# THE PHILIPPINE FISHERIES SYSTEM: A MANAGEMENT PLANNING PERSPECTIVE

by

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For Lilia and Janice

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| | | |
|---|---|---|
| ACA | - | Agricultural Credit Administration |
| ACMRR | - | Advisory Committee on Marine Resources Research |
| ADB | - | Asian Development Bank |
| AIM | - | Asian Institute of Management |
| ASEAN | - | Association of Southeast Asian Nations |
| BCGS | - | Bureau of Coast and Geodetic Survey |
| BFAR | - | Bureau of Fisheries and Aquatic Resources |
| BOI | - | Board of Investments |
| CBP | - | Central Bank of the Philippines |
| CFBL | - | Commercial Fishing Boat License |
| DAP | - | Development Academy of the Philippines |
| DBP | - | Development Bank of the Philippines |
| EDPITAF | - | Educational Development Projects Implementing Task Force |
| EEZ | - | Exclusive Economic Zone |
| FAO | - | Food and Agriculture Organization of the United Nations |
| | - | Fisheries Administrative Order |
| FIDC | - | Fishery Industry Development Council |
| FIRM | - | Fishery Resources Management Program |
| GNP | - | Gross National Product |
| GT | - | gross ton |
| IBRD | - | International Bank for Reconstruction and Development (World Bank) |
| ICLARM | - | International Center for Living Aquatic Resources Management |
| IFDP | - | Integrated Fisheries Development Plan |
| INP | - | Integrated National Police |
| IPFC | - | Indo-Pacific Fisheries Commission |
| LBP | - | Land Bank of the Philippines |
| LLDA | - | Laguna Lake Development Authority |
| LOI | - | Letter of Instructions |
| MA | - | Ministry of Agriculture |
| MARINA | - | Maritime Industry Authority |
| MEC | - | Ministry of Education and Culture |
| MFA | - | Ministry of Foreign Affairs |
| MHS | - | Ministry of Human Settlements |
| MLGCD | - | Ministry of Local Government and Community Development |
| MND | - | Ministry of National Defense |
| MNR | - | Ministry of Natural Resources |
| MOB | - | Ministry of the Budget |
| MOT | - | Ministry of Trade |
| MPI | - | Ministry of Public Information |
| MPW | - | Ministry of Public Works |

| | | |
|---|---|---|
| MSY | - | Maximum Sustainable Yield |
| MT | - | metric ton (tonne) |
| MTC | - | Ministry of Transportation and Communications |
| NACIAD | - | National Council for Integrated Area Development |
| NCSO | - | National Census and Statistics Office |
| NEDA | - | National Economic and Development Authority |
| NEPC | - | National Environmental Protection Council |
| NFAC | - | National Food and Agriculture Council |
| NFPFM | - | Navotas Fishing Port and Fish Market |
| NRMC | - | Natural Resources Management Center |
| NSDB | - | National Science Development Board |
| NSTA | - | National Science and Technology Authority (formerly NSDB) |
| OECF | - | Overseas Economic Cooperation Fund (of Japan) |
| PC | - | Philippine Constabulary |
| PCARRD | - | Philippine Council for Agriculture and Resources Research and Development (formerly PCARR) |
| PCG | - | Philippine Coast Guard |
| PD | - | Presidential Decree |
| PFMA | - | Philippine Fish Marketing Authority |
| PN | - | Philippine Navy |
| PNB | - | Philippine National Bank |
| PREPF | - | Population, Resources, Environment and the Philippine Future |
| RFTC | - | Regional Fishermen's Training Center |
| RIFT | - | Regional Institute of Fisheries Technology |
| SCSP | - | South China Sea Fisheries Development and Coordinating Programme |
| SEAFDEC | - | Southeast Asian Fisheries Development Center |
| SEC | - | Securities and Exchange Commission |
| UNDP | - | United Nations Development Programme |
| UP | - | University of the Philippines |
| UPCF | - | UP College of Fisheries |
| UPLB | - | University of the Philippines at Los Baños |
| UPMSC | - | UP Marine Sciences Center |
| UPV | - | University of the Philippines in the Visayas |
| USAID | - | United States Agency for International Development |

## 1.0 INTRODUCTION

In the Philippines, as in most other coastal nations, fish production has been exhibiting signs of leveling off in recent years. Fleet expansion, technological advances, increasing consumer demand, and the common property nature of the resource have collaborated to reach this state. Unless some form of control is instituted, a fishery collapse may be imminent.

Governments, particularly in developing countries, are confronted with the dilemma of providing more food and employment to the burgeoning population and, at the same time, keeping the resources at sustainable levels. Understandably, fishery administrators, goaded for the most part by socio-economic considerations, have placed more emphasis on fisheries development. Smith et al. (1980), however, noting the dwindling resources in many traditional fishing grounds in the Philippines, believe that the problem has now become less of development and more of management. The same authors observe the emerging orientation towards fisheries management, as development planners feel the need to take a closer look at the state of the resources and to start studying alternative management measures.

The task at hand is not simple. Fisheries management has evolved into an extremely complex and difficult process. Early on, Gulland (1974) thought of fishery management as "any control or adjustment of fishing operations ... to optimize the use of the natural resource," and viewed development and management as but two aspects of the same process of rationalizing resource use. In another context, Kesteven (1983) considers development as part of, not distinct from, management. Such an embracing view would then require the application of the principles, tools, and skills of both business management and public administration.

Recently, fisheries management has been taking on a systems approach (e.g. Hobson and Lenarz 1977; ACMRR 1979, 1980; Rothschild 1983b). No longer is it concerned solely with fish-fishermen interaction; a much broader perspective has replaced this narrow view. Management has to take into account the interrelated biological, economic, social, legal, and political aspects of the fisheries system to accomplish a set of goals. Coordination of the various system participants -- producers, processors, marketers, consumers, researchers, administrators, law enforcers, extension workers, etc. -- demands elaborate planning and implementation strategies. Moreover, the fisheries system does not exist in a vacuum and must be viewed within the larger framework of national and international developments.

The growing scope of fisheries management is evident in the proliferation of literature and conferences on various fields. In fisheries economics, the concepts of maximum economic yield in bioeconomic models and economic efficiency in fishing and management have challenged the purely biological basis of fisheries regulation (Gordon 1954; Hamlisch 1962; and Anderson 1977; among others). The human dimension further complicates policy formulation ("we rarely manage fish -- we usually manage people"), yet sociocultural considerations are a key determinant of management success or failure (Orbach 1980).

The socio-economics of fishing is nowhere more visible than in the worldwide concern for the generally poor and disadvantaged small-scale fisherfolk (Gerhardsen 1977; Smith et al. 1980; FAO 1980; Sutinen and Pollnac 1981). Underlying this problem are the social, economic, and political conditions typical in less developed countries (Marr 1976; Gulland 1980). Most of these countries are found in the tropics, where the difficulty of multispecies stock assessment, let alone management, is also widely felt. In response to these problems, guides especially useful to developing countries have been published, e.g. FAO 1978; Pauly 1980a; Roedel and Saila 1980; Stevenson et al. 1982.

This paper examines the major components of the Philippine fisheries system, focusing on capture fisheries and summing up available information on the resources, industry, and fisheries administration. Some recommendations are made that may form a broad framework for management planning.

## 2.0 THE FISHERIES

### 2.1 Fishing Areas

The Philippine archipelago, consisting of some 7,100 islands, lies in the tropical region, between Latitudes 4°23'N and 21°25'N and Longitudes 116°E and 126°30'E (Figure 1). When Spain ceded the islands to the United States in 1898, a treaty demarcated the territorial limits of the Philippines with straight lines (Figure 2), unlike the conventional 3-, 6-, or 12-mile territorial sea that follows the configuration of the coastline. The total marine area within this boundary is 433,000 square nautical miles (1.48 million sq km), almost five times the total land area.

In 1978, a presidential decree established a 200-nautical mile exclusive economic zone (EEZ), measured from the baselines connecting the outermost points of the outermost islands. The EEZ increased the total marine area under Philippine jurisdiction by about 30.5 percent of the territorial waters (based on data from Manansala 1979).

Except for the expanding tuna fishery, fishing activities are traditionally concentrated within the 200-meter isobath of the continental shelf (Figure 3). The Bureau of Coast and Geodetic Survey (BCGS) estimates a total shelf area of 266,000 sq km. Thus, the marine fisheries are currently exploiting only about 20 percent of the country's territorial waters. While the remaining untapped areas and the EEZ indicate opportunities for

Figure 1. The Philippines and neighboring countries

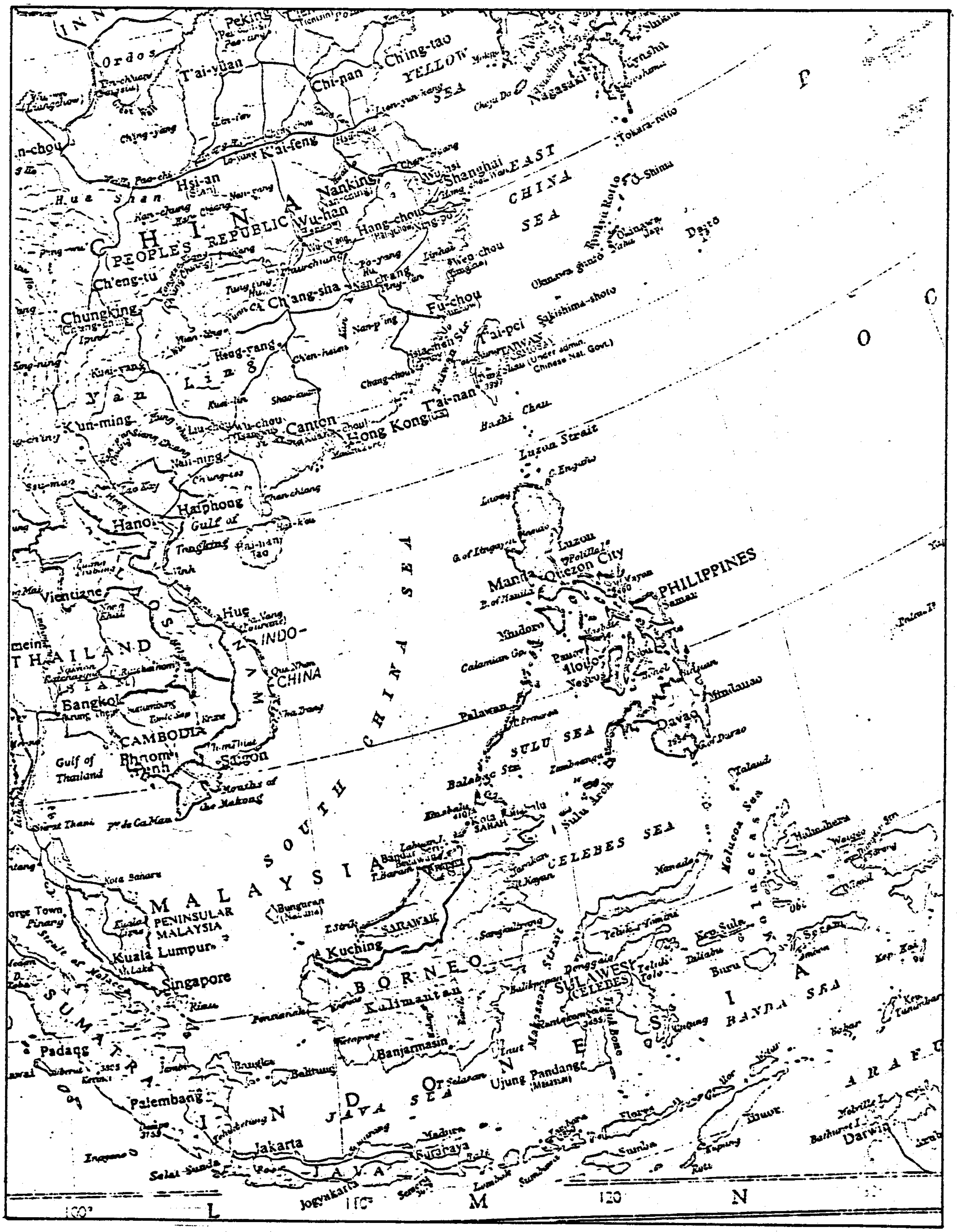
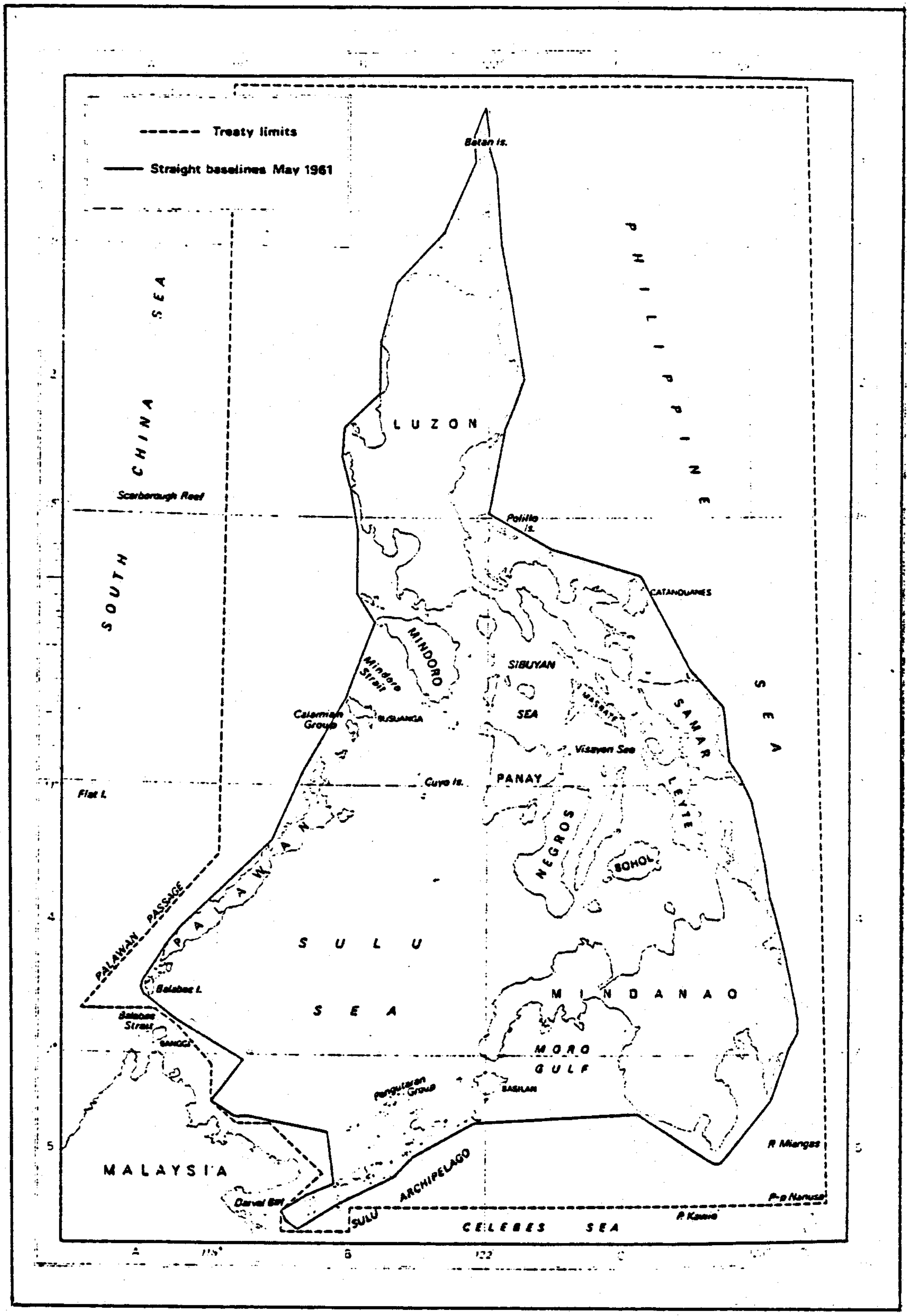


Figure 2. Territorial limits and straight baselines of the Philippines




Source: Reproduced from Prescott et al. (1977).

Figure 3. Philippine shelf areas to 200-meter depth

Source: Redrawn from Mammerckx et al. (1976).

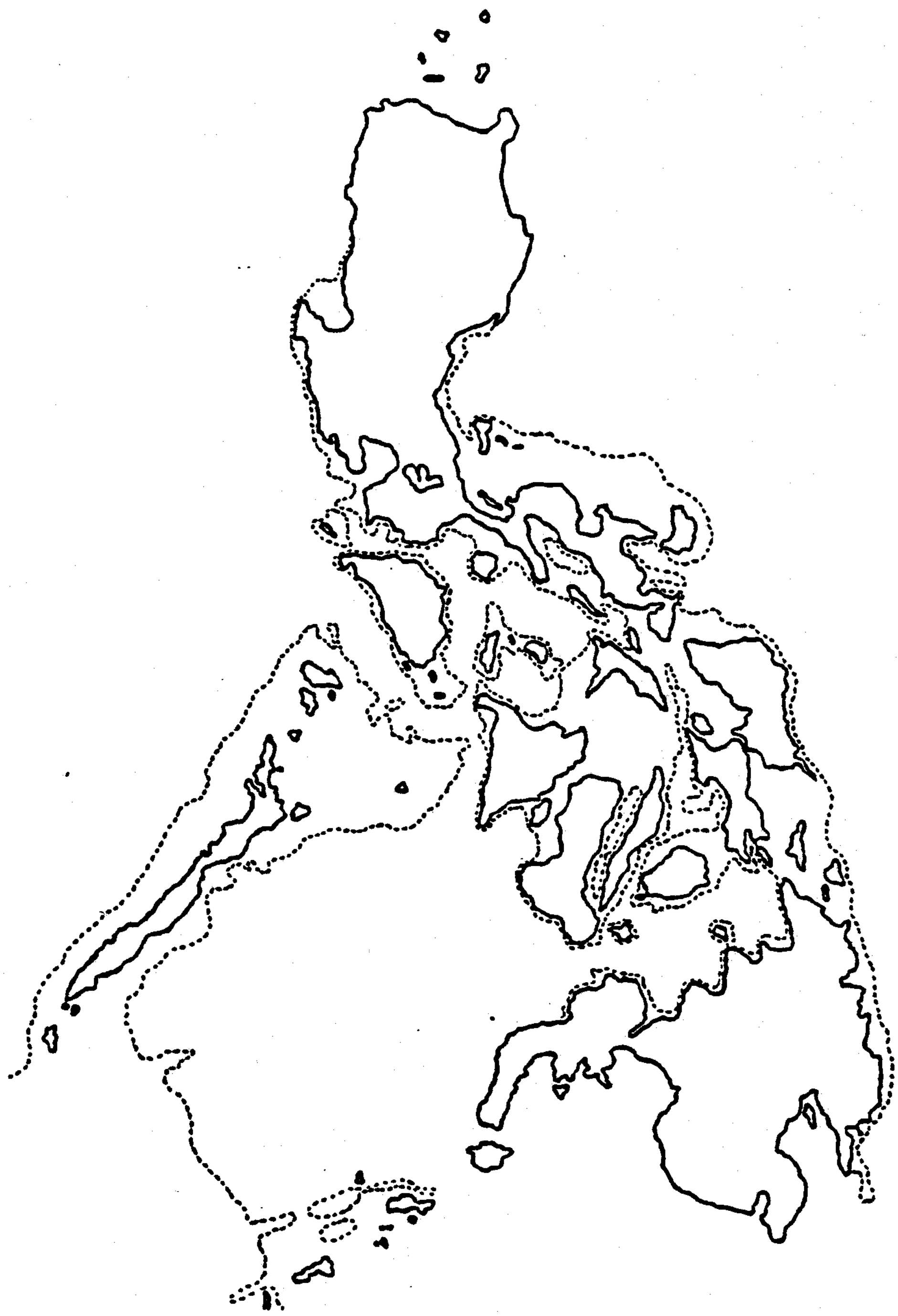
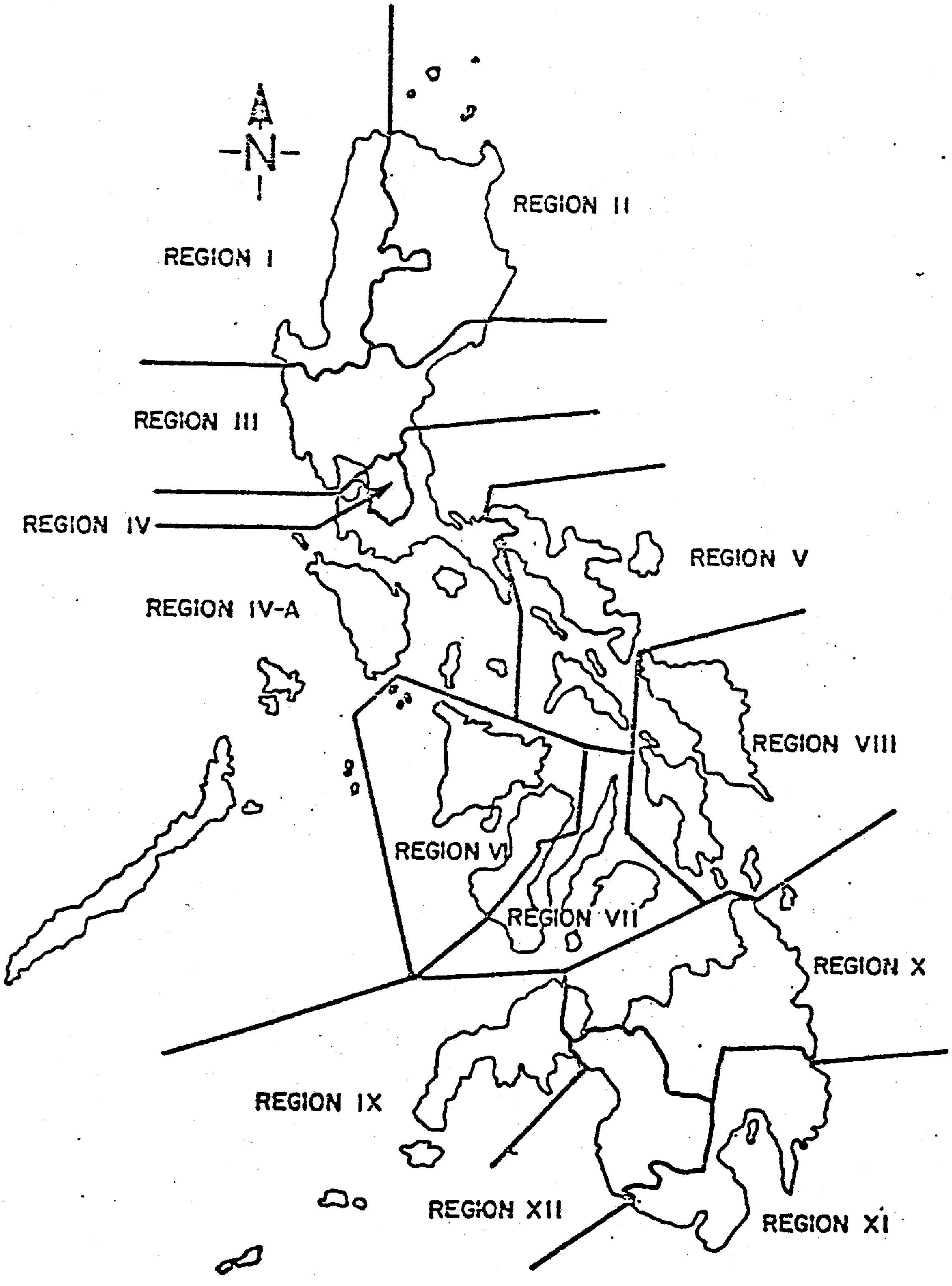


Figure 4. Administrative regions of the Bureau of Fisheries and Aquatic Resources (BFAR)

Source: Reproduced from Smith et al. (1980).



fisheries development, particularly for tuna, they also represent added responsibilities for fisheries management.

