

CHAPTER 3

THE VILLAGE OF COGTONG, CANDIJAY

3.1 Physical, Technical and Biological Attributes of Cogtong Village

Contextual variables refer to the key attributes of the resource, resource user, and management arrangements. These include six variables: 1) physical, technical and biological attributes; 2) stakeholder, community and fisher attributes; 3) market characteristics; 4) fisher and community institutional and organizational arrangements; 5) external institutional and organizational arrangements; and 6) exogenous (macroeconomic, political, social and natural) attributes.

3.1.1 Physical Attributes

The municipality of Candijay, on the Bay's south shore, is accessible by an 85 kilometer, three-hour bus ride along mostly paved roads from the provincial capital of Tagbilaran. Cogtong, a village with 80 hectares, is spatially the smallest village in Candijay but is the most densely populated at 3361 persons. The village is 4.5 kilometers away from the *poblacion* (municipal center). It is able to support a relatively dense population through fishing-related activities. Land use in Cogtong can be divided into four main categories. The largest portion, comprising 24 hectares or 30 percent of the total land area, is devoted to major agricultural crops, such as coconut, banana and rice. Residential areas account for 16 hectares (20 percent of the total land area), while areas for business uses compose 8 hectares (10% of the land area). The remaining 32 hectares (40%) of barangay lands are devoted to other uses, such as institutional, forest, swamp, marshland, mineral, and pasture uses.

Cogtong's coastal resources have been generally regarded as open access. Outside of some mangrove areas informally managed by old families until the 1980s and by holders of concession licenses, well-defined boundaries have not existed. Few restrictions have been observed on fish harvesting methods. None have regulated harvest limits. In general, anyone could fish in the Bay or cut mangrove trees. Not even residency within the Bay's municipalities was required. The MRCRMP marked the first time property rights to the Bay's mangroves were introduced on a large-scale basis. Fishing boundaries have also been introduced in the 1990s with fish sanctuaries in both Candijay and Mabini.

Customary Boundaries. For the fishery, customary boundaries are non-existent. For mangroves, limited customary rights of tenure date back to the 1940s when some 25 families informally designated mangrove areas under their care and management. Tenurial rights to each mangrove area of about one hectare or less have been enjoyed by three generations of residents. Though these rights were initially informal, they eventually evolved to formal holdings in the late 1980s and 1990s when the DENR entered into 25-year CSC with local mangrove growers. The DENR allowed the CSC holders to cut the mangroves, provided they replant the area.

Prior to this, the DENR conducted a land survey and asked the users to register their land and pay their land taxes. Some users officially filed with the municipal government, others with the DENR,

and some to both. The ambiguity of the policy on land registration and tax payments led some landowners to complain in the late 1980s about the situation of CSC holders who benefit from their mangrove holdings but pay no taxes at all. Under present laws, CSC holders are not required to pay taxes since they do not own their mangrove holdings. They are merely stewards of the resource.

In 1996, Barangay Captain James Olavides requested the DENR to survey the land again and document the landholder's area. This resulted in the issuance of 25-year Mangrove Stewardship Agreements (MSA) to new holders. At the end of the contract, the steward is allowed to re-apply.

Political Boundaries. In the Philippines, the framework for the management of coastal resources has been described as lacking in central focus, authority, or leadership, and characterized by a fragmentation of functions. Recent initiatives, however, have sought to clarify jurisdictions between the national government and the local government (DENR, DILG, DA-BFAR and CRMP 1997). The situation has further improved with the passage of the Local Government Code (LGC) of 1991 that devolved to the local governments many responsibilities previously performed by national government agencies.

In 1975, Presidential Decree 705, known as the Forestry Code of the Philippines, placed the jurisdiction of forest land, including that of mangroves, under the DENR. National policies and DENR guidelines for mangrove management are embodied in numerous legal instruments, covering regulatory measures on mangrove protection, award of mangrove stewardship contracts, and reversion of cancelled or expired fishpond lease areas to mangrove forests, among others. Moreover, the DENR has been involved in policy issuance and programs that focus on the management of mangroves and associated terrestrial and aquatic flora and fauna within the marine zone (DENR, et. al. 1997).

The jurisdiction of fishponds, however, remained with the Bureau of Fisheries and Aquatic Resources (BFAR), a bureau under the Department of Agriculture (DA). BFAR's influence as the country's main steward of fishery resources has been influenced by national legislation. Under Presidential Decree 704, or the Fisheries Decree of 1975, BFAR assumed responsibility for the formulation, administration, and implementation of fisheries policies, regulatory measures, licensing, research, and statistical data collection on all aquatic resources, except in municipal waters. In 1986, Executive Order 116 changed the scope of BFAR's jurisdiction over fishery resources in an effort to rationalize the structure and functions of existing government organizations. Only the regulatory and research functions remained with BFAR, along with the provision of policy directions and technical assistance. Since 1986, BFAR has exercised jurisdiction over offshore waters and regulated fishery licensing in these waters. In 1998, Republic Act No. 8550, known as the new Fisheries Code of the Philippines, changed the status of BFAR from a staff bureau to a line bureau of the DA. In addition to its former functions, BFAR now addresses the provision of extension services, coordination of efforts on fishery production, implementation of productivity enhancement and market development programs, and assistance to local government units in developing their technical capability.

When it comes to municipal waters, or waters within 15 kilometers from the shoreline of the municipality, jurisdiction now belongs to the municipal government. This is stipulated by the LGC. Where two municipal waters overlap, the boundary is equidistant from each municipal shore. Such is the case of Candijay and Mabini.

The passage of the Local Government Code in 1991 effected an administrative power shift that placed coastal local governments and cities at the forefront of resource management. With the devolution of management functions to local governments, the DA has been stripped of its mandate to directly establish fish sanctuaries in municipal waters. The DENR, on the other hand, is now faced with strong pressure from local government units (LGUs) to cede its authority to manage protected areas established within municipal waters (DENR, DILG, et al. 1997). No other coastal resource management activity (CRM) is accorded emphasis in the LGC more than the fishery sector.

For other CRM activities such as forestry, mining, land use, and environmental protection, the LGC provides for a “managed” scope of devolution. The DENR remains as the primary government agency responsible for the conservation, management, development and proper use of the country’s environment and natural resources, as provided for in DAO (Department Administrative Order) No. 30, series of 1992. The implementation of devolved functions, moreover, is subject to the DENR’s supervision, control and review.

Under the LGC, mangrove conservation and implementation of community-based forestry projects have been devolved from the DENR to LGUs. Community-based forestry projects refer to developmental projects involving local communities which include integrated social forestry projects, family and community contract reforestation, forest land management agreements, management of communal forests with an area of 50 square km or less, and other similar projects (DENR et al. 1997). On the other hand, the management, protection, and development of all other areas outside communal forests remain with the DENR.

For the fisheries, the devolved functions from BFAR cover a broad range: issuance of fishing licenses for operation of fishing vessels of three gross tons or less, grant of fishery privileges within municipal waters, imposition of penalties on deleterious fishing methods, enforcement of fishery laws in municipal waters, enactment of ordinances for the protection of the marine environment, dispersal of fingerlings for aquaculture, issuance of permits for fish cages, gathering of aquarium fish, and for shelled mollusks, issuance of licenses for establishing seaweed farms and pearl farms, declaration of closed seasons, and amicable settlement of boundary disputes between two or more municipalities.

Historically, the involvement of LGUs in mangrove management has been limited. Prior to 1970 and to a DENR administrative order, a municipal license was required before any individual could harvest mangroves. A DENR cutting license is now required. The Barangay Council, however, needs to endorse the application to the Municipal Council. The latter, in turn, forwards the application to the DENR for final approval.

- *Legal Provisions: Uses of Coastal Areas*

Mangrove areas in Cogtong Bay were subject to legal uses even before the MRCRMP. Concession licenses, different from a cutting permit, were intended to regulate mangrove cutting. Concession licenses were large-scale harvesting licenses issued by the DENR’s Bureau of Forestry (later known as the Bureau of Forest Development). The license entitled the holders to the “exclusive privilege to cut all the allowable harvestable timber in their respective concessions, and the additional rights of occupation, possession and control over the same to the exclusion of others.” The most common type of concession license lasted for four years. Despite a provision of the license on sustainable yield harvesting, license holders often did not adhere to any limits. Moreover, the concession license did not impose any *de facto* control on cutting practices. Mangrove cutters

in Cogtong Bay did not respect private concession areas. According to key informants, the concession licenses have not been issued in the last twenty years.

In 1984, Presidential Proclamations 2151 and 2152 declared portions of the Bay's mangroves as mangrove wilderness and mangrove swamp forest reserve, respectively (Janiola 1996). Classified as wilderness areas are the four islands of Lumislis, Kati-il, Tabondio and Calanggaman which have a total area of 275 hectares. An additional 330 hectares of mangroves fell under mangrove swamp forests, stretching approximately six kilometers along the southeast shore from Barangay Panas to Lamanoc Point. Classifying lands as either wilderness areas or mangrove swamp forests meant that "entry, sale, settlement, exploitation of whatever nature or forms of disposition" was not permitted. However, compliance with the decrees was low in the absence of strict enforcement.

The DENR introduced additional legal uses of mangrove areas along Cogtong Bay in 1984 with the first issuance of CSCs, primarily through the Integrated Social Forestry (ISF) Program. In 1989, CSC coverage expanded when the MRCRMP distributed new CSCs. The contract states that "the grantee shall have the right to peacefully possess and cultivate the land and enjoy the fruits thereof." After 25 years, the grantee may apply for renewal. The contract also formally imposes limits, albeit ambiguous, on the number of trees that can be cut. The DENR "... reserves the right to regulate the cutting or harvesting of the timber crops to ensure normal balance of forest cover on the land." Stewards interpret the limits as "sustainable harvesting."

A fairly new legal use in Cogtong was instituted in 1996 when the Candijay Municipal Council established a fish sanctuary at the Islet of Tabong Dio Cogtong. Municipal Ordinance 6, Series of 1996 prohibits all fishing, littering, traveling and swimming within the sanctuary. Also, "no person or group of persons is allowed to conduct fishing operations within one hundred fifty (150) meters from the boundary of the fish sanctuary."

Communal Boundaries. Communal use areas for mangrove cutting were established in Candijay. An informal agreement exists whereby all Candijay residents are permitted to cut mangroves within the six Candijay communal areas. However, the cut wood cannot be sold outside the municipality, and for each tree cut, a propagule must be planted.

Technical Boundaries. No comprehensive zoning or technical boundary delineation exists in Cogtong Bay in terms of restoration zones, research areas, recreational areas, and multiple use zones. A few areas, however, have been declared as protected areas, such as the mangrove wilderness, swamp forest reserve, and fish sanctuary.

3.1.2 Technical Attributes

Capture Fishery and Fishing Gear. Traditionally, Cogtong fishers have used fish corrals (*bunsod*). The 1970s, however, ushered in gillnets, filter nets, and blast fishing, which intensified fishing operations. The introduction of Danish seine in the late 1970s and the proliferation of illegal fishing operations further hastened resource depletion. Over time, the capture fishery in Cogtong Bay has become even more multi-gear. At present, fishers use nine distinct types of gear. The predominant gear types are gillnet or *pukot* (48%), simple handline or *pasol* (22%), and fish corral (11%). Other gear types are squid jigger (*tsa-tsa*), longline (*palangre*), bagnet (*basnig*), speargun (*pana*), fish pot (*bubo*), and Danish seine (*liba-liba*). About 91 percent of the respondents reported that they operate their own gear.

Based on key informant interviews on fishing gear operations, gillnets and fish corrals are used year-round (Figure 2). Longlines and squid jiggers are deployed from May to August. Gillnets for crabs are used only from August to December, while gillnets for shrimps are used from April to September. Simple handlines are deployed from September to November.

Effective Fishing Time. In terms of effective fishing time, 58 percent of the respondents operate for 3-6 hours, while 32 percent operate from 7 to 10 hours. About 10 percent fish for more than 10 hours.

Manuel Badayos and Eduardo Bajardo, both 49 years of age, share, “*We normally head for our fishing spots at 7:00 a.m. and return at about 1:00 p.m. It takes us one hour to reach our fishing spots, which cover Lumisli, Kati-il, Lunod, Kawasihan, Tagaytay and Banlas. Fishers from Mabini and other neighboring municipalities also frequent these spots. Normally, we would set our fishing gear for about one hour. If there is no catch, we would transfer to another fishing spot.*” They add, “*The length of time we usually devote to fishing has not changed since the 1970s, but our fish catch was higher then.*”

Types of Boats Used and Crew Size. The majority (71%) of the fishers in Cogtong use non-motorized boats, particularly gillnetters. Only 29 percent use motorized boats. Boat ownership in Cogtong is high (92 %).

In terms of the number of persons involved in fishing operations, 90 percent of the respondents operate with a crew of 1-2 persons. This reflects the predominance of simple gear types and of non-motorized boats.

Fish Harvest Sharing System. The sharing of fish harvest in Cogtong depends on the type of gear and ownership of the boat used in fishing. In the case of gillnets, the most common sharing system after deducting all the expenses incurred during the fishing trip is 2/3 of the net earnings to the boat owner and 1/3 to the fisher or crew. If the fisher owns the boat and mobilizes a family member to assist him during fishing operations, the entire fish harvest usually goes to the fisher. For simple handlines and longlines, the sharing system is similar. Users of fish corrals, spears, fish pots and squid jiggers, on the other hand, normally get all the fish harvest. In other cases, users of squid jiggers simply divide the harvest equally among the fishers involved. Those engaged in bagnet and Danish seine operations usually follow a sharing system of 4/5 to the owner and 1/5 to the crew.

Overall, the most common sharing system used is 2/3 of the fish harvest to the boat owner and 1/3 to the fishers (46%). The next most common system is 100 percent of the harvest to the fisher (41%), followed by equal sharing (9%), and by 4/5 to the owner and 1/5 to the crew (4%).

Mangroves. Traditionally, mangrove wood was used for constructing houses and fish corrals and for firewood. The traditional and current technique of cutting mangroves in both Cogtong and Marcelo is with a *bola*, a tool resembling a machete.

Over the years, the low intensive cutting of mangroves for traditional purposes changed. In 1965, Dr. Lim moved to Cogtong from Iloilo and developed the first fishpond on the Bay's shore. Fishponds soon became a popular business venture. The Department of Agriculture (DA) awarded Fishpond Lease Agreements (FLAs) to applicants which gave the holders the privilege of engaging in fishpond operations. Eduardo Bajardo, 49 years of age, recalls, "*In the 1970s and early 1980s, large mangrove areas were converted to fishponds. Attractive returns from the culture of fish, prawns and shrimps motivated village residents to engage in aquaculture.*"

In the early 1970s, traditional low intensive cutting methods gave way to large-scale harvesting of the mangrove forest with the arrival of commercial cutters in Cogtong. The wood was sold in larger market centers in Tagbilaran and Cebu.

At present, cutting permits are no longer issued to FLA holders. Occasionally, however, commercial cutters reportedly come to Cogtong Bay to cut mangroves on one of the islands (i.e., Lumislis) protected under Presidential Decree 2151 or 2152. In general, mangrove cutting has reverted to low intensive cutting by local residents.

Sources of Information on Fisheries and Mangroves. Fishers in Cogtong tend to be more dependent on internal information sources than on external sources. The primary information sources are other fishers (59%) and parents (22%). About 17 percent of the respondents reported that they learned fishing practices on their own. The role of government technicians in information dissemination appears minimal (2%).

On mangrove technologies, other fishers are also the main source (33%), followed by non-government organizations (7%), government technicians (7%), and information drives (4%). The rest of the respondents did not cite any information source on mangrove technologies.

3.1.3 Biological Attributes

Corals and Associated Benthos. To assess the condition of coral reefs and associated benthic life forms in Cogtong Bay, ICLARM's research team adopted the manta tow reconnaissance technique (English et al. 1994). This technique allows a visual assessment of large reef areas within a short time. The manta tow survey was conducted by towing a snorkeler holding a manta board following the contour of the reef slope. Each tow lasted for two minutes at a speed of 1 to 1.5 knots (0.7 - 1.0 m/s). A semi-quantitative description of the percentage cover, i.e., live, dead and soft corals, was estimated using the following categories: 1 = 0-10%; 2 = 11-30%; 3 = 31-50%; 4 = 51-75%; and 5 = 76-100%.

Twenty-four (24) tows were done during the field survey conducted in July 1997 covering about 3 km of coastline. Of these, 8 tows (Tow No. 1-8) were conducted at the eastern section of Lumislis Island, 4 tows (Tow No. 9-12) in Tagaytay reef, and 12 tows (Tow No. 13-24) from Lamanoc Point to Kawasihan (near Calanggaman Island).

The results of the manta tow survey indicate that living coral condition at the eastern side of Lumislis Island can be classified as poor to fair, with percentage live coral cover ranging from 11 to 50 percent (Figure 3). At Tagaytay Reef, a relatively good condition of corals was observed (i.e., live coral cover of 51-75 percent). The relative higher percentage of live corals in the area must have been influenced by hydrographic characteristics, such as depth of the reefs, water transparency, and circulation. Corals normally grow in well-oxygenated, warm and clear waters that are free from suspended sediments, excessive freshwater run-off and pollutants (Nybakken, 1982; White 1990).

