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

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International Center for Living Aquatic Resources Management (ICLARM) and
Haribon Foundation, Inc.

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ACRONYMS

AIM	-	Asian Institute of Management
BFAR	-	Bureau of Fisheries and Aquatic Resources
CAFGA	-	Cabangun Aquarium Fish Gatherers' Association
CBCRM	-	Community-Based Coastal Resource Management
CBRM	-	Community-Based Resource Management
CEP	-	Coastal Environment Program
DA	-	Department of Agriculture
DANIDA	-	Danish International Development Authority
DENR	-	Department of Environment and Natural Resources
DILG	-	Department of Interior and Local Governments
FARMC	-	Fisheries and Aquatic Resource Management Council
FSSI	-	Fund for Sustainable Society, Inc.
ICLARM	-	International Center for Living Aquatic Resources Management
IFM	-	Institute of Fisheries Management
LGC	-	Local Government Code
LGU	-	Local Government Unit
LOI	-	Letter of Instruction
LTK	-	*Lupong Tagapangasiwa ng Kapaligiran*
MCPSS	-	Marine Conservation Project for San Salvador
NAPOCOR	-	National Power Corporation
NGO	-	Non-Government Organization
NIPAS	-	National Integrated Protected Area System
NSC	-	North Sea Center
PAMB	-	Protected Area Management Board
PO	-	People's Organization
PTA	-	Parents' and Teachers' Association
PPA	-	Philippine Ports Authority
SPSS	-	*Samahang Pangkaunlaran ng San Salvador*
UP-MSI	-	University of the Philippines-Marine Science Institute

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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, village 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 events 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 fishery resources 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.

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1.0 Introduction

In 1994, the Institute of Fisheries Management (IFM) at the North Sea Centre (NSC), Denmark, and the International Center for Living Aquatic Resources Management (ICLARM), Philippines, embarked on a five-year Worldwide Collaborative Research Project on Fisheries Co-Management. Funded by the Danish International Development Agency (DANIDA), the project aims to build practical experience in fisheries co-management research, to evaluate co-management's potential as an equitable, sustainable and efficient management strategy, and to develop models of co-management for use by governments, fisher communities, non-government organizations (NGOs), and academic institutions. The two collaborating institutions have forged links with local research partners to conduct co-management case studies in selected countries throughout Asia and Africa including: Bangladesh, Benin, Côte d'Ivoire, Indonesia, Malawi, Mozambique, the Philippines, the Republic of South Africa, Thailand, Vietnam, Zambia, and Zimbabwe.

As part of its Fisheries Co-management Research Project in the Philippines, ICLARM staff have identified several case study sites in which there is sufficient experience with fisheries co-management to begin examining its 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 (NGO), 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

Fisheries co-management refers to the sharing of responsibility and/or authority between the government and local fishers/community to manage a fishery or a resource (Pomeroy and Williams 1994). It covers various partnership arrangements and degrees of power sharing. The extent of responsibility and authority, however, will differ and depend upon country- and site-specific conditions. In this light, there is no single model of co-management. 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). The San Salvador case falls under the latter situation, where the fishers have been key players in drafting a local sanctuary ordinance, reporting illegal fishing activities, and guarding resource uses in the marine sanctuary and reserve with government support. The municipal government, and eventually the village government, assisted in conflict resolution and law enforcement, among other activities. Thus, co-management calls for a dynamic partnership using the capacities and interests of the local fishers and community, complemented by the government's provision of enabling legislation, enforcement and other assistance (Pomeroy and Williams 1994). 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. The literature on common property regimes recognizes that solutions to resource use problems exist through three basic kinds of property regimes: 1) communal property or common property, where the resource is held by an identifiable community of users who can exclude others and regulate their own use; 2) state property, where state governance dictates that rights to the resource are controlled exclusively by government agencies on behalf of all the citizens; and 3) private property, where an individual or a corporate body has the right to exclude others and regulate resource use (Pomeroy and Berkes 1997). Open access, by contrast, is characterized by the absence of property rights (Bromley 1992). Not all resources used jointly by multiple individuals can be presumed as open access resources (Ostrom 1992).

The last decade has seen the proliferation of literature on community-based resource management (CBRM) and co-management. Much of what has been written has focused on the community level regarding issues of local organization, community-based process and development interventions. Much less has been written, however, about the role and activities of government. Yet, it takes two parties to have co-management, and the government is a crucial partner. If co-management initiatives are to be successful, basic issues of government legislation and policy to establish supportive legal rights and authority frameworks must be addressed (Pomeroy and Berkes 1997).

CBRM is a central element of co-management (Pomeroy and Williams 1994). It strives for more active fisher participation in the planning and implementation of fisheries management. The theme of CBRM is that self-involvement in resource management will lead to a stronger commitment to comply with sustainable resource uses and agreed upon rules. It allows the community to develop a management strategy which meets its own particular needs and conditions. As a result, a higher degree of acceptability and compliance with property rights and rules can be expected.

Building on a framework developed by the Workshop in Political Theory and Policy Analysis at Indiana University, USA, project collaborators have adopted an institutional analysis approach to

the study of fisheries co-management. As described in ICLARM/NSC Working Paper No. 1, the institutional analysis research framework is designed to examine the set of rights and rules governing the use of fishery resources. It is also meant to assess the way in which these institutional arrangements affect the resource users in terms of their incentives to cooperate in the formulation, implementation, or enforcement of resource management regimes and their methods of resolving conflicts over resource access.

The framework draws on concepts from economics, political science, anthropology, biology, and law, and bases itself on game theory, institutional economics, transaction cost economics, and public choice. 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]

2.1 Data Collection and Sampling

The data collection process has several steps. At the case study site, researchers investigate the creation of a co-management regime. A historical perspective allows the analysis to take into account data on contextual variables -- such as bio-physical and technical attributes, market, fisher/community attributes, institutional arrangements, and exogenous 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.

In San Salvador, the research team conducted a household survey to gather data on socioeconomic, bio-technical, and market variables, as well as on institutional arrangements such as property rights and rules, enforcement, and attitudes toward collective action and decision-making. The surveys also aimed to capture changes over time in various performance measures of the management regime. The list of performance indicators, divided into three major categories, is as follows:

a) **Equity**
- Participation in community affairs
- Influence over community affairs
- Control over fishery resources

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

- Fair allocation of access rights to fishery resources
- Satisfaction with fishery arrangements
- Benefits from the marine reserve
- Overall well-being of the household
- Household income

b) **Efficiency**

- Collective decision-making on policies/rules governing the use of fishery resources
- Quickness of resolving community conflicts on fishery issues

c) **Sustainability**

- Overall well-being of fishery resources
- Community compliance with fishery-related rules
- Knowledge of fishery
- Exchange of information on fisheries management

On site, seven field enumerators were trained to gather household data. The sample size of 42 was based on power analysis described by Cohen (1988), and included two sample groups of 21 each: members of the fishers' association and non-members. The sample was separated 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. Any given sample may fail to result in a statistically significant finding, even when there is a significant difference in the population. Therefore, 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.

Prior to conducting the power analysis, the following assumptions were made: 1) the *alpha* is set at 0.05, two-tail and 2) the sample size for each group equals 21. 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 (Table 1).

Table 1. Power analysis for different sample sizes

Group size	Two-Tail	One-Tail
25	.93	.97
23	.91	.95
21	.88	.94
19	.85	.92
17	.80	.89
15	.75	.85
13	.68	.80
11	.60	.73
9	.51	.65

The research team used an updated list of village households by occupation to draw up the sample of respondents for the survey. The sample included only households directly involved in fishing, either as a primary activity or a supplementary source of livelihood. Then, respondents were further classified into members and non-members of project beneficiary associations. From these groups,

random selection was employed to arrive at the final sample of respondents.

The research team then conducted key informant interviews to probe into the project experience (i.e., setting up a marine sanctuary and a marine reserve) and to investigate organizational and institutional arrangements before, during, and after project implementation. Key informants included village officials, past and current officers of beneficiary associations, members of beneficiary organizations and other community-based organizations, fish traders, community organizers, field staff and other project implementors, and various personnel of local government units (LGUs) at the municipal level. Secondary data, including local legislation/ordinances, socioeconomic-demographic profiles, project preparation documents, progress reports, and published articles, were collected to support the primary data.

2.2 Data Analysis

Descriptive and inferential statistics, both univariate and multivariate, were used to summarize and analyze primary data. The descriptive analysis covered frequency counts, percentages, means and standard deviation to provide a distribution of respondents across contextual variables. For hypothesis testing and quantitative analysis, several inferential statistical tools were employed in the study, namely: chi-square, t-test (paired and independent sample), principal component analysis, correlation analysis, and regression.

For nominal/categorical variables, chi-square tests the hypothesis of independence between samples of respondents, e.g., members and non-members. The paired t-test tests for significance of difference between two time periods while the independent sample t-test tests for significance of differences between two independent samples, e.g., members versus non-members. Correlation and regression analysis determine the relationship between dependent and independent variables. Principal component analysis, a variable reduction procedure, assesses whether relationships can be reduced to a smaller number of components or composite variables and thus account for most of the variance in the observed variables.[2]

[2] The discussion of methodology in the previous two sections comes from Pomeroy, R.S., Pollnac, R.B., Predo, C.D., and Katon, B.M., "Impact Evaluation of Community-Based Coastal Resource Management Projects in the Philippines," Research Report No. 3, ICLARM, June 1996.

3.0 Overview of the Fisheries Co-Management Experience of San Salvador

San Salvador, an island *barangay* (village) of Masinloc municipality in the province of Zambales, is located on the western coast of Luzon in the Philippines. It has been inhabited by approximately three generations of residents (Christie, White, and Buhat 1993). The initial migrants, who were largely farmers from the mainland of Zambales Province, neither had a well-defined tradition of fisheries management of its own nor an indigenous expertise on fish stock management.

Before World War II, San Salvador residents recalled an abundance of marine resources, use of non-destructive fishing methods, a relatively homogeneous population, and a subsistence economy. These attributes, together with the lack of resource use conflicts, enabled the village fishers to enjoy an open and unrestricted access to the fishery.

During World World II (early 1940s), Japanese troops occupied the island of 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.

In the 1970s, the scenario began to change due to three major 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. The decade ushered in 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 compressor, 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.

Driven by poverty and population growth, fishers from the mainland of Zambales province frequented the rich fishing grounds of San Salvador, thinking that marine resources were inexhaustible. 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 fishery resources to further stress. The average fish catch per unit effort reportedly dwindled from 20 kilos per fishing trip in the 1960s to merely 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 (Christie and White 1994). The mean dead standing coral cover was 19 percent. The worsening resource situation was closely linked to unsound fishing practices, ignorance of fisherfolk on fish stock management, siltation from the Zambales mountains, 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 lack of knowledge of marine ecosystems and the long-term effects of destructive fishing methods could have led to irreversible damage were it not for the timely intervention of external catalysts. In March 1987, Patrick Christie arrived in San Salvador as a Peace Corps volunteer working with the Bureau of Fisheries and Aquatic Resources (BFAR). For about a year, he was instrumental in assessing the needs of San Salvador, the level of environmental awareness of village residents, and existing reef conditions. He initiated dialogues with village officials, the municipal mayor, non-government organizations, and the BFAR. In the process, he drummed up support for rehabilitating the fishery resources of San Salvador. Thus, the concept of a marine sanctuary and reserve emerged in 1988.

A project proposal on the Marine Conservation Project for San Salvador (MCPSS), prepared by Patrick Christie, was approved and funded by the Netherlands Embassy and the Jaime V. Ongpin Foundation from 1989 to 1991 for US$17,000. Additional financial support beyond the two-year period came from the World Wildlife Fund Debt-for-Nature Swap program until 1993. The Haribon Foundation, as the implementing non-government organization (NGO), provided personnel and logistical support to the project. Haribon was one of the first Philippine environment groups to recognize the role of the community in managing and sustaining resource management projects. The MCPSS is virtually a milestone, being the first marine sanctuary established in Luzon, a major geographical region in the northern Philippines.

During the first two years of project implementation, the MCPSS was patterned after the Silliman University Marine Conservation and Development Program. As an innovation in the succeeding years, Haribon evolved a partnership between a natural scientist and a social worker. It also helped develop a people's organization (PO) and added a livelihood component, which distinguished the MCPSS from the project of Silliman University. The goal of the MCPSS was to reverse the downward trend in fish yields from the coral reef through community involvement in fishery resource management (White and Savina 1987).The project sought to enhance institutional capabilities, develop and implement a marine resource management plan, and establish 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 marine resource management and alternative income-generating projects.

According to Haribon, the MCPSS was conceived as a community-based coastal resources management project, not really a co-management project. Over time, however, the government became a key player 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 MCPSS used the community organizing process as a tool to achieve its goal. Under this process, the community identifies its own needs and objectives with the aid of a community organizer, develops the confidence and the will to work toward meeting the objectives, takes appropriate action, and, in so doing, develops collaborative attitudes and practices (Buhat 1994). Community organizing, as adopted by the project, did not end in the formation of groups alone. It also became a venue for resolving conflicts on resource uses and for reconciling competing interests. More importantly, it was an instrument for spurring people into action and for collectively managing fishery resources.

In late 1988, another external catalyst named Delma Buhat joined Patrick Christie in San Salvador. Ms. Buhat was a Filipino community organizer deployed by the Haribon Foundation in December 1988, in time for the formal project inauguration that month. The inauguration was attended by Mayor Jessu Edora, 150 residents, and 16 guests from local and Manila-based institutions that supported the project. Setting a tone of commitment for the ceremony was the apprehension and jailing of a group of dynamite fishers just before the inauguration (Buhat 1994).

An intensive environmental education and information campaign was a crucial part of project implementation. It employed both formal and informal methods (e.g., dialogues, slide shows, role playing, environmental drawing contests, and other popular education methods) to heighten the need to nurture the environment. The Peace Corps volunteer and the Filipino community organizer enlisted the community's assistance in conducting baseline socioeconomic-demographic surveys and evaluating traditional resource use practices. In addition, they carried out a two-year fish yield study with interested fishers in the village as record keepers to keep track of resource improvements over time. The results were shared with community leaders, municipal officials, and staff of the Department of Agriculture (DA).

A major turning point in MCPSS implementation was a 10-day trip to Apo Island of seven village residents, which provided a concrete example of how an island community manages its fishery resources. Inspired by the sanctuary experience of Apo Island in rehabilitating corals and enhancing fishery resources, a core group was informally formed after the field visit, which became known as *Lupong Tagapangasiwa ng Kapaligiran* (LTK) or Environment Management Committee (Tongson 1996). The LTK was drawn from committed individuals who consistently participated in project activities and who shared a concern for rehabilitating the island's fishery resources. The LTK, together with the community organizer and the Peace Corps volunteer, held various dialogues and meetings to motivate village residents to support the establishment of a marine sanctuary and reserve and convince the community that fisheries management was in its best interest. It was also at the

forefront of drafting a village resolution on establishing a marine sanctuary, where fishing was not allowed, and a marine reserve, where non-destructive fishing technologies could be used.

The subsequent passage of Municipal Ordinance No. 30, series of 1989, by the Municipal Government of Masinloc lent legitimacy to the effort to protect and rehabilitate San Salvador's remaining resources as well as apprehend violators. It also provided an opportunity for the municipal government and the village of San Salvador to cooperate in fisheries management.

From 1989 to 1993, the Haribon Foundation, Municipal Government of Masinloc, and the San Salvador community jointly implemented the MCPSS. In 1993, the Haribon Foundation turned over the project to the people's organization (PO) it helped establish, known as the *Samahang Pangkaunlaran ng San Salvador* (SPSS), in an emotional ceremony that ended four years of community organizing work. The SPSS, whose beginnings could be traced to the LTK, evolved from the core group established by Haribon and in 1993, formally registered with the Securities and Exchange Commission.

The municipal mayor of Masinloc adopted the project and has since become an active partner of the SPSS and the village government, reaping public recognition afterwards as a result of his active involvement in the management of the San Salvador marine sanctuary. Despite the phase-out of the Haribon Foundation in 1993, project initiatives were sustained by the village and the municipal government, demonstrating that they could share responsibility for fisheries management. The MCPSS, which adopted a community-based approach to resource management, was a vital springboard for making co-management work in San Salvador.

Despite organizational problems, the SPSS has continued to operate. The Haribon Foundation, upon request, still supports the SPSS. In early 1997, it provided para-legal training on environmental laws to the members of the *Bantay Dagat* (Guardians of the Sea) and *Barangay Tanod* (Village Police) in response to the request of the village captain. Moreover, it conducted a two-day evaluation of the SPSS members to assess their progress since the project was turned over to them in 1993. Proposed activities were reviewed against implemented activities. The future plan of SPSS to consolidate itself and strengthen its members was also laid out. Haribon, through a grant from the Fund for Sustainable Society, Inc. (FSSI), is now assisting the village in identifying viable livelihood projects. Livelihood is recognized as a crucial component of resource management since poverty lies at the root of environmental degradation of the island's marine ecosystem.

The San Salvador experience demonstrates that the community can rise above the obstacles associated with *de facto* open access nature of fisheries and initial indifference to the resource situation. It offers hope to many small island communities in a similar situation with an unwavering resolve to avert resource deterioration. Encouraged by improved fish catches and public recognition of their resource management activities, the village residents pursued collaborative efforts and renewed their confidence in their political institutions (Tongson 1996).

4.0 Contextual Variables

Contextual variables refer to the key attributes of the resource, resource user and fisheries management arrangements. They cover six sets of variables: 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.

4.1 Physical, Technical and Biological Attributes of San Salvador

This section highlights the physical, technical and biological attributes of San Salvador island which have shaped fishery-related institutional arrangements over time. It also provides a historical perspective of the changes in the island's resource status and resource uses, which led to major resource management interventions at the site.

Overall, the fishery of San Salvador may be described as multi-species, multi-gear and artisanal. Fishery resources comprise a mix of migratory and sedentary species. San Salvador has been marked by a low coral cover, a falling fish catch over time, and a decreasing catch per unit effort due largely to the shift to destructive fishing gear in the 1970s. Conflicts over fishing grounds and over fishing gear occurred due to increasing competition for fishery resources among various resource users. Fishing is generally a year-round activity and is normally done in dispersed fishing grounds, both around and outside San Salvador island.

4.1.1 Physical Attributes

San Salvador is an island village which forms part of the municipality of Masinloc in Zambales. It is located 250 kms north of Metro Manila. The trip to the Masinloc town proper involves a six-hour ride by land transportation on a paved road network. San Salvador itself is about 2 kms west of Masinloc town proper, requiring a 30-minute motorboat ride to the island facing the South China Sea. The island is bounded on the north by Masinloc Bay; on the east, by Pilapir Island; and on the south, by Panglit Island and Magalawa Island of the neighboring municipality of Palauig (Figure 1).

San Salvador's situation is typical of many Philippine islands. At the start of project implementation in 1989, it was characterized by a culturally heterogeneous population, high dependence on fishing and farming, recent in-migration of non-local groups, relatively poor coral reef status, overexploited fishery resources, and low household income (Table 2). It was also accessible to transient fishers from neighboring villages and other provinces.

