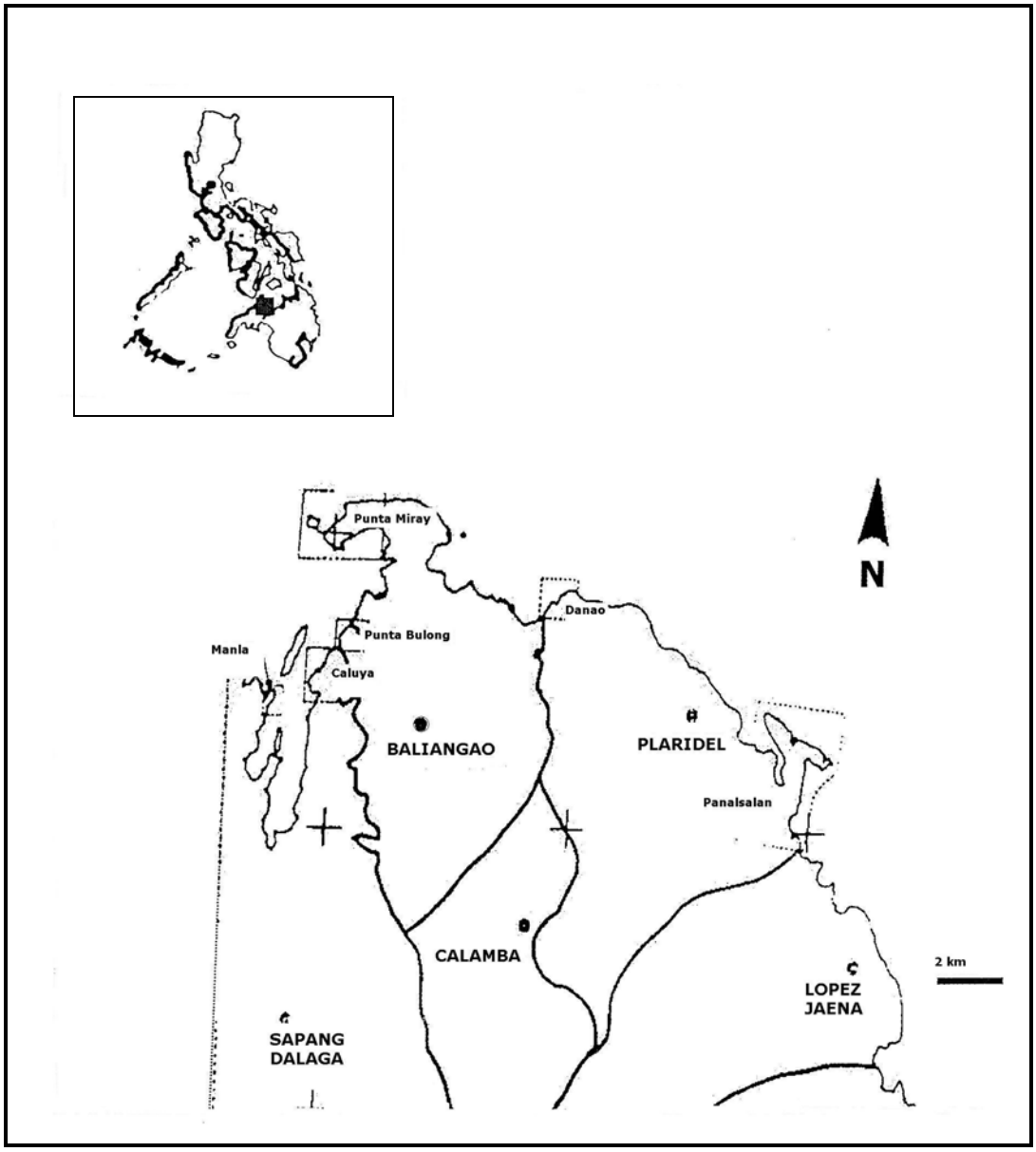


Figure 1. Map of Northern Misamis Occidental showing the six coastal PRA sites. Inset is the map of the Philippines showing the site of Mount Malindang (solid square) in Mindanao.

Methodology

An interdisciplinary team of nine members from the Coastal Ecosystem Group (CEG) carried out the first stages of the PRA of six different coastal barangays in three municipalities of Misamis Occidental: Barangays Caluya and Manla of Sapang Dalaga, Barangays Punta Miray and Punta Sulong of Baliangao, Barangays Danao and Panalsalan of Plaridel. The main goal was to generate information on biodiversity of these areas and underlying factors related to the dynamics of interactions of the population and the environment. The team consisted of academicians in the fields of marine sciences, forestry, social sciences and a development worker. Constituting part of the team were 13 key informants from the three municipalities to which the barangays belong.

Prefieldwork Phase

Prior to the conduct of the fieldwork, all nine CEG members undertook several activities to pave the way for the conduct of primary data gathering in the various barangays selected for the purpose. This prefieldwork phase included the following:

Secondary Data Collection

Beginning in March 1999, each CEG member gathered relevant materials and references to be analyzed by the team. Several offices (Municipal Agriculture Office, Municipal Planning and Development Office, and other municipal offices of Sapang Dalaga, Baliangao, Plaridel and Lopez Jaena) and libraries were visited and several people helped facilitate the process. The secondary data familiarized the team with some of the features of the proposed study sites, the PRA tools and other participatory methods that were used in other coastal communities in the Philippines and abroad.

Entry Protocols/Preparation

Later in the month of March and in early April, the team sent communications to, paid visits, and made courtesy calls to the provincial, municipal and barangay leaders to expedite entry to the preliminary sites chosen, e.g., IIRR 1998. The purpose of the programme was explained to the local government officials and the plan of action or work schedules discussed with them. With these preparations, and the contacts made in the communities, the group was able to enter the different barangays with little difficulty.

Data/Gaps Analysis

An analysis of the secondary data collected was carried out in April 1999. This was done to familiarize the team with the target sites for the PRA and to enable the team members to expand their knowledge on PRA and how its methods worked in other coastal areas in the country or abroad. The output of this activity allowed the group to identify data gaps and needs that should be taken into account in the succeeding step. Some study sites were selected at this stage. The selection criteria were: interconnectivity with the lowland and upland ecosystems, acceptability of the research to local government units, accessibility, level of biodiversity (cultural, human, and natural resources, structure and function), presence of issues and threats concerning biodiversity conservation, security and interest from the local community.

Reconnaissance

After accomplishing the secondary data analysis and the necessary preparation, a reconnaissance was conducted in the pre-selected coastal barangays. Conducted for three days from 12 to 14 April 1999, the reconnaissance survey enabled the CEG to have a quick overview of the general condition of the coastal areas and to gather some preliminary data. In addition, some secondary data were validated. The CEG members were also able to talk with some local government officials and collect

additional secondary data. More study sites were pre-selected namely, barangays Danao, Panalsalan and Bato in the municipality of Plaridel; barangays Misom, Punta Sulong and Naburos in the municipality of Baliangao; barangays Caluya, Manla and Sapang Ama in the municipality of Sapang Dalaga. Contacts were identified and selected from the barangay members. Most of these contacts had been recommended by the local government officials and by NGO and PO officers.

Processing/Analysis of Data Gathered During the Reconnaissance and Preparation of Communities

The primary and secondary data collected during the reconnaissance survey were processed and analyzed from 14 to 20 April 1999. At the same time, data previously processed/analyzed were crosschecked with the data collected during the reconnaissance. Informed with this crosschecked data, profiles of the municipalities were made. The latter were then used during the seminar-workshop held from 21 to 23 April 1999 at Plaridel, attended by the representatives of the selected municipalities.

Having made preliminary contacts during the reconnaissance survey, the CEG did follow-ups on the nine pre-selected coastal barangays. Schedules were then set for the seminar-workshop which involved the representatives of the municipalities. These representatives served as key informants, thus becoming members of the PRA team. This was done to promote participation from the communities.

Seminar/Workshop on PRA Tools and Site Identification

A three-day seminar-workshop on PRA and its tools was conducted on-site (at Plaridel) from 21 to 23 April 1999, with the representatives of the municipalities. (The invitees from Lopez Jaena did not arrive). Graced by the presence of the Mayor of Plaridel, the seminar-workshop commenced with an orientation on BRP, the Pre-implementation Phase and PRA. With the end view of including municipality representatives as members of the PRA team, the seminar-workshop aimed not only to orient the participants on the BRP but also to equip them with some knowledge and skills about PRA and its tools. A series of workshops and a field activity, in addition to inputs and discussions, facilitated learning and skill development. It helped that some participants had previous experiences in PRA-related activities in their own barangays for purposes other than research.

A preliminary resource and social map was prepared for each barangay to which the participants belonged; then, a checklist was prepared per barangay. The final sites for PRA were identified together with the participants before the seminar-workshop ended. The team finally chose five from the nine pre-selected sites and one other site after considering factors such as contiguity and heterogeneity of the barangays within a municipality, aside from the following set criteria:

a. presence of a major river system (interconnectivity);
b. acceptability of the research to local government units;
c. accessibility;
d. biodiversity (cultural, human and natural resources, structure and function);
e. existence of problematic issues and threats concerning biodiversity conservation;
f. security; and
g. interest from the local community.

The five barangays that were finally chosen were Caluya and Manla in Sapang Dalaga, Punta Sulong in Baliangao, Danao and Panalsalan in Plaridel. The sixth barangay, Punta Miray, was chosen after a thorough deliberation of the criteria and all other primary and secondary data gathered. The key informants who had come from

barangays not selected as research sites remained members of the team to assist in the fieldwork.

The group then discussed schedules for primary data gathering. After the seminar-workshop, the key informants (KIs) were assigned to collect additional data about their barangays and municipalities, and facilitate the preparation of the communities for the fieldwork to gather primary data in the selected barangays.

Participatory Checklist Preparation, PRA Tools Identification and Fieldwork Preparation

The activities held for checklist preparation, which were attended by the representatives of the municipalities or KIs, were undertaken a week after in another seminar-workshop held from 27 to 30 April 1999. With the additional secondary data brought to the seminar-workshop by the KIs, the checklist per barangay was made. The checklists were an improvement over the ones prepared during the seminar-workshop held from 21 to 23 April 1999 since there were more reference checklists, including those used in other coastal areas in the Philippines, a world recognized leader in integrated coastal management (Appendix).

As soon as the checklists were finalized, the PRA tools to be used were identified. The approaches and ways of using the various PRA tools in each barangay were also discussed. Other necessary preparations for the fieldwork were done and fieldwork schedules and logistics were confirmed with the KIs.

Fieldwork Phase

For over two weeks in the field, the six researchers from the CEG gathered primary data together with the key informants. Two days were spent for each barangay with maximum participation of and consultation with the members of the community. The team's focus was directed at identifying the various floral and faunal compositions of the coastal communities, the structures and functions thereof, and related human interactions. Of particular concern was the effect of human interactions on the environment.

Activities pertinent to methods that were iterative were carried out with site-specific modifications, dependent on the characteristic variations of each barangay. It had previously been agreed upon that at the end of each day, the team would process the day's activities and observations. However, this was not possible for the first two barangays as the activities that involved the communities were usually extended to the early hours of the evening. The latter part of the evening was spent on briefing, in preparation for the next day's activities; and by then, the teams were too tired to accomplish the task.

In data processing, the team highlighted features particular to each barangay, and took note of the interplay between resources and people's resource use patterns; as well as the resulting consequences of these resource use patterns on the environment and biodiversity conservation. At this stage, the teams were already able to identify researchable areas as issues and problems became evident from the processed data.

The following were the specific activities/methods used in data collection:

Quick Walk Along the Coast

The conduct of a quick walk along the coast/beach was usually done during the first day of fieldwork in each barangay. The team was accompanied in the walk by the KIs and the Barangay Captain and/or members of the Barangay Council, and representatives of fishers, farmers, youth and women. The purpose of the quick walk was to undertake a survey of the biophysical and socioeconomic characteristics of the area. Although everyone in the team was encouraged to

observe everything during the quick walk, each, including everyone from the community, was given a particular subject to focus on and a particular task to accomplish with a prepared checklist as guide.

Trees, grasses, shrubs, herbs and other plants along the way were identified and listed. The possible uses of the plants (medicinal, food, etc.) were verified by getting the opinions of the KIs and the community members. The kind of soil was described based on texture; and degree of slope was estimated. All forms of resource utilization and other economic activities were noted. The KIs and community members were also asked about the history or past use of the area traversed. Any person met along the way was also interviewed.

The socioeconomic conditions of the place were observed and noted. The team took into account the health situation, nutritional status, sanitation, sewerage, types of dwellings, health and educational facilities, services and utilities, water sources, drainage, means of transportation and communication.

Resource, Social, and Land Use Mapping

After the quick walk, the members of the community convened again with the group in the afternoon for the resource, social, and land use mapping. The maps produced by the KIs during the training and workshop on checklist preparation were presented to the barangay representatives. These served as base maps on which participants were urged to comment and make necessary corrections or modifications according to their perception of the conditions or locations of the resources in the area. To facilitate the process, the community members were asked to identify the specific resources and facilities in the area and where these can be found. The nature of the questions asked depended on the observations made during the quick walk. Later, the community members were asked to approximate the location of the resources, social facilities and utilities on the map. Both aquatic and terrestrial resources were also drawn.

To initiate the construction of a land use map, the members were asked to name the owners of the land from one end of the community to another. With this a parcellary map was made. After the parcellary mapping, they were asked to name the kinds of plants each landowner had planted and the present use of the land. This expedited the land use mapping. Likewise, they were also asked about the previous land use to acquire information on land conversion and processes related thereto.

Seasonal Calendars and Resource Flow Charting

The members of the barangay were asked to provide the kinds of products, both from the sea and from the land, that their barangay was producing. The facilitators verified how these resources were being utilized and managed. The enumeration of the resources in the barangay started from those that were taken from the sea. This was encouraged by letting them identify the kinds of fishing gear used and the species of fish caught and delivered to the local traders, the *compradors*. Then they were asked to identify what they considered were the top ten fish species, based on their own criteria. The top ten were then analyzed in terms of the prevailing price for each, who participated in the catching of these, or their sale, to where these fish would go and in what volume. They were also asked about the problems they encountered with regard to transport or marketing.

The same questions were asked with respect to the shellfish gathered and the products of the land, particularly copra, corn, camote, cassava and the livestock and poultry.

The group also discussed the seasons when a particular kind of fish and shellfish would be in abundance, the time when a particular

fish would have *bihod* (gravid) or at its spawning season peak and the time they would go fishing. The informants were asked about the cropping patterns and the different phases when field preparation, planting, tending and harvesting of the agricultural crops were usually undertaken. The descriptions of these phases and patterns facilitated the drawing of the seasonal calendars of the area. From their descriptions, it was clear that these events were dependent upon the lunar characteristics and rainfall pattern.

In some cases, like in Manla and Caluya, not everybody was able to participate until the end of mapping and resource flow charting as there was a need for them to go to sea. Because the low tide occurred during the time of resource flow charting, the identification of shellfish in the area was facilitated.

Transect Mapping

The second day of the fieldwork in each barangay was spent on transect mapping. The team was divided into two: one for the aquatic area and the other for the terrestrial and mangrove areas. The transects were drawn on the basis of the information derived from the previous days' activities for resource/social/land use mapping. Each member of the group, even children, if there were any, was given a task to perform as part of the team.

The aquatic group, together with the KIs, some fishers and shellfish collectors went snorkeling along an imaginary transect line of at least 50 meters to assess underwater life forms, while others in the boat recorded the observations. In the first four barangays, a basin prepared by the group with a glass bottom was used in viewing the ecosystems under water but after the glass was detached, they had to rely on mask and snorkel. Guided by the prepared checklist, a preliminary assessment was made of the status of the seagrass beds, marine algae and coral ecosystems taking into account the kinds of species, fish, shellfish, and other organisms present. Some physical and chemical parameters (salinity, pH, turbidity, air and water temperature, etc.) were determined using appropriate equipment and materials (refractometer for salinity; WTW Multiline Meter [from IHE, Delft] for temperature, pH, salinity, dissolved oxygen; improvised Secchi disc for turbidity; and mercury thermometer for air and water temperature). To reinforce these activities, the KIs conducted nonstructured interviews of some fisherfolk in the vicinity.

The terrestrial group, accompanied by KIs and community representatives, traversed a certain distance. The land use and land cover were noted. In some instances, the mangrove ecosystem was included (like in Danao and Manla) in the transecting, but in other barangays (Caluya, Punta Sulong, Panalsalan and Punta Miray), a separate group was tasked to do transecting separately in the mangrove areas. The index of relative importance (IRI) was computed following the procedures of English et al. (1994) for mangrove tree species enclosed in a 10m x 10m quadrant.

The various vegetation/land cover, soil type, and other biophysical features were identified and status of the resources observed. Previous land use, tenural status, utilization of plants and other resources or resource use, problems/issues and indigenous knowledge (if any) were noted through nonstructured interviews during the transect walk.

Nonstructured Interviews

Nonstructured interviews were conducted with people found to be best sources of certain information (e.g., the oldest person who could relate the history of the place, a shellfish collector on shellfish gathering).

Focus Group Discussion

Discussion with a group of sector representatives (fishers, shellfish gatherers, women's group, health worker, *comprador*, mat weaver, bamboo furniture maker, bangus fry gatherer, etc.) took place in the

afternoon of the second day, except in Punta Miray where Network Analysis was conducted. The topics discussed included socioeconomic and cultural conditions and the related problems/issues, perceptions towards resources and resource use, reactions/readiness toward biodiversity conservation program, dreams and aspirations (individually, as a family, or as a community). Everybody was urged to participate in the discussion. Techniques were used to ensure that even the most reserved ones will participate.

Observation

Observation was done to validate the results of the discussions and interviews and to crosscheck results of the secondary data analysis. Information collected during the reconnaissance, which served as reference during primary data gathering, were validated through observation as well.

Cross-checking

Cross-checking was carried out in each barangay after preliminary data processing and analysis. For this purpose, the team grouped itself into two, with three members each. One group was assigned to the barangays in Plaridel and the barangay of Punta Miray, the other group to the barangays in Sapang Dalaga and the barangay of Punta Sulong. The data gaps that had been identified in the pre-processing/analysis were filled, and doubts or gray areas were cleared and rectified. Undertaken in one-and-a-half-day's time, cross-checking re-enforced most of the preliminary analysis made and provided more information that were vital for the analysis.

Generally, the conduct of all methodologies made use of various analytical tools enumerated below with respect to time, space, flow pattern, decision-making, and linkage and interaction.

Time	Interview, Focus Group Discussion, Seasonal Calendar, Land Use Mapping
Space	Observation, Transect and Quick Walk, Resource/Social/ Land use Mapping
Flow Pattern	Resource/product Flow Charting
Decision-making	Interview, Focus Group Discussion
Linkage and Interaction	Interview, Focus Group Discussion, Networking Analysis

Post-fieldwork Phase

Preliminary Processing/Analysis and Barangay Profile Making

After the fieldwork and cross-checking were accomplished, activities pertinent to preliminary processing and analysis of both secondary and primary data commenced. A profile was written for each barangay following a common outline. Each team member was assigned to a particular barangay. He/She was responsible in preparing the write-up of the barangay profile and in describing the analysis of interaction dynamics of the people (P), resources (R), and environment (E).

The profile of each barangay was so designed that the barangay officials and other barangay constituents may use it as reference in the formulation of a development plan or any other management interventions that would hasten their empowerment.

Preparation of Community Validation

A meeting of the CEG was conducted to prepare for community validation. Schedules for validation in each of the barangays were made, and these were communicated in person to the respective barangay officials and KIs. A pre-community validation workshop was conducted at SEARCA, Los Baños, Laguna.

Community Validation

The community validation, carried out with the general barangay assembly, was completed in three days with the team reconstituted into two sub-groups. One sub-group was assigned to the barangays located in the municipality of Plaridel and to the barangay of Punta Miray. The other sub-group focused on the barangays located in the municipality of Sapang Dalaga and on Barangay Punta Sulong. Each sub-group accomplished the activity for one barangay in one afternoon until early evening.

The sub-group presented the profile of each barangay, including the issues and problems preliminary identified, and an analysis of information. Together with the barangay constituents, corrections and confirmations were made.

Information was presented using matrices, photographs, and other visual aids. The programme, its concepts, objectives, importance and approaches were likewise discussed. Interaction was encouraged even during the presentation. To encourage greater participation, an open forum ensued after the presentation. The PRE and SWOT (strengths, weaknesses, opportunities and threats) analysis were discussed. The community identified more researchable areas during this session. It was observed that a greater number of the residents, with the leadership of the municipal and barangay officials, attended and participated in the validation. Municipal officials were invited to the validation assemblies, but only those from the municipality of Baliangao to which the barangays of Punta Sulong and Punta Miray belong, were able to attend. As a result, the validation was able to produce additional insights and apply appropriate modifications and corrections to the draft profile of the barangays.

Processing, Analysis and Report Writing

Using the PRE-SWOT tool, further processing and analysis of the preliminary profile and report of each barangay was done. Each of the draft profiles was presented in a team meeting-workshop where comments/suggestions were made. The discussion included the trends, uniqueness and commonalities, and connectivities. The connectivities included horizontal and vertical relationships and involved multi-dimensional aspects that were socioeconomic, political and cultural in nature. Natural flow patterns and the vectors of interconnectivity were accounted for, considering the entire District I of the province where the study sites were located. Identification of researchable areas followed the PRE-SWOT analysis of each barangay. Action needs were likewise identified.

Prior to drafting the final report, another workshop was conducted to identify researchable areas, bearing in mind the interconnectivities of the three ecosystems (upland, lowland and coastal) at all aspects. The researchable areas were prioritized according to several criteria such as biodiversity, needs, urgency, linkages, and policy relevance, among others. Then, researchable areas that cut across the three ecosystems were noted.

Cooperation entities were identified in the implementation of the research. Furthermore, support programs were also enumerated in light of the thrusts for human resource development (HRD), information, education and communication (IEC), database, networking and action.

Profiles of PRA Sites

Physical Environment

Location

The Participatory Rural Appraisal (PRA) sites in the coastal bioregion included six barangays: Manla and Caluya in Sapang Dalaga; Punta Sulong and Punta Miray in Baliangao; and Danao and Panalsalan in Plaridel. Geographically located within the coordinates of 123º 32' E longitude (Manla) to 8º 39' N latitude (Punta Miray), the coastline of these barangays totaled a length of approximately 22.5 km.

Area

The land areas of the barangays ranged from 104.55 to 510 hectares, excluding tidal flats. Caluya had the largest size (510 ha) followed by Panalsalan (344 ha), Punta Miray (171 ha), Punta Sulong (146.45 ha), Manla (109.9 ha) and Danao (104.5 ha).

Accessibility

All coastal communities can be reached by land or water. Motorized banca was the popular means of water transport. Manla and Caluya can be accessed by banca through Dioyo River from the national highway, while Punta Sulong through the sea from Baliangao.

If land transportation was preferred, 'habal-habal' (motorcycle) was the popular passenger vehicle. Jeepneys and other kinds of truck were also utilized when hauling cargo materials in bulk. Manla can be reached through Casul or Damasing from the national highway. Caluya can be accessed through Sapang Dalaga from the national highway; Punta Sulong and Punta Miray can be reached through Calamba. Panalsalan can be found along the national highway (east barangay of Plaridel if going to Ozamiz from Calamba), while Danao, an interior barangay, can be accessed through Looc, Plaridel.

Physiography

The coastal barangays were characterized by narrow flat shoreline to stony and rocky mountainous formations with nearly flat to flat to slightly rugged terrain. The elevation ranged from slightly above sea level to 121 m above sea level (asl). Danao had the lowest elevation (slightly above sea level), followed by Panalsalan (1 to 50 m asl); Punta Miray (5 to 8 m asl); Punta Sulong (5 to 10 m asl); Caluya (10 to 120 m asl) and Manla (10-121 m asl). Punta Miray had one sitio comprising a chain of one large island called Cabgan Island and eight other small islets. Panalsalan also had a chain of Baobaon Islands.

Soil and Climate

Soils in these areas varied from coralline-sandy to sandy-muddy to clay-loam and sandy-loam. Sandy soils were easily drained but drainage slows down as the soils' characteristics changed from sandy-muddy to sandy-loam to clay-loam.

All barangays were classified as Type IV of Corona's climate classification with rainfall that was more or less evenly distributed throughout the year. The people recognized two dominant monsoons: *amihan,* occurring from September to February; and *habagat*, the southwest monsoon blowing in between February and August.

Water Resources

All barangays except Punta Miray, were blessed with a river/creek. Dioyo River passed through Caluya and Punta Sulong. Cawayan River also flowed through Punta Sulong. The Tabyugan Creek flowed through Manla, the Inamucan River flowed through Panalsalan, and the Ducaling River and the Itusan River which is forked by Naipus Creek before it finally drains to the sea passed through Danao. Summary of the six barangays' physical environment features can be found in Table 1.

Coastal Water Quality

Tests were made of the coastal water quality in several sample points with an average depth of 2.4 m to 4.01 m. Salinity (in ppt) and sea surface water temperature were measured. Test results revealed that salinity varied from 21.78 ppt to 32.35 ppt. The salinity levels were observed to increase with the distance from the shore to the deeper waters (*alo* [reef edge] and *ngihib* [beyond reef edge]). The overlaying waters were quite clear except in areas near the mouth (*bukana*) of the rivers and creeks. Sea surface water temperature did not differ that much. The variation was negligible in both sea surface and water temperatures (SST = 29.7˚C to 30˚C; water temperature = 29.75˚C to 30.1˚C). Tidal types in all sites were of mixed diurnal type (Choi et al. 1997).

Sediment Types

The sediment types, however, varied from *bukana* (river mouth) to *alo* (offshore, deep water) and *ngihib* (reef crest). Manla's sediment types included sandy-muddy *bukan, kalusayan* (seagrass beds), *ngihib*, sandy gravel at mid-*bukana* and sand and gravel at the inner part of Tabiogan Creek. The presence of sand and gravel in Tabiogan Creek allowed some of the residents in the past to quarry these sediments for construction purposes. Caluya was also characterized by muddy *bukana*, sandy-muddy *kalusayan* and *alo* and sandy-coralline *ngihib* substrata. Danao, on the other hand, had substrates that were sandy-muddy at the *bukana* and sandy-coralline to rocky-coralline. Panalsalan had coral rubble in front of beaches and muddy areas in waterways. The *pasil* (reef flat) and the kalusayan were sandy-muddy. Mangrove areas and seagrass beds in Punta Sulong were characterized by muddy substrate but sandy-muddy to rocky-sandy in the coral reef area. The sediment types, as well as the water qualities of the PRA sites of the coastal ecosystem were summarized in Table 2.

Status of Key Bioresources

Mangrove Forest

The estimated areas of existing mangrove forests in the six barangays ranged from 3 to 140 ha. The smallest area was found in Manla while the largest was in Danao. Except for the sparse primary growth in Danao and Punta Sulong, all the rest of the sites had secondary growth. Panalsalan, Danao and Punta Sulong had very dense secondary growth while the rest had sparse secondary growth. Secondary growth had become denser due to the DENR's program, the Coastal Environment Program at Punta Sulong, Punta Miray, and Danao. In these sites, about 79.6 ha were replanted with *bakhaw* or *Rhizophora* spp. Fifteen was the highest observed number of tree species in the research sites (Tables 3 and 4) in Punta Sulong, Danao and Punta Miray. The palm, *Nipa fruticans* was found in all sites with the densest in Caluya which had a dense afforestation of the mangrove palm.

In terms of dominance, there was an apparent shift from the prop-roots bearing *Rhizophora* spp. dominant in the Murcielagos Bay areas of Manla and Caluya to pneumatophore bearing *Sonneratia* spp. in the more exposed areas of Punta Miray, Danao and Panalsalan. The dominant mangrove tree species in Punta Sulong was the tabige or *Xylocarpus granatum* with buttress (Table 4). According to Calumpong (1994), there were about 50 tree species present in the Philippines. The total number of species present in the sites was less than 50% of the national total record.

Among the fauna associated with the mangroves were 12 species of shellfish (see Table 5), five species of birds, four species of reptiles, including the sail fin lizard, *Varanus salvator* (*halo*) and the monitor lizard, *Hydrosaurus postulosos*, the *walo-walo* (*Laticauda* sp.) and other species of lizards.