Mangrove community. Four sampling sites were visited during the July 1997 survey. These include: Lumislis and Kati-il Islands, Panas, and Katungkian (the mangrove reforestation site). In each sampling site, the transect line plot method described in English et al. (1994) was used with some modification. Starting from the seaward extent of the mangrove area, a transect line was extended landwards and perpendicular to the shore.

At 10-meter intervals along the line, the girth at breast height (GBH) of trees within a 10 x 10 m plot was measured with a fiberglass measuring tape. Those with a circumference of more than 12.5 cm (or 4-cm diameter at breast height, DBH) were recorded as trees. To measure the regenerative capacity of a particular site, mangrove seedling and saplings were counted. Those under 12.5 cm in circumference but over 1-m high were recorded as saplings, and the rest (height less than 1-m) were counted as seedlings. The saplings were counted within a 5 x 5 m subplot, and the seedlings, within a 1 x 1 m subplot.

To compare mangrove sites, three ecological parameters were used: 1) relative density (proportional number of species); 2) relative frequency (likelihood of encountering the species); and 3) relative dominance (proportional basal area covered by the species, which is a measure of the stand development). The formulae used were:

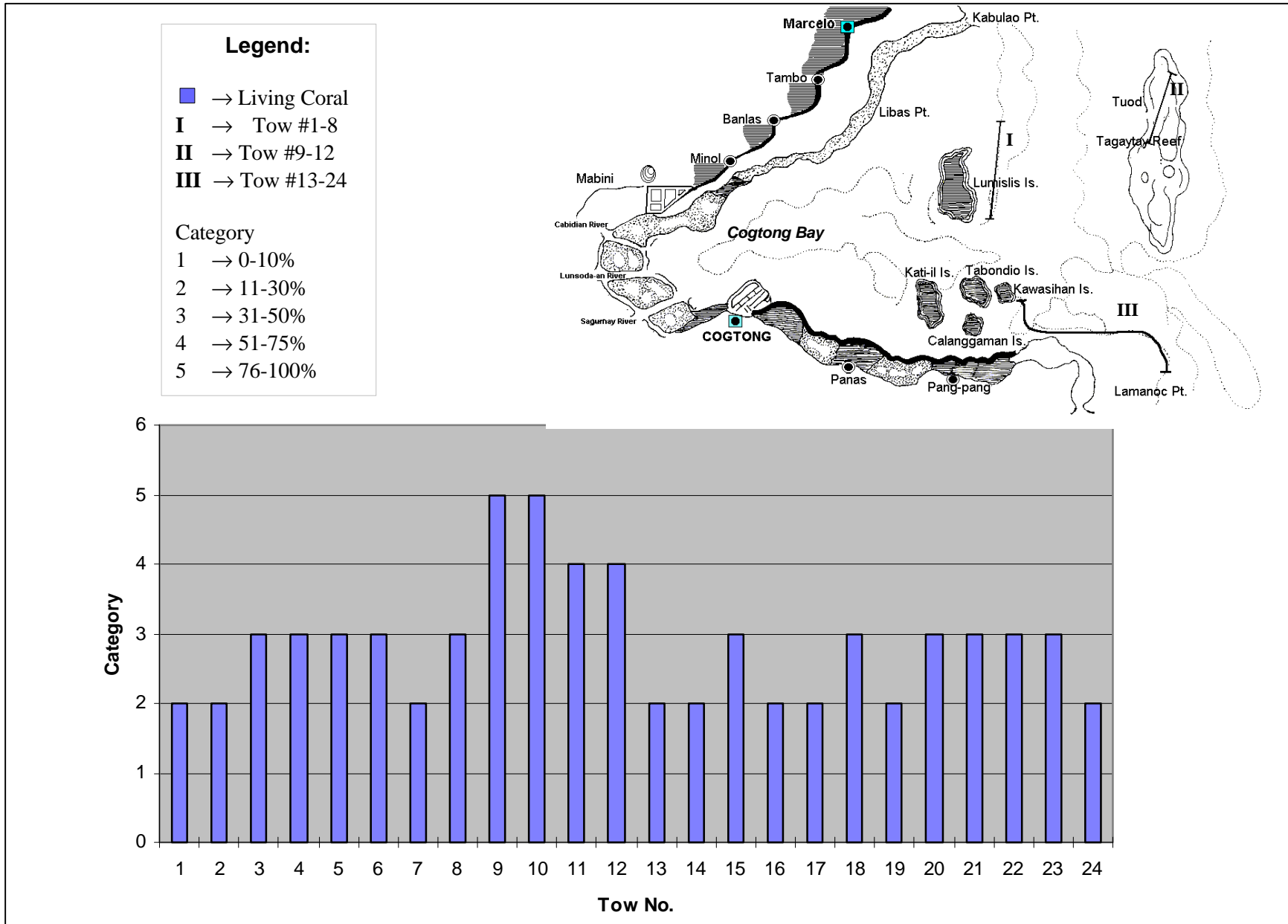
$$\begin{aligned} \text{Relative density} &= \frac{\text{individuals of the species}}{\text{sum of all individuals}} \\ \text{Relative frequency} &= \frac{\text{frequency of the species}}{\text{sum of frequencies of all species}} \\ \text{Relative dominance} &= \frac{\text{basal area for the species}}{\text{total of basal areas for all species}} \end{aligned}$$

Four major mangrove species are found in the survey sites (Table 2). *Rhizophora sp.* is the most common species in Cogtong Bay, based on their relative density, frequency and dominance values. Other species include *Sonneratia sp.*, *Avicennia sp.* and *Brugiera sp.* *Brugiera sp.* is present in Kati-il Island, while *Rhizophora sp.* is found in Panas.

Basal area contribution from the stations was highest at Katungkian, the mangrove reforestation site, with total basal area of 6.82 m²ha⁻¹. This suggests that the location of the reforestation site is suitable for mangroves. The relatively shallow depth, protection from waves, muddy substrate, and extensive fresh water run-offs, may have influenced the relatively good growth of mangroves at Katungkian. Climate, geomorphology, tidal range, freshwater inputs and soil characteristics are among the environmental factors that influence the diversity and productivity of mangrove ecosystems (English et al. 1994).

The basal area of the mangroves in Cogtong Bay, however, is relatively low compared to the mangrove stands reported in Honda Bay, Palawan (16.47 m²ha⁻¹, Garces et al. 1996); Malaysia

Figure 3. Percentage of living coral cover in Cogtong Bay.



(27.02 m²ha⁻¹; Gong et al. 1990 in Lumasag and Openiano n.d.) and in Indonesia (30.50 m²ha⁻¹; Atmadja and Soerojo 1990 in Lumasag and Openiano n.d.).

Table 2. Structural comparison of mangrove stands in Cogtong Bay, Bohol

Sampling Site	Genus	Ave. DBH ¹	BA ² (m ² /ha)	RD ³	RF ⁴	RDm ⁵	IV ⁶	DI ⁷
Catiil Island	Sonneratia sp.	28.7	0.06	2.0	60.6	62.6	154.0	
	Avicennia sp.	23.9	2.40	60.6	32.3	34	153.2	
	Rhizophora sp.	10.7	1.31	32.3	7.1	5.5	56.9	
	Brugiera sp.	14.0	0.21	7.1	2.0	1.5	24.8	
	<i>Total</i>			3.98				2.8
Lumislis Island	Sonneratia sp.	20.5	2.16	55.7	65.2	51.2	194.8	
	Avicennia sp.	38.2	0.77	14.0	13.9	18.3	85.2	
	Rhizophora sp.	22.1	1.29	30.4	20.9	30.6	105.2	
	<i>Total</i>			3.98				1.5
Panas Islet	Rhizophora sp.	17.9	4.44	100	100	100	322.3	0.0
Katungkian (Mangrove Reforestation Site)	Sonneratia sp.	23.5	0.04	0.6	0.6	0.56	25.2	
	Avicennia sp.	28	0.57	7.8	7.82	8.35	52.5	
	Rhizophora sp.	23.6	6.21	91.6	91.6	91.1	304.1	
	<i>Total</i>			6.82				2.1

¹ diameter at breast height

³ Relative density

⁵ Relative dominance

⁷ Diversity index

² basal area

⁴ Relative frequency

⁶ Importance value

In other Philippine coastal areas, low basal area values have been reported in several bays: Carigara Bay, 9.84 m²ha⁻¹ (Bonga et al. 1996); Panguil Bay, 9.08 m²ha⁻¹ (Lumasag and Openiano n.d.); and San Miguel Bay, 6.53 m²ha⁻¹ (Vega et al. 1994). These are bays where overharvesting and mangrove conversion to aquaculture are major causes of degradation/destruction of mangroves.

Fish Catch and Species Composition. A wide variety of fish species are caught in Cogtong Bay and its adjacent coastal waters. Species caught by gillnets vary from soft-bottom to reef (hard-bottom) dwelling species -- goatfishes, rabbitfishes, sardines, slipmouths, wrasses, and shrimps/crabs. Those caught with handlines (both simple and longlines) are pelagic fishes, such as mackerels, fusiliers, scads, jacks and reef dwelling snappers.

The composition of fish caught has changed over the years. Feliciano Guterez, 48 years of age, recalls, “*During the 1960s, most of our fish catch consisted of more expensive reef fishes, such as groupers, snappers, and Spanish mackerels. Now, we rarely see them anymore. The types of fish we normally catch now are cheaper and less valuable.*”

Based on key informant interviews, the typical catch per fishing trip in 1997 of the majority (about 80%) of Cogtong fishers was 2-10 kilos, down from about 15-20 kilos in the 1960s (Table 3). Catches of gillnets, which were higher at 20-40 kilos in the 1960s, progressively fell to 3-10 kilos in the 1990s. Catches from fish corrals, along with other types of fishing gear, showed a similar downtrend over time.

Feliciano Guterez, a crab catcher at present, notes, “*In the 1960s, we could easily catch 10 kilos*

of crabs or more in just half a day. Now, it is difficult to catch even a kilo. We attribute this to the increase in the number of crab catchers, the uncontrolled cutting of mangrove trees for firewood and for house construction, and the conversion of mangroves into fishponds. We have observed a decline in the volume of bivalves and shrimps as well.”

At present, Mr. Simplicio Anud, a fish corral owner, harvests 2 kilos of fish per day during the lean season (February to June) and 9 kilos per day during the peak season (September to January). Mr. Aparici, a gillnet operator, catches 10 kilos of fish per day. An operator of push nets indicated that pollution from fishpond areas may have adversely affected his shrimp catch. He noted relatively smaller shrimps (*sugpo*) in his catch.

Table 3. Trends in catch rates (kg/trip) of selected fishing gear in Cogtong Bay

Fishing Gear	1960s	1970s	1980s	1990s
1. Set longline (<i>palangre</i>)	10-15 kg	10 kg	5-7 kg	2 kg
2. Crab/fish pot (<i>bubu</i>)	10-15 kg	10 kg	5 kg	1-2 kg
3. Spear gun (<i>pana</i>)	10 kg	7 kg	5-8 kg	3 kg
4. Squid jigger (<i>tsa-tsa</i>)	10-15 kg	7-8 kg	5-8 kg	1-2 kg
5. Simple handline (<i>pasol</i>)	10 kg	Less than 10 kg	5-7 kg	1-2 kg
6. Squid jigger (<i>Ulang-ulang</i>)	10-12 kg	5-10 kg	4-6 kg	2 kg
7. Gillnet (<i>pukot/lambat</i>)	20-40 kg (sometimes 50 kg)	15-20 kg	6-10 kg	3-10 kg
8. Fish Corral (<i>bunsod</i>)	20-30 kg	10-20 kg	10-15 kg	2-9 kg

Source: Key informant interviews with fishers based on recall

Fishing Grounds. Based on the household survey, the majority (78%) of the fishers from Cogtong village operate inside the Bay, while 22% fish outside the Bay. This may be partly attributed to the predominance of non-motorized boats owned/operated by the fishers in the area. These fishers employ gillnets and simple handlines. For fish corrals, about 7 units are operating at the inner portion of the Bay.

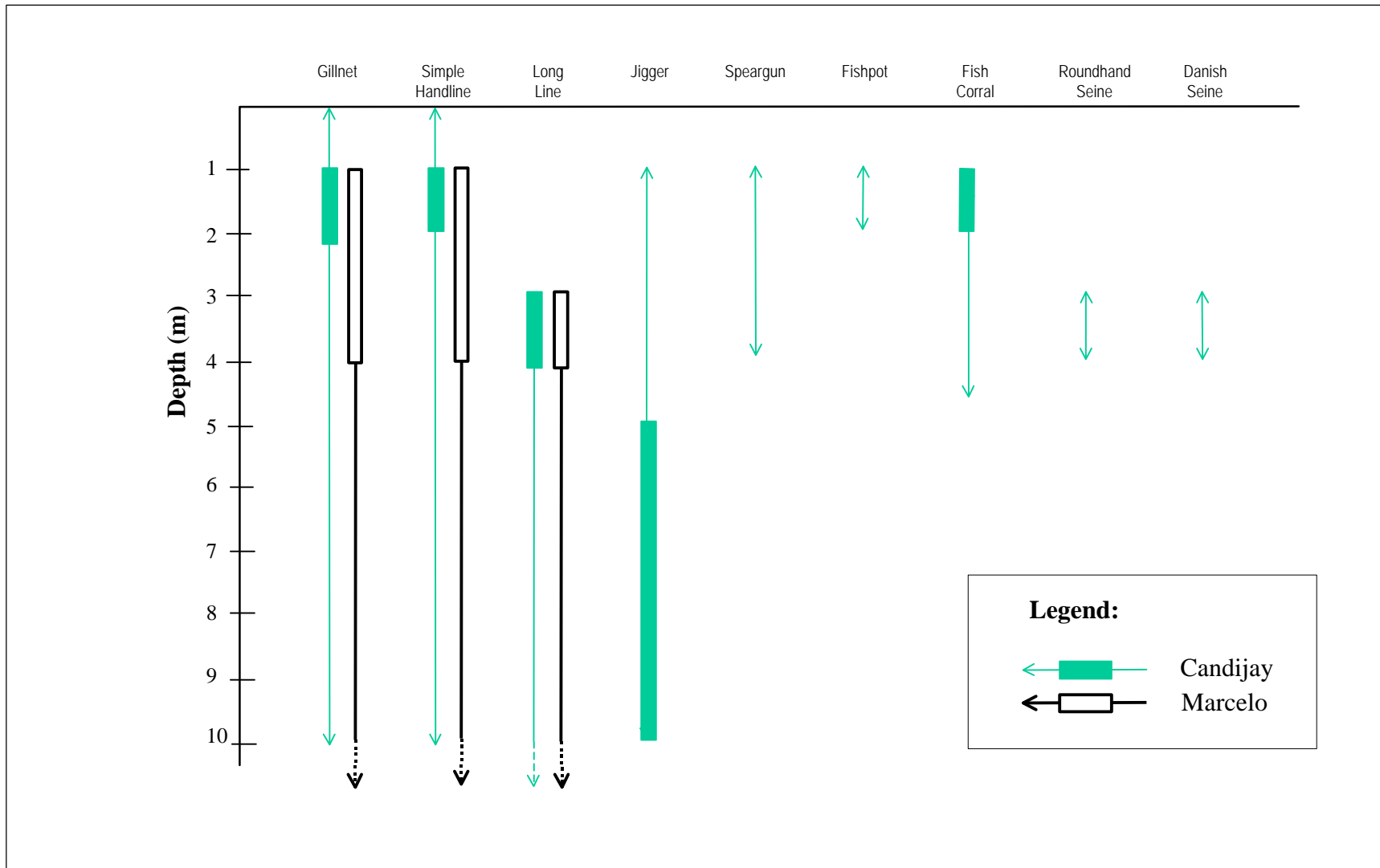
Key informants mentioned that the encroachment on their traditional fishing areas is a negative effect of the mangrove rehabilitation project. Before 1988, the distance between fish corrals was more than 200 meters, but this was shortened when mangrove rehabilitation started.

Fishing spots frequented by the fishers are the shallow portions of the Bay. About 37 percent of the fishers operate in waters less than 5 fathoms (15 m), while 20 percent fish in waters with a depth of 6-10 fathoms (18-30 m). Gillnets, simple handlines and longlines are commonly employed within the Bay. Fishing operations outside the Bay are usually in waters exceeding 25 fathoms (75 m). Gillnets are also used outside the Bay to a limited extent. Figure 4 portrays the depth of fishing operations by gear type.

Perceived Trends in the Condition of Fishery and Mangrove Resources. To obtain a comparative perception of resource conditions, 54 heads of fishing households in Cogtong were asked to describe the condition of fishery resources 15 years ago and today. A similar question was asked on the condition of mangrove resources.

Fishery Resources. About 65 percent of the fishers expressed that 15 years ago (1982), fishery resources were in a relatively good condition. The underlying reasons were linked to abundant fish catch, fewer resource users, and limited commercial fishing. In the 1960s and 1970s, commercial fishing was more extensive. About 24 percent, on the other hand, felt that the

Figure 4. Depth of Fishing Operations by Gear Type.



resources were in a bad shape due to illegal fishing activities, mangrove cutting, damaged habitats, and decreasing fish catch. Some 11 percent stated that fishery resources were neither in a bad nor good condition.