The Philippines, given its archipelagic nature, has 17,460 km of coastline, many shallow embayments and interisland seas that are readily accessible to fishing communities. The Bureau of Fisheries and Aquatic Resources (BFAR) lists 116 marine fishing grounds all over the country; some 50 of these are frequented by commercial fishing vessels. For statistical purposes, BFAR recently grouped contiguous fishing grounds into 24 "statistical fishing areas." The 13 regional offices of BFAR, following the national government's regional organization, have areas of responsibilities cutting across many of these fishing areas (Figure 4). For example, the Visayan-Sibuyan Sea area is covered by at least four administrative regions.

In addition, small-scale capture fisheries exist in inland waters. There are about 70 lakes and 861 reservoirs with an aggregate area of 199,635 hectares and 30,000 hectares, respectively (PCARR 1981b). Of the six major lakes, each having an area greater than 5,000 hectares, Laguna de Bay (south of Manila) is the largest, with an area of 90,000 hectares. The area covered by rivers is approximately 31,000 hectares (1 hectare = 2.471 acres).

## 2.2 Fishery Sectors

The production component of the fishery industry is classified by law into three sectors: 1) commercial fisheries;

2) municipal fisheries; and 3) inland fisheries. The statistics on these sectors are compiled and published annually by BFAR.

"Commercial fisheries" refer to fishing operations that use vessels of over 3 gross tons (GT). These vessels are licensed by BFAR and permitted to operate only in waters more than 7 fathoms deep.

The term "municipal fisheries" is equivalent to the fishery sector variably known as artisanal, traditional, subsistence, and small-scale fisheries. In the Philippines, this sector covers fishing activities that use boats of 3 GT or less, or gears not requiring the use of boats. Though small-scale, these fisheries are actually commercial, i.e. the fishermen sell their catch, and only in geographically remote areas are they strictly for subsistence. The municipal government has jurisdiction over the fishing area, the so-called municipal waters, that include streams, lakes, and tidal waters within the municipality, and marine waters within 3 nautical miles of the municipal coastline. However, many motorized boats licensed by municipalities are now fishing beyond 3 miles.

"Inland fisheries," as defined, include culture production in both fishponds and fishpens. The BFAR fisheries statistics, however, categorize fishponds as one sector which consists solely of data on brackishwater ponds. About 90 percent of the harvest from these ponds, with a total area of 176,230 hectares, is milkfish; the rest are shrimps, tilapia, and other wild species. Data are not collected at present from freshwater ponds, covering an estimated area of 6,000 hectares, for raising mainly tilapia and carps. Milkfish and tilapia production from lake fishpens and cages, together with inland capture fisheries, is included in the municipal inland fisheries statistics, compiled starting 1976 as a sub-sector separate from the municipal marine fisheries.

## 2.3 Production Trends

### 2.3.1 Volume

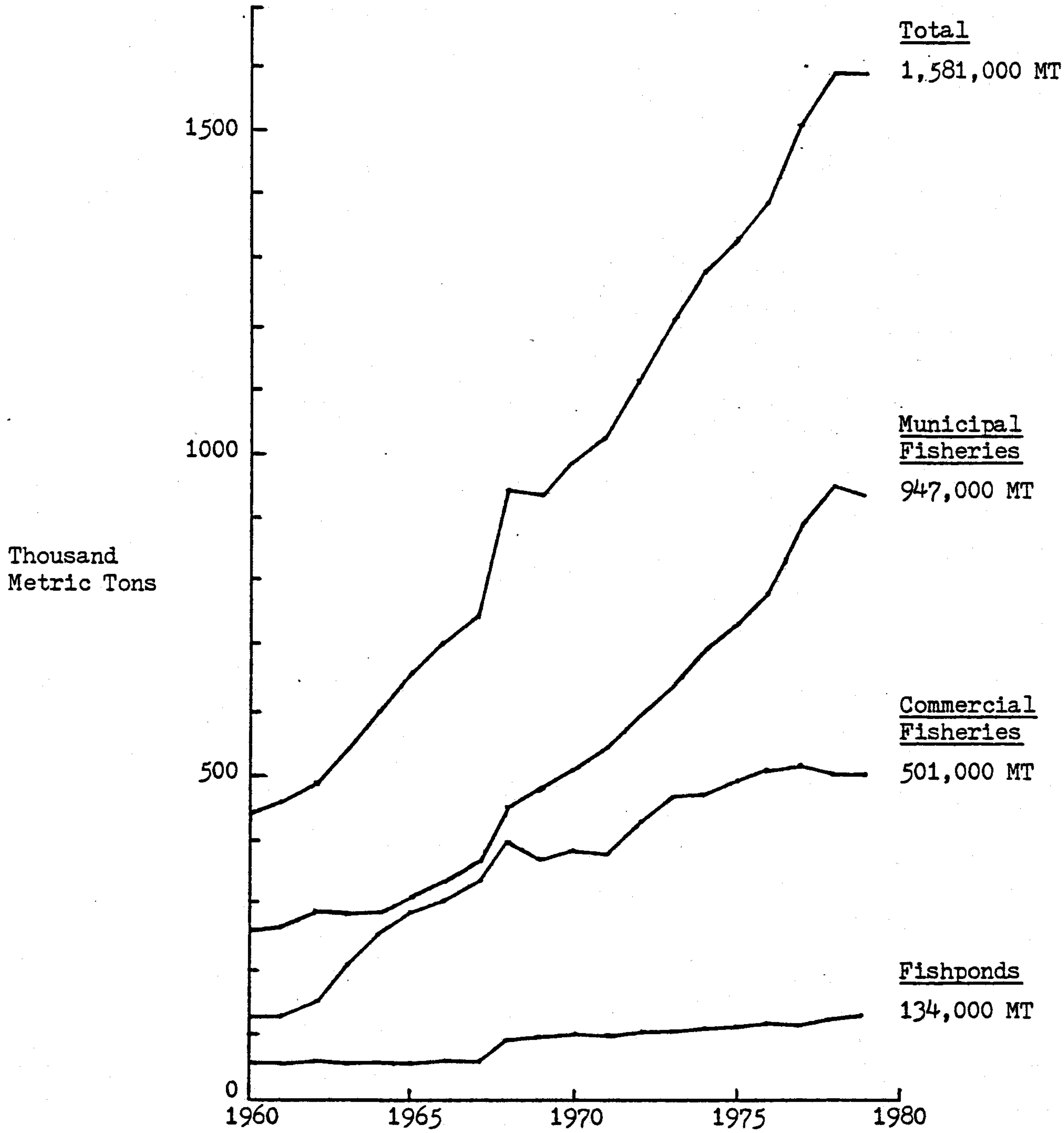
Figure 5 shows the production trend of the three sectors in terms of quantity over the 20-year period, 1960-1979. Total landings from the capture fisheries appear to have slowed down in recent years. Historically, municipal fisheries (marine and inland) have always accounted for the greater portion of the national fish production. In 1979, they contributed 59.9 % of the total volume, as compared to commercial fisheries (31.7 %) and fishponds (8.5 %).

The national average fishpond productivity, 758 kg per hectare in 1979, is far below the 1,500-2,000 kg/ha/yr levels attained by researchers and advanced segments of the industry. Government efforts are therefore promoting intensive culture methods through extension work and credit assistance. The strategy is to achieve a greater growth rate in fishpond production, as landings from the capture fishery sectors level off.

### 2.3.2 Value

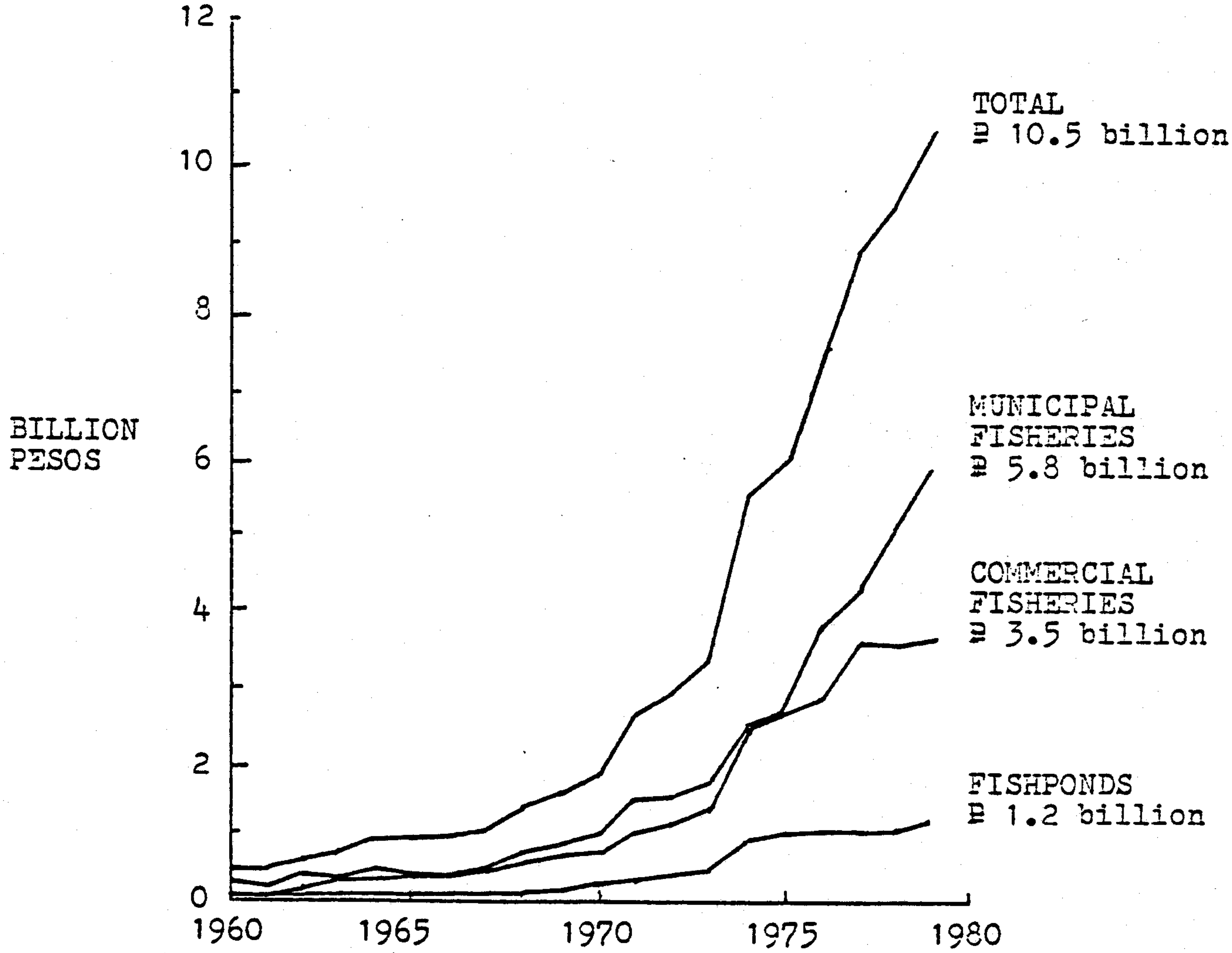
During the last five years, the combined wholesale value of fish produced from all sectors represented 4 % to 6 % of the country's gross national product (GNP). In 1979, the total value

Figure 5. Fish production in metric tons, 1960-1979




Source: Fisheries Statistics of the Philippines
BFAR (1960-1979)

Figure 6. Fish production in Philippine pesos, 1960-1979




Source: Fisheries Statistics of the Philippines
BFAR (1960-1979)

was P10.5 million (4.1 % of the GNP), of which 55.3 % was from municipal fisheries, 33.3 % from commercial fisheries, and 11.4 % from fishponds (Figure 6).

Based on the quantity sold, the average wholesale price of fish from each sector would be as follows: municipal, P6.15 per kg; commercial, P7.01 per kg; and fishponds, P8.97 per kg. Thus, fish caught by municipal fishermen are generally of low value, which means, on one hand, less revenue for these fishermen, and, on the other, cheap source of protein for the greater segment of the population living in rural areas. Fish produced through aquaculture are, by and large, more expensive and hence more affordable by people in urban centers. Unless greater emphasis is given to low-cost culture technology and low-priced species (e.g. cage culture of tilapia), aquaculture products will remain a luxury to many people.

Marginal fishermen, finding no alternative sources of income, would be driven to fish harder, exert more pressure on the dwindling resources, as demand increases. Even now, the growing scarcity of fish resources is indicated by the higher growth rate of the relative price index of fish, compared to other commodities.

## 2.4 Technology

### 2.4.1 Fishing Gears and Methods

Many types of fishing gear and methods have evolved through the centuries as human settlements developed along the shorelines of the islands. Umali (1950) documented about 55 types of gear used all over the country and categorized them into four classes: hand instruments, barriers and traps, lines, and nets. Quite a few of the fishing techniques are common in both commercial and municipal fisheries, the difference being only in the size of gear and craft employed. The commercial catch is dominated by trawl, purse seine, and bagnet catches, together comprising 90 % of the total. In municipal fisheries, the catches from surface gillnet and hook-and-line make up 50 % of the entire municipal production (Table 1).

Reef Fisheries

Most of the fishing gear types are used in shallow waters, non-trawlable, and reef areas close to shore. These are the gillnets, hook-and-line (simple and multiple handlines), fish corral, beach seine, small longlines, drive-in nets, push nets, filter net, lift net, and pots, among others. Drift gillnets have been used for catching tuna with the aid of light for attracting small fish. The drive-in nets ("muro-ami" and "kayakas") have received attention lately because the lead or stone weights of their scare-lines (Figure 7) crush and break reef-building corals. Fishing with a drive-in net can be such a large operation, sometimes involving 100 fishermen, that regulating or banning this gear may have social repercussions.

Fish corrals ("baklad") are installed in municipal waters where the current would lead the fish into the enclosures (Figure 8). Their shape and design vary in different regions but the

Table 1. Total Landings of Major Commercial and Municipal Fishing Gears, 1979

Commercial Fisheries

| Gear | MT (000) | % |
|---|---|---|
| Trawl | 177 | 35 |
| Purse Seine | 174 | 35 |
| Bag Net | 98 | 20 |
| Ring Net | 33 | 7 |
| Muro-Ami | 12 | 2 |
| Other Gears | 7 | 1 |
| Total | 501 | 100 |

Municipal Fisheries

| Gear | MT (000) | % |
|---|---|---|
| Surface Gillnet | 198 | 27 |
| Hook & Line | 166 | 23 |
| Bag Net | 44 | 6 |
| Beach Seine | 40 | 5 |
| Fish Corral | 37 | 5 |
| Other Gears | 253 | 34 |
| Total | 738 | 100 |

Source: Fisheries Statistics of the Philippines BFAR (1979)

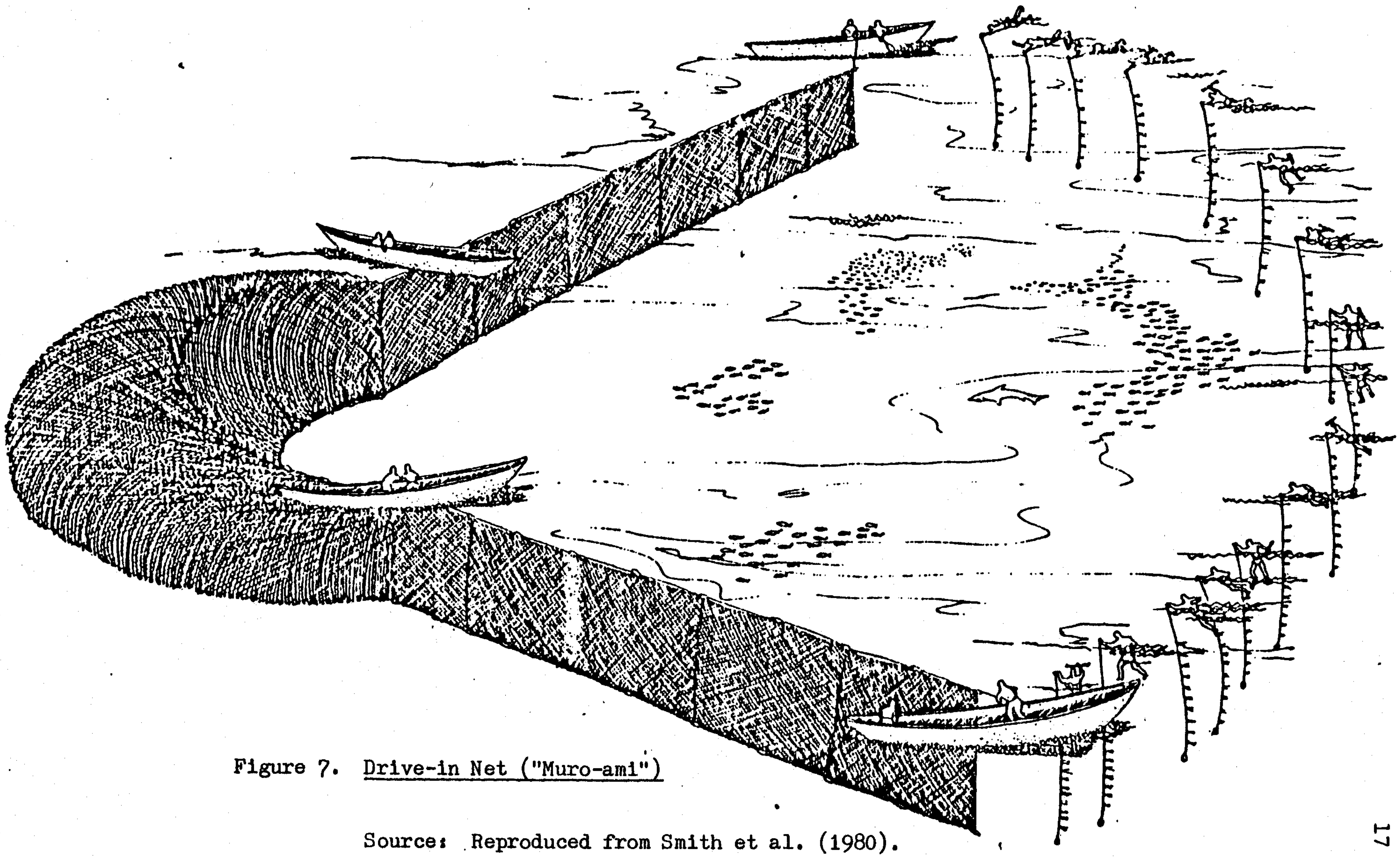


Figure 7. Drive-in Net ("Muro-ami")

Source: Reproduced from Smith et al. (1980).