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 (Figure 2). The fringing coral reefs exposed to wave action exhibit deep spur-and-groove formations dominated by massive and

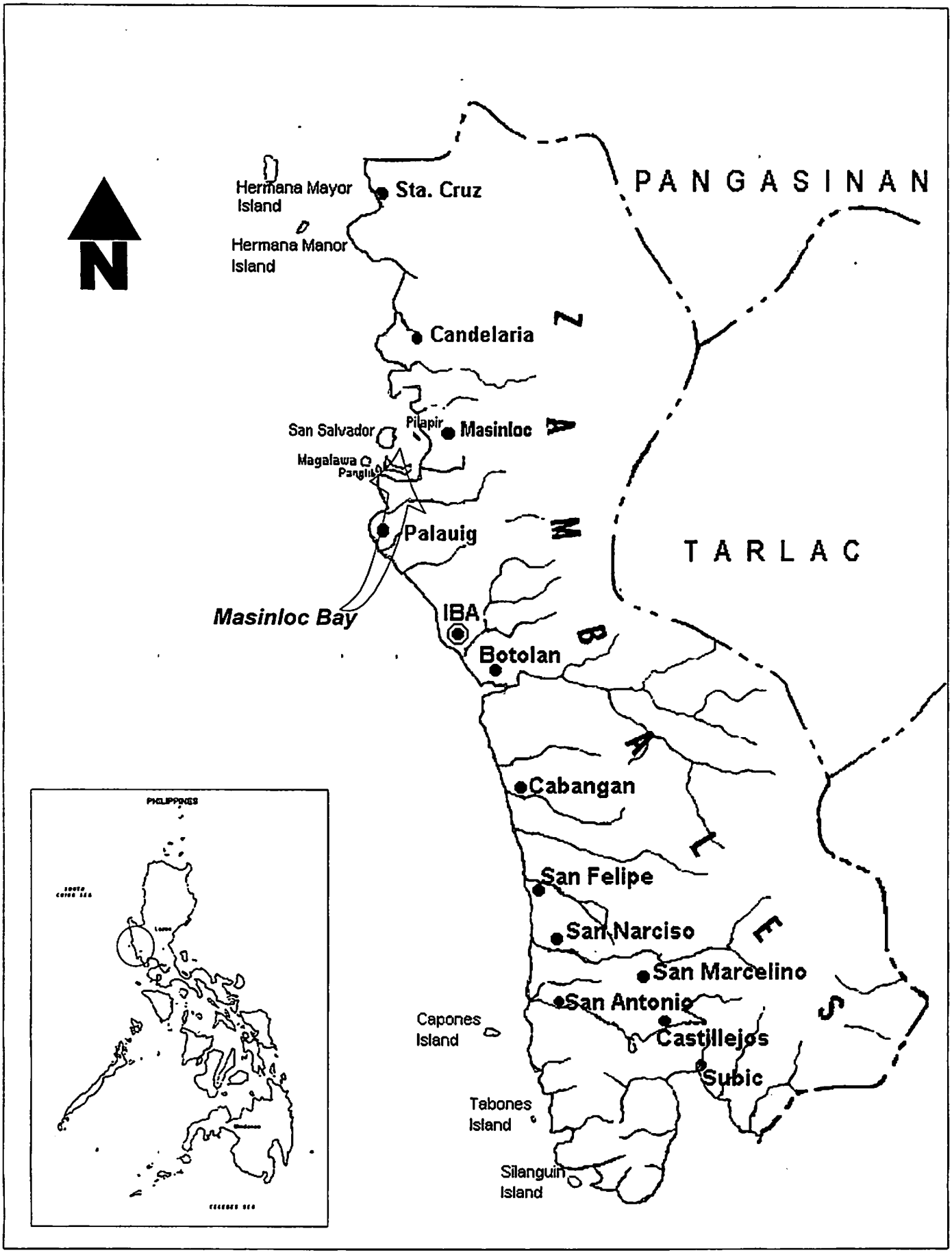
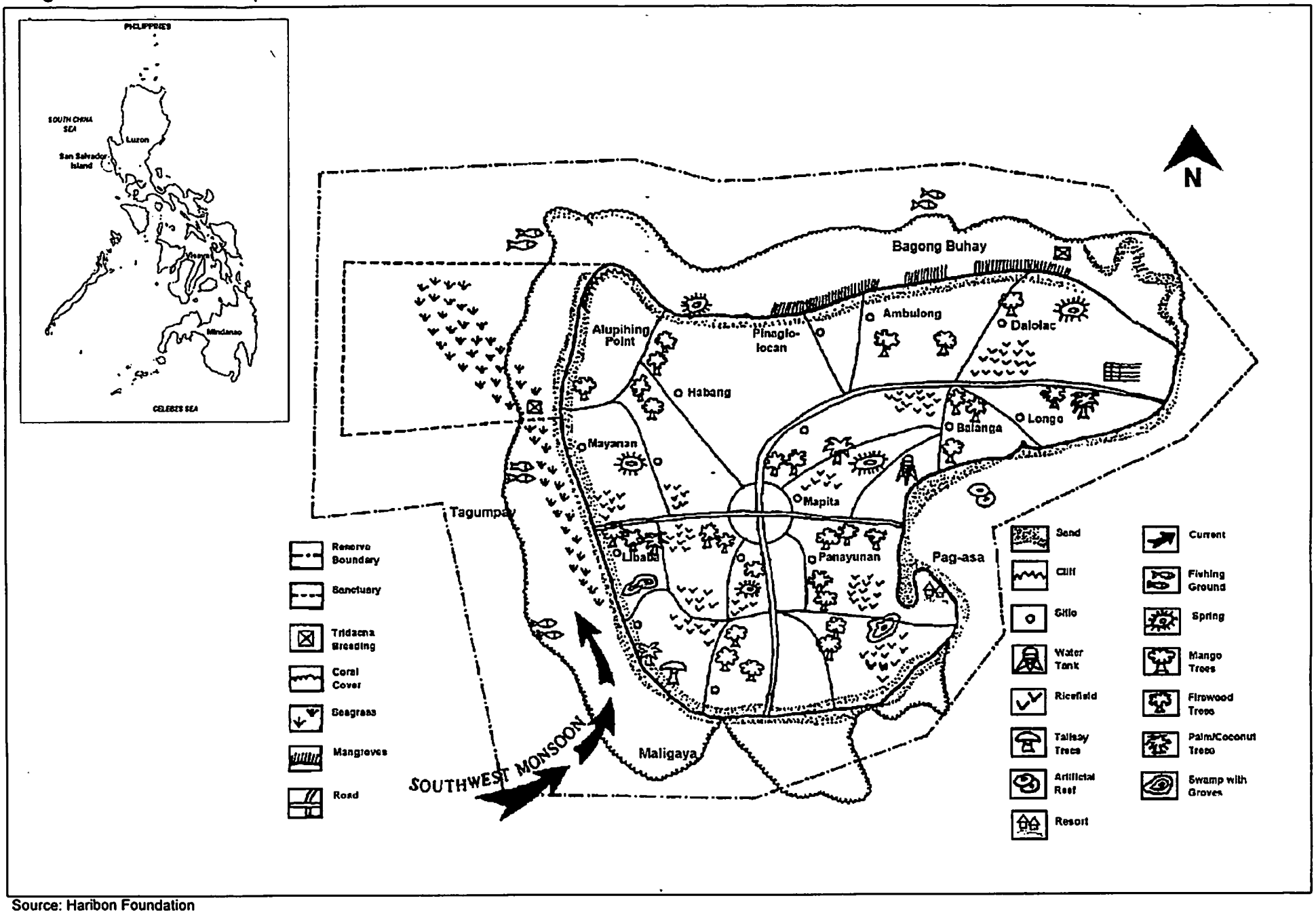


Figure 1. Location map of San Salvador Island.

Figure 2. Resource map of San Salvador Island.



Source: Haribon Foundation

Table 2. Summary of Contextual Variables: San Salvador, Masinloc in Zambales, Philippines

Period	1940s	'50s-'60s	'70s	1980-86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97
Contextual Variables															
o **Biological, physical and techno logical attributes**															
Abundant fishery resources	----------	----------													
Use of traditional fishing methods	----------	----------	----------					----------	----------	----------	----------	----------	----------	----------	----------
Shift to destructive fishing methods			----------	----------	----------	----------	----------								
Destroyed coral reefs/marine habitats			----------	----------	----------	----------	----------								
Declining fish catch				----------	----------	----------	----------								
Re-appearance of groupers, lobsters, etc./increase in fish catch after the sanctuary establishment								----------	----------	----------	----------	----------	----------	----------	----------
Zoning of Masinloc Bay waters														-----	
o **Market attributes**															
Integration into an export-oriented market for aquarium fish			----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------
o **Attributes of fishers and community**															
Dependence on fishing and farming	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------
Low household incomes					----------	----------	----------								
Heterogeneous ethnic/cultural groups			----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------
o **Village institutional and organ-izational arrangements**															
Open access to all municipal waters	----------	----------	----------	----------	----------	----------	----------								
Fragmented/unorganized fishers	----------	----------	----------	----------	----------	----------	----------	----------							
Banned practice of designating selected fishing spots by buoys and anchors			------												
Off-limits to/no fishing in marine sanctuary								----------	----------	----------	----------	----------	----------	----------	----------
Joint patrolling of municipal waters								----------	----------	----------	----------	----------	----------	----------	----------
o **External insitutional and organizational arrangements**															
Limited services from external groups			----------	----------	----------	----------	----------								
Legitimacy accorded to sanctuary manage-ment through a municipal ordinance								----------	----------	----------	----------	----------	----------	----------	----------
Legitimacy to co-management efforts															
- Local Government Code									----------	----------	----------	----------	----------	----------	----------
- National Integrated Protected Areas System (NIPAS) Act										----------	----------	----------	----------	----------	----------

encrusting coral types. The less turbulent areas with the more delicate branching corals have been heavily damaged by blast fishing and sodium cyanide use (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. Siltation from the Zambales mainland was more of a problem.

At the onset of the 1990s, the village of San Salvador pursued reforestation efforts on the island, which involved 8,000 mangrove seedlings to reduce the effects of siltation as well as 2,500 tree seedlings. About 60 percent of the trees (forest and fruit trees) survived. However, lahar from Mt. Pinatubo flowed into Masinloc Bay in 1992 and destroyed most of the one-year old mangrove seedlings. Less than 200 mangrove plants survived.

Boundaries

Historically, the waters of San Salvador have been marked by open access. Assignment problems associated with productive fishing spots were generally non-existent 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.

Legal and technical boundaries are relatively recent. They arose from the passage of the sanctuary ordinance in 1989 by the municipal government and the declaration of Masinloc Bay as a protected seascape in 1993.

Customary Boundaries. San Salvador has no customary boundaries. Anyone could fish freely in the area, denoting an open access fishery. Over time, however, this free-for-all entry led to resource depletion and degradation due to uncontrolled resource extraction for economic gain and the shift to destructive fishing methods. In 1989, formal intervention by external catalysts and local authorities became imperative to avert the worsening resource situation. This redefined access to the coastal waters of San Salvador and set in place formal property rights and rules.

Political Boundaries. 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, as defined in the 1991 Local Government Code (LGC). 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 BFAR (see section 4.6 on external institutional arrangements for details). BFAR regulates commercial

fishing activities in these national waters, along with the operations of fishing vessels of more than three gross tons.

Legal Boundaries. 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 designated a marine reserve with a strip of varying distance from the shoreline along the island and also specified a sanctuary area. A traditional fishing area within the marine reserve but outside the sanctuary was designated for non-destructive fishing methods, such as hook and line, bamboo traps (3 cm), gill nets (3 cm), spear fishing without air compressor, other types of netting, traditional gleaning, gathering of seaweeds, shells and other products, and catching of siganid juvenile (*padas*) during September. No fishing is allowed in the sanctuary. As a whole, the area of the marine sanctuary and reserve is 127 hectares.

Technical Boundaries. Masinloc Bay, together with Oyon Bay, was declared as a protected seascape under Presidential Proclamation No. 231 dated 18 August 1993, as recommended by the Department of Environment and Natural Resources (DENR). The underlying rationale is to protect and conserve the ecological, scenic, scientific and educational features of the area. The destruction of the coastal and marine resources, including mangroves, coral reefs and seagrass beds or any other activity which could disturb or destroy these ecosystems, is prohibited. In this regard, the Protected Area Management Board (PAMB) headed by the DENR drew up a management plan for Masinloc and Oyon Bays in 1996. The guiding management strategies adopted by the PAMB are resource appraisal and assessment, habitat rehabilitation, resource protection, environmental education, interpretation program (installation of boundary markers, information campaigns, and community empowerment), and management zoning.

Figure 3 shows that Masinloc Bay is divided into seven management zones at present: 1) strict protection; 2) restoration; 3) multiple use; 4) sustainable use; 5) recreational zone; 6) special use, and 7) research and development zones (DENR 1996). The marine sanctuary of San Salvador falls under the strict protection zone, where harvesting of marine resources is prohibited within defined boundaries to ensure continued resource regeneration. Another sanctuary is proposed in the vicinity of San Miguel Island to ensure the healthy condition of the reef in the area.

Restoration zones are areas where reforestation or rehabilitation is needed, mainly mangrove forests and seagrass beds. They are ecologically important due to the role they play in the reproduction of many marine organisms. They serve not only as nursery and spawning grounds for many marine species but also prevent erosion and damage from storms. To date, 26 hectares have been reforested with mangrove in Panglit Island, Luan Point, barangay Baloganon, and Balogo. Seagrasses, moreover, have been transplanted from the site of the National Power Corporation (NAPOCOR) to a one-hectare site in Oyon Bay.

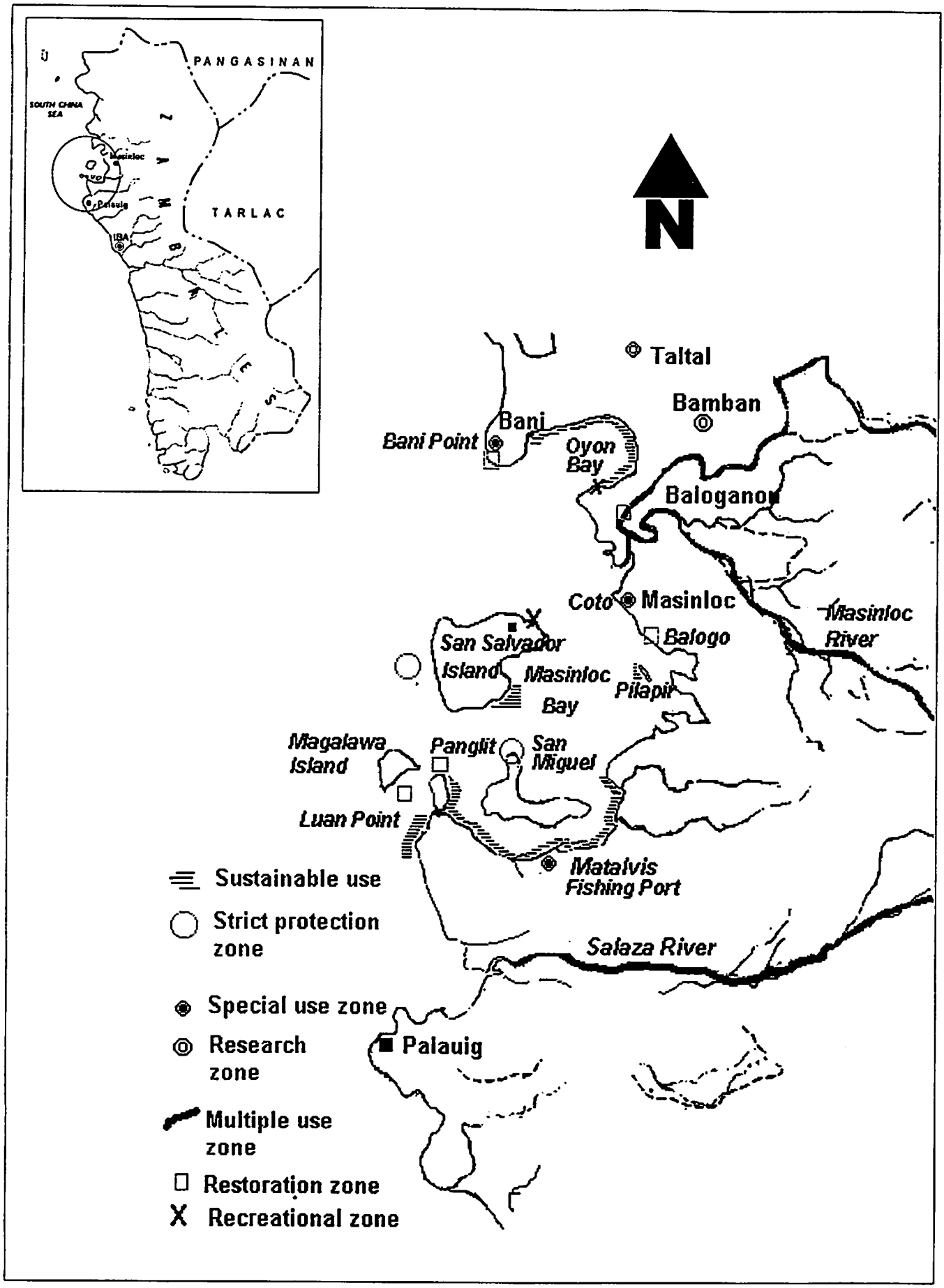


Figure 3. Management Zones of Masinloc-Oyon Bays

Multiple use zones are areas where settlement, traditional and or sustainable land use may be allowed, including agriculture, agroforestry, extraction activities and other livelihood activities. The areas identified for multiple use are the Masinloc River and Salaza River. Harvesting of *nipa* (palm) for shingles and vinegar-making as well as gathering of shells, crabs and fish for consumption are existing activities in these areas.

Sustainable use zones allow harvesting of marine resources such as fishing, firewood collection, and gleaning of the reefs and seagrass beds at low tide, subject to regulation and monitoring to prevent resource depletion. Designated areas include the southeastern portion of San Salvador where traditional fishing is allowed; Pilapir Island, which is a traditional fishing ground and a suitable site for seaweed farming and other aquaculture activities; and Port Matalvis, Luan Point and Oyon Bay proper, which are all traditional fishing grounds.

Recreational zones have been identified by the DENR for scuba diving, snorkelling and tourist-oriented activities, specifically the northeastern coast of San Salvador and the southwestern coast of Oyon Bay. Special use zones are areas of industry development, or where existing installations are located such as telecommunications facilities or electric power lines. Identified areas in Masinloc and Oyon Bay are Bani Point, site of the NAPOCOR power plant; Coto, Masinloc proper, site of the wharf; and Matalvis fishing port located near Lombo Creek. The need for monitoring discharges from these areas has been recognized as imperative due to their impact not only on the immediate area but throughout the bay.

Research and development zones are areas where information on the dynamics of the marine ecosystem can be collected and analyzed to aid in making correct management decisions on the protected area. Activities in these zones, moreover, are aimed at developing technologies to enhance livelihood such as seaweed farming, fishpen and fish cage culture, giant clam culture, sea ranching and other marine-based activities. Two areas have been identified for research and development: the Department of Agriculture's Research Outreach Station in barangay Bamban and the site of the Coastal Environment Program (CEP) in barangay Taltal.

4.1.2 Technical Attributes

Fishing Gear. From the pre-World War II period up to the 1960s, San Salvador fishers basically used traditional and non-destructive fishing methods, such as hook and line, nets and speargun. *Kunay*, a beach seine with a long scareline of coconut fronds, was also used. Gleaning in the shallow reefs was done by women largely for household consumption.

The 1970s, however, brought about a shift to destructive fishing methods, such as blast fishing and aquarium fishing with the use of sodium cyanide. These were due to the influx of migrants who brought in destructive fishing technologies, the integration of the village economy into the export market for aquarium fish, and a growing population. Destructive fishing was primarily responsible for the devastation of fishing grounds and the decline in average fish catch in San Salvador. With

the establishment of the marine reserve in 1989, destructive fishing gear types were disallowed in the reserve.

At present, fishing is done throughout the year but the choice of fishing gear varies, given monsoon conditions. Figure 4 shows the types of fishing gear used and types of fish caught by San Salvador fishers. The types of fishing gear used year-round include nets (gillnets, netsman[3] 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.

To date, there are about 204 fishers in San Salvador who use various fishing gear. Overall, the most common fishing gear is municipal bagnet (*singapong*), which is used by 34 percent of the fishers. Following are compressor (27%), hook and line (11%), handline (11%), spear fishing during free diving (11%), gill nets (5%), and speargun fishing (1%).

Municipal bagnet is a type of fishing gear which uses kerosene-pumped lamps to attract the anchovies and a net to capture the fish. As the fish congregates, the net is slowly lowered starting from the prow of the boat to the back. The net, which measures 12 meters by 6 meters, has a mesh size of 38 cms. A boat powered with a 16 horsepower engine or better is usually manned by a two-person crew. Fishers normally stay overnight at the fishing ground, depending on how fast the anchovies congregate near the lights. During a good season, fishers can harvest about 87.5 kgs. On a bad season, however, only 2.5 kgs are reportedly caught.

For non-users of the municipal bagnet, the highest fish catch for food/edible fish ranges from 11-20 kilos per fishing trip while the lowest catch is less than 5 kilos. For those using netsman for catching aquarium fish, the fish catch is relatively stable at 37 pieces per fishing trip.

New fishing methods introduced by outsiders in San Salvador since the 1970s include aquarium fishing, use of artificial octopus as a bait (origin not clear), and use of crystallite (bait) for catching octopus. Fishing gear types which are no longer existent generally cover those which have been declared illegal due to their small mesh size and coral-damaging effects such as beach seines (*kunay*, *sayorsor* and *sayongong*).

Information Sources on Gear Types. Based on a random sample survey of 42 fishing households in November 1996, San Salvador fishers are heavily dependent on other fishers for information on gear types (51%). Others draw their information from non-government organizations (15%), radio (15%), and own experience (15%). Only a few depend on government technicians (2%). Still others depend on their parents and on television (1% each).

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[3] 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.

Figure 4. Seasonality of gear types used and species caught, San Salvador Island, Masinloc, Zambales

Gear Type	Species Caught	Seasonality/Months Used											
		J	F	M	A	M	J	J	A	S	O	N	D
Nets (*lambat or panti*)	▪ *Taba* *matambaka* (big-eyed scad), *alumahan* (mackerel), *lugho*, *salaysalay* (crevalle), *mulmol* (wrasse or parrotfish), *isdang bato*, *isdang pula*, *talakitok* (trevally), *galunggong* (roundscad), *banak* (mullet)												
	▪ *Netsman* Tangfish, angelfish, butterflyfish, damselfish, chromis, goldfish, puller, scorpionfish, coralfish, other types of aquarium fish												
	▪ Singapong Dilis (anchovy), *galunggong* (roundscad), *manguliting* (anchovy), *salaysalay* (crevalle), *oriles*, *torsilyo*, *tamban*, (spanish mackerel),												
Speargun (*Pana*)	*samaral* (rabbitfish), *lapulapu* (grouper), *kugita* (octopus), *talakitok* (trevally), *torsilyo*, *sungayan*, *tarian* (surgeonfish), *isdang bato*, *surip* (fusilier), *ulang/banagan* (lobster), *maya-maya* (snapper)												
Hook and Line (*Kawil*)	▪ *Kawil* (single) *Baralyete* (yellow-fin tuna), *talakitok* (trevally), *tangigue* (indo-pacific spanish mackerel), *maya-maya* (snapper), *loro* (parrotfish), *igat* (eel), *baracuda*, *bonito* (frigate mackerel), *bisugo* (threadfin bream), *pating* (shark), *salaysalay* (crevalle), *pugita* (octopus), *tulingan* (jack)												
	▪ *Kitang* (multiple hook) *Lapu-lapu* (grouper), *mayamaya* (snapper), *danggit* (rabbitfish)												
	▪ Bondying (handline) *Baralyete* (yellow-fin tuna), *talakitok* (trevally), *tangigue* (indo-pacific mackerel), *susay* (blue marlin), *baracuda*, *pating* (shark)												
Compressor (*hookah diving*)	ulang/banagan (lobster), *lapu-lapu* (grouper), *samaral* (rabbitfish, *dalagang bukid* (fusilier), *kugita* (octopus)												

Effective Fishing Time and Crew Size. For most fishers, the effective fishing time per trip ranges from 3 hours or less (41%) to overnight (49%). Fishing trips normally involve a small crew of 1-2 persons (64%). Only 4 percent reported a bigger crew of more than 5 persons. The rest of the fishers (30%) have 3-4 assistants.

Types of Boats Used. Motorized boats are dominant in San Salvador, accounting for 109 out of 124 boats in 1996. Only 15 boats are non-motorized. The motorized boats are normally equipped with a 16-horsepower engine.

Based on a survey of fishing households in November 1996, fishers usually operate in waters with a depth of 11-30 fathoms (52%). Only 21 percent venture into waters exceeding 30 fathoms. Others (27%) fish in shallower waters of 10 fathoms and less.

Fish Harvest Sharing System. Sharing arrangements in San Salvador vary by type of gear. Handline fishing for tuna, which involves a fishing trip of 3-6 days a week outside Masinloc, has two types of fishers --- the *sukob* (trusted member) and the crew. The *sukob* is the supervisor during the fishing trip who consigns a boat from a Masinloc-based manager and who receives a share of whatever amount is earned from the trip. The crew are ordinary handliners hired by the supervisor to fish. After the fishing trip, half of the fish catch of the crew and the entire fish catch of the *sukob* are added. The expenses are then deducted from the gross earnings. Finally, the balance is divided into 3 parts (2/3 to the *sukob* and 1/3 to the boat owner).