In terms of the perceived condition of fishery resources today, fishers perceive a resource deterioration. The majority (80%) felt that the resources are now in bad shape (Table 4). They cited that a declining fish catch is the predominant reason behind their response, along with illegal fishing, overfishing, habitat destruction, presence of commercial fishers, use of fine mesh nets, and population growth. Only 15 percent perceived a very good resource condition at present. The rest (5%) perceived no change at all.

Mangrove Resources. On the condition of mangrove resources 15 years ago, the perception is somewhat divided. Almost the same percentage of respondents viewed the resource condition as good (46%) or bad (45%). The rest (9%) were neutral. Those perceiving the resource condition as good attributed it to the presence of thick mangrove stands and to less fishpond development activities in the village in the 1980s relative to the preceding two decades. Those who viewed the mangrove resource condition as bad cited the uncontrolled cutting of mangroves, decrease in mangrove stands, fishpond development, and decreasing fish catch.

With regard to the perceived resource condition today, the percentage of respondents who regarded the condition as bad increased to 65 percent, largely due to uncontrolled mangrove cutting, decline in mangrove stands, fishpond development, and declining fish catch. A lower percentage of respondents who perceived the resource situation as good (28%) explained that this could be attributed to mangrove reforestation efforts, improvement in fish catch, and information campaigns.

Comparing resource conditions now versus 15 years ago (1982), a statistically significant increase emerged in the perception of bad resource conditions for fisheries ($p < 0.05$) as well as for mangroves ($p < 0.01$). This implies that overall, the perception of resource conditions has worsened. Though the MRCRMP introduced coastal resource management interventions from 1989 to 1991 and though fishers have noted an improvement in their fish catch after the mangroves were rehabilitated, the perception is that earlier resource conditions have not been fully restored. Continuing resource rehabilitation and protection efforts remain imperative.

Table 4. Perceived Resource Conditions Based on Household Survey Results

Condition	15 Years Ago (1982)		Today (1997)		T-value	P
	No.	%	No.	%		
Fishery:					-6.153	<0.01
Bad	13	24.0	43	80.0		
Neither bad nor good	6	11.0	3	5.0		
Good	35	65.0	8	15.0		
<i>Total</i>	<i>54</i>	<i>100.0</i>	<i>54</i>	<i>100.0</i>		
Mangroves:					-2.107	<0.05
Bad	24	45.0	35	65.0		
Neither bad nor good	5	9.0	4	7.0		
Good	25	46.0	15	28.0		
<i>Total</i>	<i>54</i>	<i>100.0</i>	<i>54</i>	<i>100.0</i>		

Perceived Importance of Mangrove Management. All the respondents were unanimous in expressing that mangrove management is essential to the fishery, regardless of membership in the

village-based fishers' association, known as the *Panaghiusa sa Gagmaying Managat sa Cogtong* (PAGAMACO). This indicates an awareness of the interaction of coastal ecosystems that may be attributed, in part, to information campaigns and training sessions carried out by the project. Observations of benefits at the fishers' level that are associated with mangrove management include improved habitats for juvenile fish, higher fish catch and ban on illegal mangrove cutting.

Ecological Knowledge. Based on a random sample survey of 54 fishers in July 1997, the respondents exhibited a good knowledge of various characteristics of the sea and coast that help the fish to grow and be healthy. Multiple responses include the presence of sea grasses/seaweeds (82%), existence of mangroves (52%), presence of corals (28%), and presence of algae (13%). Members and non-members alike gave similar responses.

3.2 Attributes of Stakeholders, Community and Fishers

This section presents the socioeconomic characteristics of stakeholders, fisher community, and fishers, which carry implications for resource use and for incentives to cooperate and coordinate. Among others, it highlights the social homogeneity of barangay Cogtong, the high dependence of the village on fishery resources, the extent of fisher participation in the project, the motivation of resource users, and the extent of fisher satisfaction with their chosen occupation.

3.2.1 Stakeholders

Stakeholders are defined as institutions, social groups and individuals that possess a specific, direct and significant interest/stake in the area. The stake may come from institutional mandate, historical association, dependence for livelihood, economic interest, geographic proximity or a variety of other capabilities and concerns. Usually stakeholders are aware of their interests in the management of an area (IUCN 1996). Not all stakeholders are equally interested in conserving a resource, nor equally entitled to have a role in resource management. Stakeholders therefore must be distinguished. Criteria to distinguish stakeholders are presented in Box 1 (IUCN 1996). Social actors who score high on several accounts may be considered as primary stakeholders and those with lower scores secondary stakeholders. An individual may have representation in several stakeholder groups.

Box 1. Possible Criteria to Distinguish Among Stakeholders

- Existing rights to natural resources
 - Continuity of relationship (e.g., residents versus visitors and tourists)
 - Unique knowledge and skills for handling resources at stake
 - Losses and damage incurred in the management process
 - Historical and cultural relations with the resource at stake
 - Degree of economic and social reliance on such resources
 - Degree of effort and interest in management
 - Equity in the access to the resources and distribution of benefits from their use
 - Compatibility of the interests and activities of the stakeholder with the national conservation and development policies
 - Present or potential impact of the activities of the stakeholder on the resource base
-

Barangay Cogtong has a variety of stakeholders with an interest in the coastal resources. Some stakeholder groups are directly concerned with the mangrove wood, others the fishery, and still others the ecosystem functions provided by mangroves.

Members of the village-based fishers' association (PAGAMACO) can be identified as primary stakeholders. Original PAGAMACO members participated in the mangrove rehabilitation, artificial reef construction (AR) and mariculture components of the MRCRMP. They also attended project activities, such as seminars and meetings, and helped enforce laws on fishery and mangroves. Moreover, they worked together with the Barangay and Municipal Councils to promote a healthy ecosystem. Today, the re-organized PAGAMACO works closely with the United Barangay Federation (UBF) and Municipal Council to protect and manage coastal resources.

The firewood gatherers of Cogtong Barangay are an informal group. They rely directly on access to mangrove stands in order to cut and sell wood -- their primary source of livelihood.

Fishers and shell gatherers (mainly women) who are not part of PAGAMACO are also stakeholders. Both informal groups benefit from healthy mangroves. The fishers usually provide the primary source of income and food for their households while shell gatherers augment family income and food sources.

Holders of FLAs comprise another group of stakeholders. There is no formal organization, but individual members have a legal claim on the land. They have invested time and money into developing or attempting to develop a fishpond.

Fish vendors, another group of stakeholders, are dependent on a stable fish supply for their livelihood. No formal market arrangements exist at present. The vendors normally procure and sell fish on a competitive basis.

The Cogtong Barangay Council emerged as a stakeholder during the MRCRMP implementation period by offering moral support to project activities and helping with information campaigns and stricter enforcement. Today, the Barangay Council has become more active in managing coastal resources and has joined the UBF in influencing decision-making on coastal management.

The Candijay Municipal Council exercises jurisdiction over municipal waters. It has invested efforts in coastal resource management by passing enabling legislation, extending moral support, and helping with enforcement efforts.

The DENR is also a key player. It has jurisdiction over mangrove areas outside communal forests. It was also involved in the MRCRMP implementation.

3.2.2 Fisher Community

Cogtong, a coastal village of Candijay was originally settled because of its abundant fishery resources. The reliance and deep cultural value fishing holds in the community is seen in the name "Cogtong." The village derived its name from the legend of a large fish named *Kogtong* that helped to ensure abundant fish harvests for the original village residents. Although the Cogtong economy has expanded, fishing is still the economic mainstay upon which other employment opportunities are built. Fish trading and other business-related activities have increased over time.

A year before the MRCRMP was introduced to Cogtong, there were approximately 434 households. In 1997, the households increased to 561, representing an increase of about 3 percent per year since 1988 (the pre-project period). This translates to approximately 3,361 village

residents in 1997 from 2,508 residents in 1988. The overall occupational structure has remained fairly stable over time, where fishing households have accounted for 45 percent and fish vendors, 15 percent (Table 5). Laborers and small business operators have increased slightly to 12 percent and 11 percent, respectively. Mangrove users, however, decreased from 11 percent in 1988 to 3 percent in 1997. This is due to several reasons. There are fewer open areas left for mangrove cutting now that formal property rights have been given to CSC holders. Also, although mangrove areas have been replanted, the CSC holders are mostly fishers and most stands are not yet mature enough for cutting purposes.

Table 5. Distribution of Households by Primary Occupation: Cogtong

Occupation	1988 (%)	1997 (%)
Fisher	45	45
Fish Vendor	15	15
Laborer	6	12
Small Business Operator	7	11
Government Employee	12	10
Mangrove Gatherer	11	3
Driver	2	2
Farmer	2	2
<i>Total</i>	<i>100</i>	<i>100</i>

Overall, the village residents of Cogtong may be regarded as fairly homogeneous in terms of ethnicity and religion. The present village population is predominantly of native origin, where Boholanos comprise 80 percent. Non-Boholanos, such as Cebuanos, Hiligaynons, and other ethnic groups, account for 20 percent. These figures account for fishers and non-fishers alike. In terms of religion, the Roman Catholics have continued to be dominant (90%). The rest (10%) are Seventh Day Adventists, Jehovah's Witnesses, and *Iglesia ni Kristo*.

At present, the village facilities include: a pre-school, elementary school, high school, and a government-run fisheries college. The village also has a health center, a village hall, food market, restaurant, drug store, television facilities, electric service, radio station, postal service, and public transportation. Water is supplied from a variety of sources: water piped from a submersible pump; one communal artesian well; three privately owned artesian wells; a deep well; and, natural springs. Electricity accounts for 80 percent of light generated, while kerosene only 20 percent. Wood is the primary fuel (90%), followed by electricity (5%) and kerosene (5%). Providing recreational outlets for the village residents are a cemented basketball court, a tennis court, a mini-park, and multiple video houses.

Overall, the integration of Cogtong village into the national economy may be regarded as low to medium. Market links are medium, marked by the daily transport of fish by public transportation to neighboring villages and municipalities. Transportation links are low due to the presence of unpaved roads to and from the village and of the sole dependence on motorcycles as a mode of transportation. Communication links are medium. A hand-held radio in the village and a telephone facility are available at the Candijay town center, about 7 km away. By contrast, political links are high since the mayor of Candijay visits the village more than once a year.

3.2.3 Characteristics of Sample Fishers

A random sample of 54 fishing households was drawn from the village population. The sample comprised 27 members of the project beneficiary association, known as the PAGAMACO, as well

as 27 non-members. Table 6 shows no statistically significant difference between members and non-members in terms of mean age, education, household size, and length of residence in the village ($p>0.05$). On the average, the survey respondents are 48 years of age. They have completed an elementary education and have resided in the village for about 37 years. The majority of the village fishers were born in Cogtong (54%), while the rest came from neighboring Visayan areas (44%) and from far-flung Luzon in the Northern Philippines (2%). The average household consists of five members.

In terms of fishing experience, most respondents (76%) reported that they have been fishing for more than 15 years. About 11 percent of the respondents have fished for 11-15 years, and 12 percent, for 10 years or less. In the past, 48 percent were also engaged in non-fishing occupations such as vending, farming and carpentry. Between members and non-members, a statistically significant difference does not exist ($X^2=2.67$, $p>0.05$).

Table 6. Characteristics of Sample Fishers: Cogtong

Variable	% Members	% Non-Member	% Total	T-value	p
Age	49.2	46.8	47.9	0.72	>0.05
Education	6.5	6.1	6.3	0.45	>0.05
Household size	5.2	4.2	4.7	1.36	>0.05
Years of residence in the village	39.0	34.2	36.6	1.07	>0.05
<i>N</i>	27.0	27.0	54.0		

In terms of participation in the project, Table 7 shows that members differ significantly from non-members in four aspects of project interventions: attendance at project meetings, completion of training, influence over project planning, and knowledge of project objectives. Based on the household survey in Cogtong, attendance at project meetings was higher for members than non-members (52% versus 19%; $X^2=6.58$, $p<0.05$). On the average, most respondents attended five meetings or less. Training completion, likewise, was statistically higher for members than for non-members (30% versus 7%); $X^2=4.42$, $p<0.05$). The training duration lasted for a minimum of 3 days and a maximum of 10 days. Training topics covered mangrove planting and management, establishment of artificial reefs, livelihood, and leadership, among others. The project staff of ACIPHIL and the Department of Trade and Industry (DTI) provided the training.

Table 7. Fisher Participation in the Project: Cogtong

Variable	% Members	% Non-Member	% Total	X^2	p
Attend project meetings	51.9	18.5	35.2	6.58	0.01
Complete training	29.6	7.4	18.5	4.42	0.04
Influence project planning	48.1	5.3	33.3	5.33	0.02
Knowledge of project objectives	100.0	85.2	92.6	4.32	0.04

The survey results, moreover, show that more members than non-members indicated that they were able to influence project planning (48% versus 5%; $X^2=5.33$, $p<0.05$) and that they had a greater knowledge of project objectives (100% versus 85%; $X^2=4.32$; $p<0.05$). Based on multiple responses, these objectives are closely linked to improving coastal resource conditions, livelihood enhancement, and community development. These responses are consistent with actual project objectives.

3.2.4 Fisher Households

Household Size and Out-Migration. About 78 percent of the respondents have six members or less in their households. The rest (22%) have a larger household size of more than six members. More than one-half (57%) of the households also reported that some of their household members have left Cogtong for various reasons. These are to work (80%), to get married (11%), and to study (9%). The usual destinations include Metro Manila (50%), other provinces (33%), and other municipalities (8%). Accounting for the rest of the destinations are other countries (6%) and other villages within Candijay (3%).

Educational and Occupational Profile of Wives. The educational profile indicates that about 55 percent of the wives received an elementary education, while some 26 percent went to high school. A few (19%) pursued a college education. About 4 percent did not go to school at all. In terms of age, 80 percent of the wives are more than 35 years of age. About 13 percent are in the 25-30 age bracket.

In Cogtong, women's key roles in the village economy and contributions to the support of their households involve the use of local resources. About 30 percent of the wives are engaged in important subsistence and income-generating activities, such as shellfish gleaning, fish vending, oyster gathering, selling cooked food, and nipa shingle-making. Others are store owners (9%), teachers (4%), laundry women (2%), and dressmakers (2%). About 53 percent are housekeepers and caregivers.

During the MRCRMP implementation, women were actively involved in the fishers' association despite the lack of any deliberate planning on the part of project designers or staff to target women (Mehra, Alcott and Baling 1993). This could be linked to their perception of their role as their husband's "helpers" and to the recognition of the value of resource management in their current and future livelihoods. Women were most active in providing voluntary labor for mangrove rehabilitation and for mariculture (oysters and mussels). They also cooked community meals when the men installed the artificial reefs.

When the MRCRMP introduced oyster culture in Cogtong, the women assisted their husbands in stringing the collectors together, installing stakes, and hanging collectors. They also did much of the harvesting (Mehra, Alcott and Baling 1993).

Household Assets. Unlike paid and fixed employment, income from fishing cannot be adequately quantified due to the absence of record-keeping and to the daily income variations (Pomeroy et al. 1996). In lieu of actual income, relative wealth was based on house structure, household furnishings/facilities, and ownership of productive assets (i.e., land and boats).

To evaluate house structure, four categories were used: minimal, low, medium and high. A minimal house structure refers to a house made up entirely of light materials, such as bamboo, cogon and nipa, including the frames. A low quality house structure consists of light materials for the walls and roofs but the frames are made of wood or lumber. A medium quality structure combines lumber and concrete for the walls and frames but uses nipa or cogon for the roof. A high quality house structure, on the other hand, has either a roughly or completely finished external surface and painted or cemented inner walls, along with galvanized iron sheets for the roof. Table 8 shows no statistically significant difference between members and non-members ($X^2=6.78$, $p>0.05$). Non-members, nonetheless, are more likely to have minimal to low house structures than members.

Table 8. Percent Distribution of Assets: Cogtong

Variable	% Members	% Non-Member	% Total	X ²	p
House Structure				6.78	0.08
Minimal	11.1	14.8	13.0		
Low	33.3	48.1	40.7		
Medium	55.6	25.9	40.7		
High	-	11.2	5.6		
Household Furnishing and Facilities				4.08	0.25
Minimal	11.1	18.5	14.8		
Low	55.6	44.4	50.0		
Medium	33.3	25.9	29.6		
High	-	11.1	5.6		
Land Ownership	29.6	37.0	33.3	0.33	0.56
Ownership of motorized boats	89.7	93.3	91.5	0.26	0.61

The respondents tend to have minimal to low household furnishings and facilities. Minimal refers to the presence of 1-2 household furnishings, while low refers to the presence of 3-5 furnishings. Included on the list of furnishings/facilities are such assets as furniture, radio, cassette player, cooking stove, electric fan, water-sealed toilet, sewing machine, motorcycle, and other facilities. Ownership of productive capital such as boats and land may also be regarded as indicators of the respondents' relative wealth. The survey results reveal that there is no statistically significant difference in ownership of land and motorized boats between members and non-members ($p > 0.05$).