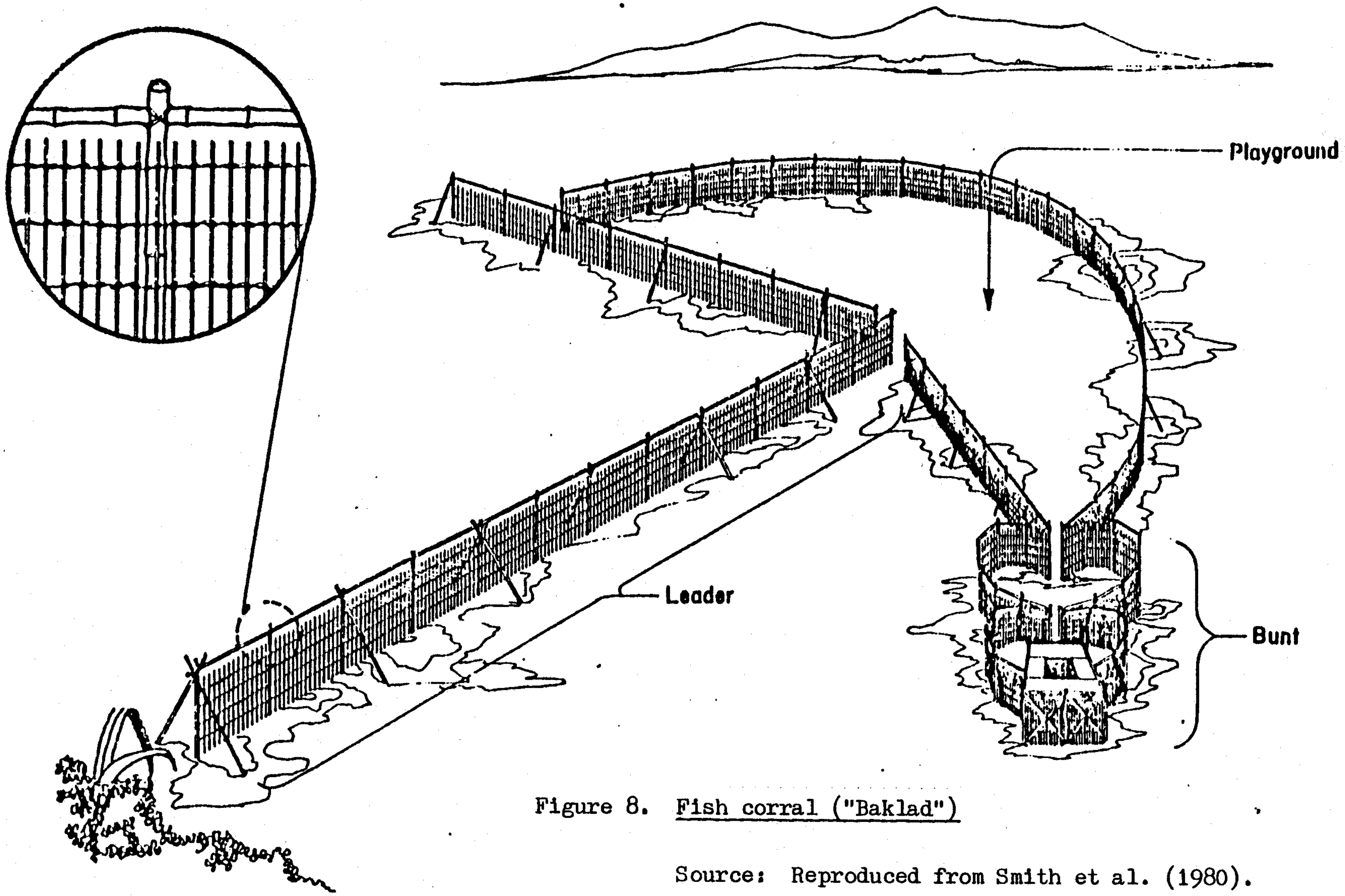
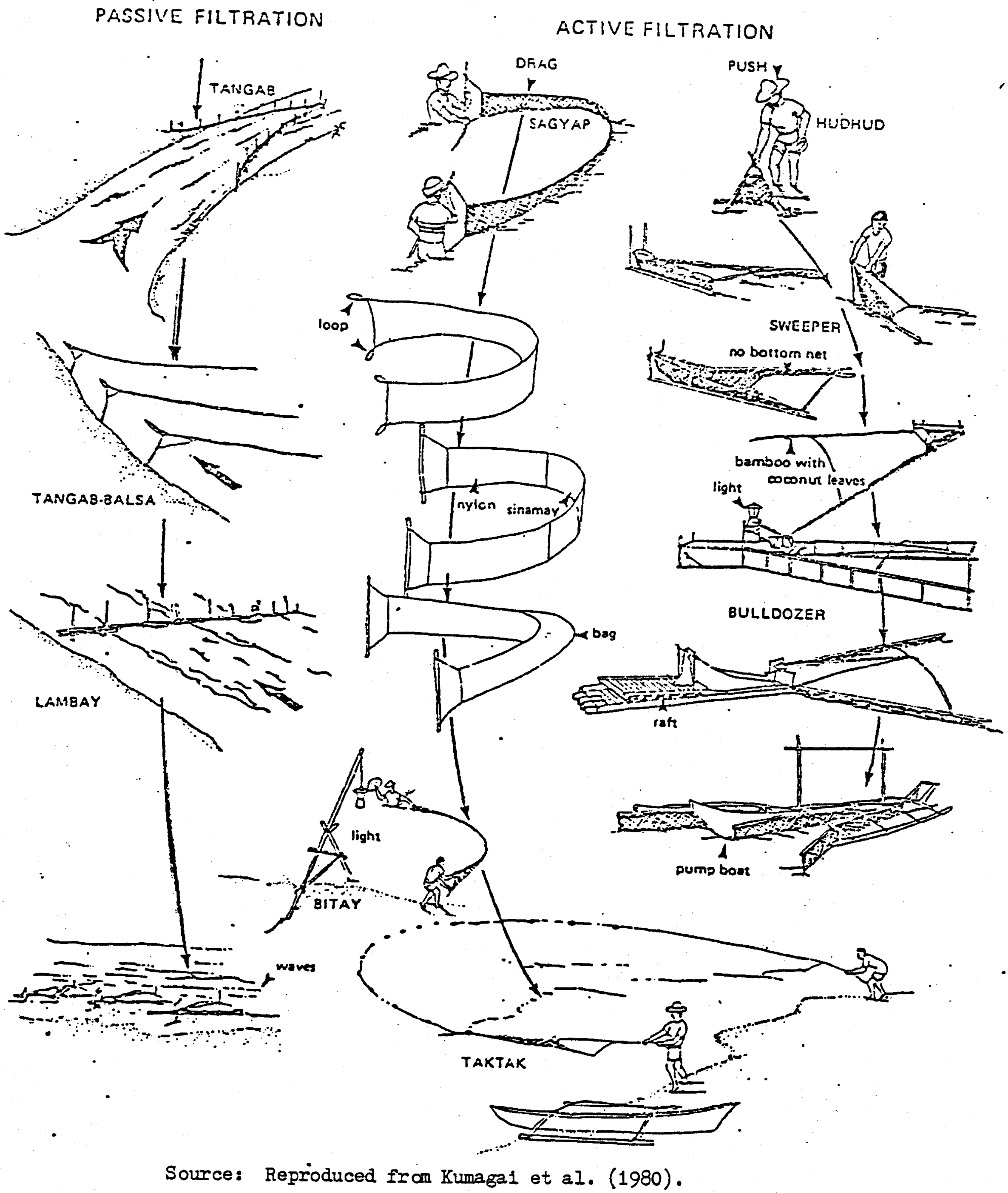



Figure 8. Fish corral ("Baklad")

Source: Reproduced from Smith et al. (1980).

Figure 9. Variations and development of milkfish fry fishing gears




Source: Reproduced from Kumagai et al. (1980).

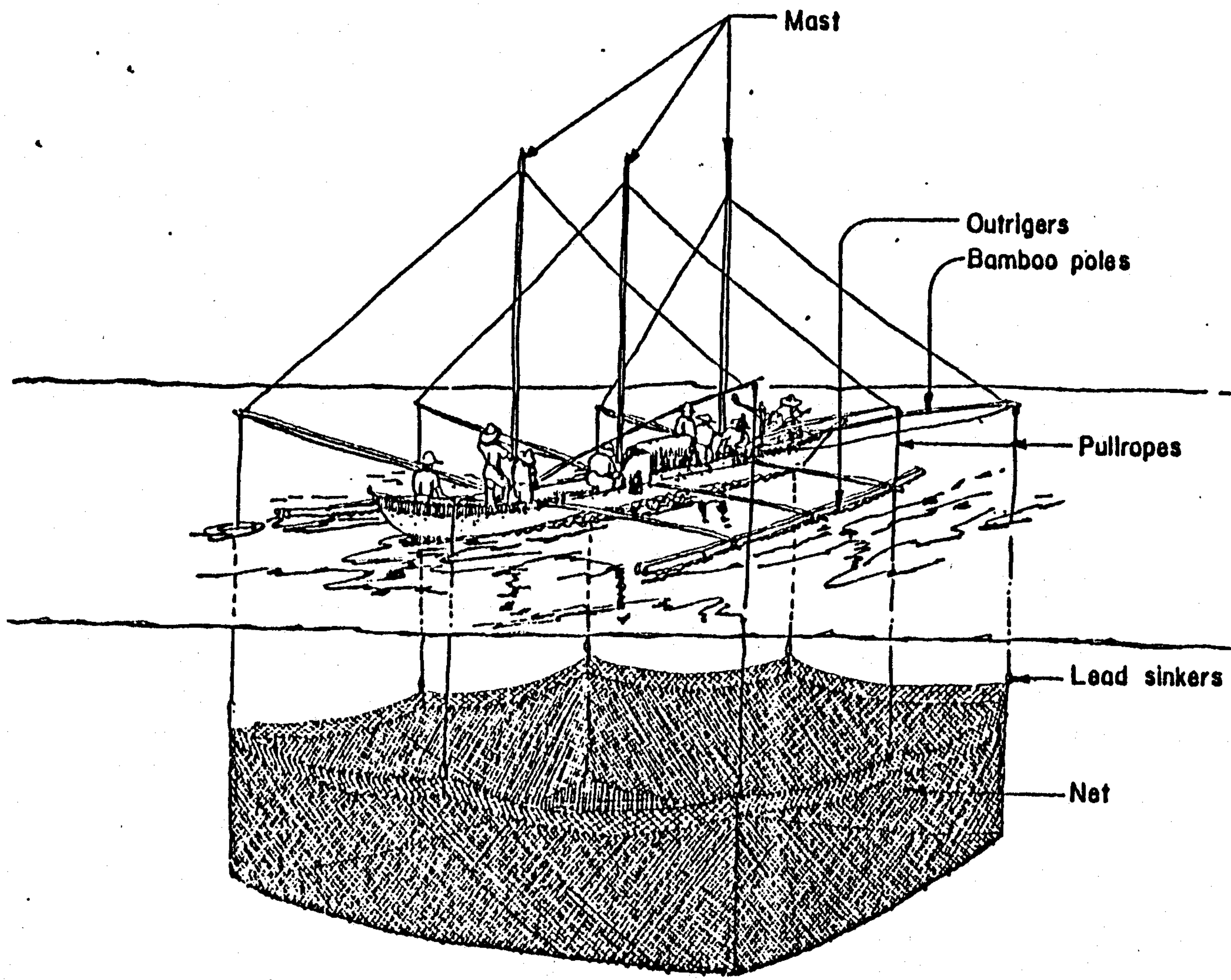
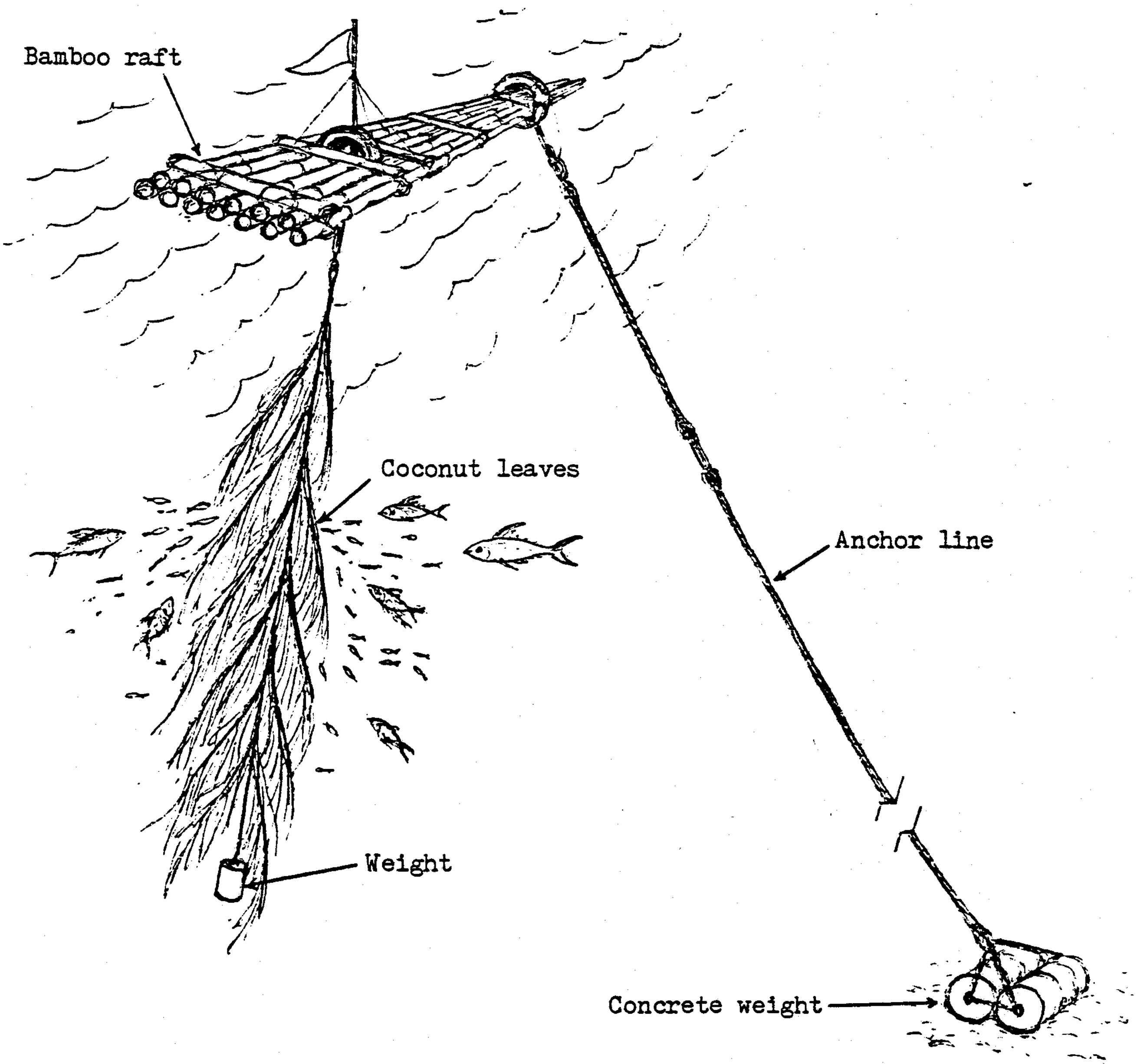



Figure 10. Bag Net ("Basnig")

Source: Reproduced from Smith et al. (1980).

Figure 11. Fish-aggregating device ("Payaw")



principle involved is the same. A similar method is employed by the Japanese passive gear, "otoshi-ami." Unlike the native fish corral which is permanently fixed to the bottom, it is constructed of netting material held in place by heavy sinkers and can be tansferred from one place to another. Both types when set along known migratory paths of tuna can trap sizable amounts of this fish, especially schools of skipjack. In the southern parts of the country, several fishermen drive the school of tuna into the corral using a scare-line of coconut leaves.

An important segment of the municipal fisheries sector is the capture fishery for milkfish fry and, to a lesser extent, shrimp fry. The country's milkfish industry is entirely dependent on this fishery as source of fry for stocking in ponds and pens. The increasing demand for milkfish fry has led to technological improvements in active methods of gathering fry (Figure 9).

Light Fisheries

Fishing with the aid of light for attracting pelagic species is a common practice that evolved from small-scale operations (Mane et al. 1969). The major commercial gears comprising the light fisheries today are the bag net, round haul seine, ring net, and purse seine. An indigenous gear, the bag net ("basnig") is a box-shaped net operated by pulleys at the booms (Figure 10). The round haul seine is similar to the lampara net but with a larger bag and smaller wings. The ring net combines the features of a round haul seine, with the bunt at the center, and a purse seine, with rings and a pursing line for closing the bottom.

Small, non-mechanized purse seines ("talakop" and "kubkob") have been traditionally used in the Philippines. In 1962, the U.S. West Coast-type of purse seiners equipped with a puretic power block was introduced through private initiative. The operation, conducted in 70-120 m depths, incorporated the lighting methods used by bagnet vessels. About five 1,000 watt bulbs are fixed above water on each side of the catcher boat to attract fish. When a sufficient fish concentration is detected by echo-sounder, the lights are turned off one at a time and a small lightboat is released. As fish aggregate around the lightboat, the catcher boat drifts away and pays out the net pulled by a skiff. The light is slowly dimmed to cause the fish to rise to the surface when the pursing begins.

Light fishing is most effective during the dark phase of the moon; thus, vessels normally fish only 20 nights a month. Fair weather is an important requisite for better fish attraction and smooth operation. An average of 19 typhoons pass through the country every year, affecting mainly the northern and eastern parts, but rarely Mindanao in the south. Since the peak of the typhoon season occurs from July to September, light fishery in the bays of southeastern Luzon is most active from April to June (trade wind season). The prevailing monsoon also makes fishing activity highly seasonal. During the northeast monsoon (November to March), vessels concentrate on the southwest section of the islands; during the southwest monsoon (July to October), they operate on the northeastern section. Shallow interisland seas in the central portion of the country, with the least weather disturbance, are therefore the most heavily exploited areas.

Purse seiners further modified their operations during the early 1970s to catch the more elusive tunas. Government trials on tuna purse seining in the late 1960s failed largely due to tuna escaping beneath the net. Seines typically extend down to 70 m (210 ft), but the thermocline in the western tropical Pacific is usually more than 450 ft, as compared to less than 150 ft in the eastern tropical Pacific. Purse seine operators then tried using the traditional fish-aggregating device ("payaw") employed by handliners and ringnetters. Encouraged by the high yields of tuna, fishing companies soon acquired bigger nets and larger, more powerful vessels.

The traditional fish-aggregating structure was made larger and stronger so it can be set farther offshore (Figure 11). The rafts are deployed about 7 miles apart, 20-60 miles from shore, in waters 2,000-3,000 m deep. There are many variations to this basic design; some large companies have designed steel pontoons in place of bamboo rafts for greater durability.

A small scout boat equipped with a fish finder monitors the raft. Whenever a sizable fish concentration is detected, the boat radios the catcher vessel on shore and gives the position of the raft. The vessel then proceeds to the fishing area, ties up with the raft and drifts for the remainder of the day. At nightfall, the vessel turns on its lights to further attract the small fishes and tuna circling around the vessel and the raft. At about two hours before dawn or moonrise, the raft is lashed to the lightboat and the usual purse seining operation begins.

Trawl Fishery

The trawl fishery probably had its beginnings with the beam trawl before the war. Today, otter trawls have designs of different foreign influences, such as the Danish, Irish, Japanese, and Spanish trawls. Bottom trawl, operated down to depths of 100 m, has been for years the leading gear in terms of total catch, but the fast expansion rate of the purse seine fleet has resulted in almost equal production from the two fisheries as of 1979. The mid-water trawl was tried in the 1960s without success. With the advent of electronic fishing aids, this gear is again being experimented on by university researchers.

### 2.4.2 Fish Processing

About 80 % of the catch is sold fresh or iced (FIDC 1980b). Consumers are thus not used to frozen fish. The rest of the catch are dried, salted, smoked, or fermented into fish sauce ("patis") and paste ("bagoong"). Some of the "trash" fish from trawl catches are converted into meal. Canning of mackerel, sardines, and tuna has developed recently, and freezing of tuna is mainly done for export purposes. The new tuna purse seiners are usually equipped with blast freezers,and at least one tuna freezer boat is stationed in the south.

Icing

Icing is the most common method of fish preservation. However, some consumers prefer certain species, such as milkfish, uniced because the presence of ice is apparently viewed as lack of freshness (Smith et al. 1980). The supply of ice is nevertheless crucial in minimizing waste due to spoilage and in ensuring that the harvests from remote areas reach the market centers. No studies have been done on the exact loss due to spoilage, but 20-40 % of the total catch is considered typical in tropical countries. Problems related to fish preservation not only limit the expansion of commercial fishing operations and marketing of municipal catches but also indicate the need for improving the quality of fish sold.

A NORCONSULT/IKO study (1975-1976, cited in FIDC 1980b) revealed that the country has an inadequate supply of ice for fish preservation. If proper ice-to-fish ratios were applied, the study calculated an ice deficiency of about 300,000 tons per year over an estimated nominal ice production capacity of one million tons in 1973. A 1977 inventory of fishery units counted a total of 501 ice plants (472 privately-owned and 29 government-owned), with an installed capacity of 12,742 tons altogether (FIDC 1980b). This means that the ice shortage is worse than earlier estimated. The situation, as FIDC pointed out, is exacerbated by the fact that "a number of existing BFAR ice plants are unable to utilize their full capacity because of age, lack of adequate maintenance, spare parts, and operating skills." Partly because of this limitation, fishing activities have concentrated in nearby inshore areas.

The fish container used is usually a round tub ("bañera"), made of galvanized iron sheet, that can hold 30-40 kg of fish. Ordinarily, a layer of crushed ice is placed at the bottom, middle, and top of the tub with stacks of fish in between. Fish is transported in these tubs by commercial fishing vessels, fish carriers, trucks, and jeeps. This type of container has several disadvantages. The tubs are not provided with holes for draining off unclean melting ice. Being round, they do not permit efficient use of the holding capacity of the transporting vessels. They also last for only a few months due to rough handling. Recommendations on alternative container designs and materials have met resistance because of the long-standing practice of using these tubs.

The storage facilities of commercial vessels are largely inadequate for long fishing trips; fish holds are only insulated and seldom refrigerated. Transport cost increases as operators often have to re-ice the catch, since iced fish stays fresh for only 6 days on the average. The use of fish carriers has extended the area of operation of some Manila-based commercial vessels.

Without such transport services, small-scale operators can only land their catch in nearby markets.

Drying, Smoking, and Fermentation

The most common salted, dried fish are the various herrings and sardines, anchovies, threadfin bream, and siganids. The preferred species for smoking are roundscad, herrings, sardines, mullet, milkfish, gizzard shad, mackerel, and frigate tuna. Fermented fish paste and sauce are made from anchovies, small shrimps, and trash fish. All these products are manufactured by small-scale or cottage industries which are able to absorb excess supply at landing sites (FIDC 1980b).