Gillnet users, on the other hand, who catch around 5-10 kilos of siganids and surgeonfish during a four-hour fishing trip, usually deduct the expenses incurred during the trip from their total earnings. The balance is then divided into five parts (or 4/5 to the fisher and 1/5 to the gillnet owner). For municipal bagnet (*singapong*) users, who catch 87 kilos of anchovies on a good fishing season, the net earnings are divided into 4 parts (2 parts to the crew and 2 parts to the boat owner).

In general, the highest net income range per fishing trip is P401 to P1000, equivalent to US $15-$38. The lowest net income per fishing trip, on the other hand, is less than P100 (US $3.80).

4.1.3 Biological Attributes

Live Coral Cover. A coral reef substrate survey in 1988 showed a 5-50 percent live coral cover with a mean of 23 percent for the whole island of San Salvador (Christie et al. 1993). The mean dead standing coral cover was estimated at 19 percent, primarily attributed to the damage wrought by blast fishing and sodium cyanide use. Snorkel transects based on Dahl's (1981) methodology were employed to estimate substrate coverage along the island's crest reef.[4]

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[4] Transects randomly distributed along the reef crest were 60 kick cycles in length. Substrate coverage percentiles were estimated within four sample circles (3-m diameter) evenly spaced along the transects.

In 1994, the Department of Environment and Natural Resources and the Raymundo Engineering Services conducted another coral reef assessment using a different methodology (i.e., manta tow reconnaissance survey). At each station, two 50-m transects were laid parallel to the shore at a uniform depth. The transect station at San Salvador, which was located at the eastern portion of the island that is well protected from strong waves, has a live coral cover of 47 percent (fair). This biological finding, however, does not indicate improvement or deterioration compared to 1988 reef conditions due to the difference in the methodologies used. At best, it indicates a fair coral reef condition at the time of the assessment.

Fish Catch and Fish Species. The devastation of San Salvador' s fishing grounds in the 1970s and 1980s led to the depletion of many types of marine products such as siganids, groupers, snappers, lobsters and spotted eagle rays. This situation prompted a major coral reef management intervention at the site, primarily through the Marine Conservation Project for San Salvador (MCPSS) from late 1988 to 1993.

Gemino Edora, a 38-year old fisher who has been fishing with a net since he was 15 years of age, recalls vividly, ***"In the 1960s, we could catch 20 kilos of fish 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 earlier decades brought about by illegal and destructive fishing activities. The native Sambals learned the sodium cyanide technique when they worked as linemen during fishing trips for the the Visayan migrants and discovered that they could obtain a higher catch with this technique.

With a sparkle in his eyes, Gemino eagerly 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. Often, I fish with three other companions 2-3 times a week. During calm months, however, we go out daily on 3- or 4-hour fishing trips, using a 100-meter long net with a mesh size of six cms to catch surgeonfish (tarian) and siganids (samaral)."***

Tio Kikoy, a fisher and an officer of the SPSS, 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."***

Boy Gocon, however, who has been catching anchovies (*dilis*) since 1974 with a municipal bagnet, noticed a downtrend in his catch. He laments, ***"I came to San Salvador in 1972 and decided to go into anchovy fishing. I used to have 10 pails (1 pail = 17 kilos) of anchovies in one hour. Now, I only have 3-4 pails."*** He ventures that the bleaching of corals and the decline in reproductive adults could have led to the present situation. He adds, ***"Anchovies do not congregate in areas where there are no live corals."***

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 square 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, when compared to Apo Island where an increase of 173 percent was experienced within two years (Christie et al. 1994). Local fishers, however, have noted an increase in fish catch since the MCPSS started. Actual surveys from 1988 to 1990 of reef catch and non-reef catch (Box 1) also confirmed that reef catch almost doubled (99%), but non-reef catch grew more slowly at 55 percent (Christie and White 1994). Table 3 shows an overall increase in fish diversity and amount of fish.

Box 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-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.

Table 3. Mean number of species and individuals per 500 square meters for important families of fishes, San Salvador Island sanctuary

Familly	Common Names	Census Month			
		May 1989		Jan 1991	
		SP	NO.	SP	NO.
Pomacentrids	Damselfishes, seargeant majors, pullers	6.0	64.0	6.3	109.0
Mullids	Goatfishes	1.0	8.0	1.0	74.0
Lutjanidae	Snappers, jobfishes, fusiliers, caesonids	1.0	2.3	1.0	10.3
Scarids	Parrotfishes	1.0	6.0	1.0	38.0
Zanclids	Moorish idols	1.0	6.0	1.0	9.0
Plectorhynids		0.0	0.0	1.0	3.0
Letrinids		0.0	0.0	1.0	1.5
Chaetonids	Coralfishes, butterfly fishes	6.0	22.0	5.0	25.0
Siganids	Rabbitfishes, spinefeet	1.0	1.3	1.0	1.3
Serranids	Groupers, seabasses	1.7	3.3	2.0	4.0
Kyposids		0.0	0.0	1.0	1.0
Nemipterids	Threadfin breams, monocle breams, butterfly breams	1.0	2.0	1.0	2.0
Acanthurids	Surgeonfishes, unicornfishes	3.0	153.0	5.0	132.0
Labrids	Tuskfishes, rainbowfishes, wrasses	6.0	23.0	3.0	14.3
Caesionids		1.0	11.0	1.0	8.0
Balistids	Filefishes, triggerfishes, leather jackets	1.7	14.0	1.3	1.8
Pomacanthids		2.3	6.3	1.0	1.5
TOTAL		**33.7**	**322.2**	**33.6**	**435.7**

Note: SP = Number of species; NO= Number of individuals

Source of data: Ridao, Cura, Christie and White (1991). Evaluation of the Marine Conservation Project for San Salvador Island.

Based on a more recent assessment of marine resources in 1994, 33 different fish species are found in San Salvador (Rath 1995). Damsel fishes are the most dominant, comprising over 50 percent of the total number observed during the marine assessment. The next most abundant fishes are butterflyfish (*Chaetodontidae*) and clown anemonefish (*Pomacentridae*), indicating good reef conditions for fish communities. They account for 21 percent of the individual fishes present. Other species include the families of surgeon fishes, groupers, sweetlips, blennies and wrasses (28%).

Fishing Grounds. Fishing grounds for edible/food fish differ from aquarium fish. In general, 66 percent of food fish is caught around San Salvador while around 25 percent comes from nearby islands. Only a handful of fishers (9%) go farther to other areas to fish (e.g., Palauig and Olongapo). The majority of aquarium fishers, on the other hand, visit fishing grounds outside San Salvador (65%), particularly nearby islands and Pangasinan.

Most Sambal fishers, particularly those who catch anchovies with a municipal bagnet, claim that they have not changed their fishing grounds over time. Some fishers who catch groupers (*lapu-lapu*) and jack/trevally (*talakitok*), however, mentioned that they shifted to nearby fishing grounds in the late 1980s.

Edgar Rico, a 26 year-old freediver who used to go spearfishing in San Salvador waters, now fishes in Baias and Bituago, some twenty minutes from the island. At present, he uses a hookah compressor, which allows him to dive deeper to around 20-25 meters for 3-4 hours, on the average. He makes two dives per fishing trip, leaving home at 7 a.m. and returning between 2-3 p.m. with three companions. Groupers are considered a prized catch, commanding higher prices in the market.

The change in fishing grounds appears to be more pronounced for the Visayan fishers than for the Sambals. Miguel Betana, a 29-year old fisher from Samar, has been catching yellowfin tuna and blue marlin with a handline in the past eight years. Before, he used to fish around the island of San Salvador. Now, he goes to other fishing grounds in Olongapo, Bolinao in Pangasinan, Mindoro, and Scarborough Shoal, which involve 8-19 hours of travel from San Salvador. The trips are usually made from March to June, lasting from 3 to 7 days per fishing trip.

Bonifacio Dumaran, the oldest Visayan migrant and an aquarium fish gatherer, fished in the waters of San Salvador until the late 1980s. He and other Visayans have since shifted to fishing grounds in Agno, Pangasinan, 15 miles away from San Salvador, due to the depletion of aquarium fish and the ban on aquarium fishing in the marine reserve since 1989. Bonifacio, who is now 63 years of age, traces his roots to Bohol in Central Visayas. Together with 20 other Visayans, he went to Magalawa island in Masinloc Bay to gather *trocha* shells (*samong*) for a Boholano buyer in the 1950s. Over time, he changed occupations --- from a *trocha* shells diver to a spearfisher and later, to a hook and line fisher. He and other Visayans settled in San Salvador in 1972.

Bonifacio recalls, "***When the trochus fishery was depleted, we changed to aquarium fish due to a ready market and abundance of aquarium fish. That was in 1973. At first, we learned to collect aquarium fish from a fellow Visayan using a compressor. Later, we picked up the aquarium fishing technology using poison. The first poison, Bladex, had a very strong effect on the fish, often resulting in instant death. Later, sodium cyanide became popular to aquarium fish collectors since it stunned the fish but did not kill them. When the poison subsided, the fish regained consciousness.***" The earnings associated with aquarium fishing attracted more Visayans to engage in it. At present, about 80 households from Purok Maligaya are engaged in collecting aquarium fish using barrier nets. The use of nets was introduced by Haribon in 1990 as an alternative aquarium fishing technology.

Occasionally, transient fishers from other areas go to San Salvador to catch fish, both food and aquarium fish. They come from neighboring villages and municipalities in Zambales as well as from far-flung provinces like Cebu in Central Visayas. The San Salvador residents, however, claim that transient fishing became less frequent after the marine reserve was established due to the crackdown on the use of illegal fishing gear.

Perceived Trends in the Condition of Fishery Resources. To obtain a comparative perception of the condition of fishery resources, a random survey of 42 heads of fishing households in San Salvador was carried out in November 1996. The respondents were asked to describe the condition of fishery resources 15 years ago and today. Most fishers (60%) indicated that 15 years ago (1981), fishery resources were in a good condition. Some 26 percent perceived the resources to be in a very good condition. The underlying reasons were linked to resource abundance, clean water, fewer fishers, and adequate fishing income to support a family. About 12 percent, on the other hand, felt that the resources were in a bad shape due largely to siltation and illegal fishing. Only 2 percent stated that the resource was neither in a bad nor good condition. Between members and non-members of the village fishers' association known as the *Samahang Pangkaunlaran ng San Salvador* (SPSS), there is no statistically significant difference in the perceived condition of fishery resources 15 years ago (X^2= 0.00, p>.05).

In terms of the perceived condition of fishery resources today, slightly more fishers (62%) felt that the resources are in a good shape (Table 4). The reasons given included high fish catch, less illegal fishing, presence of a sanctuary/breeding ground for fishes, law enforcement, and improved fishery management. About 7 percent perceived a very good resource condition at present. However, some 26 percent indicated a bad condition, attributed to the increase in the number of fishers, incidence of illegal fishing activities, and occurrence of frequent typhoons. The rest (2%) perceived no change at all. Between members and non-members of the SPSS, there is no statistically significant difference in the perceived condition of fishery resources today (X^2=0.11, p>.05).

Table 4. Perceived Condition of Fishery Resources Based on Household Survey Results

Perceived Condition	15 Years Ago (1981)		1996	
	Number	Percent	Number	Percent
Very bad	----	----	1	2.4
Bad	5	11.9	11	26.1
Neither bad nor good	1	2.4	1	2.4
Good	25	59.5	26	61.9
Very good	11	26.2	3	7.1
TOTAL	42	100.0	42	100.0
Perceived resource condition 15 years ago versus today:			**t-value = 3.02**	**p = .004**

Among all respondents, Table 4 indicates a decline in the perceived condition of overall fishery resources 15 years ago versus today using a t-test ($p<0.05$). An examination of the responses shows an increase in the percentage of respondents perceiving a bad resource condition, as well as a decrease in those perceiving a very good resource condition. Despite perceptions of overall decline in resource conditions, in individual discussions with fishers they observed improvements in coral reef fishery, but not in pelagic fishery (e.g., migratory species such as anchovies). These were manifested in the improved fish catch of siganids and groupers and the abundance of lobsters in the fishing grounds near the marine sanctuary. Morever, a two-year survey conducted by the MCPSS confirmed an uptrend in the yield of reef fish from 1989 to 1991. In addition, a marine assessment conducted in 1994 by the Coastal Environment Program attested to the predominance of damselfish and butterflyfish in the waters of San Salvador --- an indicator of good reef conditions. Were it not for the establishment of the sanctuary in 1989, the downtrend in coral reef fishery could have been more alarming, if not irreversible.

Perceived Importance of the Marine Sanctuary. Based on the survey of 42 fishing households in San Salvador, all the respondents expressed that the marine sanctuary is essential to fisheries management. A consensus on this matter, both among members and non-members of the SPSS, is striking. 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 of fish (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, which made certain fishers losers in the process (see Section 5.1 for details).

In San Salvador, the stakeholders consist of fishers, fishers' associations, fish traders, the Protected Area Management Board (PAMB), the municipal government of Masinloc, and the unorganized group of fishers and women. Except for the fish traders and the unorganized group of fishers and women, the stakeholders have a formal and legal personality.

With the implementation of the MCPSS in San Salvador, the core group of fishers known as the LTK (or Environment Management Committee) emerged as the most active stakeholder. It also had a strong link with the Barangay Council. It was at the forefront of advocacy and outreach efforts on marine conservation. It actively pushed for the ban on illegal and destructive fishing methods in the waters of San Salvador and co-enforced the provisions of the sanctuary ordinance. Together with the community organizers and the municipal government, the LTK reached out to six coastal villages of Masinloc through educational campaigns. The tangible offshoot of these efforts were requests by two nearby communities to the municipal government for the establishment of sanctuaries in their coastal waters.

Since 1993, the formally organized SPSS has taken the role of a stakeholder. It grew out of the LTK core group. SPSS has assisted the village and municipal governments in enforcing fishery-related rules by providing volunteers who help patrol the waters, together with the village police (*Barangay Tanod*) and the Guardians of the Sea (*Bantay Dagat*).

The second group of stakeholders belong to the Cabangun Aquarium Fish Gatherers' Association (CAFGA). In 1990, the CAFGA members participated in Haribon's training on aquarium fishing technology using barrier nets, instead of sodium cyanide. In 1992, moreover, they deployed 19 modules of artificial reefs (rubber tires) outside the marine reserve as an alternative fishing ground for aquarium fish.

The fish traders comprise the third group of stakeholders who are directly dependent on marine resources. They are not organized. They go about procuring and trading fish on a competitive basis.

The fourth stakeholder is the Protected Area Management Board (PAMB). The PAMB of Zambales came into existence in December 1993, in consonance with the declaration of Masinloc Bay as a protected seascape. The PAMB is mandated to act on matters related to planning, resource protection and general administration. Moreover, it delineates the boundaries of the protected area and buffer zones and promulgates rules to promote development programs on biodiversity conservation and sustainable development.

Heading the PAMB is the Regional Executive Director of the Department of Environment and Natural Resources (DENR). Members are drawn from the provincial government, municipal government, and barangay government within the territory of the protected area; the local government organizations and people's organization which are based near the protected area; and national government departments involved in protected area

Ecological Knowledge. A baseline survey administered in 1988 by Haribon to 19 randomly chosen San Salvador residents showed a fair level of bio-physical knowledge, given a mean score of 68 percent. The questions revolved around the interaction of marine and terrestial ecosystems, environmental and edible uses of marine products, survival requirements of corals, and other related items. After the conduct of information campaigns and ecological training, a second testing/survey was done in 1991 where the mean score of village residents increased to 86 percent (Ridao, Cura, et al. 1991).

Based on a random sample survey of 42 fishers in November 1996, the respondents exhibited knowledge of various characteristics of the sea and coast that help the fish to grow and be healthy. These include the presence of sea grasses/seaweeds (57%), existence of corals (29%), clean water (10%), and presence of mangroves (5%). Multiple responses were allowed. In addition, based on key informant interviews in November 1996, village fishers are knowledgeable on the period when the fish are gravid (have eggs). For milkfish, the gravid months are March to April; for anchovy, October to November; and for siganid, May.

4.2 Stakeholders

Stakeholders are defined as institutions, social groups and individuals who possess a specific, direct and significant interest/stake in the area. The stake may come from institutional mandate, historical association, dependence for livelihood, economic interest, geographic proximity and a variety of other capabilities and concerns. In general, stakeholders are usually aware of their interests in the management of an area (IUCN 1996).

Not all stakeholders are equally interested in conserving a resource nor are they equally entitled to have a role in resource management. It is necessary to distinguish among them on the basis of some criteria, as shown by Box 2 (IUCN 1996). Social actors who score high on several accounts may be considered primary stakeholders. In collaborative processes, primary stakeholders assume an active role, usually involving decision-making. Secondary stakeholders are involved in a less important way (e.g., holding a seat in a consultative body).

Box 2. Possible Criteria to Distinguish Among Stakeholders

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

The village residents may be classified into three distinct ethnolinguistic groups : 1) the native Sambals who occupy the northwestern and southeastern portions of the island (*Puroks Tagumpay and Pag-asa*); 2) the Ilocanos and Pangasinenses who reside in the northeastern portion of the island (*Purok Bagong Buhay*); and 3) the Visayans who inhabit the southwestern part of the island (*Purok Maligaya*). Figure 5 illustrates the geographic location by ethnolinguistic group. (Note: A *purok* represents a sub-village).

Within each sub-village, occupations, cultural background, and family linkages are fairly homogeneous, but among sub-villages, major differences exist. The differences stand out when the Visayans are compared to non-Visayans. The Visayans are generally aquarium fish gatherers while the non-Visayans are fishers of food fish. They also live in closer clusters, unlike the Sambals, Ilocanos and Pangasinenses whose houses are more spread out. The Visayans, moreover, tend to be more fun-loving, given regular *purok* feasts which provide occasions for getting together and for engaging in recreational activities. They have not been fully integrated into the island's Sambal community due, in part, to cultural differences and to resentment among the Sambals regarding their previous use of sodium cyanide in catching aquarium fishes. A positive development, nonetheless, has been the inclusion of a council member from the Visayan sub-village in the Barangay Council in the 1990s.

Overall, the village of San Salvador may be regarded as relatively heterogeneous in terms of ethnicity, occupation, and religion. In 1992, the Sambals comprised 50 percent of the population, the Ilocanos and Pangasinenses about 20 percent, and the Visayans, 30 percent (Dizon and Miranda 1996). Based on key informant interviews with village officials, the Visayans have been perceived as the fastest growing group in the last 10 years, presumably due to their high birth rate and to in-migration of relatives.

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 (Table 5). 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%).

At present, village facilities are limited to an elementary school, a health center, a village hall, a basketball court, and a small, privately-owned beach resort with four cottages. Overall, the integration of San Salvador into the national economy may be regarded as low to medium. Market links are medium, marked by the daily transport of fish to neighboring villages and municipalities and by the delivery of aquarium fish to Manila-based exporters.

management. Being a fairly recent organization, the PAMB is still in the process of refining its implementing guidelines. To date, the zoning of Masinloc Bay has been delineated under the leadership of the PAMB.

The fifth stakeholder is the municipal government of Masinloc, which has jurisdiction over the waters of San Salvador and has shown continuing concern for its coastal resources. In addition, it has extended visible support through an enabling legislation on the marine sanctuary and reserve, mediation in fishery-related conflicts, provision of facilities/equipment for patrolling the coastal waters, and extension of financial support to the marine guards. Moreover, it has been an active member of the PAMB since 1993.

The sixth stakeholder is the unorganized group of fishers and women in San Salvador. They neither belong to the SPSS nor the CAFGA. Dependent on fishery resources for their food and income, they glean in the shallow reefs, fish in the coastal waters, and sell fish to traders and consumers.

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

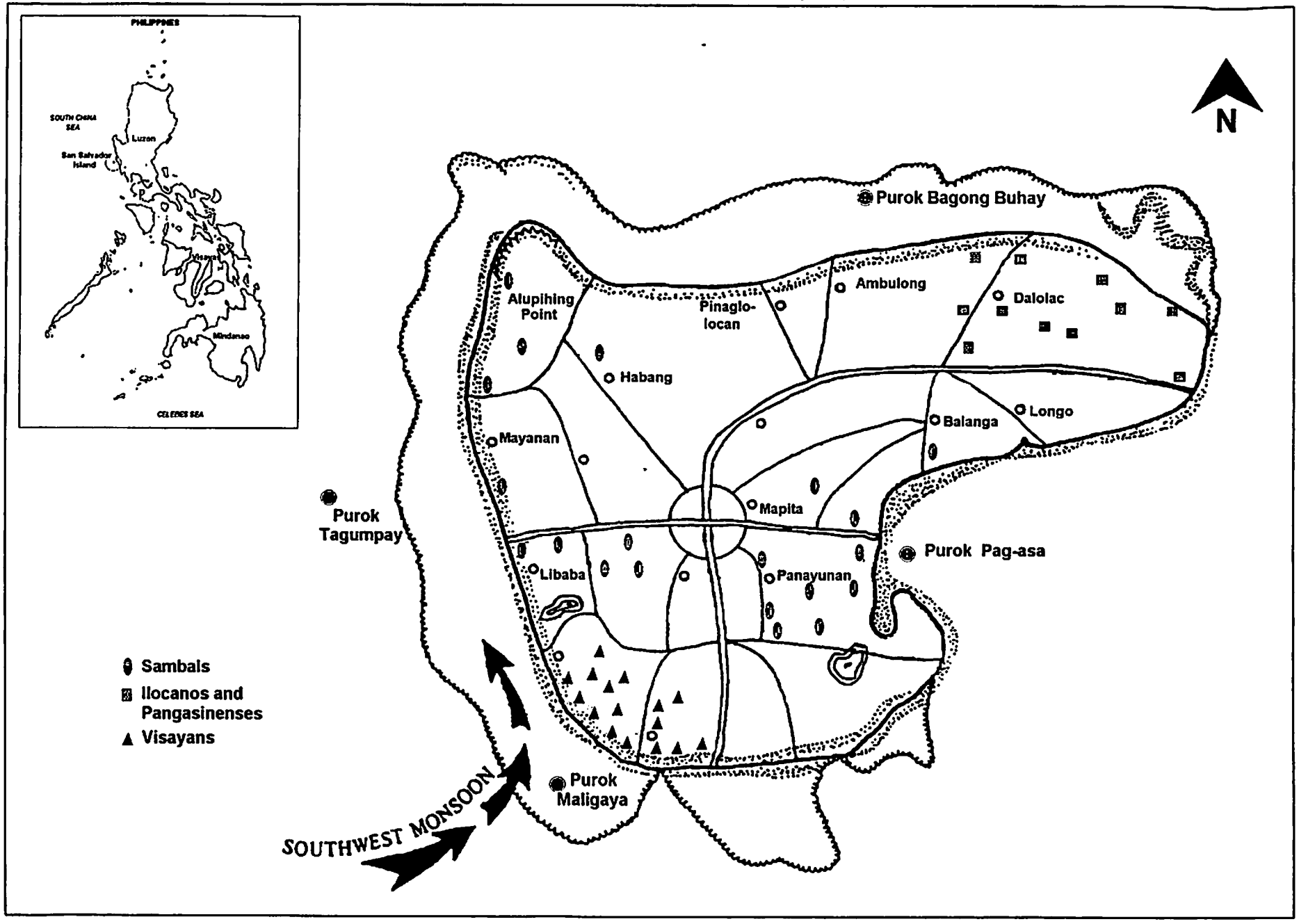
This section presents the socio-economic characteristics of the fisher community, sample fishers, and fisher households, which carry implications for resource use and for incentives to cooperate and coordinate. Among others, it highlights the economic and social heterogeneity of San Salvador, the high dependence of the community on fishery resources, the extent of fisher participation in the project, the commercial motivation of resource users, the level of indigenous knowledge, and the extent of fisher satisfaction with their chosen occupation.

