The Marine Conservation Project for San Salvador: A Case Study of Fisheries Co-Management in the Philippines

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Abstract

San Salvador, an island village of Masinloc municipality in Zambales, Philippines, has been inhabited by approximately three generations of residents. The initial migrants, who were largely farmers from the mainland of Zambales province, did not have a clear tradition of fisheries management and an indigenous expertise on fish stock management. Until the late 1960s, San Salvador residents recalled an abundance of coastal resources and a lack of resource use conflicts, which enabled fishers to enjoy an open and unrestricted access to the fishery. The scenario began to change in the 1970s due to three events: 1) influx of Visayan migrants from the Central Philippines, who belonged to a different ethnolinguistic group with different fishing practices; 2) integration of the village economy into the international market for aquarium fish; and, 3) shift to destructive fishing operations. Together, these event s progressively devastated San Salvador's fishing grounds. They also gave rise to conflicts over fishing gear and over productive fishing spots.

In the late 1980s, the effects of fishery depletion and unabated destruction of coral reefs began to be felt. Open access to the resource, coupled with the rapid decline in fish stocks over the past decades, subjected the San Salvador fishery to further stress. The average fish catch per unit effort reportedly dwindled from 20 kilos per fishing trip in the 1960s to only about 1-3 kilos in 1988, just before the start of the Marine Conservation Project for San Salvador (MCPSS). Many reef fishes, such as groupers, snappers and damselfish, were depleted. A survey of the coral reef substrate in 1988 showed an average of 23 percent live coral cover for the whole island of San Salvador. The worsening resource situation was closely linked to unsound fishing practices, ignorance of fisherfolk on fish stock management, and the existence of unscrupulous leaders from the village, who sometimes supported destructive fishing methods for their own gain. The financial and regulatory limitations of the centralized Philippine government increasingly became apparent. Local fishers, however, felt helpless about the situation and were too fragmented to embark on any collective action to halt resource degradation. The Marine Conservation Project for San Salvador, which was implemented from 1989 to 1993 by a non-government organization, known as the Haribon Foundation, highlights how the fisher community and the local government jointly regenerated fishery resources through coral reef management The redefinition of property rights and rules in 1989, along with vigorous law enforcement activities, complemented resource management efforts. The San Salvador experience attests to how a community can rise above the obstacles associated with *de facto* open access nature of fisheries. It offers hope to many small island communities in a similar situation with an unwavering resolve to avert resource deterioration.

1.0 Introduction

Fisheries co-management refers to the sharing of responsibility and/or authority between the government and community of local fishers to manage a fishery (Pomeroy and Williams 1994). The extent of responsibility and authority, however, will differ and depend upon country- and site-specific conditions. In this light, there is a hierarchy of co-management arrangements from those in which the government merely consults the fishers before regulations are introduced, to those in which fishers design, implement and enforce laws and regulations with advice and assistance from the government (Pomeroy and Berkes 1997). Co-management may be regarded as a dynamic process over time, involving the elements of participation, conflict management, leadership, power-sharing, dialogue and knowledge. Many authors agree that the analysis of co-management falls in the area of common property theory. Essentially, co-management arrangements can be analyzed in terms of who holds what kind of property rights over a resource, or who controls the fishery.

As part of its Fisheries Co-management Research Project, ICLARM staff have identified several case study sites in the Philippines in which there is sufficient experience with fisheries co-management to begin examining performance according to three measures: sustainability, equity, and efficiency. ICLARM's research team selected San Salvador Island, Zambales Province as a case study site. This was due, in part, to: 1) the strong base of knowledge already established by the Haribon Foundation, a Philippine non-government organization, that has worked on the island since the late 1980s; and 2) the sustainability of the fisheries management interventions at the site after project completion. Other criteria included the sharing of responsibility and authority for fisheries management between the government and the village; existence of institutional and organizational arrangements (property rights and rules); establishment of a resource management technology, a marine reserve; and demonstration of tangible project outcomes. In November 1996, ICLARM and Haribon signed an agreement to conduct the case study jointly.

The San Salvador case study examines the steps leading up to the creation, practical management issues, and the impact on ecosystem health, both natural and human, of a marine reserve and sanctuary off the island's northwest coast

within the overall context of co-management. Although the study offers valuable lessons of its own, it belongs within a larger regional comparative analysis of fisheries co-management arrangements in the Philippines and Asia.

2.0 Research Framework and Methodology

Building on a framework developed by the Workshop in Political Theory and Policy Analysis at Indiana University, USA, the San Salvador case study adopted an institutional analysis approach to the study of fisheries co-management. The institutional analysis research framework is designed to examine the set of rights and rules governing the use of fishery resources and to assess the way in which these institutional arrangements affect the resource users in terms of their incentives to cooperate and their methods of resolving conflicts over resource access (Figure 1). The institutional analysis approach has three components. First, analysis involves identifying contextual variables characterizing the resource and the resource user, and then linking them with the locally relevant set of rights and rules (institutional arrangements) covering resource access and use. The intent is to determine the incentives and disincentives influencing how resource users cooperate in resource management. Second, the outcomes or patterns of interaction resulting from co-management efforts are measured according to performance criteria ~ in this case sustainability, efficiency, and equity - toward assessing the management strategy's impact on the well-being of both human and non-human elements of the coastal ecosystem. Finally, the analysis concludes with a description of the conditions and factors deemed necessary to establish fair, lasting, and resilient resource management institutions.[1]

Data Collection and Sampling. The data collection process has several steps. A historical perspective allows the analysis to take into account baseline data on contextual variables and compare them to changes over time. The case study pulls together information from a random sample of 42 fishing households in the village, from key informant interviews with village leaders and members of the fishers' association, from published articles, and from individuals or organizations that have worked at the site. The sample size of 42 was based on power analysis described by Cohen

[1] See ICLARM/NSC, "Analysis of Fisheries Co-Management Arrangements: A Research Framework," Working Paper No. 1, September 1996.

(1988), and included two sample groups of 21 each: members of the fishers' association and non-members. The sample was separated so as to compare differences in members and non-members. Power analysis concerns the probability of detecting a statistically significant relationship in a sample when in fact there is a notable difference in the population. To increase the probability that the research design can find a statistically significant difference, if one exists, the concept of "power" is used to determine sample size. With the sample size of 21 in each of two groups, the power of the statistical design - or probability that any given sample would have statistically significant differences ~ is 0.88 using a two-tailed test. Applying a one-tailed statistical test increases the power to 0.94.

The sample of respondents for the survey included only households directly involved in fishing, either as a primary activity or a supplementary source of livelihood. Respondents were further classified into members or non-members of project beneficiary associations. From these groups, random selection was used to arrive at the final sample of respondents. The research team, moreover, conducted key informant interviews to probe into the project experience and to investigate organizational and institutional arrangements before, during, and after project implementation.

Data Analysis. Descriptive and inferential statistics, both univariate and multivariate, were used to summarize and analyze primary data. The descriptive analysis was meant to provide a distribution of respondents across contextual variables. For hypothesis testing and quantitative analysis, several inferential statistical tools were employed in the study: chi-square, t-test, principal component analysis, correlation analysis, and stepwise multiple regression.

3.0 Contextual Variables

Contextual variables shape collective action situations and incentive structures over time. These variables refer to the key attributes of the resource, resource user and fisheries management arrangements, namely: 1) physical, technical and biological attributes; 2) fisher, stakeholder and community 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 Physical, Technical and Biological Attributes of San Salvador

San Salvador is an island village which forms part of the municipality of Masinloc in Zambales (Figure 2). It is located 250 kms north of Metro Manila. San Salvador is about 2 kms west of Masinloc town proper, requiring a 30-minute motorboat ride to the island facing the South China Sea. White-sand beaches surround the 380-hectare island of San Salvador except for the east coast, which has denuded forests and mud flats. Off the northern, western and southern coasts are wide reef flats dominated by sea grass beds and various algae species (Christie, White and Buhat 1993). The predominant land uses in the village include areas devoted to rice farming (60%), mango growing (10%), and secondary growth forest (30%). Forest denudation has occurred in some hilly portions due to the dependence of village residents on trees for fuelwood and housing construction needs. This led to erosion and siltation before the 1990s but did not adversely affect the coastal waters. Mangrove reforestation efforts were undertaken in 1990 but most of the 8,000 seedlings were destroyed due to lahar from Mt. Pinatubo.

Historically, the waters of San Salvador have been marked by open access to fishers (Box 1). No traditional or customary boundaries existed. Assignment problems associated with productive fishing spots were virtually absent due to the abundance of fishery resources until the late 1960s. Conflicts over fishing grounds emerged only in the 1970s when some fishers informally designated their choice fishing spots with buoys. This practice, however, was banned upon the intervention of the village council.

Political boundaries for Philippine waters may be classified as municipal and national. Municipal waters extend up to 15 kms from the shoreline of the outermost inhabited island. Thus, the Masinloc municipal government exercises jurisdiction over the waters of San Salvador. The *barangay* (village) has no formally defined waters of its own. Beyond the municipal waters, the national government exercises its authority through the Bureau of Fisheries and Aquatic Resources (BFAR).

To avert marine resource depletion, Municipal Ordinance No. 30 dated 19 July 1989 declared a marine sanctuary in San Salvador where it is "unlawful for fishers to catch fish in any form or to gather seaweeds, sand, rocks, coral or anything within the habitat for breeding and culture of marine resources. Only culturing and catching of marine resources for scientific research/study shall be allowed." The same ordinance, which set in place legal boundaries, designated a marine reserve around the island where non-destructive fishing methods are allowed. As a whole, the area of the marine reserve and sanctuary is 127 hectares.