Table 1. Summary of features of the six coastal PRA sites

FEATURES	MANLA	CALUYA	PUNTA SULONG
Location	123°32'E; 8°36'N	123°34.2'E; 8°35'N	123°35'E; 8°35'N
Land area (ha)	109.9	510	146.45
Physiography	Volcanic rocky outcrops; narrow flat shoreline; 10-121 m above sea level (asl)	Rugged terrain with steep, stony and rocky mountainous formations; 10-120 m asl	Flat to slightly sloping shoreline; with tidal flats 5-10 m asl
Soil Type	Castilla clay loam	Clay loam	Clay loam
Climate	Type IV; monsoons	Type IV; monsoons	Type IV; monsoons
Accessibility (Facilities)	Bancas, motorcycles	Bancas, motorcycles	Bancas, motorcycles, trucks, jeeps
Accessibility (Route)	Highway through Casul, Sapang Dalaga; Damasing, Sapang Dalaga or Rizal, Zamboanga del Norte; through Dioyo River	6 km from highway; through Dioyo River	From Baliangao highway through Dioyo River
Origin of Name	*Takla*-sound of fiddler crab (*Uca* sp.)	*Makaluya* or tiring to climb up to buy sugar from a sugar mill in the past	Foreland or promontory pointing towards Murcielagos Bay
Total Population	637 (117 households)	767 (162 households)	1247 (184 households)
Ethnic Origin	90% Siquijor	75% Siquijor; 20% Subanons	80% Bohol
Population Structure	Young; 0-9 years old	5-15 years old dominant	Young; 1-6 years old
Residency	5-79 years	31-60 years	40-80 years
Sex Ratio	1M: 1F (slightly more male)	1:1	Slightly more male
Population Density	5.8 persons/ha	1.5 persons/ha	8.5 persons/ha
Education	Few college and high school; mainly elementary level	5% high school and college; the rest elementary level	5% high school and college; mainly elementary level
Fiesta Celebration	13 June	15-16 August	15-16 August
Toilets	Majority Antipolo type	Antipolo; water sealed	Antipolo; water sealed
Health Workers	2 BHW; 1 visiting midwife	4 BHW; 1 visiting midwife	2 BHW
Water Supply	Spring	Level II; spring; reservoirs	Level II; reservoir
Water Resources	Tabyogan Creek	Dioyo River	Dioyo River; Cawayan River
Lighting	>90% (MOELCI)	>50% (MOELCI)	>90% (MOELCI)
Infrastructure	Barangay hall; basketball court; day care center	Barangay hall; basketball court; day care center	Barangay hall; basketball court; day care center

Table 1. Summary of features of the six coastal PRA sites *(continuation)*

FEATURES	PUNTA MIRAY	DANAO	PANALSALAN
Location	123°35'E; 8°39'N	123°39'E; 8°37.5'N	123°43.5'E; 8°33.8'N
Land Area (ha)	171	104.5	344
Physiography	Flat to nearly flat peninsula; coralline islands; white sandy beach; with tidal flats; 5-8 m asl	Flat with tidal flats; gray beach sand; slightly above sea level	Flat to gently rolling terrain; coralline islands; white sandy beaches; 1-50 m asl
Soil Type	Coralline; mixed clay loam	Sandy-muddy; sandy	Clay loam
Climate	Type IV; monsoons	Type IV; monsoons	Type IV; monsoons
Accessibility (Facilities)	Bancas, motorcycles, jeepney, trucks, cars	Bancas, motorcycles, jeepney, trucks, cars	Bancas, motorcycles, jeepney, trucks, cars
Accessibility (Route)	National road from town proper (2 km)	National road from poblacion	National road (first barangay of Plaridel from Ozamiz)
Origin of Name	Place of *Miray,* the pioneer woman who opened a farm for her family	*Danao* - water lagged substrate	*Salsal* - blacksmith activity of making knives and metal tools
Total Population	1207 (269 households)	573 (105 households)	2097 (479 households)
Ethnic Origin	50% Bohol; 30% Siquijor	60% Siquijor; 35% Bohol	40% Siquijor; 60% Bohol
Population Structure	Young: 0-12 years old	Young: 0-10 years old	Young: 0-10 years old
Residency	10-60 years	10-70 years	2-70 years
Sex Ratio	1:1	1:1	Slightly more male
Population Density	7.06 persons/ha	5.5 persons/ha	6.1 persons/ha
Education	3% high school and college; mainly elementary level	Mainly elementary level	4-6% high school and college; the rest elementary level
Fiesta Celebration	19 March; 29 June; 16 July; 24 June	16 January; 3 May	11 May
Toilets	Antipolo; water sealed	Antipolo; water sealed	Water sealed
Health Workers	3 BHW	3 BHW	5 BHW; 1 visiting midwife
Water Supply	Rainfall; Artesian well from Town Proper	Level I	Level II; Reservoir
Water Resources	None	Ducaling River; Itusan River	Inamucan River
Lighting	>60% (MOELCI)	>80% (MOELCI)	>60% (MOELCI)

Table 2. Water quality, and sediment types of the coastal PRA sites

	MANLA	CALUYA	PUNTA SULONG	PUNTA MIRAY	DANAO	PANALSALAN
Salinity (°/₀₀)	23.66	23.75	21.78	31	32.35	28
Turbidity (m) (Secchi depth)	2.79	9.75	2.5	5.5	2.4	6
Water Temperature (°C)	30	29.75	23.3	30.3	30.1	29.8
Air Temperature	29.7	29.75	27	31	30	32
Sediment Type	Sandy-muddy at seagrass beds; sandy-muddy (middle of estuary); sand and gravel (inner part of Tabiogan Estuary)	Muddy (mouth of Dioyo River); sandy-muddy (seagrass and deeper waters); sandy-coralline (reef crest and slope)	Muddy (mangrove area to seagrass beds) and muddy-sandy to rocky-sandy (coral reef area)	Sandy-muddy (seagrass bed); rocky-sandy-coralline (reef flat and reef slope)	Sandy-coralline (in front of Ducaling River mouth; reef flat); sandy-muddy (mouth of Ducaling River); rocky-coralline (reef crest)	Sandy coral rubble (front beach); muddy (waterway)
pH			8.16	8.22	8.28	8.29
Dissolved Oxygen (mg/L) (1 m from the surface)			6.15	6.50	6.9	6.35

Table 3. Status of key bioresources of the six coastal PRA sites

Resource	Barangay Manla, Sapang Dalaga	Barangay Caluya, Sapang Dalaga	Barangay Punta Sulong, Baliangao	Barangay Punta Miray, Baliangao	Barangay Danao, Plaridel	Barangay Panalsalan, Plaridel
MANGROVE FOREST	Tabyogan estuary	Dioyo Estuary	Cawayan and Dioyo Estuary	Punta Miray Proper and Doyong Coast	Itusan and Ducaling Estuary	Inamucan and Sibula Estuary
	3-4 ha	10 ha	128 ha	10-15 ha	160 ha	40 ha
	Sparse secondary growth	Dense secondary growth	Very dense secondary growth; sparse primary old growth	Sparse primary old growth	Dense secondary growth; Dense primary growth	Dense secondary growth; Sparse primary growth
	9 tree sp.	9 tree sp.	15 tree sp.	15 tree sp.	14 tree sp.	15 tree sp.
	Dominance: *Rhizophora mucronata* > *R. apiculata* > *S. alba* > *Luminitzera racemosa* > *X. granatum*	Dominance: *Rhizophora mucronata* > *Sonneratia caseolaris* > *R. apiculata*	Dominance: *Xylocarpus granatum* > *R. apiculata* > *Avicennia officinalis* > *S. alba* > *L. racemosa* = *R. mucronata*	Dominance: *Sonneratia caseolaris* > *R. mucronata* > *A. officinalis* > *R. apiculata* > *R. stylosa*	Dominance: *Sonneratia* sp. > *A. marina* > *A. officinalis* > *L. racemosa*	Dominance: *Sonneratia* sp. > *A. marina* > *R. apiculata* > *R. mucronata* > *R. stylosa*
	Fauna: 10 sp. shellfish monitor lizard, snakes, birds	Fauna: 12 sp. shellfish 12 birds 3 reptiles	Fauna: 12 sp. fish 7 sp. shellfish 5 sp. bird 4 sp. reptiles	Fauna: 5 sp. shellfish 12 sp. birds	Fauna: 5 sp. shellfish	Fauna: 8 sp. shellfish 7 sp. birds 1 sp. flying fox
	Use: 5 ha nipa afforestation 3.5 ha fishpond (abandoned)	Use: 20 ha nipa plantation 10 ha fishpond	Use: >2 ha nipa plantation 25 ha fishponds	Use: 1-2 ha fishpond 20 ha saltponds	Use: 69.5 ha fishpond	Use: 13 of 50 ha fishpond converted to rice paddies

Table 3. Status of key bioresources of the six coastal PRA sites *(continuation)*

Resource	Barangay Manla, Sapang Dalaga	Barangay Caluya, Sapang Dalaga	Barangay Punta Sulong, Baliangao	Barangay Punta Miray, Baliangao	Barangay Danao, Plaridel	Barangay Panalsalan, Plaridel
SEAGRASS BEDS	Found on reef flats	Found on reef flats	Found on reef flats	Found on reef flats	Found on reef flats	Found on reef flats
	20-80% cover	20-80% cover	50-80% cover	30-60% cover	40% cover	30-50% cover
	Mixed *Enhalus* and *Thalassia*	Mixed *Enhalus* and *Thalassia*	Mixed *Enhalus* and *Thalassia*	Mixed *Enhalus* and *Thalassia*	Mixed *Enhalus* and *Thalassia*	Mixed *Enhalus* and *Thalassia*
	Small patches	Small patches	Extensive dense patches	Extensive patches	Small patches	Extensive patches
		Other seagrass species: *Cymodocea* and *Halophila*		Other seagrass species: *Cymodocea* and *Syringodium*	Other seagrass species: *Syringodium*	Leaves with dense Epiphytes
	Fauna: 10 species of shellfish crab: *Portunus pelagicus (lambay)* Fish: *Siganus fuscescens*	Fauna: Few shellfish species Fish: *Siganus fuscescens*	Fauna: 29 species of shellfish, sea hare dominant Fish: *Siganus fuscescens* Sea horse present	Fauna: Many shellfish species 4 species sea urchin crab: *Portunus pelagicus* Fish: *Siganus canaliculatus*	Fauna: 17 species shellfish Fish: *Siganus canaliculatus*	Fauna: With plenty of shellfish species, sea hare present Fish: *Siganus canaliculatus*

Table 3. Status of key bioresources of six coastal PRA sites (*continuation*)

Resource	Barangay Manla, Sapang Dalaga	Barangay Caluya, Sapang Dalaga	Barangay Punta Sulong, Baliangao	Barangay Punta Miray, Baliangao	Barangay Danao, Plaridel	Barangay Panalsalan, Plaridel
MARINE ALGAE	Patchy algae on reef	Very patchy on small reef areas	Very patchy	Rich in species in extensive reef areas	Very patchy	Rich species in reefs
	Dominant: *Sargassum* spp.	Dominant: *Sargassum* spp.	Dominant: *Sargassum* spp.	Dominant: *Sargassum* spp.	Dominant: *Sargassum* spp.	Dominant: *Sargassum* spp.
	Minor Species: *Halimeda* sp. and *Gracilaria* Associated with seagrasses and corals	Minor Species: *Padina* sp. and *Halimeda* *Caulerpa* introduced but failed	Minor Species: *Padina* sp., *Glacilaria* and *Halimeda* sp.	Minor Species: *Halimeda* sp., *Padina* sp., *Gelidiella* sp., *Turbinaria* sp. and *Gracillaria* sp.	Minor Species: 12 other spp.	Minor Species: *Galaxaura* sp., *Padina* sp. and *Halimeda* sp. *Kappaphycus* sp. successfully cultured in specific areas

Table 3. Status of key bioresources of six coastal PRA sites (*continuation*)

Resource	Barangay Manla, Sapang Dalaga	Barangay Caluya, Sapang Dalaga	Barangay Punta Sulong, Baliangao	Barangay Punta Miray, Baliangao	Barangay Danao, Plaridel	Barangay Panalsalan, Plaridel
CORAL COMMUNITY	Narrow fringing reefs on island and coastline	Narrow fringing reefs	Seagrass dominated reef	Extensive fringing reefs	Less extensive fringing reefs	Extensive fringing reefs with channels and overhangs
	Status: poor on mainland; fair to good on *takot* or shoal	Status: poor	Status: poor	Status: poor to fair	Status: poor to fair; but small patches good to excellent	Status: poor to fair; with small patches good Dense crown of thorns
	Common: Massive (*Porites* and other brain corals)	Common: 3 species massive corals	Common: *Pocillophora* sp., *Porites* sp., few *Acropora*	Common: *Acropora* tabulate abundant plus other branching spp.; 2 species of *Acropora*	*Common: Acropora sp.* (tabulate and branching) and foliose	*Common: Acropora sp.* tabulate also very abundant; plus branching and massive corals
	7 other species; mainly massive			11 species other hard corals 2 species soft corals	15 species total with dominant soft coral communities	
				Dense crown of thorns found in gradually sloping reefs	Sparse crown of thorns sea star	Dense crown of thorns sea star
	Silty	Silty	Less silty	Less silty	Less silty	Less silty

Table 3. Status of key bioresources of six coastal PRA sites (*continuation*)

Resource	Barangay Manla, Sapang Dalaga	Barangay Caluya, Sapang Dalaga	Barangay Punta Sulong, Baliangao	Barangay Punta Miray, Baliangao	Barangay Danao, Plaridel	Barangay Panalsalan, Plaridel
FISH	142 fish species recorded	56 species	103 species from *bungsod*	56 species 8 species deep sea	26 species	32 species
	Siganidae (most common)	*Siganidae* (most common)	*Siganidae* (most common)	*Siganidae* dominated	*Siganidae* (very common)	*Siganidae* (very common)
	Fished from Rizal, Sapang Dalaga, Plaridel, Baliangao waters	36 species of shellfish from Naburos and Punta Sulong Reefs	28 species shellfish from seagrass beds	17 species reef fish with indicator 3 species (butterfly fish)	Ducaling Estuary with bangus fry	
		12 species from mangrove area	Reef fish very small in size	22 species shellfish (sizes very small)	Shore waters and Iligan Bay as fishing grounds	Shore waters and Iligan Bay as fishing grounds

Table 3. Status of key bioresources of six coastal PRA sites (*continuation*)

Resource	Barangay Manla, Sapang Dalaga	Barangay Caluya, Sapang Dalaga	Barangay Punta Sulong, Baliangao	Barangay Punta Miray, Baliangao	Barangay Danao, Plaridel	Barangay Panalsalan, Plaridel
TERRESTRIAL RESOURCES	Major crop: coconut	Major crop: coconut	Major crop: coconut	Major crop: coconut	Major crop: coconut	Major crop: coconut
	Minor crop: banana, cassava, corn	Minor crop: banana	Minor crop: banana, cassava, corn, rice	Minor crop: banana, corn, cassava, camote, vegetables	Minor crop: corn (few)	Minor crop: rice, corn, fruits, vegetables
	Few: cacao, coffee and vegetables			Plantation: mango, pomelo	Total vegetation: 77 sp.	
	Premium trees: ipil and tugas	Fruit trees: 15 sp. Crops and vegetable: 25 sp. Other: 58 sp. Timber tree: 24 sp.	Fruit trees: 29 sp. Timber trees: 56 sp. Vegetables: 8 sp. Grass/Herbs: 36 sp. Ornamental: 38 sp. Root crops: 5 sp.	33 other plant sp.		
	48 sp. medicinal plants	Grass and herbs: 30 sp.	54 sp. medicinal plants	23 sp. medicinal plants plus bangkuro or *Morinda citrifolia*	30 sp. medicinal plants	45 sp. medicinal plants

Table 4. Mangrove tree species observed in six coastal PRA sites

Barangay Manla	Barangay Caluya	Barangay Punta Sulong	Barangay Punta Miray	Barangay Danao	Barangay Panalsalan
Avicennia marina	*Avicennia officinalis*	*Aegiceras corniculatum*	*Avicennia alba*	*Avicennia marina*	*Aegiceras corniculatum*
A. officinalis	*Bruguiera sexangula*	*Avicennia marina*	*A. marina*	*A. officinalis*	*Avicennia marina*
Ceriops tagal	*B. parviflora*	*A. officinalis*	*A. officinalis*	*Ceriops tagal*	*A. officinalis*
Lumnizera racemosa	*Ceriops* sp.	*Bruguiera* sp.	*Bruguiera sexangula*	*C. decandra*	*Bruguiera sp.*
Rhizophora apiculata	*Rhizophora mucronata*	*Ceriops* sp.	*Brigioera sp.*	*Excoecaria agallocha*	*Ceriops sp.*
R. mucronata	*R. apiculata*	*Lumnitzera racemosa*	*Ceriops sp.*	*Lumnitzera littorea*	*Excoecaria agallocha*
R. stylosa	*Xylocarpus granatum*	*Rhizophora mucronata*	*Excoecaria agallocha*	*Lumnitzera racemosa*	*Lumnitzera racemosa*
Sonneratia alba		*R. apiculata*	*Lumnitzera racemosa*	*Rhizophora mucronata*	*Rhizophora mucronata*
Xylocarpus granatum		*R. styloza*	*Rhizophora apiculata*	*R. apiculata*	*R. apiculata*
		Sonneratia alba	*R. mucronata*	*R. stylosa*	*R. stylosa*
		S. caseolaris	*R. stylosa*	*Sonneratia alba*	*Sonneratia alba*
		Scyphiphora hydrophyllacea	*Scyphiphora hydrophyllacea*	*S. caseolaris*	*Scyphiphora hydrophyllacea*
		Xylocarpus granatum	*Sonneratia alba*	*Xylocarpus granatum*	*Xylocarpus granatum*
			S. caseolaris		*Xylocarpus moluccensis*
			Xylocarpus mollucensis		

Table 5. Floral and faunal associates of mangroves in the six coastal PRA sites

Associates	Manla	Caluya	Punta Sulong	Punta Miray	Danao	Panalsalan
Flora	talisay balok-balok balagon nipa agbao ipil balagon 1 balagon 2 pantod bunot buri siyapo	talisay balok-balok balagon nipa agbao ipil pantod bunot buri siyapo	nipa siapo balagon 1 balagon 2 *Acanthus* sp.	*Acanthus* sp. sapinit *Dischidia* sp. balagon malabago agbao balok-balok palma	nipa balagon pagaypay romblon bangkal balok-balok balagon *Acanthus* sp. agbao	nipa banay agbao balok-balok taloot nigad alma bagaswa borakaw olasiman balagon *Acanthus* sp. pagaypay
Fauna						
A. Shellfish	bagongon embao tuway dalodalo sihi tapok-tapok	tuway bagongon tapok-tapok sihi dalo-dalo baye dalo-dalo laki imbaw saka-saka talaba tagnipis bakalan bilaog	alimango bagongon dalo-dalo imbaw talaba tapok-tapok tuway	bagongon dalo-dalo tuway sihi taguinipis	tuwai imbaw bagongon tapok-tapok dalo-dalo	balongsangag imbaw dalo-dalo bagongon talaba tuway tapok-tapok saka-saka
B. Birds	bagwa lapay luayo kingfisher	bagwa tikarol kingfisher tamsi talabong yoho lapay	alyabyab kingfisher lapay tulabong yuho	tamsi kingfisher	tamsi	tukmo tugikaw kurwakwak tikarol talabong kulansiyang tugikaw
C. Fish	tambasakan bunog	tambasakan gono ibis	tambasakan ahaan bangus bawak bigiw dalagon manabing sabalo/awa	tambasakan gono ibis	tambasakan gisaw bunog palo ahaan	tambasakan guno gisaw
D. Crustacean	takla alimango ulang	alimango suga-suga uson agokoy takla ulang	alimango	saka-saka takla agokoy ulang	kagang alimango sugasuga agukoy	alimango
E. Others	halo ibid	balagtok (*Rattus* sp.) halo	flying fox (*Pteropus vampyrus**)	red ants, flying fox (*Pteropus vampyrus*), termite, butterfly	flying fox (*Pteropus vampyrus*), crocodile	flying fox (*Pteropus vampyrus*)

* Rabor 1977

Loss of tree species may be attributed to heavy cutting in the past and mangrove conversion into fishponds, salt ponds and rice paddies. The fishpond areas ranged from two to 69.5 ha with the highest conversion occurring in Danao, Plaridel. Although, there were only two hectares of fishponds in Punta Miray, there was a 20-ha salt pond devolved from fishponds. There were about 37 ha of mangrove areas converted into rice paddies in Panalsalan. More than half of these paddies were abandoned.

Seagrass Beds

Of the 16 Philippine species (Fortes 1994), four were observed in the six PRA sites. The most common seagrass species present in all sites were *Enhalus acoroides* and *Thalassia hemprichii*. These species occured in single or mixed species seagrass beds. Seagrass cover in all sites ranged from 20% to 80%, but the densest were found in Punta Sulong, Punta Miray and Panalsalan. In Caluya, *Cymodocea* sp. and *Halophila* sp. were also found. In Punta Miray, aside from *Cymodocea* sp., *Syringodium* sp. was also found (Tables 3 and 6).

At the time of the rapid appraisal, the blades of the dominant seagrass species had thick epiphytic or epibiotic growth. Fishers from the sites attributed the dense infestations on seagrass blades to the slack water during the southwest monsoon. They added that during northeast monsoon, strong waves and currents tend to clean up the epibionts so leaves appear cleaner after the NE Monsoon. Moreover, run-off that contained agrochemicals from land may have contributed to these infestations.

Among the faunal associates of the seagrass beds, 36 species of shellfish (Table 7) were observed to be very common. These different kinds of shellfish buried themselves at different depths in the sandy-muddy substrate of the beds. The juveniles of the blue crab *Portunus pelagicus* also settled in these beds to seek shelter and food. The adults of this crab occupied the clear sandy substrate adjacent to the seagrass beds. In Punta Sulong, Caluya, and Punta Miray, the sea hare, *Dollabela* sp. (*donsol*) was quite common. During the drier months of March to May, this nudibranch mollusk shed egg strings (*lokot*) that were harvested by local fisherfolks to sell in local markets. Among the fish associates, the highly herbivorous rabbitfish *Siganus fuscescens* or *danggit* was the dominant finfish that needed the seagrass beds. Its juveniles or fingerlings swarmed over *Thalassia* beds to forage and seek shelter. Fishers mentioned that the *danggit* followed a feeding migration pattern, in that as juveniles they foraged on seagrass beds and then left the area for sometime. When they reached the sub-adult stage or experienced their first maturity they visit the beds again to forage and mate. Gravvid females also joined these sub-adults to spawn. The mating and spawning periods of these fish occurred during the New Moon phase. Common knowledge about this pattern was the basis for formulating the ordinance providing for a monthly fishing ban period of 2 to 3 days from the New Moon in all of the six sites. In Punta Sulong, the Philippine species of seahorse (*Hippocampus* sp.) was found, but this species had become rare because fishers had been collecting and drying them for the curio and aphrodisiac dried seahorse trade. The fisherfolk also noted several species of fish whose juveniles utilized the seagrass beds as shelter and nursery areas.

Marine Algae

Tables 3 and 8 show a list of marine algal species observed in all sites. Most occurred in small patches from the waters of mangroves down to the reef slopes. *Padina* sp., *Halimeda* sp. and *Gracillaria* sp. were common near mangrove areas while *Sargassum* sp., *Turbinaria* sp., *Amphiroa* sp. and *Galaxaura* sp. were very common in the reef flats, either forming narrow zones or found interspersed within seagrass beds and coral communities. The brown algae (*Phaeophyta*) *Sargassum* spp. formed

sparse to dense beds in all sites. The most common fish that utilized the *Sargassum* sp. bed was another siganid, the *kitong* or *Siganus guttatus*. Like *S. fuscescens*, schools of *S. guttatus* used *Sargassum* beds as food, shelter and spawning grounds during the new moon phase.

Table 6. Seagrass species observed in the six coastal PRA sites

Barangay Manla	Barangay Caluya	Barangay Punta Sulong	Barangay Punta Miray	Barangay Danao	Barangay Panalsalan
Enhalus acoroides *Thalassia hemprichii*	*Enhalus acoroides* *Thalassia hemprichii* *Cymodocea* sp. *Halophila* sp.	*Enhalus acoroides* *Thalassia hemprichii*	*Enhalus acoroides* *Thalassia hemprichii* *Cymodocea* sp. *Syringodium* sp.	*Enhalus acoroides* *Thalassia hemprichii* *Syringodium* sp.	*Enhalus acoroides* *Thalassia hemprichii* *Syringodium* sp.

Table 7. Common shellfishes observed in the six coastal PRA sites

Barangay Manla	Barangay Caluya	Barangay Punta Sulong	Barangay Punta Miray	Barangay Danao	Barangay Panalsalan
Gastropods Annikad 1 Annikad 2 Bongkawel Buta-buta Kundandoy Kumang-kumang Saang **Bivalves** Amahong Bisala Kalaykay Kandiis Litob Sulod-sulod Sundang-sundang	Bangongon Bakalan Bilaog Dalo-dalo baye Dalo-dalo laki Imbaw Saka-saka Sihi Tagnipis Talaba Tapok-tapok Tuway	**Gastropods** Amomongpong Aninikad Bagongon Baluso Bongkawil Bulanbulan Butabuta Dalodalo Kapinan Kondadoy Puki Saang Tagmanok Tapoktapok Tuigtuig Turay-ok **Bivalves** Amahong Bugatan Bisala Imbaw Kabankaban Kandiis Katupngan Kalaykay Litob Talaba Tambayang Tuway	Amahong Amomongpong Aninikad Ansoanso Bakalan Budong Bug-atan Gubaguba Kalaykay Kandiis Kapinan Katupnan Kibol Kondasoy Liswi Litob Puki Saang Sungkodsungkod Tagmanok Turay-ok Wasaywasay	Amomongpong Aninikad Bagongon Baloso Bisala Bongkawil Budyong Buta-buta Dalo-dalo Hunsoy-hunsoy Imbaw Kapinan Kibol Lagang (deep sea) Litob Limban Nasa Pusik Saang Sali-ot or Taklobo Samong Sigay Sulod-sulod Talaba Tamislat Tipay Tuwai	Amomongpong Aninikad Bagongon Baloso Bisala Bongkawil Budyong Buta-buta Dalo-dalo Hunsoy-hunsoy Imbaw Kapinan Kibol Lagang (deep sea) Litob Limban Nasa Pusik Saang Sali-ot or Taklobo Samong Sigay Sulod-sulod Talaba Tamislat Tipay Tuwai

Coral Communities

According to Gomez et al. (1992) the status of Philippine coral reefs may be categorized into excellent (only 1.3% remaining), good (7.5%), fair (49.2%), and poor (42%). The study sites of this assessment included the northern reefs of Misamis Occidental and the contiguous Murcielagos Bay of Zamboanga del Norte. They rated these sites as being poor to fair, i.e., with coral cover of less than 50%. The coral reefs in the six sites were of two types, the fringing and shoal types. The fringing reefs showed a characteristic gradual sloping. Using the standards used by Gomez et al. (1992), three western sites had poor status (10 to 15% cover) except for the shoal shared by Manla and Caluya, which had been considered as fair (Tables 3 and 9). The remaining types of corals present in these areas were few colonies of massive *Porites* sp. The waters overlaying these reefs appeared silty compared to the waters in the other three sites. The three eastern sites had fair status but particularly in Plaridel (Danao and Panalsalan), small patches of corals may be considered excellent (Table 9). In these sites, dense tabulate *Acropora* spp. were present together with several species of branching *Acropora*. In addition, several branching, massive, fungiid, and brain corals occur. Table 9 shows the different species of corals found in these patches. Two species of soft corals were found in the three sites.

Also very common in the reef sites with fair to good status were the crown of thorns sea stars (*Acanthaster planci*), a known voracious grazer on coral polyps. Dense populations of this predator occurred in Panalsalan reefs. Local fisherfolk attribute this to the heavy rainfall that occurred in the sites.

Fish

Up to 142 kinds of fish (Table 3) were named by the fishers and the highest number was recorded in Manla. These fish were mainly caught within the shallow areas of the coasts of Zamboanga del Norte, Baliangao, Plaridel and Lopez Jaena. Some fishers visited the waters of Bohol, Siquijor and Iligan Bay. In Punta Miray, eight species of deep water fish were named. These were fished at depths of 70 to 100 fathoms (21 to 30 meters). The dominant fish in the catch were siganids.

In areas with fair to good coral communities, several reef fish species found were said to be indicators of good health (Aliño 1994). Good examples of these were the reef fishes found in Punta Miray (Table 10) and the abundance of *bangus* fry collected along Ducaling Estuary was unique to Danao.

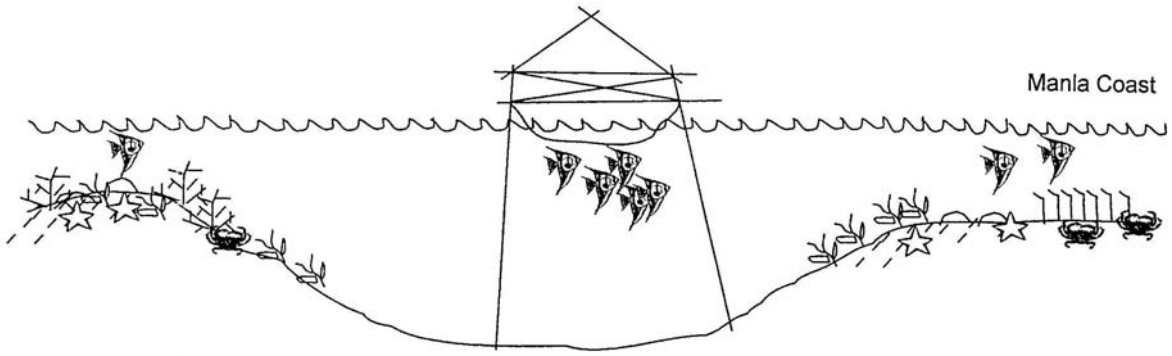
The period between May and September was the peak harvest period of most finfish and commercial invertebrates identified by local communities (Table 11). These months coincided with the annual peak in spawning and breeding of most commercial fishes (Johannes 1978; Robertson 1991). The coastal transect maps of the research sites are found in Figures 2 to 7.

Terrestrial Resources

As in the lowlands, the six coastal barangays have coconuts as the major crop. Bananas, cassava, corn and rice were the minor crops planted either in the understorey of coconuts or in open field areas. Figures 8, 9, 10, 11, 12 and 13 show the transects or horizontal profiles of the various coastal barangays.