4.3.1 Fisher Community

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 village economy was essentially a subsistence economy. The onset of the 1970s, however, altered the socioeconomic landscape with the influx of Visayan migrants from the Central Philippines 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.

Figure 5. Geographic location of San Salvador residents by ethnolinguistic group.



Transportation links, however, may be considered low due to the absence of paved roads within the island and of the heavy dependence on private boats (not commercial) for plying the distance between the island and mainland Zambales. Communication links, likewise, are low since the only communication facility available is a hand-held radio. Telephone and telegraph stations are non-existent. By contrast, political links are high due to the frequent visits of the mayor of Masinloc (more than 12 times a year).

Table 5. Distribution of Households by Primary Occupation

Occupation	1989 (%)	1996 (%)
Fisher	60.0	64.0
Farmer	36.0	23.0
Market Vendor	0.5	2.0
Small Business Dealer	—	2.0
Construction Worker	—	1.0
Teacher	1.0	1.0
Boat Builder	1.0	1.0
Others (Laborers, Wage Earners)	1.5	6.0
Total	100.0	100.0

4.3.2 Characteristics of Sample Fishers

A random sample of 42 households was drawn from a population of households in San Salvador which are dependent on fisheries. The sample comprised 21 members of the village fishers' association, known as the *Samahang Pangkaunlaran ng San Salvador* (SPSS), and 21 non-members of the SPSS. Table 6 shows that no statistically significant difference exists 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.

The majority of the respondents (76%) are long-time residents, having lived in San Salvador for more than 15 years. Only 17 percent have a length of residence of 10 years or shorter. In terms of fishing experience, most respondents (69%) reported that they have been fishing for more than 15 years. About 21 percent of the respondents have fished for 6-10 years while only 10 percent have done so for less than 10 years. In the past, 43 percent were also engaged in non-fishing occupations such as farming, carpentry and construction work. Between members and non-members, a statistically significant difference does not exist (X^2=1.56, p>0.05).

Table 6. Characteristics of Sample Fishers

Variable	Member	Non-Member	Total	T-value	p
Age	41.0	37.7	39.4	0.92	>0.05
Education	6.8	6.2	6.5	0.65	>0.05
Household Size	6.1	5.2	5.7	1.38	>0.05
N	21.0	21.0	42.0		

In terms of participation in the project, Table 7 shows that members differed significantly from non-members in four aspects of project interventions: attendance at project meetings, completion of training, influence over project planning, and knowledge of project objectives. Based on a household survey of 42 respondents in San Salvador, attendance at project meetings was higher for members than non-members (86% versus 48%; $X^2=6.86$, $p<0.05$). Similarly, a higher percentage of members completed their training than non-members (76% versus 33%; $X^2=7.79$, $p<0.05$).

Based on multiple responses, training activities completed by village fishers included the use of barrier nets instead of sodium cyanide to catch aquarium fish (25%), environmental awareness and protection (19%), fisheries management and related fishing technologies (19%), and sanctuary establishment and management (19%). Other types of training covered cooperative development (13%), patrolling of coastal waters (6%), and artificial reef establishment (3%). Lower percentage responses of 3 percent each were obtained for project evaluation and sustainable development. For most respondents, the training duration lasted for 1-3 days (45%) and 4-6 days (26%). Haribon provided most of the training (82% of the responses).

Table 7. Fisher Participation in the Project

Variable	% Members	% Non-Members	% Total	X^2	p
Attend project meetings	85.7	47.6	66.7	6.86	0.009
Complete training	76.0	33.0	55.0	7.79	0.005
Influence project planning	66.7	33.3	50.0	4.67	0.030
Knowledge of project objectives	100.0	76.2	88.1	5.68	0.017

The survey results, moreover, show that more members than non-members indicated that they were able to influence project planning (67% versus 33%; $X^2=4.67$, $p<0.05$) and that they had a greater knowledge of project objectives (100% versus 76%; $X^2=5.68$; $p<0.05$). Based on multiple responses, these objectives are closely linked to increasing fish stocks and improving coastal resource conditions (70%), livelihood improvement (13%), and community development (8%). These responses are consistent with actual project objectives. Around 9 percent, all of whom are non-members, admitted that they are not knowledgeable on project objectives.

4.3.3 Fisher Households

Age Composition of Respondents' Households and Out-Migration. Slightly more than half (51%) of the household members are young (within the 0-15 age bracket). Approximately 31 percent belong to the 16-30 age range, while 16 percent fall under the 31-60 age bracket. Only 2 percent are older than 60. This indicates a very young population. About 26 percent of the households reported that some of their household members have left San Salvador for various reasons. These are to work (53%), to study (20%), and to get married (27%). The usual destinations include Metro Manila (39%) and overseas (17%).

Educational Background of Household Members. Forty-three percent (43%) of household members have gone to an elementary school, while 25 percent have obtained a high school education. Only 2 percent attained a college education. The rest of the household members have yet to reach schooling age (30%). Between male and female members, less males than females have gone to high school (17% versus 31%). A similar trend holds for elementary education (40% for males versus 46% for females). This may be explained by the greater involvement of sons and other male household members in fishing activities.

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

To evaluate house structure, four categories were used: minimal, low, medium and high. A minimal house structure refers to a house made up entirely of light materials, such as bamboo, cogon and nipa, including the frames. A low quality house structure consists of light materials for the walls and roofs but the frames are made of wood or lumber. A medium quality structure combines lumber and concrete for the walls and frames but uses nipa or cogon for the roof. A high quality house structure, on the other hand, has either a roughly or completely finished external surface and painted or cemented inner walls, along with galvanized iron sheets for the roof. Table 8 indicates that a statistically significant difference exists between members and non-members on house structure ($X^2=4.84$, $p<0.05$). More

members are likely to have medium to high quality house structures (76%) than non-members (43%).

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 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.

Ownership of productive capital such as boats and land may also be regarded as indicators of the respondents' relative wealth. The survey results reveal that there is no statistically significant difference in land ownership. The ownership of motorized boats, however, indicates that members are more likely to own motorized boats than non-members (41% versus 25%, $X^2=4.703$, $p<0.05$).

Table 8. Percent Distribution of Assets

Variable	% Member	% Non-Member	% Total	X^2	p
House Structure				**4.84**	**0.028**
Minimal	14.3	28.6	21.5		
Low	9.5	28.6	19.0		
Medium	19.1	19.0	19.0		
High	57.1	23.8	40.5		
Household Furnishings and Facilities				**3.86**	**0.049**
Minimal	33.3	38.1	35.7		
Low	19.0	42.9	31.0		
Medium	19.0	14.2	16.6		
High	28.6	4.8	16.7		
Land Ownership	31.0	28.6	29.8	**0.099**	**0.750**
Ownership of motorized boats	41.1	25.0	33.05	**4.703**	**0.030**

Occupational Multiplicity and Dependence on Fishery Resources. Overall, most respondents (83%) are dependent on fishing as a primary occupation. In terms of income, 57 percent of the members ranked fishing as their most important source, providing more than half of their household earnings. For 43 percent of the non-members, fishing also provides more than half of their household earnings. The difference between members and non-members is not statistically significant (X^2=0.857, p>0.05).

In terms of food, fishing provides more than half of the food requirements for about 38 percent of the members. The same finding holds true for 43 percent of the non-members (X^2=0.389, p>0.05). This finding indicates that the respondents derive their food from more than one source, which includes farming.

Occupational multiplicity as a survival strategy is fairly evident in the pursuit of other occupations by the household heads. Apart from fishing, the respondents are engaged in farming (38%), as well as in livestock raising, carpentry, boat building, construction and blacksmithing (26%). Thirty-six percent of the household heads reported that they did not have non-fishing occupations. The survey also showed that 47 percent of the respondents' household members who are older than 15 years have jobs related to fishing, farming, business, construction, and services. The rest are either unemployed (6%) or below 15 years of age (47%) and are therefore economically dependent on other household members.

A differentiation exists between male and female household members who belong to the 16 and older age group. Female members are primarily engaged as caregivers or providers of unpaid domestic services (44%), while male members are fishers, farmers and construction workers (18%). None of the male household members who are older than 15 years reported that they are doing unpaid domestic work. In San Salvador, men are traditionally not expected to perform domestic chores.

Remittances do not play a substantial role in the income of most households in San Salvador. The survey showed that 31 percent of all respondents are receiving remittances from outside. Members have a slightly higher dependence on external remittances than non-members but the difference is not statistically significant (38% versus 23%; X^2=1.00, p>0.05). The survey results further showed that less than 26 percent of the respondents' immediate household members have gone to other areas to work.

Job Satisfaction. Given the chance to live their lives over, 57 percent of the sample would still choose to become fishers (Table 9). Between members and non-members, the difference is not statistically significant (52% versus 62%; X^2=0.39, p>0.05). The reasons, however, varied. For the members, fishing is attractive due to the following: easy income from fishing (27%), absence of a boss (13%), not tiresome (13%), and capability of fishing to support family needs (13%). Non-members, on the other hand, cited that fishing is the only job they know well (36%), which was not cited by any member at all. Somehow, this implies that some non-members perceive more limited job options than members. Non-members also

mentioned that fishing allows them to stay close to their family (14%) and that they are used to fishing as an occupation (14%). Moreover, they felt that their limited education confines them to fishing and that they do not need a higher education in order to fish (14%).

For those who would not stay in fishing (43%) if they had their lives to live over, the predominant reason is associated with the difficulty of fishing. This was expressed by 78 percent of the non-members and 45 percent of the members. Some respondents, particularly non-members, felt skeptical on their capacity to improve their lives with fishing (11%). Other reasons included the decline in fish catch (15%), dangerous nature of fishing (10%), and desire to change jobs (9%). The decline in fish catch and the desire to change jobs were cited by members, but not by non-members.

Table 9. Job Satisfaction of Fishers

Choice	% Member	% Non-Member	% Total	X^2	p
Choose fishing, given the chance to live one's life over	52.0	62.0	57.0	0.39	0.53
Stay in fishing now	29.0	62.0	45.0	4.71	0.03
N	21.0	21.0	42.0		

When the respondents were asked if they would change their occupation now from fishing to something else, about 45 percent said no. Between members and non-members, the difference is statistically significant (29% versus 62%; $X^2=4.71$, $p<0.05$). Thus, 55 percent of the fishers are willing to change occupation at present, but the willingness is conditional. The members, who appear more willing to switch to another occupation, qualified their response by expressing that they would do so if the income is better than fishing (33%). Other reasons include the desire for a more stable job (13%) and the increase in the number of dependents (7%). Non-income related reasons also emerged, such as difficulty of fishing (27%), unstable weather conditions (7%), accidents at sea (7%), and inability to pursue hard work at present (7%).

For non-members, the majority (62 percent) would opt to stay in fishing now due largely to the quick income from fishing and to their being used to fishing as an occupation. Only 38 percent indicated a willingness to switch to other occupations because of the perceived difficulty and risks associated with fishing (50% of responses). Lower frequency responses of 10 percent each are linked to the desire for better income, preference for a stable job, non-ownership of fishing gears, unstable weather conditions, and inability to improve life with fishing.

The responses to the two questions -- one hypothetical (future) and the other current -- indicate some ambivalence on job satisfaction, particularly on the part of members. More than half (52%) of the members indicated that they would still choose fishing if they were to live their lives over. Yet, only 29 percent would like to stay in fishing at present. An examination of the underlying reasons indicates that though the members of the fishers' association are satisfied with the economic and psychological benefits of fishing as an occupation, they are open to other possibilities which can improve their economic condition at present. This could have been the result of their exposure to other options over time and their willingness to try other occupations.

4.4 Market Characteristics

The fishery of San Salvador, which consists of both edible/food fish and aquarium fish, is at present heavily market-driven.This has changed from the subsistence-oriented market of the 1960s. For the overall picture, 86 percent of the fishers covered by the random sample survey reported that they sold more than half of their catch. Only 14 percent indicated that they sold less than half of their catch.

The present orientation of the market 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 of fish, market outlets, number of traders, extent of dependence on *suki* (favored buyer), and other attributes, as highlighted by Box 3.

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

Food Fish/Marine Products. In general, San Salvador fishers sell their edible fish catch to primary buyers (43%), wholesalers (33%), and consumers (21%). Only three percent (3%) goes to retailers. The choice of these marketing outlets is governed by the existence of a *suki* (favored buyer), best price offer, and proximity to San Salvador. The normal destination of food fish is the town market, where a high percentage of 93 percent is absorbed. Some 7 percent is retained at the village.

To prevent spoilage, food fish is packed in insulated boxes with ice. The trade of fresh fish is dominated by women, who are usually spouses of fishers and are boat owners themselves. The

traders augment their own fresh fish by buying the catch of other fishers in San Salvador and procuring from the brokers/middlemen at the Masinloc fish port.

Before 1988, there were only four women traders from San Salvador who sold fresh fish at Masinloc. Now, their number has more than doubled to 10. Over time, they noticed an increase in the volume of fish landed in Masinloc, which was attributed to the presence of the marine sanctuary and better enforcement of fishery laws prohibiting dynamite fishing and use of sodium cyanide. They also observed a stability in consumer preferences and market outlets. Marketing channels, at present, include the following: 1) fisher --> fish trader--> consumer; 2) fisher --> primary buyer --> fish retailer --> consumer; and 3) fisher from other towns --> fish trader from other towns (Bamban, Candelaria, etc.) --> fish retailer at Masinloc --> consumer. The second category is the most common marketing channel.

Fish is sold by by weight or by gallon in San Salvador and in Masinloc. Prices are determined by the type of fish and size of fish. They are also affected by the volume of fresh fish landed at the Masinloc fish port, which, in turn, is dependent on climatic conditions and the lunar season. During stormy seasons or strong winds when fish supply in the market is low, the prices of fish usually increase by as much as 75-85 percent. Red tide outbreaks, on the other hand, trigger a reduction in the prices of some fish, crabs, shrimps, shells and seaweeds since consumers are scared to eat toxin-laden fishery products (particularly shellfish). The main sources of information on fish prices are other fishers (31%), *suki* (31%), and primary buyers/middlemen (29%). To a lesser extent, neighbors also provide price information.

Sea urchin, a traditional household consumption item in San Salvador, began to be commercially traded only in the 1990s. Providing a market incentive was a Japanese buyer who offered P25 (about US $1) per glass (drinking glass). This, however, triggered the depletion of sea urchin in San Salvador and prompted the village council to ban its commercial collection in 1994.

In general, the comparative retail prices of fish in 1987 and 1996 increased over time. Several types of fish registered double-digit price increases: rabbitfish or *samaral* (14%), tilapia (17%), anchovies or *dilis* (23%), and milkfish (25%). The traders noted much higher increases in Spanish mackerel or *tanigue* (67%), mullet or *banak* (43%) and jack/trevally or *talakitok* (33%). The retail prices of blue crabs (*alimasag*) increased by 50 percent.

The trade of fresh, food fish is very competitive and is dominated by individuals. Apart from a tax levied by the Philippine Ports Authority (PPA) on boats landing fish at the Masinloc fish port, there is no official control over individual fish traders, such as issuance of licenses or restriction of fish trading in the area. Fishing facilities in Masinloc are limited to an ice plant and a fish port. Based on key informant interviews with fish traders, fish drying/processing is not a problem since traders can sell their fish within the day.

The survey results indicate that 43 percent of the fishers of food fish have maintained a *suki* relationship. This is largely due to the services the *suki* provides and the guaranteed market that

comes with this arrangement. Multiple responses given by fishers on the advantages of the fisher-*suki* relationship include direct access to emergency loans (35%) and a guaranteed market for food fish (10%). The rest did not cite any reason. Among the most sought after services from the *suki* are loans for basic needs and fuel for fishing trips. In this type of relationship, however, the trader normally dictates the price of fish and limits the fishers' choice of market outlets. Nonetheless, all of those who have a *suki* cited that they are happy with their *suki* arrangements. Relationships with a *suki* have generally lasted from 1-4 years (42%) to 5-10 years (33%).

Aquarium Fish. The gathering of aquarium fish in San Salvador dates back to the 1970s when externally-based middlemen visited the village to procure fish for the lucrative export market. In the 1980s, aquarium fish gatherers were required to secure a permit from the municipal government of Masinloc before they were allowed to gather aquarium fish from Masinloc Bay. With the depletion of aquarium fish in the bay and the ban imposed since 1989 by the sanctuary ordinance on catching aquarium fish in the marine reserve, most fishers later moved to new fishing grounds in Pangasinan and nearby islands.

At present, there are 40 aquarium fish traders in San Salvador, up from only 10 traders in 1987. They come from Purok Maligaya, the Visayan sub-village, and account for 80 percent of all fish traders in San Salvador. Aquarium fish traders normally have their own motorized boats and implements for gathering aquarium fish and hire their own divers for collecting the fish.

Unlike the fishers of food fish, the aquarium fishers sell all their fish. The favorite marketing channels are wholesalers (67%) and primary buyers (24%). Individual collectors absorb only 9 percent Underlying the choice of these channels are existence of *suki* relationships (53%), best price offer (29%), proximity (12%), and ease in selling fish (6%). Most of the aquarium fish are brought to far-flung Manila (61%). Only 39 percent is sold at Masinloc.

Aquarium fish traders normally pack their fish individually in transparent, water-filled plastic bags, carefully replacing the water in the bag daily and refilling the oxygen from an oxygen tank to keep the fish alive. The traders usually procure varied types of aquarium fish for 3-5 days. At times, they also collect fish from other fish gatherers and traders in Purok Maligaya, particularly when an exporter specifies a substantial volume of aquarium fish. The traders later transport the fish in rented vehicles to middlemen and Manila-based wholesalers, who, in turn, sell them to buyers in the United States and Europe.

The Manila-based exporters are able to dictate the prices of aquarium fish, having organized themselves into a traders' association and standardized their buying prices. They regularly keep track of movements in the international market, particularly of the current dollar prices of aquarium fish in the United States.

The San Salvador traders claim that they can sell all the aquarium fish they transport to Manila-based exporters. Some feel, however, that they deserve better prices due to the effort involved in collecting the fish. Over time, the prices of certain types of aquarium fish have remained fairly stable, for

instance, striped blennie and coral hogfish. Others suffered price declines of 25-50 percent in 1996 compared to 1987, specifically yellow tail, butterflyfish, pink damselfish, chromis, red wrasse, emperator angelfish, diamond butterfly, and zebra angel, among others. By contrast, prices more than doubled for pinatos, cow fish, and domino. Others registered lower, but positive, price increases of 67-80 percent, particularly yellow longnose, yellow angelfish, coral beauty, regal angelfish, and yellow tang.

Despite market fluctuations and delayed payments by Manila exporters for about 15 days, the aquarium fish gatherers and traders of San Salvador have continued to engage in this livelihood due to the absence of rejects and to knowledge of the technology. On the average, they earn a net income of around P1,000 (US $38) per week.

Around 67 percent of the aquarium fishers maintain a fisher-*suki* relationship. The major reasons are linked to a guaranteed market for their fish (31%), access to emergency credit (25%), and access to fishing assets (6%). The rest did not cite any reason. Among fishers who maintained a *suki,* a general satisfaction with this marketing relationship existed. Most ties have lasted for less than 5 years (56%), followed by 5-10 years (44%).

4.5 Community Institutional and Organizational Arrangements

This section focuses on San Salvador's tradition of collective action, attitudes of fishers towards collective action and responsibilities for fisheries management, and decision-making. Moreover, it examines the evolution of property rights and rules over time, along with attitudes toward rules and rule-breaking. Finally, it provides insights into the actual monitoring and enforcement of fishery-related rules in the village.

4.5.1 Tradition of Collective Action and Attitudes of Fishers

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 basically 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 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 for collecting aquarium fish, instead of sodium cyanide. In 1990, CAFGA participated in Haribon's training on the use of barrier nets. In 1992, it 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.

Current Membership in Village Organizations. A survey of 42 respondents in November 1996 indicated that a statistically significant difference exists between SPSS members and non-members on organizational membership. Members are more likely to have more than one organizational affiliation than non-members (1.05 versus 0.10; $t=11.74$, $p<0.05$).

As perceived by members, the benefits associated with membership in SPSS are directly related to livelihood. About 74 percent stated that they got credit, patronage refund, and low prices of consumer goods, in addition to information on fishing technologies. Approximately 26 percent could not cite any benefit.

In terms of familiarity with the purpose of the SPSS, 48 percent of the members mentioned that the purpose is to improve livelihood while 33 percent linked the purpose to the improvement of fishery and environmental management. The rest (19%) stated that the SPSS seeks to achieve unity within the island. These are congruent with the declared purposes of the association.

Attitudes Toward Association Leadership and Decision-Making. Most members have a positive regard for their association leader, perceiving the leadership to be not only respectable (91%) but also credible (91%). The leadership may also be described as legitimate, having been elected by the members themselves.