Box 1. Physical, technical and biological attributes of San Salvador

Indicator	Physical, technical and biological attributes
Boundaries	• Open access fishery; difficulty in limiting physical access from the 1970s to the late 1980s • No assignment of fishing spots • Defined physical, legal, political, and technical boundaries from 1989 onwards
Single or multiple gear fishery	• Multiple gear: nets (gillnet, netsman, and municipal bagnet); speargun; hook and line (single, multiple hook, and handline); compressor (hookah diving) • Existence of gear conflicts in the 1970s and 1980s, particularly on destructive fishing gear (e.g., blast fishing, cyanide fishing, and *kunay* or beach seine)
Artisanal or industrial fishery	• Artisanal • Fishing vessels of less than 3 gross tons
Level and mix of technology	• Mix of technology: traditional/non-destructive and destructive technologies • Minimal fish processing at the village level
Dispersed or localised fishing patterns	• Year-round fishing, particularly for fishing operations involving nets, speargun, and hook and line (multiple hook); seasonal fishing for handline, single hook and line, and compressor • Dispersed fishing grounds: around the island and nearby islands (for food fish) and in other provinces (for aquarium fish and tuna)
Multi-species or single species fishery	• Multi-species (parrotfish, mackerel, scad, trevally, mullet, anchovy,tuna, crevalle, rabbitfish, surgeonfish, grouper, snapper, lobster, octopus, damselfish, butterfly fish, angelfish, etc.)
Migratory or sedentary fishery resources	• Both sedentary and migratory species
Level of stock exploitation	• Falling fish catch over time from 20 kilos per fishing trip in the 1960s to barely 3 kilos per fishing trip in the late 1980s; decreasing catch per unit effort until the late 1980s; depletion of siganids, groupers, snappers, lobsters and spotted eagle rays in the late 1980s • Increased fish density in 1991 by at least 35%; re-appearance of lobsters, eaglerays, groupers, sharks, and marine life after the establishment of the marine sanctuary

Indicator	Physical, technical and biological attributes
Status of habitat	• Low coral cover (23% live coral cover) • Relatively clean coastal waters now

Masinloc Bay, together with Oyon Bay, was declared as a protected seascape under Presidential Proclamation No. 231 dated 18 August 1993. The rationale is to protect and conserve the ecological, scenic, scientific and educational features of the area. Technical boundaries now exist with the division of Masinloc Bay into seven management zones: 1) strict protection; 2) restoration; 3) multiple use; 4) sustainable use; 5) recreational zone; 6) special zone; and 7) research and development zones. The marine sanctuary of San Salvador falls under the strict protection zone, where harvesting of marine resources is prohibited within defined boundaries to assure continued resource regeneration.

The San Salvador fishery may be described as multi-species, multi-gear and artisanal. The types of fishing gear used year-round include nets (gillnets, netsman[2] and municipal bagnet), speargun, and *kitang* (multiple hook and line). Seasonal gear types include single hook and line (*kawil),* handline *(bondying),* and compressor (hookah diving), which are generally used from 4 to 7 months only. Fishery resources comprise a mix of migratory and sedentary species. Fishing is generally a year-round activity and is normally done in dispersed fishing grounds, both around and outside San Salvador island. Two specific fisheries exist in San Salvador. One is for edible food fish and the other is for aquarium fish. Fishing grounds for edible/food fish differ from those of aquarium fish. In general, most fishers catch food fish around San Salvador or nearby islands. Only a handful of fishers go outside the Masinloc Bay area. The majority of aquarium fishers, on the other hand, visit fishing grounds outside San Salvador, particularly nearby islands and Pangasinan.

Fishers' accounts indicate **a** general improvement in the resource situation, particularly for reef fish. Gemino Edora,

[2] Netsman refers to the net used by aquarium fish collectors as an alternative to sodium cyanide. The net is used to encircle coral heads in order to prevent the fish from escaping. Once the fish is encircled, the collector scoops the fish out.

a 38-year old fisher recalls vividly, *"In the 1960s, we could catch 20 kilos offish a day. However, just before the marine sanctuary was established in 1989, we could barely catch a kilo of fish."* He attributes the downtrend to the destruction of marine habitats in the 1970s and 1980s brought about by illegal and destructive fishing activities. Gemino adds, *"Now, our catch has improved to about 5-10 kilos of reef fish per fishing trip. We have a sanctuary where the fish are able to breed undisturbed."* Tio Kikoy, a fisher and an officer of the fishers' association, also noted that before the sanctuary was established, they could catch less than a kilo of siganid from midnight to early morning. *"Today, we can catch a kilo in just one hour,"* he says. *"We have also observed that lobsters and groupers now abound in the sanctuary and nearby fishing grounds."*

A baseline survey of fish population in 1989 affirmed the low population of fish in San Salvador, which had a mean count of 322 fish per 500 sq. meters. By 1991, the mean count had improved to 436 fish per 500 sq. meters, representing a 35 percent increase in fish density (Christie and White 1994). The recuperation of the San Salvador reef, nonetheless, may be regarded as relatively slow, due largely to the heavy damage incurred in the past. Actual surveys from 1988 to 1990 of reef catch and non-reef catch (Table 1) confirmed that reef catch almost doubled (99%), but non-reef catch grew more slowly at 55 percent (Christie and White 1994). Based on a more recent assessment in 1994, increased species diversity and amount of reef fish are present in San Salvador (Rath 1995).

Table 1. Summary of reef yield and non-reef catch for San Salvador, April 1988-March 1990

	April 1988-March 1989	April 1989-March 1990
Reef catch (kg)	23,877 (n=129)	47,457 (n= 126)
Non-reef catch (kg)	10,608 (n= 60)	16,413 (n= 44)
Total catch (kg)	34,485	63,870
Reef yield ($t\text{-}km^{-2}year^{1}$)*	7.0	14.0

** 3.4 km^2 reef area to 40-m isobath*

Source of data: Christie and White (1994). *Reef Fish Yield and Reef Condition for San Salvador.*

The aquarium fishers shifted from San Salvador waters to other fishing grounds approximately 15 miles away in the late 1980s due to depletion of aquarium fish and the ban on aquarium fish collection in the marine reserve since 1989.

The use of chemicals, such as sodium cyanide, was the preferred method of collecting aquarium fish. In 1990, Haribon introduced nets as an alternative technology. This technology has been widely accepted by fishers.

The results of the household survey revealed that respondents perceived a decline in the overall fishery resources today versus 15 years ago. Despite perceptions of overall decline in fishery resources, the fishers reported that they have observed improvements in the coral reef fishing, but not in pelagic fishery. Improvement in the reef fishery is a direct result of the marine reserve and sanctuary.

Perceived Importance of the Marine Sanctuary. Based on the survey of fishing households in San Salvador, all respondents expressed that the marine sanctuary is essential to fisheries management. A consensus on this matter is striking, both among members and non-members of the fishers' association, known as the *Samahang Pangkaunlaran ng San Salvador* (SPSS). Multiple responses on fishers' observations since the establishment of the sanctuary included an increase in fish stocks/fish catch (53%), protection of coastal resources through a designated breeding ground for fish (18%), decline in illegal fishing (10%), improved condition of the coastal waters (7%), re-appearance of certain types offish (7%), and arrival of more visitors in the village (3%). A minority (3%) indicated a negative observation, specifically on the emergence of conflicts over fishing gear and restricted fishing areas immediately after the passage of the sanctuary ordinance.

3.2 Attributes of the Fisher Community, Fishers, and Fisher Households

The village of San Salvador has been inhabited by approximately three generations of residents (Christie et al. 1994). At first, the population was relatively homogeneous, consisting primarily of farmers from the Luzon mainland who did not have their own tradition of fisheries management. The dependence of the village on marine resources was consumption-driven. The onset of the 1970s, however, altered the socioeconomic landscape with the influx of *Visayan* migrants from the Central Philippines, who belonged to a different cultural group with different fishing practices, and with the integration of the village into the international market for aquarium fish.

At the start of the MCPSS in early 1989, some 1,500 people comprising 255 families resided in San Salvador. Approximately 60 percent of the households were engaged in fishing and 36 percent in farming (Buhat 1994). Monthly incomes ranged from US $44 to $66. The latest census data (1995) indicate that the population of San Salvador has grown to 1,620 persons, up by 8 percent since 1989. Males comprise 51 percent and females 49 percent.

Overall, the village of San Salvador may be regarded as relatively heterogeneous in terms of ethnicity, occupation, and religion. In 1992, the *Sambals* (native resident group) comprised 50 percent of the population, the *Ilocanos* and *Pangasinenses* about 20 percent, and the *Visayans*, 30 percent (Dizon and Miranda 1996). The *Visayans* are perceived as the fastest growing group in the last 10 years, presumably due to high birth rate and to in-migration of relatives.