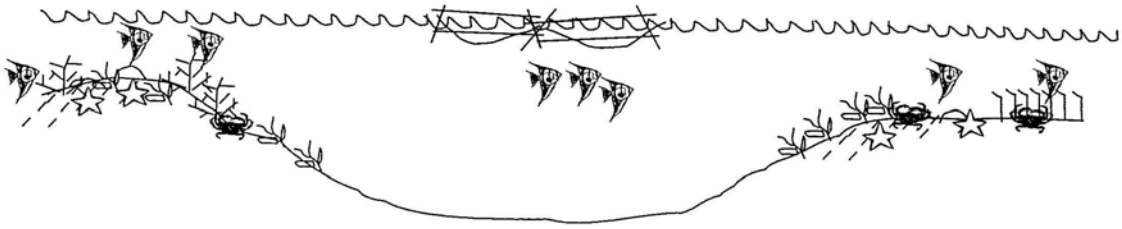
Up to 29 species of fruit trees, 56 species of timber trees, 38 species of grass and herbs were observed in the sites (Table 12). There were 23 to 54 kinds of medicinal plants in the sites.

Soil in farmlands required fertilizers to be productive, especially in Punta Miray and Panalsalan.



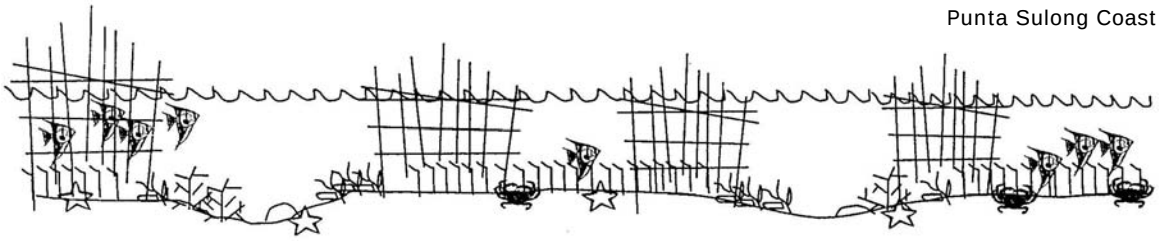
DIRECTION	Northeast	Northeast	Northeast	Northeast	Northwest	Northwest
SLOPE	flat to sloping	sloping	bottom	bottom	sloping	flat
SUBSTRATE	sandy-coralline		sandy-muddy		sandy-coralline	sandy-muddy
RESOURCES	corals, fish, algae		soft bottom communities		algae, massive corals, seagrasses	
PROBLEMS AND ISSUES	blast fishing; siltation; flash flood	blast fishing; siltation; flash flood	newlook; siltation; flash flood	fine mesh nets; siltation; flash flood	overcollection of invertebrates; siltation; agrochemicals; sewage flash flood	
OPPORTUNITIES	marine sanctuary		floating fish cages		shellfish collection	

Figure 2. Coastal transect map of Barangay Manla, Sapang Dalaga, Misamis Occidental



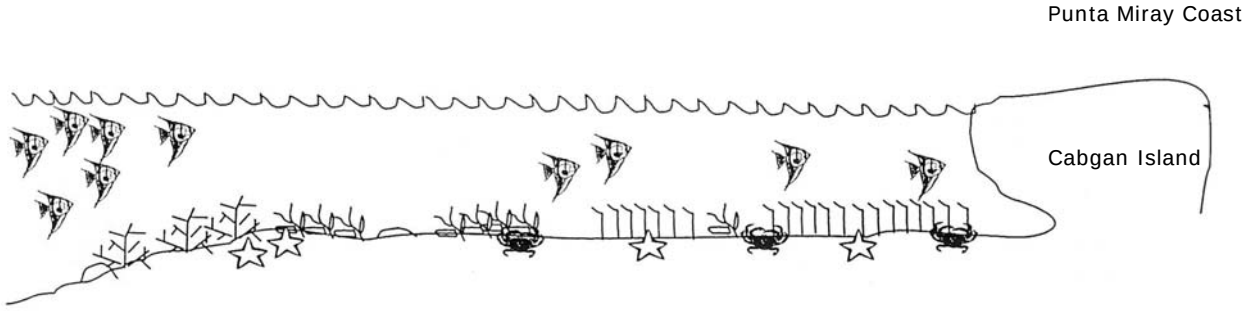
DIRECTION	Northwest	Northwest	Northwest	Northwest	Southwest	Southwest
SLOPE	flat to sloping	sloping	sloping	sloping	flat	flat
SUBSTRATE	sandy-coralline		sandy-muddy		sandy-coralline	sandy-muddy
RESOURCES	corals, fish, algae		soft bottom communities		algae, massive corals, seagrasses mangrove reforest	
PROBLEMS AND ISSUES	blast fishing; siltation; flash flood	blast fishing; siltation; flash flood	fouling in fish cages; fouling on bottom; siltation; flash flood		overcollection of invertebrates; siltation; agrochemicals; sewage flash flood	
OPPORTUNITIES	marine sanctuary		pelagic culture		ecotourism	

Figure 3. Coastal transect map of Barangay Caluya, Sapang Dalaga, Misamis Occidental



DIRECTION	**Northwest**	**Northwest**	**Northwest**	**Northwest**	**Northwest**	**Northwest**
SLOPE	flat to sloping	sloping	flat	flat	sloping	flat
SUBSTRATE	sandy-muddy	sandy-muddy	sandy-muddy	sandy-muddy	sandy-muddy	sandy-muddy
RESOURCES	few branching corals; seagrasses		soft bottom communities seagrasses; shellfish		algae; few corals; dense seagrasses	
PROBLEMS AND ISSUES	blast fishing; siltation; flash flood	blast fishing; siltation; flash flood	siltation; alteration of current by fish corals; siltation; flash flood		overcollection of invertebrates; siltation; agrochemicals; sewage flash flood	
OPPORTUNITIES		seagrass reserve	shellfish collection		ecotourism	mariculture

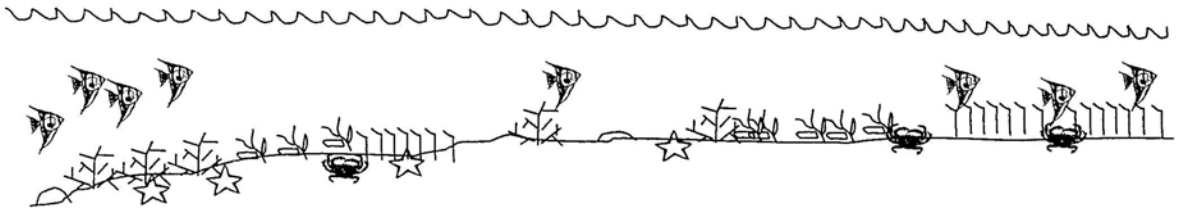
Figure 4. Coastal transect map of Barangay Punta Sulong, Baliangao, Misamis Occidental



DIRECTION	Northwest	Northwest	Northwest	Northwest	Northwest	Northwest
SLOPE	sloping	flat	flat	flat	flat	flat
SUBSTRATE	sandy-coralline		sandy-coralline			sandy-coralline
RESOURCES	reef slope fishes; dense corals; algae		reef flat fishes; dense corals; algae		algae; few corals; dense seagrasses patches; mangrove reforestation	
PROBLEMS AND ISSUES	blast fishing; siltation; *lagtang* poisoning; flash flood	blast fishing; siltation; flash flood	siltation; newlook; blast fishing; flash flood		overcollection of invertebrates; siltation; agrochemicals; sewage; flash flood	
OPPORTUNITIES		ecotourism	ecotourism		ecotourism	mariculture

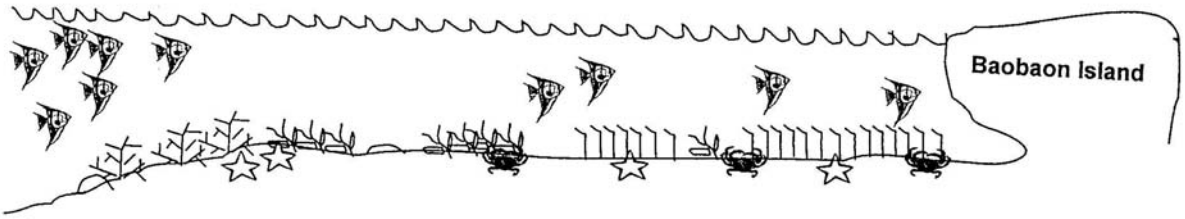
Figure 5. Coastal transect map of Barangay Punta Miray, Baliangao, Misamis Occidental

Danao Coast



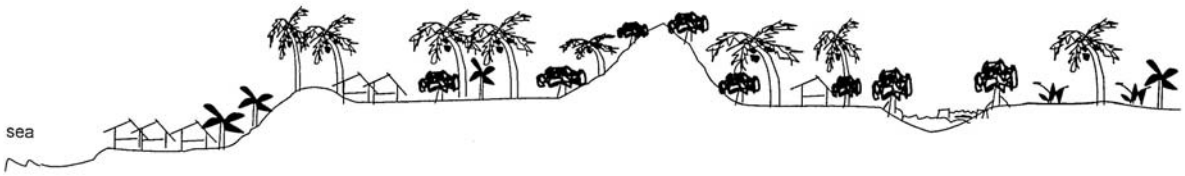
DIRECTION	**Northeast**	**Northeast**	**Northeast**	**Northeast**	**Northeast**	**Northeast**
SLOPE	sloping	sloping	flat	flat	flat	flat
SUBSTRATE	sandy-coralline		sandy	coralline	sandy-muddy	sandy-muddy
RESOURCES	few branching; soft corals		soft corals; seagrass; shellfish		algae; few corals, dense seagrasses; shellfish; bangus fry	
PROBLEMS AND ISSUES	blast fishing; siltation	blast fishing; siltation	blast fishing; siltation		overcollection of invertebrates; siltation; agrochemicals; sewage eutrophication; fry harvesting	
OPPORTUNITIES		marine reserve	shellfish collection		ecotourism	mariculture

Figure 6. Coastal transect map of Barangay Danao, Plaridel, Misamis Occidental



DIRECTION	**Northeast**	**Northeast**	**Northeast**	**Northeast**	**Northeast**	**Northeast**
SLOPE	sloping	flat	flat	flat	flat	flat
SUBSTRATE	sandy-coralline		sandy-coralline			sandy-coralline
RESOURCES	reef slope fishes; dense corals; algae		reef flat fishes; dense corals; algae		algae; dense corals; seagrasses patches; mangrove reforestation	
PROBLEMS AND ISSUES	blast fishing; siltation	blast fishing; siltation	blast fishing; siltation		overcollection of invertebrates; siltation; agrochemicals; sewage eutrophication; fry harvesting	
OPPORTUNITIES		ecotourism	ecotourism		ecotourism	mariculture

Figure 7. Coastal transect map of Barangay Panalsalan, Plaridel, Misamis Occidental

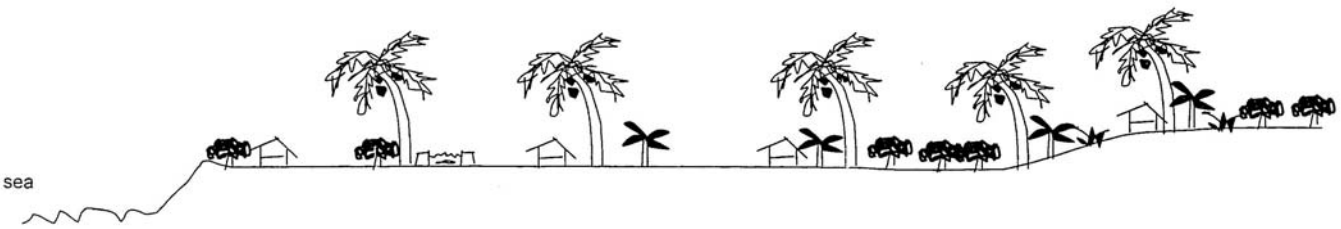


DIRECTION	Southwest	Southwest	Southwest	Southwest	Southwest	Northeast	Northeast
SLOPE	flat	sloping to steep	flat to nearly flat	sloping to steep	flat	Tabyogan Creek	flat to nearly flat
LANDFORM	flat/rocky outcrops	flat	flat	hilly/rock outcrops	creek bank	flat	flat
LANDUSE & LANDCOVER	settlement	reservoir; spring potable water	coconut-based; settlement	coconut-based; settlement	coconut-based; settlement	mangrove trees; abandoned fishpond	coconut-based; grassland
SOIL TYPE	sandy-loam; stony	stony; sandy-loam	sandy-loam; stony	sandy-loam; stony	rocky; stony	muddy; gravel	sandy-loam; stony
MAJOR CROP	coconut	coconut	coconut	coconut	coconut	bakhaw, mayuro, pagatpat	coconut-based
MINOR CROP	banana	banana, corn, cassava	corn, cassava, camote		corn		banana, cassava
ECONOMIC ACTIVITY	sari-sari store	selling of potable water					copra drying
PROBLEMS AND ISSUES	soil erosion; low soil fertility	soil erosion; low soil fertility	dead coconuts due to El Niño; tenancy	dead coconuts due to El Niño; tenancy	low production; low soil fertility		low soil fertility; lack of water supply
OPPORTU-NITIES		plenty of potable water	premium tree species present	premium tree species present		one tree cut; replaced w/ ten	premium tree species present

Figure 8. Terrestrial transect map of Barangay Manla, Sapang Dalaga, Misamis Occidental

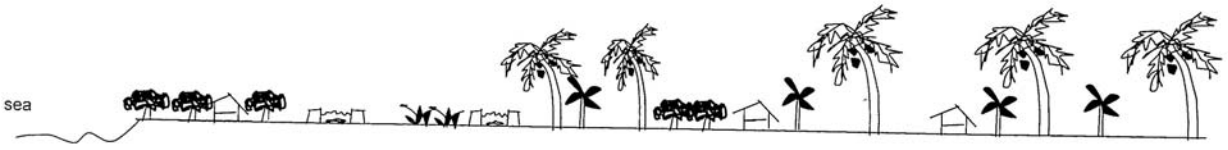
DIRECTION	South	Southwest	Southwest	Southwest	Southwest	North	North
SLOPE	flat to nearly flat	sloping	flat to nearly flat	gently sloping	gently sloping	steep	flat to nearly flat
LANDFORM	flat	ridge (rocky hill)	hill top	gully	hilly	hillside	hill
LANDUSE & LANDCOVER	settlement and agriculture	agriculture with bush	agriculture with small pasture	agriculture with small pasture	agriculture	agriculture with small pasture	agriculture and grassland (with 1 house)
SOIL TYPE	stony; sandy-loam	stony; sandy-loam	sandy-loam	rocky; sandy-loam with rock outcrops	rocky; sandy-loam with rock outcrops	rocky outcrops with patches of sandy-loam	rocky outcrops with sandy to clayey soil on top
MAJOR CROP	coconut	coconut	coconut	coconut		coconut	corn, cassava, peanut, camote
MINOR CROP	fruit trees, romblon	banana, corn, cassava	corn, cassava, camote			vegetables, corn, cassava	vegetables
ECONOMIC ACTIVITY	sari-sari store; mat weaving	firewood gathering	tuba gathering; corn, cassava field cultivation	copra production; coconut picking		corn, cassava field cultivation	field cultivation
PROBLEMS AND ISSUES	insufficient water supply	rocky soil; low soil fertility	low soil fertility; lack of water supply; tenancy	dead coconuts due to El Niño; tenancy		soil erosion; low soil fertility; tenancy	low soil fertility; lack of water supply
OPPORTUNITIES	romblon handicraft		nito handicraft				ecotourism

Figure 9. Terrestrial transect map of Barangay Caluya, Sapang Dalaga, Misamis Occidental



DIRECTION	West	West	Southwest	Southwest	Southwest	Southwest	East
SLOPE	steep	flat	flat	flat	flat	flat	sloping
LANDFORM	coastal flat; rocky	coastal flat	coastal flat	coastal flat	coastal flat	hilly	hilly
LANDUSE & LANDCOVER	coconut-based; settlement	coconut-based; settlement; fishpond	coconut-based; settlement	coconut-based; settlement	coconut-based; settlement	coconut-based; settlement; grassland	coconut-based; settlement; grassland
SOIL TYPE	sandy; clay-loam	clay-loam; rocky	sandy; clay-loam	sandy; clay-loam	sandy; clay-loam	sandy; clay-loam	sandy; clay-loam
MAJOR CROP	coconut	coconut	coconut	coconut	coconut	coconut	coconut
MINOR CROP		banana	corn, banana	corn, banana, cassava	vegetables, cassava, banana	vegetables, cassava, banana	banana, mango
ECONOMIC ACTIVITY	most families are engaged in fishing (bungsod); hog raising	most families are engaged in fishing (bungsod); hog raising	copra production; hog raising	most families are engaged in fishing (bungsod); hog raising	most families are engaged in fishing (bungsod)	most families are engaged in fishing (bungsod)	
PROBLEMS AND ISSUES	death of coconuts due to El Niño; poverty; low income	death of coconuts due to El Niño; poverty; low income	lack of potable water; tenancy	low production; death of coconuts due to El Niño; lack of potable water	low production; lack of potable water; tenancy	low production; tenancy; death of coconuts due to El Niño	low soil fertility; lack of water supply; death of coconuts due to El Niño
OPPORTUNITIES	fish processing	fruit processing; medicinal plants	premium tree species present; fruit processing	premium tree species present; fruit processing	nito handicrafts industry	fruit processing	fruit processing

Figure 10. Terrestrial transect map of Barangay Punta Sulong, Baliangao, Misamis Occidental



DIRECTION	Northeast	Northeast	Southeast	Southeast	West	West	South
SLOPE	flat to nearly flat	flat	flat	flat	flat	flat	flat to nearly flat
LANDFORM	rocky coralline	rocky coralline	coastal flat	coastal flat	coastal flat	coastal flat	hilly
LANDUSE & LANDCOVER	beach resort; settlement	salt beds	salt beds; settlement; banana plantation	small fishpond; settlement; fruit plantation	coconut-based; settlement; banana plantation	coconut-based; grassland	coconut-based; grassland
SOIL TYPE	sandy; clay-loam; rocky	sandy; clay-loam; rocky	sandy silty; clay	sandy silty; clay	sandy silty; clay	sandy silty; clay	sandy silty; clay
MAJOR CROP	banana	coconut	coconut	banana	coconut	coconut	coconut
MINOR CROP	corn, cassava	corn, banana	corn, banana	vegetables	vegetables	corn	corn
ECONOMIC ACTIVITY	hog raising; fishing	most families are engaged in fishing and salt production	salt production	fruit harvesting	copra production	copra production	copra production
PROBLEMS AND ISSUES	death of coconuts due to El Niño; poverty; low income; lack of potable water	death of coconuts due to El Niño; poverty; low income; lack of potable water	lack of potable water; tenancy	low production; death of coconuts due to El Niño; lack of potable water	low production; low soil fertility; lack of potable water	low production; tenancy; death of coconuts due to El Niño	low soil fertility; lack of water supply; death of coconuts due to El Niño
OPPORTU-NITIES	ecotourism	medicinal plants	premium tree species present	premium tree species present		fruit processing	fruit processing

Figure 11. Terrestrial transect map of Barangay Punta Miray, Baliangao, Misamis Occidental

DIRECTION	North	North	Southwest	Southwest	West
SLOPE	flat to nearly flat	flat	flat	flat	flat
LANDFORM	coastal flat	coastal flat	coastal flat	coastal flat	coastal flat
LANDUSE & LANDCOVER	old growth mangrove forest (pagatpat) and 2-year old reforestation	small fishpond; agriculture; swamps with settlement	mangrove forest with abandoned fishponds	mayuro dominated; second growth forest; 3-year mangrove reforestation; abandoned fishpond	mangrosetum (10 species); 2 year-old reforestation (bakhaw)
SOIL TYPE	gray sand	sandy-loam	sandy-loam	sandy-loam	sandy-loam
MAJOR CROP	mangrove for protection	coconut with trees like bangkal, inyam, ipil-ipil	piapi, pagatpat, tungog, sagasa, mayuro (dominant)	mayuro and bakhaw	bakhaw, pagatpat, piapi
MINOR CROP		banana, kangkong, corn, cassava, camote	coconut (newly planted)		nipa, mayuro
ECONOMIC ACTIVITY	shellfish collection; bangus fry collection; fishing	tending of corn, camote, cassava garden			
PROBLEMS AND ISSUES	plastic litter; mangrove pruning; poverty; low income	flooding; water logging; low production; tenancy poverty; low income; low soil fertility	coconut encroachment in mangrove area; firewood gathering; abandoned fishponds	firewood gathering; abandoned fishponds	mortality of some mangrosetum species
OPPORTUNITIES	ecotourism	successful mangrove reforestation		mangrosetum	

Figure 12. Terrestrial transect map of Barangay Danao, Plaridel, Misamis Occidental

DIRECTION	Southwest	North	North	North	Southeast	Southeast
SLOPE	flat to nearly flat	flat	sloping	sloping	sloping	sloping
LANDFORM	flat	valley	hilly	swamp	hilly	hillside
LANDUSE & LANDCOVER	settlement & agriculture	agriculture	agriculture	mangrove area	agriculture	agriculture
SOIL TYPE	clay-loam	clay-loam	clay-loam	sandy; clay-loam	clay-loam	clay-loam
MAJOR CROP	coconut	abandoned rice paddy	coconut	pagatpat, piapi	coconut	coconut
MINOR CROP	cassava, banana	coconut	corn, cassava, camote	bakhaw	corn, cassava	corn, cassava
ECONOMIC ACTIVITY	sari-sari store					
PROBLEMS AND ISSUES	rat infestation; low production	salt water intrusion; low production	soil fertility; tenancy; low production	mangrove cutting for firewood	soil fertility; tenancy; low production	soil fertility; tenancy; low production
OPPORTUNITIES		rice paddy should be put into other use			fruit processing	

Figure 13. Terrestrial transect map of Barangay Panalsalan, Plaridel, Misamis Occidental

Table 8. Common marine algae observed in the six coastal PRA sites

Barangay Manla	Barangay Caluya	Barangay Punta Sulong	Barangay Punta Miray	Barangay Danao	Barangay Panalsalan
Caulerpa sp. *Gracillaria* sp. *Halimeda* sp. *Sargassum* sp. *Turbinaria* sp.	*Avrainvillea* sp. *Glacillarias* sp. *Halimeda* sp. *Padina* sp. *Turbinaria* sp. *Sargassum* spp.	*Gracillaria* sp. *Halimeda* sp. *Padina* spp. *Sargassum* sp. *Turbinaria* sp.	*Amphiroa sp.* *Enteromorpha* sp. *Gelidiella* sp. *Gracilaria* sp. *Halimeda* sp. *Padina* sp. *Sargassum* spp. *Turbinaria* sp.	*Amphiroa* sp. *Chaetomorpha* spp. *Enteromorpha* sp. *Eucheumoides* sp. *Galaxuara* sp. *Gelidiella* sp. *Gracilaria* sp. *Halimeda* spp. *Halymenia* sp. *Kappaphycus* sp. *Padina* sp. *Sargassum* sp. *Siagora* sp. *Turbinaria* sp.	*Amphiroa* sp. *Galaxaura* sp. *Halimeda* spp. *Kappaphycus* sp. *Padina* sp. *Sargassum* sp. *Turbinaria* sp.

Table 9. Coral communities observed in the six coastal PRA sites

Barangay Manla	Barangay Caluya	Barangay Punta Sulong	Barangay Punta Miray	Barangay Danao	Barangay Panalsalan
Favia sp. *Leptastrea* sp. *Diploria* sp. *Fungia* spp. *Porites* sp. *Goniopora* sp. *Pocillopora* sp. *Millepora* sp. *Platygyra* sp.	*Porites* sp. *Pocillopora* sp.	*Pocillopora* sp. *Goniopora* sp. *Porites* sp. *Acropora* sp.	*Acropora* sp. tabulate (very common) *Acropora* sp. 1, 2 branching *Agaricia* sp. *Heliophora* sp. *Pocillopora* sp. *Porites* sp. *Seriatopora hystrix* *Stylopora* sp. *Plerogyra* sp. *Favites* sp. *Millepora* sp. *Meandrina* sp. *Fungia* sp. (Soft corals) *Sarcophyton* sp. *Lobophyton* sp.	*Acropora* spp. (tabulate, branching) *Agaricia* *Stylophora* spp. *Fungia* spp. *Montipora* spp. *Pocillopora* sp. *Millepora* spp. *Acropora* sp. *Plerogyra* sp. *Goniopora* sp. *Galaxea* sp. *Fungia* sp. (Soft corals) *Sarcophyton* sp. *Lobophyton* sp.	*Acropora* spp. 1, 2, 3 (tabulate, branching) *Acropora cervicornix* *Montipora* sp. *Seriatopora hystrix* *Pocillopora* sp. *Porites* sp. *Agaricia* sp. *Pavona* sp. *Fungia* sp. *Millepora* sp. *Stylopora* sp. *Favites* sp. *Favia* sp. *Galaxea* sp. (Soft corals) *Sarcophyton* sp. *Lobophyton* sp.

Table 10. Common reef fishes at Barangay Punta Miray reef flats

SCIENTIFIC NAME	LOCAL NAME
Scolopsis bilineatus	
Therapon sp.	timbungan
Dascyllus aruanus	palata
Chromis viridus	palata
Aeoliscus strigatus	
Odonus sp.	langis
Rhinecanthus sp.	
Acanthurus lineatus	langis
Labroides demidiatus	cleaner wrasse
Parupeneus barberinus	timbungan
Lethrinus sp.	katambak
Pentapodus trivittatus	salangukod
Chaetodon klenii	alibangbang
Zanclus sp.	alibangbang
Heniochus sp.	alibangbang
Acanthurus sp.	langis
Other scarids and labrids	

Table 11. Seasonal calendar of fishes caught by Punta Miray fishers

January	pirit
February	ibis, katorsa, palotpot, katablak, pirit
March	ibis, katorsa, palotpot, katablak, pirit
April	ibis, katorsa, palotpot, katablak, pirit, bugalobog, barongoy, pugita*
May	ibis, katorsa, palotpot, katablak, pirit, bugalobog, barongoy, bugaong, pugita*, commonwealth, sigarilyo, ulang*, uyap*, lambay*
June	kutob, bugalbog, pugita*, commonwealth, sigarilyo, ulang*, uyap*, barongoy, lambay*
July	kutob, bugalbog, pugita*, commonwealth, sigarilyo, ulang*, uyap*, barongoy, lambay*
August	kutob, bugalbog, pugita*, commonwealth, sigarilyo, ulang*, uyap*, barongoy, lambay*
September	kutob, bugalbog, tabagok*, commonwealth, sigarilyo, barongoy, sawasid*
October	kutob, bugalbog, commonwealth, barongoy
November	kutob, bugalbog, commonwealth, barongoy
December	kutob, bugalbog, barongoy
Year-Round Fishes:	kitong, danggit, malansi, guno, mamsa, tangigue, balo, indangan, bukaw, tamala, bolinao, nokos*, danglay, labayan, sunghan, ulapay, paitaam, samolok, lingi-lingi, kapal, timbungan, diwit, ubod, alibangbang, bilong-bilong, dale-dale, bulaknitan, pineapplehon, bantol, karabalyas, samin-samin, gatasan
Rare:	ibo, pugapo

* invertebrates

Table 12. Terrestrial plants observed in the six coastal PRA sites*

Manla	Caluya	Punta Sulong	Punta Miray	Danao	Panalsalan
Trees and Other Plants:					
tugas, ipil, inyam, bangkal, ulingon, padal-usa'g halo, balete, bogo, bay-ang, anit, bayok, balayong, binunga, gmelina, halom, hanagdong, siapo, taluto, bagalnga, lagnob, tipolo, talisay, u-on, pitogo, romblon, mahogany, pantod, naga, ipil-ipil, dapdap, sabana, santol, balok-balok, caballero, pandan	tugas, gmelina, bagalnga, kapok, tipolo, mahogany, bayug, akasya, anit, banitlong, binunga, balete, teak, kapok, naga, taluot, bogo, mangga, bayabas, kaymito, gapas-gapas, falcata, talisay, inyam, bangkal, salong, chiko, tambis, sereguelas	akasya, anit, anonang, bagalnga, bago, bahay, balayong, balite, balok-balok, bangkal, bangkoro, banitlong, bansilay, gisok, bayanti, bay-ang, bayok, bogom, bonot-bonot, dapdap, mango, buongon, sambag, buli, fire tree, fringon, gmelina, halom, hanagdong, inyam	sangkahoy, taruy, nigad, agbao, palma, binunga, bangkoro, bangkal, malabago, bagalnga, taluot, tipolo, siapo, tuba-tuba, madre de cacao, bitaog, tugas, sereguelas, mango, pantod, pandan, is-is, salong, halom, binunga, naga, mahogany, ipil-ipil, kapok, chestnut, balok-balok, bakan, ipil	ipil-ipil, balok-balok, binunga, talisay, inyam, mahogany, tipolo, mango, bayabas	tabon-tabon, bogo, gmelina, mahogany, tipolo, bagalnga, ipil-ipil, seryales, mango, buongon, atis, tiesa, chiko, inyam, balete, bayabas, patod, pandan, tangan-tangan, pitogo, romblon, kaymito, madre de cacao, mahogany, mangga-mangga, naga, salong, siapo, sibukao, tagubahid, talisay, taluot, tipolo, tiwi, tugas, ulingon, uon
Medicinal Plants:					
abokado, ampalaya, hibi, baho-baho, busikad, handilib-on, mandalusa, dila-dila-dila'g iro, kalabo, marbas, alangitngit, gapas	ampyon, atis, balili, hagonoy, buta-buta, lagundi, dalapot, cogon, kapayas, lumboy, sagosahis, salong, halom	baho-baho, bangka-bangkaan, cogon, hagupit, mayana, busikad, bayabas, atis, abokado, salong, handalamay, buta-buta, duguan, lomboy	bayabas, biasing, lumboy, handilib-on, katyubong, kabkabon, bila-bila, ulasiman, hagonoy, kanding-kanding	bayabas, amyon, santol, abokado, panyawan, cogon, atis, mayana, hagonoy, ulasiman	tabon-tabon, santol, kaymito, bahay, kalabo, mango, marbas, cogon
Agricultural Crops and Vegetables:					
lubi, mais, camoteng kahoy, camote, saging, gabi, ampalaya, string beans, upo, alugbati	lubi, mais, cassava, camote, gabi, saging, mani, kamunggay, tubo, ube	lubi, mais, camoteng kahoy, gabi, apale, okra, beans, likway, peas, alugbati, paliya, palay, ube, sili, kamunggay, pinya, talong	lubi, camoteng kahoy, camote, kamunggay, kadios, talong, upo, alugbati, saluyot, mais, gabi, paliya	lubi, mais, gabi, camoteng kahoy, gabi, talong, luya, alugbati, okra	lubi, palay, mais, camote, camoteng kahoy, ube, pechay, gabi, badyang, luya, kamatis, sili

*see Appendix Table 41 for the equivalent scientific names

Table 13. Summarized key historical events in the six coastal barangays

1900s	Immigration of Boholanos, Siquijodnons, Cebuanos to the area
1920s to 1930s	Dense coastal resources (beach and terrestrial trees, mangroves, coral and reef communities, wildlife (mammals, birds, reptiles, etc.)
	Cyclone hit Plaridel
	Sawmill operated in Manla and Panalsalan (MATCO)
1940s to 1960s	Utilization of mangroves, first as fuel wood for salt making, then later made to charcoal for an acetylene black manufacturing firm in Iligan City.
	Start of introduction of destructive methods of fishing (blast fishing, poisons, fine mesh nets, hand-trawls)
	Disappearance of bats, monkeys and other wildlife
1970s	Peak of dynamite fishing; Conversion of mangroves to fishponds and rice paddies; Heavy use of mangroves (tungog) for coconut wine industry and tanning (dye)
1980s	Implementation of Integrated Social Forestry Program (ISFP) of the DENR; Presidential Decree on Tree Planting (encouraged re-planting of mangroves); Use of compressors in fishing; Prohibition of *sud-sud* and *baling*
1990s	DENR's Coastal Environment Program (CEP) implemented; Municipal ordinances on illegal fishing formulated and enforced; Ordinance on monthly fishing ban period of two to three days

Significant Historical Events

Throughout the decades, since the migration of people from the islands in the Visayas, significant developments had occurred with regard to patterns of resource use and resource use management. The specific historical events that developed from such patterns were summarized in Table 13 and Appendix Table 13.