Almost all respondents (95%) also advanced the view that decision-making on fisheries management should be participatory, involving all those who will be affected by the decision. With regard to actual decision-making within the association, the majority (81%) perceived the decision-making process as democratic and participatory, marked by consultation and election to arrive at major agreements.

Attitudes Toward Collective Action. Based on the survey of 42 respondents, inclusive of SPSS members and non-members, the attitudes toward collective action are positive. About 91 percent of the respondents expressed that the people in the village could work together to solve community problems (Table 10). A similar percentage also felt that village fishers could work together to solve fishery problems. Many fishers (69%), moreover, mentioned that both the government and the fishers should work together to solve fishery problems. In all these responses, members do not differ significantly from non-members ($p>0.05$).

Table 10. Attitudes Toward Collective Action

Attitude	% Member	% Non-Member	% Total	X^2	p
The community can work together to solve village problems	91	91	91	0.0	1.00
Fishers can work together to solve fishery problems	91	91	91	0.0	1.00
The government and the community can work together to solve fishery problems	71	67	69	0.11	0.74
N	21	21	42		

Attitudes Toward the Distribution/Sharing of Responsibility for Fisheries Management. When the respondents were asked about the extent of sharing responsibility for fisheries management, the majority (64%) expressed that the government and the fishers must have equal responsibility (Table 11). The rest (36%) opted for a less equal sharing. Among these respondents, about 19 percent are in favor of giving more responsibility for fisheries management to fishers than to government while 14 percent expressed otherwise. Only a handful (2%), solely from non-members, felt that neither the government nor the fishers should have any responsibility. Thus, there is strong support for co-management.

Willingness to Support a Similar Project in the Future. A high percentage of the respondents (95%) indicated a willingness to support a project similar to the MCPSS in the future. The response of members and non-members is similar in this regard ($p>0.05$). The finding is encouraging in light of project accomplishments at the site and the painstaking efforts pursued by Haribon over a four-year period.

When asked about the types of fish and quantity of fish that they are willing to contribute per year to a project similar to the MCPSS, most respondents (82%) expressed that they are willing to give 1-10 kilos of jack/trevally, anchovy, grouper, surgeonfish and threadbream. About 6 percent would give more than 50 kilos of rabbitfish while the rest (7%) would share 21-30 kilos of jack/trevally and milkfish.

Table 11. Attitudes Toward the Sharing of Responsibilities for Fisheries Management

Attitude	% Member	% Non-Member	% Total	X^2	p
				2.59	0.11
The government will have all the responsibility for fisheries management while the fishers will have none.	4.80	9.50	7.14		
The government will have most of the responsibility while the fishers will have relatively less.	4.80	9.50	7.14		
The government and the fishers will have equal responsibility.	76.20	52.38	64.30		
The government will have less responsibility while the fishers will have most of the responsibility.	14.30	23.81	19.04		
The government will have no responsibility while the fishers will have all the responsibility.	0.00	0.00	0.00		
Both the government and the fishers will not have any responsibility for fisheries management.	0.00	4.80	2.38		
N	21.0	21.0	42.0		

Note: Responses were collapsed to equal/unequal in computing the Chi-square.

4.5.2 Decision-Making at the Village Level

At the village level, formal decision-making is carried out by a 10-member *Barangay* 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 *Barangay* 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 (*singapong*) to leave their anchors with a float in their chosen fishing ground to signify prior occupancy. No other fisher could enter the fishing ground while the anchor was in place. 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 penalize the fishers who left their anchors

in the waters. All fishers were then allowed to remove the anchor, enter the fishing ground, and return the anchor to the owner. If the retrieved anchor was brought to the Council, the owner had to pay a fine of P50 to redeem it. Half of the fine went to the Council and the other half to the person who turned over the anchor. 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 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. The LTK, an informal core group formed in 1989, 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.

Later, 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 September 1993, fines increased from P750 to P1,000 (US $29- $38) for the first offense, and imprisonment, from two weeks to one month. For the second offense, fines doubled from P1,000 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, and where a general vote finally resolved the issue. Having lost community support for their cause, the *kunay* fishers moved to other fishing grounds where no restrictions existed. Today, however, *kunay* is no longer used due to the mounting opposition over time from fishers in other areas.

4.5.3 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 boundaries 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 of fish corrals and mollusk beds in municipal waters outside of the marine reserve. Beyond these restricted boundaries, open access still prevails.

Types of Rules Prevailing 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 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 of fish 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. Boy Gocon, a fisher from San Salvador, shares: "***We head for our favorite fishing ground in early afternoon, usually at 1:00-2:00 p.m., to get there ahead of other fishers. Fishing, however, starts only after dusk. There are no formal rules but we respect the decision of other fishers who have already dropped their anchor on a particular fishing spot. Other fishers should stay away and look for their own spot. Each fisher is required to keep a distance of 30 meters from the boat of the other fisher. In cases where the desired fishing area has a buoy (but no fisher is around), the interested fisher may remove the buoy, but not cut it, and enter the fishing ground.***"

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 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 (*padas*) 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. Input rules refer to the mandatory payment of membership fees by SPSS members to support the association's operations, apart from 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 a fishery should be managed. These basically define how rules are made and enforced (Ostrom 1991). Of critical importance are the arrangements for monitoring and enforcing compliance with the operational rules and for settling disputes (see section 4.5.4 and 4.6.2 for details). 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. Arrangements for settling disputes involve the conduct of hearings by the the village captain and the municipal mayor before legal cases are elevated to the court.

Constitutional rules (Ostrom 1991) 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 have been 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, 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 4.6.2 of this paper). They empower lower level institutions to establish rules and initiate action for resource management, among other provisions.

Knowledge of Rules. A survey of 42 fishers in San Salvador in November 1996 indicated that the fishers were aware of fishery-related rules, particularly those embodied in local ordinances and national laws (e.g., formal rules). Based on multiple responses, the most frequently mentioned formal rules are the following: 1) prohibition of blast fishing (30%); 2) ban on cyanide fishing (30%); 3) ban on fishing inside the marine sanctuary (16%); 4) ban on using fine mesh nets (16%); and 5) prohibition of aquarium fishing in the marine reserve (3%). The rest mentioned the ban on dropping one's anchor in reef areas and the prohibition of catching siganid juvenile (*padas*) during the closed season (3%). Only 2 percent expressed that they do not know any fishery law. The fishers, likewise, understand the reasons behind these fishery laws. The predominant reason is to protect marine resources and increase fish stocks (97%, multiple responses).

For informal rules, the fishers cited the maintenance of a 30-meter distance between boats in the fishing grounds. About 19 percent mentioned this rule.

Attitudes Toward Rules. The respondents generally felt that rule-breaking is not acceptable (69%). Both members and non-members shared the same attitude (X^2=0.11, $p>0.05$). About 26 percent of all respondents indicated that it is sometimes acceptable to break rules while 5 percent neither agreed nor disagreed. For those who find rule-breaking unacceptable, several reasons were given (multiple responses): 1) rule-breaking will damage the environment (24%); 2) people must learn to obey rules (16%); 3) rule enforcement must be fair to all (14%); 4) rule-breaking may encourage others to violate the law (14%); and 5) rules are created for the good of all (11%).

For those who felt that rule-breaking is sometimes acceptable, the reasons are basically linked to

immediate survival needs. About 9 percent stated that feeding the family is more important. Another 9 percent mentioned that, in the absence of other fishing grounds, rule-breaking may sometimes become acceptable. Still others (17%) felt that it becomes acceptable to those who are used to breaking the law.

When the 42 respondents were asked if the rules on fish harvesting must be changed, 52 percent disagreed while 46 percent agreed. Members and non-members did not differ in their responses (X^2=0.38, $p>0.05$). The rest (2%) of the respondents were neutral. Most respondents reasoned that since the rules are properly set and implemented, they see no need to change them (35%, multiple responses). Moreover, changing the rules might cause conflict (26%). Still others expressed that the existing rules must be retained since they are supportive of fishery resource rehabilitation and of the project (17%).

For those who wanted the rules to be changed, they felt that people need to earn a living and improve their livelihood (20%). The rules, moreover, should benefit the fishers (15%). Others (5%) expressed that they would like the rules to be changed since they prefer a nearer fishing ground.

4.5.4 Monitoring and Enforcement

In the 1970s and 1980s, rights on entry to fishing grounds were observed by fishers based on an informal agreement. The *Barangay* Council, however, intervened when conflicts over fishing grounds arose, particularly on the practice of leaving anchors with a buoy to designate an occupied fishing area.

When the marine sanctuary ordinance was enforced 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 1994, four military personnel were assigned to the area to assist in apprehending violators. The village 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 the time this research was conducted, 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* (Guardians of the Sea), 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.

Of the 39 violations during the first eight months of enforcing the sanctuary ordinance, 35 were committed by non-resident fishers from as far away as Cebu in the Central Philippines. Village residents who violated the sanctuary rules claimed that they did so out of economic need or temptation when large schools of fish were spotted. These violators were warned and asked to pledge not to repeat the violation. In general, first-time offenders were only warned. Second-time violators were fined. If the violators were unable to pay the fine, their catch was sold and the proceeds used to maintain the sanctuary. If they refused to pay the fine, the case was referred to the Municipal Council. Ka Osing Elorde recalls, "***In one instance, a fishing boat from Cebu was catching lobsters at night. The fishing crew refused to pay the fine. What we did was to report the offense to the municipal government. In turn, the mayor ordered the confiscation of the boat until the fine was paid.***"

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 net (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 taken include the confiscation of fish, 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 (3.2% each). In general, the majority of the violators are non-residents of San Salvador.

Current Perceptions of Rule Enforcement and Violations. Based on the perceptions of 42 respondents covered by the random sample survey in November 1996, the most common violations involved illegal fishing and intrusion into the marine sanctuary (83%). These are consistent with the nature of violations officially recorded by the marine guards. Illegal fishing activities include the use of fine mesh nets, use of compressor, and blast fishing. The common perception is that the violators are outsiders or non-residents of San Salvador (60%), which also jibes with village records. The rest (40%) declared that the violators are from the village itself.

In terms of rule enforcement, the respondents stated that sanctions are imposed on the violators. These sanctions help foster compliance with fishery rules in San Salvador and uphold the spirit of the law. The most common perceptions are that violators are arrested (31%) and fined (26%). They are also jailed (20%), if not warned (17%) or asked to surrender their fishing gear (6%).

On the actual responsibility for enforcing fishery rules and regulations in San Salvador, 57 percent of all the respondents perceived a partnership between the government and the fisherfolk (e.g.,

fishers' association and fishers). The rest (43%) perceived that only the government is responsible. This latter finding, however, was affected by the non-members who gave a higher frequency response to the category of government only (52% for non-members versus 33% for members).

Table 12. Actual Responsibility for Enforcing Fishery Rules and Regulations

Responsible Unit	% Member	% Non-Member	% Total	X^2	p
				1.56	0.21
Government only	33.0	52.0	43.0		
Government and fisherfolk	67.0	48.0	57.0		
N	21.0	21.0	42.0		

Need for More Marker Buoys. Since 1994, marker buoys in the sanctuary have increasingly disappeared due to typhoons and strong waves. In October 1996, this situation became a source of conflict between a violator and the village authorities. A village guard relates, "***We saw a village resident fishing in the sanctuary and called his attention. He refused to stop his boat so we were forced to chase him. When he continued to ignore us, we had to fire a warning shot at his boat. The bullet, unfortunately, hit the leg of the violator.***" An uncle of the fisher complained that not all the boundaries of the sanctuary are readily visible and threatened to file a case in court. Later, the mayor called the parties involved to clarify the situation. The lawsuit against the village authorities did not prosper since the parties agreed to settle the case amicably and the barangay government shouldered the medical expenses of the wounded fisher.

At present, plans are already in the pipeline to replace the marker buoys and ropes with the assistance of the municipal government. The village fishers will provide free labor in the preparation and installation of the buoys while the municipal government will finance the cost of the materials. A watchtower is also envisaged, using the proceeds of the *Galing Pook* award given to the municipal government of Masinloc in July 1996 for the management of the San Salvador sanctuary. The *Galing Pook* award is a national award from the Asian Institute of Management (AIM) and the Department of Interior and Local Governments (DILG) to local government units which have demonstrated outstanding achievements in various fields. It is also a recognition of excellence in local governance.

4.6 External Institutional and Organizational Arrangements

This section highlights the delivery of services to San Salvador by external organizations before, during and after project implementation. It also discusses the decision-making arrangements at various levels: national, provincial and municipal.

4.6.1 Services from External Organizations

Prior to the implementation of the MCPSS in 1989, San Salvador was virtually bereft of services from interested organizations and social groups. Only the Bureau of Fisheries and Aquatic Resources (BFAR) visited the village to monitor milkfish fry in the area. The implementation of the MCPSS, however, proved to be a positive development. It brought San Salvador into the mainstream of services from government agencies, non-government organizations, and an academic institution, apart from giving rise to the formal organization of resource users in the village.

During the implementation of the MCPSS (1989-1993), Haribon Foundation, Inc. was responsible for community organizing, provision of technical assistance, training and fund mobilization. The Netherlands Embassy along with the Jaime V. Ongpin Foundation, a non-government organization, provided grants and donations until 1991. From 1991 to 1993, additional financial support came from the World Wildlife Fund Debt-for-Nature Swap program.

Assistance in re-seeding the sanctuary and reservation area with 101 giant clams came from an academic institution, the UP-Marine Science Institute (UP-MSI). The effort was in line with reversing the trend of declining ***tridacnid*** stocks through the re-stocking of coral reefs. It was also meant to build on the progress made in establishing mariculture technology. The UP-MSI established two ocean nurseries in San Salvador --- one in Purok Tagumpay (within the sanctuary) and another in Purok Bagong Buhay on the eastern coast (outside the sanctuary). The latter was an alternate site during the rainy season, being protected from strong waves and storm surges. Purok Bagong Buhay turned out to be a better site for rearing giant clams because of the conducive environment. In Purok Tagumpay, most clams were lost during the storm due to the strong current.

Another organization which rendered services in San Salvador during the MCPSS implementation was the Department of Agriculture. It participated in project-related meetings and provided resource persons for alternative income-generating projects such as swine raising, food processing and fish vending.

The municipal government of Masinloc extended valuable support to the MCPSS by enacting the sanctuary ordinance and actively enforcing fishery-related laws. Also deployed to safeguard the marine sanctuary and marine reserve was the *Bantay Dagat*, a group of marine guards partly funded by the municipal government since 1993.

After the completion of the MCPSS, the municipal government continued to be an active partner of the SPSS in fisheries management. In particular, it provided support in terms of radio equipment, patrol boat, gasoline, food for the sanctuary guards, and updating of the penalties imposed on violators of the sanctuary ordinance. Starting 1997, it plans to augment the annual honoraria of each sanctuary guard to P2,400 (US $91.25). At present, the village government is footing the honoraria of four guards at P1,500 (US $57) each per year.

The Department of Environment and Natural Resources (DENR), on the other hand, assisted in

zoning the waters of San Salvador in 1989 and responded to the request of the village government to rehabilitate a 5-hectare mangrove area in 1991. One year after the completion of the MCPSS, it introduced the Coastal Environment Program (CEP). It has carried out new marine resource assessments, provided training on seaweed farming, and dispersed goats as an income-generating activity in San Salvador. Moreover, it has been at the forefront of organizing the Protected Area Management Board (PAMB) for the management of protected areas in Zambales and of formulating a management plan for Masinloc Bay and Oyon Bay, which provided a a basis for zoning the two bays.

Haribon Foundation, on its part, continued to assist San Salvador after the completion of the MCPSS. In response to the request of the village captain, it provided a para-legal training on environmental laws in early 1997. In addition, Haribon assessed the progress of SPSS in terms of planned and implemented activities and helped lay out future plans to consolidate the fishers' association. At present, it is identifying viable livelihood projects in San Salvador through a grant from the Fund for Sustainable Society, Inc. In addition, Haribon will revitalize the association of aquarium fish gatherers to ensure that their trade will be environmentally sustainable.

4.6.2 Decision-Making 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 of fish sanctuaries and fishing reservations; declaration of closed season by area specification, gear or species of fish; and prohibition of illegal fishing such as the use of explosives, obnoxious substances, fine mesh nets, and electro-fishing gadgets. The agency mandated with the development and regulation of fisheries was the Bureau of Fisheries and Aquatic Resources (BFAR).

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. The mandate of protection of communal marine and fishing resources extends to offshore fishing grounds of local fishers against foreign intrusion (UP-Local Government Center 1996).

In 1987, changes also occurred in the mandate of BFAR. From a line agency with quasi-judicial functions, BFAR evolved to a staff bureau under the Department of Agriculture. Its role shifted to that of a support bureau, responsible for providing the policy framework on fisheries and for extending support services to make fisheries profitable. Consequently, its programs are now geared towards support to three main areas: 1) regulation; 2) research; and, 3) general administration. In particular, BFAR is charged with planning for the proper management and use of fishery and

aquatic resources in the Philippines and conducting studies on the economics of the fishing industry. Moreover, it provides technical assistance/advisory services in the procurement and operation of fishing vessels as well as in the determination and designation of fish landing points for all commercial fishing boats. At present, however, BFAR does not have any on-going fishery-related program in San Salvador. It responds, however, to cyanide testing requests.

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 BFAR were devolved to the municipal government. Nonetheless, many local governments still require technical and financial assistance to fulfill their new mandates. Like other sites, this holds true for the municipal government of Masinloc.

The LGC, among others, now places under the jurisdiction of municipal governments the management of municipal waters 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. They also cover marine waters between two lines drawn perpendicular to the general coastline from points where the boundary lines of the municipality touch the sea at low tide and a third parallel line with the general coastline within 15 kilometers from the shoreline.

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 Bayan*) 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. This sharing of proceeds, however, has yet to be realized.

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 such as air bubble fishing (*pa-aling*), *muro-ami*, and Danish seine (*hulbot-hulbot*), among others. Violations are punishable by a fine of not more than P2,500 (US $95) or imprisonment of not more than six months, or both, upon the discretion of the court.

Despite the legal strides favoring devolution efforts, some conflicts in decision-making still need to be resolved. While the general objective of the LGC is local autonomy, the management authority of the national government through BFAR still prevails on several types of fishery activities. These include fish cages, fish sanctuaries, fish pond leases, seaweed, pearl farms, and establishment of fishery-related facilities (UP-Local Government Center 1996).

Moreover, under the Fisheries Decree of the Philippines, municipal waters were previously defined as areas seven kms from the coastline. With the growing discontent and restlessness among municipal marine fishers against commercial fishers, Letter of Instruction (LOI) No. 1328 was passed in May 1983, prohibiting the operation of commercial trawls and purse seiners within a distance of seven kms or 3.78 nautical miles from the shoreline of all provinces of the Philippines. The LOI was meant to protect municipal fishery resources from heavy exploitation of fishery resources and provide municipal fishers a wider area with which to operate fishing boats of three gross tons or less. With the redefinition of municipal waters by the LGC and the enforcement of LOI 1328, amendments are warranted. Commercial fishers, as regulated by the national government through BFAR, can operate in Philippine waters seven fathoms deep or more which sometimes cover part of the municipal waters.

In the early 1990s, another key decision-maker emerged known as the Protected Area Management Board (PAMB). This was an offshoot of 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. The 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 participate in drawing up the management plan for Masinloc Bay.

Thus, the decade of the 1990s introduced major reforms supportive of co-management, which will govern future decisions and policies on fisheries. Apart from the Local Government Code, the

Philippine government enacted the National Integrated Protected Areas System (NIPAS) Act in 1992 to safeguard sanctuaries and other protected areas in the country, which, in turn, mandated the creation of PAMBs with a multi-sectoral orientation. At the same time, stakeholder participation in resource management is being insitutionalized through the establishment of Fisheries and Aquatic Resource Management Councils (FARMCs) at the village, municipal and provincial levels by virtue of Executive Order No. 240. Thus, ample opportunity is provided for consultations and deliberations on resource management through formal venues for interaction and direct representation.

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.

4.7 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, which started in the 1970s, and the intervention of external catalysts in the late 1980s, which reversed the degradation of the marine environment. The first event was associated with the shift by village residents from traditional and generally non-destructive fishing technologies to new technologies used by the migrants, which wrought havoc on marine habitats and increasingly depleted fishery resources. The second event marked the beginning of a conscious effort to heighten environmental awareness among residents and local officials and to collectively carry out an intervention to rehabilitate marine habitats and stop illegal fishing in the waters of San Salvador. This was initiated by a Peace Corps Volunteer in 1987 and supported by Haribon Foundation from 1989 to 1993 through the Marine Conservation Project for San Salvador.

The project initiative was followed by a chain of events that eventually lent legitimacy to marine sanctuaries as protected areas. The declaration of Masinloc and Oyon Bays as protected seascapes in 1993 was preceded by collective action on the part of the San Salvador fishers' association (SPSS) and the rest of the village residents. They campaigned against the construction of the Masinloc Coal Power Plant in barangay Bani, located a few miles from San Salvador's northwestern side. They believed that the power plant would destroy their environment and their livelihood. They initiated mass action, wrote letters, and delivered speeches to halt the plant's construction. Due to the endorsement of the plant by the President of the Philippines, however, construction pushed through. To appease the village, the President signed a proclamation declaring Masinloc and Oyon Bays as protected seascapes, upon the recommendation of the Department of Environment and Natural Resources. In 1996, the bays were officially delineated into management zones. Included in the management zones was a strict protection zone for resource regeneration, which covered the San Salvador marine sanctuary.

5.0 Incentives to Cooperate and Patterns of Interaction

The incentives to cooperate are found at various levels: 1) among fishers; 2) between government organizations (GOs) and non-government organizations (NGOs); and 3) among fishers, GOs and NGOs. In turn, these have triggered certain types of interactions, both positive and negative, which have influenced project results over time.

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
■ 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)	■ Eventual support by alienated groups for sanctuary management ---> rule compliance ----> shift to non-destructive fishing technologies ■ 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 (e.g., 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

5.1 Among Fishers

At the level of village fishers, the motivating factors behind collaborative efforts are largely rooted in their dependence on the resource base and their realization of the need to decisively act on declining fish yields. In addition, the legitimacy, enforceability and relevance of rules provided an incentive to cooperate, along with tangible benefits from co-management efforts.