Box 2. Attributes of fishers and fisher community

Indicator	Socioeconomic and Other Attributes
Homogeneity/heterogeneity of resource users	• Homogeneous resource users until the 1960s • Heterogeneous resource users since the 1970s
Dependence on the fishery for livelihood	• High dependence on the fishery (about 60% of the village residents) • More than half of the total household income comes from fishing at present
Motivation of users	• Fishery exploitation was primarily subsistence-driven until the 1960s and then more market-driven from the 1970s onwards
Attitudes of fishers	• Initially indifferent towards collective action • Relatively stronger collaborative attitude since 1989 as a result of community organizing efforts and sanctuary establishment
Level of information and knowledge on the fishery and management	• High indigenous knowledge of fishing gear • Lack of knowledge on fish stock management and coral reef rehabilitation • Improved knowledge of sustainable fisheries management as a result of the Marine Conservation Project for San Salvador (1989-1993)

The occupational groupings for the entire village have also remained fairly heterogeneous. In 1996, households engaged in fishing as a primary occupation have grown to 64 percent while those involved in farming now account for 23 percent. Market vendors, small business dealers and construction workers have a share of two percent each.

Others are teachers and boat builders (1% each), while the rest are drivers, laborers and marine guards (6%). In terms of religious affiliation, the Roman Catholics are the most dominant, consisting of 86 percent of the population at present. Protestants account for 7 percent, while the Jehovah's Witnesses and *Iglesia ni Kristo* account for the balance (7%). Community infrastructure and services are limited and basic. Private boats are used for transportation. A hand-held radio is the only communication facility available in the entire village.

A random sample of 42 households, including 21 members of the SPSS village fishers' association and 21 non-members, was drawn from a population of fishing-dependent households in San Salvador. No statistically significant differences exist between members and non-members in terms of mean age, education and household size. On the average, survey respondents are 39 years of age. They have completed an elementary education and have a household size of almost six members. Members showed a higher participation than non-members ($p<0.05$) in four aspects of project interventions: attendance at project meetings, completion of training, influence over project planning, and knowledge of project objectives.

Household Assets. 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 figures, relative wealth was based on house structure, household furnishings/facilities, and ownership of productive assets (i.e., land and boats). In terms of house structure, members tend to own houses made of sturdy materials (i.e., cement, lumber, and galvanized iron sheets) more than non-members (76% versus 43%; $X^2= 4.84$, $p<0.05$). Likewise, a statistically significant difference exists between non-members and members on household furnishings and facilities. Non-members are more likely to have minimal to low household furnishings than members (81% versus 52%; $X^2=3.86$, $p<0.05$). Minimal refers to the presence of only 1-2 furnishings in the household, while low refers to 3-4 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. In terms of land ownership, there is no statistically significant difference between members and non-members. The ownership of motorized boats, however, indicates that members are more likely to own motorized boats than non-members (41% versus 25%, $X^2=4.703$, $p<0.05$).

While 83 percent of the respondents reported fishing as their primary occupation, 66 percent of the respondents mentioned that they also engage in non-fishing occupations. Among San Salvador households, occupational multiplicity is a survival strategy. The majority of the respondents are satisfied being fishers. Approximately one-third of the respondents' households received remittances from family members living away from the household.

3.3 Market Characteristics

The fishery of San Salvador is heavily market-driven at present. This has changed from the subsistence-oriented market of the 1960s. Eighty-six percent of the fishers covered by the household survey reported that they sold more than half of their catch. The present market orientation is mixed in terms of product composition (e.g., food fish and non-food fish), market destination (domestic and international), and value of fishery products (low to medium for food fish and high for aquarium fish). The marketing arrangements for food fish differ from those of aquarium fish, particularly in terms of fishing grounds/origin offish, market outlets, number of traders, extent of dependence on *suki* (favored buyer), and other attributes, as highlighted in Box 3. The survey results indicate that the fishers of food fish (43%) tend to be less dependent on a *suki* than the aquarium fishers (67%). Although the *suki* normally decides the final buying price of various fish products, the fishers are generally satisfied with the advantages that go with the relationship. These include: 1) direct access to emergency loans for basic needs; 2) a ready market for fish; and 3) access to fishing assets.

Box 3. Summary of Present Market Characteristics

Characteristic	Food/Edible Fish	Aquarium Fish
Fishing Ground	Around San Salvador (66%)	Outside San Salvador (65%)
Market outlets	Primary buyer (43%) Wholesalers (33%) Consumers (21%) Retailers (3%)	Wholesalers (67%) Primary buyer (24%) Individuals/retailers (9%)
Place sold	Masinloc town market (93%) San Salvador (7%)	Manila (61%) Masinloc (39%)
Number of traders	10	40
Existence of *suki* (favored buyer)	43% with *suki*	67% with *suki*
Length of *suki* relationship	< 5 years -- 42% 5-10 years -- 33% > 10 years -- 25%	< 5 years -- 56% 5-10 years -- 44%
Market orientation	Local and national	International
Value of product	Low/medium	High

3.4 Community Institutional and Organizational Arrangements

In general, San Salvador does not have a long tradition of collective action. Except for the Parents' and Teachers' Association (PTA), which has existed since the 1970s to improve school-related activities, most village organizations are fairly recent. The catchers of food fish belong to the *Samahang Pangkaunlaran ng San Salvador* (SPSS), which started with 60 members in 1993. Today, it has a membership of 135 persons. Only 20 members, however, are reportedly active due to the limited livelihood projects of the association (e.g., cooperative store) and to funds mismanagement in the past by some committee members. The SPSS has addressed itself to marine resource management, identification of income-generating projects, mobilization of village residents in community activities, and adoption of fishing methods that are not detrimental to the environment. To date, the association runs two cooperative stores and assists in patrolling the coastal waters of San Salvador on a rotation basis.

Another fairly young organization is the Cabangun Aquarium Fish Gatherers' Association (CAFGA), composed of *Visayan* fishers in Purok Maligaya. It was organized by Haribon in the early 1990s to reduce alienation from the marine

conservation project, which was triggered by the ban on aquarium fishing in the marine reserve. It was also an instrument for the adoption of an alternative, non-destructive fishing technology that uses barrier nets (netsman) for collecting aquarium fish, instead of sodium cyanide. In 1992, CAFGA members deployed artificial reefs outside the marine reserve as an alternative fishing ground for aquarium fish. The newest organization in San Salvador is the *Samahan ng Kababaihan.* It is a women's organization formed by the wife of the mayor in 1994 for fund-raising activities, poultry raising and fish paste making.

Attitudes toward collective action among survey respondents were high. About 91 percent of the respondents expressed that the people of San Salvador could work together to solve community problems and that fiishers could work together to solve fishery-related problems. Seventy percent felt that government and community could work together to solve fishery problems.

Decision-Making at the Village Level. At the village level, formal decision-making is carried out by a 10-member *Barangay* (Village) Council. Headed by a *barangay* captain, it has representatives from each sub-village who are elected by their constituents and whose term of office lasts for three years. The Council is responsible for implementing fishery-related laws and preparing new local ordinances on fisheries management.

The Village Council has been actively involved in fisheries management primarily through conflict resolution and law enforcement. In the 1970s, it was a common practice among San Salvador fishers who used the municipal bagnet fishing gear *(singapong)* to leave their anchors with a float in their chosen fishing ground to signify prior occupancy. Conflicts over fishing grounds arose when other fishers removed the anchor, arguing that the waters of San Salvador are an open access area and, therefore, cannot be privately owned by the previous user. The *Barangay* Council, on its own, intervened to resolve the conflict by passing a village ordinance regulating the use of municipal bagnets and decided to impose a fine on the fishers who left their anchors in the waters. This decision eventually eased the tension among fishers and ceased to be a source of conflict in San Salvador since the 1980s.

During the implementation of the MCPSS, new ordinances were passed, foremost of which is the sanctuary and reserve ordinance (Municipal Ordinance No. 30). Decision-making was participatory, marked by a series of community consultations and public hearings to thresh out issues and conflicting interests. An informal core group formed in 1989, known as the *Lupong Tagapangasiwa ng Kapaligiran* (LTK) or Environmental Management Committee, was responsible for drafting the provisions of the sanctuary ordinance, holding information campaigns, and endorsing the proposed ordinance to the *Barangay* Council. The *Barangay* Council, in turn, recommended the approval of the ordinance to the Municipal Council of Masinloc.

The *Barangay* Council initiated amendments to the sanctuary ordinance by banning *kunay* (beach seine) in the waters of San Salvador and imposing stiffer penalties for violations of the sanctuary ordinance. Starting in September 1993, fines increased from P750 to PI,000 (US $29-$38) for the first offense and, imprisonment, from two weeks to one month. For the second offense, fines doubled from PI,000 to P2,000 (US $38-$76) and, imprisonment, from three weeks to three months. For the third offense, the maximum penalty is now P2,500 (US $96) and imprisonment of six months, or both, along with the confiscation of fishing gear and fishing boat.

The *kunay* owners strongly opposed the banning of their fishing gear in the marine reserve, going as far as drafting a resolution calling for the abolition of the MCPSS and convincing people to sign it (Tongson 1996). The majority, however, did not sign the resolution, knowing the threat that the said gear posed to the marine environment. A general assembly was held, where the municipal mayor intervened. A general vote finally upheld the ban on beach seine.

3.4.1 Fishery-Related Property Rights and Rules in San Salvador

Property Rights. Traditional or customary rights and tenure do not exist in San Salvador. Fishers could fish anywhere whenever they pleased without fear of being apprehended by formal government authorities. With the implementation of the sanctuary ordinance in 1989, however, the open access area was reduced to give way to the 127-hectare marine sanctuary and marine reserve, where legal sanctions now prevail. The sanctuary is strictly a no-fishing zone while

the marine reserve is a traditional fishing zone where non-destructive technologies are allowed. Thus, with the marine reserve, rights of access (entry rights) and withdrawal (harvesting) exist. Management rights exist for all fishers in San Salvador. Exclusive fishery privileges can be granted by the Municipal Council to operators offish corrals and mollusk beds in municipal waters outside of the marine reserve. Beyond these restricted boundaries, open access still prevails.