Occupational Multiplicity and Dependence on Coastal Resources. All respondents are dependent on fishing as a primary occupation. Fishing provides more than half of household earnings for 78 percent of the respondents.

Occupational multiplicity as a survival strategy among fishing households is fairly evident. Apart from fishing, respondents are engaged in fish trading (19%), carpentry (6%), farming (4%), and gathering of wood, *nipa* palms, and oysters (5%). The rest are engaged in tailoring, masonry, hog raising, and service-related jobs (22%). Forty-four percent of the respondents, however, reported that they do not have a secondary occupation.

The harvest of mangrove products accounts for less than half of household income for 91 percent of the respondents. This indicates that mangrove products supplement household earnings. Some households (35%) also receive remittances from members living outside the household to augment their income. The difference between members and non-members in dependence on external remittances is not statistically significant (33% versus 37%; $X^2 = 2.08$, $p > 0.05$).

Job Satisfaction. Given the chance to live their lives over, 52 percent of the sample would no longer choose to become fishers (Table 9). Between members and non-members, the difference is not statistically significant (48% versus 56%; $X^2 = 0.30$, $p > 0.05$). The predominant reason for giving up fishing is linked to the desire to earn a higher income and improve living conditions (82%). Other reasons (multiple response) relate to the difficulty of fishing (25%) and declining fish catch (14%).

For those who chose to remain in fishing (48%), the reasons are: lack of skills in other jobs (39%), being used to fishing (31%), contentment with fishing (12%), absence of a boss (8%), and provision of basic needs (8%). This finding partly suggests that fishers face limited options in

terms of job opportunities, given their work experience and limited education, which lead them to choose fishing again if they were to live their lives over.

Table 9. Job Satisfaction of Fishers

Choice	% Member	% Non-Member	% Total	X²	P
Leave fishing, given the chance to live one's life over	48.1	55.6	51.9	0.30	0.59
Shift from fishing now	70.4	84.5	75.9	0.91	0.33

When the respondents were asked if they would change their occupation now from fishing to something else, about 76 percent said yes. Underlying this response are economic reasons, such as the need for higher earnings (56%) and to improve living conditions (39%). Others qualified their response by expressing that they would shift to other occupations if the alternative job was light and easy (10%). Non-income related reasons for leaving fishing also emerged. These cover the difficulty of fishing (12%), declining fish catch (7%), and old age/weak body (2%). Thus, the yearning for a better economic status appears stronger in the fishers' desire to shift now from fishing to other jobs.

3.3 Market Characteristics

Fishery. The fishery of Cogtong is market-driven and oriented toward food fish. About 89 percent of the 54 fishers covered by the random sample survey in July 1997 reported that they sold the bulk of their catch. Only 11 percent indicated that they sold less than half of their catch. The sale of fish primarily takes place at the village (91%). About 7 percent goes directly to the Candijay town market (7%). Only 2 percent of food fish is sold outside Candijay, particularly in Mabini, Guindulman, Jagna, and Tagbilaran. F2 highlights the market attributes of Cogtong.

Box 2. Summary of Present Market Characteristics

Indicator	Attributes
Fishing ground Market outlets	Inside Cogtong Bay (78%) Consumer (54%) Primary buyer (28%) Retailers (18%)
Place sold	Village (91%)
Number of traders	30
Existence of <i>suki</i> (favored buyer)	48% with <i>suki</i>
Length of <i>suki</i> relationship	< 5 years – 69% 5-10 years – 23% > 10 years -- 8%
Market orientation	Local/Provincial
Value of product	Low/medium

In relation to market outlets, Cogtong fishers reported that they sell their food fish to consumers (54%), primary buyers/fish dealers (28%), and retailers (18%). The choice of these market outlets is governed by the existence of a *suki* (credit-marketing relationship between a fish buyer and a fisher), proximity, and best price offer. The trade of fresh fish is dominated by women, who are usually spouses and daughters of fishers.

Key informants recalled that before 1988, there were about 10-15 full-time fish traders from Cogtong. Now, their number has reportedly doubled to 30. Of this number, 20 traders go offshore to procure their fish. Fish traders have generally observed stability in market outlets, but not in the volume of fish procured from Cogtong fishers. Pedro Odoná, 53 years of age, recalls, “*In 1988, we could sell around 50-60 kilos daily of fish caught from Cogtong Bay. Now, we are fortunate if we can sell 30-40 kilos a day of fish caught from Cogtong Bay. The volume of fish catch from Cogtong Bay has declined.*” Bebot Galagar, another fish trader, adds, “*In the 1980s, we bought all our fish directly from village fishers. With the onset of the 1990s, we started buying fish offshore.*”

Market channels, at present, include the following: 1) fisher --> fish trader --> consumer; 2) fisher --> primary buyer/fish dealer (village-based and offshore) --> consumer; and 3) fisher --> primary buyer/fish dealer (village-based and offshore)--> fish retailer --> consumer. The first category is the most common marketing channel.

Fish are normally packed in ice to preserve their quality and are stored either in styrofoam

containers or plastic-covered buckets. Fish traders obtain their fish directly from village fishers. Most traders load their fish on motorcycles (*habal-habal*) early in the morning and transport them to the Candijay town market. Fish intended for more distant markets outside Candijay are transported by bus. At times, about 10 transient fish traders go to Cogtong to procure fish. These transient traders come from other municipalities, such as Jagna, Ubay, Guindulman, and Anda.

Fish are sold by weight or by gallon in Cogtong. Prices are determined by the type of fish and size of fish. Groupers and blue marlin normally command higher market prices. Fish prices are also affected by the volume of fresh fish landed, which, in turn, is dependent on climatic conditions and on the lunar season. During stormy seasons or windy periods when fish supply in the market is low, fish prices tend to increase by at least 60 percent. The main sources of information on fish prices (multiple response) are fish buyers/dealers (41%), other fishers (37%), and market vendors (30%).

In general, the comparative retail prices of marine products in 1988 and 1997 increased. Several types of fish registered double-digit price increases of at least 40 percent: herring (*mangsi*), snapper (*katambak*), rabbitfish (*kitong*), trevally (*mamsa*), and grouper (*pugapo*). The traders noted that prices almost tripled for mackerel (*andohao*), anchovy (*bolinao*), and hairtail (*diwit*) over a nine-year period.

The trade of food fish is very competitive. There is no official control over individual fish traders, such as the restriction of fish trading in the area or the imposition of rules on fish landing. Ice plant facilities are virtually non-existent in Cogtong. Based on key informant interviews, fish vendors dry their fish or process them into fish paste (*guinamos*) when they cannot sell all their fish at the end of the day. The processed fish, however, is normally for home consumption only. At times, fish drying is also done, but traders noted that dried fish commands a lower market price.

The survey results indicate that 48 percent of the fishers have maintained a *suki* relationship. This is largely due to the services that the *suki* provides and the guaranteed market that comes with this arrangement. Multiple responses given by fishers on the advantages of the fisher-*suki* relationship include a guaranteed market for food fish (24%), availability of emergency credit (22%), and provision of fishing assets (2%). The rest (52%) did not have a *suki*. Among the most sought after services from the *suki* are loans for basic needs and provision of capital. In this type of relationship, however, the trader normally dictates the price of fish and limits the fishers' choice of market outlets. Nonetheless, 83 percent of those who have a *suki* expressed that they are happy with their *suki* arrangements. Most *suki* relationships have generally lasted for 1-4 years (69%).

Mangrove Wood. Wood gathering/trading in Cogtong is a part-time livelihood. In 1988, there were about 10 full-time wood traders/gatherers. Their number was reduced by 30 percent in 1997 due largely to geographical restrictions in trading mangrove wood, death of earlier wood gatherers, and migration of some wood traders to other areas.

Wood gathering and trading are family-based activities, where family members harvest and gather mangrove branches, chop, remove the bark, and dry the wood. *Bakhaw* (*Rhizophora sp.*) is normally gathered for firewood due to its relative abundance and ease in cutting the wood. When posts are needed, wood gatherers cut down the tree trunks of *Avicennia sp.* The major mangrove harvesting grounds in Candijay are found in Cabidian, Lumisli (Cogtong part), Sagumay, and Pangpang. The dried wood is transported to the market and sold to a wholesaler or to a store owner. Demand for firewood rises during stormy seasons, when wood gathering is difficult, and

during village festivals (*fiestas*), when large quantities of food are cooked using firewood.

Salome Beltran, a wood trader who is 53 years of age, shares, “*We normally produce 100 bundles of wood in two days. Each bundle comprises 6 pieces of cut wood. We deliver the wood bundles directly to our suki, who then sells the wood to consumers. We get paid in cash upon delivering the wood. However, when our suki has remaining stocks, we are paid in kind, such as rice, canned goods, cigarettes, kerosene, and other basic items, instead of cash. During emergencies, we normally get a loan from our suki.*”

The procurement price of mangrove firewood has increased by 50 percent from 1988 to 1997. In 1988, one bundle of *bakhaw* was sold at P1.00. Now, it costs P1.50 (US \$0.04). The retail price to consumers is P2.00 (or US \$0.06) per bundle. The sale of mangrove firewood is confined to the municipality of Candijay, in line with a local ordinance that seeks to restrict mangrove harvesting and exploitation.

3.4 Community Institutional and Organizational Arrangements

The following section focuses on the tradition of collective action, attitudes toward collective action, and responsibilities for coastal resource management and decision-making in the village of Cogtong. Included in the analysis are the evolution of property rights and rules and attitudes toward rule breaking. Moreover, insights into the actual monitoring and enforcement of coastal resource management-related rules are presented.

3.4.1 Tradition of Collective Action

Cogtong does not have a rich tradition of collective action at the village level. The oldest village level organization is the Parents’ and Teachers’ Association (PTA), whose existence dates back to the 1970s. The PTA supports school-related improvements.

In 1984, an organization dedicated to environmental protection was formed. The group, known as COMAGCO (Cogtong Mangrove Growers’ Cooperative), sought to protect mangroves and rehabilitate the fishery, which had been subject to intense and destructive harvesting pressures. The catalyst in forming the organization was Mr. Gulle. Originally a resident of Barangay Cogtong, Mr. Gulle migrated to General Santos City in Mindanao to work for the Planning Division of the Development Bank of the Philippines. Upon retiring, Mr. Gulle, who had gained much environmental knowledge, returned to Cogtong and saw the degraded coastal resource condition.

Mr. Gulle was able to mobilize support for COMAGCO. Members consisted mainly of residents from Cogtong, but also included some residents from the neighboring coastal barangay of Panas. The main actions of COMAGCO were directed toward protecting the mangroves and fishery. In one instance, the group discovered that a fishpond was being constructed in one of the mangrove areas protected under Presidential Decree 2151/2. COMAGCO reported the violation to the Municipal Council, resulting in the stoppage of construction. The Philippine National Police (PNP) supported COMAGCO by giving members the authority to arrest anyone involved in illegal mangrove harvesting. Barangay officials also lent support to the group by giving travel allowances for members to attend court hearings. COMAGCO disbanded in 1988 when Mr. Gulle, the president and founder, returned to General Santos City without appointing a successor.

The MRCRMP was implemented in Cogtong Bay in 1989. Community organizing was one of the four main components of the project. This component deployed project catalysts (community organizers) who conducted awareness drives, pursued capacity building, and helped set up people's organizations at the project sites. Community organizing was implemented in two phases: social preparation-cum-value formation and organization building. A direct offshoot of this component was the formation of PAGAMACO, a village-based fishers' association that officially registered with the Department of Labor and Employment (DOLE) in 1989. As part of the community organizing component, a municipal-wide United Federation was also proposed. Although the effort succeeded in Mabini, the idea never materialized in Candijay. There were only two FAs in Candijay, both of which had internal leadership problems. The original membership of 58 individuals was divided into three groups for project-related activities. The groups, which were not mutually exclusive, included mangrove planters (44 members), artificial reef cooperators (28 members) and mariculture cooperators (22 members). The overall objective of the association was to rehabilitate and protect the coastal resources of Cogtong Bay.

Individuals involved in mangrove rehabilitation collected and planted propagules on lands assigned to them. Artificial reef adapters helped in constructing and deploying artificial reefs. Members involved in mariculture built structures to facilitate oyster production. Association members also attended seminars, joined enforcement efforts, and helped conduct information campaigns. PAGAMACO, however, did not form a cooperative of any type. Unofficially, the association disbanded a few months after the MRCRMP staff left. Officially, PAGAMACO remained as a DOLE-registered organization. On 22 February 1997, PAGAMACO became active again at the barangay level with the assistance of the Bohol Resource Management Development Organization (BOREMADEV). Now, it has 71 registered members. The association has recently applied to the Barangay Fisheries and Aquatic Resources Management Council (BFARMC) for a 50-hectare reforestation contract.

Other village-based organizations were initiated after the MRCRMP. The St. Joseph Multi-Purpose Cooperative, which existed from 1993 to 1994, operated a store. Later, it stopped store operations due to losses incurred. The members eventually decided to discontinue the cooperative.

Recently, another cooperative was formed as a joint effort of residents in Cogtong and Panas, called the Candijay Multi-Purpose Cooperative. The group has purchased a fishing boat for the use of all members to support their livelihood.

A youth group also exists to help the young people in the village to develop into persons of good moral character. Religious organizations also abound to promote the Catholic way of life.

All of the village-based groups just mentioned are formal organizations. No informal groups function in Cogtong.

Current Membership in Village Organizations. A survey of 54 respondents in July 1997 indicates that 46 percent belong to a fishers' organization (PAGAMACO) and 26 percent to civic and religious organizations. The rest (28%) are not affiliated with any association at all. About 11 percent belong to more than one village association.

As perceived by the respondents, the purposes of PAGAMACO are varied: 1) improve the condition of coastal resources and prevent resource destruction (17%); 2) provide information on fishing (17%); 3) foster unity among members (13%); 4) stop illegal fishing (9%); 5) increase fish

catch/stock (6%); and 6) help develop the community (6%). These are congruent with the declared purposes of the association. Lower frequency responses include: plant mangroves, help the less fortunate, and promote oyster culture. About 39 percent were unable to cite any purpose, all of whom are not PAGAMACO members.

Attitudes Toward Association Leadership and Decision-Making. Most PAGAMACO members have a positive regard for their association leader, perceiving the leadership not only as very respectable (74%), but also very credible (89%). The leadership may also be described as legitimate, having been elected by the members themselves. With regard to actual decision-making within the association, the majority (96%) perceived the decision-making process as democratic and participatory, marked by consultation and election to arrive at major agreements.

Attitudes Toward Collective Action. Based on the survey of 54 respondents, inclusive of PAGAMACO members and non-members, the attitudes toward collective action are positive. About 98 percent of the respondents expressed that the people in the village could work together to solve community problems (Table 10). For the fishery, around 89 percent felt that village fishers could work together to address fishery problems. Similarly, they felt that mangrove growers could work together to solve mangrove-related problems (94%). These responses are encouraging since mangroves and fisheries are part of a mutually supportive ecosystem. Many fishers (80%), moreover, mentioned that both the government and the fishers should work together to solve fishery problems, indicating a positive attitude toward fisheries co-management.

Table 10. Attitudes Toward Collective Action

Attitude	% Member	% Non-Member	% Total	X ²	p
The community can work together to solve village problems	100.0	96.0	98.0	1.01	0.312
Mangrove growers can work together to solve mangrove problems.	88.0	100.0	94.0	3.17	0.074
Fishers can work together to solve fishery problems	89.0	89.0	89.0	0.00	1.000
The government and the community can work together to solve fishery problems	93.0	67.0	80.0	5.97	0.050
<i>N</i>	27	27	54		

Attitudes Toward the Distribution/Sharing of Responsibility for Fisheries Management. When the respondents were asked about the extent of sharing responsibility for resource management, the majority (74%) expressed that the government and the fishers must have equal responsibility (Table 11). The rest (26%) opted for a less equal sharing. Among these respondents, about 17 percent are in favor of giving more responsibility for fisheries management to the government while 9 percent expressed otherwise. Overall, there is a relatively strong support for co-management.

Table 11. Attitudes Toward Responsibility Sharing for Resource Management

Attitude	% Member	% Non-Member	% Total	X ²	P
				1.30	0.52
The government will have most of the responsibility for resource management while the fishers will have relatively less.	11.1	22.2	16.6		
The government and the fishers will have equal responsibility.	77.8	70.4	74.1		
The government will have less responsibility while the fishers will have most of the responsibility.	11.1	7.4	9.3		
N	27	27	54		

Willingness to Support a Similar Project in the Future. A fairly high percentage of the respondents (76%) indicated a willingness to support a similar project in the future. The response of members and non-members is similar in this regard ($X^2=2.53$, $p>0.05$). The finding is encouraging in light of project accomplishments at the site and the painstaking efforts pursued by ACIPHIL and Network Foundation.

When asked about the contribution that they are willing to give in kind per year (i.e., types of fish and quantity of fish) to a similar project in the future, 66 percent of the respondents expressed that they are willing to give small and large pelagics, such as anchovies and squids. Others (48%) would contribute crabs and demersals, such as rabbitfish and breams. Still others would give crabs (7%). The amount of fish to be donated to the project is around 5 kilos, costing approximately US \$1 to 2 per kilo.