The alarming downtrend in their fish catch, which became even more pronounced just before the implementation of the Marine Conservation Project for San Salvador (MCSPSS), was highlighted by the findings of the 1988 resource and ecological assessment (REA) and by learning dialogues with external catalysts. In 1989, the observation tour of Apo Island provided the core group members an opportunity to compare the status of San Salvador's marine resources with that of Apo Island, interact with other fishers on coral reef rehabilitation, and rethink their own fisheries management practices. The tour led to a series of interactions which paved the way for the establishment of a marine sanctuary and marine reserve in San Salvador, backed by a municipal ordinance and by vigorous law enforcement efforts which made rules legitimate and enforceable. Successful experiences elsewhere helped provide San Salvador fishers the confidence and the motivation that they, too, could embark on a similar undertaking.

The path to co-management in San Salvador, however, was not problem-free. The immediate losers in the process were the Visayan aquarium fishers who, because of the sanctuary ordinance, could no longer catch aquarium fish from the area occupied by the marine reserve and could no longer use sodium cyanide, as well as those fishers who traditionally fished in the sanctuary area. Customary open access rights were redefined by the sanctuary ordinance, along with allowable types of fishing gear in the marine reserve. Resentment among aquarium fishers prevailed in the initial year, aggravated by the lack of alternative livelihood activities at the outset of MCPSS implementation. The following year, however, saw the introduction of an alternative, non-destructive technology for catching aquarium fish using barrier nets and the subsequent deployment of artificial reefs outside the marine reserve as a substitute fishing spot. The limited supply of aquarium fish in San Salvador

waters and the increase in the number of fishers, nonetheless, eventually compelled the fishers to fish in other fishing grounds around Zambales and in the neighboring province of Pangasinan.

Another alienated group of fishers were Sambals who used beach seine (*kunay*). The aquarium fishers saw an opportunity to point out the destructive effects of *kunay* on fishing habitats and eventually clamor for banning its use in San Salvador. The *kunay* owners, who initially supported the sanctuary ordinance, found themselves at the losing end. They were compelled to shift to other fishing grounds, where the said fishing gear was not banned, and later stop its use completely due to mounting opposition. It also led to a waning of enthusiasm in the activities of the village fishers' association, particularly on the part of those adversely affected by the ban.

Over time, tangible benefits from resource management efforts, which increasingly became more evident after two years of MCPSS implementation, provided a new incentive to cooperate. Some alienated groups even expressed that they were won over to the sanctuary concept upon seeing the improvement in fish catch. In turn, this led to rule compliance and a shift to non-destructive fishing technologies among San Salvador fishers.

The benefits from direct project involvement were also social and political. New village leaders emerged, who largely came from the ranks of core group members. Their social standing in the village was enhanced, enabling them to rise to political positions in their community. In turn, this meant continuing support for project-related efforts and sustained enforcement of collective choice rules on the management of the area occupied by the sanctuary and marine reserve.

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

At the level of government organizations and non-government organizations, the desire to improve socioeconomic conditions, together with the concern for sustainable coastal resource management and food security, served as an incentive to collaborate. This led to the mobilization of additional funds for livelihood activities and for law enforcement support (e.g., boat, radio facility and honoraria/food for marine guards). In 1993, the formal creation of the *Bantay Dagat* reinforced law enforcement in San Salvador.

Another incentive to cooperate came from policy-driven directions and legislation-led reforms. The emergence of a collective thrust on sustaining development through a prudent stewardship of environmental resources favored collaborative efforts. Government and non-government organizations jointly participated in project meetings, various situations involving problem-solving, consensus-building, and conflict resolution, and outreach efforts to neighboring villages. This was evident in efforts behind village consultations, passage of the sanctuary ordinance, and banning of destructive fishing methods in San Salvador. A sharing of monitoring and evaluation results also took place, increasing awareness of resource management results over time. The passage of the Local Government Code in 1991, moreover, helped strengthen the partnership between government and non-government organizations.

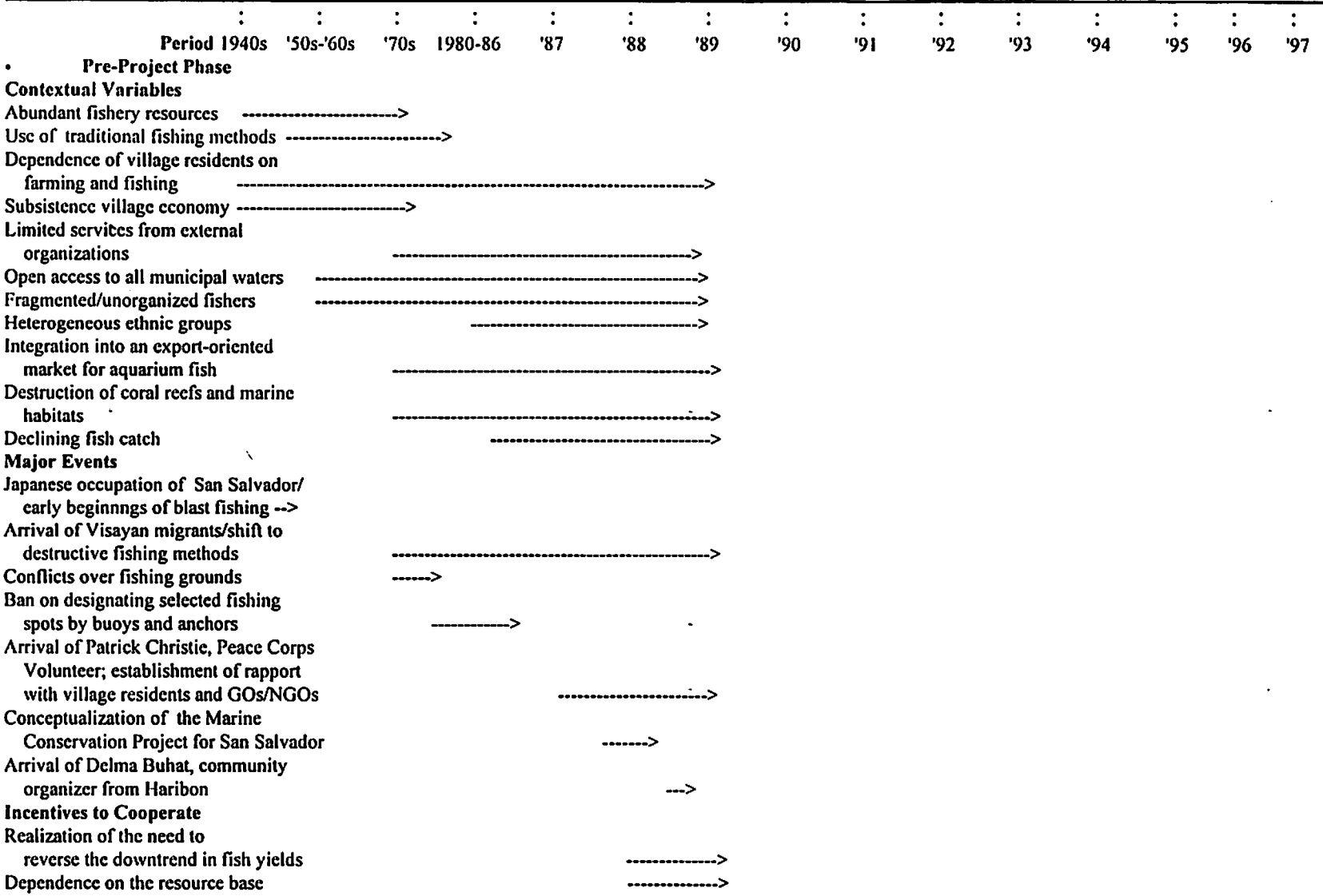
5.3 Among Stakeholders, Government Organizations and Non-Government Organizations

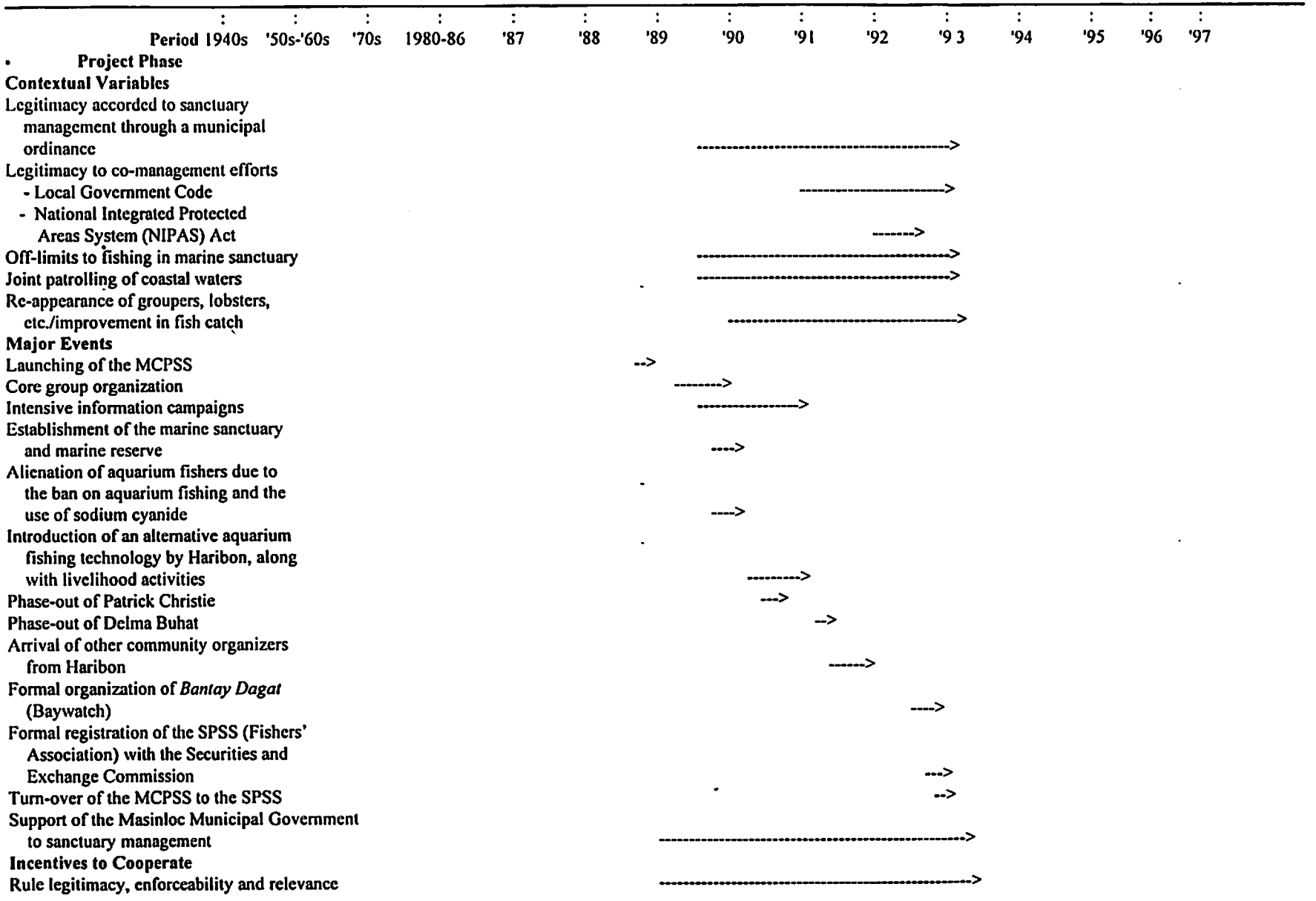
The enactment and strict enforcement of the sanctuary ordinance provided legitimacy to collaborative management of coastal resources in San Salvador among the stakeholders, government organizations and non-government organizations. This led to a joint patrolling of coastal waters and the apprehension of illegal fishers which, in turn, fostered compliance with fishery-related laws.

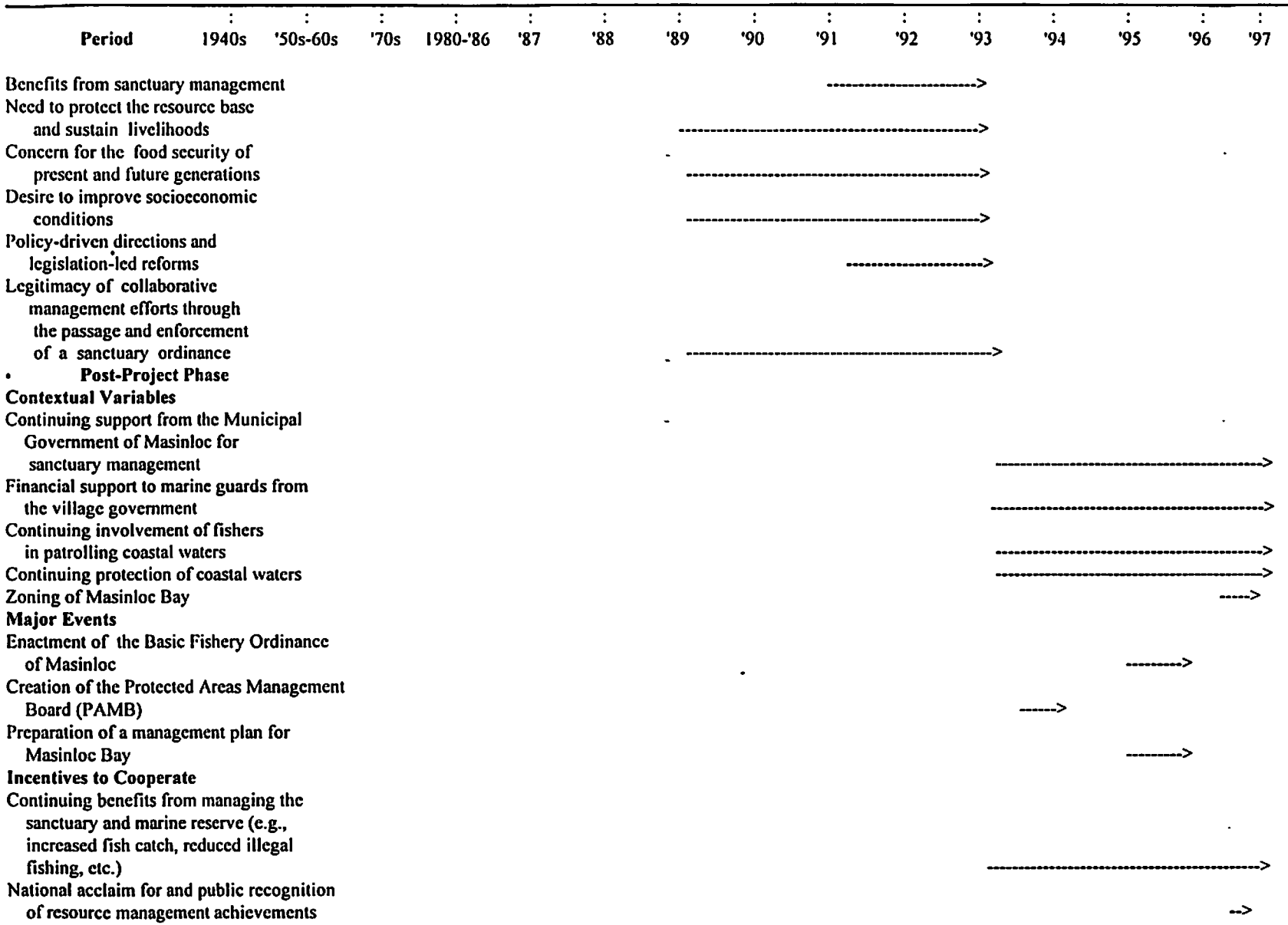
The formal devolution of powers and responsibilities to local government units through a supportive national legislation, which comprised a new constitutional rule in 1991, also served as an incentive for the community and other groups to rally behind the local government in sustaining the marine sanctuary and marine reserve. Moreover, the enactment of the National Integrated Protected Areas System (NIPAS) Act paved the way for the declaration of Masinloc and Oyon Bays as protected seascapes and for the subsequent delineation of these bays into management zones.

Worth noting, too, are the national acclaim for the resource management accomplishments of San Salvador in 1996 through the prestigious *Galing Pook* award and the benefits from sanctuary management, which provided a sense of pride and achievement to all collaborators. These helped strengthen the resolve to maintain the sanctuary and pursue strict law enforcement. Moreover, they heightened the interest of external groups in successful collaborative management models which could be replicated in other areas with similar conditions.

Table 13. Summary of Contextual Variables, Major Events, and Incentives To Cooperate by Project Phase: San Salvador




Period 1940s '50s-'60s '70s 1980-86 '87 '88 '89 '90 '91 '92 '9 3 '94 '95 '96 '97
• Project Phase
Contextual Variables
Legitimacy accorded to sanctuary management through a municipal ordinance
Legitimacy to co-management efforts
- Local Government Code
- National Integrated Protected Areas System (NIPAS) Act
Off-limits to fishing in marine sanctuary
Joint patrolling of coastal waters
Re-appearance of groupers, lobsters, etc./improvement in fish catch
Major Events
Launching of the MCPSS
Core group organization
Intensive information campaigns
Establishment of the marine sanctuary and marine reserve
Alienation of aquarium fishers due to the ban on aquarium fishing and the use of sodium cyanide
Introduction of an alternative aquarium fishing technology by Haribon, along with livelihood activities
Phase-out of Patrick Christie
Phase-out of Delma Buhat
Arrival of other community organizers from Haribon
Formal organization of Bantay Dagat (Baywatch)
Formal registration of the SPSS (Fishers' Association) with the Securities and Exchange Commission
Turn-over of the MCPSS to the SPSS
Support of the Masinloc Municipal Government to sanctuary management
Incentives to Cooperate
Rule legitimacy, enforceability and relevance


Period
1940s
'50s-60s
'70s
1980-'86
'87
'88
'89
'90
'91
'92
'93
'94
'95
'96
'97
Benefits from sanctuary management
Need to protect the resource base and sustain livelihoods
Concern for the food security of present and future generations
Desire to improve socioeconomic conditions
Policy-driven directions and legislation-led reforms
Legitimacy of collaborative management efforts through the passage and enforcement of a sanctuary ordinance
Post-Project Phase
Contextual Variables
Continuing support from the Municipal Government of Masinloc for sanctuary management
Financial support to marine guards from the village government
Continuing involvement of fishers in patrolling coastal waters
Continuing protection of coastal waters
Zoning of Masinloc Bay
Major Events
Enactment of the Basic Fishery Ordinance of Masinloc
Creation of the Protected Areas Management Board (PAMB)
Preparation of a management plan for Masinloc Bay
Incentives to Cooperate
Continuing benefits from managing the sanctuary and marine reserve (e.g., increased fish catch, reduced illegal fishing, etc.)
National acclaim for and public recognition of resource management achievements

6.0 Outcomes/Performance Indicators of Co-Management

Ideally, baseline data should be compared with current data to measure changes over time. In this study, it was not possible to measure physical and social changes due to data limitations, data comparability, and inability to conduct a coral reef assessment using the methodology adopted in 1988. To measure the performance of co-management over time, the perceptions of project participants and non-participants may be the best alternative. In a previous evaluation of community-based coastal resource management sites in the Philippines, it was shown that the perceptions of perceived changes over time are useful in the absence of solid baseline data (Pomeroy, Pollnac, Predo and Katon 1996). The technique involved a visual, self-anchoring, ladder-like scale which allowed for making ordinal judgments, placed little demand on informant memory, and could be rapidly administered. The respondents were shown a ladder-like diagram with 10 steps, where 10 represented the best possible scenario and 1 the worst possible scenario in terms of the perceived changes in the indicators. The respondents were asked to indicate the appropriate step on the ladder which corresponds to their perceptions of changes in various time periods: before the project (e.g., before 1989), today, and five years from now. Box 5 summarizes the performance indicators.

Box 5. Performance Indicators of Co-Management

Equity

- Participation in community affairs
  1. community affairs in general (PARTICIPATION IN GENERAL)
  2. community fisheries management (PARTICIPATION-FISHERIES MGT)
- Influence over community affairs
  1. community affairs in general (INFLUENCE IN GENERAL)
  2. community fisheries management (INFLUENCE-FISHERIES MGT)
- Control over fishery resources (CONTROL)
- Fair allocation of access rights to fishery resources (ALLOCATION-ACCESS)
- Satisfaction with fishery arrangements
  1. sanctuary management (SATISFACTION-SANCTUARY MGT)
  2. marine reserve management (SATISFACTION-RESERVE MGT)
  3. mangrove management (SATISFACTION-MANGROVE MGT)
- Benefits from the marine reserve (BENEFITS-MARINE RESERVE)
- Overall well-being of the household (HOUSEHOLD WELL-BEING)
- Household income (INCOME)

Sustainability

- Overall well-being of fishery resources (FISHERY WELL-BEING)
- Community compliance with fishery-related rules (COMPLIANCE)
- Knowledge of fisheries (KNOWLEDGE-FISHERIES)
- Exchange of information on fisheries management (INFORMATION EXCHANGE)

Efficiency

- Collective decision-making on rules governing the use of fishery resources (COLLECTIVE DECISION-MAKING)
- Quickness of resolving community conflicts on fishery issues (CONFLICT RESOLUTION)

Analysis and Discussion. The first step in the analysis involved the calculation of mean values for the difference between each indicator for *today* (T_2) and *before the project* (T_1). A paired comparison t-test was used to determine if the mean differences between the two time periods are statistically significant. For the overall sample, Table 14 shows a statistically significant increase in perceived levels of **all** performance indicators ($p<0.01$). It also shows that relatively larger positive changes were perceived in knowledge of fisheries, information exchange on fisheries management, satisfaction with fishery arrangements (e.g., mangrove management and sanctuary management), benefits from the marine reserve, and quickness of resolving fishery conflicts.

Table 14. Perceived pre-project to post-project changes in performance indicators for all respondents: before the project and now

Indicator	All			
	Today (T_2)	Before (T_1)	T_2-T_1	*p*
Equity				
a. Participation in general	5.26	3.54	1.72	<0.01
Participation- fisheries mgt	4.71	3.24	1.47	<0.01
b. Influence in general	5.67	3.36	2.31	<0.01
Influence-fisheries mgt	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:				
Satisfaction-sanctuary mgt	6.21	3.24	2.97	<0.01
Satisfaction-reserve mgt	5.88	3.26	2.62	<0.01
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 also 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 from the perspective of equity, efficiency, and sustainability. Relatively larger positive changes 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.

Table 15 shows the perceived *pre-project changes* to post-project changes (*today*) in the performance indicators based on membership in the village-based fishers' association. Members as well as non-members perceived positive and statistically significant changes in all indicators. The only exception lies in the members' perceived participation in community fisheries management. Though the members perceived a positive increase over time, the difference before the project and now is not statistically significant ($p>0.05$).