Fishery-Related Rules in San Salvador. The shift in San Salvador to a communal property regime was accompanied by the formulation and enforcement of various rules over time: 1) operational; 2) collective choice; and 3) constitutional. Operational rules govern and regulate resource use. They directly affect day-to-day decisions made by the fisher concerning where, when and how to harvest fish; who should monitor the actions of others and how; and what rewards and sanctions are assigned to certain actions (Ostrom 1991). Operational rules can be formal (written, legitimized) or informal (unwritten, traditional). In San Salvador, operational rules may be classified into: 1) boundary rules (who can enter the fishery); 2) allocation rules (actions or procedures for fish harvesting); 3) scope rules (specification of the characteristics offish 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 fishers in terms of time, money and/or materials for management and participation).

Informal operational rules. Informal operational rules, made by village fishers themselves, pertain to the first come, first served entry to the fishing ground, the exclusive privilege to fish near artificial reefs by members of the aquarium gatherers' association, and the observance of a 30-meter distance between boats during fishing operations. The first two rules are boundary rules, while the third is an allocation rule.

Formal operational rules. Formal operational rules in San Salvador are largely embodied in municipal ordinances and other related legislation. For instance, the Municipal Council requires fishers to secure fishing permits before they can fish in the municipal waters. This represents a boundary rule. Formal allocation rules strictly prohibit fishing and gathering of marine products from the sanctuary, except for scientific research or study. They also ban destructive fishing gear and practices in the marine reserve, such as dynamite fishing, *muro-ami* type or related fishing methods

using scarelines or poles, spear fishing using compressor or scuba, cyanide or other strong poisons, fine mesh gillnets (below 3 cms), and *kunay* (beach seine) fishing gear. Scope rules pertain to the ban on gathering *siganid* juvenile *ipadas)* in September. Aggregation rules require SPSS members to hold dialogues and meetings before endorsing a resolution formally to the *Barangay* Council which, in turn, forwards the resolution to the Municipal Council for deliberations 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 San Salvador, violations of the Basic Fishery Ordinance call for a fine of not more than P2,500 (US $96) or imprisonment of not more than six months, or both, upon the discretion of the court. Violations of the sanctuary ordinance likewise involve a maximum fine of P2,500, or imprisonment, or both. Input rules refer to the mandatory payment of membership fees by SPSS members to support the association's operations, apart from their participation in guarding the sanctuary, monitoring illegal fishing activities, and reporting rule violations to the village and municipal governments.

Collective choice rules are rules used by fishers, officials or external authorities about how the fishery should be managed. These basically define how rules are made and enforced. Of critical importance are the arrangements for monitoring and enforcing compliance with the operational rules and for settling disputes (Ostrom 1991). Responsible for reporting violations of fishery laws in San Salvador are members of the government-deployed sea patrol (*Bantay Dagat)* and SPSS members. They are assisted by other law enforcement officers who apprehend illegal fishers. Under existing collective choice rules, management is not compulsory for SPSS members. Settling disputes usually involve the conduct of hearings by the village captain and the municipal mayor before legal cases are elevated to the court.

Constitutional rules determine which types of rules are permissible and who has collective choice rights (governance and modification). They define who is eligible to participate in the system and establish the process and rules by which collective choice rules are created, enforced and modified (Ostrom 1991). In San Salvador, everyone participates in the system, but the SPSS members are more active in rule making. At the national level, constitutional rules which apply to San Salvador include the national legislation on the devolution of powers and authority to local government units, popularly known as the Local Government Code, the establishment of protected areas as embodied in the

National Integrated Protected Areas System (NIPAS) Act, and other related national legislation enacted by the government (discussed under Section 3.5 of this paper). They empower local institutions to establish rules and initiate action for resource management, among other provisions.

The survey results show that fishers are aware and knowledgeable about the rules. They also feel that rule breaking is not acceptable. Most respondents stated that the fishery rules currently in place should not be changed. They felt that these rules are supportive of fishery resource rehabilitation and that they are being implemented properly.

3.4.2 Monitoring **and** Enforcement

An understanding of rules and rule compliance is essential to analyzing the behavior and outcomes associated with managing a communal property such as a sanctuary and marine reserve. In San Salvador, rule enforcement structured the action situation. Though certain resource users were alienated in the beginning due to the imposition of operational and collective choice rules, vigorous enforcement efforts and the political will of local leaders helped foster compliance. Constitutional rules, moreover, created a setting that was conducive to decentralized decision-making and conflict resolution, allowing the fishers to be involved in rule making.

When the marine sanctuary ordinance was implemented in 1989, the LTK informally took the lead in monitoring violations. This was done despite the absence of a legal permit from the central fisheries agency recognizing the sanctuary (Tongson 1996). In the San Salvador case, however, the absence of a permit did not deter enforcement. The sanctuary was marked by buoys and signboards written in the local dialect. The LTK members took turns in guarding the sanctuary and reporting violations to the *Barangay* Council. The residents assisted the LTK in patrolling the sanctuary, who found it relatively easy to conduct surveillance due to the presence of the guard house near the sanctuary. If village authorities felt unable to confront a violator, they contacted the municipal government for support.

Up until early 1994, four military personnel were assigned to the area to assist in apprehending violators. The

Barangay Captain, however, asked the military to leave in 1994 when they were caught fishing in the sanctuary, and therefore, provided the wrong example to the fishers. At present, the responsibility for monitoring and enforcing fishery-related rules lies with three members of the *Barangay Tanod* (Village Police), five members of the *Bantay Dagat* (sea patrol), and eight SPSS volunteers who serve on a rotation basis. Three guards watch the sanctuary every night while one guard patrols the area at daytime. In the early years of enforcement, operations were hampered by the informal enforcement structure, along with the lack of hand-held radios and patrol boats. The mayor, in response to the petition of the *Barangay* Council and the LTK, provided a boat, an outboard motor, and a hand-held radio. *Bantay Dagat*, moreover, was formally organized in 1993 to patrol the waters of San Salvador and was supported by the village government and the municipal government.

Recorded **Violations.** Based on incomplete village records kept by the marine guards from 1989 to 1996, most violations have involved fishing inside the sanctuary (72%). Others include aquarium fishing in the marine reserve (10%), use of compressor inside the marine reserve (10%), dynamite fishing (4%), and use of fine mesh nets (4%). In terms of the action taken, the violators were warned (48.2%), fined (19%), asked to surrender their fishing gear (13%), and imprisoned (7%). Other types of action included the confiscation offish, return of live fish to the sea, loss of job as a marine guard, and one person being shot in the leg due to the failure to heed the warning of the guards patrolling the waters. In general, the majority of the violators are non-residents of San Salvador.

3.5 External Institutional and Organizational Arrangements

National Level. In the 1970s, the centralized government control of fisheries was further reinforced by Presidential Decree No. 704, popularly known as the Fisheries Decree of 1975. The Fisheries Decree revised and consolidated all fishery-related laws and decrees in the Philippines, providing a basis for many of the laws currently in existence. The decree defined the boundaries of the waters for municipal and commercial fishing. Among others, it stipulated the establishment offish sanctuaries and fishing reservations; declaration of closed season by area specification, gear or species offish; and prohibition of illegal fishing such as the use of explosives, obnoxious substances, fine mesh nets,

and electro-fishing gadgets. In 1987, a new Philippine Constitution was ratified, which declared that the exploration, development and utilization of natural resources, including aquatic resources, are under the "full control and supervision of the State." Unlike the previous constitutions, the 1987 Constitution articulated a marine resources development policy and limited the exclusive use and development of marine wealth to Filipino citizens.

Municipal Level. The enactment into law in 1991 of the Local Government Code (LGC) signalled the formal devolution of powers and responsibilities to the local governments. The changed administrative arrangements resulting from the LGC have created a supportive policy environment for co-management to prosper. A number of the administrative and management functions of the BFAR were devolved to the municipal government. The LGC, among others, now places under the jurisdiction of municipal governments the management of municipal waters (up to 15 kilometers from the shoreline) and the enforcement of fishery laws in these waters, along with mangrove conservation. Municipal waters are defined as streams, lakes, and tidal waters within the municipality, not privately owned and not part of national parks, public forest, timber lands, forest reserves or fishery reserves.

Since 1991, municipal governments have been given the exclusive authority to grant fishery privileges in the municipal waters and impose associated fees and rentals. Thus, the Municipal Council *(Sangguniang Bayari)* is now authorized to grant fishery privileges to erect fish corrals, oyster, mussel or other aquatic beds or milkfish fry areas, within a definite zone of the municipal waters. Registered organizations and cooperatives of marginal fishermen, however, have the preferential right to such privileges. The Municipal Council is also mandated to issue licenses for the operation of fishing vessels of three tons or less and to penalize the use of destructive fishing methods. In addition, municipal governments are now entitled to share in the proceeds from the use and development of national wealth within their respective areas and to receive a 40 percent share of the gross collection derived by the national government from fishery charges.

Local government units, moreover, may "enter into joint ventures and other collaborative arrangements with non-governmental and people's organizations." Partnerships cover delivery of basic services, capability-building and

livelihood projects, and local enterprise development designed to improve productivity and income, diversify agriculture, spur rural industrialization, promote ecological balance, and enhance the economic and social well-being of the people. The municipal government of Masinloc has taken steps in this direction and has recently initiated discussions with Haribon Foundation and Jaime V. Ongpin Foundation on prospective livelihood projects.