3.4.2 Decision-Making at the Village Level

At the village level, a 10-member Barangay Council conducts formal decision-making. Council membership is composed of representatives from sub-villages who are elected by their constituents for a three-year term. A Barangay Captain, elected by all barangay residents, also for a three-year term, heads the Council. The Council has the authority to pass ordinances on coastal resources and to enforce laws within barangay boundaries.

Before the MRCRMP, the Cogtong Barangay Council took preventive measures to discourage illegal fishing, such as monitoring coastal waters and reporting illegal fishing practices to the Municipal Council for formal action. The Council would then conduct an investigation and refer the case to the court if enough evidence was found.

The Barangay Council, however, was not very active in mangrove management before the MRCRMP. On rare occasions when illegal cutters were caught, laws were not enforced. The Barangay Captain was responsible for conducting an investigation and forwarding the case to the Municipal Council if enough evidence was found. Due to the lax enforcement policy of the Municipal Council at that time, the barangay captain seldom conducted preliminary investigations. During the MRCRMP phase, residents were informed an investigation would be conducted. If the

available evidence merited legal action, the case was forwarded to the Municipal Council. In most cases, the foot patrol apprehended the illegal cutters and warned them. If caught again, charges were filed. There were no repeat offenders. Enforcement went hand in hand with information campaigns conducted by the Barangay Council on the importance of mangroves.

Barangay involvement in coastal resource management was not limited to more strict enforcement. When the project was proposed, Barangay Council members went door to door to encourage people to join PAGAMACO. Village ordinances were passed to prohibit the destruction of mangrove plants. The Council also listened to the concerns of the people and to proposed solutions. For instance, the Council recognized communal mangrove areas to support the livelihood of firewood gatherers.

In 1994, the Cogtong Barangay Council linked up with three other Barangay Councils in Candijay to form the United Barangay Federation (UBF). During the first meeting, the UBF resolved that all of Candijay waters be redefined as a marine reserve area. It also proposed the restriction of all fishing operations within municipal waters three days before and three days after the spawning season. However, the Barangay Councils do not have the necessary judicial power to approve such resolutions. The resolutions were intended as messages to the Municipal Council which did have the authority to approve such resolutions. The UBF also continued to request the national government to convert abandoned FLA areas into timberland. It has also worked with the recently reactivated PAGAMACO to push the Municipal Council to enact stricter environmental laws.

3.4.3 Property Rights and Rules

Property Rights. Outside of the areas of traditional family use and concession licenses in Barangay Cogtong, customary rights and tenure for mangroves do not exist. Local residents, as well as cutters from other provinces, could harvest without observing any cutting limits. Cutting was done on a first come, first served basis.

Mangroves. The first issuance of CSCs in 1984 and the subsequent large-scale implementation of CSCs during the MRCRMP changed the property rights structure. Within the boundaries of the CSC, the mangrove stewards can restrict access and withdrawal. CSC holders have “the right to peacefully possess and cultivate the land and enjoy its fruits.” They are entitled to harvest the mangroves, provided they replant the trees. They can also limit the entry of outsiders to their areas. The CSC lasts for 25 years, but is renewable afterwards.

Outside the boundaries of the CSCs, and even within some land areas held under CSC, the property rights picture is ambiguous and still being contested as FLA operators continue to try and exert their privileges. Where CSCs and FLAs both exist, the rights of CSC holders have sometimes prevailed. (For an example, the reader is directed to the Marcelo case study where a discussion is found in Section 3.4.3. The example is germane to Cogtong’s situation because the decisions are above the barangay and municipal levels).

Areas not bounded by CSC but subject to FLA seem to be moving towards a communal property ownership. Dating back to the MRCRMP phase, and continuing until the present, village residents have petitioned the national government to recognize the rights of residents versus the privileges of FLA operators. The petitions called for the cancellation of FLAs and their redefinition as communal swampland. The local residents argued that the 1987 Constitution recognizes “the rights of subsistence fishers, especially of local communities, to the preferential use of communal

marine and fishing resources, both inland and offshore.” FLAs only grant the holder the privilege to develop the land into a fishpond. Therefore, residents claim that their rights exceed the privilege of fishpond operators. Some FLAs, such as those granted to Jaime Borja, Toradio Tecson and Jose Martier, have been cancelled based on this argument.

Fishery. Traditional rights and tenure do not exist. Except for the area covered by the recently established fish sanctuary at Tabong Dio Cogtong, open access prevails. Management rights exist for all fishers in the village. Exclusive fishery privileges can be granted by the Municipal Council to operators of fish corrals and mollusk beds in municipal waters outside of the fish sanctuary, but to date has not been done.

Property Rules. Many rules exist that govern the behavior of fishers: operational, collective choice, and constitutional rules. Operational rules, which govern and regulate resource use, directly affect day-to-day decisions made by the fishers on where, when and how to harvest fish (Ostrom 1991). They also identify who should monitor the actions of others and how, and what rewards and sanctions are assigned to certain actions. Operational rules may be formal (written/legitimized) or informal (unwritten/traditional). In Cogtong, operational rules may be classified into: 1) boundary rules (who can enter the resource area); 2) allocation rules (actions or procedures for harvesting); 3) scope rules (specification of the characteristics of the resource that can be harvested); 4) aggregation rules (procedures in decision-making that involve multiple individuals); 5) penalty rules (punishment for non-compliance); and 6) input rules (requirements from resource users in terms of time, money and/or materials for management and participation). Examples of these rules are provided in the next section.

Formal operational rules. Formal operational rules in Cogtong are largely embodied in local ordinances, national legislation, CSC contracts, and other legal instruments. For instance, the Municipal Council requires fishers to secure fishing permits before they can fish in the municipal waters. This represents a boundary rule. Legal mangrove cutting, likewise, is limited to holders of CSCs and of cutting permits from the DENR. Formal allocation rules ban destructive gear and practices, such as dynamite fishing, use of cyanide or other strong poisons, use of fine mesh gillnets (below 3 cm), deployment of commercial fishing boats in municipal waters, and scaring fish. A local ordinance enacted in 1984 also prohibits any person from operating *Liba-liba* (Danish seine) within seven kilometers from the shoreline.

Scope rules pertain to the ban on catching and selling gravid *siganid* since 1981. A closed season was declared in 1996 within the area of the *Sauranan sa Danggit* (rabbitfish concession area), as stipulated in Municipal Ordinance 12-87, to allow rabbitfish to spawn. Aggregation rules require PAGAMACO members to hold dialogues and meetings before endorsing a resolution formally to the *Barangay* Council. In turn, the Village Council forwards the resolution to the Municipal Council for deliberation and legal action. Village assembly meetings are convened for issue clarification and consensus building, with the active participation of village and municipal officials. Penalty rules also exist in Cogtong. Violations of fishery rules call for a fine or imprisonment of not more than six months, or both. Input rules refer to the mandatory payment of membership fees by PAGAMACO members to support the association’s operations, apart from helping report rule violations.

Informal operational rules. Informal rules also exist in Cogtong, both for fisheries and mangroves. Entry to the fishing ground is on a first come-first served basis (boundary rule). During fishing operations, fishers are required to deploy their fish nets with care so that they do not get

entangled with other nets (allocation rule). When constructing fish corrals, fishers also observe a distance of 200 meters between fish corrals (allocation rule). For mangroves, CSC holders usually allow other coastal resource users to enter their mangrove area (boundary rule). In the communal mangrove area, firewood gatherers are not arrested for cutting trees, provided they plant a propagule for each tree cut.

Collective Choice Rules. Collective choice rules define how rules are made and enforced. These are used by resource users, officials or external authorities in making decisions about how the resource should be managed. For example, these rules state what proportion of the group must agree before a rule may be adopted or what methods will be used to monitor and enforce compliance with the stated rules (Ostrom 1991). Accordingly, because the MRCRMP was a co-management project, both the government and local resource users have collective choice rules. Of critical importance are the arrangements for monitoring and enforcing compliance with the operational rules and for settling disputes.

The DENR's Forest Management Bureau (FMB), formerly known as the Bureau of Forest Development, has legal jurisdiction over mangrove areas. Therefore, government collective choice rules relative to the mangroves are vested within the act that established and described the operation of the FMB. Responsible for reporting violations of fishery laws in Cogtong are members of the government-deployed sea patrol (*Bantay Dagat*) and PAGAMACO members. Assisting them are other law enforcement officers who apprehend illegal fishers. Arrangements for settling disputes involve the conduct of hearings by the village captain and the municipal mayor before legal cases are elevated to the court.

The newly re-organized PAGAMACO has yet to pass any association rules governing coastal resources. The PAGAMACO constitution, nonetheless, details the collective choice rules that must be followed. The meeting must be legal (i.e., at least 50 percent of the members are present to achieve a quorum), and, for a proposal to be accepted, it must be supported by a simple majority vote. For amending existing rules, 80 percent of the members must support the amendment.

Members are responsible for monitoring PAGAMACO rules. Rule breakers are subject to fines. Persistent rule breakers are expelled from the organization. For example, if a member fails to attend the monthly meeting, he pays a fine of P25 (US \$0.74). If he misses three consecutive meetings, he has to leave the association. Disputes are settled by a vote during the general assembly. Due to the short period that the reactivated PAGAMACO has functioned (since February 1997), not many collective choice rules have been established. Further, no instances of rule-breaking and conflict resolution have occurred.

Constitutional rules. Constitutional rules (Ostrom 1991) determine the types of rules that are permissible and identify who has collective choice rights (governance and modification). Therefore, constitutional rules define who is eligible to participate in the process of rule formation, monitoring and enforcement. Again, two sets of constitutional rules exist in Cogtong Bay. The first set is embodied within the Local Government Code, Fisheries Decree of the Philippines and other related national legislation enacted by the government (for further discussion see section 3.5.2).

The second set of constitutional choice rules is associated with PAGAMACO. Although the FAs have not yet passed any mangrove or fishery-related rules, the association has formal rules on the process for passing operational rules. All members of PAGAMACO are involved in the process of rule formation. To be a member of PAGAMACO, the individual must possess several

characteristics. The individual must be: a resident of Barangay Cogtong; a coastal resource user; vice-free; and willing to pay a one-time membership due of P5 and monthly dues of P5. He must also attend an orientation seminar given by existing members and receive 70 percent of the votes cast by existing members before he is accepted for membership. Any member may propose a new idea at the general assembly meeting held on the first Saturday of every month. A discussion follows if consensus is not immediate. After the discussion, a majority vote resolves the issue.

Although decision-making powers are distributed to all association members, four committees exist which are responsible for presenting ideas on different facets of the organization. The four committees are: education; project management; finance; and, audit and inventory. These committees prepare and send reports to the Board of Directors. The Board may either endorse/present the idea to the general assembly or reject the idea. The Board consists of five officers: secretary; treasurer, auditor, vice-president; and, president. The officers are elected through secret ballots for a term of one year. Elections are conducted during the general assembly meeting on the second week of December. At least 80 percent of the members must be present to have a legal election.

Knowledge of Fishery Rules. A survey of 54 fishers in Cogtong in July 1997 indicated that the fishers are aware of fishery-related rules, particularly those embodied in local ordinances and national laws (e.g., formal rules). Based on multiple responses, the most frequently mentioned formal rules are: 1) prohibition of illegal fishing (85%); 2) ban on the use of fine mesh nets (6%); and, 3) ban on commercial fishing within 15 kms from the shoreline (2%). About 19 percent expressed that they do not know any fishery law. Most fishers, likewise, understand the reasons behind these fishery laws. The major reasons cited are to protect marine resources/improve coastal resource conditions (59%), increase fish stocks (18%), allow fish juveniles to mature (13%), and avoid conflicts between municipal and commercial fishers (2%).

For informal rules, 18 percent of the fishers cited the maintenance of a 200-meter distance between fish corrals, first come-first served basis when entering the fishing grounds, avoidance of tangled nets during fishing operations, and imposition of sanctions on violators. The majority (82%) of the respondents were unable to cite any informal fishery rules.

Knowledge of Mangrove Rules. Most respondents expressed that mangrove cutting is formally prohibited in certain areas (67%), while 33 percent are not aware of any rules at all. The reasons cited for such existing rules include the need to preserve/increase mangrove stands (46%) and to increase fish catch (17%). These reflect a basic understanding of the relationship between mangroves and fishery.

Attitudes Toward Rules. The respondents generally felt that rule-breaking is not acceptable (67%), inclusive of members and non-members alike. For about 18 percent, rule-breaking is sometimes acceptable. About 15 percent neither agreed nor disagreed. For those who find rule-breaking unacceptable, several reasons were given (multiple responses): 1) people must learn to obey rules (39%); 2) rule-breaking will encourage others to violate the law (28%); 3) fear of imprisonment (13%); and 4) rule-breaking will damage the resources (11%). The rest did not cite any reason.

For those who felt that rule-breaking is sometimes acceptable, the reasons are basically linked to immediate survival needs. About 15 percent stated that the family's needs are more important. Another 7 percent mentioned that rule-breaking is sometimes acceptable if it benefits the majority.

When the respondents were asked if the rules on fish harvesting must be changed, 53 percent agreed while 33 percent disagreed. The rest (14%) were neutral. For those who agreed, enforcement is perceived as weak and that stricter measures are imperative. They felt that illegal fishing methods are still prevalent, enforcement is lax, and the destruction of coastal ecosystems has continued. For those who disagreed, they felt that the rules are effective and that they help prevent conflicts among resource users.

When asked if the rules on mangrove cutting/harvesting should be changed, most respondents (63%) agreed, 20 percent disagreed, and the rest were neutral (17%). Some respondents are dissatisfied with existing laws on mangrove cutting due to: 1) declining mangrove stands (37%); 2) lack of involvement of the local government (19%); 3) lack of mangrove management (19%); 4) lax enforcement (11%); 5) decreasing fish catch (9%); and 6) political interference/influence (2%).

3.4.4 Monitoring and Enforcement

Monitoring and enforcement has a different history at each time period: before the MRCRMP, during the MRCRMP, immediately after the MRCRMP, and now. Before the project, monitoring and enforcement was lax. Patrolling of mangrove areas was not done. The PNP did not enforce the cutting laws on their own initiative. When the PNP did respond to complaints, violators were just told to stop, but no penalties were imposed. Illegal fishing activities were dealt with more severely. If violators were caught, fines, and sometimes imprisonment, were imposed.

During the MRCRMP phase, monitoring efforts intensified. A *Bantay Dagat* and a foot patrol were initiated. For the *Bantay Dagat*, the Municipal Council provided enforcement officers and a boat engine. The MRCRMP supplied a boat, money for gas, and boat crew. PAGAMACO members also joined the *Bantay Dagat* that coordinated efforts with the *Bantay Dagat* being operated out of Mabini. The foot patrol included MRCRMP staff, DENR staff and PAGAMACO members.

Apart from the physical presence of law enforcement officers to discourage illegal fishers and cutters, the policies of the Barangay and Municipal Councils on enforcement became stricter. Offenders were not merely told to stop. If illegal cutters were apprehended, the culprits were usually warned and made to sign a promise to stop illegal cutting. If the same culprit was caught again, the offender would be tried for both the first and second offenses. Only two illegal cutters were caught by the foot patrol in Cogtong. Neither offender was caught again so no formal action was taken.

Penalties on illegal fishers were imposed in most cases. Some first time offenders, mostly poor fishers, were released only if they promised to stop their illegal activities. The equipment of illegal fishers, such as blast fishers and commercial fishers, was impounded until the fine was paid. Only two formal arrests were made during the MRCRMP, both for blast fishing. The two arrests sent effective signals to illegal fishers in Cogtong Bay during the project phase (The Network Foundation 1990).

Information campaigns were also conducted. The Municipal Council, Barangay Council, MRCRMP staff, and PAGAMACO members were all involved in explaining the importance of mangroves and new enforcement policies.

Immediately after the completion of the MRCRMP in 1991, the sea patrol stopped because no one would pay for the gas. Illegal fishing activities soon returned to Cogtong Bay. The foot patrol disbanded in the absence of project staff and DENR staff to coordinate the efforts. CSC holders monitored their lands on an individual basis. The boat procured by the project was turned over to the DENR.

The present situation is different. Since 1995, the sea patrol has revived its activities. The Cogtong Barangay Council repaired the MRCRMP boat turned over by the DENR. Now, the patrol goes out from 7:00 a.m. to 4:00 p.m. about three times a week, completely funded by the Municipal Council. Three men, a policeman and other municipal employees, join the sea patrol. The *Bantay Dagat* program resumed after the Municipal Council funded a *Bantay Dagat* seminar. However, the mayor, for unknown reasons, refused to deputize any graduates as fish wardens for the *Bantay Dagat*. As a compromise, the mayor instead initiated the sea patrol using municipal employees who are perceived by local residents as corrupt. During the Municipal Council meeting held on the final week of the conduct of this research, the Municipal Council again officially requested the mayor to deputize the graduates of the *Bantay Dagat* seminar.

Today, illegal cutting is still a problem to CSC holders in Cogtong. However, the large boats have almost completely stopped coming to cut mangroves. Local residents today are responsible for illegal cutting.