Smith et al. (1980) note that, "indeed, processing into smoked or dried fish plays a very important function of allocating the supply of a very perishable commodity through time." Except in the Manila area where processors operate year-round, processing is dependent upon the seasonal supply of the desired species in most other localities. When supply of fresh fish is high and prices low, Manila processors substantially increase their production of dried fish and hold them in cold storage for later sale (Guerrero et al. 1976, cited in Smith et al. 1980). Although processing is generally unprofitable when prices of fresh fish are high, the year-round operation makes it profitable in the long run. And because the processing units are small-scale, large volumes are not required to keep them viable.

Canning

Fish canneries existed before the war but shortly shut down due to stiff competition with imported canned fish. In 1972, a vegetable canning company started branching out into fish canning. After an import quota on canned fish was imposed in 1976, 25 fish canning firms were established. The products are canned mackerel, sardines, and tuna (FIDC 1981a). Production rose from 459 MT in 1975 to 22,000 MT in 1978.

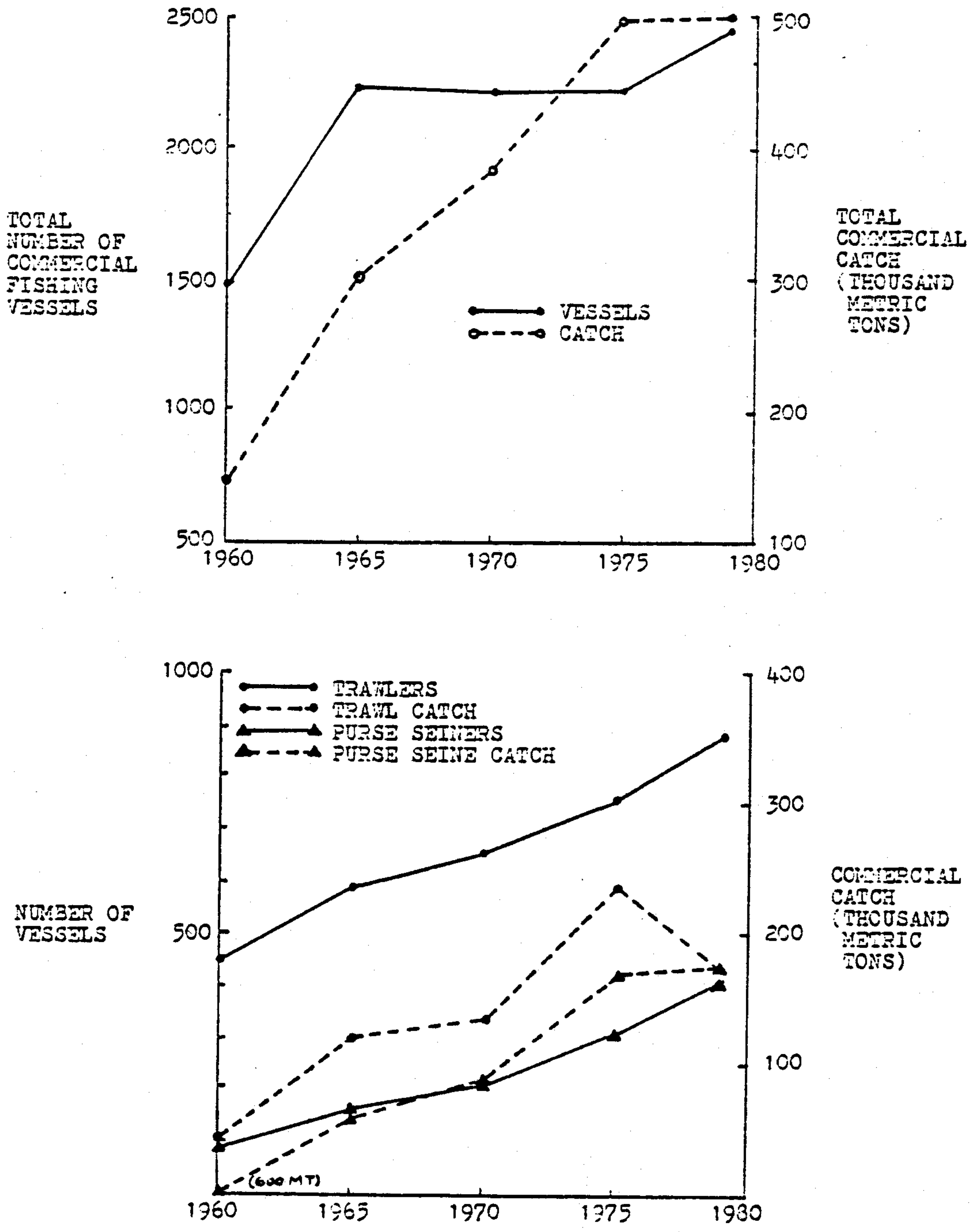
In early 1981, the Mar Fishing Company set up "the largest and most modern tuna cannery in Southeast Asia" (FIDC 1981a). To supplement the supply from local fishermen and trap owners, the company plans to vertically integrate the cannery with its own fleet of purse seiners. The plant, located in Zamboanga (Mindanao), has a maximum processing capacity of 150 MT of fish per day, with a projected annual earning of $69 million in foreign exchange. This development will undoubtedly induce fishermen to increase their effort.

## 2.5 State of the Fisheries

### 2.5.1 Catch Trend and Fleet Expansion

The total landings from the commercial fisheries had been rising until 1975, then remained virtually at the same level the next four years as the total number of vessels jumped from 2,132 to 2,464 (Figure 12). The number of trawlers and purse seiners has been steadily increasing from 1960 to 1979, but by the late 1970s their total landings began tapering off. Even without a

Figure 12. Fleet expansion and catch trend




Source: Fisheries Statistics of the Philippines
BFAR (1960-1979)

Table 2. Regional Distribution of Commercial Fishing Vessels, 1979

| | Region | Total No. of Units | Trawl | Purse Seine | Bag Net | Other Gears |
|---|---|---|---|---|---|---|
| I. | Ilocos | 28 | 26 | - | - | 2 |
| II. | Cagayan Valley | 68 | 3 | - | - | 65 |
| III. | Central Luzon | 107 | 57 | - | 15 | 35 |
| IV. | National Capital | 839 | 452 | 137 | 33 | 217 |
| IV-A. | Southern Tagalog | 352 | 42 | 40 | 245 | 25 |
| V. | Bicol | 152 | 58 | 12 | 57 | 25 |
| VI. | Western Visayas | 283 | 191 | 54 | 34 | 4 |
| VII. | Central Visayas | 133 | 19 | 71 | 21 | 22 |
| VIII. | Eastern Visayas | 82 | 22 | 6 | 21 | 33 |
| IX. | Western Mindanao | 228 | 2 | 38 | 168 | 20 |
| X. | Northern Mindanao | 41 | 2 | 17 | 8 | 14 |
| XI. | Eastern Mindanao | 136 | 3 | 30 | 34 | 69 |
| XII. | Southern Mindanao | 15 | - | 3 | 5 | 7 |
| | Total | 2,464 | 877 | 408 | 641 | 538 |

Source: Fisheries Statistics of the Philippines BFAR (1979)

Table 3. Number of Commercial Fishing Vessels by Tonnage Class

| Year | Total Tonnage (GT) 1/ | Total No. of Units 2/ | Tonnage Class 3.1-9.9 GT | 10-49.9 GT | 50-99.9 GT | 100-Over GT | GT Not Reported |
|---|---|---|---|---|---|---|---|
| 1960 | 36,578 | 1,458 | 574 | 621 | 229 | 12 | 22 |
| 1965 | 66,122 | 2,231 | 865 | 716 | 349 | 112 | 189 |
| 1970 | 89,688 | 2,063 | 594 | 821 | 441 | 163 | 44 |
| 1975 | 101,209 | 2,132 | 785 | 893 | 314 | 140 | - |
| 1979 | 117,668 | 2,464 | 864 | 1,095 | 311 | 194 | - |

1/ Includes accessory vessels (carriers, skiffs, light boats, etc.).

2/ Catcher boats only.

Source: Fisheries Statistics of the Philippines BFAR (1960-1979) rigorous economic analysis, these trends suggest an overcapitalization in the nation's commercial fishing fleet operating in traditional fishing grounds.

The distribution of commercial vessels by administrative region (Table 2) indicates the concentration of fishing effort in heavily exploited areas. Vessels from at least four regions (IV, IV-A, V, and VI) exploit the Tayabas Bay-Sibuyan-Visayan Sea region, the most productive fishing area for years. The highest number of commercial vessels registered in Region IV (National Capital Region) reflects not only the overfishing situation in Manila Bay but also the "distant-water" fleet of trawlers and purse seiners that fish the major grounds all over the country. The expansion of this fleet is responsible for the increase in accessory vessels (fish carriers, skiffs, light boats, and scout boats) from 41 units in 1960 to 456 units in 1979. Fish carriers bring ice to the catcher boats and transport the catch to Manila and other major fish landing sites; the fishing vessel does not have to leave the fishing area for weeks.

The commercial fleet expansion shows an increasing trend towards larger vessels. Table 3 gives the distribution in number of vessels by tonnage class. Vessels of 100 GT and above rose from only 12 units in 1960 to 194 units, mostly of purse seiners, in 1979. As of 1980, the tuna fishing fleet includes 10 purse seiners of more than 500 GT, two of which are more than 1,500 GT (FIDC 1981a). The growth of the tuna fishery also resulted in the increase of commercial ringnetters using fish-aggregating rafts, coinciding with the decrease in boats operating round haul seines.

While the trend towards larger vessels opened new fishing grounds, these are still mainly in the shelf areas not reached by smaller boats. The vessels, mostly old and second-hand, are apparently minimizing trip costs and optimizing their returns. The highly-priced tuna has lured some operators to venture into deeper waters. The trawl fishery, however, is more constrained by the limited trawlable areas, few of which remain relatively unexploited.

In municipal fisheries, the typical fishing craft is a "banca," with a dugout bottom and reinforced marine plywood sides. Since they are narrow and light (3 GT or less), most bancas have outriggers for stability. Powered boats commonly use a 10-16 hp Briggs and Stratton gasoline engine. In some regions, bamboo rafts are used for fishing close to shore. Smith et al. (1980) cited a 1976 BFAR count of 244,589 bancas, 46 % of which were motorized. A national census of fishery units in 1977 tallied a total of 214,797 bancas; only 38 % were motorized (FIDC 1980a). Aside from these data, there is no historical record of the total number by type of gear in municipal fisheries.

The BFAR production statistics for municipal fisheries show a continuous upward trend until 1978 and a slight decrease in 1979. Prior to 1976, these figures were estimated by projecting the annual production growth rate based on a 1951-1958 survey of six municipalities. Many researchers therefore believe that these data are underestimates. The municipal statistics were improved through a better sampling scheme in 1976, with assistance from the UNDP/FAO South China Sea Fisheries Development and Coordinating Programme (SCSP).

Smith et al. (1980) analyzed three reports that gave independent estimates of the overall fish production from 1970 to 1976. Using fish consumption data to arrive at their estimates, these studies consistently obtained estimates higher than those of BFAR. The first showed the same increasing trend; the second gave declining production since 1971; and the third had production rising through 1974, but at a slower rate, and decreasing in 1975. Despite this disagreement, researchers place more reliability on the increasing output from the commercial and aquaculture sectors during the same period. The implication is that the municipal catch is at least leveling off.

2.5.2 Catch Composition

More than 2,000 species of fish are present in Philippine waters, but not all of these are caught in large quantities nor have commercial value. Most fishing gears catch a variety of fish and invertebrates. The tuna and milkfish fry fisheries are relatively the only single species fisheries in the country.

Biologists have classified the economically important species into pelagic and demersal fisheries. The latter are sometimes divided into soft-bottom (trawlable) fisheries and hard-bottom (non-trawlable or reef) fisheries. Invertebrates are treated separately in some studies. In others, the major commercial invertebrates (shrimp, squid, and blue crab) caught by trawls are grouped under demersal fisheries.

The multispecies catch composition of the principal commercial and municipal fishing gears is evident in Tables 4 and 5. More than one species actually comprise most of the groups, such as the roundscads (Decapterus), mackerels (Rastrelliger), sardines (Sardinella), anchovies (Stolephorus), frigate tuna (Auxis), cavalla (Caranx), slipmouths (Leiognathus), groupers (Epinephelus), snappers (Lutjanus), and squids (Loligo, Sepia, etc.). Since the BFAR catch data are obtained from the monthly reports of commercial vessels and field sampling of municipal catch, a fine breakdown into species would be impractical.

Some generalizations may be drawn from the species composition data: 1) the two fishery sectors catch the same species or stocks; 2) various types of gear are competing for the same species; 3) pelagic and demersal types of gear catch both groups of fish, indicating the concentration of fishing activities in shallow areas; and 4) any management measure directed at any one species or sector would have an effect on the other. All these add difficulty to the already complex task of fisheries management.

Table 4. Species Composition of Landings by Major Commercial Fishing Gears, 1979

| Principal Species Groups | Trawl MT(000) | Trawl % | Purse Seine MT(000) | Purse Seine % | Bag Net MT(000) | Bag Net % |
|---|---|---|---|---|---|---|
| **Pelagic** | | | | | | |
| Roundscads | 14.9 | 8.4 | 68.8 | 39.5 | 22.9 | 23.4 |
| Mackerels | 6.2 | 3.5 | 14.8 | 8.5 | 1.9 | 2.0 |
| Anchovies | 1.3 | 0.8 | 1.6 | 0.9 | 17.3 | 17.7 |
| Sardines | 2.9 | 1.6 | 8.0 | 4.6 | 25.3 | 25.9 |
| Round Herrings | 2.1 | 1.2 | 7.5 | 4.3 | 5.6 | 5.7 |
| Bigeye Scad | 5.7 | 3.2 | 7.9 | 4.5 | 0.9 | 0.9 |
| Cavalla | 1.2 | 0.7 | 0.3 | 0.2 | 0.8 | 0.8 |
| Crevalle | 4.1 | 2.3 | 2.9 | 1.7 | 0.1 | 0.1 |
| Flying Fish | * | * | 0.3 | 0.2 | * | * |
| Spanish Mackerel | 0.9 | 0.5 | 2.0 | 1.1 | 0.4 | 0.4 |
| Yellowfin/Bigeye Tuna | - | - | 8.8 | 5.0 | 0.9 | 0.9 |
| Skipjack | * | * | 16.7 | 9.6 | 0.2 | 0.2 |
| Eastern Little Tuna | * | * | 4.1 | 2.4 | 2.0 | 2.1 |
| Frigate Tuna | * | * | 19.1 | 11.0 | 7.5 | 7.7 |
| Sub-Total | 39.4 | 22.3 | 162.8 | 93.5 | 85.8 | 87.8 |
| **Demersal** | | | | | | |
| Slipmouths | 42.2 | 23.9 | 0.2 | 0.1 | 3.9 | 4.0 |
| Threadfin Bream | 16.1 | 9.1 | * | * | * | * |
| Lizard Fish | 12.6 | 7.2 | 0.6 | 0.4 | - | - |
| Fusiliers | 0.1 | * | - | - | 0.2 | 0.2 |
| Groupers | 0.9 | 0.5 | - | - | - | - |
| Snappers | 0.6 | 0.3 | - | - | - | - |
| Goatfishes | 14.0 | 7.9 | * | * | * | * |
| Croakers | 3.1 | 1.8 | - | - | 0.1 | 0.1 |
| Moonfish | 0.6 | 0.3 | 1.6 | 0.9 | 1.8 | 1.9 |
| Sub-Total | 90.2 | 51.0 | 2.5 | 1.4 | 6.1 | 6.2 |
| **Invertebrates** | | | | | | |
| White Shrimp | 4.5 | 2.5 | * | * | 0.1 | 0.1 |
| Squids | 8.3 | 4.7 | 1.1 | 0.6 | 2.4 | 2.4 |
| Blue Crab | 3.9 | 2.2 | * | * | * | * |
| Sub- Total | 16.7 | 9.4 | 1.1 | 0.6 | 2.5 | 2.6 |
| Total (Principal Species) | 146.3 | 82.8 | 166.4 | 95.6 | 94.4 | 96.6 |
| Total Landing | 176.7 | 100.0 | 174.0 | 100.0 | 97.8 | 100.0 |

* Less than 100 MT or 0.1 %.

Source: Fisheries Statistics of the Philippines BFAR (1979)

Table 5. Species Composition of Landings of Major Municipal Fishing Gears, 1979

| Principal Species Groups | Surface Gillnet | | Hook & Line | | Bag Net | |
|---|---|---|---|---|---|---|
| | MT(000) | % | MT(000) | % | MT(000) | % |
| **Pelagic** | | | | | | |
| Roundscads | 8.3 | 4.2 | 5.5 | 3.3 | 1.9 | 4.2 |
| Mackerels | 21.7 | 10.9 | 3.9 | 2.4 | 0.3 | 0.6 |
| Anchovies | * | * | - | - | 18.0 | 40.8 |
| Sardines | 45.1 | 22.8 | 0.1 | * | 8.8 | 19.9 |
| Round Herrings | 6.0 | 3.0 | - | - | 0.4 | 0.9 |
| Bigeye Scad | 5.3 | 2.6 | 6.5 | 3.9 | 0.7 | 1.6 |
| Cavalla | 3.5 | 1.8 | 6.4 | 3.8 | 0.2 | 0.4 |
| Crevalle | 2.5 | 1.3 | 1.8 | 1.1 | 1.1 | 2.5 |
| Flying Fish | 7.4 | 3.7 | 0.1 | * | 1.4 | 3.2 |
| Spanish Mackerel | 4.0 | 2.0 | 4.9 | 2.9 | * | * |
| Yellowfin/Bigeye Tuna | 2.0 | 1.0 | 31.5 | 18.9 | 0.2 | 0.5 |
| Skipjack | 4.4 | 2.2 | 11.6 | 7.0 | 0.1 | 0.3 |
| Eastern Little Tuna | 3.5 | 1.7 | 7.1 | 4.3 | 0.3 | 0.7 |
| Frigate Tuna | 4.4 | 2.2 | 19.1 | 11.5 | 0.6 | 1.2 |
| Sub-Total | 118.1 | 59.6 | 98.5 | 59.2 | 34.0 | 76.9 |
| **Demersal** | | | | | | |
| Slipmouths | 10.9 | 5.5 | * | * | 5.6 | 12.7 |
| Threadfin Bream | 3.5 | 1.8 | 8.6 | 5.2 | - | - |
| Lizard Fish | 0.8 | 0.4 | 0.4 | 0.2 | - | - |
| Fusiliers | 3.0 | 1.5 | 2.0 | 1.2 | - | - |
| Groupers | 1.8 | 0.9 | 10.5 | 6.3 | * | 0.1 |
| Snappers | 2.1 | 1.1 | 9.2 | 5.5 | 0.2 | 0.4 |
| Goatfishes | 4.7 | 2.4 | * | * | * | * |
| Croakers | 1.8 | 0.9 | 0.4 | 0.2 | * | * |
| Moonfish | 2.8 | 1.4 | - | - | * | 0.1 |
| Sub-Total | 31.4 | 15.8 | 31.1 | 18.7 | 5.9 | 13.3 |
| **Invertebrates** | | | | | | |
| White Shrimp | 1.8 | 0.9 | - | - | * | 0.1 |
| Squids | 0.1 | * | 7.8 | 4.7 | 2.9 | 6.4 |
| Blue Crab | 7.0 | 3.5 | * | * | - | - |
| Sub-Total | 8.9 | 4.5 | 7.8 | 4.7 | 2.9 | 6.5 |
| Total (Principal Species) | 158.4 | 79.9 | 137.4 | 82.6 | 42.8 | 96.7 |
| Total Landing | 198.1 | 100.0 | 166.3 | 100.0 | 44.2 | 100.0 |

* Less than 100 MT or 0.1 %.

Source: Fisheries Statistics of the Philippines BFAR (1979)

The historical catch record of the main species groups common to the two sectors cannot be plotted prior to 1976, the year BFAR first collected statistics on municipal fisheries by species groups. The data for 1976-1979, however, show that for most groups the municipal catches follow the same trends as those of the commercial catches. On total, the municipal sector landed more yellowfin tuna, skipjack, sardines, anchovies, mackerel, and shrimp than the commercial sector. Individual fishing grounds may of course exhibit different comparative levels in sectoral production.

The record of roundscad landings represents the growth of the purse seine fleet. Not important before the war, this species group has been dominating the total catch since the early 1960s. However, Mane et al. (1969) noted that "the roundscad catch consists overwhelmingly of juvenile individuals which indicates the possibility that the industry may suffer a sudden setback in the event of non-arrival of successful broods." The total landings of roundscad peaked at 225,000 MT in 1976 then dropped to 146,000 MT in 1979. Researchers believe that the roundscad fishery may benefit if the location and abundance of the adult stock could be determined.

The commercial catch for the other small pelagic species (sardines, mackerels, and anchovies) shows varying degrees of fluctuation. Species and gear interaction, aside from other biological and environmental variables, may account for this pattern.

The catch data for skipjack and yellowfin tuna do not show any dramatic increases as the export market expanded in the 1970s. It is likely that the figures are understated. Researchers suspect that a considerable amount of tuna is being sold at sea to foreign vessels. Some of the catch directly sold to exporters and processors may also go unreported. The catch consists mostly of immature fish, indicating that the Philippine waters may be the nursery grounds for the Western Pacific stock of yellowfin and skipjack tuna.

Slipmouths, the most important demersal species in terms of volume, show the same catch trend as the roundscads through the 1970s. The commercial catch reached its highest at 67,000 MT in 1975, then dropped to 46,000 MT in 1979. A similar dwindling catch is indicated for threadfin bream (*Nemipterus*) and penaeid shrimps, whereas the landings of lizard fish (*Saurida tumbil*) have been fluctuating. Squids appear to be leveling off, but Hernando and Flores (1981) believe that squid landings may be doubled through expansion to underexploited areas, technological improvements, and financial support.