Table 15. Perceived pre-project to post-project changes in performance indicators for members and non-members: before the project and now

Performance Indicator	Member				Non-Member			
	Today	Before			Today	Before		
	(T_2)	(T_1)	T_2-T_1	*P*	(T_2)	(T_1)	T_2-T_1	*p*
Equity								
a. Participation in general	5.05	3.38	1.67	<0.05	5.48	3.71	1.77	<0.01
Participation-fisheries mgt	5.09	3.48	1.61	>0.05	4.33	3.00	1.33	<0.01
b. Influence in general	6.10	3.76	2.34	<0.01	5.24	2.95	2.29	<0.01
Influence-fisheries mgt	6.05	4.14	1.91	<0.05	5.86	2.67	3.19	<0.01
c. Control over fisheries	5.29	2.19	3.10	<0.01	5.57	2.71	2.86	<0.01
d. Allocation-access	6.24	3.10	3.14	<0.01	5.86	3.86	2.00	<0.01
e. Satisfaction with fishery arrangements:								
Satisfaction-sanctuary mgt	6.10	2.81	3.29	<0.01	6.33	3.67	2.66	<0.01
Satisfaction-reserve mgt	5.81	2.52	3.29	<0.01	5.95	4.00	1.95	<0.05
Satisfaction-mangrove mgt	6.43	2.14	4.29	<0.01	6.81	3.19	3.62	<0.01
f. Benefits-marine reserve	6.14	3.24	2.90	<0.01	6.48	3.10	3.38	<0.01
g. Household well-being	6.71	4.14	2.57	<0.01	6.71	4.19	2.52	<0.01
h. Income	6.43	3.38	3.05	<0.01	6.33	3.67	2.66	<0.01
Efficiency								
a. Collective decision-making	5.48	3.57	1.91	<0.05	6.00	3.43	2.57	<0.01
b. Conflict resolution	6.48	3.40	3.08	<0.01	6.48	3.38	3.10	<0.01
Sustainability								
a. Fishery well-being	7.19	4.10	3.09	<0.01	6.86	4.90	1.96	<0.01
b. Compliance	5.52	2.90	2.62	<0.01	6.29	4.05	2.24	<0.01
c. Knowledge-fisheries	6.29	2.05	4.24	<0.01	5.76	2.76	3.00	<0.01
d. Information exchange	5.81	1.86	3.95	<0.01	5.90	3.38	2.52	<0.01

For the perceptions *today* and *five years from now,* members as well as non-members perceived positive and statistically significant changes in the performance indicators of co-management ($p<0.01$). Non-members, however, perceived a positive, but not statistically significant difference, in the perceived well-being of fishery resources five years from now ($p>0.05$).

The second step in the analysis was to determine if the members of the fishers' association (e.g.,

SPSS) differed from non-members. This was accomplished by subtracting the pre-project perception from the today perception for each indicator (T_2-T_1) and calculating a two-sample t-test for the difference of mean values between the member and non-member samples. As indicated by Table 16, 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 16. 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

Moreover, the *today* perception was compared with the perception *five years from now* for each indicator using a two-sample t-test (e.g., members versus non-members). Positive changes were perceived in all indicators but there is no statistically significant difference between members and non-members ($p>0.10$).

The third step in the analysis was to examine the relationships between perceived changes in the performance indicators and independent variables. Since people's behavior toward the project is based on their perceptions, it is important to determine the correlates of variability in perceptions to deepen one's understanding of the factors which ultimately influence the behavior associated with co-management. The independent variables are selected from the contextual variables discussed

earlier in Section 4 of this case study. These variables can be further categorized into basic social variables, project-related variables, attitudinal variables, occupational variables, economic variables, and resource-related variables.

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

An examination of Table 17 shows that the respondent's length of education is related to perceptions of smaller changes in two indicators: participation in community affairs in general and influence over fisheries management. For project-related variables, the knowledge of project objectives and number of project objectives known are positively correlated with changes in the perceived satisfaction with the management of the marine reserve (Table 18). This finding demonstrates the importance of having a good grasp of project objectives in relation to perceived satisfaction from marine reserve management.

Moreover, influence on planning is positively correlated with perceived changes in knowledge of fisheries and information exchange. This underscores the usefulness of interactive discussions and participatory planning in bringing about perceived improvements in the knowledge base.

Table 17. Correlation between performance indicators and selected household and individual level variables

Indicator	Age	Years of Education	Household Size
Participation in general	-0.0746	-0.3443*	0.1338
Participation-fisheries management	-0.0773	-0.1351	-0.1213
Influence in general	-0.0101	-0.0352	0.0446
Influence-fisheries management	0.0319	-0.3697*	0.0919
Control over fisheries	-0.2289	-0.0846	0.0299
Access-alocation	0.0698	-0.0635	0.1763
Satisfation-sanctuary mgt	-0.1059	-0.0816	0.0058
Satisfaction-marine reserve mgt	0.0830	-0.0342	-0.0458
Satisfaction-mangrove mgt	0.2145	-0.0406	0.1529
Benefits-marine reserve	0.1761	0.1078	-0.1236
Household well-being	-0.0491	-0.2649	0.1541
Income	-0.0410	-0.2838	0.1819
Collective decision-making	0.0339	-0.1494	-0.0240
Conflict resolution	0.0726	-0.1728	0.0040
Fishery well-being	-0.1431	-0.2812	0.1619
Compliance	0.2190	-0.1449	-0.0268
Knowledge-fisheries	0.2948	-0.1525	0.0819
Information exchange	0.2327	-0.0299	0.0270

* p = <.05

Table 18. Correlation between performance indicators and project-related variables

Indicator	Knowledge of Objectives	Attend Meetings	Influence on Planning	Member	Objectives Known (#)
Participation in general	-0.0387	-0.1491	-0.2284	-0.0176	-0.0516
Participation-fisheries	0.1008	-0.1001	-0.1342	0.0447	-0.0158
Influence in general	0.0148	0.0435	0.1566	0.0088	0.0264
Influence-fisheries	-0.1094	-0.2175	0.0904	-0.2245	-0.1616
Control over fisheries	-0.0346	0.0992	0.0501	0.0501	-0.0711
Allocation-access	-0.0339	0.1018	0.0384	0.2304	0.0450
Satisfaction-sanctuary mgt	0.0210	-0.0218	0.0848	0.1002	0.2301
Satisfaction-reserve mgt	0.3105*	0.1765	0.2853	0.1997	0.3391*
Satisfaction-mangrove mgt	0.1381	0.0664	0.1878	0.1315	0.2254
Benefits-marine reserve	-0.0070	-0.1171	0.2860	-0.0788	0.1623
Household well-being	0.0749	0.0197	-0.418	0.0139	-0.1031
Income	-0.0597	0.0000	0.2030	0.0902	-0.0495
Collective decision-making	-0.0698	-0.0967	0.0966	-0.1127	0.0065
Conflict resolution	0.0935	-0.0574	0.0271	-0.0090	0.0947
Fishery well-being	-0.0105	0.1964	0.2330	0.2151	0.0338
Compliance	0.2503	0.0211	0.2986	0.0796	-0.0136
Knowledge-fisheries	0.2147	0.1386	0.3724*	0.2548	0.0833
Information exchange	0.2991	0.2285	0.3041*	0.2851	0.2958

*p = <.05

Table 19 presents the correlation between the co-management performance indicators and attitudinal variables. Respondents who felt that the community could work together perceived smaller positive changes in control over fisheries, fair allocation of access rights, satisfaction with sanctuary management and with mangrove management, and benefits from the marine reserve ($p<0.05$). The shift from customary open access, where every fisher can do what he wants, to that of curtailed/restricted rights to the fishery resource may have given rise to this perception. In a common property regime, changing the situation from one of independent action to that of a collective action is imperative. In the process, individual fishers give up certain rights and decisions for achieving a common good and for reducing joint harm to their resource base and their livelihood.

Those who felt that rule-breaking is sometimes acceptable tended to perceive smaller positive changes in influence over community affairs ($p<0.05$). Violators of fishery rules are not likely to receive respect from San Salvador residents and to perceive a strong influence over community affairs.

Table 19. Correlation between performance indicators and attitudinal variables

Indicator	Community can work together	Fishers can work together	Rule breaking is sometimes acceptable
Participation in general	0.0556	-0.0641	-0.0814
Participation-fisheries mgt	0.0484	0.1753	-0.0998
Influence in general	0.1865	0.1566	-0.3422*
Influence-fisheries	-0.1362	0.0904	-0.2719
Control over fisheries	-0.3106*	0.2016	-0.0583
Allocation-access	-0.3504*	0.2056	-0.0920
Satisfaction-sanctuary mgt	-0.3175*	-0.0288	-0.1115
Satisfaction-reserve mgt	0.2303	0.1088	0.0195
Satisfaction-mangrove mgt	-0.3900*	0.0899	-0.1906
Benefits-marine reserve	-0.4143*	-0.0652	-0.1087
Household well-being	0.0566	-0.2285	-0.0036
Income	-0.0604	-0.0220	-0.1011
Collective decision-making	-0.2480	0.0261	-0.0191
Conflict resolution	-0.1448	0.1931	-0.1547
Fishery well-being	-0.1803	-0.0276	-0.0545
Compliance	0.1599	0.0920	-0.0338
Knowledge-fisheries	0.0493	0.2496	-0.1494
Information exchange	0.0956	0.1927	-0.2075

*p = <0.05

Table 20 shows that the number of fishing gear used by the fishers is positively correlated with perceived changes in collective decision-making on rules governing fishery resource uses. The more numerous the types of fishing gear used, the greater is the perceived change in collective decision-making. This is understandable since in the formulation of rules on the marine reserve, several types of gear/fishing methods were banned (e.g., fine gillnets with a mesh size below 3 cms, use of

scarelines or poles, spear fishing using compressor, cyanide fishing, beach seine (*kunay*) and other destructive gear). Fishers with varied gear types must have felt a greater need to participate in collective decision-making and express their sentiments.

Table 20. Correlation between performance indicators and occupational variables

Performance Indicators	# of gear	Primary occupation	Secondary occupation	Choose fishing	Change occupation	Fishing income (%)
Participation in general	-0.0307	0.0707	0.0000	0.0330	-0.0252	0.1405
Participation-fisheries mgt	0.2128	0.1867	0.1370	-0.0968	0.0456	0.2534
Influence in general	0.0235	0.1453	0.1552	0.2054	-0.2137	-0.0966
Influence-fisheries mgt	-0.0833	-0.0037	-0.0059	0.2496	-0.0935	0.0416
Control over fisheries	0.2224	0.1838	-0.1134	-0.1302	-0.0897	0.0301
Allocation-access	0.0279	-0.1031	-0.0815	-0.0139	-0.0220	-0.0384
Satisfaction-sanctuary	0.0572	0.1206	-0.0545	-0.0067	0.1478	0.0385
Satisfaction-reserve	-0.0017	-0.0510	0.0555	-0.1997	0.2689	-0.1141
Satisfaction-mangrove	0.0344	-0.2352	-0.1926	0.0786	0.0584	-0.0188
Benefits-marine reserve	0.0138	-0.1058	0.1171	0.2162	-0.0679	-0.2523
Household well-being	-0.0972	-0.0062	-0.2465	0.0242	-0.1568	0.1534
Income	0.0837	0.0605	-0.1196	-0.1270	0.0291	0.1805
Collective decision-making	0.3279*	-0.0936	0.0398	0.1510	-0.0400	-0.0322
Conflict resolution	0.0331	0.0363	0.0574	-0.0677	0.1695	0.2074
Fishery well-being	0.0862	-0.0321	-0.2028	-0.1009	-0.0189	-0.0179
Rule compliance	0.2548	-0.2404	0.1478	0.0546	0.0629	-0.1394
Knowledge of fisheries	-0.0672	-0.2542	0.2633	0.0028	0.0741	-0.1568
Information exchange	0.0680	-0.0595	0.2285	-0.0329	0.0864	-0.0760

*p = <.05

Table 21 indicates that fishing as the primary source of total household income is associated with smaller changes in perceived fair allocation of access rights, knowledge of fisheries, and information exchange ($p<0.05$). The more dependent the household is on fishing income, the smaller is the perceived fair allocation of access rights to fishery resources. The household has more to lose in the short-term if the area occupied by the sanctuary is large and if nearby fishing grounds are not as productive. Moreover, the greater the dependence on fishing as a primary income source, the smaller are the perceived increases in knowledge and information exchange on fisheries. Most probably, this is due to the relatively more limited time available for other activities like training and interactive discussions, particularly if fishing is done in distant fishing grounds and takes up a longer time. For instance, aquarium fishers who go to Pangasinan as well as tuna fishers using *bondying* or handline in the distant fishing grounds of Olongapo and Scarborough Shoal report a minimum fishing time of 8 hours and a maximum of 19 hours or more per fishing trip.

For those receiving remittances from external sources, larger positive changes were perceived in

compliance with fishery rules and knowledge of fisheries. The additional income from relatives outside the village must have reduced the pressure to earn a living for economic survival and released time for expanding knowledge of fisheries. It has also led to a perceived increase in rule compliance.

Table 21. Correlation between performance indicators and economic variables

Performance Indicators	Fishing as a primary income source	Outside remittances
Participation in general	0.0236	-0.0244
Participation-fisheries management	0.1667	0.1904
Influence in general	-0.0903	-0.2663
Influence-fisheries management	0.1301	-0.0201
Control over fisheries	-0.0314	0.1151
Allocation-access rights	-0.4122*	-0.0920
Satisfaction-sanctuary mgt	0.0172	0.1385
Satisfaction-marine reserve mgt	-0.1085	0.1844
Satisfaction-mangrove mgt	-0.3612	-0.0484
Benefits-marine reserve	0.1692	0.1218
Household well-being	-0.0811	-0.1846
Income	0.0000	0.0209
Collective decision-making	0.2951	0.1028
Conflict resolution	-0.0605	0.0794
Fishery well-being	-0.1763	-0.0545
Rule compliance	0.1336	0.3322*
Knowledge of fisheries	-0.3594*	0.3382*
Information exchange	-0.3910*	0.2036

p = <0.05

Table 22 shows the correlation between the performance indicators and resource-related variables: perceived pre-project condition of fishery resources and ecological knowledge. Those who felt that the resource condition was good 15 years ago tended to perceive larger increases in their satisfaction with marine reserve management ($p=<.05$). Those who had higher levels of ecological knowledge perceived positive and statistically significant changes in participation in fisheries management and in information exchange. However, they tended to perceive a smaller increase in satisfaction with marine reserve management ($p<0.05$). (Ecological knowledge was based on the number of characteristics of the sea and coast that help the fish to grow and be healthy that the respondent could give).

As the fourth step in the analysis, the co-management performance indicators were subjected to a principal component analysis (with varimax rotation) to determine if relationships between the indicators were such that they could be reduced to fewer composite indicators for further analysis. Table 23 shows the results. The indicators per component were selected and ranked based on eigen values. Indicators with factor loadings of 0.50 and above were retained in the component analysis,

resulting in a total of six components.

Table 22. Correlation between performance indicators and resource-related variables

Performance Indicators	Perceived pre-project resource condition	Level of ecological knowledge
Participation in general	-0.0179	0.1005
Participation - fisheries management	0.1035	0.3884*
Influence in general	0.1218	0.1562
Influence - fisheries management	0.0543	-0.0317
Control over fisheries	-0.2619	-0.0382
Allocation - access rights	0.0392	0.0854
Satisfaction-sanctuary mgt	0.1950	0.1175
Satisfaction-marine reserve mgt	0.5242*	-0.3907*
Satisfation-mangrove mgt	0.0997	-0.1074
Benefits-marine reserve	-0.0032	0.2085
Household well-being	0.0911	-0.0355
Income	-0.0599	0.0000
Collective decision-making	0.1248	0.0614
Conflict resolution	-0.0663	0.1146
Fishery well-being	-0.0476	0.0342
Rule compliance	0.1869	0.0759
Knowledge of fisheries	-0.1200	0.0623
Information exchange	0.0660	0.3020*

*p = <.05

Performance indicators loading highest on Component 1 are those directly related to fishery resource management, such as perceived changes in information exchange on fisheries, satisfaction with marine reserve management, and knowledge of fisheries. Indicators loading highest on Component 2 are perceptions of collective decision-making, compliance with fishery rules, overall well-being of the household, and benefits from the marine reserve, reflecting a combination of behavioral and material gains. Those loading highest on Component 3 are resource-related equity indicators such as perceived satisfaction with mangrove management, benefits from the marine reserve, and participation in community fisheries management.

Indicators loading highest on Component 4 are all related to community/collective equity --- perceived participation in community affairs in general, influence on community fisheries management, influence on general community affairs, and satisfaction with sanctuary management. Those loading highest on Component 5 are perceptions of household income, overall well-being of fishery resources, knowledge of fisheries, and quickness of resolving community conflicts, which comprise a mix of resource-related and human behavior indicators. Finally, indicators loading highest on Component 6 are perceived control over fishery resources and fair allocation of access rights to fishery resources, which are both attitudinal equity indicators.

Table 23. Principal component analysis of performance indicators

Performance Indicator	Compo-nent 1	Compo-nent 2	Compo-nent 3	Compo-nent 4	Compo-nent 5	Compo-nent 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*

The fifth step in the analysis is to determine the relationships between the component indicators and the independent variables mentioned earlier (Tables 17 to 22). Independent variables significantly related ($p<0.10$) to any of the six components were selected and used in a stepwise multiple regression analysis. The purpose was to determine the set of independent variables that explained most of the variance in each of the six components. In this analysis, the criterion for entry into the regression equation was alpha < 0.10. Partial correlations are examined at each step for indications of changes that could be the result of multicollinearity. Where there is reason to suspect multicollinearity, which can result in unstable regression coefficients, the offending variable is not used in the regression analysis (Pomeroy, Pollnac, et al. 1996). Table 24 presents the results.

Table 24. 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 Independent Variables:	Standardized coefficient	T-value	Probability (2-Tail)
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 towards rules (e.g., rule-breaking is not acceptable)	0.281	2.015	0.0511
$R = 0.527$; $R^2 = 0.278$; Adjusted $R^2 = 0.220$			
$N = 42$; $DF = 3$; $F = 4.86$; $p = 0.0059$			

Four variables were entered into the regression equation for Component 1: household asset index, number of training programs attended, influence on project planning, and perceived pre-project resource condition (1 = good, 0 = bad). Respondents with more household assets tended to perceive larger increases in Component 1. These households may be regarded as relatively better off economically if the asset index is viewed as a proxy variable for relative wealth. (Income from fishing is difficult to quantify due to the variations in daily income and the absence of record-keeping). Influence on project planning is also associated with positive changes in the component. Component 1 comprises information exchange, satisfaction with marine reserve management, and knowledge of fisheries.

The regression coefficients of the perceived pre-project resource condition and number of training programs attended 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 with others and to seek more knowledge on fisheries, but not necessarily through training since the training coefficient is negative. The four independent variables entered into the equation jointly account for 21 percent of the variance in Component 1 (adjusted R^2=0.209). The multiple regression equation is statistically significant ($p<0.05$).

For Component 2, five 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. 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. Component 2 consists of collective decision-making, compliance with fishery rules, household well-being, and benefits from the marine reserve.

The last three 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 more members than non-members of the fishers' association possess these characteristics. The members have a relatively longer schooling and a statistically higher influence on project planning. They also registered a statistically higher ownership of boats. Perhaps, respondents with these characteristics are 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 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 linked to lead to perceptions of larger positive changes in Component 3. Component 3 consists of satisfaction with mangrove management, benefits from the marine reserve, and participation in community 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 Component 3. 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. The multiple regression is statistically significant ($p<0.01$).

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. Of these, influence on project planning and age exhibited positive regression coefficients, implying that these independent variables are associated with perceptions of large positive changes in Component 4. Component 4 comprises behavioral equity indicators such as participation in community affairs in general, influence over fisheries management, influence over community affairs in general, and satisfaction with sanctuary management. Attempts to bring about perceived increases in these equity 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 (behavioral equity). 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. Together, the eight independent variables account for 57 percent of the variance in Component 4 (adjusted R^2=0.566). The regression equation is statistically significant ($p<0.01$).

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. However, those whose **total**

household income is heavily dependent on fishing tend to score low on this component. Component 5 comprises total household income, well-being of fishery resources, knowledge of fisheries, and quickness of resolving community conflicts on fisheries. 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. Together, they account for 39 percent of the variation in the component (adjusted R^2=0.394). Component 6 consists of control over fishery resources and fair allocation of access rights to fishery resources. 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 communal 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 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 the fishers' ownership of the project and providing venues for active interaction in mapping out project plans and implementing strategies. The key is to build up planning capabilities at the village level, enhance confidence in articulating one's thoughts, and empower fishers to carry out their own resource management decisions. Instilling proper attitudes toward rule-breaking is also imperative since this will tend to enhance compliance with fishery rules, safeguard the well-being of fishery resources, and sustain co-management arrangements.

7.0 Synthesis

This section synthesizes the contextual variables and incentives which shaped fisheries co-management institutional arrangements in San Salvador over time. Six sets of contextual variables are covered by the study: physical, technical and biological attributes, attributes of fishers and fisher community, market attributes, fisher or community institutional and organizational arrangements, external institutional and organizational arrangements, and exogenous attributes. Also highlighted are the outcomes of co-management in terms of equity, efficiency and sustainability.

7.1 Contextual Variables

The island village of San Salvador 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. The lack of resource use conflicts and the existence of relatively abundant fishery resources until the late 1960s enabled village fishers to enjoy an open and unrestricted access to the fishery. The scenario began to change in the 1970s due to several events: 1) influx of Visayan migrants from the Central Philippines, who belonged to a different ethnolinguistic group; 2) integration of the village economy into the international market for aquarium fish; and, 3) shift to destructive fishing operations such as blast fishing, aquarium fish collection using sodium cyanide, spear fishing with air compressor, and deployment of fine mesh nets, which worsened the indiscriminate harvest of large and small fish alike. Together, these events progressively devastated San Salvador's fishing grounds. Conflicts over fishing gear and over productive fishing spots also began to emerge.