Demography

The total population of the barangays ranged from 573 to 2,097. Panalsalan had the highest number (2,097) of people. This was followed by Punta Sulong with a population of 1,247. Punta Miray ranks third with a population of 1,207. This was succeeded by Caluya (767), Manla (637) and Danao (573). The barangays had a household size varying from four to eight individuals. The number of households in the six barangays ranged from 105 to 269 with Danao having the lowest number and Punta Miray, the highest. Caluya had 162 households, while Punta Sulong had 184 (Table 1 and Appendix Tables 20 to 25). The population in general had a 1:1 ratio of male to female, except Punta Sulong and Panalsalan where males slightly predominated. The population density ranged from 1.5 persons/hectare (Caluya) to 8.5 persons/hectare (Punta Sulong). Punta Miray had a higher density (7.06 persons/ha) as well as Panalsalan (6.1 persons/ha). Danao and Manla exhibited almost the same density (5.5

persons/hectare and 5.8 persons/hectare, respectively). From these figures, it can be said that the coastal communities were not densely populated. However, land was owned by a very small number of landowners, making access to and control over the resources, a privilege of the few.

Most of the people in the barangays had already resided in their respective areas for more than fifty years. Moreover, the population of each community was dominated by young individuals (Appendix Tables 14 to 19). The places of origin of most residents were Siquijor, Bohol, and Cebu.

In general, these areas were characterized by low level of formal education. Only 3% to 6% of the population had gone to high school or college.

Social and Health Services

Educational facilities in some areas like Danao were inadequate. Others had a three-room elementary school building where two classes used one room. Panalsalan had both elementary and secondary schools.

Health care was given attention in all barangays. A barangay health worker assisted the midwife who visited the area regularly.

The barangays already had water facilities and utilities, except Punta Miray where water was too saline to drink. The establishment of the water facilities in the other five barangays was made possible with the assistance of the Comprehensive and Integrated Development of Social Services of the Department of Social Welfare and Development (DSWD-CIDSS), the Coastal Environmental Program of the Department of Environment and Natural Resources (DENR-CEP), and local government.

Likewise, electricity had also reached the areas as early as 1980 through the Misamis Occidental Electric Company, Incorporated (MOELCI). Mostly, the barangays had either earth or gravel roads which only the habal-habal (motorcycle) can easily maneuver. In those barangays that were quite near to the town proper, like Danao and Punta Miray, the roads allowed the entry of motorcycles with sidecars.

Economic Institutions

Livelihood and Ownership of Land, House, and Banca

A brief overview of these economic institutions in the research sites disclosed certain general characteristics; features peculiar to one or more of the barangays studied (Table 14). On the whole, fishing was the main livelihood, supplemented with farming at the subsistence level for several.

In all six barangays, large tracts of land were owned by a small number of big landowners. Most of these private lands were planted with coconuts. In fact, in three of the barangays, majority of the landless residents occupied the coconut land of these landowners. Some residents, as tenants, were allowed to occupy a certain space on the coconut land; others occupied land without paying rent; others do so on *hulam* (borrow), an unwritten agreement of occupancy in return for cleaning the undergrowth of the coconut trees.

In all, at the share of copra making, whether tenant or borrower, was 1/3 of the proceeds, net of expenses. Those given permission to stay in the land as tenants or caretakers also took charge of picking the nuts and having them dehusked, shelled and dried.

Still, several others occupied unplanted lands without paying rent. In other barangays, several residents built their houses on public lands.

A large number of residents owned the houses that they resided in. Otherwise, the houses were owned by relatives of the

occupants, or were rented out by the owners.

While the majority of coastal barangay residents were fishers, only a few owned bancas. There were more non-motorized bancas than motorized ones, even if the latter was more efficient in fishing than the former. Although, some of these motorized bancas were not used for fishing but for ferrying passengers to and from neighboring barangays or municipalities, charging fares that vary depending on distance traveled and the route used (via rivers or along channels in the area).

Rents, Taxes, and Interests

Rentals paid included those for the use of a market stall, a house, a fishpond or a motorized boat. A fish market stall in Calamba can be rented at P1,000.00 a year. Land rents varied with the type of house being built. Those who built concrete houses paid rent for as low as P150.00 per year, while those who built wooden houses paid P30.00 per year. In Barangay Danao, renting a 22-ha fishpond cost P30,000.00 a year and P2,000.00 a year for a 2-ha fishpond. The rates were much higher in Panalsalan, at P50,000.00 a year for a 12-ha fishpond.

For passengers who wanted to use a motorized *banca*, a regular-sized one can be rented for P200.00 to P250.00 a day; and P1,000.00 to P1,500.00 a day for a bigger-sized one.

Taxes were collected for commodity trading and for setting up certain facilities. A *banca* owner in Danao, for example, paid a P50.00 registration fee for a non-motorized *banca* and a P100.00 fee for a motorized one. An annual tax of P30.00 was charged for using the *pukot*, a local fishing gear. For using the *bungsod*, a fee of P50.00 per quarter or P200.00 a year was demanded; the highest fee for *bungsod* collected by the local government. One reason could be that the coastal waters of Punta Sulong were already saturated with *bungsods* that the local government was already trying to discourage its use. The fee was much lower in Panalsalan, at P25.00 a year, and in Danao at P30.00 a year.

In Danao, a *comprador* had to pay P800.00 as trader's tax per year. For traders of *bangus* fry, a resident *comprador* had to pay P200.00 a year; and a non-resident *comprador* of *bangus* fry had to pay P750.00 a year. This open bias in taxes showed the preferential treatment and protection given by the local government to local *compradors*.

All barangays derived shares from community taxes, real property and sales taxes as prescribed by law.

For water supply, residents paid a monthly fee of P20.00 to P30.00 per month, or P5.00 to P10.00 per 10-gallon container of water.

In four of the barangays, informants admitted to paying 10% interest per month on loans incurred with co-residents. Loans incurred with loan sharks from neighboring municipalities cost them 20% to 25% per month.

Land Prices

Land prices rose invariably. In Danao, for instance, a 3-ha land cost P50,000.00 in 1996; a 2-ha land cost P80,000.00 in 1998; and a 12m x 12m plot cost P6,500.00.

Wages

The wages for jobs associated with copra production appeared to be consistent in two of the six barangays. For instance, for shelling nuts, P8.00 was paid for every 100 nuts shelled or P80.00 for every 1000 nuts shelled. In Manla, a copra maker earned P2.00 for every kilogram of copra produced or a quarter of P800.00, which was the usual gross income of the production process. For picking (*kuhit*) nuts, a wage of P2.00 to P3.00 for each tree was paid; P12.00 for every hundred of coconuts dehusked (*bunot*); P0.50 per sack or P30.00 per hundred nuts smoke-dried *(landa*); between P12.00 and P20.00 for every 100 nuts shelled (*lugit*).

However low the wages paid for each job, it was still preferable to performing all tasks from start to finish of copra production and getting paid for the whole job package for only P400.00 per thousand kg of copra.

Even fetching water earned P5.00 per drum. Weeding also earned P70.00 per day.

Certain farm tasks were given to particular farm workers who get paid on daily basis. For example, in Punta Miray, a worker was hired at P100.00 per day if the worker plows the field with his own carabao (the price of hiring a carabao was P50.00/day). The costs were doubled in Panalsalan where a planter charged P100.00 per day. The cost of harvesting was the same. Preparing the seedlings in bundles cost P0.50 per bundle.

A worker in Punta Miray who was hired to construct a *bungsod* was paid P50.00 per day, with a provision for meals, or P70.00 per day without meals.

The sharing of the fish sales was equal between the boat owner and the fisher who used the boat.

Productive Age

The productive age was observed to be 10 years and above, although only a portion of the youngest and oldest age groups were really active. The ratio of productive age to population of four barangays was summarized by gender in Table 14, indicating a great number of productive residents.

Resource Flow

Patterns vary in the six research sites. In the barangays of Danao and Panalsalan, the movement appeared to be monolinear from the gatherers, collectors, and fishers to the traders, then to the retail outlets. The produce were brought to the town proper of Plaridel and then to the cities of Oroquieta and Ozamiz. Surplus were transported to Iligan City.

In Danao, the flow pattern of *bangus* fry differed from that of other barangays. From the gatherer, the product was taken to the local comprador, then to two other destinations: the fishpond owner or storage. From storage, the fry was brought to Dipolog City or Pagadian City, then to retail outlets in Zamboanga del Norte and Zamboanga del Sur.

The resource flow patterns took a multilinear direction in the barangays of Sapang Dalaga and Baliangao. From collectors in Manla, the products were taken to local *compradors,* Calamba market stalls or to Calamba *compradors*. From local *compradors*, they were brought to the town proper of Baliangao before being transported to Dipolog City. On the other hand, the goods that were taken to Calamba *compradors* were sold to Dipolog *compradors*. The last stop, whichever route was taken, was Dipolog City.

In Caluya, the fish and shellfish caught were bought by local *compradors* who sold them to retail buyers in Caluya and in the nearby barangays of Piñan and Mutia in Zamboanga del Norte. A fraction of the goods from the local *compradors* were also sold to the buyers or *compradors* in Calamba and Sapang Dalaga before being brought to Dipolog. When harvest was abundant, some goods were taken from the Caluya *compradors* to Oroquieta, then to Ozamiz, and then to Iligan.

In Punta Sulong and Punta Miray, the fish and other produce were bought by Punta Sulong *compradors*, and then brought to the Baliangao town proper on Saturdays, and to Oroquieta on other days. From the Baliangao town proper, whatever unsold fish were brought to Oroquieta or to Sapang Dalaga, then to Dipolog. Whatever fish or shellfish left unsold in Oroquieta would be taken to Iligan.

In four of the barangays, the farthest destination of the products was Iligan City located southeast of the research site.

Table 14. Some significant economic features of the six coastal PRA sites

ECONOMIC FEATURES	BARANGAY MANLA	BARANGAY CALUYA	BARANGAY PUNTA SULONG	BARANGAY PUNTA MIRAY	BARANGAY DANAO	BARANGAY PANALSALAN
Means of Livelihood						
Fishing	90%	80%	95%	90%	90%	70%
Fishing-farming	5%	20%	4.5%		5%	
Farming	5%					10%
Others			0.5%	10%	5%	
						20%
Land and House Ownership						
Owned		25%	Nobody among		5%	some
Use of Public Land	majority		small		15%	few
Tenanted/Rented		75%	landowners admitted owning lands		80%	most
Banca Ownership						
Motorized	32		70	10	17	
Non-motorized				90	90	300
Rent			Stalls at Calamba = P1000.00/year	P50/cottage (at beach) P3-5/person and entrance fee	Residential lot; Concrete house: P150/year Temporary house: P30/year Fishpond: 22 ha, P30,000/year 2 ha, P2,000/year motorized boat, P200-P250 per day	1994: P50,000.00 per year for 12 ha fishpond area
Economically Active Age or Productive Age (10 years old up)	Combined: 74.88% Male: 49.69% Female: 50.31%	Combined: 74.71% Male: 51.83% Female: 48.17%	Combined: 78%	Combined: 53%	Combined: 70.74% Male: 50.93% Female: 49.07%	Combined: 75.39% Male: 50.54% Female: 49.46%
Share from Copra Production	1/3 to tenant 2/3 to landowner	1/3 to tenant 2/3 to landowner	1/3 to tenant 2/3 to landowner	1/3 to tenant 2/3 to landowner	1/3 to tenant 2/3 to landowner	1/3 to tenant 2/3 to landowner

Table 14. Some significant economic features of the six coastal PRA sites (*continuation*)

ECONOMIC FEATURES	BARANGAY MANLA	BARANGAY CALUYA	BARANGAY PUNTA SULONG	BARANGAY PUNTA MIRAY	BARANGAY DANAO	BARANGAY PANALSALAN
Taxes			P50/qtr or P200/yr for *bungsod* P5/10 gal, drinking water	10% share from community tax; P0.50 per fish container	P50 (non-motorized), P400 (motorized) as registration fee; P30 annual tax for pukot, *bungsod*, and pumpboat; P800 per year-*comprador*; P750/yr – barangay fee for non-resident *comprador*; P200/yr barangay fee for resident *comprador*; 25% share from real property tax	P10/yr, brgy. clearance; P25/yr, brgy. share for *bungsod*; P5/coconut cut; P20/tree cut; 50% share, barangay community tax
Interest		Karnehay Group: 10% interest, payable before celebration		10%/mo – payable if the money loaned out was from *hulog-hulog*; 20% to 25%/month: loan sharks in Baliangao, Caluya, and Oroquieta	10% (daily payments for 2 months)	10% (daily payments for 2 months)
Land Prices					P50,000 for 3 ha (1996); P80,000 for 2 ha (1998); P6,500 for 12m x 12m	

Table 14. Some significant economic features of the six coastal PRA sites (*continuation)*

ECONOMIC FEATURES	BARANGAY MANLA	BARANGAY CALUYA	BARANGAY PUNTA SULONG	BARANGAY PUNTA MIRAY	BARANGAY DANAO	BARANGAY PANALSALAN
Wages						
Copra Production 1. saka/kuhit 2. lugit/bunot 3. landa 4. transport	¼ of the gross income is paid for the labor cost, i.e., gross income = P8/kg labor cost = P2/kg P400 per thousand on a pakyaw basis		P8/hundred	Fetching water at P5.00 per drum; Weeding at P70/day P80/ thousand	1. P2.50/tree 2. P12/hundred 3. P0.50/sack	1. P2-P3/tree 2. P20/hundred 3. P30/ hundred 4. P10/sack
Rice Production 1. daro 2. planting 3. harvest 4. bunot/ semilya				1. P50/day (carabao only) 2. P100/day (man + carabao)		1. P200/day (man + carabao) 2. P100/day 3. P100/day 4. P0.50/ bundle
Setting up of fishpond				P50/day (with meals) P70/day (without meals) Mason helper: P120-P150/day P70-P80/day		
Fishing					equal share between fishers and owner of boat	

Table 14. Some significant economic features of the six coastal PRA sites (*continuation*)

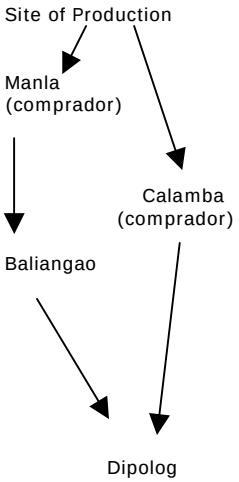
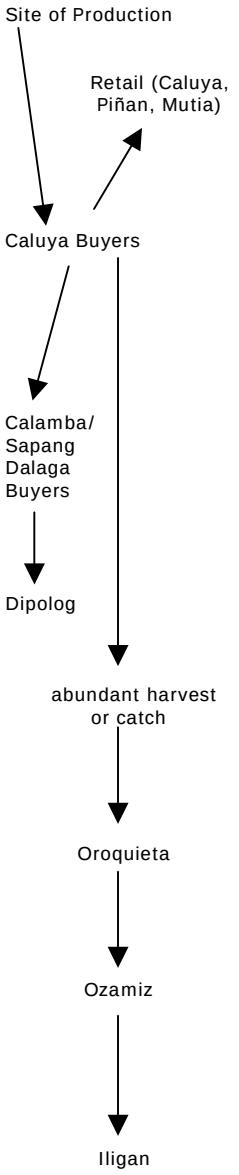
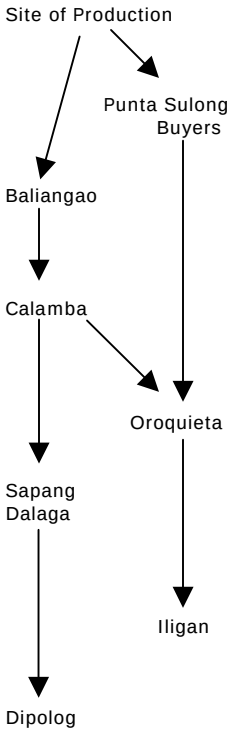
ECONOMIC FEATURES	BARANGAY MANLA	BARANGAY CALUYA	BARANGAY PUNTA SULONG
Resource Flow			

Table 14. Some significant economic features of the six coastal PRA sites (*continuation*)

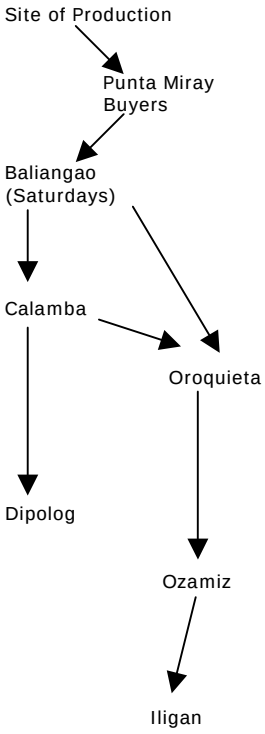
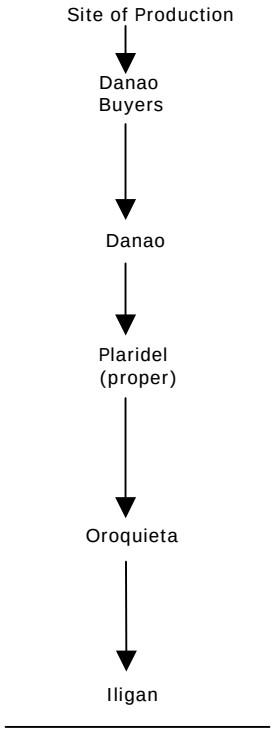
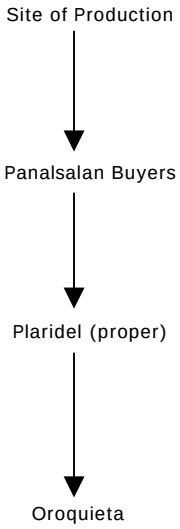
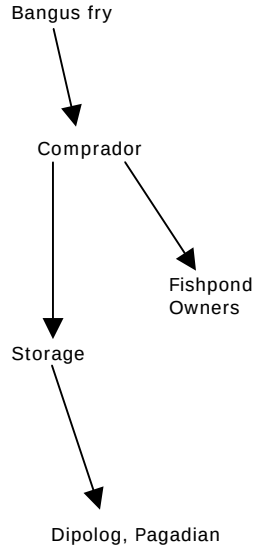
ECONOMIC FEATURES	BARANGAY PUNTA MIRAY	BARANGAY DANAO	BARANGAY PANALSALAN
Resource Flow			
			

Table 15. Estimated fisher's income from selected fish (Punta Miray) and shellfish (Punta Sulong)

Fishing Gear	Fish	Volume (kg/banca/day)	Market Price (PhP/kg)	Total Income (PhP)
pana	danggit	0-2	25-40	0 to 50-80
pukot	kitong	0-2	40-50	0 to 80-100
palangre	kutob	5-25	20-30	100-150 to 500-700
palangre	katambak	0-2	40-50	0 to 80-100
newlook	bolinao	0-30	20	0 to 600
newlook	malanse	0-20	18	0 to 360
bungsod	samolok	0-10	30-40	0 to 300-400
pana/pasol	pugapo	0-10	60	0 to 600
pana/pasol	tanguige	0-15	60	0 to 900
pasol	mamsa	3-10	50	150-500
compressor	sunghan	5-20	20	100 to 400
compressor	indangan	0-20	30	0 to 600
pukot	pirit	0-20	20-30	0 to 400-600
pana	pugita	0-2	40-50	0 to 80-100
pasol	nooks	0-2	70	0 to 140
pukot	lambay	3-5	50	150 to 250
bungsod	pasayan	0-5	40	0 to 200
	Shellfish	(caltex)		
	aninikad	0.5-5	10-13	6.50 to 65
	bongkawil	0-28 pcs	0.75-1/pc	0 to 21-28
	litob	0.5-3	3-3.50	1.75 to 10.50
	turay-ok	0.5-2	3.50	1.75 to 7
	saang	rare	10	
	budyong	rare	10	
	taklobo/saliot	rare	35	
	tuway	0-2	2	
	imbaw	0-5	2/pc	

Estimated Income from Selected Fishes and Shellfishes

A typical day for a fisher usually earned him somewhere from nothing to, in extremely rare occasions, P900.00 for a catch of 30 kg; depending on the kind of fishing gear used and the type of fish caught. This was typical in almost all of the six PRA sites. Although the descriptions below were taken from the data collected in Punta Miray (Table 15) and for shellfish in Punta Sulong, very similar situations were observed in the other coastal barangays. In Punta Miray, a fisher was able catch *danggit* with a *pana* (spear) at the rate of 0 to 2 kg/banca/day. This was sold in the market for P25.00 to P40.00 a kilogram, depending on the fish size. A catch of zero meant the catch was just or barely enough for the family's viand for the day. This was also true with other types of fish. Thus, fishing in these coastal areas was possible only for subsistence. A "newlook" fishing gear for *bolinar* (*Engraulidae*) earned as much as P600.00 per day, and the compressor, which was prohibited and caught *sunghan* (*Acanthuridae*) fish earned between P100.00 and P400.00. The compressor, though prohibited, was still used by a few who reasoned that the catch of other gears cannot meet the family's basic needs.

Mainly collected by women and children at Punta Sulong tidal flats, shellfishes provided the lowest possible income in the area. *Aninikad* (*Strombidae*), a species of shellfish also common in the other barangays, can be gathered at a volume of half a tub of *caltex (*one-liter container) to five tubs at a time. This volume of shellfish gathered would earn from P5.00 to P65.00 for one gatherer, depending on the prevailing market price. *Bongkawil* (*Strombidae*) occasionally earned as much as P28.00. The income from *litob*, and *turay-ok* ranged from P1.50 to P10.50, and P1.75 to P7.00, respectively. Other kinds of shell like *saang*, *budyong* and *taklubo* or *saliot* commanded a higher price but had become

so rare that collection of the latter two was already prohibited by law. Most of the collected shellfishes were brought home for family consumption. The species popularly known as *tuway* and *imbao* from the mangrove areas had also diminished so that women and children who depended on these experienced a decline in income. Other shellfishes may be collected in larger volumes, but because of their low commercial value, they were not prioritized as income sources since the cost of handling and transporting them far exceeded the proceeds.

Normally, an artisanal fisher or shellfish gatherer's income hardly met his/her family's needs, except in rare times when the volume collected was large. They became dependent on loans and cash advances provided by *compradors* for survival. The data on fish catch and shellfish collection per barangay and the gears used, as well as the seasonality of these resources and their prevailing prices are presented in Appendix Tables 26 to 38.

The income derived from copra production (Table 14) by a few, supplemented the meager income earned from fishing.

Social Institutions

The Family, Kinship and Marriage

The basic unit of social structure in the six research sites was the family, not unlike the picture drawn in most other parts of the Philippines (Fox 1959). The residents recognized the role of the father as the major earner and the mother as the main guardian of social values and of children's welfare, aside from housekeeping and helping provide for the family. The kinship system was bilateral in structure as inmost families in the Philippines, whereby descent was traced to both father's and mother's lines. Kinship is traceable up to the fourth generation, as in many other communities (Jocano 1969). Thus, family support for and control of any one member was lateral and vertical.

Instilling the values of industry, respect for elders, honesty, neighborliness and other values, was the primary concern of early child rearing activities. Domestic chores were divided among the children at an early age not only for the purpose of teaching them to share tasks, but also to train them on household management.

Marriage was prohibited among cousins or relatives to the third or fourth degree of consanguinity. It was largely matrilocal, that is, the newly married couple usually stayed with woman's family after wedding until they were financially able to support themselves. As soon as able, they move out to a new residence within the barangay. When the earning spouse found work outside the barangay, the family moved with him. In a few cases when the spouse found work outside the country, the remaining members of the family moved to the remaining spouse's parents' house.

Family Roles in Economic Activities

Since most fathers were fishers, the children and wives assumed roles related to fishing. In most cases, it was the wife who delivered the catch to the trader (*comprador*). The *comprador* was usually a *suki* (favorite) who had a long standing and well-established relationship with the fisher's family. The informants revealed that the woman was usually the one who delivered the catch to the *suki* because the woman was the better seller. Being more diplomatic than the man in transacting business, the woman, thus, had more success in bargaining for higher prices.

The women also performed other tasks. Many wives managed backyard poultry, piggery, or *sari-sari* (retail) stores.

Children were also actively involved in fishing activities. They gathered shellfish and bangus fry with their mothers or fathers to help augment the family income. These activities were also seen as opportunities for children to learn from the father or mother about certain techniques vital in fishing and shellfish gathering. In fact, several children

preferred shellfish gathering over attending classes because aside from earning, they also had more fun. Several parents, however, allowed their children to gather shellfish only when there were low tides, which occurred in the early evenings or late afternoons, by which time school was over.

Depending on the type of fishing gear used, the family members participated in different forms of collective work. While there were fishing gears that involved both husband and wife, and sometimes the children (like the *pukot*), there were gears which had to be male-operated since they required physical strength. Among households which owned a *bungsod* (fish corral) or two, it was the male member/s of the family that did the collecting of fish. There were a number of women who accompanied their husbands to sea at low tide (as in Caluya) but because gathering the fish catch from the *bungsod* required a lot of physical strength, families who owned a *bungsod* normally sent only their men to sea. The wife sometimes helped in putting up the *bungsod*, but at other times, the husband hired other people to assist him in the construction. For making repairs on the *bungsod*, it was the men who gathered poles of bamboo or mangrove cuttings. It was also usually the husbands who changed the ribbing of the nets; though sometimes, with assistance of his wife and children.

Women did the sorting and weighing (if a scale was available) of the fish collected. Sorting involved segregating the fish into those for household consumption, for immediate *kilaw*, and for sale or delivery to the *suki*.

In fishing households that also engaged in farming for subsistence, when the husbands were at sea with older male children, the women and younger children took care of farming tasks. When both mother and father were out, the eldest of children took charge of household management. However, if the households had fishponds, it was usually the husbands who tended them.

Roles in Decision-Making

Both the husband and wife were involved in decision-making especially when purchasing or selling an item. They discuss, for example, whether or not to put up a bungsod and where or how to get the capital. The decision to put up a bungsod usually entailed the sale of a fattened pig. It was the wife who usually makes the final decisions regarding the use of resources at home. Matters concerning the education of children were discussed and decided upon by both husband and wife. Other areas of decision-making needed to be studied to determine the gender role differentiations.

Roles in Conflict Management

Conflict management practices varied per barangay; but in general, petty quarrels were resolved among the parties in a neighboring fashion, usually, in the presence of older and respected residents. The Barangay Captain and other local bodies of authority intervened only in more serious conflicts.