### 2.5.3 Total Potential Yield

The preceding sections have shown that production from the capture fisheries has slowed down in recent years. The increase in fishing units was accompanied by a decline in catch rates. Assuming that the present BFAR figure of 1.5 million MT total production is the best available estimate, and that the marine capture fisheries provide an average of 80 % of the total (1976-1979), the total marine landings would be approximately 1.2 million MT. This level of exploitation may be compared to the potential yield of Philippine marine waters estimated by various authors.

Table 6 summarizes the approximations, which range from 1,024,000 MT to 3,700,000 MT. Smith et al. (1980) made a critique of the methods and assumptions used in arriving at these estimates.

First, the two highest estimates, 2.9 million MT and 3.7 million MT, are considered questionable. The authors arbitrarily assume that present levels could be increased by 80-100 % through improved technology.

Second, productivity estimates of 20 $MT/km^2$ for the shelf area to 200-m depth may be unreasonably high. In the Gulf of Thailand, regarded as one of the richest fishing grounds in the region, the estimated productivity of demersal resources up to the 50-m isobath only is 3.85 $MT/km^2$. And productivity normally declines with increasing depth. Even if pelagic species, which account for 65-70 % of the Philippine marine landings, were added, total productivity should not reach 20 $MT/km^2$. The review concludes that a productivity estimate of 6-10 $MT/km^2$ (all fish) for the shelf up to 200-m depth is more acceptable.

Third, the studies also disagreed on the total area of the shelf. If the BCGS measurement of 266,000 $km^2$ is used, the

Table 6. Estimates of Productivity and Potential Yield

Source: Reproduced from Smith et al. (1980)

| Location | Source | Bottom type, depth, and estimated area | Estimated annual average productivity per km² (mt) | Estimate of MSY demersal and pelagic (1,000 mt) | Estimate of total MSY (000 mt) |
|---|---|---|---|---|---|
| 1. Philippines | Kvaran (1971) | (a) 200,000 km² shelf area (0-200 m) | 3.5 (demersal) | 700 | |
| | | (b) 200,000 km² shelf area (0-200 m) | 3.25 (in-shore pelagic) | 650 | 1,650 |
| | | (c) 1,500,000 km² deep water (200+ m) | .2 (off-shore pelagic) | 300 | |
| 2. Philippines | Menasveta et al. (1973) | (a) Sulu Sea (200+ m) | .5 - .65 (pelagic) | 604 | |
| | Aoyama (1979) | (b) Shelf Area (0-200 m) | 2.75 (demersal) | 420 | 1,024 |
| 3. Philippines | NORCONSULT/IKO(1975) | 185,000 km² shelf area (0-200 m) | 20.0 (all fishes) | | 3,700 |
| 4. Philippines | AID (1977) | 185,000 km² shelf area (0-200 m) | 10.0 (all fishes) | | 1,850 |
| 5. Philippines | Yutuc and Trono (1977) | (a) 126,500 km² shelf area (0-100 m) | 18.0 (all fishes) | | |
| | | (b) 139,500 km² shelf area (100-200 m) | 1.8 (all fishes) | | 2,914 |
| | | (c) 1,500,000 km² deep water (200+ m) | .26 (all fishes) | | |
| 6. Gulf of Thailand | SCSP (1978c) | Shelf area (0-50 m) | 3.85 (demersal only) | | |
| 7. South Jamaica | Munro (1978) | Coral reef and adjacent shallow areas | 4.1 (demersal and pelagic neritic) | | |
| 8. Western Indian Ocean | FAO (1979) | Coral reef and adjacent shallow areas | 5.0 (demersal only) | | |
| 9. Worldwide | Stevenson and Marshall (1974) | Coral reef and adjacent shallow areas | 4.1 (all fishes) | | |
| 10. Caribbean | Gulland (1971) | Coral reef and adjacent shallow areas | 4.0 (demersal and pelagic neritic) | | |
| 11. Bahamas | Gulland (1971) | Coral reef and adjacent shallow areas | 2.5 (demersal and pelagic neritic) | | |
| 12. West Africa | Pauly (1976) | Coastal lagoon (ave. depth–50 cm) | 15.0 (all fish) | | |
| 13. Philippines | Alcala (as reported in Marshall 1979) | Reef area (Sumilon Island Reserve) | 15.0 (all fish) | | |
| 14. South Texas | Saila (1975) | Shallow bays | 12.1 (all fish) | | |

Notes on assumptions made and method used to calculate MSY or to estimate productivity per km².

1. a. Assumed same producitivity as Gulf of Thailand productivity and also applied Schaefer total biomass model.
   b. 15-25% catch per unit effort reduction applied to Schaefer model.
   c. .2 t/km² assumed without documentation.
2. a. Based on Gulland (1971) formula ($C_{max} = .5\ M \cdot B_o$).
   b. Based on Gulland (1971) formula with slight modification.
3. Calculated present annual catch equal to 10 t/km² and arbitrarily assumed technology would double this to 20 t/km².
4. Assumed same productivity as richest areas of Gulf of Thailand.
5. a. Calculated present catch equal to 10 t/km² (0-100 m), and
   b. 1 t/km² (100-200 m), and arbitrarily assumed technology would increase this by 80%.
   c. .26 t/km² estimated from exploratory fishing.
6. Total biomass Schaefer model to estimate MSY.
7. Surplus yield model from concurrent trap fishing intensities.
8. Extrapolating from trap catch data in different areas.
9. Highest found through literature review.
10. Intuitive comparison with other Western Central Atlantic areas.
11. Intuitive comparison with other Western Central Atlantic areas.
12. Observed catch levels assumed to be optimum.
13. Unknown.
14. Unknown.

potential yield from the shelf would then be anywhere from 1,596,000 MT to 2,660,000 MT. This means that, with the production level currently at 1.2 million MT, there would still be room for development, even more if fishing would expand to deeper waters. Although such an optimistic view may be used to justify government-supported development programs, especially those directed at municipal fisheries, the consensus among researchers is that the municipal catch from shallow coastal areas has probably reached its maximum sustainable yield.

2.5.4 Regional Status

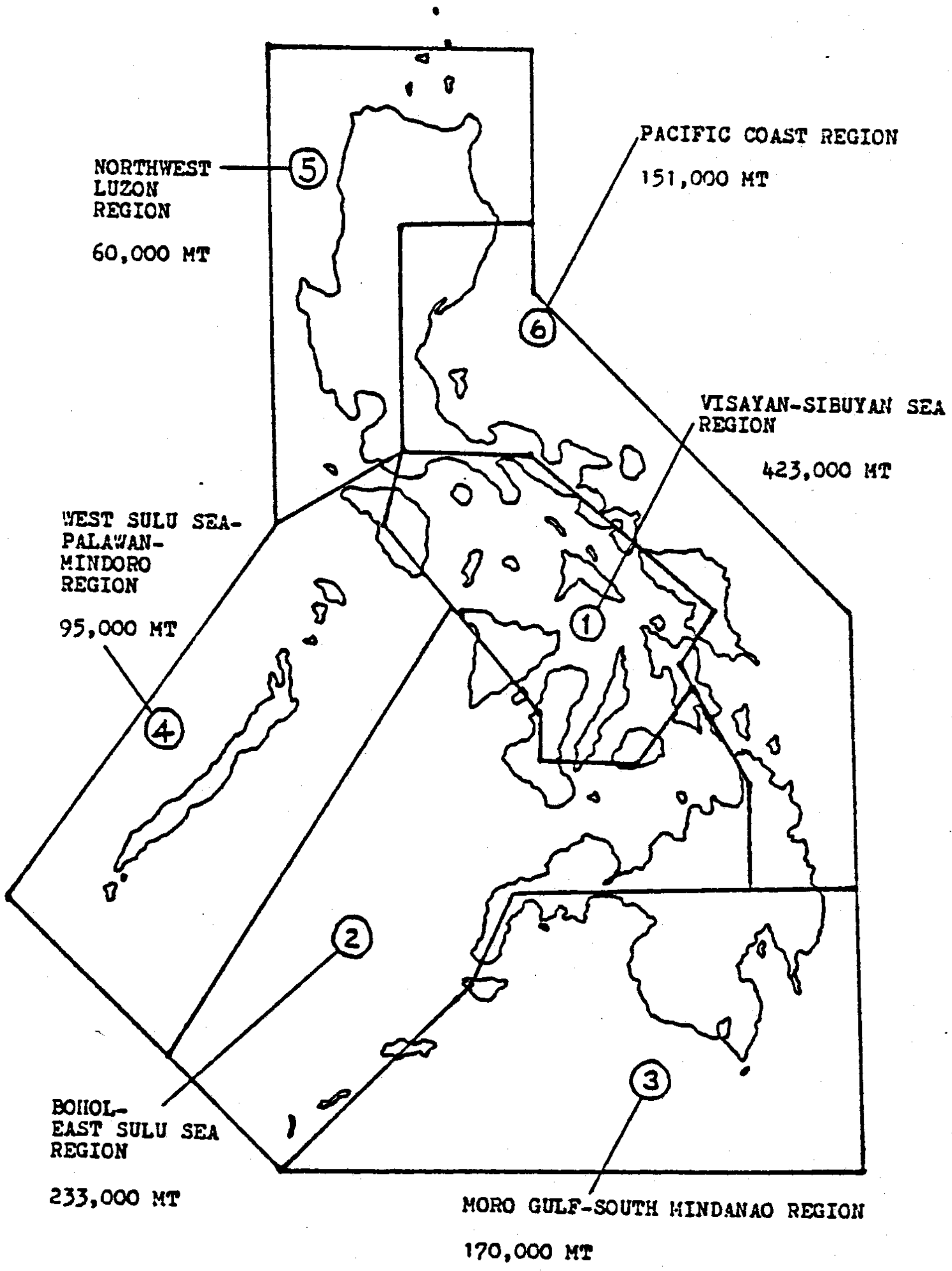
The above gross estimates do not offer much as a reference for fisheries management planning, considering the uneven distribution of fishing activities in the country, variations in biological productivity, and differences in the physical environment of the fishing grounds. A series of workshops conducted by BFAR and SCSP, therefore, attempted to evaluate the state of the fisheries in the following sections of the country: 1) Visayan Sea and Sibuyan Sea areas (SCSP 1976); 2) Sulu Sea, Bohol Sea, and Moro Gulf areas (SCSP 1977); 3) Pacific Coast (SCSP 1978); and 4) north and western coasts of Luzon (SCSP 1979).

The results of the resource assessment are summarized in Buzeta (1977) and Smith et al. (1980). The BFAR-SCSP investigators admit the inadequacy of available statistics: "It cannot be too strongly stressed that the assessments have been made with data which have been recognized often as only estimates and therefore some conclusions may prove to be wrong. However, it is probable that the data were not so inaccurate that the conclusions cannot be used as first approximations to the truth and, as the statistics are improved and a deeper knowledge of the fish stocks and the fisheries are brought together, improvements will be possible to guide the planning of fisheries development." The workshops pointed out that better analysis would have been achieved if good data on fishing effort (e.g. number of vessels, fishing days, hours, or trips) were available.

The following summary of the regional fisheries status comes from Buzeta (1977) who further subdivided the country into six regions, taking into account "the operation of the fishing fleet, both commercial and artisanal, and the unity of the fishing grounds more than biological and ecological considerations." Figure 13 shows the regional subdivision and the total landings from each region in 1979. A breakdown of the regional landings by major resource units is given in Table 7, and a comparison of the 1975-1976 and 1979 regional landings in Table 8.

Comparing the estimated potentials for each region with the BFAR 1975-1976 catch data, Buzeta arrived at the probable status of the fisheries. In light of the 1979 catch increases, his conclusions regarding some of the species groups need to be updated.

Figure 13. Fishing regions and regional landings, 1979




Source: Regional subdivisions after Buzeta (1977). Landings from Fisheries Statistics of the Philippines, BFAR (1979); excluding seaweeds.

Table 7. Regional Landings by Resource Groups, 1979

| Fishing Region 1/ | Total | | Pelagic Species | | Demersal Species | | Invertebrates | | Seaweeds | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MT(000) | % | MT(000) | % | MT(000) | % | MT(000) | % | MT(000) | % |
| 1. Visayan-Sibuyan Sea | 423.7 | 34.2 | 235.9 | 30.8 | 149.3 | 52.4 | 38.1 | 46.4 | 0.4 | 0.4 |
| 2. Bohol-East Sulu Sea | 330.3 | 26.7 | 181.5 | 23.7 | 45.2 | 15.9 | 6.0 | 7.3 | 97.6 | 92.0 |
| 3. Moro Gulf-South Mindanao | 178.1 | 14.4 | 155.4 | 20.3 | 11.4 | 4.0 | 3.3 | 4.0 | 8.0 | 7.5 |
| 4. West Sulu Sea-Palawan-Mindoro | 95.0 | 7.7 | 71.7 | 9.4 | 20.6 | 7.2 | 2.7 | 3.3 | - | - |
| 5. North-West Luzon | 60.1 | 4.9 | 25.1 | 3.3 | 17.2 | 6.0 | 17.8 | 21.7 | * | * |
| 6. Pacific Coast | 150.6 | 12.2 | 95.5 | 12.5 | 41.1 | 14.4 | 14.0 | 17.1 | * | * |
| Total | 1,237.8 | 100.0 | 765.1 | 100.0 | 284.8 | 100.0 | 81.9 | 100.0 | 106.0 | 100.0 |

1/ After Buzeta (1977).

* Less than 100 MT or 0.1 %.

Source: Fisheries Statistics of the Philippines BFAR (1979)

Table 8. Regional Fish Landings, 1975-1976 and 1979 (Excluding Invertebrates and Seaweeds)

| Fishing Region | 1975-1976 1/ | | 1979 2/ | |
|---|---|---|---|---|
| | MT(000) | % | MT(000) | % |
| 1. Visayan-Sibuyan Sea | 399.3 | 36.3 | 385.2 | 36.7 |
| 2. Bohol-East Sulu Sea | 179.5 | 16.3 | 226.7 | 21.6 |
| 3. Moro Gulf-South Mindanao | 80.8 | 7.3 | 166.8 | 15.9 |
| 4. West Sulu Sea-Palawan-Mindoro | 164.4 | 14.9 | 92.3 | 8.8 |
| 5. North-West Luzon | 103.7 | 9.6 | 42.3 | 4.0 |
| 6. Pacific Coast | 171.5 | 15.6 | 136.6 | 13.0 |
| Total | 1,099.2 | 100.0 | 1,049.9 | 100.0 |

1/ From Buzeta (1977) who combined the BFAR 1975 commercial catch with the 1976 municipal catch statistics.

2/ From BFAR (1979) commercial and municipal catch statistics, following Buzeta's regional subdivisions.

1. Visayan-Sibuyan Sea Region

| Species Group | Estimated Potential | Status |
|---|---|---|
| Demersal | >200,000 MT | Fully exploited |
| Pelagic | | |
| - Mackerels, anchovies | 47,000 MT | Fully exploited |
| - Roundscad, sardines, etc. | 160,000 MT | Underexploited (?) |

This area still produces the highest amount of fish among the regions, accounting for 37 % of the total, despite the drop in fish landing from 399,300 MT in 1975-1976 to 385,200 MT in 1979. While the demersal catch decreased by 100,000 MT, the pelagic catch increased by nearly 85,000 MT, most of which were roundscads and sardines. With the number of trawl vessels increasing and the demersal catch decreasing, this fishery has already surpassed its estimated potential. The catches of the small pelagics appear to have reached their full potentials as of 1979.

2. Bohol-East Sulu Sea Region

| Species Group | Estimated Potential | Status |
|---|---|---|
| Demersal | 49,000 MT (trawlable areas) | Further increase possible over untrawlable grounds |
| Pelagic | | |
| - Roundscad | >15,000 MT | Not fully |
| - Other species | >68,000 MT | exploited (?) |
| - Tunas | Probably >100,000 MT for Moro Gulf-Sulu Sea (Regions 2,3,4) | Increase possible |

The regional fish landings increased from 179,500 MT in 1975-1976 to 226,700 MT in 1979. Accounting for 22 % of the total, the area ranked second again to the Visayan-Sibuyan Sea region in 1979, mainly due to considerable increases in the landings of small pelagic fish. The assessment workshop felt that the potential of the small pelagics was just slightly above the 1975-1976 catch levels. Their total landings, however, rose by about 77,000 MT in 1979, which may indicate full exploitation of these resources.

For skipjack and yellowfin tuna, the estimated potential for Sulu Sea and Moro Gulf combined is about 100,000 MT. Survey results show that tunas caught in Sulu Sea are older by one year (2-3 years old) than those caught in Moro Gulf. This observation suggests that the fish move westward from Moro Gulf and are recruited into the Sulu Sea fishery. The 1979 decrease in tuna landings may have resulted from intense fishing activities in the Moro Gulf area.

The demersal catches mostly came from trawlable grounds, which cover only 30 % of the shelf area in this region. Since there is not much room for trawling expansion, the potential lies in the resources over untrawlable grounds more accessible to the gear types used by municipal fishermen.

3. Moro Gulf-South Mindanao Region

| Species Group | Estimated Potential | Status |
|---|---|---|
| Demersal | 17,000 MT (trawlable areas) | Fully exploited; increase possible on untrawlable grounds |
| Pelagic | | |
| - Roundscad | >10,700 MT | Increase possible (?) |
| - Sardines, anchovies, etc. | >13,500 MT | |
| - Tunas | Probably >100,000 MT for Moro Gulf-Sulu Sea (Regions 2,3,4) | Increase possible |

The catch from this region consists chiefly of pelagic species, 78 % in 1975-1976 and 93 % in 1979. While the demersal catch decreased, the pelagic catch markedly rose in 1979. The area previously ranked last among the six regions with a total fish landing of 80,800 MT, but jumped to third in 1979 with 166,800 MT.

Municipal fishermen account for 60-70 % of the regional catch. As in the Bohol-East Sulu Sea region, demersal catches in untrawlable grounds may be increased by municipal fisheries. The pelagic types of gear, such as ring net, bag net, drive-in corral, and multiple handlines are widely used in this region. Buzeta estimated that the potential yield for small pelagics was well above the 1975-1976 catches. The 1979 catches may have already reached the full exploitation stage for this group.

4. West Sulu Sea-Palawan-Mindoro Region

| Species Group | Estimated Potential | Status |
|---|---|---|
| Demersal | 70,000 MT | Some trawlable grounds untapped; increase possible on untrawlable grounds |
| Pelagic | | |
| - Roundscad | 98,000 MT | Increase possible (?) |
| - Tunas | Probably >100,000 MT for Moro Gulf-Sulu Sea (Regions 2,3,4) | Increase possible |

This region produced the fourth highest catch of about 164,400 MT in 1975-1976. Pelagic species have always accounted for the greater bulk of the catch (78 %), mostly from the municipal fisheries. In 1979, the regional catch amounted to only 92,300 MT (9 % of the total) and dropped to fifth position, because of the considerable reduction in the roundscad catch and, to a lesser extent, in the demersal catch.

The small pelagic species, particularly roundscad, mackerel, sardines, anchovies, and frigate tuna, are suspected to be transboundary or shared species with the neighboring countries. Like the highly migratory tunas, it is difficult to assess the potentials of these species without information on the fisheries in adjacent waters. Even in the Philippine internal waters, the boundaries of unit stocks are not known. The decrease in roundscad landings in this region, coinciding with the increases in East Sulu Sea and Moro Gulf, may have biological implications.

The traditional grounds of Manila-based trawlers are located northeast of Palawan. These are probably fully exploited, but the potential lies in the demersal resources over hard-bottom, reef areas northwest of Palawan and the virtually untapped trawlable grounds off the west coast of Palawan.

5. North and West Luzon Region

| Species Group | Estimated Potential | Status |
|---|---|---|
| Demersal | 57,000 MT | Fully exploited or overexploited |
| Pelagic | 43,000 MT | Traditional areas fully exploited; possible expansion in deep waters off NW Luzon for tuna |

The region ranked fifth in 1975-1976 then moved to sixth in 1979. The regional catch dropped from 103,700 MT to 42,300 MT, only 4 % of the total. The traditional fishing grounds, in order of importance, are Manila Bay and Lingayen Gulf off the west coast, and Babuyan Channel north of Luzon. Manila Bay is considered fully exploited or probably overexploited.

Buzeta mentioned the prospect of pelagic resources being available in the deeper waters off the northwest coast. In 1980, tuna purse seiners have in fact set up fish-aggregating rafts in that area. Skipjack and yellowfin tuna catches there amounted to only 4,000 MT in 1979 and recent data may indicate further developments. Length measurements may establish connections with the Sulu Sea-Moro Gulf tunas and their migratory patterns. There is also speculation that the adult stock of roundscad may be found in the deep waters off western Luzon, western Palawan, and in the interior Sulu Sea.

6. Pacific Coast Region

| Species Group | Estimated Potential | Status |
|---|---|---|
| Demersal | 78,000 MT | Traditional grounds fully exploited |
| Pelagic | (?) | Possible expansion in offshore areas for tuna |

This region, as well as the West Sulu Sea and Northwest Luzon regions, used to land more fish than the Moro Gulf area, which now occupies the third position among the regions. The Pacific Coast dropped from third in 1975-1976 (171,500 MT) to fourth in 1979 (136,600 MT). Most of the 1979 catch came from the municipal fisheries (69 %) and consisted of pelagic species (70 %). Roundscads, sardines, and anchovies comprised 48 % of the pelagic catch.

San Miguel Bay and Lamon Bay, the traditional fishing grounds in this region, are fully exploited. Shrimp resources in these areas were assessed to have a potential yield of 13,000 MT. But shrimp landings dropped from 11,000 MT to 3,000 MT in 1979, a probable indication of overfishing. The workshop found no evidence of overfishing in other areas (SCSP 1978).