Recorded Violations. No records exist of the warnings issued to illegal cutters and fishers, but records from as far back as 1958 document incidents where the Municipal Council took formal action. No records documented offenses per village, thus, violations are reported for Candijay in general. Recorded violations occurred in 1958, 1960, 1970, 1975, 1980, 1985, and 1988-1997. A recorded violation does not consider the number of actors. If, for example, five people in one boat were apprehended for illegal fishing, only one violation is recognized. There were 25 instances of official action by the Municipal Council during all the years covered. For the years prior to the MRCRMP, there were six violations. Dynamite fishing accounted for two violations (33%). Illegal possession of dynamited fish, illegal possession of explosives intended for fishing, fishing using a bow and arrow without a bow and arrow license and, cutting without a municipal permit represent one recorded violation each. The illegal cutting charge applied to 1960, before the DENR mandated a DENR license instead of a municipal license.

During the project, there were only three recorded violations: two cases of illegal possession of explosives for dynamite fishing and one case of illegal possession of dynamited fish. Only the case of possession of explosives was forwarded to the court. The other case was dropped due to a lack of evidence.

Seven years after the MRCRMP, 16 violations have been recorded. Illegal fishing with methods other than blast fishing represents one half of the violations (total of eight cases). Four cases of cutting and collecting timber without a license were also reported. Blast fishing (three instances) and illegal possession of dynamited fish (one instance) are the remaining violations on record.

Current Perceptions of Rule Enforcement and Violations. Based on multiple responses, the most commonly violated rules involve dynamite fishing (98%), sodium cyanide fishing (46%), entry of commercial fishing boats in municipal waters (32%), use of fine mesh nets (13%), and beach quarrying (4%). Multiple responses indicate that the violators came from the village (59%) and from other areas within Candijay (57%). The rest came from other towns (20%).

In terms of rule enforcement, the respondents stated that sanctions are imposed on the violators. Based on multiple responses, violators are arrested (65%), warned (39%), fined (35%), and jailed (32%). Around 19 percent cited that no action was taken on violators. Thus, enforcement is perceived to be wanting in some cases. Only 56 percent of the respondents were satisfied with rule enforcement. About 39 percent were dissatisfied, and the rest were neutral.

On the responsibility for enforcing fishery rules and regulations in Cogtong, 76 percent of the respondents felt that the government and fishers are responsible for actual law enforcement. Thus, a partnership between the government and fishers appears to be felt.

Table 12. Actual Responsibility for Enforcing Fishery Rules and Regulations

Responsible Unit	% Member	% Non-Member	% Total	X ²	P
				4.23	0.12
Government and fishers	70.4	81.5	75.9		
Government only	14.8	18.5	16.7		
Fishers only	14.8	—	7.4		
<i>N</i>	27.0	27.0	100.0		

3.5 External Institutional and Organizational Arrangements

The following section highlights the delivery of services to Barangay Cogtong by external organizations before, during and after the MRCRMP. Also discussed are the provincial and national level decision-making arrangements.

3.5.1 Services from External Organizations

Prior to the MRCRMP, Barangay Cogtong did not receive many benefits from external organizations. The barangay was a recipient of a 1984 reforestation contract as part of the national government's Integrated Social Forestry (ISF) program, but community problems of illegal cutting and fishing as well as the FLA-related problems were largely ignored.

During the MRCRMP, both Candijay and Mabini began to receive services from external organizations. ACIPHIL Inc. and the Network Foundation implemented the MRCRMP. Services brought by the MRCRMP were community organizing, mangrove rehabilitation, artificial reef construction, mariculture, and law enforcement. The USAID funded the project. New institutional support was provided by the Municipal Council through the passage and enforcement of laws aimed at better coastal resource management.

Services after the MRCRMP completion have come from various organizations. The Provincial Agriculture Office, in collaboration with the Department of Interior and Local Government (DILG), and the Municipal Government of Candijay conducted a *Bantay Dagat* training seminar in July 1995. The Bohol Resource Management Development Organization (BOREMADEV) helped reorganize PAGAMACO in February 1997 so the organization could apply for a 50-hectare reforestation contract. BOREMADEV also conducted seminars and training on Coastal Resource Leadership and provided information on the environmental effects of various fishing practices.

3.5.2 Decision-Making Arrangements

National Level. The national government had a more active role in coastal resource management in Cogtong Bay until the early 1990s. In the 1970s, centralized government control over coastal resources was reinforced with Presidential Decrees (PD) 704 and 705. Popularly known as the Fisheries Decree of 1975, PD 704 revised and consolidated all fishery related laws and decrees in the Philippines. The decree defined the current boundaries for municipal and commercial fishing. Some of the most consequential sections of PD 704 stipulated the establishment of fish sanctuaries and fishing reservations; declaration of a closed season by area, gear, or species of fish; and, prohibition of illegal fishing such as the use of explosives, obnoxious substances, fine mesh nets, and electro fishing gadgets.

Likewise, PD 705, or the Forestry Reform Code of the Philippines was also issued in 1975 and served to centralize forestry decision-making at the national level. PD 705 merged the Bureau of Forestry, Reforestation Administration, Southern Cebu Reforestation Development Project, and the Parks and Wildlife office into one body called the Bureau of Forest Development (BFD). The BFD recognized that mangroves could not be effectively managed within the broader scope of forestry regulations. As such, the Coastal Resources Management Committee (CRMC) was formed at the DENR.

National level laws that have been passed complementing MRCRMP activities and goals have stemmed from the CRMC. The most relevant example is the DENR Administrative Order Number 15, Series of 1990. Section four states that the “conversion of thickly vegetated mangrove areas into fishponds shall no longer be allowed.” The same section later called for the reclassification of abandoned or undeveloped FLAs into forest land.

Also important in influencing national level decision-making was the new Philippine Constitution enacted in 1987 that further brought coastal resources under state control. The constitution declared that the exploration, development and utilization of natural resources, including aquatic resources, are under the “...full control and supervision of the State.” Unlike previous constitutions, the 1987 Constitution articulated a marine resources development policy. The new constitution also limited exclusive use and development of marine wealth to Filipino citizens as the mandate of protection of communal marine and fishing resources extends to offshore fishing grounds of local fishers against foreign intrusion (UP-Local Government Center 1996).

Municipal Level. Before the MRCRMP, the participation of the Candijay Municipal Council in mangrove management was minimal. With the implementation of the MRCRMP, the situation changed. Before, there was no monitoring of illegal cutting and no imposition of penalties. Confusion prevailed on who was responsible for enforcing mangrove laws in Candijay. The following discussion is drawn from excerpts of the minutes of the Candijay Municipal Council meeting on 31 July 1972. The vice-mayor reported that a boat full of firewood was not apprehended by the Philippine National Police (PNP) and that he had requested the Chief of Police to appear at the meeting for an explanation. Both the Chief and a patrolman were present during the Council meeting. The patrolman explained that he apprehended the boat, but the Chief of Police ordered him to release the boat instead. The Chief then explained to the Council that only the Bureau of Forest Development (BFD) could apprehend illegal cutters.

During the MRCRMP phase, the Candijay Municipal Council lent moral and material support. The mayor attended some of the project’s early meetings and encouraged people to join. The

Council also deployed the municipal agriculturist to the project site. To hasten the construction of an office and dorm for the project staff, it donated a piece of land as well as lumber and galvanized iron sheets. In support of enforcement efforts, the Council provided police officers and lent an engine for the use of the patrol boat for seven months, or until the project was able to procure its own engine in 1990. Agreements permitting mangrove cutting in communal areas, but restricting the sale of mangrove firewood to the municipality, were also adopted to facilitate smooth project operations.

After the completion of the MRCRMP, however, the Municipal Council ceased to support the *Bantay Dagat* due to financial constraints. However, it became active in passing ordinances, such as the ban on using destructive fishing gear in Candijay waters in 1994 and the declaration in 1996 of a closed season for *Sauranan Sa Danggit*, a rabbitfish area. It also established a fish sanctuary at the Islet of Tabong Dio Cogtong in 1996.

In addition, the Municipal Council promulgated many resolutions. For example, during the project phase, it requested President Corazon Aquino to cancel three FLAs and asked the authorities of the BFD and Bureau of Fisheries and Aquatic Resources (BFAR) to reject any applications for fishponds within the municipality. An urgent petition was also sent to President Aquino to “help the residents of Candijay recover a substantial means of livelihood by restoring to them the beneficial use and enjoyment of the mangrove swamp areas . . .” abandoned by FLA owners. Further, a request was made to BFAR to detail a fish inspector to Cogtong to identify and confiscate illegally caught fish. These actions resulted in the cancellation of the FLAs held by Jaime Borja, Toradio Tecson and Jose Martier. President Aquino forwarded the request on converting abandoned FLA areas to timberlands to the DENR, but no action has been taken yet. The BFAR deployed a fish inspector, which helped diminish the trading of illegally caught fish.

After the completion of the MRCRMP, the Municipal Council continued to ask for assistance in managing coastal resources. It requested the Provincial Government of Bohol to allocate a motorboat for a sea patrol and the Philippine Coast Guard to assign a naval attachment to Barangay Cogtong to fight illegal activities. No naval attachment was sent. The Provincial Governor, moreover, was unable to give a new patrol boat. Consequently, the Cogtong Barangay Council took the initiative to repair the boat purchased by the project after it was formally turned over to them by the DENR. At present, the boat is being used to patrol the coastal waters. A memorandum of agreement between the Council and the DENR allows DENR to use the boat when needed.

Outside of requests for help, the Municipal Council demonstrated support for sustaining the goals that the MRCRMP stood for. It officially commended PNP members for a job well done when apprehending illegal fishers and cutters. The Council, moreover, refused to grant the request of fishpond operators to have their lands titled.

Provincial Level. The provincial government of Bohol has not been directly involved in managing the coastal resources of Cogtong Bay. Mangrove management is not within its legal jurisdiction.

3.6 Exogenous Events

Three major events had a direct influence on the coastal resources of Cogtong. The first event was in 1965 when Dr. Lim moved to Barangay Cogtong from Iloilo and developed the first fishpond in the area. The introduction of fishponds contributed to the devastation of mangroves. The second

major exogenous event affecting the coastal resources of Cogtong was the arrival of commercial fishers in the late 1960s and of commercial mangrove cutters in the early 1970s, which ushered in destructive operations and led to a worsening resource situation. The MRCRMP was the third major exogenous event. PAGAMACO was organized and illegal activities were drastically reduced during the project phase due to vigilant enforcement efforts pursued by the project.

3.7 Incentives to Cooperate and Patterns of Interaction

Incentives to cooperate are found at various levels: 1) among resource users; 2) between government organizations (GOs) and non-government organizations (NGOs); and, 3) among resource users, GOs and NGOs. The incentives to cooperate have triggered certain interactions, both positive and negative, that have influenced project results over time. Box 3 highlights the incentives and patterns of interaction at various levels.

3.7.1 Among Resource Users

Incentives for the resource users to cooperate originate in a common reliance on coastal resources for their livelihood. Beginning in the 1970s, the residents of Barangay Cogtong began to notice that the fish populations were decreasing. A combination of fewer mangrove stands surrounding the Bay, harmful fishing practices and overfishing reduced the productivity of the Bay's fishery. The decrease in fish catch was intensified by a need to feed a growing population.

The perspectives of village residents were also changing. COMAGCO's brief existence and the 1984 ISF reforestation project had helped heighten environmental awareness. When the MRCRMP was proposed in the late 1980s, more residents were mobilized to help manage coastal resources. Local resource users welcomed participation in the project. Collective action resulted in the recognition by most local residents of the need to establish property rights over previously open access mangroves. Resource users also volunteered time and effort to help curtail illegal fishing and illegal mangrove cutting activities.

3.7.2 Among Government Organizations (GOs) and Non-Government Organizations (NGOs)

The involvement in the MRCRMP of DENR, ACIPHIL, Inc., and Network Foundation was prompted by three main factors: 1) gain experience in the design and implementation of a community-led, NGO-assisted coastal resource management project; 2) validate the learnings of the Central Visayas Regional Project (CVRP) in coastal resource management; and; 3) develop and test other new approaches to mangrove management.

Box 3. Incentives to Cooperate and Patterns of Interaction: Cogtong

Incentives to Cooperate	Patterns of Interaction
• Among Resource Users	
Common reliance on coastal resources	Illegal fishing, commercial fishing, and illegal mangrove cutting → resource deterioration and conflicts among resource users → community organizing and information campaigns → stricter rule enforcement and recognition of property rights → support for resource management
Increased environmental awareness	Information dissemination on sound environmental management → involvement in resource management projects → recognition by village residents that positive action could be taken
• Among Government Organizations (GOs) and Non-Government Organizations (NGOs).	
Desire for better coastal resource management	Issuance of national legislation in support of coastal resource management → creation by DENR of the Coastal Resource Management Committee
Concern for improving the quality of life of impoverished families who rely on coastal resources for livelihood	Design of a community-based resource management project patterned after the Central Visayas Regional Project (CVRP) → partnership between DENR and NGOs in implementing the MRCRMP
• Among Resource Users, GOs and NGOs	
Need to fight illegal fishing and illegal mangrove cutting	Joint effort to patrol the sea and land during the project phase → termination of <i>Bantay Dagat's</i> patrol operations after MRCRMP completion → return of illegal fishing and cutting → recent collaboration between a newly elected municipal councilor and the fishers' federation (UBF) to give priority to environmental concerns → passage of more fishing legislation and reactivation of sea patrol → establishment of a fish sanctuary
Legitimacy of property rights	Monitoring and enforcement of required cutting permits and mangrove stewardship contracts → alienation of firewood gatherers → informal agreement between project staff, fishers' association, Municipal Council, Village Council, and firewood gatherers to designate communal areas for firewood gathering

ACIPHIL's earlier experience with the IBRD-assisted CVRP, where it extended technical assistance to the project, provided the driving force to expand to other areas and promote/refine tested approaches. The Network Foundation, a development-oriented organization primarily concerned with poverty alleviation and environmental protection, continued the work of ACIPHIL in Cogtong Bay after September 1991. A stated goal of Network Foundation is to improve the quality of life of impoverished families who rely on communal resources for livelihood (Janiola 1996).

ACIPHIL and Network Foundation, together with the authority-wielding DENR, sought to establish legitimate property rights over the Bay's mangrove areas. The DENR issued CSCs to mangrove growers, providing a legal instrument for assuring tenurial security for mangrove areas under their stewardship.

After the project ended, the Candijay Municipal Council decreased support for coastal management activities due to a change in the mayor and to budgetary constraints. Recently, however, it renewed its involvement in coastal resource management. Immediately after the project, illegal fishing and illegal cutting were minimal. Over time, however, violators returned to Cogtong Bay and illegal fishing resumed. The Municipal Council must have realized that vigilant law enforcement is imperative.

More importantly, Marcos Dellosa Jr., a graduate of the Bohol School of Fisheries, was elected as a member of the Municipal Council in June 1992. His desire to protect Cogtong Bay's coastal resources motivated him to forge a strong political relationship with the United Barangay Federation to implement ordinances and activities on sustainable harvesting. As a consequence, the sea patrol was reorganized. The Municipal Council also pushed for the reactivation of the *Bantay Dagat* program, which is now awaiting the mayor's approval. In addition, it supported the establishment of a 20-hectare fish sanctuary in Cogtong as positive step toward managing coastal resources more sustainably. The procurement of buoys and nylon materials started in 1997. The Council has also requested the Provincial Commander of Bohol to station a naval detachment in Cogtong to assist in guarding the coastal waters.

The Municipal Council, moreover, sought the services of the Bohol Resource Management Development (BOREMADEV) Foundation in organizing the Barangay Fisheries and Aquatic Resource Management Council (BFARMC), as well as in conducting coastal resource management training in 1996. As an offshoot of these activities, the BFARMC later came up with a resolution on coastal management and protection. BOREMADEV, on its own, offered to strengthen the PAGAMACO so the latter could represent village fishers on issues that directly affect them.

3.7.3 Among Resource Users, Government Organizations (GOs) and Non-Government Organizations (NGOs)

Open access, along with traditional, non-destructive harvesting practices, worked well for the residents of Cogtong only until the late 60s. The situation changed when commercial fishers and cutters began to frequent the Bay to harvest and sell coastal products to the larger market centers of Tagbilaran and Cebu. In the 1970s, Cogtong Bay became a haven for both illegal fishers and illegal mangrove cutters due to weak law enforcement, inadequate legislation, and free-for-all entry to coastal areas. The residents witnessed the exploitation of coastal resources by large-scale commercial fishers and cutters who reaped major financial benefits, but hastened the devastation of coastal resources.

Local resource users cooperated with GOs and NGOs to establish formal property rights to mangrove areas. Without government recognition, such property rights could not be established. Moreover, illegal activities within Cogtong Bay were so rampant that external interventions were needed to assist the under-equipped and under-funded Municipal and Barangay Councils.

Despite the willingness to collaborate, there were initial obstacles to implementing the project. Notwithstanding the early enthusiasm of local resource users and moral support from the barangay and municipal levels, village residents maintained a guarded skepticism of the project and were not readily inclined to volunteer their labor. The issuance of FLAs by the DA, along with continued illegal cutting and illegal fishing in Cogtong Bay, discouraged many village residents from planting

mangroves. Either the trees would be cut down under an FLA or, if the trees survived long enough, illegally cut and sold in Cebu. Therefore, project credibility and skepticism of the government's political will hampered project action.