Physical, technical and biological attributes. In the late 1980s, the village residents felt the effects of fishery depletion and unabated coral reef destruction. Open access to fisheries, coupled with the rapid decline in reef and non-reef fish stocks over the past decades, subjected fishery resources to further stress. The average fish catch per fishing trip dwindled from about 20 kilos in the 1960s to barely 3 kilos in 1988. In the same year, a survey of the coral reef substrate showed an average of 23 percent live coral cover for the entire island of San Salvador.

The San Salvador experience shows that, over time, the changes in resource use patterns were driven by poverty and economic survival. In turn, they shaped the physical, technical and biological attributes of the resource (i.e., unrestricted entry to fishing grounds, use of destructive types of fishing gear, and dwindling fish stocks). The shift from an open access fishery to a communal property regime with access and harvesting rules was prompted, in part, by the alarming downtrend in fish stocks, which threatened the livelihood of San Salvador residents. 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. Thus, the 127-hectare marine sanctuary and reserve was established to regenerate fishery resources through the Marine Conservation Project for San Salvador (MCPSS). The project was jointly implemented from 1989 to 1993 by the Haribon Foundation, Inc. and the local fishers' association. The municipal government participated by providing the enabling legislation, assisting in conflict resolution, enforcing fishery laws, and

providing facilities for patrolling coastal waters.

The year 1989 saw the redefinition of access to the coastal waters of San Salvador and the restriction of the types of fishing gear used. Through a sanctuary ordinance endorsed by the San Salvador Village Council and enacted by the Municipal Council of Masinloc, new institutional arrangements (e.g., property rights and rules) were formally set in place, along with the designation of boundaries for the marine sanctuary, where fishing was strictly prohibited. A traditional fishing area within the marine reserve but outside the sanctuary was set aside for non-destructive fishing methods such as hook and line, bamboo traps (3 cms), gill nets (3 cms), spear fishing without air compressors, traditional gleaning, gathering of seaweeds, shells and other products, and catching of siganid juvenile (*padas*) during September.

A new legal environment also came into being in 1989 with the imposition of penalties on destructive fishing practices such as blast fishing, use of poles or scarelines, cyanide fishing, deployment of small mesh gillnets (below 3 cms), catching of aquarium fishes, catching of endangered species, gathering of tortoise eggs, and *kunay* (beach seine) fishing. In 1991, political boundaries were defined. With the enactment of the Local Government Code, coastal resource management fell under the jurisdiction of the municipal government. Municipal waters were extended up to 15 kilometers from the shoreline of the outermost inhabited island of the municipality. Beyond the municipal waters, the national government exercises its authority through the Bureau of Fisheries and Aquatic Resources.

In 1993, technical boundaries were set in place with the declaration of Masinloc and Oyon Bays as protected seascapes. The bays were divided into various management zones. The marine sanctuary of San Salvador was formally designated as a strict protection zone, where harvesting of marine resources is prohibited to ensure continued resource regeneration.

At present, the San Salvador fishery may be described as multi-gear, multi-species and artisanal (Box 6). The types of fishing gear used year-round include nets, speargun, and multiple hook and line. Seasonal gear types include single hook and line, handline, and compressor (hookah diving), which are generally used from 4 to 7 months only. Fisheries 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 : food fish and aquarium fish. Fishing grounds for 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 Masinloc Bay area. However, most aquarium fishers using barrier nets and tuna fishers using handlines (*bondying*) visit distant fishing grounds outside San Salvador, such as Pangasinan, Olongapo, and Scarborough Shoal.

Box 6. Physical, technical and biological attributes of San Salvador

Indicator	Physical, technical and biological attributes
Boundaries	• No assignment of fishing spots • Open access fishery ; difficulty in limiting physical access from the 1970s to the late 1980s • 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
Status of habitat	• Low coral cover (23% live coral cover) • Relatively clean coastal waters

Attributes of Fishers and Fisher Community. Before the onset of the 1970s, the fishers of San Salvador were basically homogeneous. Due to in-migration over time, the resource users have become heterogeneous. At present, they consist of three distinct ethnolinguistic groups: 1) native Sambals; 2) Ilocanos and Pangasinenses; and, 3) Visayans. Among these groups, the Visayans have not been fully integrated into the island's Sambal community due, in part, to cultural differences and resentment among the Sambals regarding their previous use of sodium cyanide in catching aquarium fish.

San Salvador has been marked by a dependence on the fishery for livelihood. Groups dependent on the fishery such as fishers, fish vendors, and boat builders increased from 60 percent in 1989 (when the project started) to about 67 percent in 1996. The rest of the village residents have been engaged in farming, construction work, and service-related occupations.

Befpre the project started, the resource users and other stakeholders were relatively indifferent to resource degradation problems and were too fragmented to embark on any collective action. Due to the intervention of external catalysts, which included a Peace Corps Volunteer and the staff of the Haribon Foundation, the attitudes of village residents towards collective action were developed and reinforced. Knowledge of fisheries was also enhanced through training, information exchange, and other interactive discussions.

Box 7. 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)

Market Attributes. Until the 1960s, resource use was basically for subsistence. The 1970s, however, ushered in a market-driven orientation that subjected the fishery resource base to a more intensive extraction. The commercial collection of aquarium fish as well as of sea urchin hastened their depletion. Food fish, likewise, was not spared, resulting in the disappearance of groupers, snappers, and other types of fish in the late 1980s.

At present, the San Salvador fishery has a mixed market orientation (Box 8). It has a varied product composition (e.g., food fish and aquarium fish) and market destination (e.g., local/domestic for food fish and international for aquarium fish). The value of food fish may be regarded as low to medium, while that of aquarium fish may be viewed as high. The market structure is marked by many buyers and sellers, as well as by the presence of *sukis* (favored buyers) who extend loans to fishers and provide a guaranteed market for their fish catch. S*ukis*, however, generally dictate the price of fish in exchange for the services they provide to fishers.

Box 8. Market Attributes

Indicator	Market Attributes
Subsistence or market oriented	• Market-oriented since the 1970s
Market structure	• Many sellers and buyers • Existence of *sukis* (favored buyers) who provide loans to fishers and a guaranteed market for fish • Dominance of women in fish trading activities
Market orientation	• Mixed market orientation: local and national for food fish and international for aquarium fish
Value of fishery products	• Low to medium for food fish • High for aquarium fish

Decision-Making Arrangements. Decision-making arrangements are concerned with how institutional arrangements (i.e., property rights and rules) are made. In this context, organizational and institutional arrangements come about, both at the level of the fisher community and of external institutions. At the village level, the informal core group in San Salvador (which eventually evolved into a fishers' association) initially provided the driving force for planning and implementing new institutional arrangements. The strong leadership and pronounced environmental consciousness of the core group and subsequently, of the officers of the village-based fishers' association, were crucial to the pursuit of new fishery arrangements, which prohibited access to the sanctuary and imposed the use of non-destructive fishing practices in the marine reserve. The core group members were initially responsible for drumming up village support for the marine sanctuary and marine reserve, holding dialogues on new fishery arrangements, and reaching out to neighboring villages to heighten concern for the environment.

For the village fishers, the decision-making process was participatory and democratic, marked by

consultations, public hearings, and a majority vote for arriving at the final decision. The resource users were given ample opportunities to express their concerns. Conflict resolution involved the intervention of village and municipal officials, which helped clarify issues and finalize rules. The representation of resource users and stakeholders in decision-making at the village and municipal levels was high. At the provincial and national levels, it may be regarded as low to medium.

The shift 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 the 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 or sanctions are assigned to certain actions (Ostrom 1991). Operational rules can be formal (written, legitimized) or informal (unwritten, traditional). In San Salvador, informal operational rules pertain to the first come, first served entry to the fishing ground, the observance by fishers of a 30-meter distance between boats during fishing operations, and the exclusive privilege to fish near artificial reefs by members of the aquarium gatherers' association. Formal operational rules deal with the allowable fishing gear and practices in the marine reserve, the ban on fishing in the marine sanctuary, the prohibition of the commercial collection of sea urchin, and the prescribed penalties for violators.

Collective choice rules, on the other hand, are rules used by fishers, their officials, or external authorities about how the fishery should be managed. They include arrangements for monitoring and enforcing compliance with the operational rules and for settling disputes (Ostrom 1991). In San Salvador, collective choice rules are basically embodied in the sanctuary ordinance and the Basic Fishery Ordinance of Masinloc. The responsibility for enforcement rests with the marine guards and the designated members of the village-based fishers' association. In resolving fishery-related conflicts, the village captain and the mayor play a key role in terms of mediation in and clarification of grievances before legal cases are elevated to the court.

Over time, constitutional rules complemented the collective choice rules and operational rules by further legitimizing the co-management arrangements in San Salvador. Constitutional rules determine who are eligible to participate in the system and establish the process by which collective choice rules are created, enforced and modified. In San Salvador, everyone participates in the system, but the SPSS members have been 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, and the establishment of protected areas as embodied in the National Integrated Protected Areas System (NIPAS) Act. They empower local level 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 expressed that these rules are supportive of fishery resource

rehabilitation and that they are being implemented properly.

Box 9. Decision-Making Arrangements

Indicator	Decision-Making Arrangements
Leadership/power structure of user groups	• Legitimate, democratic, credible and respectable leaders • Participatory decision-making; majority vote
Main types of rules	• Informal operational rules: 1) entry to the fishing ground is on a first come, first served basis; 2) a 30-meter distance must be observed between boats during fishing operations; 3) only members of the aquarium getherers' association could fish near the artificial reefs • Formal operational rules: 1) ban on destructive fishing methods in the marine reserve; 2) prohibition of all types of fishing or gathering of marine products in the marine sanctuary; 3) ban on the commercial collection of sea urchin; 4) prohibition of *tambog* (bamboo pole) in fishing • Collective choice rules: provisions on monitoring and enforcement and on settling disputes as embodied in the Sanctuary Ordinance and in the Basic Fishery Ordinance • Constitutional rules: Local Government Code and National Integrated Protected Areas System (NIPAS) Act
Decision-making process for operational and collective choice rules	• Democratic: marked by consultations and public hearings • Majority vote
Level of representation of resource users and stakeholders in the decision-making processes at different levels (local, provincial, regional, national)	• Village and municipal : high • Provincial : low to medium • Regional : low • National : low
Relevance of rules	• Medium • Favorable attitude towards rules: rule-breaking is not acceptable
Enforcement of rules and regulations/sanctions	• Medium enforcement • Monitoring and enforcement is done jointly by the municipal government, village government, and members of the fishers' association • Violators of fishery laws are warned, fined and sometimes imprisoned • Resources available for monitoring and enforcement: motorized boat, hand-held radios, guard house, enforcement personnel, and funds for operating expenses • Level of compliance: high for village residents and medium for outside fishers

An understanding of rules and rule compliance is essential to analyzing the behavior and outcomes associated with managing a communal property. In San Salvador, rule enforcement structured the action situation. Certain resource users were alienated in the beginning due to the imposition of operational rules and collective choice rules. Eventually, the political will of local leaders as well as vigorous law enforcement helped foster compliance. Constitutional rules, moreover, helped create an environment that was conducive to decentralized decision-making, rule making, and conflict resolution.

Perceptions of local leadership are also important in influencing the community's participation in collective action and in conformity with institutional arrangements. At the village level, the leaders of the fishers' association are regarded as legitimate, having risen to positions of power and influence through an electoral process. They are also seen by their constituents as respectable, credible, and democratic. The positive regard for local leaders is a favorable element in enforcing institutional arrangements.

Exogenous Variables. The most notable exogenous events which dramatically shaped fisheries management in San Salvador are the influx of 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 reversed the degradation of fishery resources. No 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 study (i.e., 1989-1996).

7.2 Incentives to Cooperate and Patterns of Interaction

In San Salvador, the major incentives to cooperate may be summed up as: 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 of formal support for protected area management; 5) public recognition of co-management achievements.

The contextual attributes combined to shape the incentive structure faced by the stakeholders. In turn, they generated strategies for collective action on new institutional arrangements, from which patterns of interaction emerged. By themselves, institutional arrangements do not generate patterns of interaction, but they shape the choices that stakeholders make in relation to other group members (Oakerson 1992).

As an illustration, when the native Sambals pushed for the ban on aquarium fishing inside the marine reserve and on the use of sodium cyanide, the Visayan aquarium fishers reacted by pressing for the prohibition of *kunay* (beach seine), a fishing gear used by the Sambals. The ruling on *kunay* required a series of village assembly meetings and caused tension between village residents for and against the method. The majority felt that the method caused overfishing and coral reef degradation (Christie

and White 1994). This method was used to collect primarily juvemile fish measuring about 15 cm long on the average. The group of fishers who used *kunay* resented the ban since they felt that it was a traditional, nondestructive method. They also expressed frustration because they had earlier supported the sanctuary resolution and now were being harmed by the *kunay* ban. Following a petition by the *kunay* group for the participation of the mayor, a general vote was held to resolve the issue. Afterwards, a formal resolution legitimized the ban. Both aquarium fishers and beach seine users, who were the immediate losers in the process, felt alienated. Nonetheless, they opted to comply with the rules by moving to other fishing grounds. Resentment among the Visayan aquarium fishers was aggravated by the lack of alternative livelihood activities at the outset of project implementation. Eventually, the Visayan fishers shifted to barrier nets (or netsman), a non-destructive method for gathering aquarium fish. The method was introduced by Haribon, a non-govenment organization. As for the *kunay* users, they stopped using the beach seine when other areas started to protest its use.

With the subsequent headway in resource management efforts, 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. 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 favored a greater rule compliance and a willingness to shift to non-destructive fishing practices.

On the part of the officers of the fishers' association, the enhancement of their social and political standing hastened their rise to positions of power and leadership in the village and served as an incentive to further support co-management efforts. As a result of the stability in political leadership during the post-project phase, project initiatives were sustained even after the Haribon Foundation phased out from San Salvador. Strong linkages between village residents on one hand, and government units at the village and municipal levels on the other hand, also helped sustain co-management. The joint patrolling of coastal waters and apprehension of illegal fishers generated greater rule compliance and fostered the stability of co-management arrangements.

Over time, other incentives to cooperate emerged via policy and legislative reforms at the national and municipal levels. These included reforms in governance, declaration of protected areas, and banning of commercial fishing and destructive gear in the coastal waters of Masinloc, among others.

7.3 Outcomes of Co-Management

A comparison of the perceived pre-project to post-project changes in the performance of co-management shows that San Salvador fishers perceive positive and statistically significant changes in **all** performance indicators of co-management: equity, efficiency and sustainability ($p<0.01$). 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.

Between members and non-members of the village-based fishers' association, there is no statistically significant difference in the perceived changes in the indicators. This finding is encouraging from the equity perspective due to the similar impact of the project on village fishers.

From the perspective of San Salvador fishers, the total perceived performance of co-management is associated with perceived changes in influence over project planning, attitude toward rules (i.e., rule-breaking is not acceptable), and attitude toward collective action (i.e., the community can work together). Thus, improving the total perceived performance of co-management requires reinforcing a sense of project ownership and providing interactive venues for mapping out 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 towards rules and towards 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).

8.0 Characteristics of Successful Fisheries Co-Management Institutional Arrangements

The experience of San Salvador demonstrates a successful case of fisheries co-management for the period under review (1989-1996). The village fishers, on one hand, were the key players in the regeneration and management of coastal resources. The municipal government, on the other hand, was an active partner in conflict management, provision of enabling legislation for the marine sanctuary and reserve, and pursuit of law enforcement activities. Village fishers recalled that confrontations with violators of the sanctuary ordinance called for the support of the municipal government, particularly when village authority figures felt unable to do so. Community field workers were hesitant to become directly involved in the enforcement of the ordinance since they felt that it was an inappropriate role (Christie, White and Buhat 1993). The municipal government, moreover, helped address the inadequacy of law enforcement facilities over time by providing a motorized boat, hand-held radios, honoraria for the marine guards, and fuel for patrolling the coastal waters of San Salvador.

Based on the performance indicators of co-management in terms of equity, efficiency and sustainability, the village fishers perceived positive and statistically significant increases in all indicators. Moreover, the generally equitable effects of the marine sanctuary and marine reserve as a communal property regime are evident in the finding that both project cooperators (e.g., members of the village-based fishers' association) and non-cooperators perceived positive changes, without any statistically significant difference between the two groups.

In this section, several conclusions are presented to provide insights on the characteristics of successful fisheries co-management institutional arrangements, along with the underlying explanatory variables. These insights are largely drawn from regression analysis, correlation analysis, key informant interviews, household survey data, and secondary materials.

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 (e.g., 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 management. They define the required mechanisms and 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. Dialogues, public hearings, and fora for conflict resolution offer opportunities for interactive discussions and consensus building. Active participation by those affected, particularly in planning and mapping out co-management activities, is vital to ensure agreement with the proposed interventions and encourage fishers to take responsibility for implementation. Fostering a strong sense of project ownership may be viewed as strategic since the resource users are deliberately given a stake in the project at the outset, not just during the project implementation and post-project phases.

4. **Supportive local leadership and cooperation among fishers.** In the case of 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 the case of 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. Without an understanding of the project's short-term and long-term objectives, along with a willingness to act as key players, perceived changes in co-management will be difficult to sustain.

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), as shown by the regression results on the total perceived performance of co-management. This highlights the

importance of deliberately transforming attitudes to support the management of a communal property such as a marine sanctuary, hand in hand with technical interventions.

Communal property, in essence, refers to a situation where the resource is held by an identifiable community of interdependent users who exclude others from harvesting the resource (Feeny 1994). In a communal property regime, stability is partly dependent on a positive attitude towards rules, which influences rule compliance.

In San Salvador, the correlation results showed a positive relationship between perceived compliance with fishery rules and external remittances. It appears that perceived improvements in rule compliance can be achieved by diversifying or providing additional income sources. This will help ease the pressure on the use of fishery resources and reduce the incidence of rule violations.

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 the case of San Salvador, the Masinloc municipal government filled this role. Eventually, the government-organized marine guards (*Bantay Dagat*) and village police (*Barangay Tanod*) also assisted in patrolling the coastal waters of San Salvador. Co-management efforts resulted in an actual imposition of sanctions against violators of fishery-related laws, higher rule compliance, and reduced incidence of community conflicts.

Over time, other supportive policies and legislation came into existence, both from the national and municipal governments. In 1991, the enactment into a national law of the Local Government Code (LGC) formalized the devolution of powers and responsibilities for coastal resource management to local governments, which created a favorable environment for co-management to prosper. Among other provisions, the LGC also supported the active participation of non-government organizations in community development. In 1993, the national government declared Masinloc Bay as a protected seascape. This resulted in the formulation of a management plan and the zoning of the bay into various management zones in 1996. It also reinforced the status of the San Salvador sanctuary as a protected area. At the local level, the Municipal Council of Masinloc enacted its Basic Fishery Ordinance in 1995, which affirmed the extent of its municipal waters, declared as unlawful any commercial fishing within its waters such as air bubble fishing (*pa-aling*), *muro-ami*, and Danish seine (*hulbot-hulbot*), and required the issuance of permits and licenses for the capture, use or culture of fishery and aquatic resources, among others.

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, in exchange for future longer term benefits. Individuals could no longer act in isolation and defy new ordinances without suffering the penalties prescribed under the new property regime. Thus, being able to work together as a community also means giving up unrestricted, open access rights, as well as independent decision-making and control, in order to achieve a collective good. The prohibition of destructive fishing methods in the marine reserve also means reduced individual benefits from the marine reserve, particularly for those who previously used destructive fishing gear and for those who were compelled to shift to more distant fishing grounds.

9. **Job satisfaction of fishers.** In the case of 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 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, knowledge of fisheries, 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 influence perceived household income levels as well as perceived resource conditions. In fishing villages driven largely by economic survival and poverty, it is important to rethink the consequences of fishery co-management institutional arrangements. Introducing alternative, non-destructive technologies in a timely manner, providing supplemental income sources, and diversifying existing skills are important.

11. **Tangible benefits from co-management arrangements.** In an area with a marine sanctuary, all resource users are excluded. Most community members, however, can benefit

from the spill-over fish production in surrounding areas (e.g., marine reserve and nearby fishing grounds). 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. Based on the survey of fishing households in 1996, 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 of fish, and improved condition of coastal waters.

12. **Built-in monitoring and evaluation schemes.** Co-management interventions need to show results and concrete benefits to stimulate commitment and participation. In this regard, baseline studies, monitoring, and evaluation must be built into the project to provide a basis for changes brought about by the interventions. Information sharing and dissemination must be pursued to broaden awareness of resource conditions and of breakthroughs achieved in socioeconomic and behavioral areas.

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 sustains interest in the project. It also provides a basis to rethink the situation, identify new concerns, and refine earlier management strategies. Well-documented projects can contribute to policy changes on coastal resource management and provide building blocks for new co-management initiatives.

13. **Reinforced incentives to collaborate.** Over time, incentives must be reinforced at various levels to motivate resource users and other groups to cooperate. Incentives to collaborate in San Salvador include: a) dependence on fishery resources; b) legitimacy, enforceability and relevance of fishery rules; c) tangible benefits from co-management efforts; d) policy-driven reforms in terms of devolution of powers and responsibilities to local government units for coastal resource management and formal support for protected area system management; and, e) public recognition of co-management achievements. Disincentives must also be carefully analyzed to reduce resentment and indifference. These will help activate interest in collective resource management.

Public acclaim for achievements in fisheries management is instrumental in reinforcing the commitment of the fishing community and the municipal government to sustain project initiatives and enforce fishery rules, as shown by the San Salvador experience. San Salvador's several awards provided a sense of pride to fishers and local government units.

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 external catalysts and government units which are committed to protecting life-support systems and sustaining livelihoods. A shared vision for tomorrow and a firm resolve to take action on reversing resource deterioration help provide the initial driving force for the co-management of coastal resources.

However, the challenge of protecting earlier resource gains remains. The village-based fishers' association known as the *Samahang Pangkaunlaran ng San Salvador* (SPSS) needs further strengthening due to organizational problems over time and the limited number of active members at present. The recent move of the Haribon Foundation to address this concern is encouraging, made possible by a grant from the Fund for Sustainable Society, Inc. Livelihood opportunities must also be expanded. Some village fishers (46%) felt that changing the rules on fish harvesting may be warranted by the immediate survival needs of the fishing household and by a desire to fish in a nearer fishing ground. 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 San Salvador 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, offers hope for many heterogeneous island communities without any tradition of collective action and without any expertise on fish stock management. It affirms that a shift from a *de facto* open access fishery to a communal property regime can be achieved, though fraught with competing interests and some degree of alienation in the beginning for certain resource users. 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.

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