Although foreign vessels have long been fishing the deep waters farther offshore for tuna, expansion of the local fisheries is constrained due to the following: 1) the deep waters are beyond the reach of municipal fishing boats which currently account for most of the tuna catches; 2) the northeast monsoon restricts fishing activities in exposed areas to only six months a year; and 3) undeveloped infrastructure facilities (roads, ports, markets) limit marketing operations.

## 2.6 Socio-Economic Characteristics

### 2.6.1 Fish Consumption

The population of the Philippines has been increasing at an average rate of 3.3 % per year, with a doubling time of 21 years. Along with this growth come, among other things, the problems of increasing food production and providing employment opportunities. In both areas, the fishery industry is perceived by government planners to have an important role.

Filipinos are traditionally a rice-and-fish eating people. Estimates of per capita fish consumption vary. BFAR statistics show an increasing trend over the years, from 19.2 kg in 1960, when population stood at 27 million persons, to 29.8 kg in 1979, at 46 million persons. FAO (1973) gave an estimate of 14.2 kg per capita for 1972, lower than BFAR's figure of 19.2 kg for the same year. On the other hand, the Special Studies Division of the Ministry of Agriculture conducted food consumption surveys in 1970 and 1976, involving 1,000 families all over the country, and found that per capita consumption of fish decreased from 37.6 kg in 1970 to 25.1 kg in 1976 (FIDC 1980a). Outside of cereals, fish ranked next only to fresh fruit in terms of consumption, but was higher than that of fresh vegetables, pork, dairy, beef, carabeef, poultry meat, and eggs.

FAO (1973) also estimates that fish in the Filipino diet accounts for 54 % of his total animal protein intake. Despite this high level of fish consumption, the Philippines has not been self-sufficient in fish on the basis of the per capita requirement established by the Food and Nutrition Research Center. The share of fish in the required nutritional basket, varying from 26.97 kg to 36.50 kg per capita from 1960 to 1979, is higher than the amount actually consumed. Even though fish production has been increasing at an average of nearly 6 % per year (against a population growth rate of 3.3 %) and canned fish products are still being imported, a nutritional shortfall still exists. This situation is one reason government planners give a high priority to fisheries development.

### 2.6.2 Employment

According to the National Census and Statistics Office (NCSO), the country's total labor force increased from 13,417,000 in 1972 to 16,245,000 in 1976. As of 1976, unemployed persons made up 5 % of the labor force. The same office includes fisheries in the agriculture, fishery, and forestry industry sector, which altogether absorbs more than 50 % of the total number of employed persons (FIDC 1979a).

BFAR keeps a yearly record of the number of licensed commercial fishermen, but historical data on municipal fishermen are fragmentary. The number of fishpond caretakers/operators is derived from an average employment rate of one person per hectare of pond. Based on these estimates, the total number of persons engaged in fishing and fishpond production in 1976 was about 720,000, equivalent to 4.4 % of the country's labor force that year. The Fisheries Decree of 1975 cites an estimate of 2.2 million people dependent on the fishery industry as a whole, including production, marketing, processing, net making, boat building, and other related activities.

The number of licensed commercial fishermen peaked at 52,470 in 1974, then decreased to 42,145 in 1979. Municipal fishermen, by BFAR's estimation, numbered more than 500,000 in 1976. A lower figure was obtained from a 1977 inventory of fishery units conducted by an interagency group coordinated by FIDC. This census, considered more reliable, counted a total of 365,388 municipal fishermen from 285,120 fishing households, for an average of 1.3 fishermen per household (FIDC 1980a). Lake fishermen in Laguna de Bay have decreased in recent years, from about 10,000 in 1968 (LLDA 1978) to 5,126 in 1978 (Mercene 1980). Even if evidence of decreasing employment in fisheries is not clearly established, biological constraints to fish production will limit the number of people that the industry can support.

### 2.6.3 Domestic Marketing

Sorting, icing, and stacking of catch in tubs or trays are done on board commercial vessels. Manila-based fishing fleets, provided, with radio communications, are in constant contact with their home base to keep track of market conditions and to report the catch situation in the fishing ground. Fish carriers are called in once the fish hold is close to full capacity; the carriers then replenish the catcher boats with ice and supplies, and transport the catch to the landing points. BFAR lists 76 commercial fishing ports distributed in the 13 administrative regions. Municipal fishermen land their catch on some of these ports, but most unload on open beaches along some 10,000 fishing villages scattered all over the country.

Of the landing sites, only the Navotas Fishing Port and Fish Market is considered modern in terms of facilities and services. The 67-hectare complex in the northeastern section of Manila Bay was constructed with foreign funding assistance in 1973 on what used to be a fish landing beach at a cost of P88 million (FIDC 1980b, 1981a). Harbor and market operations started in 1977, and today the port serves some 350 commercial fishing vessels, unloading an average of 521 MT per day. On a yearly basis, the port absorbs about 40 % of the total commercial landings in the country.

Starting at the landing site, the distribution channels follow the usual marketing chain of middlemen, wholesalers, and retailers. Some practices are perhaps unique to the Philippines. One is the "suki" relationships, "a system of patronage," among the various marketing participants (Jocano and Veloro 1976, in Smith et al. 1980). The relationship comes in various forms, extending backwards and forward along the chain, with mutual benefits to the parties involved. For example, a broker develops and maintains "suki" ties with fishermen-suppliers by selling the catch promptly at as high a price as possible, which then assures him of a steady supply from the fishermen. Similarly, the broker establishes ties with regular vendor-retailers, who are also guaranteed a dependable supply from the broker if they prove their reliability in repayment.

The middlemen (brokers, corporations, contractors, consignees, and agents) dominate the distribution of fresh fish in the country. In some places, the middlemen are bypassed, the fishermen selling their catch directly to wholesalers. Where middlemen and wholesalers deal only in large volumes, municipal fishermen dispose of their catch to retailers or have their wives do the selling. According to FIDC (1980b), middlemen perform diverse functions in domestic marketing, such as granting credit to boat owners, acting as agents for fishermen in bidding and selling, transporting fish for contractors, and acting as buying agents negotiating credit terms with fishermen.

There are 10 major fish marketing centers in the country: Navotas and Divisoria in the Greater Manila area; Baguio City in

Northern Luzon; Dagupan City in Central Luzon; San Pablo City in Southern Tagalog; Iloilo City, Bacolod, and Cebu City in the Visayas; and Davao City and Zamboanga City in Mindanao (FIDC 1980b). Fish flow from these centers to other inland markets.

In many wholesale markets, particularly in Navotas and Divisoria, auctioning is done by "whisper or secret oral bidding." Buyers whisper their bids to the broker, who decides on who is the highest bidder. The "suki" relationship, however, is an important consideration in this system (Smith et al. 1980). In other provinces, markets practice an open auctioning system.

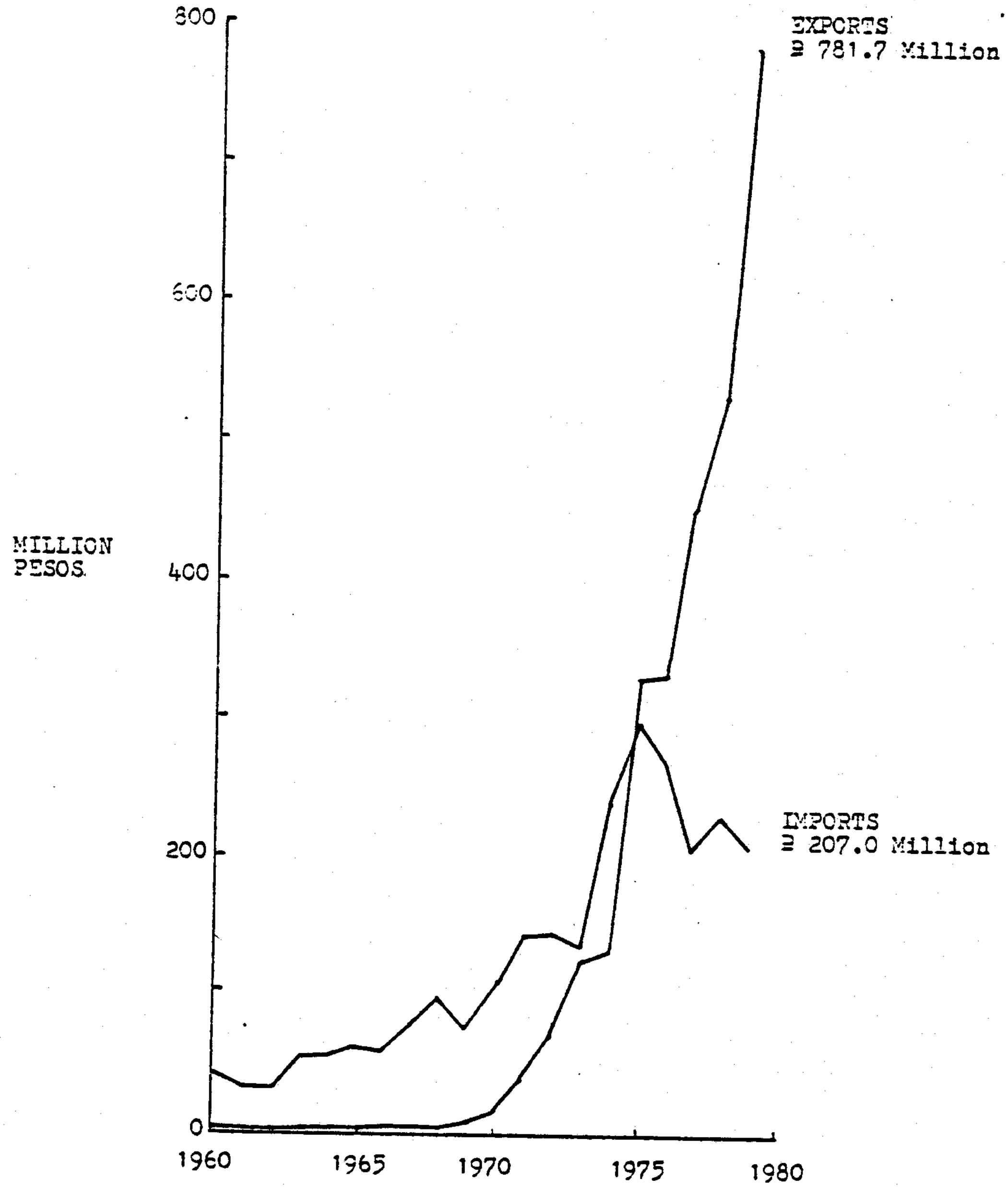
The secret nature of the bidding process poses several problems in making an economic analysis of the fisheries system. FIDC (1980b), citing a study by Agro-Tech Consultants, singled out the lack of market knowledge as the major defect of this auction system, which results in 1) undue control over supply and prices by the few brokers dominating the market; 2) selling prices that are not truly reflective of the demand and supply situation, often higher than what should otherwise be; 3) unverifiable computations of incomes to producers and others dependent on value of sales; 4) inability of the government to collect its due share of taxes due to lack of an official recording system; and 5) difficulty in getting market statistics which, in the long run, may be used for the benefit of the market participants themselves.

A workshop on fish marketing management in 1979 described the present system as being dispersed, inefficient, and uncoordinated: the catch from municipal fishing villages is seldom collected to a volume that can provide economies of scale; fish products are not optimally utilized since surplus at certain periods and places does not reach consumption centers; marketing costs are high due to several middleman stages; and "fish deficits" exist in inland areas of Northern Luzon and Central Mindanao (FIDC 1980b). These perceived weaknesses are largely attributed to inadequate marketing, storage, and transportation facilities, a deficient road network, and unsound designation of unloading points. The government, therefore, places a high priority on the development of fish marketing and port infrastructure.

### 2.6.4 Foreign Trade

The Philippine foreign trading in fish and fishery products has been favorable to the nation since 1975. Export has been growing at a faster rate than import up to that year, and while export continued to increase thereafter, import exhibited a downtrend (Figure 14). In 1975, the volume of import products (86,910 MT) was higher than that of export products (25,988 MT). But the value of exports amounted to P328 million, compared to imports valued at P295 million, indicating that the country has been exporting higher-priced items. It was not until 1978 that both value and volume of exports exceeded those of imports.

Figure 14. Foreign trade of fishery products, 1960-1979




Source: Fisheries Statistics of the Philippines
BFAR (1979)

Table 9. Imports of Fishery Products in Million Pesos, 1979

| Products | ₱ M | % |
|---|---|---|
| Canned | 142.6 | 68.9 |
| Fish Meal | 61.5 | 29.7 |
| Fresh | 1.5 | 0.7 |
| Salted, Dried, Smoked, etc. | 1.4 | 0.7 |
| Total | 207.0 | 100.0 |

Source: Fisheries Statistics of the Philippines
BFAR (1979)

Table 10. Exports of Fishery Products in Million Pesos, 1979

| Products | ₱ M | % |
|---|---|---|
| Shrimp (frozen/chilled) | 264.5 | 33.8 |
| Tuna (frozen/chilled) | 234.9 | 30.0 |
| Shells and By-Products | 108.3 | 13.9 |
| Seaweeds (dried) | 57.1 | 7.3 |
| Aquarium Fish (live) | 20.4 | 2.6 |
| Squid/Cuttlefish (frozen/chilled) | 16.1 | 2.1 |
| Shark and By-Products | 5.7 | 0.7 |
| Sea Cucumber (dried) | 4.9 | 0.6 |
| Milkfish (frozen/chilled) | 4.5 | 0.6 |
| Scallops (frozen/chilled) | 3.0 | 0.4 |
| Other Products | 62.3 | 8.0 |
| Total | 781.7 | 100.0 |

Source: Fisheries Statistics of the Philippines
BFAR (1979)

According to the NCSO foreign trade statistics, fresh and frozen fish ranked second to bananas among non-traditional, unmanufactured export products for the period 1970-1976 (FIDC 1979a). Fishery products have thus become an important foreign exchange earner. In 1979, the proceeds from fishery exports of P782 million were more than enough to offset the import bill of P207 million.

Canned products accounted for almost 70 % of total value of imports in 1979, but these items have been decreasing since 1975. Japan is the chief source of canned fish, mostly sardines and mackerels. Fish meal from Peru, Thailand, and Chile comprised nearly 30 % of the total value of imports. Fresh, salted, dried, smoked, and other processed products made up the rest of the imports (Table 9).

Prior to the 1970s, shells and shellcraft articles were the main export products. The emergence of tuna, shrimp, seaweeds, and other non-traditional products was responsible for the phenomenal rise in exports during the last decade. In 1979, 85 % of the total value of exports came from frozen or chilled shrimp and tuna, shell by-products, and dried Eucheuma seaweeds (Table 10). Exports of live aquarium fish, frozen milkfish, squid and cuttlefish, Asian moon scallops, dried sea cucumber, and shark by-products have been increasing in recent years.

Japan has displaced the United States as the biggest importer of Philippine fishery products. Exports to Japan amounted to P339.7 million (43.4 % of the total in 1979), while exports to the U.S. amounted to P291.9 million (37.3%). Most of the shrimp, squid, scallop, and shark products went to the Japanese market. The U.S. is still the biggest importer of tuna, followed by Italy and Japan, as well as of ornamental shells and shellcraft, dried seaweeds, aquarium fish, and milkfish (for the large Filipino communities in the U.S., especially in Hawaii). The leading importers of dried sea cucumber are Hong Kong, Singapore, Japan, and Taiwan. Philippine fishery products have also entered into non-traditional markets, such as West Germany, France, Spain, Norway, Denmark, Sweden, Canada, and Korea.

The growth of fishery exports has been encouraging, and the government is pushing fish production not only as a source of food but also of foreign exchange earnings. Further expansion is expected through product development, better quality control, improved fish handling technology, and intensive aquaculture of exportable species (FIDC 1979b). Socio-economic considerations call for increasing participation of small fishermen in supplying exportable fishery products. Most of the high-valued items, such as tuna, squid, aquarium fish, crab, sea cucumber, and seaweeds, are caught or gathered by municipal fishermen.

Planners view the introduction of more efficient capture technology as an assurance of a steady supply of export products. With increasing worldwide demand and high prices for fishery products providing the incentive for greater production, development planning efforts need to weigh the potential benefits from export expansion within a broader, long-term fisheries management regime.

### 2.6.5 Economics of Fishing

The few studies on the economics of fishing mostly deal with profitability estimates of various types of gear or fishing operations. San Antonio et al. (1979) prepared a BFAR information handout on the costs and returns of commercial fishing gears, with the net income derived from estimated "probable sales" of catch. De la Cruz and Yutuc (1977, cited in Smith et al. 1980), calculated from a small sample the rates of return of some municipal fishing gears. These economic data are not generally applicable, however, because of seasonal and geographical variabilities in costs, prices, resource availability, and degree of fishing competition.

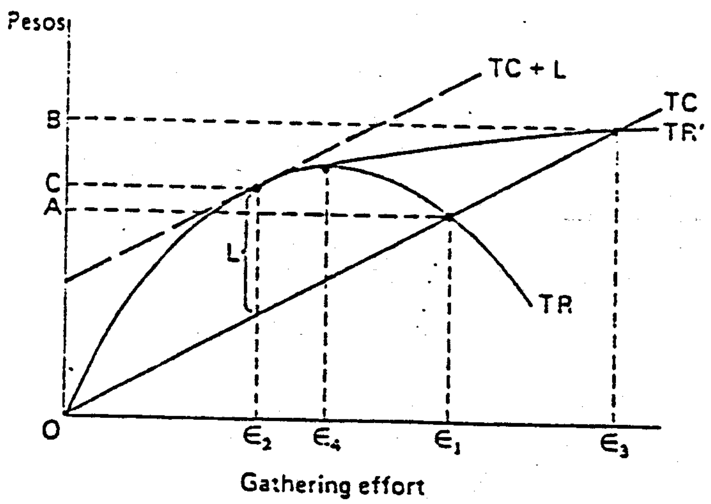
Commercial fishing boat operators have allegedly incurred losses as a result of fuel cost increases. In response to requests for a government fuel subsidy, the FIDC analyzed the business operations of various fishing firms. From the few financial statements made available, the study found "no clear relationship among fish prices, production volumes, and fuel prices," but pointed to old boats and inefficient types of gear as the probable cause of dwindling fishing revenues (FIDC 1980b). Still, no definite conclusion could be made due to "insufficiency of data, unavailability of comparable data over a reasonable time frame, and the difficulty of establishing appropriate lag time." Investigators have to consider as well the changing state of the resource and total capacity of the fishing vessels in determining the causes of business losses in fishing.

In their analysis of the Philippine milkfish resource system, covering the fry fishery, aquaculture, and marketing, Chong et al. (1982) evaluated the economics of the concession arrangement in fry gathering. Coastal municipalities are authorized by law to award concessions to a fry ground zone for one to three years through public bidding. The municipality as "owner" of the resource receives as income the concession license fee from the highest bidder. A concessionaire has the exclusive right to purchase fry gathered from his zone where, thus, a local monopsony exists. However, access to the fry resource is unrestricted as long as the gatherers sell their catch to the concessionaire.

Since the prospective concessionaire takes into account the historical catch and returns from the fry ground, as well as the risks involved, Chong et al. concluded: "In the long run, therefore, competitive bidding for the fry concession should result in the municipality receiving the full amount of the resource rent and with gatherers and concessionaires receiving the full amount of their opportunity cost."

Figure 15 shows the model used by the authors to support their conclusion. Two cases are depicted: 1) biological overfishing is possible, represented by the total revenue curve TR; and 2) biological overfishing is not possible, represented by the total revenue curve TR'.

Figure 15. Milkfish fry fishery economics model




Hypothetical Relationship between Gathering Effort (E), Total Revenue (TR or TR'), and Total Cost (TC), with and without Concession Licence Fee (L). The total revenue curve, TR, assumes biological overfishing can occur with increased gathering effort. The other total revenue curve, TR', assumes biological overfishing cannot occur within the relevant range of gathering effort where TC <TR'.

Source: Reproduced from Chong et al. (1982).

In an open-access fishery, gathering effort would tend to increase to $E_1$ in the first case and to $E_3$ in the second case. At these levels, the total cost (TC) equals the total revenue (TR or TR') and all rent or profit from the resource is dissipated. The concession license fee (L) increases the total cost to the line, TC + L, which will be tangential to the TR curve. Because prospective concessionaires, with their knowledge of historical returns and costs, would be willing to bid just high enough, their expected returns would cover all their costs, including opportunity cost and the concession fee. Hence, in the long run, the municipality should be able to extract the maximum rent or concession fee, which is equal to the maximum difference between TC and TR or TR'.

Optimum allocation of resources is attained at effort $E_2$. According to Chong et al., effort is reduced to this level through the pricing mechanism. To recover the concession fee, the concessionaire has to pay the gatherers at a price lower than that which they would receive under open-access equilibrium. (The monopsonist is able to indirectly pass the "tax," i.e. concession fee, to the gatherers by lowering prices because he is a price-taker when selling fry and cannot pass this cost forward to his buyers.) Effort is reduced as gatherers whose individual opportunity cost is higher leave fry gathering for other activities, and those whose opportunity cost is equal or less than the return from fry gathering remain. The concession arrangement thus results in economic efficiency.

There are no empirical data to support the hypothesis of Chong et al. regarding either case of cost-revenue-effort relationship since time-series data are not available. Even then, the authors believe the second case of increasing sustainable yield and total revenue curves is more probable, not only because catching of adult milkfish is prohibited, but also because a spawner in its lifetime produces 15 million eggs, only two of which are needed to maintain the adult stock.

The analysis indicated alternative management approaches. If the goal is maximizing employment instead of economic efficiency, the municipality can control effort at $E_4$ in the case where biological overfishing is possible. At this level, the sustainable yield and total revenue are maximized, while at the same time overfishing is avoided. In the second case, the number of fry gatherers is maximized at $E_3$, the open-access equilibrium. Municipalities concerned with redistributing the benefits from the resource may encourage fry gateherers to bid collectively for the concession. Gatherers may increase their share of the resource rent if they either control effort or act as concessionaires themselves. In the Western Visayas, a gatherers' cooperative has been granted concession rights at a reduced rate.