Roles in the Trading of Fish: Mananagat and Suki

The fisher, *mananagat*, patronized a particular buyer, the *suki comprador*, for whom all the catch, other than those for household consumption were reserved. This was so since the *suki comprador* usually provided the fisher support in terms of cash loans for the purchase of family needs like rice, sugar, cooking oil, even cash advance for the tuition fees of children, for repair of damaged parts of the *bungsod* or for putting up a new one, smaller items like cigarettes, coconut wine, etc.

The unwritten rule was that if a fisher highly regarded the support extended by the *suki comprador*, the fisher would not sell to other buyers. If ever there were selling outside the *mananagat-suki* relationship, this was called *sindikato* (shady deal) in some barangays (Blanc-Szanton 1972). Anyone discovered to be selling other than

to the *suki* suffered because no one bought from the fisher again or worse, support, in terms of cash loans, were withdrawn by the *suki*.

The loans became necessary since earnings from the daily catch was often insufficient. In effect, the fisher-*suki* relationship was one which compelled the fisher to continue selling to one particular *comprador* who determines the price based on the buying price in Calamba or other destination points, with a margin of profit. Since debts were written off through the compulsory delivery of fish, it was not uncommon that another loan had to be made again even before the previous loan had been fully paid.

Social Ranking: Perceptions of the Residents

In many of the barangays, the residents classified themselves as rich, average or poor. Those perceived to belong to the category of rich were the ones owning beautiful concrete houses, with plenty of money, probably with one member of the family working abroad. The families may have owned a vehicle, large coconut lands, big fishponds, or a combination of these. The houses of families with a member working abroad were more durable and aesthetically pleasing than the others. This was taken as a sign of financial success; which was part of the net social benefits of remittances of overseas Filipinos (Rodriguez 1996). The people considered average were the government employees and/or *bungsod* owners. Those considered poor were the shellfish gatherers, fishers, or tenants/ caretakers of large coconut lands. The rich were the minority. The poor were perceived to constitute the biggest numbers in some barangays, while in others, it was the average who constituted the majority.

Beliefs and Practices

People in the research sites observed certain rituals and practices for various reasons. Some rituals were performed to ensure a bountiful harvest. They believed that the degree to which the steps in a ritual were followed had a great effect on its effectiveness. Other rituals were performed prior to the use of some resources or the commencement of an activity. Offerings were likewise made to ensure its success. Some considered certain signs of nature as indicative success of their harvests.

In three of the barangays studied, there were a number of beliefs that had relevance to fisheries. In setting up a new *bungsod,* several rituals were performed to ensure that the fish catch is plentiful. One was a procedure followed in the *palihi* or *palina* that required gathering of certain grasses that stick to other materials. These grasses, like *amorseco* and *sampinit*, *hibihibi* and *kamanyan* were mixed, left to burn over coal and the resulting smoke set to waft towards the *bungsod*, like incense. What the practice hoped to achieve was for the *bungsod* to attract fish and prevent its escape from the *bungsod* in the manner that *amorseco* sticks on to fabrics. Another practice was the slaughtering of an animal or fowl and offering it to the spirits before commencing a new activity like using a new *pukot*, to ensure good catch or harvest. This complemented the traditional belief in the goddess of the sea, the supernatural being that commanded spirits to assist the supplicant in the fishing activities. In two barangays, the belief was that a new *banca* should be blessed by sprinkling it with the blood of a slaughtered duck to ensure that the *banca* remained afloat and protected from accidents.

It was believed that the *bungsod* must only be transferred during the ebb tide in the day and the high tide in the evening to ensure big fish catch.

In one barangay, the belief that frequent inclusion of seagrass flowers in the menu would make the diner a mermaid became widespread.

People also believed that there were symbolic meanings discernible from certain conditions of plants or celestial bodies. One example is that the volume of fish catch will

be low when the *dapdap* (*Erythrina* sp.) tree bore its orange blossoms. Another example is that the phase of the moon can predict fish catch volume – when the half moon faced the mountain, less fish catch was expected.

To ensure the bountiful harvest of agricultural crops, some beliefs had involved offering of chicken to the spirits before clearing the area. Also, another belief referred to assuring a bountiful harvest by soaking the seeds in chicken blood and offering to the spirits a prescribed number of betel nut leaves, precise number of plates of cooked rice, saltless chicken meat, prescribed number of glasses of tuba and other food, offer the same to the spirits at dusk. Another ritual done to ensure that root crops like camote grew big required the male planter, naked, to place the cuttings in a big, wide-mouthed basket before planting. He was also to place three pieces of *do-ol* (*Sonneratia* root) and a pinch of ash or powder in the first three holes before planting the *camote* (sweet potato) cuttings. Some added sugar and egg yolk to simulate sweet, big and glutinous flesh of the crop.

In one barangay, it was believed that in fetching water from the spring, one had to remain quiet to avoid disturbing the spirits; otherwise the offender became ill. In another barangay, the residents believed that because of the noise from the increasing number of people, the spirits fled from the community to quieter areas in the hinterlands. This latter belief served as a reminder of how the indigenous people, bothered with the increasing number of settlers coming from outside the area, had taken flight to the hinterland, in pursuit of the spirits. This observation had been noted in previous studies (as in IPA 1998).

It can be seen how the beliefs, some probably still practiced, and some recalled only by the older members of the community, had pertained to ensuring optimum use of the benefits of the resource base. Other beliefs had referred to ensuring the protection of the resource base, or to exercising of sanctions against those who ignored the guardians of the resources. More research in this area has to be done to examine their deeper implications on biodiversity conservation.

From the description of the social institutions, it can be gathered that the social structure can also be a function of the nature of resource use and resource management. An in-depth analysis of the different roles may be highly relevant in the utilization and conservation of the resource base.

Political Institutions and Community-Based Organizations

LGUs and Government Agencies

The research sites were political units-barangays of selected municipalities. Each barangay had its own set of local government officials (barangay captain, barangay councilors, appointive officials, Sangguniang Kabataan chair, purok and other officials). Three coastal environmental programs (CEPs) of the DENR and two Integrated Social Forestry Program also of the DENR were launched in each of the barangays. The only barangay where the DENR not launched any program hosted a CIDSS-DSWD project and a Bureau of Fisheries and Aquatic Resources project of the Department of Agriculture (DA-BFAR) (Table 16).

There were other national government agencies which the informants recognized to be rendering services in the sites. These were the Department of Health (DOH), Department of Social Welfare and Development (DSWD), Department of Trade and Industry (DTI), the Philippine National Police of the Department of Interior and Local Government (DILG-PNP), Department of Education, Culture and Sports (DECS), National Irrigation Administration (NIA), and the Philippine Coconut Authority (PCA).

So far, no assessment had been made by the communities regarding the successes or

failures of the different programs, their services and their underlying policies as was observed elsewhere (Moffat, et al. 1998; Thia-Eng and Garces 1994). An assessment or any evaluative undertaking participated in by the community would have served as input to actions addressing the coastal resource management problems based on a legal framework acceptable to the communities.

The need for barangays and municipalities to agree on the use of the sea and set policies on the conservation of marine life had often already been expressed; and while habitats for diverse species of fish and shellfish communities still exists, it is advisable that appropriate action be taken to set these policies in place.

People's Organizations

There were community-based organizations, most of which were initiated by programs launched by national government agencies. Others were initiated by nongovernment organizations (NGOs) that operated worldwide, nationwide or provincewide. The Fisheries and Agricultural Management Council (FARMC), inspired by the DA, had been founded in three of the research sites. The beginnings of women's organizations in the barangays were evident. Probably, the most dynamic of the organizations were those inspired by the CEP. There were fishers organizations in practically all of the research sites, and a small coconut farmers association in Panalsalan, inspired by PCA-related activities. Cooperatives were said to have already been established in three barangays.

There were community-based and community-managed associations initiated by nongovernment organizations. Noteworthy were the Paghiusa og Pagtambayayong sa mga Mangingisda sa DANAO (United Fisherfolks of Danao, a People's Organization) or PAGMASDAN of Danao and Himaya Foundation in Punta Miray. The first was inspired by the PIPULI Foundation, an environmental organization operating in the province of Misamis Occidental. The other, Himaya Foundation, was supported by World Vision International. While the goals of either were not mutually exclusive, practical considerations of distance prevented linkage between the Danao-based associations and the Punta Miray-based organizations.

Linkages, however, were clear between the community-based organizations that were environment conscious and the DENR and PIPULI. The latter had played a significant role in raising awareness on environmental conservation in at least four of the research sites. It has also initiated the move for organizational development of local associations in efforts at institutionalizing biodiversity conservation.

Several municipal ordinances regulated the modes of fishing like the ban on dynamite and other illegal and destructive fishing modes and gears; protection of wildlife; development, management of fishery resources; and development of other natural resources. The ordinance, which seemed to have had the greatest, if not the most immediate impact on the lives of the residents, banned fishing two to three days after the New Moon.

In all, there appeared to be varied forms of interfacing between government and nongovernment institutions. As mentioned, there still was a high degree of dependence on authority. This was different from the situation in Estancia, a fishing municipality located at the eastern tip of the Island of Panay in Western Visayas. Estancia displayed an increased independence of the electorate, underscoring the modifications in the patron-client relationships (Blanc-Szanton 1991). There were considerations of emerging community-based and community-managed environmental associations. The first steps had been taken towards institutionalizing efforts in biodiversity conservation.

Table 16. Significant political features of the six coastal PRA sites

POLITICAL FEATURES	BARANGAY MANLA	BARANGAY CALUYA	BARANGAY PUNTA SULONG	BARANGAY PUNTA MIRAY	BARANGAY DANAO	BARANGAY PANALSALAN
Government Agencies (GA)	Municipal Gov't Office (MGO), Barangay Government Office (BGO) Purok Officials, Youth Council (SK), CIDSS-DSWD, DOH, DA-BFAR, DENR	Barangay Government Office (BGO), Youth Council (SK) DA, ISFP-DENR, DOH	MGO, BGO, Purok Officials, SK, CEP-DENR, DOH, DA, PCA	MGO, BGO, Purok Officials, SK, DA, DOH, CEP-DENR, DSWD	MGO, BGO, Purok Officials, SK, DA, DOH, CEP-DENR, DTI, DILG, DSWD, PNP	Barangay Government Office (BGO), Youth Council (SK) DA, ISFP-DENR, DOH
People's Organization (PO)	SEAKA (1995) – CIDSS-DSWD supported; Women's Organization, Manla Fisherfolks Association (MFA)	Caluya Fisherfolks Association (CFA)	PUPLABI (1993), FARMC (1998), Punta Sulong Coop (PUNSUWACO)	Brotherhood Himaya Foundation, PUMICODA (1993), Women's Organization, PMFFMPCOOP, FARMC (1997)	FARMC, DACOSDA, PAGMASDAN, Women's Organization	FARMC, Women's Organization, NIA, Small Coco Farmers Association, ISFP Coop
Nongovernment Organizations	PIPULI Foundation (conducted a seminar on nature conservation)	PIPULI Foundation (conducted a seminar on nature conservation)	MOFECO; PIPULI Foundation (conducted a seminar on nature conservation)	World Vision International	St. Nicolas Ecological Group; PIPULI Foundation (community organizing)	
Municipal Ordinances	#5, 1998: bans the destruction of wildlife #99-002: ecological protection, development, management of fish and aquatic resources; Bantay Dagat; Ban period of fishing; Ban on illegal fishing gears and activities	#99-001 and 99-002: protection and development of natural resources and environment; Fishing ban period	Fishing ban period; Ban on dynamite fishing; Ban on use of baling and sud-sud	Fishing ban period; Ban on dynamite fishing; Ban on use of baling and sud-sud	#12-88: bans catching of siganid fish during spawning period; #1-88: imposes fines on any stray animals; #14-90: regulates fishing in the municipal waters; #5-92: bans catching of fish > 4 tons 15 km from seashore; #11-93: bans the use of compressor; #12-93: bans the use of 3-ply fishnet, muro-ami, and lampornas; #1-94: bans the use of superlight and underwater lights within 15 km from the seashore; #6-94: bans fishing and cutting with mangrove forest; #11-95: prohibits throwing of waste and other refuse within 10 m radius from shoreline, irrigation canals, riverbanks, creeks, and wharf sites; #11-96: requires certification from barangay captain and mayor before issuance of cutting permit from PCA and DENR	Ban on dynamite and other forms of illegal and destructive fishing

Community Perceptions on Coastal Biodiversity and Its Conservation

Interviews, FGD sessions and community validation facilitated the discussion on community perceptions on coastal biodiversity. Generally, issues regarding fish catch decline, environmental degradation, mangrove reforestation, destruction of the seagrass beds and coral communities and sanctuary establishment, among others, were discussed. The people expressed their views and gave insights on how they perceived these concerns. They also elaborated on their awareness on the effects of their actions on the environment.

Most of the people were aware of the environmental degradation that brought about changes in their barangay. They were aware that such changes were mostly caused by indiscriminate use of resources by an increasing population.

The degradation of the varying ecosystems as resource base such as mangrove forests, seagrass beds and coral communities had resulted to low catch, diminishing wildlife resources, pollution and even flash foods. This condition was worsened by illegal practices such as blasting, poisoning and improper methods of collection. The people were aware that the ecosystems were interlinked with each other and they recognized that the destruction in one affected the others. However, the care, conservation and protection of the resource base were hardly implemented as the residents had to compete for a living, which ultimately led to the overexploitation of resources.

Efforts, though, were undertaken to conserve and protect the resources. These efforts were triggered by the realization that if environmental degradation cannot be arrested, there will come a time when there will no longer be fish available to eat or earn from. The pressures were also felt in the terrestrial environment with the increased activities that promoted loss of soil productivity. Overexploitation of the resources and contamination emanating from a mining company in the adjacent province only added to the destruction of the resource base.

It was the people's perception that if the persons practicing illegal fishing were properly apprehended and the corresponding ordinance/law strictly enforced, the destruction of the resource base will be minimized. They stressed the need for proper policing and observance of existing rules and regulations together with information, education campaign, and communication to enhance environmental awareness. The need for a people's organization (PO) to focus on these, particularly in areas where POs are wanting, was recognized. While they were willing to participate in activities to conserve or preserve the resource base, they were only willing to do so if it will not interfere with their opportunities to earn a livelihood or subsistence and will not cause their eventual displacement.

The people had demonstrated their awareness of the importance of the mangrove forest. They had learned that mangrove forests afforded them protection from strong winds and erosion. At the same time, these provided habitat, breeding and spawning grounds for fishes and shellfishes, and other wildlife species. They resented the conversion of mangroves to fishponds and rice paddies by stewardship contract holders. These conversions had reduced the areas available for fishing; as well as the fish and shellfish population.

People were already enthusiastic about engaging in reforestation activities; yet cannot because of the unavailability of funds. Thus, few continued to undertake reforestation after support of government-funded programs were pulled out because of financial incapacity.

The establishment of sanctuaries was perceived positively as these will protect areas that encouraged habitation, and propagation of fish and other resources.

However, there was the fear of reduced catch due to diminished fishing grounds; as well as, the apprehension about displacement. Some subscribed to the idea of establishing a sanctuary as a joint effort of adjoining barangays, like Manla and Caluya. Other barangays suggested that people who were directly affected should be involved and to make sure they will not be disadvantaged. It was also suggested that, while waiting for the sanctuary, provisions for alternative livelihood for those who may be displaced, be set in place.

The people were eager to tap locally available raw materials as an alternative means of living. They were willing to engage in alternative livelihood activities that were environment-friendly. Diversified mariculture of fish, shellfish, shell and fruit processing were among those alternative means viewed as offering better chances of livelihood.

Activities and circumstances that transpired in the terrestrial ecosystem, such as those in the farmlands, were also seen as detrimental to the rivers and to the sea/coastal area. Among these were seepage and flushing of fertilizers and chemical used by the farms, and fishponds. The sedimentation and erosion which worsened during flash floods (*bun-og)* had likewise adversely affected fishing, their means of livelihood.

Despite these grim scenarios, they were still hopeful that with unity, positive efforts and sustained consciousness, their means of livelihood can still be upgraded.

Community Aspirations

Being able to provide food for the family at all times and send their children and grandchildren to school were the common dreams of the people. Parallel to this was the dream of having alternative sources of income/livelihood, including deep sea fishing, using *basnig* and offshore drift net, so that pressures will be eased on the resources of the sea and land. The people also aspired for adequate provision of basic services to the coastal communities like water supply and road network.

Another common desire was to contribute to the rehabilitation, conservation and protection of these resources and the resource base for a better environment and improved quality of life. The people also wished to succeed in stopping all forms of illegal practices and over-exploitation of resources; and hoped that the national government and local government units (LGUs) would become committed in implementing projects and programs that are pro-poor and be able to strictly enforce environmental laws/regulations without bias. Other aspirations pertained to the eradication of graft and corruption and increase in efficiency and effectiveness of agrarian reform program as well as improved means of access to economic resources, including the appropriate technology, finance and skills training.

Results and Discussion

To arrive at a synthesis of the described data there was a need to consider the whole extent of practices undertaken by all groups – organized or unorganized – in resource use and resource conservation. These practices were indicative of the dynamics of relationships between people, resources and environment (PRE). (Appendix Tables 39 to 40e).

A closer observation of the sub-ecosystems of all six barangays allowed an analysis of general trends in the barangays; as well as the peculiar characteristics of people's resource use pattern and their implications to biodiversity conservation.

The Mangroves (*Katunggan*)

Historically, coastal communities made use of mangrove prunings and cuttings from old growth mangroves as material in house construction. People's more common uses of mangroves were: as firewood, fencing, for *tungog,* the commercial coloration used for tuba (coconut wine fermented from the sap of coconut inflorescence), and for fish gear construction (particularly *bungsod* poles after the 1970s). Mangrove fuelwood was used to fire the massive salt making (in drums) activities of several households in two barangays.

Many houses facing the shoreline were protected by mangroves planted by residents, since mangroves acted as windbreakers.

The most destructive large-scale use was burning mangroves for the charcoal business of a number of local elite and, later, of a non-resident who had earned the political patronage of a past president of the country. For decades, this trader supplied charcoal to the plant of an Iligan-based firm manufacturing acetylene black.

The conversion of large areas of mangroves to rice paddies in Panalsalan, to fishponds in Caluya, Punta Sulong and Danao, and to saltbeds and fishponds in Punta Miray had destroyed a considerable expanse of mangrove areas in these barangays. The destruction was made more critical when the converted area became unproductive, thus abandoned. While some abandoned fishponds had been reforested, others were left idle, becoming environmental hazards. In the abandoned rice paddies, there were evidences of agrochemical seepage, thus polluting also the mangrove areas. The extent of pollution from such seepage is a possible area of investigation.

In most parts of the mangroves, shellfish and fish abounded. The actions of many shellfish gatherers, who employed methods such as trampling of feet, posed a grave threat to the mangrove areas. Likewise, the movement of boats that maneuvered the ways and channels disturbed the mangroves growing along the channels.

The traditional knowledge systems about shellfish included indicators that disclosed the areas of location, kind and the quantity of shellfishes. A study of these indigenous knowledge systems would be instructive.

Although there were mono-species reforestation initiatives undertaken by some communities in Manla and Caluya with the assistance of their respective local governing council; an ISF project had been launched in Panalsalan, Punta Miray, Punta Sulong and Danao, and Coastal Environment Programs (CEPs). No conclusive statements can be made yet with regard to the success or failure of rehabilitating the damaged portions of the mangroves or rehabilitating those that had been subjected to burning or use conversion.

There were however regulations and policies governing mangroves resource use/ management in some of the barangays. In Manla, a barangay resolution required the planting of 10 trees for every tree cut. The municipal ordinance in Baliangao which

covered Punta Miray prohibited the cutting of mangroves but was more breached than observed. There were some form of regulated cutting in Punta Sulong, Panalsalan, and Danao. In Danao, regulated cutting applied particularly to the old growth mangroves.

In several of these barangays which had formulated local ordinances governing mangroves use, community associations monitored compliance of the residents. One such association was *Bantay Dagat* (sea watchers) who monitored the barangays of Panalsalan and Danao in Plaridel and in the barangay of Punta Sulong in Baliangao. As was expected, indiscriminate pruning of mangroves occurred less where regulations were effectively enforced. Likewise, where the enforcement was efficiently monitored, the mangroves stood a better chance of conservation. The different levels of effectivity in enforcement of regulations and policies, or the degree of violation of such and the implications, will be useful areas of study.

In fact, mangrove conservation and rehabilitation were better assured with the involvement of organized groups. The CEPs in Punta Miray, Punta Sulong and Danao had triggered the emergence of community-based organizations: PUMICODA (Punta Miray Coastal Dwellers Association) in Punta Miray; PUPLABI (Punta Sulong, Plaza, Bigaan Coastal Dwellers Association) in Punta Sulong; DACOSDA (Danao Coastal Dwellers Association) in Danao, and CFA (Caluya Fisherfolks Association) in Caluya. Besides these, there were also FARMCs in four barangays – Punta Miray, Punta Sulong, Danao and Panalsalan. There were other organizations concerned with mangrove rehabilitation initiated by NGOs like the Himaya Foundation (sponsored by World Vision International), and PAGMASDAN or *Panaghiusa og Pagtambayayong sa mga Mangingisda sa Danao* (initiated by the PIPULI Foundation) in Danao. However, many of these organizations only had minimum knowledge on biodiversity conservation or were active only for as long as the program was funded by government.

Generally, associations that grow out of the programs initiated and funded by the government, cannot very well sustain themselves once funding allocated for the programs is exhausted. In contrast, there was the example of PAGMASDAN which was able to sustain itself without government financing through its efforts with the non-government organization, PIPULI.

In general, among the six barangays studied, there were indicators of differential readiness of organized groups to be tapped for advocacy of programs for biodiversity conservation and community-based research. The undertakings of appropriate HRD programs will raise levels of organizational development of these various groups. In fact, there were already NGOs doing advocacy work, research and training in the area. But, although there was community organizing being undertaken by NGOs in a number of these barangays, most activities of NGOs there, like PIPULI, leaned more towards awareness raising and training, to which participants from the six barangays were invited.

There were features of the *katunggan* which were particular to specific barangays. In Punta Miray, the Cabgan Island had been historically noted to be the roosting area of a flying fox (*kabog*), which thrived in the dense mangrove trees and the island fringes. In Punta Sulong, *nito*, a kind of vine, grew in the mangrove areas. In the past, women had participated in the production of *nito* handicraft for export. However, the business lasted only as long as the Cebu-based traders demanded the handicraft. The business did not thrive when the Cebu traders stopped placing orders. Some domestic orders, however, served as income source for a few women. The potential was there for *nito* handicraft production on a large scale, which can be a source of alternative livelihood for women.

In Danao, there are still remaining old growth forests. They host areas for shelter,

foraging and breeding of fish and other marine life. Tide pools created encourage the recruitment of *bangus* fry and other fish larvae. The primary growth forest recruits wildlife of birds and reptiles.

The people of Danao recalled vividly how the primary growth trees had protected them for a cyclone that hit the area during World War II. The awareness on the value of the resource was high especially with trainings conducted by the NGOs, particularly PIPULI. The trainings served to encourage the people to plant more species of mangrove trees. There was a policy implemented for the protection of this forest.

In Panalsalan, the mangroves were converted into rice paddies which was unproductive. Lying idle, they were invaded by a fern, *pagaypay* (*Achrosticum sp*.), a pest, which posed a threat to the other mangrove tree species.

The Seagrass Beds (*Kalusayan*)

The wide and dense seagrass beds provided the communities with multiple species of shellfish and fishes. Most of the shellfishes were available throughout the year, and were generally gathered by women, men and children. The gatherers had acquired knowledge on the type, location, and quantity of shellfishes in particular parts of the seagrass beds. Normally done during the daytime low tides, shellfish gathering was for children, a means of family income augmentation. A number of parents allowed their children to go shellfish gathering in the afternoons after school; although some children still skipped school to collect shellfish.

Despite the fact that, for decades, the communities had benefited from the seagrass beds, none had instituted measures to conserve them. While there was a general feeling that the number of shellfish species has not reduced, there were evidences of diminishing catch due to destruction of the seagrass beds. This was attributable to a number of factors, and among them was the use of destructive fishing gears that literally mowed the seagrass beds during fishing activities. *Baling* and *sudsud* are some of such forms of destructive fishing gear. Banned in the 1980s, the consequences of the use of such gear were still deeply felt.

Secondly, the actions of shellfish gatherers who grabbled through the seagrass beds, crushed the blades with their hands or trampled on the beds with their feet, uprooted or damaged the plants. This condition was worsened by the movement of boats whose propellers got entangled in the blades especially during ebb tide.

A geophysical occurrence was the third factor causing destruction to the seagrass bed, the *bun-og* (flash flood). It occurred during the rainy season when rivers, like the Dioyo River, flooded the sea near the river mouth areas. This occurrence uprooted the plants and destroyed associated fauna like sea urchin and sea cucumber. The fish, especially, were rendered weak, sometimes lifeless.

Other destructive conditions were agrochemical seepage and siltation. The former emanated from mangrove areas converted to rice paddies; the latter, from eroded agricultural land. Both contributed to the thick infestation of epiphytes and epizoonts.

There were unique features characterizing a number of barangays. In Punta Miray, mangrove afforestation was undertaken in seagrass beds near the Cabgan islands, a practice which would eventually annihilate the seagrass. In Punta Sulong, the sea cucumber was still very much in evidence. While the sea cucumber was not necessarily a key resource, its presence (although diminishing in number, indicating biodiversity loss) gave enough hope that regeneration of the species was possible. This possibility of enhancing large-scale production of *balat*, if tapped, provided a viable alternative source of income especially that it commanded a high price from proprietors of restaurants.

The diminishing number of the sea horse, while still evident in the barangay of Punta Sulong, also signaled the destruction of the species.

Marine Algae (*Kasamo-an*)

The use of the *Sargassum* sp. (*samo*) as cover to retain the freshness of fish catch, had been widely practiced in the six coastal communities. There had been no conscious effort, though, to conserve the algae. Marine algae destruction had been brought about by the actions of shellfish gatherers who trampled on the algae and uprooted them in the process. Fishers who engaged in blasting or poisoning contributed in the degradation of the marine algae. The propellers of boats moving about the waterway especially during low tide added to the destruction. Flushing of agrochemicals from existing and abandoned rice paddies also polluted the waters, aggravating the situation. Moreover, the positioning of the fish gear, *bungsod*, altered the hydrodynamics, adversely affecting the growth patterns of algal species. While there were FARMCs in four of the six communities, whose goals included preservation of reef corals and algae, no concrete activities were made to reverse the destruction done to the marine algae.

In Barangay Panalsalan, what was evident was the prospect of culturing *Kappaphycus*, a red algae that served as a major caragghenan source. In Caluya, there was an initiative of the people to culture *lato (Caulerpa* sp.), the algae that formed part of the diet of most households; although, *lato* culturing had not yet fully come into fruition in the community.

In general, community economic activities combined with the geophysical factor, all contributed to the degradation of the marine algae as much as they affected the seagrass beds described earlier.

The Coral Communities (*Kapagangan*)

Much of Manla's corals had been destroyed. The older residents of Manla used the massive corals in the construction of pathways, houses and in the repropping of reclamation sites. This had destroyed much of Manla's corals. Several fishers in Punta Miray and Punta Sulong used a fishing gear that involved pounding on the corals, disturbing the coral communities and eventually destroying them. Blast fishing was prevalent even when the municipality banned it. In one barangay, many blast fishers were even supported by local officials, leaving the *bantay dagat* members helpless. Local associations had limited knowledge of ecology and of coral biology and many still believed that corals were dead rocks. Uncontrolled access to the resources resulted to the damaged coral reefs.

Each of the coastal barangays had their own particular resources and their share of problems. In Manla, there abounded sea stars and sea cucumbers (also found in Punta Sulong). There were no municipal or barangay ordinances that regulated the harvest of such resources. Several residents of Manla had quarried sand and coral heads, not only from Manla but also from neighboring Naputhao Island and Cabgan Islands in Punta Miray.

A note of hope was drawn with the awareness raising activities conducted by the DENR and PIPULI. Even more hopeful was the interest of several officials and residents to consider setting up a sanctuary in a shoal shared with neighboring barangay of Caluya.

In Punta Miray, the harvest of large shells in the reef slope and flats were unregulated. Abundant in the deeper portions of the reefs were *Conus* spp., now being studied at the Marine Science Institute of the University of the Philippines for their potential to cure diseases of the central nervous system.

Along the reef near Cable Landing, minors were hired to collect the harvests of blast

fishing, an illegal and destructive method used by some fishers. Using minors was a popular tactic among dynamite fishers because they knew that if caught, minors cannot be charged by law and imprisoned.

It was reported that a high official, who owned beach resorts in Cable Landing, was part to blame for the continued practice of dynamite fishing in the area. He was said to be lax about enforcing the ordinance on dynamite fishing, especially when the blasters involved his relatives and friends. He also did not impose regulations related to collection of curios, disposal of garbage or trampling of seagrass beds.

In Danao and Panalsalan, there were small patches of healthy and diverse coral species not present in other barangays.

Lack of appropriate knowledge and of serious enforcement of ordinances protecting the environment were only some of the factors that contributed to the destruction of the coral reefs. In some barangays though, there were potentials that can be tapped to pursue efforts in conserving biodiversity.

Finfish (*Isda*)

More than 90% of the residents of the six barangays were fishers, with open access to the sea, dependent on the marine resources not only for subsistence but also for livelihood. With the level of harvesting, the habitats (mangroves and coral reefs) were not able to sustain the fisheries (for recruitment, shelter, nursery and feeding grounds). The municipal ordinance prescribing the observance of a ban period every month helped to sustain the fisheries and conserve biodiversity.