In October 1995, the Municipal Council of Masinloc enacted its Basic Fishery Ordinance, otherwise known as Municipal Ordinance No. 51-95. It affirmed the extent of its municipal waters, as defined in the Local Government Code of 1991. It also required the issuance of licenses and permits to capture, use or culture fishery and aquatic resources and prescribed a schedule of license fees by type of fishing gear and fishing boat. In addition, the Municipal Council required the payment of fees for exclusive fishery privileges within its municipal waters and ruled that other fishers shall not fish within 200 meters from any fish corral in marine fisheries operated under exclusive fishery privileges or within 100 meters in fresh water fisheries, unless they belong to the same licensee. It also declared as unlawful any commercial fishing within its municipal waters. The municipal mayor visits San Salvador often during the year resulting in support for local resource management initiatives.

The enactment of the National Integrated Protected Areas System (NIPAS) Act in 1992 and the subsequent declaration of Masinloc Bay as a protected seascape in 1993 paved the way for establishing local Protected Area Management Boards (PAMBs). The multisectoral PAMB now administers protected areas in a participatory mode, guided by consensus or majority vote. The municipal government of Masinloc and the village government of San Salvador, which had jurisdiction over the marine sanctuary even before the PAMB came into being, are now required to coordinate more closely with DENR and the PAMB and to participate in drawing up the management plan for Masinloc Bay.

Provincial Level. At present, the provincial government of Zambales is not directly involved in managing the San Salvador sanctuary and supporting the enforcement of fishery-related rules. Its distance to the far-flung island of San Salvador may partly account for this. Nonetheless, it has taken notice of the accomplishments associated with the San

Salvador experience, along with the national reward/recognition that the San Salvador sanctuary has reaped. In July 1996, the Asian Institute of Management (AIM) and the Department of Interior and Local Governments (DILG) awarded the *Gating Pook* to the Masinloc government for its outstanding achievement in sanctuary management.

3.6 Exogenous Events

The most notable exogenous events which have dramatically affected fisheries management in San Salvador are the influx of *Visayan* migrants to the island in the 1970s, which altered the technological, socioeconomic and biological landscape, and the intervention of external catalysts in the late 1980s, which helped reverse the degradation of fishery resources. No major shocks to fisheries management were brought about by natural calamities, political instability, macroeconomic interventions, and civil unrest which threatened the survival of co-management institutional arrangements in San Salvador during the period covered by this case study (1989-1996).

4.0 Incentives to Cooperate and Patterns of Interaction

In San Salvador, the major incentives to collaborate over time include: 1) dependence on the fishery resource base and realization of the need to avert resource deterioration; 2) legitimacy, enforceability and relevance of rules; 3) tangible benefits from co-management initiatives; 4) policy-driven reforms in terms of the devolution of powers and authority to local government units for coastal resource management and formal support for protected area management; and, 5) public recognition of co-management initiatives. Box 4 summarizes the incentives and patterns of interaction, at various levels.

Before World War II, fishers recalled that San Salvador was marked by abundant marine resources, use of non-destructive fishing methods, and a relatively homogeneous population. During World World II (early 1940s), Japanese troops occupied San Salvador and sometimes used explosives to catch fish, marking the early beginnings of blast fishing in the area on a limited scale. After World War II and until the 1960s, most village fishers continued to use

non-destructive, traditional fishing methods, such as hook and line, improvised speargun, and gill nets. Also used was *kunay*, a beach seine with a long scareline of coconut fronds for herding fish from the reef flat into a fine mesh net (5-cm net). Women often gleaned in shallow reefs. Local fisheries in the 1960s easily met the subsistence needs of the village residents. Farming provided additional livelihood for the island's residents.

Box 4. Incentives to Cooperate and Patterns of Interaction

Incentives to Cooperate	Patterns of Interaction
Among Fishers and Stakeholders	
■ Dependence on fishery resources; realization of the need to reverse the downtrend in fish yields from coral reefs; concern for protecting the resource base and sustaining livelihoods	■ Observation tour by village core group members of a successful sanctuary (Apo Island) ----> information campaigns on the environment and public hearings on sanctuary establishment ---> endorsement, enactment and strict enforcement of a municipal ordinance on sanctuary and marine reserve management
■ Legitimacy, enforceability and relevance of rules governing the sanctuary and marine reserve: prohibition of fishing in the sanctuary and ban on destructive fishing methods in the marine reserve	■ Rule compliance by most fishers of food fish; alienation of aquarium fishers due to the ban imposed by the ordinance on aquarium fishing and use of sodium cyanide in the marine reserve ---> introduction of an alternative aquarium fishing technology ---> shift to barrier nets for collecting aquarium fish ---> eventual shift of aquarium fishers to other fishing grounds
	■ Resentment among beach seine (*kunay*) users ---> shift to other fishing grounds where *kunay* was not banned
	■ Eventual support by alienated groups for sanctuary management ---> rule compliance ----> shift to non-destructive fishing technologies
■ Tangible benefits from collaborative efforts (e.g., increase in fish catch; receipt of patronage refund from the cooperative store managed by the local fishers' association; and enhanced social and political standing of village leaders)	■ Emergence of new leaders ---> election to political positions of core group members in the village who are supportive of sustainable fisheries management ---> continuing support for project-related efforts
Among Government Organizations (GOs) and Non-Government Organizations (NGOs)	
■ Desire to improve socioeconomic conditions	■ Inflow of additional funds to support livelihood activities --> training and financial assistance to fishing households
■ Concern for sustainable fisheries management and for the food security of present and future generations	■ Support to law enforcement functions (boat, radio facility, and honoraria/food for marine guards) ---> formal creation of *Bantay Dagat* (Baywatch) ---> better law enforcement and protection of the well-being of fishery resources
■ Policy-driven directions and enforcement of constitutional rules (i. e., Fisheries Decree of the Philippines, Local Government Code, and National Integrated Protected Areas System Act)	■ Participation in joint coastal resource management and in joint problem-solving/conflict resolution ---> sharing of monitoring and evaluation results with various groups on the resource status ---> greater awareness of resource management results over time

Incentives to Cooperate	Patterns of Interaction
Among Stakeholders, GOs and NGOs	
■ Legitimacy of collaborative management due to the passage and enforcement of collective choice rules (e.g., municipal ordinance on the marine sanctuary and Basic Fishery Ordinance of Masinloc)	■ Joint patrolling of coastal waters —> apprehension of illegal fishers ----> greater rule compliance
■ Enactment of supportive national legislation/constitutional rules on the devolution of powers and responsibilities, as well as on protected area management (e.g., Local Government Code and National Integrated Protected Areas System Act)	■ Assumption of joint responsibility for coastal resource management and for sustaining the sanctuary ---> subsequent delineation of Masinloc and Oyon Bays into management zones
■ National acclaim for and public recognition of resource management achievements (e.g., *Galing Pook* award, etc.); benefits from sanctuary management (higher fish catch, reduced illegal fishing activities, etc.)	■ Sense of pride and achievement by collaborators ——> stronger resolve to support sanctuary management ——> sustained law enforcement and resource management—> heightened interest of external groups in successful collaborative management models

The l970s ushered in an influx of *Visayan* migrants who were searching for better fishing grounds and who decided to settle in San Salvador, particularly in Cabangun (now Purok Maligaya) where they purchased a piece of land. Relatives soon joined the initial batch of *Visayan* migrants. The decade, moreover, saw a pronounced shift to non-traditional and destructive fishing operations, such as blast fishing, aquarium fish collection using sodium cyanide, and spear fishing with air compressors, which eventually devastated San Salvador's fishing grounds. The increased deployment of fine mesh nets aggravated the indiscriminate harvest of large and small fish alike.

The 1970s also marked the integration of San Salvador into an export-oriented market for aquarium fish via middlemen who visited the village. The *Visayan* migrants, in particular, were catching aquarium fish for a growing market in the United States and Europe. Historically, aquarium fish gatherers used sodium cyanide, which damages the reef.

In San Salvador, changes in resource use patterns were largely driven by poverty and economic survival. In turn, they influenced the physical, technical and biological attributes of the resource (i.e., unrestricted entry to fishing grounds, resource competition, use of destructive fishing gear, and dwindling fish stocks). The shift from an open access fishery to a communal property regime in 1989 was prompted, in part, by the alarming downtrend in fish catch, which

threatened the livelihood of San Salvador residents. The average fish catch per fishing trip reportedly dwindled from about 20 kilos in the 1960s to barely 3 kilos in 1988. A survey of the coral reef substrate in 1988 showed an average of 23 percent live coral cover for the entire island of San Salvador.

The vulnerability of fishers to scarcity in fish supply and its effects motivated them to rethink existing fishery arrangements with the assistance of external catalysts — mainly through a Peace Corps Volunteer and through the field workers of the Haribon Foundation. Haribon, a non-government organization, was one of the first Philippine environment groups to recognize the role of the community in managing and sustaining resource management projects. In 1988, the concept of a marine sanctuary and reserve emerged in San Salvador. Informal dialogues took place with local officials, fishers, and non-government organizations, which led to the formulation of the Marine Conservation Project for San Salvador (MCPSS).