2.6.6 Socio-Economic Analysis

The concern for low-income municipal fishing communities motivated a series of socio-economic studies starting in the early 1970s. Smith et al. (1980) compiled and analyzed comparable data from the community surveys made by Baum and Maynard (1976a,b,c,d,e), Gagni and Luna (1978), Rubio et al. (1978), and Herrin et al. (1978). Table 11 summarizes the results of the analysis, which, although involving only a relatively small sample from the estimated 10,000 fishing villages in the country, provides important socio-economic indicators of municipal fishing households for guiding fisheries research, development, and management programs.

The studies reflect the general poverty of municipal fishing households: with an average per capita income of P725 per year and an average household of 6.3 members, the annual household income would amount to nearly P4,570 in 1978. A 1974 social indicators project (Abrera 1976) established the poverty threshold for a 6-member household to be P7,738 ("the barest minimum by which subsistence can be theoretically achieved"), which when adjusted for inflation would be P10,621 in 1978. The annual income of an average fishing household would thus be approximately one-half below the poverty line, placing municipal fishermen among "the poorest of the poor" in Philippine society.

The survey results suggest the reasons for these low income levels. The average productivity among the respondents is 2.33 MT per fisherman; the national average is even lower, 1.33 MT per fisherman annually. Except for shrimp and tuna caught by some fishermen, the municipal catch consists mainly of low-grade, hence low-priced, species. Income varies depending upon whether

Table 11. Socioeconomic Survey Results from 15 Fishing Communities

(Source: Smith et al. 1980)

| | Total or Weighted Mean |
|---|---|
| **Community and Household Information** | |
| Sample Size (number of respondents) | 509 |
| Average Annual Per Capita Income | ₱725 |
| Average Age of Fisherman-Household Head | 40.5 years |
| Average Education of Fisherman-Household Head | 4.9 years |
| Average Household Size | 6.3 members |
| Average Number of Working Members | 1.8 members |
| % of Households Owning Land | 20.1 % |
| **Fishing Activity** | |
| Full-Time Fishermen (% of total no.) | 65.8 % |
| % of Fishermen Owning Gear | 73.7 % |
| % of Fishermen Owning Boat | 39.8 % |
| Fishing Effort (average no. of trips per year) | 198 trips |
| Average Annual Catch Per Fisherman | 2.33 MT |
| **Fishermen's Attitudes** | |
| % Willing to Change Occupation | 49.5 % |
| % Willing to Change Location | 29.4 % |
| % Belonging to Fishermen's Organizations | 15.2 % |
| % Belonging to Other Organizations | 36.2 % |
| % Believing Personal Living Standard is Same/Worse | 78.1 % |
| % Dissatisfied with Family Condition | 64.6 % |

the gear or boat is owned by the fisherman and whether the boat is motorized or non-motorized. Only 40 % of the fishermen own boats and less than half of the fishing craft are motorized. Many households supplement their income with other activities, but for the very poor, less-educated families, dependence on fishing is great since their opportunity wage is virtually nil.

Another cause for the rising poverty is inflation. Fuel cost more than tripled from 1972 to 1980, evidently decreasing the real income from fishing with gasoline-powered boats. Although retail price for fish also more than tripled within the same period, Smith et al. (1980) believe it is unlikely that prices received by fishermen increased as much. Only 22 % of the respondents felt that they were better off than they were 5 years earlier.

The review sums up the situation: "Only in the rare case does a heavy dependence upon fishing imply abundant resources, a readily accessible market, and consequent above-average income levels for municipal fishermen. In other words, the generally low standards of living of municipal fishermen appear more related to socio-economic (rural development) and biological (resource) constraints than to a lack of access to the resource because of inadequate vessels and gear."

The analysis also suggests policy alternatives. Almost two-thirds (65.8 %) of the fishermen expressed dissatisfaction with their present living conditions. While the better educated among them tend to have higher annual per capita income, with education comes increasing dissatisfaction with their condition. Whereas potential geographic mobility is expectedly low (29.4 %), potential occupational mobility is almost 50 %. According to Smith et al., this willingness to shift from fishing to another occupation has two positive policy implications. First, promoting alternative income-generating activities in rural areas can draw the better-educated fishermen away from fishing. Second, for the younger, less-educated, and poorer fishermen, who are less able to take on a new activity, supplementing, rather than replacing, the fishing activity would be appropriate, i.e. encouraging full-time fishermen to be part-time fishermen.

In a larger context, the impoverished condition of municipal fishermen is part of the nationwide poverty problem in the Philippines. Smith et al. view the rapidly growing rural population and slowing down of rural-to-urban migration as trends to a possible increase in the number of households dependent on fishing. Ultimately, the solution lies within the rural development framework. In the long run, government programs to develop the countrysides can provide employment opportunities in sectors other than fisheries.

## 3.0 FISHERIES ADMINISTRATION

### 3.1 Fishery Agencies

The Philippine government underwent a sweeping reorganization during the 1970s that led to the creation of new agencies and strengthening of old ones. Government agencies involved in fisheries affairs in one way or another have increased, but the highest body with overall jurisdiction is the Ministry of Natural Resources (MNR). Under it are two agencies directly responsible for fisheries administration: the Bureau of Fisheries and Aquatic Resources (BFAR) and the Fishery Industry Development Council (FIDC).

BFAR evolved from the Division of Fisheries established in 1920 within the former Bureau of Science (Mane and Tan 1969). The Division eventually became a Bureau in 1947 under the Department of Agriculture and Commerce. After several changes, the Bureau got its present name in 1974 and placed under the then newly created Department of Natural Resources (now a Ministry), which used to be part of the Department of Agriculture and Natural Resources.

BFAR has a central office in Manila and regional, provincial, and district offices. The units of the BFAR Central Office that have responsibilities related to fisheries management are the Fisheries Research, Economics and Statistics, Conservation and Enforcement, Legal, Training, and Extension Divisions. The Bureau has 7 research and training vessels, but only two of these are in good condition. It also operates demonstration fish farms, hatcheries, and stations in selected sites all over the country.

The responsibilities of BFAR, as the implementing arm for all policies and programs on fish production and conservation, cover not only capture fisheries in both marine and inland waters but also aquaculture. It has the power to issue licenses, permits, and lease agreements to regulate fish capture and culture activities. Because of the growing need for research-based information on the fishery resources, its research and statistics staffs are under strong pressure to improve their research manpower, facilities and management.

The FIDC was created through the Fisheries Decree of 1975 (PD No. 704) to serve as the umbrella organization for fisheries policy formulation and review, interagency planning and project implementation, promotion of a healthy investment climate for fisheries, and mobilization of the private sector into an active partner in fisheries development. Two of its specific functions have direct relevance to fisheries management: to update and monitor the Integrated Fisheries Development Plan (IFDP) and to prepare and coordinate a comprehensive resource assessment program.

The Council is composed of the Minister of Natural Resources as Chairman, the BFAR Director as Executive Officer, and the following as members: the Ministers of Agriculture, National

Defense, Trade, Public Works, Transportation and Communications; the Governor of the Central Bank of the Philippines; the Chairmen of the Development Bank of the Philippines, Philippine National Bank, and Board of Investments; and a representative each from the private inland fisheries associations and marine fisheries associations. Staff support is provided by a Secretariat headed by an Executive Director.

The Council's composition reflects the various needs and aspects of the fishery industry, such as aquaculture development, law enforcement, domestic and foreign trade, infrastructure development, and credit assistance. The involvement of financial institutions is noteworthy because the Council can potentially control the infusion of capital into the industry if necessary. The industry representatives are expected to lead their associations in cooperating and coordinating with government agencies to attain the objectives of the development plan, as well as to implement fishery policies and regulations.

Another agency attached to the MNR is the Natural Resources Management Center (NRMC), its research arm for policy matters. Most of its activities are concentrated at present on forestry policy studies. It has equipment for satellite imagery analysis, using tapes from U.S. remote sensing agencies. With this capability, the NRMC has collaborated with the Bureau of Forest Development in estimating the extent of mangrove areas, and with BFAR and the University of the Philippines (Marine Sciences Center) in assessing the coral cover in Philippine waters. The Center has also worked with FIDC in pooling together fishery experts in a workshop to arrive at a consensus on the potential yield from the country's fishery resources.

Other agencies have the potential capability, either individually or through interagency collaborative research, to conduct more in-depth studies on the various impacts of marine policy options. Among these agencies are the Development Academy of the Philippines (DAP), the Asian Institute of Management (AIM), and the business, economics, sociology, law, and public administration schools or colleges of the University of the Philippines (UP) System. The UP College of Fisheries itself needs to develop its faculty for fisheries economics and management.

A specialized agency for post-harvest activities, the Philippine Fish Marketing Authority (PFMA), was created in 1976 under the MNR. Because of its role in fish distribution, the PFMA was recently transferred to the Ministry of Human Settlements (MHS). Its functions include the development and/or operation of marketing infrastructures (fishing ports and markets), promotion of improved marketing methods, provision of ancillary marketing services (price information, market intelligence), and preparation and implementation of fishing ports and market programs. The agency is currently managing the Navotas Fishing Port and Fish Market and monitoring fish prices in major market centers.

Another MHS-attached agency is the National Environmental Protection Council (NEPC), also created in the mid-1970s. Its potential role in fisheries administration lies in its task of requiring government and private organizations to undertake environmental impact analyses of proposed development projects prior to implementation. The Council staff has prepared the operational guidelines, time-frame, and flow chart for processing and approval of impact studies. This process resembles the one followed in the U.S.; its possible application in fisheries management planning activities should be explored.

### 3.2 Research Management System

One of the earliest government reforms during the 1970s was the development of a national research system in agriculture and natural resources. This responsibility was assigned to the Philippine Council for Agricultural Research, created in 1972 by Presidential Decree No. 48 and recently renamed Philippine Council for Agriculture and Resources Research and Development (PCARRD). Supported by a full-time Secretariat, this Council serves as the central authority for systematically coordinating all government manpower, facilities, and funds for research in crops, livestock, forestry, fisheries, and mining. PCARRD is attached to the National Science and Technology Authority (NSTA), the ministerial body for science development.

PCARRD's mandate gives it the power to review all research proposals and to recommend these to the Ministry of the Budget for funding. Thus, only those proposals recommended by PCARRD are eligible for government funding. With this authority, the Council steers the direction of research in the country, ensuring that the limited funds are spent for priority research projects. PCARRD has identified research centers and stations to form a national research network, strengthened by infrastructure development and scholarship programs largely funded by a loan from the U.S. Government.

The formulation, review, and evaluation of research programs, projects, and proposals are done by National Commodity Teams. A team is assigned to each of the three fisheries research commodities: Marine Fisheries, Aquaculture, and Inland Waters. Each composed of a Team Leader, specialists in relevant disciplines, and at least one industry representative, these teams work with the PCARRD Fisheries Research Division on an "on-call" basis following the annual review schedule.

In setting the general thrusts for fisheries research, the commodity teams are guided by the goals defined in the national development plan and the action program drawn by the Ministry of Natural Resources. The national research programs for the fisheries commodities were first formulated in 1973 and periodically updated since then. Each program consists of research areas which are broad enough to accommodate basic and applied research projects or studies needed to pursue the research thrusts. These areas are ranked according to priority, based on the needs of the industry and consumers, state of knowledge, and availability of manpower and facilities.

In Marine Fisheries and Inland Waters, high priority is given to resource-oriented research: stock assessment, biological studies, and environmental research. The Aquaculture research program is similar to the agriculture program in that studies are mostly experimental and involve such areas as seed production technology, culture management systems, disease control, and aquaculture engineering. To focus more attention on specific fisheries commodities or resources, the three major research groupings were subdivided in late 1980. Research programs were again drawn up for each of the sub-commodities, and implementing agencies assigned to definite research areas according to their present capabilities. The priority commodities are listed in Table 12.

To complete the research cycle, PCARRD has an outreach program for verifying newly developed technologies in specific sites and for disseminating research results. The private sector participates in PCARRD-sponsored workshops and other forums to evaluate research findings and identify research problems. The Fisheries Research Division also maintains linkages with the three international fisheries organizations based in the Philippines: the Southeast Asian Fisheries Development Center (SEAFDEC) Aquaculture Department, the UNDP/FAO South China Sea Fisheries Development and Coordinating Programme (SCSP), and the International Center for Living Aquatic Resources Management (ICLARM).

During its ten years of operation, the research management system has undergone both in-house and external evaluation to

Table 12. Priority Commodities for Fisheries Research

(Source: PCARR 1981a)

Marine Fisheries

1. Tuna
2. Shrimps
3. Seaweeds
4. Pelagic Fish
5. Demersal Fish
6. Invertebrates
7. Coral Reef

Aquaculture

1. Fish
   1.1 Milkfish
   1.2 Tilapia
   1.3 Mullet
   1.4 Carp
   1.5 Other Species (siganids, catfish, sea bass, groupers, eel, mudfish etc.)
2. Crustaceans
   2.1 Prawn
   2.2 *Macrobrachium*
3. Molluscs
   3.1 Mussels and Oysters
4. Seaweeds
   4.1 *Eucheuma*, *Gracilaria*, *Caulerpa*, etc.

Inland Waters

1. Lakes
   1.1 Luzon Lakes
   1.2 Visayas Lakes
   1.3 Mindanao Lakes
2. Reservoirs
3. Mangrove Swamps
4. Freshwater Swamps
5. Estuarine Areas and Rivers

pinpoint weaknesses and recommend improvements. In fisheries, inadequacy in research manpower and facilities is still the main drawback. Research funding for fisheries is roughly equivalent to only one-fourth of one percent of the total value of fish production in the country. About half of the fisheries research budget goes to marine fisheries research, which is inherently more expensive to undertake (PCARR 1981a). However, because of the emphasis on production technology development in aquaculture research, the return on research investment in this sector is potentially higher than in the other research areas. Increasing aquaculture productivity is part of the government's strategy to make up for the anticipated slowing down in production from the capture fisheries.

PCARRD is not directly involved in the formulation of fisheries policy, which is the responsibility of MNR and its agencies. The research system, however, can be responsive to the needs of policy makers in identifying and supporting pertinent studies, and thus indirectly help shape policies. Delivery of research information through seminars and publications has been institutionalized to avail decision makers of possible inputs from the research community.

Despite the periodic process of problem identification, several research gaps exist in the program, mainly due to manpower deficiency. But, where capabilities are present, agency initiative is found wanting. A system of awarding research honoraria through grants-in-aid programs has encouraged some researchers. Still, established research centers have to improve on their respective research management systems in terms of setting priorities, budget preparation, and scheduling of operations. Management at the station level becomes crucial as research facilities develop and research manpower improve through PCARRD's support programs.

### 3.3 Fishery Policies and Objectives

Two major laws promulgated in the 1970s spell out the general policies on fisheries development and management in the Philippines. The first is Presidential Decree No. 704, known as the Fisheries Decree of 1975, which either revised or consolidated existing laws and decrees. This decree updates the Fisheries Act (Act 4003) which itself evolved from laws dating back to 1932. The second is PD No. 1599, signed in 1978, establishing the exclusive economic zone (EEZ) of the Philippines. These two decrees indicate the growing importance of fisheries in national development.

The Fisheries Decree of 1975 declares it a state policy "to accelerate and promote the integrated development of the fishery industry and to keep the fishery resources of the country in optimum productive condition through proper conservation and protection." In pursuing this policy, the government shall provide assistance to the industry, which the decree proclaims a "preferred area of investment," and shall encourage the exportation of fish and fishery products. The decree also states the basic concept of partnership between the public and private sectors in the conservation and development of the fishery resources. Active participation of the private sector in fisheries management is, therefore, a responsibility that goes with the privilege granted by the state to utilize the resources.

The above policy is translated into the following general objectives to guide fisheries development planning (FIDC 1981b):

1. To increase fish production efforts and efficiency not only to a level of self-sufficiency but also towards surplus.

2. To upgrade product quality and manage fish supply towards optimum seasonal and geographical distribution.

3. To uplift the livelihood of rural families.

4. To improve foreign exchange position through export expansion and by enhancing domestic capabilities for import substitution.

5. To attain and sustain optimum yield from fishery resources through balanced utilization and conservation.

6. To maximize participation of local fishing industry in the development of fishery resources.

7. To enhance the partnership between government and industry in the exploitation and conservation of fishery resources.

The MNR admits that these objectives "cannot becomme mutually compatible nor can all of them be attained simultaneously. There could be conflicts between satisfying domestic demand and accelerating exports; between increased production and resource conservation; between maintaining stable domestic prices in a situation of cost-push and international demand-pull pressures; between the economics of scale of large operations and the need to uplift the small fishermen; between short-term objectives and long-run goals" (Aguenza 1980). These conflicts, the Ministry believes, can only be resolved through effective management, which calls for "determining your variables and their interrelationships, transforming these variables into definable quantities, and taking action on the basis of maximum net benefit." With administrators aware of the complex task before them, the continuing planning effort should result in more government intervention in fisheries matters during this decade.

The declaration of an EEZ necessitated the definition of the country's position relating to sovereign rights, levels of jurisdiction, and responsibilities over these waters. Significantly, the potential impact of the EEZ has heightened the need for firming up national policies on fisheries management not only within the zone but also within the territorial waters.

Although the country's fishing fleet still has to fully exploit many areas of the waters under state jurisdiction, planners appreciate the potential value of the fishery resources within the extended maritime zone as worldwide EEZ declarations curtail the distant-water fishing operations of other countries. Thus, the general policies that have been proposed on foreign participation in fisheries aim to derive economic benefits as well as protect local interests.

The underlying policy is two-fold (FIDC 1981b). First, "foreign interests will be encouraged to engage in joint venture activities as a preferred undertaking to licensing of foreign fishing vessels." Second, applications from foreign fishing firms to operate with 100 % foreign equity shall be evaluated on a case-to-case basis, considering diplomatic, economic, political, and research considerations. In formulating country-specific policies, the Ministry of Foreign Affairs shall be consulted.

The most common joint venture arrangement to be promoted is one in which ownership is divided between a government or private firm and a foreign firm. The FIDC staff has listed the following local inadequacies, ranked according to priority, that a proposed joint venture should address: 1) capital and equipment; 2) resource data base; 3) processing and shore facilities; 4) gear technology other than those for tuna; 5) employment and training of local crew; and 6) export markets for species other than tuna.

Where fishing vessels are involved, these shall be subject to the same requirements and regulations as local vessels. However, joint venture vessels cannot operate in areas sufficiently exploited by local fishermen. Transhipment at sea is prohibited; they should touch port to land or report their catch. A fishery technician should be allowed on board, and catch-effort data regularly reported in a prescribed form. Furthermore, a vessel has to serve as marketing outlets in areas where joint venture operations are prohibited, by buying at least 10 % of its landed volume from small fishermen at current market prices. This requirement is designed to ensure that greater benefit would accrue to municipal fishermen engaged in tuna fishing.

Similar policies are proposed by the FIDC staff for foreign companies that are granted fishing privileges. Licensing of foreign vessels may be allowed in designated areas outside the traditional fishing grounds, provided that arrangements are made to benefit municipal fishermen, e.g. foreign vessels purchasing the catch from a fleet of small boats engaged in tuna handlining. The catch has to be exported either in canned form or, in the case of tuna, in fresh state of sashimi-grade quality, to minimize competition with local firms exporting frozen fish.

Regarding foreign participation in experimental or exploratory fishing, the proposed policies are as follows: 1) such activities can only be conducted jointly with national research or educational agencies, based on an operation plan mutually agreed upon and only in non-traditional fishing areas, for testing gears or methods not presently used commercially by the local industry; 2) disposition of catch should be under government supervision; and 3) catch and effort data have to be regularly reported in a prescribed form.

These proposed policies, drafted by the FIDC Secretariat, still await official sanction from the MNR before they can be implemented.

## 3.4 Development Plans and Programs

### 3.4.1 Integrated Development Plan

Upon its creation, the FIDC embarked on the preparation of an Integrated Fisheries Development Plan (IFDP), with the following major components: 1) production; 2) marketing; 3) credit; 4) education; and 5) research and statistics. Shortly after the plan was completed in 1976, the President ordered the participation of 16 government agencies to implement it. The IFDP incorporated the Expanded Fish Production Program, which includes a Fisheries Extension Program, earlier developed by BFAR. The plan was updated in 1977 and is subject to periodic reviews.

The government's support services for the fishery industry are in response to the growing needs of a developing country for food, employment opportunities, and foreign exchange earnings. The general objectives of the IFDP therefore reflect the policies and goals mentioned in the previous section, with the main thrusts directed on increasing fish production for domestic consumption and export, and on improving marketing and distribution. As in the stated policies, the plan aims to maintain the fishery resources in optimum productive condition; new production units are to be added only if necessary and "found consistent with ecological balance." At present, however, entry into the fisheries is open, except for closures in certain areas.

The integrated approach to fisheries development is increasingly being adopted in area-specific programs. A package of support services is extended to improve production, marketing, processing, preservation, credit delivery, and cooperative formation. The first of such plans to reach initial implementation stage is the ADB-funded comprehensive fisheries development plan for Northern Palawan. Fishing is the predominant livelihood in this area which is believed to have still abundant fishery resources.

Other similar undertakings are in various phases of planning: the ADB-assisted project in the Bohol-Cebu area, with potentials for tuna and demersal fisheries development; the MNR-IBRD small-scale fisheries development project in the Bicol-Samar-Masbate areas, close to major fishing grounds of Samar Sea, Visayan Sea, and Ticao Pass; the Cogtong Bay (Bohol) fishery industry complex development project and the Marinduque ice plant-cold storage project, both supported by the National Council for Integrated Area Development (NACIAD); and the SCSP-assisted project in Tawi-Tawi, Sulu Archipelago (Chavoso 1980).