However, decades of employing destructive fishing methods had reinforced the increasing population pressure on the resources, resulting to diminishing catch. Although some fishing gears like push nets and drag nets had been prohibited in a number of coastal barangays, blast fishing went on uncontrolled in others. Even the placement of *bungsod* in the barangays of Punta Sulong had disturbed the hydrodynamics, affecting the growth of marine algae. In another barangay, the stationery lift net (newlook) had aroused the worry of citizens who were bothered by the fact that the gear caught just about everything, even small fry, due to very small net mesh size. The barangays close to Punta Miray, where the new look abound, were resistant to the installation of the newlook fishing gear as it also deprived neighboring fishers of abundant catch.

In Barangay Panalsalan, efforts had been exerted through the FARMC to culture coral cod (*pugapo*) in fish cages, following indigenous knowledge of the hydrodynamics of the area and biology of the species. Along the fish cages, bivalves like *amahong* (*Perna* sp.) and *talaba* (*Modulus* sp.) were suspended to feed on the particles from the fish cages. This way, the fouling of the sediments under the fish cages was minimized. In Punta Sulong, initiatives had been exerted to experiment on the mass production of *lokot*, the eggstream of sea hare, locally known as *donsol*. Cooked as a viand, *donsol*, according to the curious residents, cannot last longer than three days at sea, no matter how careful the experiments had been.

In Punta Miray, where the newlook are plentiful, even the youth voluntarily assisted in harvesting *(ahas)* the catch seven times a day: at 7:00 p.m., 10:00 p.m., 12:00 a.m., 1:00 a.m., 3:00 a.m., 6:00 a.m., and 7:00 a.m. Even fingerlings, like those of siganids, were caught. Since there was a ban on harvesting siganid fingerlings, this was an obvious and blatant violation. The fingerlings caught were secretly processed to *ginamos* (fermented fish) which commanded a high price among buyers who traded the commodity outside Punta Miray, or outside the municipality of Baliangao. Another fishing gear typical in Punta Miray was the *palangre* (hook-and-line).

In Punta Sulong, the highest number of *bungsods* (around 98), were installed; resulting to overfishing, no matter how

extensive the seagrass beds and the mangrove forests were. The big number of bungsods caused hydrodynamics alteration in seagrass beds and mangrove forests.

In Danao, the fishers used the hand trawl, a gear that had to be registered. The gear was particularly useful for catching *bangus* fry, which was bountiful only in the area and a source of livelihood for most of the communities in the barangay. There were regulations regarding fees that fry catchers had to pay to the common fund of the barangay. But since there were already 70 (and growing) pieces of hand trawls being used in the area, they can already threaten the sustainability of the resource.

These gears promoted overfishing, worsening the degraded condition of reef flat and endangering the associated flora and fauna.

The conditions in the barangays were not unlike the threats to the resources in Southeast Asia (Wilkinson 1994). These included rapid decline in coral reefs due to pollution and overfishing; loss of mangrove forests; damaged seagrass beds and near collapse of fisheries. From a brief review of experiences, it was apparent that the issues arising from the use and status of coastal resources and from coastal resource management in the research sites echoed the issues found in areas elsewhere in the Philippines (VSO 1993). These issues included those that were socioeconomic, legal-institutional and environmental in nature.

Terrestrial (*Kamad-an*) Resources

The coastal communities studied had tracts of land that varied in hectarage and physiography. Manla's physiography was dominated by rocky outcrops with a very narrow coastline and several steep areas. Similarly, Caluya had a rugged terrain of steep stony or rocky mountains, with a very narrow coastal belt. Danao's coastal plains were relatively flat. Punta Miray had nearly flat to flat land. Punta Sulong had flat to slightly rolling land.

Primarily due to its physiography, most land areas cultivable were planted with coconut, the major crop. A big number of coconut lands were owned by very few large landowners, virtually all of whom were absentee landlords. Maintaining cleanliness of the area under the trees was a task performed by *bantays* (caretakers) who borrowed (*hulam*) the plot of land on which to plant subsistence crops like rice, corn, cassava, camote and even bananas. Part of the unwritten agreement was the permission to build houses near the undercrops or in sites directly under the coconut trees. It was significant that many of these caretakers did not consider themselves tenants of the land although they also performed the tasks of hauling coconuts and drying them for copra production. They also shared 1/3 of the proceeds of the copra net of expenses.

Due to the damaging effects of the El Niño in 1998, coconut production plummeted. Consequently, the farmers turned to, or intensified fishing activities in order to survive.

There were also open fields of patch farms of rice and corn which were rainfed (*salud*) and other patches of root crops and banana.

In all, farming provided a source of subsistence and income augmentation to fishers' households. In Punta Sulong, an exceptional case of land use was found in the large vacant area which was to be converted to pastureland. It was the property of a big landowner who also had a large mango orchard in the barangay. The intended pastureland was formerly a coconut plantation with its own workers. The landowner had dismissed the coconut workers when his family decided to cease producing copra. This had deprived the workers of a livelihood source, compelling them to turn to fishing; thus, increasing, the pressure on marine resources.

Parts of the land were planted with *nipa* and bamboo which make good construction materials. A lot of areas have dense growths of grasses and herbs with countless

medicinal properties and can be used in post-natal care and to cure or alleviate skin and respiratory diseases, the common cold, kidney troubles, etc. Some herbs/grasses cannot be named by the residents, yet somehow, they had notions about their medicinal uses.

Timber trees and fruit trees abound in many diverse species. Considered important for their wide range of uses (lumber, furniture or boat making, fuelwood), a number of premium species were already disappearing. Two of these, *ipil* and *tugas*, still grew in Punta Sulong and Manla, even if only in very small quantity. Aside from their edible fruit, some fruit trees were also used for lumber, handicraft, medicine, and boat making.

The communities served as abode of several wildlife and domesticated animals. Some of these faunal species, however, had diminished to an alarming degree that they could be considered rare. Hunting was considered one fatal cause of the disappearance of certain species. Another cause was the disruption of their habitat. In all, many of the causes can be attributed to human invasion.

Several issues had been identified with regard to resource use and resource management of the terrestrial sub-ecosystem of coastal communities. A primary concern was landlessness and socioeconomic problems. Residents recognized the need for an optimal land reform design that would be effective in "reducing rural poverty and inequality while increasing efficiency of resource use" (Hajami, Quisumbing and Adriano 1990). This may sound farfetched considering the long history of landlessness in the area. While there had been no apparent attempt to investigate the contentious interactions between the large landowners and the landless majority, discussions of this sort had been made elsewhere (Kerkvliet 1991), particularly on how resources should be distributed. Poor soil quality worsened the situation, especially when combined with extreme climatic fluctuations. Moreover, that the prices were controlled by millers and *compradors* became a harsh reality which many fishers and farmers already accepted. It was also significant that some people were aware that, especially for copra, pricing was heavily influenced by the international market. More significant, though, was the fact that the diminishing number of some premium species had alerted some residents on the need to minimize cutting, and to replant the species to help regenerate them.

In some areas, residents demonstrated consciousness on soil rehabilitation by the planting of legumes and using animal manure. In other areas, cut corn stalks were left on the ground in particular positions to prevent soil erosion. In other areas, rituals were done to bring about bountiful harvest.

The resource use patterns had undoubtedly affected biodiversity; sometimes, to an irreversible degree. While there were indications of awareness to rehabilitate or regenerate the environment, situations of the people prevented them from doing so.

Troubling most residents was their need for alternative livelihood sources while seeking means to repair the damage brought upon the environment. Diversification of mariculture, often cited by several residents in the communities, was declared desirable because it can enable communities to exercise control over and gain access to "the commons".

Network Analysis

The previous sections articulated the host of resource use and resource management patterns that had adversely affected the environment, threatening biodiversity and sustainability. A network analysis was necessary to examine the factors that led to such patterns and consequent problems; and determine the relatedness of these factors and their effect on biodiversity, its conservation and environmental security.

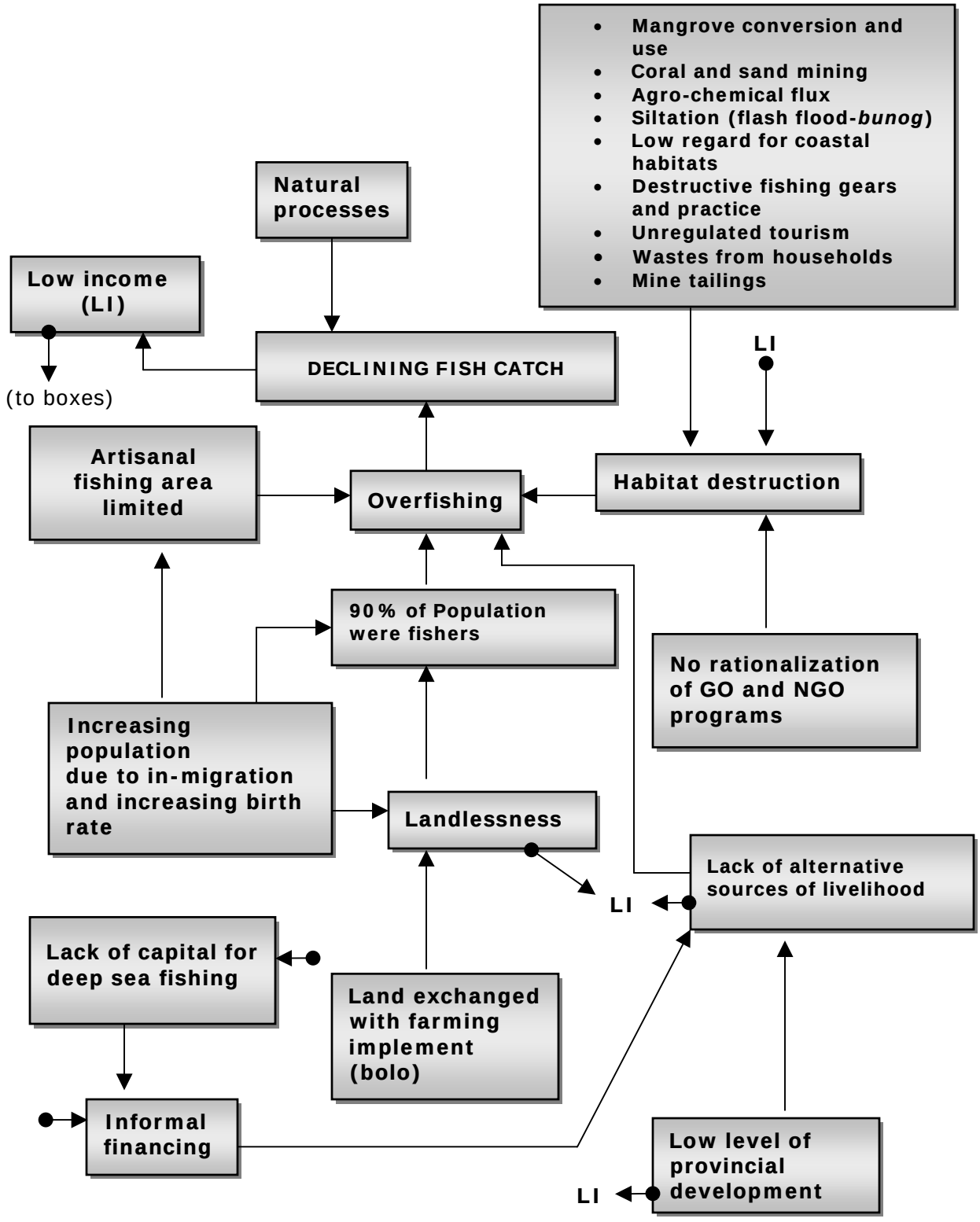


Figure 14. Network analysis of issues and problems in the six coastal PRA sites

Figure 14 shows that central to this network was declining fish catch, the reduced volume and decreased diversity of fish and shellfish collected per effort. Aptly described as the critical transition from the period of abundance to scarcity – *gikan sa halop paingon sa pudyot* (literally, from scooping of fish and shellfish in large quantities to just picking the left-over-morsels) – an experience not unusual to many fishers.

Underlying this condition of declining fish catch was a long inventory of factors, each related to the other. One of the direct causes was overfishing. This was traceable to about 90% of the fishers who engaged in artisanal fishing in a limited area. Population increase was caused by the high birth rate and in-migration of people from the other bioregions (upland and lowland), as well as, from coastal areas of other provinces.

Landlessness worsened the situation for most households. Farming was marginal for most of the families growing root crops or corn on land that was not theirs. Being caretakers or tenants of land of absentee landlords, they exercised no control over it.

The low level of provincial development and the lack of alternative sources of livelihood heightened the pressure on the resource base which was exhibited through different forms of habitat destruction. Such destruction had continued because of ineffective enforcement of existing regulations. As mentioned earlier, the forms of habitat destruction included: mangrove exploitation and mangrove area use conversion, coral and sand mining, agro-chemical flux from rice paddies and fishponds, siltation due to flashflood, *bun-og*, use of destructive fishing gears and practice of destructive fishing methods, unregulated tourism, improper disposal of household wastes, mine tailings, and others. Combined with this was the low regard that many people have for coastal habitats, as they were ill-informed about the subject matter. The other causes of declining fish catch are processes of natural character.

The households dependent on the fish catch earned very little because of the combination of the factors described. Unable to generate enough capital for deep sea fishing, frustrated with the unsustainability of artisanal fishing in a limited area, the fishers were compelled to avail of informal financing, which provided a short term financial relief but further sank them in debt.

Because of the various economic, social and political conditions, the patterns of resource use and resource management, the capacity of these resources to serve as habitats, spawning, breeding, and feeding grounds were reduced, threatening biodiversity and biodiversity conservation.

The problems stemming from the adverse effects of the interplay of the natural or physical phenomena and anthropocentric activities needed to be responded to in a way acceptable to all sectors and stakeholders, which not only considers the dynamism of community knowledge but also mobilizes the energy of the community members.

Interconnectivities

Although the focus of this PRA had been the study of specific coastal barangays, several horizontal and vertical interconnectivities had been observed, some of which are presented below:

Horizontal

Natural

Potable water

The abundant water supply (*ambalong*) at Manla supplied the other barangays of Caluya, Naburos, Sapang Ama, Punta Sulong and Punta Miray.

Water current system

A strong current entered Murcielagos Bay from the east. This current was a small branch of the Pacific Equatorial Current that entered through the Bohol Sea. Tidal currents (diurnal) from Sulu Sea and mixed in Bohol Sea also added to the hydrodynamics of the vicinity waters.

Marine plants and animals

Organisms with dispersal abilities (mangrove, seagrass, algae, fish, shellfish) had propagules that were carried by current systems.

Social

Affiliation by intermarriage of the elites (power group)

Pedro Arce (from Punta Sulong) who was a charcoal concessionaire in the past was a brother-in-law of the Barricas from Punta Miray who then had a very strong connection with Ferdinand Marcos.

Economic

Agrochemicals and mining effluents (particularly mercury and cyanide from Phillex mining and small scale miners)

Effluents spread from one barangay to another through the current systems.

Fishing

Fishers fished everywhere in Murcielagos Bay, Mindanao Sea, and Bohol Sea.

Farm and Marine Products

The six barangays sold their products in major market places like Calamba, Dipolog, Oroquieta, Ozamiz and Iligan. Dried sea stars and sea cucumbers (beche-de-mer) from Manla and handicrafts from Danao were sold in Cebu.

Vertical

Natural

Bun-og or flash flood

A strong flash flood coming from the lowlands and uplands flooding the Dioyo River was experienced once or few times a year in Manla, Caluya, and Punta Sulong. The flash flood carried with it large volumes of silt that turned the waters of these barangays red. Panalsalan and Danao also experienced the same heavy siltation through the Langaran River, the biggest river in Plaridel.

Movements of migratory aquatic species in relation to their life cycles

Sea to estuary (and vice versa): Siganids (*kitong, danggit*): Eggs were hatched at sea and upon reaching juvenile stage, the fingerlings foraged in *Sargassum* and seagrass beds in waters that had slightly reduced salinity.

Sea to mangrove waters: Penaeid species such as prawns and shrimps hatched their eggs in the sea and juveniles migrated to seagrass beds and to the brackish mangrove waters to forage.

Sea to the rivers (and vice versa): Eels (*bakasi*) spawned in the marine waters and

as elvers, migrated back to rivers upstream to mature.

Social

Manla with Subanon cemetery

A woman from Manla talked about an ancient *lubnganan* or cemetery of the Subanons of Mount Malindang and Zamboanga del Norte in her sitio in Manla.

Economic

Use of tubli (Derres sp.*) from the lowlands (Calamba and Bonifacio)*

People of Punta Miray claimed to have observed fishers use *tubli* extracts to poison fish (and reef organisms) in the waters of Cabgan Islands.

Agrochemicals from cornfields, coconut plantation, fruit orchards, rice paddies that flowed through rivers and creeks of Inamucan, Panalsalan; Ducaling, Danao; Langaran, Poblacion, Plaridel; Dioyo River; Cawayan River, Punta Sulong; and Tabyogan Creek, Manla.

Use of fertilizers (N, P, K) enhanced eutrophication in coastal waters (Danao: presence of *Enteromorpha* sp.; Dioyo and Langaran Rivers with populations of water hyacinth).

Organic chemicals

These may have a role in the biological magnification among aquatic organisms.

Sewage from households

This may also have contributed to eutrophication in both river and coastal waters.

Marine Products

Fermented fish (*ginamos*) and dried fish (*bulad*) were bought from major market places and brought to the uplands by Subanons and other upland residents. These processed fish were the main viands of people from the uplands.

Upland Products

Spices and vegetables were sold in lowland markets and were bought by people from coastal barangays.

Conclusion

The ways and different degrees by which the people in the communities utilized the resources and how these resource use practices assault the environment are described in the study. Beyond doubt, several parts of the sub-ecosystems were degraded and other parts displayed different levels of preservation and rehabilitation. The dynamics of resource use and resource management change over time. This impels a serious study of concerns identified by the people in the communities, as well as, those areas which the researchers believe are researchable. It is imperative that the Biodiversity Research Programme help respond to the people's needs and concerns, especially when these concerns pertain to biodiversity conservation; and likewise aid in the institutionalizing efforts to ease pressure on the resource base.

Because the problems and issues derived from the communities were interrelated, the programs responding to them also need to be integrated.

It is fitting to state that the exercise had gained achievements beyond the PRA's original objectives.

Recommendations

Researchable Areas

Suggestions from the Local Communities

The concerns articulated by the communities are translatable to categories of areas of research and areas of action. Without doubt, all communities acknowledged the urgency of addressing the problem of generating alternative sources of livelihood in order to ease the pressure on the resources. While there was the determined effort to seek other sources of livelihood, there was also the expressed need of a number of residents to achieve a heightened level of awareness for biodiversity conservation and environmental regeneration. The communities also expressed the need for further investigation and research on several areas of concern.

Foremost among the identified researchable areas is the development of a feasibility study on the establishment of a marine sanctuary, a suggestion that came from all six communities. Several communities had already suggested possible sites for the envisioned sanctuary, but still need to identify a site.

Three communities expressed their desire to rehabilitate or regenerate important disappearing species. They also regarded research on the restoration of lost species as an urgent matter. Other suggested topics required marine algal research, biology of the sea hare, and *Kappaphycus* sp. (*guso*) disease research. The last suggestion concerning marine research was the use of suitable mangrove species for reforestation.

Foremost among suggested research topics in the terrestrial sector concern the following: land tenure, regeneration and restoration of indigenous premium species of banana like *lakatan* and *tundan,* the potential of the banana species *española*, and research into the causes of *bunsalo* in banana. Considered urgent was soil analysis and soil rehabilitation. Likewise, important was potable water research. One community emphasized the need for research into appropriate technology in farming, a suggestion advanced by residents of Manla, the barangay whose physiography was characterized by rocky outcrops, a narrow strip of coastline abruptly rising to steep, and stony to rocky mountainous terrain. Another barangay, Punta Sulong, strongly suggested research into the use of crushed shell as add-on to animal feeds.

There were other topics that greatly interested the communities. These were: (1) diversified mariculture studies of fish, shellfishes, marine algae, etc.; (2) possible contamination effects of mining effluents (suggested by those living near a mining site); (3) the status and effect of agro-chemical flushings to the river and sea from rice paddies and fishponds; and (4) women and maternal health problems.

Other suggested topics were related to the people's search for alternative sources of livelihood. These included: (1) investigation of species that can be harvested from the sea such as oysters, mussels, and sea cucumber; (2) exploratory studies on fruit preservation, and (3) ecotourism. There were also suggestions to study the (4) feasibility of installing cold storage facilities in the areas; and (5) ways of improving fishpond management in the converted mangrove areas.

People were also interested on the dynamics of interaction across barangays, municipalities, and sectors with regard to biodiversity conservation. The need for closely examining the training needs of community organizations, women organizations, and youth organizations had also been expressed.

Communities that had been most greatly affected by geophysical occurrences

recommended research on the causes and effects of *bun-og* and the possibility of predicting its occurrence. One other expressed concern was salinity intrusion to the rice paddies.

While not all of the topics recommended by the communities were directly related to biodiversity conservation, they were the ones most relevant to them and ones that can significantly affect their use of the resources. In fact many of the recommended topics constitute the goal or substance of action programs which are tackled in another subsection of this discussion.

Researchers' Perspective

Bearing in mind the desire of the six communities for investigation of particular areas of interest to them, certain areas for research are noted here, which may be categorized under general headings of *Methods, Knowledge and Policy*.

Methods. These include the following topics that are not exclusive to the coastal ecosystem but cut across the three ecosystems:

1. Biodiversity inventory and assessment

2. Methods of assessing soil erosion

Knowledge. Under this are topics that are applicable to the coastal ecosystem, or to all three.

1. Biology/Ecology

    a) Biodiversity inventory and assessment (What are the important species and ecosystems to conserve?)
    b) Ecological assessment of threats to rivers and riverine resources.
    c) Assessment and comparison of vegetative cover and impact of conservation practices on soil erosion on the coastal barangays of Sapang Dalaga, Baliangao, Plaridel and Lopez Jaena.
    d) Dynamics of physico-chemical and biological flows from upland and lowland to the marine waters.
    e) Watershed/water sources assessment including water quality, ecology and resource potential.
    f) Salinity intrusion to farmlands
    g) Assessment of the impact of existing marine reserves and sanctuaries on biodiversity conservation in the coastal barangays of Misamis Occidental.
    h) Feasibility, siting and design of marine reserves/sanctuary in the coastal barangays of Sapang Dalaga, Baliangao, Plaridel and Lopez Jaena.

2. Socioeconomic

    a) Market structures and livelihood activities: impact on biodiversity.
    b) Alternative sources of livelihood using local resources (oyster, sea hare, and mussel culture, pearl farming in the case of coastal ecosystem).
    c) Gender roles in biodiversity enhancement, sustainability and degradation.
    d) Resource use and resource management and implications for biodiversity conservation.

        1) Practices
        2) Resource control/Access profile
        3) Tenure
        4) Time use and income flows of farming and fishing activities

3. Ethnoecology/Culture

    a) Indigenous knowledge systems and ethnoecology of the practices in resource use and resource management.
    b) Organizational development of community associations and the institutionalization of efforts for biodiversity conservation.
    c) Informal rules and formal institutional arrangements governing resource use over time.

d) Power structures and politico-economic impact on biodiversity resource use and conservation.
e) Transformation in practices over time as population moves from coastal, lowland to upland.

Policy

1. Policy Research

   Evaluation of marine fisheries conservation policies, e.g., implementation, effectiveness, and acceptance.

2. Policy Advocacy

   a) Developing inter-municipality agreements on resource use and resource management. (For immediate action.)
   b) Policy formulation regarding impact of mining activities on coastal resources.
   c) Resource tenure, control over, and access to resources – implications for biodiversity and implications for biodiversity policy.
   d) Systems of community/co-management resources, certificates of stewardship contracts (CSCs), abandoned fishponds, mangrove reforestation (requires assessment of awards of CSCs to selected few and evaluation of prospects for co-management of abandoned fishponds, etc.

Support Programs Recommended

It is recommended that action programs that support the research initiatives in the following classifications be undertaken: Capability Building (Human Resource Development), Information, Education, and Communication (IEC), Networking, Community Organizing, and Immediate Action Programs.

Among the HRD activities recommended are a basic course in ecology, methods of biological and ecological assessment, particularly for people involved in alternative livelihood, training of researchers on gender and development especially with regard to resource access and control, Philippine-Netherlands exchange of foreign students or researchers, and training of students, faculty and staff from local schools.

As to IEC, the coastal ecosystem group recommends campaign for flora and fauna protection, dissemination of information about existing ordinances that pertain to environmental conservation and regeneration; and the design of campaign materials for the same or compilation of materials thereon.

The often-repeated need for community organizing should be answered by coordinating with organized groups and engaging in organizational development/ institutional strengthening thereof.

There are existing NGOs and institutions which may already have vital material which constitute the bulk of the database. Research publication may also form part of the concern of the program.

Certain integrated community livelihood projects should be implemented immediately to address the urgent need for alternative livelihood.

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Appendix

Checklist of the PRA of Six Coastal Barangays of Mount Malindang

I. Biophysical Environment

A. Physical
   1. Topography (location, bathymetry, etc.)
   2. Climate (rainfall, air temperature, etc.)
   3. Water quality
      a. salinity
      b. turbidity
      c. dissolved oxygen
      d. pH value
      e. water temperature (when and where)
      f. soil/sediment characteristics (texture, etc.)
      g. drainage system
      h. hydrography
         i. current pattern
         ii. current direction
         iii. tide

B. Biological: Status of Coastal and Marine Resources

   1. Coral Reefs
      a. location
      b. kind of species
      c. distribution/cover
      d. structure
      e. productivity
      f. status
      g. presence of artificial reef, types
      h. destructive activities
      i. management and rehabilitation activities

   2. Fishes
      a. distribution and density
      b. pregnancy peaks
      c. fishing methods, gears
      d. quality and volume of catch
      e. market and prices
      f. fishing regulations
      g. problems encountered

   3. Mangrove forest (*Katunggan)*
      a. location
      b. species
      c. density
      d. status
      e. utilization and management

f. physical and chemical environment
    i. sediment characteristics
    ii. soil texture and pH value
    iii. salinity

4. Seagrass beds (*Kalusayan*)
    a. location
    b. species
    c. distribution cover
    d. structure
    e. productivity
    f. status
    g. destructive activities
    h. management and rehabilitation
    i. salinity, turbidity, water temperature, fertility
    j. fauna

5. Algae (*Kasamo-an*)

6. Other types of fish caught
    a. fish pond
    b. mariculture
    c. fish farming
        i. types of species
        ii. status
        iii. land- and marine-based
        iv. technology used
        v. volume of production
        vi. labor requirement
        vii. market and price
        viii. management practices
        ix. problems encountered
    d. fish sanctuary (location, species, management practices, problems)

7. Special difficulties
    a. typhoons, flood
    b. pollution types and sources (agrochemicals and fertilizers)
    c. siltation
    d. land conversion
    e. displacement of species or migratory birds

II. Sociocultural Environment

A. Population Size and Composition
    1. barangay population
    2. distribution of population by sex and age
    3. distribution of population by *sitio* or *purok*
    4. schooling population
    5. economically active population

B. Social Services
    1. education
        a. school buildings

b. levels of schooling (elementary, secondary, tertiary)
c. number of school teachers

2. health
   a. facilities, personnel, services
   b. leading causes of morbidity and mortality
   c. nutritional status
   d. sanitation status (toilets, garbage)
3. utilities (electricity, potable water, other infrastructures)
4. roads, bridges, trails, drainage
5. means of transportation
3. religious institutions
4. recreational and other facilities
5. communication facilities

C. Historical Events
   1. creation of the barangay
   2. in-migration
   3. construction of roads and other facilities
   4. occurrence of disasters
   5. important events

D. Labor Force Disaggregated by Sex and Age
   1. fisheries
   2. farming
   3. employment (regular, contractual, self)
   4. other income generating activities

E. Community Activities, Festivals and Leisure

F. Family and Kinship
   1. roles
   2. levels of living
   3. occupation of household members
   4. children concerns
   5. marriage institutions, inheritance

G. Indigenous Beliefs and Practices
   1. related to medicine and health
   2. related to resource use and management (farming, fishing)

H. Gender Concerns in Elements Discussed Above

III. Economic Institutions

A. Products
B. Pricing
C. Wages
D. Interests, Rents, Taxes
E. Commodity Flows
F. Income and Expenditure
G. Land Tenure and Land Use
H. Industries, Storage, Processing, etc.