Implemented from 1989 to 1993 by the Haribon Foundation with funding from the Netherlands Embassy, Jaime Ongpin Foundation, and the World Wildlife Fund, the MCPSS sought to reverse the downward trend in fish yields from the coral reef through community involvement in fisheries management (White and Savina 1987). It also strengthened institutional capabilities and established a coral reef fish sanctuary and a traditional fishing reserve area. In addition, it encouraged community development through the formation and strengthening of local core groups responsible for fisheries management and through alternative income-generating projects. Though the project was not conceived as a co-management project in the beginning, the municipal government became a key player over time. This was due to the realization that the political dynamics in San Salvador are affected by the broader political milieu. The provision of the enabling legislation for the sanctuary, along with assistance in law enforcement and conflict resolution, called for government involvement. Thus, co-management emerged in the course of project implementation.

The contextual attributes combined to shape the incentive structure faced by the village fishers. In turn, they generated strategies for collective action on new institutional arrangements which later shaped the patterns of interaction and choices of fishers, government organizations, and non-government organizations. With the existence of an

environmentally-conscious community, an enabling legislation at the local and national levels, and vigilant law enforcement efforts, headway was achieved in resource management. Tangible benefits became evident within two years of project implementation. Fishers observed a higher fish catch, a re-appearance of lobsters, groupers and other marine life, and a reduction of illegal fishing. Said benefits provided a new incentive to cooperate over time. Some alienated groups even expressed that they were won over to the sanctuary concept upon seeing the improvement in their fish catch. In turn, this fostered a greater rule compliance, favored a willingness to shift to non-destructive fishing practices, and earned for the municipal government and the village an award for sanctuary management.

5.0 Outcomes of Co-management

To assess the outcomes/performance of co-management over time, the perceptions of project participants and non-project participants on social and physical changes were used in the absence of solid baseline data. The performance indicators of co-management covered equity, efficiency and sustainability. The method for measuring changes over time involved a visual, self-anchoring, ladder-like scale which allowed for making ordinal judgments. This method placed little demand on informant memory and could be rapidly administered for capturing perceived changes over three time periods: before the project, today, and five years from now.

Table 2 shows that San Salvador fishers perceive positive and statistically significant changes in **all** performance indicators of co-management ($p<0.01$), using a paired comparison t-test. Relatively larger positive changes were perceived in knowledge of fisheries and information exchange on fisheries management, satisfaction with fishery arrangements, such as mangrove management and sanctuary management, benefits from the marine reserve, and quickness of resolving community conflicts.

Table 2. Perceived pre-project to post-project changes in performance indicators for all respondents: before the project and now

Indicator	All	
	Today	Before

	(T_2)	(T_1)	T_2-T_1	*p*
Equity				
a. Participation in community affairs				
1. Participation in general	5.26	3.54	1.72	<0.01
2. Participation - fisheries management	4.71	3.24	1.47	<0.01
b. Influence over community affairs				
1. Influence in general	5.67	3.36	2.31	<0.01
2. Influence - fisheries management	5.95	3.40	2.55	<0.01
c. Control over fisheries	5.43	2.45	2.98	<0.01
d. Allocation-access	6.05	3.48	2.57	<0.01
e. Satisfaction with fishery arrangements				
1. Satisfaction-sanctuary mgt	6.21	3.24	2.97	<0.01
2. Satisfaction-reserve mgt	5.88	3.26	2.62	<0.01
3. Satisfaction-mangrove mgt	6.62	2.67	3.95	<0.01
f. Benefits-marine reserve	6.31	3.17	3.14	<0.01
g. Household well-being	6.71	4.17	2.54	<0.01
h. Income	6.38	3.52	2.86	<0.01
Efficiency				
a. Collective decision making	5.74	3.50	2.24	<0.01
b. Conflict resolution	6.48	3.40	3.08	<0.01
Sustainability				
a. Fishery well-being	7.02	4.50	2.52	<0.01
b. Compliance	5.90	3.48	2.42	<0.01
c. Knowledge-fisheries	6.02	2.40	3.62	<0.01
d. Information exchange	5.86	2.62	3.24	<0.01

A paired comparison t-test was done to determine if the mean differences between *today* and 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 with co-management institutional arrangements. Relatively larger positive increases were perceived in participation in community fisheries management, quickness of resolving fishery conflicts, satisfaction with sanctuary management, compliance with fishery rules, and benefits from the marine reserve.

To determine if the members of the fishers' association (e.g., SPSS) differed from non-members, the *today* perception for each indicator was subtracted from the *before project* perception (T2-T1). Table 3 shows that there is no statistically significant difference between members and non-members in the perceived levels of all performance indicators ($p>0.05$ and $p>0.10$).

Table 3. Differences between members and non-members with respect to perceived pre-project to post-project changes: before the project and now

Indicator	Members T_2-T_1	Non-Member T_2-T_1	T-Value	Probability
Equity				
a. Participation in general	1.67	1.77	-0.11	>0.10
Participation-fisheries mgt	1.61	1.33	0.28	>0.10
b. Influence in general	2.34	2.29	0.05	>0.10
Influence-fisheries mgt	1.91	3.19	-1.28	>0.10
c. Control over fisheries	3.10	2.86	0.24	>0.10
d. Allocation-access.	3.14	2.00	1.14	>0.10
e. Satisfaction with fishery arrangements:				
Satisfaction-sanctuary mgt	3.29	2.66	0.63	>0.10
Satisfaction-reserve mgt	3.29	1.95	1.34	>0.10
Satisfaction-mangrove mgt	4.29	3.62	0.67	>0.10
f. Benefits-marine reserve	2.90	3.38	-0.48	>0.10
g. Household well being	2.57	2.52	0.05	>0.10
h. Income	3.05	2.66	0.39	>0.10
Efficiency				
a. Collective decision-making	1.91	2.57	-0.66	>0.10
b. Conflict resolution	3.08	3.10	-0.02	>0.10
Sustainability				
a. Fishery well-being	3.09	1.96	1.13	>0.10
b. Compliance	2.62	2.24	0.38	>0.10
c. Knowledge-fishery	4.24	3.00	1.24	>0.10
d. Information exchange	3.95	2.52	1.43	>0.05

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, but there is no statistically significant difference between members and non-members ($p>0.10$).

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. Indicators with factor loadings of 0.50 and above were retained in the component analysis, resulting in a total of six components (Table 4).

Table 4. Principal component analysis of performance indicators

Performance Indicator	Compo-nent 1	Compo-nent 2	Compo-nent 3	Compo-nent 4	Compo-nent 5	Component 6
Information exchange	**0.85**	-0.00	-0.01	0.10	0.23	0.28
Satisfaction- reserve management	**0.80**	0.10	-0.04	0.17	0.02	-0.05

Knowledge of fisheries	**0.67**	0.04	0.11	0.10	**0.50**	-0.05
Collective decision-making	-0.10	**0.93**	0.10	0.18	0.03	0.11
Compliance	0.34	**0.77**	-0.08	0.03	0.24	-0.27
Household well-being	-0.11	**-0.61**	-0.01	0.40	0.43	-0.27
Benefits - marine reserve	-0.14	**0.50**	**0.76**	-0.05	-0.12	-0.03
Satisfaction- mangrove mgt	0.21	-0.13	**0.81**	0.15	0.29	0.21
Participation in fisheries management	0.33	0.07	**-0.53**	0.48	0.14	0.36
Participation in community affairs in general	0.10	0.03	-0.18	**0.84**	0.18	0.20
Influence on fisheries mgt	0.06	0.09	0.16	**0.84**	0.34	-0.07
Influence on community affairs	0.41	-0.26	0.15	**0.58**	-0.22	-0.01
Satisfaction - sanctuary management	0.30	0.29	0.11	**0.52**	0.30	0.43
Household income	-0.06	-0.07	-0.02	0.22	**0.88**	0.05
Fishery well-being	0.25	0.07	0.07	0.12	**0.75**	0.28
Conflict resolution	0.22	0.20	0.10	0.46	**0.54**	0.26
Control over fisheries	0.12	0.11	-0.16	-0.05	0.49	**0.71**
Fair allocation of access rights	0.18	-0.18	0.42	0.32	0.10	**0.71**
Variance %	*14*	*13*	*10*	*16*	*16*	*10*

For further analysis, the relationships between component indicators (as dependent variables) and the independent variables were established through a stepwise multiple regression analysis (Table 5). The purpose was to determine the set of independent variables that explained most of the variance in each of the six components.