To address the problem of conflicting government policy, the MRCRMP staff assisted the FAs in formally requesting the DENR to stop issuing cutting permits for FLA areas and to convert all existing lands under FLA agreements to communal swamp lands, particularly those that have not been cleared or have been abandoned. The cancellation of some FLAs provided a foretaste of initial success. The DENR assured the residents around Cogtong Bay that cutting permits for FLA areas would no longer be issued. Without a cutting permit, cutting trees on FLA lands would therefore be illegal. This policy created conflicts between the FAs and DENR on one side, and the FLA holders, on the other. The conflicts sometimes escalated to the point of armed security guards threatening to use deadly force to keep trespassers off FLA lands while workers clear the land. Today, village residents still resent the construction of fishponds, but there are no physical hostilities.

By working together, PAGAMACO members, project staff and, at times, staff from government agencies were able to diminish illegal activities within Cogtong Bay. The legitimacy provided by the government, alongside enforcement efforts by project staff and project cooperators, contributed to the prevention of more environmental damage during the MRCRMP phase.

To deal with the problems of illegal activities, MRCRMP personnel and PAGAMACO members actively participated in monitoring illegal activities. The dedication and firm resolve of the MRCRMP staff in stopping fishpond construction, illegal fishing, and illegal cutting eased the members' doubts about the government's commitment to the project.

Not all resource users, however, were happy with the project. When the MRCRMP began, *de facto* rules on who could cut the mangroves changed. Those who cut mangrove trees without any cutting permit from the DENR were now apprehended. The firewood gatherers complained that their livelihood had been taken away. In 1991, PAGAMACO, MRCRMP, the Municipal Council, Village Council and firewood gatherers agreed to leave some mangrove areas as open access. The firewood gatherers could harvest wood from these areas, but they were required to plant a tree for every tree cut in the communal area. Further, the wood that was cut could not be sold outside of Candijay. The compromise was suitable to all parties and has had fairly good operational success to date.

3.8 Outcomes/Performance Indicators of Co-Management

Ideally, baseline data should be compared with current data to measure changes over time. However, baseline studies on physical, biological and social aspects of Cogtong are not available. A comparison of sites with and without project intervention may also be adopted, but the difficulty of finding a similar site with no project intervention precluded this option. In light of these constraints, the perceptions of project participants and non-participants may be the best alternative in measuring the performance of co-management over time. In a previous evaluation of community-based coastal resource management sites in the Philippines, it was shown that the perceptions of perceived changes over time are useful in the absence of solid baseline data (Pomeroy, Pollnac, Predo and Katon 1996). The technique involved a visual, self-anchoring, ladder-like scale which allowed for making ordinal judgments, placed little demand on informant memory, and could be rapidly administered. The respondents were shown a ladder-like diagram with 10 steps, where 10 represented the best possible scenario and 1 the worst possible scenario in terms of the perceived changes in the indicators (Annex 1). The respondents were asked to indicate the appropriate step on the ladder which corresponds to their perceptions of changes in various time periods: before the project (e.g., 1988), today, and five years from now. Box 4 summarizes the performance indicators.

Box 4. Performance Indicators of Co-Management

<p style="text-align: center;">Equity</p> <ul style="list-style-type: none"> ❑ Participation in community affairs <ol style="list-style-type: none"> 1. Community affairs in general (PARTICIPATION IN GENERAL) 2. Coastal resource management (PARTICIPATION-CRM) ❑ Influence over community affairs <ol style="list-style-type: none"> 1. Community affairs in general (INFLUENCE IN GENERAL) 2. Coastal resource management (INFLUENCE-CRM) ❑ Control over mangrove resources (CONTROL) ❑ Fair allocation of mangrove harvesting rights (ALLOCATION-HARVEST) ❑ Satisfaction with mangrove management (SATISFACTION-MANGROVE MGT) ❑ Benefits from the mangrove area (BENEFITS-MANGROVE AREA) ❑ Overall well-being of the household (HOUSEHOLD WELL-BEING) ❑ Household income (INCOME) 	<p style="text-align: center;">Sustainability</p> <ul style="list-style-type: none"> ❑ Overall well-being of coastal resources (COASTAL RESOURCE WELL-BEING) ❑ Community compliance with rules <ol style="list-style-type: none"> 1. Mangrove rules (COMPLIANCE – MANGROVE) 2. Fishery rules (COMPLIANCE – FISHERY) ❑ Knowledge of mangroves (KNOWLEDGE - MANGROVES) ❑ Exchange of information <ol style="list-style-type: none"> 1. Mangroves (INFO EXCHANGE - MANGROVE) 2. Fishery (INFO EXCHANGE – FISHERIES) <p style="text-align: center;">Efficiency</p> <ul style="list-style-type: none"> ❑ Collective decision-making on rules governing the use of mangrove resources (COLLECTIVE DECISION-MAKING) ❑ Quickness of resolving community conflicts on mangrove issues (CONFLICT RESOLUTION)
--	--

Analysis and Discussion. The first step in the analysis involved the calculation of mean differences between *today* (T_2) and *before the project* (T_1) for each indicator. A paired comparison t-test was used to determine if the mean differences between these two time periods are statistically significant. For the overall sample, Table 13 shows a statistically significant increase in perceived levels of **all** performance indicators ($p < 0.01$), except overall well-being of coastal resources and

household income. Weak law enforcement efforts must have affected the perceived gains in the well-being of coastal resources due to the resumption of illegal mangrove cutting and illegal fishing after project completion. Increases in the income of fishing households, moreover, have not been statistically significant. Larger positive changes, by contrast, were perceived in knowledge of mangrove, participation in coastal resource management, and information exchange on both mangrove and fisheries management. These represent areas where the project had direct intervention.

Table 13. Perceived pre-project to post-project changes in performance indicators for all respondents: before the project and now, Cogtong

Indicator	All			
	Today (T ₂)	Before (T ₁)	T ₂ -T ₁	P
Equity				
a. Participation in general	5.26	3.39	1.87	<0.01
Participation – CRM	5.43	3.30	2.13	<0.01
b. Influence in general	5.37	3.46	1.91	<0.01
Influence-CRM	5.33	3.54	1.80	<0.01
c. Control – mangrove	4.74	3.00	1.74	<0.01
d. Allocation-harvest	5.56	4.15	1.41	<0.01
e. Satisfaction-mangrove management	5.59	3.74	1.85	<0.01
f. Benefits-mangrove area	5.50	4.33	1.17	<0.01
g. Household well-being	4.67	3.93	0.74	<0.01
h. Household income	4.56	4.13	0.43	>0.05
Efficiency				
a. Collective decision-making	5.39	3.70	1.69	<0.01
b. Conflict resolution	5.30	3.39	1.91	<0.01
Sustainability				
a. Coastal resource well-being	4.56	4.43	0.13	>0.05
b. Compliance - mangrove rules	5.02	3.35	1.67	<0.01
Compliance - fishery rules	5.43	3.48	1.94	<0.01
c. Knowledge-mangrove	5.57	3.35	2.22	<0.01
d. Information exchange-mangrove	5.37	3.28	2.09	<0.01
Information exchange-fisheries	5.56	3.48	2.07	<0.01

A paired comparison t-test was also done to determine if the mean differences between perceptions *today* and *five years from now (future)* are statistically significant for each indicator. The results show that all respondents perceived positive and statistically significant changes in **all** performance indicators ($p < 0.01$), indicating optimism on future co-management indicators in terms of equity, efficiency, and sustainability. Relatively larger positive changes were perceived in overall well-being of the household, benefits from the mangrove area, and control over fishery resources.

Table 14 shows the perceived *pre-project changes* to post-project changes (*today*) in the performance indicators based on membership in the village-based fishers *association*. *Members* perceived positive and statistically significant changes in the indicators, except in the overall well-being of coastal resources and household income. For non-members, the perceived levels of four indicators are positive, but not statistically significant: benefits from the mangrove area, overall household well-being, household income, and overall well-being of coastal resources. The findings imply that more efforts are required to bring about perceived improvements in material and ecological gains.

Table 14. Perceived pre-project to post-project changes in performance indicators for members and non-members: before the project and now, Cogtong

Performance Indicator	Member				Non-Member			
	Today (T ₂)	Before (T ₁)	T ₂ -T ₁	P	Today (T ₂)	Before (T ₁)	T ₂ -T ₁	P
Equity								
a. Participation in general	5.74	3.41	2.33	<0.01	4.78	3.37	1.41	<0.01
Participation – CRM	5.81	3.22	2.59	<0.01	5.04	3.37	1.67	<0.01
b. Influence in general	5.70	3.59	2.11	<0.01	5.04	3.33	1.70	<0.01
Influence – CRM	5.85	3.81	2.04	<0.01	4.81	3.26	1.56	<0.01
c. Control – mangroves	5.11	3.30	1.81	<0.01	4.37	2.70	1.67	<0.01
d. Allocation – harvest	5.85	4.11	1.74	<0.01	5.26	4.19	1.07	<0.01
e. Satisfaction – mangrove mgt	5.85	3.81	2.04	<0.01	5.33	3.67	1.67	<0.01
f. Benefits – mangrove area	5.96	4.26	1.70	<0.01	5.04	4.41	0.63	>0.05
g. Household well-being	4.89	3.85	1.04	<0.01	4.44	4.00	0.44	>0.05
h. Household income	4.48	4.07	0.41	>0.05	4.63	4.19	0.44	>0.05
Efficiency								
a. Collective decision-making	5.56	3.67	1.89	<0.01	5.22	3.74	1.48	<0.01
b. Conflict resolution	5.59	3.48	2.11	<0.01	5.00	3.30	1.70	<0.01
Sustainability								
a. Coastal resource well-being	4.70	4.37	0.33	>0.05	4.41	4.48	0.07	>0.05
b. Compliance – mangrove	5.00	3.37	1.63	<0.01	5.04	3.33	1.70	<0.01
Compliance – fishery	5.67	3.52	2.15	<0.01	5.19	3.44	1.74	<0.01
c. Knowledge – mangrove	5.93	3.44	2.48	<0.01	5.22	3.26	1.96	<0.01
d. Info exchange – mangrove	5.63	3.30	2.33	<0.01	5.11	3.26	1.85	<0.01
Info exchange – fisheries	5.74	3.56	2.19	<0.01	5.37	3.41	1.96	<0.01

For the perceptions *today* and *five years from now*, members perceived positive and statistically significant changes in all performance indicators of co-management ($p < 0.01$). Non-members, likewise, appeared optimistic on all indicators, except influence over community affairs ($p > 0.05$).

The second step in the analysis was to determine if the members of the fishers *association* differed from non-members. This was accomplished by subtracting the pre-project perception from the today perception for each indicator ($T_2 - T_1$) and calculating a two-sample t-test for the difference of mean values between the member and non-member samples. As indicated by Table 15, the only statistically significant difference between members and non-members lies in the perceived participation in community affairs ($p < 0.05$). Members tended to perceive greater participation in community affairs, which could be partly linked to deliberate project efforts to involve them in collective concerns.

Moreover, the *today* perception was compared with the perception *five years from now* for each indicator using a two-sample t-test (e.g., members versus non-members). Positive changes were perceived in all indicators. However, there is no statistically significant difference between members and non-members, except in the perceived quickness of resolving community conflicts ($p < 0.05$). Members tended to perceive higher gains in conflict resolution.

Table 15. Differences between members and non-members with respect to perceived pre-project to post-project changes: before the project and now, Cogtong

Indicator	Members T ₂ -T ₁	Non-Member T ₂ -T ₁	T-Value	Probability
Equity				
a. Participation in general	2.33	1.41	2.24	<0.05
Participation – CRM	2.59	1.67	1.76	>0.10
b. Influence in general	2.11	1.70	1.04	>0.10
Influence – CRM	2.04	1.56	1.28	>0.10
c. Control – mangroves	1.81	1.67	0.35	>0.10
d. Allocation- harvest	1.74	1.07	1.12	>0.10
e. Satisfaction – mangrove mgt	2.04	1.67	0.62	>0.10
f. Benefits – mangrove area	1.70	0.63	1.51	>0.10
g. Household well-being	1.04	0.44	1.15	>0.10
f. Household income	0.41	0.44	-0.08	>0.10
Efficiency				
a. Collective decision-making	1.89	1.48	0.90	>0.10
b. Conflict resolution	2.11	1.70	0.97	>0.10
Sustainability				
a. Coastal resource well-being	0.33	0.07	0.65	>0.10
b. Compliance – mangrove rules	1.63	1.70	-0.24	>0.10
Compliance – fishery rules	2.15	1.74	0.87	>0.10
c. Knowledge – mangrove	2.48	1.96	1.35	>0.10
d. Info exchange – mangrove	2.33	1.85	1.41	>0.10
Info exchange – fisheries	2.19	1.96	0.59	>0.10

The third step in the analysis was to examine the relationships between perceived changes in the performance indicators and independent variables. Since people's behavior toward the project is based on their perceptions, it is important to determine the correlates of variability in perceptions to deepen one's understanding of the factors which ultimately influence the behavior associated with co-management. The independent variables are selected from the contextual variables (Sections 3.1 to 3.4 of this case study). These variables can be further categorized into basic social variables, project-related variables, attitudinal variables, occupational variables, economic variables, and resource-related variables.

The basic social variables are age, level of education, household size, and length of residence in the village. Project-related variables include the respondent's knowledge of project objectives, attendance at meetings, influence on project planning, and membership in the village-based fishers' association. Attitudinal variables refer to the views on collective action (i.e., the community can work together and the fishers can work together to solve given problems), responsibility sharing for resource management between the government and fishers, and to the views on rule-breaking and rule revision. Occupational variables include the number of fishing gear used by respondents, existence of a secondary occupation, job satisfaction (i.e., choose fishing if one were to live one's life over and change occupation now), and mangrove dependence. Economic variables include the receipt of external remittances and dependence on fishing for household income). The resource-related variables refer to the respondent's evaluation of the condition of fishery resources 15 years ago, condition of mangrove resources 15 years ago, and the level of ecological knowledge.

Simple correlation on Table 16 indicates that the length of formal education is positively related to perceptions of larger increases in six indicators: influence over community affairs, influence over CRM, participation in community affairs in general, participation in coastal resource management (CRM), control over mangrove resources, and information exchange on fisheries. More educated

respondents are likely to perceive statistically significant changes in these indicators, which basically call for human interaction and an understanding of issues on community affairs and fisheries management. In particular, influence over community affairs and influence over coastal resource management are striking ($p < 0.01$). In a village where a low educational attainment is predominant, more educated individuals tend to be more articulate, analytical, and assertive, enabling them to fit easily into the role of opinion-makers in their community.

Table 16. Correlation between performance indicators and social variables

Performance Indicators	Age	Years of Education	Household Size	Years of Residence
Participation in general	-0.158	0.292*	0.049	0.022
Participation – CRM	-0.115	0.330*	0.038	0.140
Influence in general	-0.097	0.374**	0.096	0.085
Influence – CRM	-0.151	0.473**	0.100	-0.052
Control – mangroves	-0.066	0.271*	0.206	0.002
Access – harvest	0.014	0.100	-0.029	0.133
Satisfaction – mangrove mgt	-0.086	0.048	0.067	0.159
Benefits - mangrove area	0.050	0.027	-0.052	0.088
Household well-being	-0.117	-0.070	-0.230	0.214
Household income	-0.059	-0.160	-0.176	0.185
Collective decision-making	0.037	0.080	0.092	0.141
Conflict resolution	-0.028	0.178	0.057	0.183
Coastal resource well-being	0.087	-0.213	-0.062	0.129
Compliance – mangrove rules	-0.030	0.132	0.013	0.149
Compliance – fishery rules	-0.039	0.225	0.155	0.208
Knowledge – mangrove	0.007	0.259	0.045	0.241
Info exchange – mangrove	-0.026	0.293	0.055	0.142
Info exchange – fisheries	-0.198	0.266*	0.133	0.132

** $p < 0.01$; * $p < 0.05$

For project-related variables, the knowledge of project objectives is positively correlated with perceptions of three performance indicators: participation in CRM, household well-being, household income, and overall well-being of coastal resources (Table 17). These variables are logically linked to one another. When a good grasp of project objectives is translated into actual participation in coastal resource management, associated improvements in the resource base are likely to be perceived, along with perceived increases in household income.

Attendance at project meetings is positively correlated with perceived changes in participation in community affairs in general, influence over coastal resource management, well-being of coastal resources, and knowledge of mangroves. Influence on planning is associated with perceptions of positive and statistically significant changes in the overall well-being of coastal resources. Participatory planning on resource management measures must have reinforced perceptions of the overall well-being of coastal resources due to the conscious effort to take action on resource-related problems in the Bay and avert further resource deterioration. Membership in the fishers' association, however, is associated with smaller increases in perceived participation in general community affairs, most likely due to the long hours that they devote to fishing (3-10 hours).