I. Tourism
J. Trading
K. Gender Concerns in Each of the Elements A to J

IV. Institutional and Policy Framework

A. Institutional Arrangements, Policies for Resource Use and Management, Policies for Price Control and Policy-making Bodies
B. Cooperatives (number, quality, kind, purpose)
C. Government Agencies and Special Programs (DENR, BFAR, DAR, DSWD, DTI, PCA and others)
D. Voters, Leadership Structure
E. Local Government Unit (composition, projects, plans, problems)
F. Formal Organizations of Fishers, Farmers, Women, Youth, Other Sectors (purpose, composition, activities, programs)
G. Multisectoral Organizations
H. Special Purpose Organizations and Other Interest or Cause-Oriented Groups
I. Dynamics of Formal/Informal Institutional Arrangements
J. Conflict and Conflict Management
K. Gender Concerns in Each of the Elements from A to J

Appendix Tables

Appendix Table 1. Mangrove tree species abundance at Manla, Sapang Dalaga, Misamis Occidental

Tree Species	Density (no/km^2)	Mean dbh (cm)	Mean Height (m)	Importance Value (%)
Lumnitzera racemosa	33,330	4.2	5.2	48.19
Avicennia officinalis	33,333	4.0	6.0	24.56
Rhizophora mucronata	56,661	9.2	5.8	90.88
Rhizophora apiculata	16,665	6.2	5.4	51.87
Sonneratia alba	13,332	6.8	6.3	50.81
Xylocarpus granatum	6,666	6.0	4.5	32.62
Mean	26,664.5	6.07	5.53	49.82

dbh – diameter at breast height

Appendix Table 2. Mangrove tree species abundance at Caluya, Sapang Dalaga, Misamis Occidental

Tree Species	Density (no/km^2)	Mean dbh (cm)	Mean Height (m)	Importance Value (%)
Rhizophora mucronata	293,333	8.9	6.4	130.2
R. apiculata	146,665	14.3	5.7	65.0
Sonneratia caseolaris	66,666	42.0	7.8	104.5
Mean	168,888	21.7	6.6	99.9

dbh – diameter at breast height

Appendix Table 3. Mangrove tree species abundance at Punta Sulong, Baliangao, Misamis Occidental

Tree Species	Density (no/km^2)	Mean dbh (cm)	Mean Height (m)	Importance Value (%)
R. apiculata	110,000	13.5	7.1	67.0
S. alba	50,000	16.0	10.0	51.4
S. granatum	90,000	26.7	7.4	74.4
L. racemosa	30,000	5.3	5.4	24.5
R. mucronata	20,000	8.3	7.0	24.5
A. officinalis	30,000	28.3	7.0	57.9
Mean	55,000	16.35	7.25	49.95

dbh – diameter at breast height

Appendix Table 4. Mangrove tree species abundance at Punta Miray, Baliangao, Misamis Occidental

Tree Species	Density (no/km^2)	Mean dbh (cm)	Mean Height (m)	Importance Value (%)
Rhizophora mucronata	104,000	11.23	7.15	74.37
R. apiculata	56,000	9.57	5.28	55.41
R. stylosa	24,000	11.00	5.33	26.61
Avicennia offinalis	40,000	35.75	10.00	61.12
Sonneratia caseolaris	48,000	59.00	7.71	82.44
Mean	54,400	25.31	7.09	59.99

dbh – diameter at breast height

Appendix Table 5. Mangrove tree species abundance at Danao, Plaridel, Misamis Occidental

Tree Species	Density (no/km^2)	Mean dbh (cm)	Mean Height (m)	Importance Value (%)
Sonneratia spp.	120,000	78.8	11.6	106.70
Avicennia marina	40,000	62.2	6.6	72.60
A. officinalis	110,000	61.1	13.0	89.50
Lumnitzera racemosa	80,000	6.1	5.7	30.82
Mean	87,500	52.0	9.2	74.91

dbh – diameter at breast height

Appendix Table 6. Mangrove tree species abundance at Panalsalan, Plaridel, Misamis Occidental

Tree Species	Density (no/km^2)	Mean dbh (cm)	Mean Height (m)	Importance Value (%)
Rhizophora apiculata	24,000	6.20	3.0	34.77
R. mucronata	24,000	8.80	2.7	27.37
R. stylosa	24,000	7.08	4.0	25.65
Sonneratia alba	128,000	29.30	8.9	101.6
Avicennia officinalis	40,000	34.00	4.8	54.20
A. marina	40,000	24.60	5.2	55.90
Mean	46,667	18.33	4.8	49.92

dbh – diameter at breast height

Appendix Table 7. Fishes commonly caught by fishers in Barangay Manla, Sapang Dalaga, Misamis Occidental

Family	Local Name	Family	Local Name
Lutjanidae	Aha-an	Scathophagidae	Langkiya
Chaetodontidae	Alibangbang		Lalagan
Scombridae	Anduhaw		Likti
Chanidae	Awa	Clupeidae	Lupoy
Teraponidae	Bugaong	Trachichthyidae	Lingi-lingi
Mullidae	Babakan	Labridae	Molmol
Balistid	Bulaknitan	Carangidae	Malapati
Engraulidae	Bolinaw	Clupeidae	Malanse
Leiognathidae	Bakagan	Carangidae	Mamsa
Hemirhaphidae	Balamban	Labridae	Maming
Belonidae	Balo	Lutjanidae	Mayamaya
Execeotidae	Bangsi	Diodontidae	Mosi
Scorpaenidae	Bantol		Nipanipa
Hyporhamphidae	Bigiw	Loligonidae	Nokos
Gobiidae	Bunog	Lutjanidae	Pargo
	Danglay	Pomacentridae	Palata
Siganidae	Danggit	Leiognathidae	Palutpot/sapsap
Trichuridae	Diwit	Muraenidae	Panangitan
Soleidae	Dalidali	Balistidae	Pakol
Platacidae	Dalapugan	Balistidae	Pugot
Mugilidae	Gisaw	Barracuda	Rompi
Berycidae	Ganting	Gerreidae	Samolok
	Gatasan	Pempheridae	Sulong
Atherinidae	Guno	Mobulidae	Salasa
Acanthuridae	Indangan	Penaeidae	Sapayan
Plotosidae	Ito		Talambago
Apogonid	Ibis		Tiristiris
Siganidae	Kitong	Clupeidae	Tuloy
Lutjanidae	Katambak	Labridae	Talad o tawi-od
Carangidae	Kutob	Scombridae	Tangigue
	Kapal	Synodontidae	Tikitiki
	Komu	Syngnathidae	Tukogtukog
Mullid	Kulisiw	Diodontidae	Tandan
Ostraciidae	Kabankaban	Sphyraenidae	Tabangko
Portunidae	Kasag	Palaemonidae	Ulang
Labridae	Labayan	Haemulidae	Uli balay
Portunidae	Lambay		
	Laub	Engraulidae	Bolinaw
Acanthuridae	Langis		Barawan
Scombridae	Lapiz	Carangidae	Caraballas
Sardines	Malanse	Scorpaenidae	Lalong
Carangidae	Malapati		Lali
Loligonidae	Nokos	Labridae	Lupit
Leiognathidae	Palotpot		Lalap
Serranidae	Pogapo	Atherinidae	Guno
Caestonidae	Solid	Carangidae	Kutob
Stolephoridae	Tulakhang	Acanthuridae	Langis
	Tabangko	Carangidae	Mamsa
Caesionidae	Ulan-ulan		
	Uyabang		
Clupeidae	Malubgas		
Siganidae	Tulagbago		
Lethrindae	Dugso		
Labridae	Bunlay-bunlay		
	Timbungan		

(Reference: Conlu 1986)

Appendix Table 8. Fishes caught by fishers at Barangay Caluya, Sapang Dalaga, Misamis Occidental

Family	Local Name	Family	Local Name
Leiognathidae	Sapsap	Balistidae	Pakol
	Balila	Scatophagidae	Lankiya
	Gatasan	Mobulidae	Salasa
Berycidae	Ganting	Atherinidae	Gono
Hyporhamphidae	Bigiw	Synodontidae	Tiki-tiki
Mugilidae	Gisaw		Diwit-diwit
Chanidae	Bangus	Scorpaenidae	Bantol
Balistidae	Pogot		Tagotong
	Bulog		Bulo-buaya
Teraponidae	Bugaong	Hemirhamphidae	Suwasid
Siganidae	Danggit	Belonidae	Balo
Mobulidae	Pagi		Tambalongan
Labridae	Labayan		Sunogan
Serranidae	Pugapo		Malatubong
Balistid	Bulaknitan		
Siganidae	Kitong		
Scombridae	Tangige		
Carangidae	Kotob		
Chaetodontidae	Alibangbang		
Gerreidae	Samolok		
Scombridae	Anduhaw		
Labridae	Mameng		
Carangidae	Talakitok		
Labridae	Molmol		
	Danglay		
Anguilidae	Balakase		
Carangidae	Mamsa		
Pomacentridae	Palata		
Acanthuridae	Langis		
	Dalangdang		
Lutjanidae	Katambak		
	Teris-teris		
Leiognathidae	Babakan		
	Timbungan		
Clupeida	Malanse		
Engraulidae	Bolinao		
	Ubod		
Apogonidae	Ibis		
	Pantaan		
Sphyraenidae	Tabangko		
Lutjanidae	Ahaan		

(Reference: Conlu 1986)

Appendix Table 9. Fishes caught by fishers at Barangay Punta Sulong, Baliangao, Misamis Occidental

Family	Local Name	Family	Local Name
	Agoo		Kumay
Lutjanidae	Ahaan	Carangidae	Kutob
	Anay-anay	Mullidae	Kulisiw
	Angol	Labridae	Labayan
Scombridae	Anduhaw		Lalagan
Apogonidae	Ibis	Scatophagidae	Langkiya
Chanidae	Awa/Sabalo		Languso
Cyprinidae	Babakan	Acanthuridae	Lantong balaknitan
Leiognathidae	Bakagan	Serranidae	Lapulapu
	Balagbagi		Likti
Anguilidae	Balakasi	Labridae	Lupit
Balistid	Bulaknitan		Malangsi
Hemirhamphidae	Balamban	Carangidae	Malapati
Belonidae	Balo	Labridae	Maming
Cyprinidae	Banak	Carangidae	Mamsa
Chanidae	Bangus		Manabing
Exocoetidae	Barongoy		Milo-milo
	Bebebuanga	Labridae	Molmol
Hyporhamphidae	Bigiw		Olapay
Engraulidae	Bolinao/talakhang		Osoos
	Bugalbog	Dasyatidae	Pabanogon/pagi
Teraponidae	Bugaong	Pomacentridae	Palata
	Bulo-buaya	Leiognathidae	Palutpot/Sapsap
	Bunog	Muraenidae	Panangitan
Soleidae	Dali-dali		Pabusugon
Siganidae	Danggit		Pugot
	Danglay		Puyo
	Dapogon	Pentapodidae	Salanggukod
	Darundoy	Mobulidae	Salâ-sà
	Dugso	Gerreidae	Samolok
Berycidae	Ganting	Caesionidae	Solid
Mugilidae	Gisaw/Banak	Acanthuridae	Sunghan
Atherinidae	Guno	Sphyraenidae	Tabangko
Belonidae	Gurami		Tagotongan
Channidae	Halu-an		Talad
Apogonid	Ibis	Carangidae	Talakitok
	Idlason	Clupeidae	Tamban
Acanthuridae	Indangan	Peiophthalmidae	Tambasakan
	Ipos-ipos/labud	Diodontidae	Tandan
Plotosidae	Ito	Synodontidae	Tiki-tiki
Syngnathidae	Kalukabayo		Timbaga
Anguilidae	Kasili		Timbungan
Lutjanidae	Katambak	Palaemonidae	Ulang
	Kiampaw		Ulapay
Siganidae	Kitong		Ulayag
		Sergestidae	Uyap

(Reference: Conlu 1986)

Appendix Table 10. Fishes caught by fishers at Barangay Punta Miray, Baliangao, Misamis Occidental

Family	Local Name	Family	Local Name
Siganidae	Ketong	Sarpin	Pinyahon
Siganidae	Danggit		Bantol
Carangidae	Kutob	Carangidae	Karbalyas
Atherinidae	Gono		Saminsamin
Clupeidae	Malansi		Gatasan
Apogonidae	Ibis	Lutjanidae	Dalangdang
	Katursa		
Leiognathidae	Palotpot		
Lutjanidae	Katambak		
Teraponidae	Bugaong		
	Bugalbog		
Carangidae	Mamsa		
Scombridae	Tanguige		
Belonidae	Balo		
Charharinidae	Iho		
Serranidae	Pugapo		
Acanthuridae	Indangan		
	Bukaw		
Octopidae	Pugita		
Octopidae	Tabagok		
	Tamala		
Engraulidae	Bolinao		
Sepiidae	Nokos		
	Danglay		
	Commonwealth		
Carangidae	Sigarilyo		
Scombridae	Pirit		
Labridae	Labayan		
	Sunghan		
	Ulapay		
	Pantaan		
Gerreidae	Samolok		
Trachichthidae	Lingilingi		
	Kapal		
Penaeidae	Pasayan		
Portunidae	Lambay		
	Lambo (deep sea)		
Sergestidae	Uyap		
Portunidae	Alimango		
	Timbongan		
Trichuridae	Diwit		
	Ubod		
Chaetodontidae	Alibangbang		
Exocoetidae	Barongoy		
Hemirhamphidae	Suwasid		
Menidae	Belongbelong		
	Daledale		
Balistidae	Bulaknitan		

(Reference: Conlu 1986)

Appendix Table 11. Fishes caught by fishers at Barangay Danao, Plaridel, Misamis Occidental

Family	Local name
Siganidae	Danggit
Carangidae	Kotob
Teraponidae	Bugaong
Siganidae	Kitong
	Timbungan
Caestonidae	Solid
Labridae	Molmol
Carangidae	Talakitok
Loligonidae	Nokos
Cyprinidae	Banak-banak
Plotosidae	Ito
Gerreidae	Samulok
Portunidae	Lambay
	Bugalbog
Leiognathidae	Palotpot
Lutjanidae	Katambak
Carangidae	Mamsa
Acanthuridae	Langis
	Danglay
	Ilak
Acanthuridae	Sunghan
Scombridae	Anduhaw
Berycidae	Ganting
	Bangus fry
	Moong-moong
	Gurami

(Reference: Conlu 1986)

Appendix Table 12. Fishes caught by fishers at Barangay Panalsalan, Plaridel, Misamis Occidental

Family	Local name
Gerreidae	Samolok
Apogonia	Ibis
Siganidae	Kitong
Siganidae	Danggit
	Tabang-banak
Mugilidae	Gisaw
Clupeidae	Malubgas
Lutjanidae	Katambak
	Matambaka
	Kapal
Engraulidae	Bolinao
Labridae	Mulmul
	Bogalbog
	Lubay-lubay
Labridae	Talad
Teraponidae	Bugaong
Gobiidae	Bunog
Belonidae	Balo
Plotosidae	Ito
Atherinidae	Guno
	Danglay
	Tubo-tubo
Serranidae	Lapu-lapu
Atherinidae	Guno
	Inid
Octopodidae	Buko-buko
Octopodidae	Kubotan
	Dalapugan

(Reference: Conlu 1986)

Appendix Table 13. Significant key historical events in the coastal PRA sites

Manla	Caluya	Punta Sulong	Punta Miray	Danao	Panalsalan
		1900s Immigration from Siquijor and Bohol; use of bamboo fishing gear that is environmentally friendly	1901 Spaniard carrier stranded near Cabgan Island [with remnant: *pugon* (coal burning chamber) still seen nowadays]		1900s Immigration of Boholanos, Siquijodnons, and Cebuanos to Plaridel
1920s Sawmill operation at Snag area 1940s-1970s Intensive utilization of *bakhaw* species for salt making and then *bakhaw* for charcoal making for the American Union Carbide Company demands	1930s-1950s Dense big dipterocarp trees; primary growth of mangrove forest dense (as tall as coconuts); Sayaw birds dense; *kabog* dense (blackened the sky)	1940s "Golden age"; fish and shellfish very dense; dense primary growth; mangrove trees only used for house construction	1942 Dense vegetation with plenty of bushes/grasses and guavas; dense corals and mangrove forests; Cable Landing: communication center of Japanese	1920s Dense mangrove forests Late 1930s – 1940s Pre WWII; strong cyclone hit Danao; primary growth of mangroves served as protection	1920s Dense primary growth of mangrove forests; forests with monkeys; dense wild ducks, birds, fish and shellfish 1937 to 1938 Panalsalan Primary School Opening; MATCO Operating
	1954 Start of charcoal making	Early 1950s Small scale charcoal making	1950s Salt making using mangrove trees; start of dynamite fishing	Early 1950s Small scale charcoal making	1950s Salt making using mangrove trees as fuelwood; Small scale charcoal making; In late 1950s large scale charcoal making for American Union Carbide in Iligan
	1960s to early 1970s Intensive charcoal making 1965 *Kabog* disappeared	Late 1950s to 1960s Intensive charcoal making; use of destructive fishing like *tero, tubli, baling;* several *kabog* still present; use of *tongog* in tuba making		Late 1950s Large scale charcoal making Late 1960s-1970 Fish in mangrove tide pools	1960s Increased deforested mangrove area; start of mangrove conversion into rice paddies; building irrigation canals

Appendix Table 13. Significant key historical events in the coastal PRA sites (*continuation*)

Manla	Caluya	Punta Sulong	Punta Miray	Danao	Panalsalan
1970s Peak in dynamite fishing	1970s Survey by DENR to determine areas not planted with or managed as fishponds – for reforestation; last sighting of many monkeys; certificate of stewardship (CSC) also granted to non-Sapang Dalaga residents 1975 Subdivision of mangrove clearings into parcels (ISFP) for nipa plantation	1970s Continued exploitation of mangroves, particularly for tungog and charcoal making	1970s Peak in dynamite fishing	1970s Conversion of mangrove forests into fishponds	1970s-80s DENR-ISFP
1980s Tree Planting Presidential Decree; Integrated Social Forestry Program	1980s Tree planting as graduation requirement	1980s ISFP: mangrove stewardship agreements to 50 residents and non-residents with 1-5 ha average landholding; conversion to fishponds; increased destructive means of fishing 1983 Last observed bountiful harvest of marine products 1984 Appearance of Newlook; Mayor Agapito Yap Jr. banned *baling* and *sud-sud*	1980s Trawlers allowed in the area for one year	1982 ISFP (more conversion into fishponds)	1980s Operation of National Irrigation Administration; electrification; water system; health care
1990s Protection and conservation campaign; 1 tree cut to be replaced by 10	1990s Implementation of municipal ordinances to protect the remaining mangrove forest; sighting of two (2) monkeys in the nipa area	1990s CEP and reforestation	1990s More houses were built; implementation of ban period for fishing 1998 Inauguration of Bumbaran Beach at Cable Landing	1990s CEP; ordinances and banning illegal fishing; Bantay Dagat; Ban period enforcement	1990s Coco lumber; more environmental degradation observed

Appendix Table 14. Population by age bracket and sex in Manla, Sapang Dalaga, Misamis Occidental (May 1999)

Age Bracket (years)	Male	Female	Total
0-5	36	26	62
6-10	56	42	98
11-15	40	41	81
16-20	26	26	52
21-25	35	31	66
26-30	26	39	65
31-35	28	20	48
36-40	19	17	36
41-45	12	19	31
46-50	18	14	32
51-55	7	7	14
56-60	7	5	12
61-65	7	1	6
66-up	14	20	34
TOTAL	**329**	**308**	**637**

Appendix Table 15. Population by age bracket and sex in Caluya, Sapang Dalaga, Misamis Occidental (May 1999)

Age Bracket (years)	Male	Female	Total
0-5	50	36	86
6-10	46	62	108
11-15	57	43	100
16-20	37	43	80
21-25	37	33	70
26-30	28	31	59
31-35	31	22	53
36-40	28	15	43
41-45	19	25	44
46-50	15	15	30
51-55	6	14	20
56-60	16	13	29
61-65	7	8	15
66-up	16	14	30
TOTAL	**393**	**374**	**767**

Appendix Table 16. Population by age bracket at Punta Sulong, Baliangao, Misamis Occidental (May 1999)

Age Bracket (years)	Number	Ratio
1-6	217	17.4%
7-11	90	7.2%
12-16	130	10.4%
17 above	810	65.0%
TOTAL	**1,247**	**100%**

Appendix Table 17. Population by age bracket at Punta Miray, Baliangao, Misamis Occidental (May 1999)

Age Bracket (years)	Number	Ratio
1-6	302	25%
7-11	241	20%
12-16	217	18%
17 above	326	10%
TOTAL	**1,207**	**100%**

Appendix Table 18. Population by age bracket and sex in Danao, Plaridel, Misamis Occidental (May 1999)

Age Bracket (years)	Male	Female	Total
0-5	25	23	53
6-10	41	40	81
11-15	29	21	50
16-20	21	24	45
21-25	13	12	25
26-30	11	11	22
31-35	22	20	42
36-40	14	14	28
41-45	11	9	20
46-50	8	14	22
51-55	19	12	31
56-60	10	8	18
61-65	2	6	8
66-up	5	8	13
TOTAL	**231**	**227**	**458**

Appendix Table 19. Population by age bracket and sex in Panalsalan, Plaridel, Misamis Occidental (May 1999)

Age Bracket (years)	Male	Female	Total
0-5	170	132	302
6-10	151	140	291
11-15	135	120	255
16-20	107	127	234
21-25	78	81	159
26-30	92	88	180
31-35	82	69	151
36-40	68	63	131
41-45	64	56	120
46-50	55	46	101
51-55	26	33	59
56-60	92	99	191
61-65	22	27	49
66-70	18	18	36
71-up	14	21	35
TOTAL	**1152**	**1058**	**2217**

Appendix Table 20. Number of households and population by Purok in Barangay Manla, Sapang Dalaga, Misamis Occidental (May 1999)

Purok	Number of Households	Population
I	55	278
II	31	187
III	31	171
TOTAL	**117**	**637**

Appendix Table 21. Number of households and population by Purok in Barangay Caluya, Sapang Dalaga, Misamis Occidental (May 1999)

Purok	Number of Households	Population
I	76	328
II	44	223
III	42	216
TOTAL	**162**	**767**

Appendix Table 22. Number of households by Purok in Barangay Punta Sulong, Baliangao, Misamis Occidental (May 1999)

Purok	Number of Households
I & II	74
III & IV	81
V	29
TOTAL	**184**

Appendix Table 23. Number of households by Purok in Barangay Punta Miray, Baliangao, Misamis Occidental (May 1999)

Purok	Number of Households
I	26
II	38
III	56
IV	26
V	54
VI	30
VII	39
TOTAL	**269**

Appendix Table 24. Number of households and population by Purok in Barangay Danao, Plaridel, Misamis Occidental (May 1999)

Purok	Number of Households	Population
I	90	485
II	15	88
TOTAL	**105**	**573**

Appendix Table 25. Number of households and population by Purok in Panalsalan, Plaridel, Misamis Occidental (May 1999)

Purok	Number of Households	Population
I	62	269
II	95	417
III	60	264
IV	66	288
V	61	267
VI	76	335
VII	59	257
TOTAL	**479**	**2097**

Appendix Table 26. Price of fish at Manla, Sapang Dalaga, Misamis Occidental

Kind of Fish	Price from Fishers (Peso/kg)	Price from Compradors (Peso/kg)
Guno	3.00/caltex	10.00/caltex
Danggit		
Small	20.00	35.00
Regular	25.00	40.00
2nd class	35.00	50.00
1st class	40.00	60.00
Kitong		
Small	20.00	35.00
Regular	25.00	40.00
2nd class	40.00	50.00
1st class	40.00	60.00
Big	50.00	70.00 – 80.00
Bugaong	25.00	40.00
Molmol	15.00 - 25.00	40.00
Samolok	15.00 - 25.00	30.00
Palata	"giveaways" (*panghilas*)	
Labayan	15.00	25.00 – 30.00

Appendix Table 27. Volume of catch, number and peak of seasonal use of different fishing gears observed in Caluya, Sapang Dalaga, Misamis Occidental

Type	Number	Catch	Peak Season
Gill net (*pukot*)	20	3-5 kg/3 hrs/day	Nov. – Jan.
Spear (*pana*)	80	0-1 kg/4 hrs/day	
Fish trap (*bobo*)	20	3 kg/day	
Paugmad	1		
Bukatot	100	0-1 kg/day	April – Nov.
Fish corral (*bungsod*)	3	0-10 kg/day	Oct. – Dec.
Compressor	2	3-50 kg/day	April – June
Fish cage	2		
Sud-sud	5		
Tapsay	10		
Palangre			

Appendix Table 28. Prices of fish and shellfish at Caluya, Sapang Dalaga, Misamis Occidental

A. Eskuwedo (premium) fish	Price (Peso/kg)
Danggit	20.00 – 45.00
Ketong	40.00 – 60.00
Pugap	200.00 (live)
	70.00 (fresh)
Ahaan	50.00 – 60.00
Timbonga	40.00 – 50.00
Tangige	70.00
Mamsa	40.00 – 50.00
Katambak	30.00 – 50.00
B. Shellfish/echinoderm	**Price per caltex**
Litob	3.00
Aninikad	12.00
Bonkawil	1.00/pc
Kandiis	4.00
Amomongpong	3.00
Tuway	2.00
Bagongon	1.00
Dalo-dalo	2.00
Imbaw	1.00/3 pcs
Alimango payat	40.00 – 50.00
Alimango red fat	180.00
Alimango green fat	120.00
Nooks	70.00
Balat	0.30/pc

Appendix Table 29. Types of gear and fish caught by fishers of Punta Sulong, Baliangao, Misamis Occidental

Gear	Fish Catch Composition	Volume of Fish Catch
Baling	All fish in the kalusayan including bunog, bulaknitan, gisaw, gino, ibis, ulang	
Bubo	aha-an, dapugan, indangan, lalagan, lapulapu, likti, maming, molmol, pugapo, timbungan, ulapay (if panangitan is trapped ahead, it scares off the fishes)	About 2.5 kg
Bukatot	balakasi	
Pana	shallow fish, danggit	Small volume
Panak		
Pasol	dalangdang, fish found in saging-saging	Very minimal
Piyango	pugapo, indangan, maming, molmol, ulapay	1.5 kg
Pukot	danggit, timbungan, katambak, salanggukod	3-4 kg
Sudsud	all fish in the kalusayan, alimango, lokun, sapayan	
Tapsay	gisaw, banak, tabudyok	

Appendix Table 30. Punta Sulong, Baliangao bungsod fish catch composition

Name	Usual Volume of Catch
Agoo	Close to 5 kg or more
Babakan	-do-
Balo	-do-
Bebebuanga	Less than 5 kg
Bugaong	Close to 5 kg or more
Bunog	-do-
Danggit	-do-
Danglay	-do-
Gisaw	-do-
Ibis	-do-
Ito	-do-
Katambak	-do-
Kitong	-do-
Kulisiw	-do-
Labayan	-do-
Lalagan	Less than 5 kg
Palutpot	Close to 5 kg or more
Salanggukod	-do-
Talad	-do-

Appendix Table 31. Buying and selling fish at Punta Sulong, Baliangao, Misamis Occidental

Species caught by the bungsod	Price in buying fishes from the fishers (PhP)	Price at which comprador sells (PhP)
Kitong	50	70
Danggit	40	60
Katambak	40	60
Samolok	25-40	50
Gisaw/banak	25-30	45
Bugaon	25	40
Kulisiw	20-25	40
Babaka	25-30	40
Danglay	40	50
Palotpot	20	35-40
Ibis	7	15
Salangukod	15	25
Lalasan	40	60
Bunog	15	20
Labayon	15	20
Talad	15	40
Balo	25-40	50
Ito	20-35	50
Agoo	10-15	35
Bebebuanga	15-25	25
Lambay	40	50-60
Nokos	70	90-100
Pasayan	70	90-100

Appendix Table 32. Price and volume for gathered shellfish (Punta Sulong)

Species	Price (PhP)	Volume
Bongkawil	75/piece	0-28 pieces
Aninikad	13/caltex	½-5 caltex
Litob	3.50/caltex	½ -3 caltex
Turay-ok	3.50/caltex	½-2 caltex
Kandiis	5.00/caltex	1-3 caltex
Amahong	5.00/glass	
Katapngan	5.00/glass	
Punaw	5.00/glass	1-3 caltex
Bisala	5.00/glass	1-3 caltex
Kibol	13/caltex; Viand	0-3 pieces
Imbaw	2/piece	
Liswi		
Dalo-dalo	Viand	1-5 caltex
Bagongon	Viand	2-10 caltex
Tuway	5.00/glass	
Manok-manok	0-1 piece	
Aslowan	0-2 pieces	
Taruytoy	5-15 caltex	
Sungkod-sungkod	Viand	1 caltex
Talaba	7.00/glass	
Anso-anso	Viand	
Amomongpong	1.50/caltex	½-1 caltex
Lampinong	Viand	
Bongaton	0.75/piece	1-3 caltex
Buta-buta	Viand	

Appendix Table 33. Fish gear used, volume of catch and prices of finfish and crustaceans sold in Punta Miray, Baliangao, Misamis Occidental