Table 5. Regression analyses of co-management performance indicators

Dependent Variable: Component One			
Independent Variables:	Standardized coefficient	T-value	Probability (2-Tail)
Household asset index	0.411	2.519	0.0162
Number of training programs attended	-0.389	-2.355	0.0239
Influence on project planning	0.301	1.778	0.0835
Perceived pre-project resource condition	-0.254	-1.737	0.0908
$R = 0.535$; $R^2 = 0.286$; Adjusted $R^2 = 0.209$			
$N = 42$; $DF = 4$; $F = 3.71$; $p = 0.0123$			
Dependent Variable: Component Two			
Length of education	-0.586	-4.101	0.0002
Influence on project planning	-0.495	-3.566	0.0010
Choose fishing as an occupation (job satisfaction)	0.417	3.148	0.0033
Boat ownership	-0.339	-2.661	0.0116
Knowledge of project objectives	0.258	1.828	0.0759
$R = 0.668$; $R^2 = 0.446$; Adjusted $R^2 = 0.369$			
$N = 42$; $DF = 5$; $F = 5.80$; $p = 0.0005$			
Dependent Variable: Component Three			
Fishing as the most important source of total household income	0.602	3.287	0.0022
Fishing as the primary occupation of the household head	-0.465	-2.537	0.0154

Number of fishing gear	0.246	1.777	0.0836
R = 0.525; R^2 = 0.276; Adjusted R^2 = 0.219			
N = 42; DF = 3; F = 4.83; p = 0.0060			
Dependent Variable: Component Four			
Receipt of remittances from outside the village	-0.557	-4.334	0.0001
Community can work together	-0.459	-4.208	0.0002
Influence on project planning	0.509	3.875	0.0005
Ecological knowledge	-0.414	-3.593	0.0011
Age	0.468	3.506	0.0013
Attendance at meetings	-0.324	-2.520	0.0167
Willingness to change occupation	0.287	2.420	0.0212
Fishing as the primary occupation of the household head	-0.234	-2.116	0.0420
R = 0.807; R^2 = 0.651; Adjusted R^2 = 0.566			
N = 42; DF= 8; F = 7.69; p = 0.0000			
Dependent Variable: Component Five			
Fishing as the most important source of total household income	-0.688	-4.759	0.0000
Community can work together	-0.462	-4.245	0.0002
Fishing as the primary occupation of the household head	0.483	3.256	0.0025
Fishers can work together	0.328	3.017	0.0047
Boat ownership	-0.237	-2.122	0.0410
Knowledge of project objectives	-0.192	-1.741	0.0904
R = 0.783; R^2 = 0.612; Adjusted R^2 = 0.546			
N = 42; DF = 6; F = 9.22; p = 0.0000			
Dependent Variable: Component Six			
Perceived pre-project resource condition	0.396	3..232	0.0026
Knowledge of project objectives	0.280	2.234	0.0316
Influence on project planning	0.255	2.026	0.0500
Community can work together	0.232	1.865	0.0701
R = 0.673; R^2 = 0.453; Adjusted R^2 = 0.394			
N = 42; DF = 4; F = 7.66; p = 0.0001			
Dependent Variable: Total Perceived Performance			
Community can work together	-0.398	-2.818	0.0076
Influence on project planning	0.355	2.530	0.0157
Attitude toward rules (e.g., rule-breaking is not acceptable)	0.281	2.015	0.0511
R = 0.527; R^2 = 0.278; Adjusted R^2 = 0.220			
N = 42; DF = 3; F = 4.86; p = 0.0059			

For Component 1, four independent variables were entered into the regression equation: household asset index, number of training programs attended, influence on project planning, and perceived pre-project resource condition (1 = good, 0 = bad). Together, they account for 21 percent of the variance in Component 1 (adjusted R^2=0.209). Component 1 consists of performance indicators directly related to fisheries management, such as information exchange, satisfaction with marine reserve management, and knowledge of fisheries. Respondents with more household assets (proxy variable for relative wealth) and who felt they were able to influence project planning tended to perceive larger increases in Component 1. For the perceived pre-project resource condition and number of training

programs attended, the regression coefficients turned out to be negative. This indicates that respondents who have a good perception of fishery resource conditions 15 years ago and who attended more training tended to score low on Component 1. Conversely, those who perceived a resource problem 15 years ago and who did not attend a lot of training activities tended to perceive larger changes in information exchange, satisfaction with marine reserve management, and knowledge of fisheries. Their perception of a resource crisis may have prompted them to interact informally with others and to seek more knowledge on fisheries, but not necessarily through training (since the training coefficient is negative). The multiple regression equation is statistically significant ($p<0.05$).

For Component 2, five independent variables were entered into the regression equation: knowledge of project objectives, job satisfaction (e.g., choose fishing if one were to live one's life over), influence on project planning, length of education, and boat ownership. Together, they account for 37 percent of the variance in Component 2. The regression equation is statistically significant ($p<0.01$). A closer look at the regression coefficients shows that the first two independent variables - knowledge of project objectives and job satisfaction — have positive coefficients, and are therefore associated with perceptions of larger changes in the component. Component 2, which combines behavioral and material gains, consists of collective decision-making, rule compliance, household well-being, and benefits from the marine reserve. This suggests that a good grasp of what the project seeks to achieve and a preference for fishing as an occupation influence perceived changes in Component 2.

The last three independent variables (e.g., influence on project planning, length of education, and boat ownership) have negative coefficients. These results are somewhat perplexing. Those who have obtained a higher education, who have influenced project formulation, and who owned boats tended to perceive smaller changes in Component 2. A review of fisher's attributes indicates that relatively more members than non-members of the fishers' association possess these characteristics. The members have a statistically higher influence on project planning and a slightly longer schooling. They also registered a statistically higher ownership of boats. Perhaps, respondents with these characteristics tend to be more critical of the extent of changes in variables comprising Component 2. Perhaps, over time, they had encountered difficult situations, where perceived compliance with fishery rules was compromised and where collective

decision-making did not always work in their favor. Consequently, their perceptions of household well-being and benefits from the marine reserve were also affected. Most likely, this situation applies to alienated groups, such as aquarium fishers, users of *kunay* (beach seine), and some core group members who intervened on behalf of relatives who violated the sanctuary ordinance, but did not receive any special privileges despite their position in the fishers' organization.

For Component 3, three independent variables were entered into the regression equation: fishing as the primary occupation of the household head, fishing as the most important source of **total** household income (but not the only source), and number of fishing gear. They account for 22 percent of the variance in the component (adjusted R^2=0.218). The multiple regression is statistically significant ($p<0.01$). The positive regression coefficients of the number of fishing gear and dependence on fishing as the primary source of total household income indicate that these variables are likely to lead to perceptions of larger positive changes in Component 3. Component 3 comprises resource-related equity indicators, such as benefits from the marine reserve, satisfaction with mangrove management, and participation in fisheries management. Fishing as the primary occupation of the head of the household, however, has a negative regression coefficient, indicating that respondents with this characteristic tended to score low on this component. This may be explained, in part, by the long hours devoted to fishing by household heads, particularly by those who have to go to distant fishing grounds, which prevent large increases in perceived participation in community fisheries management and in benefits from the marine reserve.

Eight independent variables are associated with perceived changes in Component 4: receipt of remittances from outside the village, community can work together, influence on project planning, ecological knowledge, age, attendance at meetings, willingness to change occupation from fishing to something else, and fishing as the primary occupation of the household head. Together, these independent variables account for 57 percent of the variance in the component (adjusted R^2=0.566). The regression equation is statistically significant ($p<0.01$). Of the eight variables, influence on project planning and age are associated with perceptions of large positive changes in Component 4. This component consists of collective/community equity indicators, such as participation in community affairs, influence over fisheries

management, influence over community affairs, and satisfaction with sanctuary management. Attempts to bring about perceived increases in these indicators need to focus on a strong sense of project ownership by providing opportunities for fishers to influence project planning. Working with older fishers will also positively influence perceived changes in Component 4.

Contrary to expectations, the receipt of external remittances is associated with smaller changes in Component 4. Despite additional income from outside sources, which can help reduce the pressure to earn a living from fishing and release some free time for other activities, those receiving remittances perceived less positive changes in participation in community affairs, as well as in influence on both fisheries management and community affairs in general. Attendance at meetings also showed a negative regression coefficient, implying that mere attendance is not necessarily equated with perceptions of large increases in Component 4. The same holds true for ecological knowledge and fishing as the primary occupation of the household head.

For Component 5, the six explanatory variables which entered the regression equation are: fishing as the most important source of total household income, fishing as the primary occupation of the household head, community can work together, fishers can work together, boat ownership, and knowledge of project objectives. Of the six independent variables, fishing as the primary occupation of the household head and the attitude that fishers can work together to solve a fishery problem are associated with perceptions of large increases in Component 5. This component comprises resource-related and behavioral indicators, such as household income, overall well-being of fisheries, conflict resolution, and knowledge of fisheries. However, those whose **total** household income is heavily dependent on fishing tend to score low on this component. It appears that lessening the total household's dependence on fishing income by diversifying income sources is likely to lead to perceived positive changes in safeguarding the well-being of fisheries and hastening the resolution of fishery-related conflicts. It will also tend to shape perceived changes in household income and knowledge of fisheries. The rest of the independent variables (e.g., community can work together, boat ownership, and knowledge of project objectives) are linked to smaller changes in the component. Together, the six variables account for 55 percent of the variance in Component 5 (adjusted R^2=0.546). The multiple regression equation

is significant ($p<0.01$).

For Component 6, the four independent variables which influence perceived positive changes in the component include: the attitude that the community can work together, perceived pre-project resource condition as good, knowledge of project objectives, and influence on project planning. All these variables have a positive influence in shaping perceived changes in Component 6. Component 6 comprises attitudinal equity indicators, such as control over fishery resources and fair allocation of access rights. Together, the four independent variables account for 39 percent of the variation in the component (adjusted $R^2=0.394$). The multiple regression equation is significant ($p<0.01$). The fishers' understanding of project objectives and their influence over project planning tend to shape perceived changes in control over fishery resources and fair allocation of access rights. Fisheries tend to be better managed when the resource managers have a good grasp of why they are managing a common property resource, are aware of resource-enhancing measures to sustain the resource base, and have ample opportunities for contributing their insights during project planning exercises. In addition, instilling values on sharing responsibilities for communal property management and other collective efforts tend to bring about perceived increases in Component 6. Thus, co-management efforts must consciously aim at promoting a clear perception of project aims and transforming values to support collective resource management. They must also elevate the fishers' consciousness of resource conditions and deliberately seek the ideas and suggestions of fishers in planning the project.