Table 17. Correlation between performance indicators and project variables

Indicator	Attend Meetings	Influence on Planning	Member	Objectives Known (#)
Participation in general	0.284*	0.209	-0.296*	0.146
Participation – CRM	0.249	-0.114	-0.237	0.286*
Influence in general	0.102	0.018	-0.142	0.049
Influence – CRM	0.523*	-0.066	-0.175	-0.055
Control – mangroves	-0.154	-0.009	-0.048	0.042
Allocation – harvest	0.166	0.157	-0.154	-0.021
Satisfaction–mangrove mgt	0.141	0.194	-0.086	-0.009
Benefits – mangrove area	0.072	0.105	-0.205	0.228
Household well-being	0.226	0.181	-0.158	0.261
Household income	0.106	0.227	0.010	0.279*
Collective decision-making	0.047	0.064	0.124	0.065
Conflict resolution	0.121	0.094	-0.133	0.067
Coastal resource well-being	0.249*	0.507*	-0.090	0.276*
Compliance – mangrove	0.082	0.036	0.034	-0.099
Compliance – fishery	0.184	0.116	-0.120	-0.014
Knowledge – mangrove	0.324*	0.139	-0.184	0.212
Info exchange – mangrove	0.100	0.073	-0.192	-0.100
Info exchange – fisheries	0.188	0.048	-0.082	-0.138

* p<.05

Table 18 presents the correlation between co-management performance indicators and attitudinal variables. Those who felt that rule-breaking is unacceptable tended to perceive smaller changes in benefits from the mangrove area. They must have felt that greater benefits could have been achieved if rule violations were less rampant.

Table 18. Correlation between performance indicators and attitudinal variables

Indicators	Community can work together	Fishers can work together	Rule breaking is unacceptable	Fishers and government must have equal responsibility
Participation in general	0.076	-0.180	-0.033	-0.130
Participation – CRM	0.150	-0.158	-0.034	-0.091
Influence in general	0.087	-0.105	-0.073	-0.009
Influence – CRM	0.079	0.204	-0.047	0.127
Control – mangroves	0.156	0.171	-0.171	0.010
Allocation – harvest	0.153	0.175	-0.030	0.053
Satisfaction –mangrove mgt	0.054	0.222	-0.049	-0.002
Benefits – mangrove area	0.114	0.068	-0.300*	-0.059
Household well-being	0.127	0.045	-0.056	0.076
Household income	0.109	0.051	-0.117	0.046
Collective decision-making	0.225	0.219	-0.136	0.170
Conflict resolution	0.261	0.210	-0.197	0.047
Coastal resource well-being	0.069	-0.032	-0.081	-0.040
Compliance – mangrove	0.083	0.160	0.000	-0.026
Compliance – fishery	0.077	0.197	-0.093	0.105
Knowledge – mangrove	0.119	0.139	0.167	0.093
Info exchange – mangrove	0.120	0.215	0.115	-0.024
Info exchange – fisheries	0.109	0.193	0.067	-0.123

* p < 0.05

Table 19 shows a statistically significant and positive correlation between the number of fishing gear used and participation in coastal resource management. Those who used more gear must have

perceived a greater stake in coastal resource management. Table 20 shows that dependence on fishing (i.e., at least half of household income comes from fishing) is positively associated with perceived changes in the fair allocation of mangrove harvesting rights.

Table 19. Correlation between performance indicators and occupational variables

Performance Indicator	# of Gear	Secondary occupation	Choose fishing	Change occupation	Mangrove income (%)
Participation in general	0.022	0.021	-0.022	0.036	0.142
Participation-CRM	0.309*	0.212	-0.026	0.015	0.087
Influence in general	0.092	0.125	0.080	0.176	0.013
Influence-CRM	-0.038	0.111	0.066	-0.115	-0.042
Control – mangroves	0.115	0.068	0.176	-0.039	-0.031
Allocation – harvest	-0.001	0.065	-0.123	0.094	-0.037
Satisfaction-mangrove	0.018	0.042	0.018	0.122	0.013
Benefits-mangrove area	0.024	0.029	0.038	-0.229	0.062
Household well-being	0.093	-0.104	-0.194	-0.055	-0.025
Household income	0.115	-0.099	0.046	-0.132	0.063
Collective decision-making	0.083	0.124	-0.088	-0.187	0.038
Conflict resolution	0.051	0.141	-0.063	-0.232	-0.052
Coastal resource well-being	0.154	-0.031	-0.078	-0.255	0.075
Compliance-mangrove	-0.016	0.067	-0.140	0.105	0.059
Compliance-fishery	-0.086	0.015	-0.069	-0.146	0.006
Knowledge-mangrove	-0.080	0.009	0.003	-0.157	0.039
Info exchange-mangrove	-0.147	-0.053	0.010	-0.097	-0.093
Info exchange – fisheries	-0.171	0.049	0.094	-0.033	-0.083

Table 20. Correlation between performance indicators and economic variables

Performance Indicator	Fishing income (%)	Outside remittances
Participation in general	0.180	-0.031
Participation – CRM	-0.144	-0.029
Influence in general	0.091	0.075
Influence – CRM	0.063	-0.032
Control – mangroves	0.079	-0.002
Allocation – harvest	0.276*	-0.013
Satisfaction – mangrove mgt	0.076	-0.093
Benefits – mangrove	-0.102	-0.195
Household well-being	-0.112	-0.125
Household income	-0.062	-0.110
Collective decision-making	-0.040	0.047
Conflict resolution	0.013	-0.006
Coastal resource well-being	-0.027	-0.059
Compliance – mangrove	0.083	-0.023
Compliance – fishery	0.215	-0.067
Knowledge – mangrove	-0.017	-0.116
Info exchange – mangrove	0.073	-0.069
Info exchange – fisheries	-0.101	-0.154

* p < 0.05

Table 20 shows the correlation between performance indicators and resource-related variables: perceived pre-project condition of fishery resources, perceived pre-project mangrove resource condition, and ecological knowledge. Those who felt that fishery conditions were bad 15 years ago tended to perceive larger increases in benefits from the mangrove area, household income, overall well-being of coastal resources, and compliance with fishery rules.

Table 21. Correlation between performance indicators and resource-related variables, Cogtong

Performance Indicator	Perceived pre-project resource condition: fishery	Perceived pre-project resource condition: mangrove	Level of ecological knowledge
Participation in general	-0.064	-0.117	-0.100
Participation – CRM	-0.015	0.208	-0.176
Influence in general	-0.085	-0.046	-0.266
Influence – CRM	0.204	0.132	-0.410**
Control – mangrove	0.011	0.176	0.013
Allocation – harvest	0.114	0.056	-0.137
Satisfaction – mangrove mgt	-0.062	0.113	-0.114
Benefits – mangrove	0.312*	0.313*	-0.053
Household well-being	0.262	0.124	0.175
Household income	0.398**	0.245	0.217
Collective decision-making	-0.161	0.149	-0.124
Conflict resolution	-0.232	0.225	-0.326*
Coastal resource well-being	0.504**	0.344*	0.038
Compliance – mangrove	0.052	0.169	-0.179
Compliance – fishery	0.325*	0.073	-0.356**
Knowledge – mangrove	0.188	0.229	-0.362**
Info exchange – mangrove	-0.073	0.023	-0.285*
Info exchange – fisheries	0.097	0.198	-0.382**
p < .05			

Likewise, perceptions of bad mangrove conditions 15 years ago are associated with perceived improvements in benefits from the mangrove area and in the overall well-being of coastal resources. These relationships are substantiated by fishers' observations after the rehabilitation of mangroves, such as thicker mangrove stands, improved fish habitats, improved fish catch, and a decline in fishpond development.

Those who had higher levels of ecological knowledge, however, perceived smaller changes in influence over coastal resource management, conflict resolution, knowledge of mangroves, compliance with fishery rules, and information exchange on both fisheries and mangrove management. (Ecological knowledge was based on the number of characteristics of the sea and coast that help the fish to grow and be healthy that the respondent could give). Respondents with greater ecological knowledge appear to be more critical of changes in these indicators, which explains the negative correlation coefficient. Most likely, certain expectations related to these indicators were not fully met.

As the fourth step in the analysis, the co-management performance indicators were subjected to a principal component analysis (with varimax rotation) to determine if relationships between the indicators were such that they could be reduced to fewer composite indicators for further analysis. Table 22 shows the results. The number of components to be retained was based on the scree-test. Within each component, indicators with factor loadings of 0.50 and above were retained for analysis.

Table 22. Principal component analysis of performance indicators: Cogtong

Performance Indicators	Component	
	One	Two
Conflict resolution	0.86	0.19
Knowledge of mangrove	0.81	-0.08
Collective decision-making	0.78	0.14
Information exchange on mangrove management	0.77	-0.23
Influence over coastal resource management	0.75	0.02
Compliance with mangrove rules	0.72	-0.21
Satisfaction with mangrove management	0.70	-0.04
Compliance with fishery rules	0.70	0.06
Information exchange on fisheries management	0.69	-0.26
Control over mangrove resources	0.66	0.04
Participation in coastal resource management	0.57	0.11
Influence over community affairs	0.55	-0.27
Fair allocation of mangrove harvesting rights	0.55	0.28
Participation in community affairs	0.53	0.02
Household income	0.02	0.86
Overall well-being of coastal resources	0.04	0.85
Household well-being	0.09	0.76
Benefits from mangrove areas	0.37	0.59
<i>Variance</i>	<i>38.4</i>	<i>15.4</i>

Performance indicators loading highest on Component 1 are those directly related to behavioral indicators, such as perceived changes in conflict resolution, knowledge of mangroves, collective decision-making, information exchange on mangrove management, influence over coastal resource management, compliance with mangrove rules, satisfaction with mangrove management, compliance with fishery rules, information exchange on fisheries management, control over mangrove resources, participation in coastal resource management, influence over community affairs, fair allocation of mangrove harvesting rights, and participation in community affairs. Indicators loading highest on Component 2 are those associated with perceived material and ecological gains: household income, overall well-being of coastal resources, household well-being, and benefits from mangrove areas.

Regression analysis using the component indicators. The fifth step in the analysis is to determine the relationships between the component indicators and the independent/contextual variables mentioned earlier (Tables 16 to 21). Independent variables significantly related ($p < 0.10$) to any of the two components were selected and used in a stepwise multiple regression analysis. The purpose was to determine the set of independent variables that explained most of the variance in each component. In this analysis, the criterion for entry into the regression equation was $\alpha < 0.10$. Partial correlations are examined at each step for indications of changes that could be the result of multicollinearity. Where there is reason to suspect multicollinearity, which can result in unstable regression coefficients, the offending variable is not used in the regression analysis (Pomeroy, Pollnac, et al. 1996). Table 23 presents the results.

Table 23. Regression analyses of performance indicators, Cogtong

Dependent Variable: Component One	Standardized Coefficient	T-value	Probability (2-Tail)
Independent Variable:			
Length of education of respondent	0.335	2.567	0.013
R = 0.335; R ² = 0.112; Adjusted R ² = 0.095 N = 54; DF = 1; F = 6.591; p = 0.013			
Dependent Variable: Component Two			
Perceived pre-project condition of fishery resources	0.389	3.487	0.001
Knowledge of project objectives	0.333	2.854	0.006
Attitude toward rules (i.e., rules on fish harvesting must be changed)	0.198	1.710	0.093
R = 0.629; R ² = 0.396; Adjusted R ² = 0.359 N = 54; DF = 3; F = 10.91; p = 0.000			
Dependent Variable: Total Perceived Performance			
Perceived pre-project condition of fishery resources	0.392	3.076	0.003
R = 0.392; R ² = 0.154; Adjusted R ² = 0.138 N = 54; DF = 1; F = 9.463; p = 0.003			

Twenty-two (22) independent variables, drawn from Tables 16 to 21, were used in the regression analysis. Out of these variables, one emerged in the regression equation for Component 1: length of education of the respondent. Respondents who have a higher educational attainment tended to perceive larger increases in Component 1, which is basically associated with behavioral indicators that require a lot of interaction, communication, and a good grasp of various situations. The regression equation is statistically significant ($p < 0.05$).

For Component 2, three variables were retained in the regression equation: perceived pre-project condition of fishery resources as bad, knowledge of project objectives, and attitude toward changing rules (i.e., rules on fish harvesting must be changed). Together, they account for 36 percent of the variance in Component 2 (adjusted R² = 0.359). The regression equation is statistically significant ($p < 0.01$). A closer look at the regression coefficients shows that all the independent variables have positive coefficients, and are therefore associated with perceptions of larger changes in the component. Component 2 consists of material and ecological gains, such as perceptions of household income, household well-being, benefits from mangrove areas, and overall well-being of coastal resources. This suggests that those who viewed the pre-project resource condition as bad, those who are knowledgeable of project objectives, and those who felt that existing rules should be changed tended to score high on Component 2. These variables are closely linked to each other. For households whose survival and livelihood are dependent on coastal resources, perceived material and ecological gains are intertwined with resource conditions. An understanding of project objectives and satisfaction with existing rules also shape perceived gains.

The next step in the analysis was to sum up the component scores for the two components to obtain an overall measure of perceived changes, or total perceived performance (TPP). The correlation of the total perceived performance with the independent variables was calculated. Variables manifesting significant correlations with the dependent variable were selected during the stepwise multiple regression analysis.

The results show that a change in the total perceived performance of co-management in Cogtong village is strongly influenced by the perception of a resource crisis prior to project implementation. This independent variable accounts for 14 percent of the variance in the component (adjusted

$R^2=0.138$). The regression equation is statistically significant ($p<0.01$). The finding suggests that those who recognize a bad resource condition before the project phase tend to perceive positive changes in the TPP.

Regression analysis without using the component indicators. As an additional analysis, independent variables (from Tables 16 to 21) were directly regressed against each performance indicator. The clusters/components generated by the principal component analysis were not used. The purpose was to identify key independent variables that are associated with perceived changes in each performance indicator.

Table 24 shows that five indicators exhibited statistically significant regression equations ($p<0.05$): participation in coastal resource management, influence over coastal resource management, control over fisheries, overall well-being of coastal resources and compliance with fishery rules. The relationships of other indicators with independent variables are not shown here since they did not turn out to be statistically significant ($p>0.05$).

Table 24. Regression results of performance indicators, Cogtong Village: without the component indicators

Dependent Variable: Participation in coastal resource management	Standardized Coefficient	T-value	Probability (2-Tail)
Independent Variables			
Length of education of the respondent	0.314	2.618	0.012
Number of fishing gear used	0.296	2.457	0.018
Membership in fishers' association	0.222	1.843	0.071
Number of known objectives	0.208	1.730	0.090
$R = 0.547$; $R^2 = 0.300$; $Adjusted R^2 = 0.243$			
$N = 54$; $F = 5.243$; $p = 0.001$			
Dependent Variable: Influence over coastal resource management			
Length of education of the respondent	0.437	3.869	0.000
Number of ecological characteristics cited	0.367	3.247	0.002
$R = 0.597$; $R^2 = 0.357$; $Adjusted R^2 = 0.331$			
$N = 54$; $F = 14.130$; $p = 0.000$			
Dependent Variable: Overall well-being of coastal resources			
Perceived fishery resource condition 15 years ago	0.479	4.167	0.000
Number of known objectives	0.308	2.658	0.011
Length of fishing experience (number of years)	0.207	1.796	0.079
$R = 0.606$; $R^2 = 0.367$; $Adjusted R^2 = 0.329$			
$N = 54$; $F = 9.673$; $p = 0.000$			
Dependent Variable: Compliance with fishery rules			
Independent Variables			
Perceived fishery resource condition 15 years ago as bad	0.365	2.2854	0.006
Length of education of the respondent	0.278	2.168	0.035
$R = 0.426$; $R^2 = 0.181$; $Adjusted R^2 = 0.149$			
$N = 54$; $F = 5.650$; $p = 0.006$			

Note: Performance indicators which did not exhibit significant regression equations ($p<0.05$) are not included in this table.

The regression results indicate that the education of the respondent is a key explanatory variable. It underlies perceived changes in three behavioral indicators, particularly participation, influence and compliance with fishery rules. More education tends to be associated with positive perceptions of changes in these behavioral indicators, implying that education is critical to efforts to mobilize village fishers for coastal resource management and to enforce rule compliance

Knowledge of objectives is a positive explanatory variable in perceived changes in participation and overall well-being of coastal resources. A good grasp of project objectives is favorable to perceived changes in these variables, highlighting the need for implementors to spend time in making the fishers understand the aims of the project. Also influencing perceived changes in participation are membership in the village fishers' association and number of fishing gear used. This finding is understandable since the project deliberately involved members in collective resource management activities. Fishers who use more diversified fishing gear, moreover, tend to have more stake in coastal resources, and are more likely to participate in activities that directly affect their livelihood.

The length of fishing experience is positively associated with perceived changes in the overall well-being of coastal resources. Long-time fishers tend to be more aware of changing resource conditions over several decades than new fishers. They would tend to be more observant of declining fish catch over time with the devastation of mangroves and the use of blast fishing. They would also likely notice an improvement in resource conditions, if interventions were introduced to encourage sound coastal resource management practices.

Perceived changes in compliance with fishery rules are partly explained by the perception of a bad resource condition 15 years ago. Awareness of a resource problem favors the observance of fishery-related rules, particularly if this goes hand in hand with measures to prevent further resource degradation.