Kind of fish	Fishing Gear	Volume of Catch (kg)	Market price (Peso/kg/banca/day)
Ketong	pukot	0-2	40.00 – 50.00
Danggit	pana	0-2	25.00 – 40.00
Kutob	palangre	5-25	20.00 – 30.00
Gono	newlook	0-15	5.00
Malansi	newlook	0-20	18.00
Ibis	sabay	0-1	10.00
Katorsa	newlook	0-5	12.00
Palotpot	newlook	0-15	8.00
Katambak	palangre	0-2	40.00 – 50.00
Buganong	pangre/newlook	0-10	30.00
Bugalbog	pana/pukot	0-10	30.00
Mamsa	pasol	3-10	50.00
Tanguige	pana/pasol	0-15	60.00
Balo	pukot/pasol	0-10	30.00 – 40.00
Iho	pasol	talagsa	30.00
Pugapo	pasol/pana	0-10	60.00
Indangan	compressor/pasol	0-20	30.00
Bukaw	palangre/pasol	0-10	20.00
Pugita	pana	0-2	40.00 – 50.00
Tabagok	sulu/sug-an	talagsa (rare)	40.00 – 50.00
Tamala	pana	0-5 pcs	10.00/tapok
Bolinao	newlook	0-30	20.00
Nokos	pasol	0-2	70.00
Danglay	pukot/newlook	0-5	40.00
Commonwealth	pasol/talagsa		30.00
Sigarilyo	pasol	0-5	25.00 – 30.00
Pirit	pasol	0-20	20.00 – 30.00
Labayan	pukot	talagsa	10.00
Sunghan	compressor/pana	5-20	20.00
Ulapay	pana/bunsod	0-12	30.00
Pantaan	bunsod/newlook	0-12	30.00
Samolok	bunsod/newlook	0-10	30.00 – 40.00
Lingilingi	pana	talagsa	10.00/tapok
Kapal	pukot	talagsa	20.00
Pasayan	bunsod/pukot	0-5	40.00
Lambay	pukot	3-5	50.00
Lambo (deep sea)	pasol	3-10	30.00 – 40.00
Uyap	bunsod/newlook	0-5	8.00/caltex
Alimango	bubo	talagsa	90.00 – 100.00
Timbongan	pukot/pasol	0-8	40.00
Diwit	pasol	0-5	30.00
Ubod	palangre	0-3	30.00
Alibangbang	compressor/pana	5-10	20.00
Barongoy	pukot	5-10	25.00
Suwasid	bunsod/pukot	0-3	30.00
Belongbelong	pasol/newlook	talagsa	30.00
Daledale	pana	talagsa	10.00/pc
Bulaknitan	bunsod (lusayan)	3-10	10.00/tapok
Pinyahon	palangre	3-10	3.00/pc
Bantol	pana (samoan)	talagsa	10.00/tapok
Karbalyas	pukot/newlook	0-15	30.00
Saminsamin	newlook	0-3	30.00
Gatasan	pana	0-1	consumo

Appendix Table 34. Prices of shellfish at Punta Miray, Baliangao, Misamis Occidental

Kinds of Shellfish	Volume of Catch (caltex/day)	Market Price (Peso)/ (pc or caltex/banca/day)
Bongkawil		1.00/pc
Aninikad	1, 4, 10	10.00/caltex
Liswi	1, 10	15.00/caltex
Litob	10, 20	3.00/caltex
Tagmanok	1, 2	15.00/caltex
Bakalan	10, 20	3.00/caltex
Kibol (diminishing)	1–2 pcs	
Sungkodsungkod		
Ansoanso	2, 4	1.50/caltex
Kondasoy	2, 4	1.50/caltex
Amomongpong	3, 6	3.00/caltex
Bug-atan	1-2 pcs	
Kandiis	1, 2	
Kalaykay	2, 5	3.00/caltex
Turay-ok	10, 20	2.00/pc (big) 1.00/pc (small)
Gubaguba		
Sang	3, 6	
Budyong	1, 2	
Puki	3, 4	
Katupnan	20-30 pcs	4.00/pc
Kapinan	10-20 pcs	
Wasaywasay	10-20 pcs	1.00/caltex
Amahong	10-20 pcs	

Appendix Table 35. The prices and seasonality of common fish in Danao, Plaridel, Misamis Occidental

Fish	Price (Peso)	Season
Danggit	50.00 (big), 35-40 (small)	February to May
Kitong	50.00 (big), 35-40 (small)	February to May
Molmol	25.00 (big), 20.00 (small)	November to February
Banak-banak	25.00 (big), 20.00 (small)	Amihan
Lambay	35.00	
Katambak	50.00 (big), 35-40 (small)	February to May
Danglay	50.00 (big), 35-40 (small)	Himatayon, Aya-ay
Anduhaw	30.00	Full Moon, Walay Hangin
Kotob	25.00 (season), 35-40 (less)	Full Moon
Timbungan	50.00 (big), 35-40 (small)	February to May
Bangus Fry	0.20-0.30 per piece (season), 0.40-0.50 per piece (less catch)	May to September

Appendix Table 36. The prices and seasonality of common shellfish in Danao, Plaridel, Misamis Occidental

Kind of Shellfish	Season	Price (Peso)
Aninikad	December	10.00/caltex
Bongkawil	December	10.00/caltex
Saang	December	10.00/piece
Samong	New Moon, 1st Quarter	
	Full Moon	120.00/kg
Amomongpong		12.00/caltex
Budyong	May-August	10.00/piece
Sali-ot/Taklobo	*Tin-aw/Linaw*	35.00/piece
Lumban	*Aya-ay*	1.00/kg
Baloso		1.00/3 pieces
Bagongon		10.00/taro (can)
Dalo-dalo		10.00/sack
Tuwai		5.00/pack
Imbaw		10.00/5 pieces
Sigay (for shellcraft)		10.00/caltex
Nasa (for shellcraft)		10.00/caltex

Appendix Table 37. The prices of common fish in Panalsalan, Plaridel, Misamis Occidental

Fish species	Price from fishers (Peso/kg)	Price from Comprador (Peso/kg)	Market
Nokos	80.00	10.00	Listed fish may be sold to neighbors or to markets in Plaridel *poblacion* or in Oroquieta.
Samolok	30.00	35.00 – 40.00	
Ibis	15.00 – 20.00	20.00 – 30.00	
Kasag	10.00	15.00	
Ulang	10.00/caltex	12 -15.00/caltex	
Kitong	40.00 – 60.00	50.00 – 70.00	
Danggit	50.00	60.00 – 70.00	
Tabang-banak	25.00 – 35.00	35.00 – 40.00	
Gisaw	20.00 – 25.00	30.00 – 35.00	
Malubgas	20.00 – 25.00	30.00 – 35.00	
Katambak	20.00 – 25.00	60.00 – 70.00	
Matambaka	50.00	60.00 – 70.00	
Kapal	50.00	25.00 – 30.00	
Bolinao	20.00 – 25.00	25.00 – 30.00	
Mulmul	20.00 – 25.00	30.00 – 35.00	
Bongalbog	25.00 – 30.00	30.00 – 35.00	
Lubay-lubay	30.00	35.00	
Talad	30.00	35.00	
Bugaong	25.00 – 30.00	30.00 – 35.00	
Bunog	15.00 – 20.00	20.00 – 25.00	
Palo	15.00 – 20.00	20.00 – 25.00	
Ito	20.00 – 25.00	30.00 – 35.00	
Guno	7.00 – 10.00	12.00 – 15.00	
Fanglay	25.00 – 30.00	30.00 – 35.00	
Tubo-tubo	30.00 – 35.00	35.00 – 40.00	
Lapu-lapu	40.00 – 50.00	60.00 – 70.00	
Guno	40.00 – 50.00	60.00 – 70.00	
Inid	40.00 – 50.00	60.00 – 70.00	
Buko-buko	25.00 – 30.00	30.00 – 35.00	
Kubotan	30.00 - 35.00	40.00 – 50.00	
Dalapugan	35.00 – 40.00	50.00	

Appendix Table 38. Prices of farm products in Punta Miray, Misamis Occidental

Crops	Season	Harvest and Price
Coconut (Lubi)		
copra		
tibuok		1,500 lubi or
ulingon		5-6 landay (sacks)
mibrib		
coco lumber		P 4/kg
poste sa newlook		P 5/bugkos
		1999: 300 pcs;
		250/tree
Saging kadisnon (banana)		P 700 net quarterly
Mangga (mango)	2x/year (El Niño, no fruits)	P 25-30/kg
Kaimito (starapple)	July (Panhig)	
Pomelo (citrus)	October (Pangulilang)	
Tambis/makopa	Jan. – Mar. (peak)	
Siniguelas	Once a year	P 15-20/pc
Bayabas (guava)	Summer	P 1/tuhog (3-5 pcs)
Mais	May	P 5/putos
Kamoteng kahoy (cassava)	No season	P 2/putos (3 pcs)
Kamoteng balagon (sweet potato)	Staple food	consumo
Sambag (tamarind)		consumo

Appendix Table 39. PRE analysis of data from the six coastal PRA sites

Resource	Barangay Manla	Barangay Caluya	Barangay Punta Sulong	Barangay Punta Miray	Barangay Danao	Barangay Panalsalan
Mangrove	a. Barangay Council, SEAKA, MFA; poles for fuelwood, bungsod, fence; with reforestation of *Rhizophora* spp.: 1 tree cut = 10 trees planted; sustainability dependent upon participation b. fishers/shellfish gatherers: - shellfish gathering/fishing - trampling of feet as threat - fuel, bungsod making for poles - boat's impact on mangrove along ways and channels c. fishpond owners/operators: - abandoned fishponds not reforested d. NGA/LGUs: initiated community-based reforestation	CFA: a. shellfish gathering in mangroves; pruning and/or cutting of mangroves b. loss or conversion of mangrove areas with abandoned fishponds; seepage with agro-chemical (pollution is increased) c. NGA/LGU: initiated reforestation	a. PUPLABI, FARMC: tungog poles for bungsod and firewood; windbreakers and shelter belt; active participation and protection with 7 spp. mangrosetum; with regulation b. loss or conversion of mangrove areas with 75 ha abandoned fishponds, some reforested with *Rhizophora* sp. and nipa; some operators are non-residents c. NGA/LGU: initiated reforestation (i.e., Municipal ordinance)	a. PUMICODA, HIMAYA, FARMC: poles for fuelwood, housing and tungog; windbreak, shelterbelt; inactive PUMICODA and FARMC, without regulation b. saltbed/fishpond owners and operators: loss or conversion of mangroves into saltbeds and fishponds (some are abandoned), pollution increased c. with Municipal Ordinance prohibiting cutting with CEP reforestation project	a. DACOSDA, PAGMASDAN, FARMC, San Nicolas Ecological Association: poles for nungsod and firewood; windbreak/shelter belt; active organizations with bantay dagat, with regulation (with old growth forest) b. with tidepools and indicators of shellfish c. loss of mangrove into fishponds greater extent; abandoned with reforestation to some d. with reforestation project, bantay dagat, with ordinance, with reforestation project (DENR)	a. ISFP, FAF poles for fir b. with refo project, Bar Dagat, with ordinance; reforestatio (DENR-Inte Social Fores [ISF])

Appendix Table 39. PRE analysis of data from the six coastal PRA sites *(continuation)*

Resource	Barangay Manla	Barangay Caluya	Barangay Punta Sulong	Barangay Punta Miray	Barangay Danao	Barangay Panalsalan
Seagrass Beds	a. shellfish collectors: women, children and fishers; - destructive methods and trampling; - poor knowledge and economic valuation of seagrass beds and bunog	-do-, with indicators of shellfish	-do-, with indicators of shellfish	-do-	-do-, with indicators of shellfish	destructive methods: trampling, b
	b. fishpond, rice paddies and cornfields owners/operators - agro-chemical flushing/seepage	-do-	-do-	-do-	-do-	-do-
	c. fishers: trampling, uprooting, propellers	-do-	-do- (bungsod establishment)	-do-	-do-	-do- - NGAs and rice paddies to be mang soil erosion, siltation to s beds
Marine Algae		a. fishers: illegal fishing aggravates waste	a. shellfish gatherers: trampling, uprooting b. fishers: alter current flow c. fishpond operators destructive to samo	a. shellfish gatherers: uprooting and trampling b. fishers: bungsod alter current systems and/or flow c. fishpond operators: agrochemical flushing	a. shellfish collector: trampling b. blasting and poisoning; boat's propeller affects marine algae; also bungsod positioning affect algae	a. FARMC – promote preservatio communitie algae; - culture of *Kappaphycu* b. NGA, LGU allowed con of mangrov rice paddies agrochemic encourage g of algal spe indirect imp algae

Appendix Table 39. PRE analysis of data from the six coastal PRA sites *(continuation)*

Resource	Barangay Manla	Barangay Caluya	Barangay Punta Sulong	Barangay Punta Miray	Barangay Danao	Barangay Panalsalan
Coral Communities	a. fishers: massive corals used as construction materials (foundation in houses and pathways); reprop of land reclamation	a. corals disturbed by illegal fishing and other methods of restoration; strong waves during *amihan*	a. destructive methods of fishing (ex-pounding) disturb the communities ban period, bungsod	a. PUMICODA – has limited knowledge of coral biology and ecology; with mangrove reforestation, sediment and nutrient load is reduced;	a. blast fishing and other destructive method of fishing; ban period with bantay dagat	a. most are municipaliti ban period
	b. NGAs, LGUs: support protection, monitoring and implementation of laws/regulation (poor enforcement)	-do-	-do-	-do- ban period; blast fishing prior to local election period; blast fishers captured	-do-	-do-
	c. fishpond/rice paddies operators; flushing/seepage: siltation and agro-chemical pollution	-do-	-do-		-do-	-do-
	d. compradors and financiers: promotes overfishing to pay debts and for subsistence	-do-	-do-	-do-		
Coconuts	a. owners: poor production with El Niño, young coconuts b. bantay – share augments income c. millers and compradors: control pricing affected by local and international market	-do-	-do-	-do-	-do-, with water logging	-do-

Appendix Table 39. PRE analysis of data from the six coastal PRA sites *(continuation)*

Resource	Barangay Manla	Barangay Caluya	Barangay Punta Sulong	Barangay Punta Miray	Barangay Danao	Barangay Panalsalan
Corn Cassava Camote	bantay: added income but for consumption only; fertilizer dependent	-do-	-do-	-do-	with water logging	-do-
Fish and shellfish					a. 95% of residents per household are fishers b. access to all with fishing gears c. often catch provides income and livelihood d. habitats (mangroves, and coral reefs) that can sustain fisheries (for recruitment, shelter, nursery and feeding grounds) ensure sustainability; ban period may help biodiversity e. the area still has habitat for a diverse fish and shellfish communities	
Other plants, trees and bamboos	boat making, herbal medicine, fuelwood	-do-	-do-	-do-	- herbal	
Other unique features	-do-	-do-	-do-	-do-	- bangus fry gathering; - dependent on the sub-ecosystem	ecotouring c baubuan

Appendix Table 40a. PRE of the unique features of the six coastal sites: *mangrove resources* (primary and secondary growth, including reforestation)

Manla	Caluya	Punta Sulong	Punta Miray	Danao	Panalsalan
None	None	Growth of nito in the nipa area Stakeholders: women, fishers, landowner, worker Several women, sometime in the past, had participated in the production of nito handicraft, purportedly for export. This business, however, went on only as long as the Cebu-based trader demanded the product, which was not very long. The business was sustained after the trader stopped placing orders. Some domestic orders presently serve as income source for a few women. The potential is there for nito handicraft production on a large scale, assuming that the raw materials supply is long-lasting, and be a source of woman empowerment.	Cabgan Islands as roosting area of kabog (bat) Stakeholders: Fishers, local residents Fishers and other residents at Cabgan observed dense colony of roosting bats in dense mangrove trees on the fringe of the islands. Because the residents drove these bats away, at present this can be rarely seen.	Old growth forest Stakeholders: POs (DACOSDA), PAGMASDAN, FARMC, San Nicolas Ecological Group; shellfish collectors (women and children); fishers Various environment friendly organizations, both POs and NGOs, which compose a great number of people from the community. As protection (against cyclones, typhoons, erosion and inundations) forest, it benefits almost all constituents of community. A cyclone hit the place prior to World War II. Trainings and learning about the values of these resources conducted in the barangay. Awareness became widespread (from individuals, family, and community). Policy for the protection of this forest was implemented, and capacitated the people to plant more of other species to make the area denser. The presence of the primary growth created an area that is favorable as shelter, feeding and breeding and even spawning of fish and other marine life. Likewise, population of shellfish in these areas increased. Tide pools are created where bangus fry and other fish fries are encouraged. Wildlife like birds and reptiles recruit in the area.	50 hectares mangrove converted into rice paddies Stakeholders: DENR, ISF beneficiaries, DA, NIA, residents 43 residents as members who share their labor as counterpart Specific to beneficiaries There is awareness, IEC and training Failure of rice paddies, did not meet expected level of production. There was cropping but the dike is substandard. At present, rice paddies are idle and invaded with a mangrove fern (pagaypay); few paddies converted into fishponds.

Appendix Table 40b. PRE of the unique features of the six coastal sites*: seagrass beds*

Manla	Caluya	Punta Sulong	Punta Miray	Danao	Panalsalan
None	None	Sea cucumbers, sea horse, sea hare Stakeholders: fishers, buyers, youth While neither balat nor sea horse is necessarily a key biological resource, their diminishing number is indicative of the loss of biodiversity, in a way Regeneration of the sea cucumber may enhance large scale production for purposes of raising the income of gatherers of the product which commands a high price Balat may be gathered even by the youth	Mangrove afforestation near Cabgan islands Stakeholders: PUMICODA (PO) Limited to members or beneficiaries as to future benefits. Afforestation on seagrass beds would eventually annihilate seagrass if bakhaw will really establish in the area.	None	None

Appendix Table 40c. PRE of the unique features of the six coastal sites: *coral community*

Manla	Caluya	Punta Sulong	Punta Miray	Danao	Panalsalan
Sea stars and sea cucumbers Stakeholders: gatherers High demand for resource by compradors from Cebu City. Fishing ban periods are not applicable to sea cucumbers and sea stars. No municipal ordinance regulating the harvest of these resources. **Coral Reef** A number of residents of Manla quarry sand and collect corals for rip-rap (foundations) as construction materials. These materials are either collected from the reefs of Naputhao Island and Cabgan Islands in Punta Miray. Uncontrolled or unregulated access due to lack of awareness in 1970s. IEC program of PIPULI and DENR strengthen on coral reefs. Establishment of a sanctuary in a shoal shared with Caluya.	None	None	***Conus* spp., sea cucumbers and other large shells in the reef slope and flats** Stakeholders: fishers; shellfish collectors; youth *Conus* spp. are now being studied as a drug for the central nervous system. These species together with other large shells are harvested without any regulation. No good study on their distribution and abundance. Sea cucumbers have disappeared in the reefs. **Youth as frontline after a dynamite explosion.** Young people are asked to collect blasted fish in Balasdiyot reef (near Cable Landing); since being minors, they will not be imprisoned if ever they are caught. **Coral Community** A local government leader reportedly owns beach property and does not impose regulations on littering, garbage disposal and collection of curios, etc.	**Small but excellent coral communities near the beach**. Small patches of healthy and diverse coral species present.	**Planting of legumes and using animal manure in rice paddies** Stakeholders: barangay kagawad The kagawad interviewed claimed that he has reduced the amount of commercial fertilizer in his own small rice paddy to produce a certain amount of harvest. He even encouraged others to use the same system that he recognizes to be helpful to the environment.

Appendix Table 40d. PRE of the unique features of the six coastal sites: *fin fish*

Manla	Caluya	Punta Sulong	Punta Miray	Danao	Panalsalan
None	None	**Highest number of *bungsods* installed** Stakeholders: fishers, buyers, youth About 98 *bungsods* (fish corrals) are set up in the extensive seagrass beds and near mangrove forest. Overfishing is the clear impact.	**Newlook** Stakeholders: youth, fishers Young people particularly out of school youth voluntarily assist in the harvesting (ahas) of newlook catch. This is practiced 7 times, one at 7 p.m., 10 p.m., 12 a.m., 1 a.m., 3 a.m., 6 a.m., and 7 a.m. Kuyog or siganid fingerlings are caught. Although there is a ban in harvesting this particular fish, the owners of newlook hide the catch and process it into ginamos or fermented fish which will command a high price outside of Baliangao.	***Bangus* fry** Stakeholders: fry gatherers, fishers Women and youth are also involved. Open access to all registered hand trawl gear. Families could earn a living on a daily basis especially during harvesting season; community is organized resulting in a harmonious relationship with concessionaire and compradors. Sustainability of this resource depends on the conditions of other resources, namely seagrasses, rice paddies and fishponds in the uplands (pollution), siltation, mangrove forests, and the mother bangus or awa. Unsustainable fishing because of too many (>70) hand trawls operating despite the gear specification; the fry gives impetus to preserving associated resources.	Few number of *bungsods*

Appendix Table 40e. PRE of the unique features of the six coastal sites: *terrestrial resources*

Manla	Caluya	Punta Sulong	Punta Miray	Danao	Panalsalan
Premium trees Presence of few premium trees that may be regenerated that may enhance biodiversity. ***Hulam* or borrow system** Done by friends and relatives. Limited number of people (only caretakers) can enjoy this farming system. Caretakers maintain the clearing. Sustainable because of abundant water. **Nipa afforestation** Stakeholders: fishers and shellfish gatherers Utilize the abandoned dumping area (SNAG) of sawdusts (mulchy) into a nipa plantation.	**Chicken blood on seeds (belief)** For bountiful harvest **Bakhaw roots on camote cuttings** Planting during low tide and full moon would give plenty of big and sweet camote. **Abundant and healthy bamboos on the edge of the island** Used in *amakan* making. **Nipa plantation (afforestation) in cleared bakhaw (mangrove) forest** Attacked by leaf miner pests; affected by bunog; market price and roofing materials as competitor.	**Pasture land of Roque Su** Formerly coconut plantation; the owner had made the coconut workers leave the area. This has deprived the workers of a livelihood, promoting unequal access to a precious resource– land; making empowerment impossible, minimizing the opportunity for environmental security. **Mango orchard of Roque Su** No participation of the community because the venture is individual profit-driven; minimal prospect of community empowerment or environmental security. **Presence of *ipil* and *tugas* (premium species)** Stakeholders: landowner, former workers on the land. The presence of such rare and disappearing species indicates of the chance for regeneration of important species, promoting biodiversity. Long term impact: enhance the capacity of the community to earn a living.			**50 hectares mangrove converted into rice paddies** Stakeholders: DENR, ISF beneficiaries, DA, NIA, residents 43 residents as members who share their labor as counterpart Specific to beneficiaries There is awareness, IEC and training Failure of rice paddies, did not meet expected level of production. There was cropping but the dike is substandard. Rice paddies are idle and invaded with a mangrove fern (pagaypay); other paddies converted into fishponds.

Appendix Table 41. Local names of plants and their scientific names

Local Name	Scientific Name
Abokado	*Persea america*
Achuete	*Bixa orellana*
Akasya	*Samanea saman*
Alugbati	*Basella rubra*
Alibutra	*Arcangelisia flava*
Alipata	*Excoecaria agallocha*
Ampalaya	*Momordica charantia*
Anahaw	*Livistona rotunfifolia*
Anabiong	*Trema orientalis*
Anonang	*Cordia myxa/C. dichotoma*
Agusahus	*Panicum palmaefolium*
Atis	*Annona squamosa*
Alibangbang (fringon)	*Bauhinia malabarica*
Bagalnga	*Melia dubia*
Bago	*Gnetum gnemon*
Bahay	*Antabotrys* sp.
Bakhaw lalaki	*Rhizophora apiculata*
Bakhaw babae	*Rhizophora mucronata*
Bakhaw kamang	*Rhizophora stylosa*
Baho-baho	*Chromolaena odorata*
Balaniog	*Brucea amorissima*
Balanggit	*Cyperus mallaccensis*
Balite	*Ficus balete*
Balili	*Panicum stagninum*
Balogbog	*Clitoria ternatea*
Balok-balok	*Pongamia pinnata*
Balingbing	*Averhhoa carambola*
Bangkal (kaatuang)	*Nauclea orientalis*
Bankuro	*Morinda citrifolia*
Bansilay	*Cratoxylon blancoi*
Badyang	*Alocasia macrorhiza*
Batang	*Gigantochloa levis*
Bayanti	*Aglaia Ilanosiana*
Bayabas	*Psidium guajava*
Bayog	*Dendrocelamus merillianus*
Bayok	*Pterspermum diversifolium*
Betel nut	*Areca catechu*
Binunga	*Macaranga tanarius*
Bitaog	*Calophyllum inophyllum*
Bitoon	*Cyperus* sp.

Appendix Table 41. Local names of plants and their scientific names *(continuation)*

Local Name	Scientific name
Bogo	*Garuga floribunda*
Boongon	*Citrus grandis*
Boyo	*Piper* sp.
Bunga	*Areca catechus*
Bunga de China	*Adonidia merrilli*
Bungalon	*Avicennia marina*
Buri	*Crypha elata*
Busikad	*Kylinga monocephala*
Buta-buta	*Excoecaria agallocha*
Cacao	*Theobroma cacao*
Camote	*Ipomoea batatas*
Camoteng kahoy	*Manihot utilissima*
Cattail (sagbot)	*Typha angustifolia*
Champaca	*Michelia champaca*
Champacang puti	*Michelia longiflora*
Chico	*Achras (Manilkara) zapota*
Cogon	*Imperata cylindrica*
Dampalit	*Sesvirum putulacastrum*
Dap-dap	*Erythrina* sp.
Dila-dila og iro	*Nopalea cochinellifera*
Duguon	*Mysitica simiarum*
Dulao	*Circuma longa*
Eskobang mayawis	*Sida* sp.
Fire tree	*Delonix regia*
Gmelina	*Gmelina arborea*
Gabi-Gabi	*Reaphidophora merrillii*
Gabon	*Blumea balsamifera*
Guyabano	*Annona muricata*
Hanagdong/anabyong	*Trema orientalis*
Handalamay	*Pipturus arborescens*
Handalusa	*Justicia gendarusa*
Hagonoy	*Wedelia biflora*
Halum/Alum	*Manihot multiglandulosus*
Hibi-hibi	*Mimosa pudica*
Iba	*Averrhoa bilimbi*
Isis	*Ficus ulmifolia*
Inyam	*Antedesma boñus*
Ipil/balayong	*Intsia bijuga*
Ipil-ipil (sangkahoy)	*Leucaena leucocephala*
Kab-kab	*Drynaria puercifolia*
Kaimito	*Chrysophyllum caimito*

Appendix Table 41. Local names of plants and their scientific names *(continuation)*

Local Name	Scientific name
Kalamansi	*Citrus madurensis*
Kamagong	*Diospyrus philippinensis*
Kamansi	*Artocarpus communis*
Kamatis	*Lycopersicum esculentum*
Kapi	*Coffea* sp.
Kapok	*Ceiba pentandra*
Kasoy	*Anacardium occidentale*
Katyubong	*Datura metel*
Kitob	*Gelichenia linearis*
Kulitis	*Amaranthus viridis*
Kanding-kanding	*Waltheria indica*
Kangkong	*Ipomoea reptans*
Kawayan	*Bambusa* sp.
Labnog	*Ficus hauili*
Lagtang	*Anamirta cocculus*
Lagundi	*Vitex trifolia*
Limonsito	*Triphasia trifoliata*
Lomboy	*Syzygium cumini*
Lubi	*Cocos nucifera*
Lumbang	*Alaeorites mollucana*
Lumboy	*Aleurites molluccana*
Luya	*Zingiber officinale*
Macopa	*Sizygium sawarangense*
Madre de cacao	*Gliricidia sepium*
Mahogany	*Swietenia macrophyla*
Mais	*Zea mays*
Malunggay	*Moringa oleifera*
Mangga	*Mangifera indica*
Mani	*Arachis hypogaea*
Mani-mani	*Desmodium heterocarpum*
Mansanitas	*Muntingia calabura*
Marang	*Heterophylla odoritissima*
Mayana	*Coleus blumei*
Mayuro	*Lumnitzera racemosa*
Nangka	*Artocarpus heterophylla*
Naga/Narra	*Pterocarpus indicus*
Nito	*Lygodium* sp.
Okra	*Hibiscus esculentus*
Olasiman	*Portulaca oleracea*
Pagatpat 1	*Sonneratia alba*

Appendix Table 41. Local names of plants and their scientific names *(continuation)*

Local Name	Scientific name
Pagatpat 2	*Sonneratia caseolaris*
Pagaypay	*Achrostichum* sp.
Pako	*Athyrium esculentum*
Palang-palang	*Ipomoea pes-caprae*
Pandan	*Pandanus* sp.
Pantud	*Pandanus* sp.
Papaya	*Carica papaya*
Piapi1	*Avicennia alba*
Piapi2	*Avicennia officinalis*
Pili	*Canarium luzonicum*
Pinya	*Ananas comosus*
Pisau	*Bidens pilosa*
Pitogo	*Cycas rumphii*
Potolan1	*Bruguiera sexangula*
Potalan2	*Bruguiera* sp.
Rambutan	*Nephelium lappaceum*
Romblon	*Pandanus* sp.
Sagasa	*Scyphiphora hydrophyllacea*
Saging	*Musa* spp.
Saluyot	*Corchorus olitorius*
Sambag	*Tamarindus indica*
Santol	*Sandoricum koetjape*
Sapinit	*Caesalpinia nuga*
Sereguelas	*Spondias purpurea*
Seryales	*Ximenia Americana*
Sibukao	*Cesalpinia sappan*
Sili	*Capsicum frutescens*
Siyapo	*Wikstroemia* sp.
Sunting	*Cassia alata*
Tagum	*Indigofera suffauticosa*
Tabigi	*Xyloxarpus mollucensis*
Talhib	*Saccharum spontaneum*
Talisay	*Terminalia catappa*
Talong	*Solanum melongena*
Tangan-tangan	*Ricinus communis*
Tanglad	*Andropogon citratus*
Tipolo	*Artocarpus blancoi*
Tikog-tikog	*Scirpus grossus*
Tikong	*Fimbristylis globulosa*
Tisa	*Lucuma nervosa*

Appendix Table 41. Local names of plants and their scientific names *(continuation)*

Local Name	Scientific name
Tiwi	*Coix* lacryma *jobi*
Tubo (sugarcane)	*Saccharum officinarum*
Tuba-tuba	*Jatiopha curcas*
Tubli	*Croton tigerium*
Tugas	*Vitex parviflora*
Tulog-tulog	*Phyllanthus rhamnoides*
Tungog	*Ceriops* sp.
Ulingon	*Cratoxylon celebicum*

References: Moody *et al.* 1984; Quisumbing 1978; Science Education Center (1971)

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