The final step in the analysis was to sum up the component scores for the six components to obtain an overall measure of perceived changes, or total perceived performance (TPP). The correlations of total perceived performance with the independent variables were calculated. Variables manifesting significant correlations with the dependent variable were selected during the stepwise multiple regression analysis. The results show that, from the perspective of San Salvador fishers, the total perceived performance of co-management is related to changes in three independent variables: community can work together, influence on project planning, and the attitude that rule-breaking is unacceptable. These variables account for 22 percent of the variance in the component (adjusted $R^2=0.220$). Changes in the total perceived performance of co-management are positively linked to perceived influence on project planning and to the

unacceptability of rule-breaking as a personal behavior. However, those who perceived that the community could work together appear to score low on the total perceived performance. The regression equation is statistically significant ($p<0.01$).

The findings suggest that improving the total perceived performance of co-management requires reinforcing a sense of project ownership and providing venues for the interactive mapping out of institutional arrangements. The key is to strengthen planning capabilities, enhance confidence in expressing one's thoughts, and empower stakeholders to carry out their own resource management decisions. Moreover, value transformation in terms of proper attitudes toward rules and toward collective action, must go hand in hand with other project interventions to achieve conformity with property rights and rules and promote stable co-management arrangements. The willingness of fishers to comply with the rules, complemented by law enforcement efforts and a supportive local leadership, enhances the viability of the rules as coordinating devices for structuring behavior and for managing a communal property (i.e., marine reserve).

6.0 Characteristics of Successful Fisheries Co-Management Institutional Arrangements

1. **Existence of a resource availability problem.** The San Salvador experience confirms that collective arrangements develop when a group dependent on a resource experiences resource availability problems (i.e., declining or low fish catch). Village fishers who felt that the pre-project resource condition was bad tended to perceive larger changes in information exchange, knowledge of fisheries, and satisfaction with marine reserve management. The perception of a resource crisis has motivated them to interact with others and actively seek more information on fisheries. In the absence of skills on fish stock management, the San Salvador fishers drew on the expertise of external catalysts and derived inspiration from the experience of Apo Island in coral reef rehabilitation.

2. **Specification and enforcement of property rights.** Property/user rights address resource ownership and managerment. They define the required mechanisms and the structures to optimize resource use and

conservation, along with the means and procedures for enforcement. The San Salvador experience affirms that when user rights are clearly specified, legitimate, and enforced, as with the marine reserve and sanctuary, there is a likely change in the behavior and attitude of fishers toward conservation and a much greater chance that the intervention will be maintained.

3. **Influence of fishers on project planning and participation by those affected.** The San Salvador experience underscores the influence of fishers on project planning in bringing about perceived improvements in the overall performance of co-management. Drawing out insights from the community on what it needs and what matters to its members, as well as providing formal and informal venues for a free exchange of ideas, is a must. Active participation by those affected, particularly in mapping out co-management activities, is vital to ensure agreement with the proposed interventions and encourage fishers to take responsibility for implementation.

4. **Supportive local leadership and cooperation among fishers.** In San Salvador, leadership was definitely crucial to the establishment and continuity of the marine sanctuary and marine reserve. In the early years of project implementation, the informal, yet committed and determined core group, provided the leadership and the will to obtain community support for the sanctuary, file petitions and resolutions, report rule violations, and carry out environmental outreach efforts to neighboring villages. Later, the formally organized fishers' association, which spinned off from the core group, was at the forefront of protecting the sanctuary and marine reserve from illegal fishers and other law violators.

Based on the regression results, the attitude that fishers can work together can help bring about perceived increases in the overall well-being of fishery resources, conflict resolution, household income, and knowledge of fisheries. In San Salvador, the Haribon Foundation, a non-government organization, was largely responsible for re-orienting values and mobilizing village residents for collective action.

5. **Knowledge of project objectives.** A clear understanding of project objectives is likewise essential to co-management, particularly in enhancing perceived changes in collective decision-making, compliance with fishery rules, and benefits from the marine reserve. It is also linked to perceived improvements in control over

fisheries and fair allocation of access rights. Fisheries tend to be better managed when the day-to-day resource managers have a good grasp of why they are managing the resource and are aware of resource-enhancing measures.

6. **Positive attitude toward rules.** Also crucial to co-management institutional arrangements is a proper attitude toward rules (e.g., rule-breaking is not acceptable). This highlights the importance of deliberately transforming attitudes to support the management of a marine sanctuary and marine reserve, hand in hand with technical interventions. In a communal property regime, stability is partly dependent on a positive attitude toward rules, which influences rule compliance.

7. **Presence of legal and policy support.** Legitimacy of co-management interventions must also be provided through legal and policy support, complemented by a vigorous, fair and sustained law enforcement. In San Salvador, the Masinloc municipal government filled this role. Eventually, the government-organized marine guards and village police also assisted in patrolling the coastal waters of San Salvador. Co-management resulted in an actual imposition of sanctions against violators of fishery laws, higher rule compliance, and reduced incidence of community conflicts.

At the local government level, the municipal government of Masinloc demonstrated visible support to the project at the outset, primarily in terms of enabling legislation, conflict resolution, and law enforcement. Over time, the village *(barangay)* government became an active partner in monitoring illegal fishing activities. This was made possible by the election of some core group members to political positions in the village, assuring a local leadership that was supportive of resource management objectives.

8. **Community cooperation.** The attitude that the community can work together is positively associated with perceived improvements in control over fishery resources and fair allocation of access rights. However, it is negatively associated with the total perceived performance of co-management. These findings point out the existence of trade-offs in community cooperation. This may be better understood in the context of San Salvador's shift to new institutional arrangements. Establishing a communal property regime in a village with a long tradition of open access to fisheries is not easy. Some fishers are likely to suffer immediate losses

due to the redefinition of fishing rights and rules, the designation of a protected area where fishing is no longer allowed, and the banning of certain fishing methods in a previously unrestricted fishery. Being able to work together as a community means giving up unrestricted, open access rights, as well as independent decision-making and control, in order to achieve a collective good.

9. **Job satisfaction of fishers.** In San Salvador, job satisfaction is an explanatory variable that positively influences perceived changes in collective decision-making, rule compliance, and benefits from the marine reserve.Targeting fishers who would still choose fishing as an occupation if they were to live their lives over appears promising as a strategy for achieving a perceived improvement in rule compliance, which partly fosters the stability of fisheries co-management institutional arrangements, and in collective decision-making on fishery rules, which contributes to efficient institutional arrangements.

10. **Dependence on fishing as the most important source of total household income.** As shown by the regression results, dependence by households on fishing as a primary income source is likely to result in perceived improvements in benefits from the marine reserve and satisfaction with mangrove management. Since fishing income is directly linked to sound fisheries management, it is understandable for fishing-dependent households to be more conscious of changes in their resource base.

Dependence on fishing as the most important source of total household income, however, is negatively associated with perceived changes in other co-management indicators such as conflict resolution, collective decision-making, household income, and overall well-being of fishery resources. Thus, any threat to household earnings predominantly derived from fishing is likely to negatively affect perceptions of fishery conflict resolution and collective decision-making. It will also tend to influence perceived household income levels as well as perceived resource management conditions. In fishing villages driven largely by economic survival and poverty, it is important to introduce alternative, non-destructive technologies in a timely manner, provide supplemental income sources, and diversify existing skills.

11. Tangible benefits from co-management arrangements. Fish yield monitoring surveys in San Salvador indicated a 35 percent increase in fish density within two years of establishing the marine sanctuary. Changes

in fish diversity also took place. In the process, both project cooperators and non-cooperators gained from fish stock management. Survey results also indicated that all respondents, regardless of their status as project cooperators or non-cooperators, were convinced that the marine sanctuary is essential to fisheries management. Tangible observations since the sanctuary was established include an increase in fish catch, decline in illegal fishing, re-appearance of various types offish, and improved condition of coastal waters.

12. **Built-in monitoring and evaluation schemes.** Co-management interventions need to show concrete benefits to stimulate commitment and participation. Keeping track of the effects of management on the environment (e.g., fish abundance and reef health) and on the community (e.g., attitudes, income, assets, etc.) provides information that helps the clientele and the implementors understand what is occurring and helps sustain interest in the project. It also provides a basis to rethink the situation, identify new concerns, and refine earlier management strategies.

13. **Reinforced incentives to collaborate.** Over time, incentives must be reinforced at various levels to motivate resource users and other groups to cooperate. Disincentives must also be closely analyzed to come up with measures to reduce resentment and indifference. These will help activate interest in collective resource management.

In sum, the San Salvador experience demonstrates that the community can transcend obstacles associated with *de facto* open access nature of fisheries, in collaboration with those who are committed to protecting life-support systems. However, the challenge of protecting earlier resource gains remains. Livelihood opportunities need to be expanded. Though the majority of village fishers do not see the need to change the rules at present, unaddressed survival needs potentially threaten the sustainability of the marine sanctuary. Moreover, the election of a new village captain in May 1997 who is perceived to be unsympathetic to the sanctuary poses a new threat. Continuing advocacy of environmentally-sound efforts and support for the sanctuary by the new political leadership are imperative. The San Salvador experience, despite its drawbacks, still offers hope to many heterogeneous island communities without any

expertise on fish stock management. It affirms that a shift from a *de facto* open access fishery to a communal property regime, though not problem-free, can be achieved. The ability and unwavering resolve of resource users and stakeholders to cope with emerging threats, nonetheless, will heavily influence the resiliency of institutional arrangements in the future.