### 3.4.2 Financing Programs

Even before the integrated plan was conceived, a number of government financial institutions have been granting loans for various fisheries projects. Credit assistance for either capital acquisition (vessels, engines, gear, etc.) or operating and rehabilitation costs is being provided by the Central Bank of the Philippines (CBP) through the rural banks, the Development Bank of the Philippines (DBP), the Philippine National Bank (PNB), the Agricultural Credit Administration (ACA), and the Land Bank of the Philippines (LBP). Altogether the loans granted to fisheries from 1968 to 1978 amounted to nearly P2.5 billion, of which P1.8 billion were for production purposes and the rest for marketing and processing projects (FIDC 1979b). The average annual growth rate of total borrowings during the period was 15.9 %. Loans for municipal fisheries alone totalled more than P342 million as of 1978 (Smith et al. 1980).

Low repayment rates have been the common drawback of credit programs for small fishermen. For example, the DBP Small Foreshore and River Fishermen Program, which extended P279 million in loans to 70,828 fishermen, has been suspended indefinitely because of the huge amount of arrears: less than 1 % of the borrowers were paying regularly (Smith et al. 1980). The very low catch rates, particularly in Luzon where many areas are overfished, have made repayment impossible. There are other factors contributing to this failure: inadequate supervision, ineffective repayment design, poor marketing facilities, inherently high risk involved in capture fisheries, and high administrative costs of extending so many small loans (FIDC 1979b).

From a fisheries management perspective, credit programs have to be planned with caution. As the ACMRR Working Party (1980) admonishes, "Investment planners must cooperate closely with those looking at the resources [because] the effect of investments leads easily to excess investment and overcapacity ... Unless these investments are matched to the resources and their current state of exploitation, the impact on the fisheries as a whole could be disastrous, even in cases when measured by narrow criteria (e.g., the internal rate of return) the investments appear successful."

Aware of the problems that marked the then existing credit programs, the FIDC Technical Committee on Credit designed a new credit program, named "Biyayang Dagat," which adopted the successful features of the ongoing rice production ("Masagana 99") credit program. The concept began taking form after the President pledged during the national convention of fishing associations in 1977 to "give fisheries the same attention that government had heretofore given to rice." The following year, before the FAO Indo-Pacific Fisheries Commission meeting in Manila, he announced that a credit program similar to Masagana 99 shall "be put in effect in favor of small fishermen in the Philippines" (FIDC 1979b).

Launched in August 1979, the program initially identified priority target areas, but the coverage soon expanded nationwide when the President directed the release of P850 million to the program (FIDC 1980a). Spread over a 5-year period, the amount is projected to produce an increment of 251,000 metric tons. After nine months of implementation, P10.87 million have been loaned out to 831 fishermen (Perez, M. 1980).

The new program aims to overcome previous shortcomings through an area-specific approach, institutional support and coordination, and cooperative-based borrowing. Specific areas shall be selected based on resource availability, existence of cooperatives, and market accessibility, among other criteria. BFAR shall recommend suitable projects for each area, provide extension workers to supervise the projects, and assist in evaluating loan applications and collecting payments. Other agencies involved are the PFMA, for marketing; the Ministry of Local Government and Community Development (MLGCD), for organization of cooperatives; and the DBP, PNB, CB-rural banks, and other financial institutions, for granting loans.

Eligible borrowers are fishermen's cooperatives, "Samahang Nayon" pre-cooperatives, and their members. An individual member-borrower must have the cooperative as co-guarantor, while a cooperative-borrower has to meet the bank's debt-equity ratio requirement. In both cases, the financed asset is held under chattel mortgage by the bank. A member-borrower must deposit daily amortization to the cooperative, which has the right to take over the fishing unit if amortization is not met. Cooperatives will also be responsible for marketing the produce where an area marketing cooperative does not exist.

Despite these well-conceived strategies, the program has had its share of criticisms, particularly on the heavy responsibilities placed on BFAR, the prominent role of cooperatives, and the choice of target areas (Smith et al. 1980). BFAR had 145 marine fisheries extension workers employed in 1978, 90 % of which were assigned to municipal fisheries. For such a nationwide program, the need may not only be to maximize their services but also to increase their number. The cooperative's marketing role is meant to eliminate dependence of municipal fishermen on middlemen, but this approach also "indicates considerable faith in an organizational concept (coops) that has been unfortunately known more for its failures than its successes, both in the Philippines and elsewhere in the world." Curiously, many of the target provinces have fishing grounds identified by BFAR as overfished. But these areas, particularly in Luzon and Eastern Visayas, are economically depressed as well, and were perhaps selected for political reasons.

Field observations after less than a year of implementation confirm the shortage in manpower for supervising the borrowers and the "extreme difficulty" of organizing fishermen's cooperatives (Perez, M. 1980). In addition, the pace of credit delivery has been slow: some rural banks were reluctant to participate in the "non-collateralized" program, because of the widespread credit misuse (e.g., reselling of financed boats or equipment) in similar programs in the past. Yet, optimism pervades among program planners and implementors. Initial successes have been reported, mostly in still productive grounds where fishermen were able to increase their catch and make payments regularly. Adjustments in the program are being made to deal with localized situations.

### 3.4.3 Formation of Fishermen's Organizations

For the past decade the government has been helping municipal fishermen form organizations to raise their standard of living. A joint MLGCD-BFAR program promotes the formation of pre-cooperatives ("Samahang Nayon") for fishermen, which may eventually evolve into full-fledged cooperatives if certain capital requirements are met. Essentially the same scheme is being applied to small farmers.

A pre-cooperative is supposed to enable municipal fishermen to increase their catch and income by obtaining services and goods through their own capital or borrowings. This stage alone is beset by the usual inadequacies in government assistance and marketing facilities. Although BFAR has reportedly organized 610 Samahang Nayons as of 1978, their status has not been documented; the MLGCD has recorded only 8 fishermen's cooperatives in the country, again indicating the difficulty of implementing this program (Smith et al. 1980). Repeated failures in this effort tend to raise suspicions among fishermen, making further attempts to organize them more unlikely to succeed.

A different, and more ambitious, approach is being used in the Fishery Resources Management Program (FIRM), being implemented by the Development Academy of the Philippines (DAP), in cooperation with MNR and BFAR. Instead of forming cooperatives, the program organizes municipal fishermen into associations that would operate like corporations. The aim is to transform these fishermen into commercial fishermen through joint ownership of larger vessels and optimum use of human resources. Training workshops are held to develop technical, business management, human relations, and communications skills among the association's officers and members.

The 3-phased program starts with the "Human Resources Development" stage, under which a total of 3,843 fishermen have been trained as of 1978. The second phase consists of a "Short-Term Innovation Package" (STIP), designed to improve fishing gear and methods, marketing practices and facilities. Of the existing 71 associations, 23 have moved into this phase, only 14 of which have registered positive net income. In the last phase, a "Long-Term Innovation Package" (LTIP) enables the association to acquire commercial fishing vessels and gears, fish processing plants, cold storage, and other marketing facilities. Four associations have reached this capital-intensive stage: two are fishing with ring nets, one with a tuna drift gill net, and the other with a commercial bag net (Smith et al. 1980).

FIRM organizers admit the slow progress of the program which they attribute to the difficulty in securing collateral-free loans from the rural banks. A low repayment rate on the loans is also a problem. The strong political will behind the new credit program ("Biyayang Dagat") may circumvent all these shortcomings, but deeper still, as Smith et al. (1980) suggest, planners need to address the causes of failures and successes of fishermen's organizations in the Philippines.

In Rhode Island and Costa Rica, for example, Poggie (1981) gathered data that indicate independence as a "psychoculturally adaptive characteristic" of small-scale fishermen. A cooperative has to be compatible with a fisherman's need to be independent, otherwise attempts to impinge on this need are likely to fail (e.g., imposition of types of boats and gear, or fishing locations selected by others).

The success of the fishermen's cooperative in Point Judith, Rhode Island, lies in limiting its functions to providing supplies and marketing assistance, which an individual fisherman by himself could not improve. In Costa Rica, Poggie observed that where middlemen are numerous enough to compete with one another in such functions as obtaining supplies and equipment for the fishermen, the perceived benefits from a cooperative are low. Similar sociological insights may help guide government efforts to organize municipal fishermen for their own benefit.

### 3.4.4 Small-Scale Aquaculture Projects

Municipal fishermen are also the target beneficiaries of production-oriented government programs in aquaculture: 1) the BFAR Nationwide Seafarming Program, and 2) the Laguna Lake Development Authority (LLDA) Laguna de Bay Fishpen Development Project. Both aim to provide an alternative or supplementary source of income to the fishermen and, at the same time, reduce their dependence on fishing. The first promotes the mariculture of oysters, mussels, and seaweeds in shallow, sheltered bodies of water; the second involves the culture of milkfish in pens and tilapia in cages in a freshwater lake. On a small or medium scale, these aquaculture ventures entail relatively low costs and simple technology. Loans are available for these projects under the above programs and the new Biyayang Dagat credit program.

About 60 potential sites for the seafarming program have been identified, 14 of which have been designated for initial implementation (Chavoso 1980). The strategy is to establish demonstration farms in these sites to serve as stations for technology verification trials and dissemination. Eventually, the farms will be turned over to qualified small fishermen.

The LLDA project, financed by a loan from ADB, will develop 2,500 hectares of pens and cages within the fishpen belt (Figure 16). Fishpens are to be constructed in modules of 2.5, 5, and 10 hectares. The project also envisions the establishment of a fish hatchery-nursery complex near the lake to produce 100 million milkfish fingerlings and 36 million tilapia fingerlings for stocking the pens and cages. LLDA will be the coordinating agency, with DBP administering the loan and PFMA providing marketing services. The project started in 1980 and is expected to produce 16,290 metric tons of fish by 1982 (Baguilat 1980).

Commercial culture of oysters and mussels has been practised for years in some bays, but seaweed farming, fishpen and cage culture were developed only during the last decade. Seaweed (Eucheuma) farming experienced a boom in the south during the mid-1970s but soon declined due to overproduction and erratic

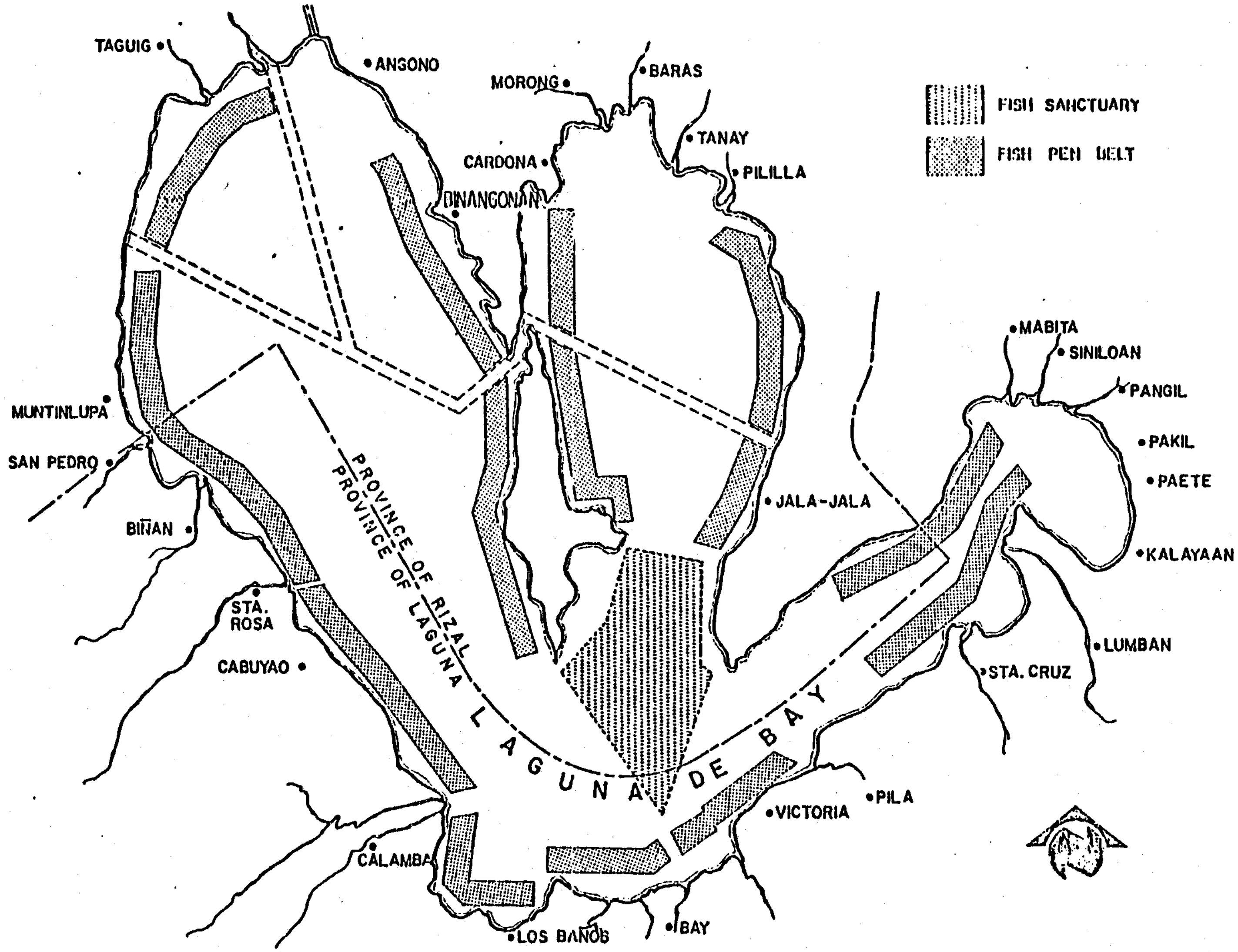



Figure 16. Fish pen belt and fish sanctuary in Laguna de Bay lake

Source: Reproduced from Smith et al. (1980).

buying policies of exporting companies. Farming is again picking up, this time in Central Visayas. As in Southern Mindanao and Tawi-Tawi, most farmers are former or part-time municipal fishermen. In a recent study, Smith and Smith (1980) found the income from seaweed farming higher than that from fishing in the Danahon area, Bohol.

In concept, encouraging fishermen to engage in mariculture can reduce fishing pressure on the resource. Such a shift, however, may not take place easily because of sociocultural barriers. Pollnac (1978) observed the negative attitudes of Costa Rican fishermen towards aquaculture, which to them means losing independence, the thrill of fishing, and the perception of unlimited catch based on luck and skill. An insight on the probable success of the aquaculture programs may be gained through socio-economic research to determine if such attitudes exist among Filipino fishermen faced with dwindling resources and income. Conflicts in user rights and property disputes may also arise, and here management planning should be able to provide order in area-specific development.

### 3.4.5 Development of Marketing Infrastructure

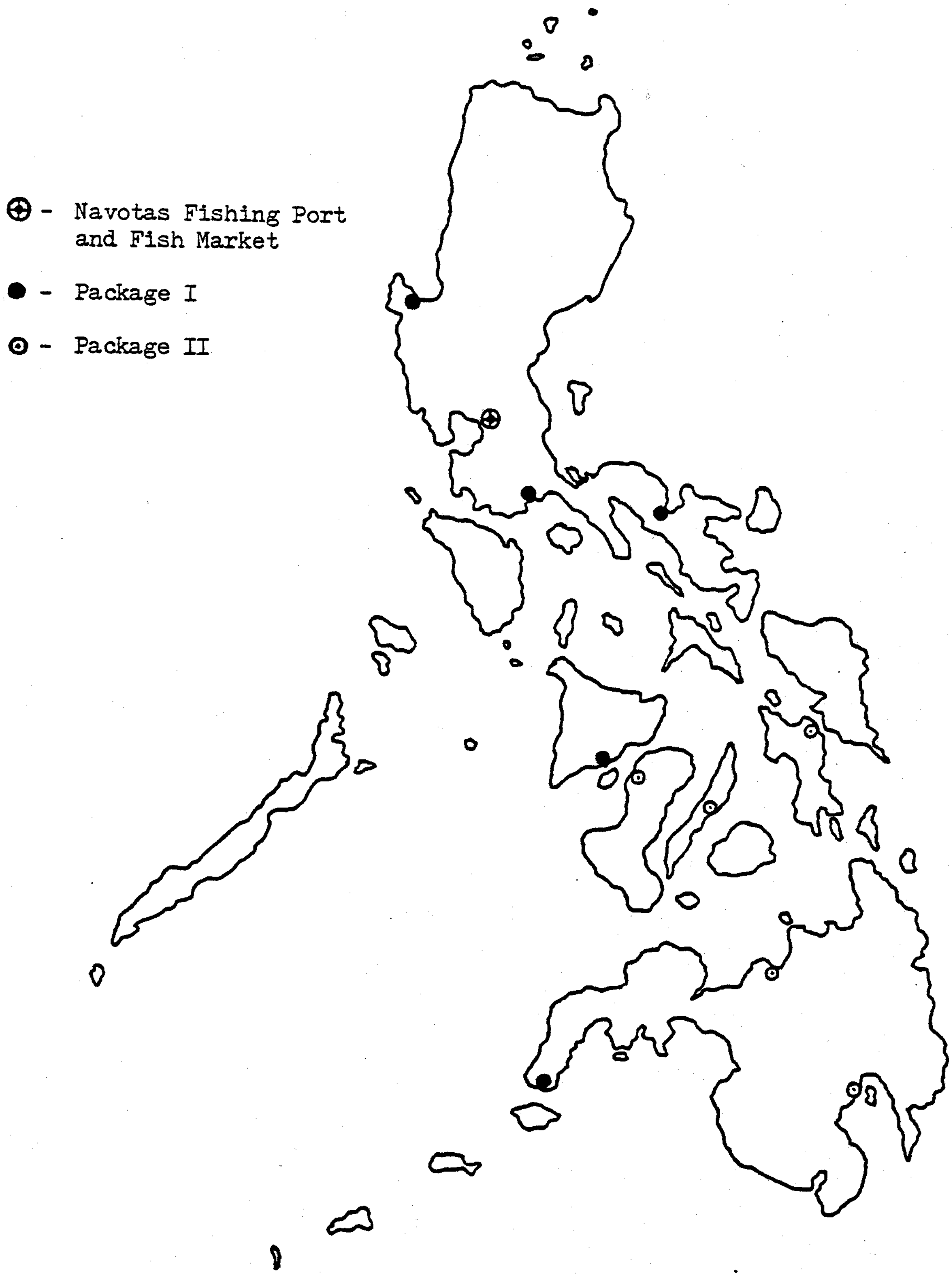
To support the various production-oriented programs, the IFDP has for its second major component a national fish marketing infrastructure development program. Fishing ports, market halls, ice plants, and cold storage units will be set up in strategic areas to provide the vital link between fish production and distribution. These infrastructures are expected to stimulate production, widen the distribution network, reduce post-harvest losses, and in effect increase local consumption, exports, and revenues from the fisheries. Leading this development effort is the PFMA, with assistance from the Ministry of Public Works (MPW), MNR, FIDC, and BFAR.

Social, economic, and political considerations are evident in the selection of priority target sites for infrastructure development. The program has to take into account, among other variables, the population distribution, consumption demand, number of fishing boats and their areas of concentration, and the potential yield from the resource. Of these information requirements, planners recognize the need for more accurate resource assessment at the local level to determine the appropriate type and size of the facilities.

Figure 17 shows the existing and proposed locations of commercial fishing ports development. The first to be constructed was the Navotas Fishing Port and Fish Market which now absorbs 40 % of the country's commercial fisheries landings for distribution to Metro Manila and nearby provinces. Planned to be an integrated complex, the port area is being further developed to include processing plants, shipbuilding and repair facilities, fuel depots, commercial establishments, and other general utilities.

Construction is underway in five places under the Commercial Fishing Ports Development Projects, Package I. Funds for these projects include a $46 million loan from the Overseas

Figure 17. Development sites for commercial fishing ports




Source: FIDC (1980b).

Economic Cooperation Fund (OECF) of Japan and a local counterpart of P87.9 million (FIDC 1980b). Five other sites are targetted for the Package II port construction projects. All these sites are existing landing points close to major fishing grounds and market centers. Planning is also going on for the development of municipal fishing ports. Priority is given to 54 landing places in economically depressed areas. These sites are found in the municipalities of Cagayan, Southern Leyte, Northern Leyte, Southern Mindanao, and the Sulu Archipelago where small fishermen are highly concentrated.

Other projects aim to further improve the distribution system. The BFAR "Cold Chain" project includes the rehabilitation of its 16 existing ice plant-cold storage units, as well as the construction of 18 new units in selected areas. This network is designed to satisfy part of the ice requirements for fish preservation on board vessels, at landing points, and at distribution outlets. The PFMA plans also to provide transport service facilities, such as collection-distribution terminals, insulated trucks, and refrigerated carriers. These will connect the port sites to the major consumer centers and help even up the distribution in fish surplus and deficit areas.

### 3.4.6 Education and Training

The slow progress in fisheries research and development has always been attributed to insufficient manpower specially trained to do research and extension work. To solve this problem in the long run, the Educational Development Projects Implementing Task Force (EDPITAF) started planning a fisheries education project in the mid-1970s. The project, to be supported by a World Bank (IBRD) loan of $38 million (Chavoso 1980), will establish the University of the Philippines in the Visayas (UPV), which will focus on fisheries academic programs. The UP College of Fisheries in Quezon City, Metro Manila will be relocated to the UPV site in Miag-ao, Iloilo (Panay Island) and be the core college of the new university. Land preparation and building construction are now in progress.

A staff development program for the UPV is now going on, funded by the project. Selected faculty members are doing their graduate studies in foreign universities through fellowship grants. Some are specializing in stock assessment and fish biology to generate expertise in fisheries management. PCARRD has also been managing a local scholarship program for fisheries undergraduate and graduate studies. The grants come from funds contributed by a consortium composed of SEAFDEC, MNR, BFAR, UP, and PCARRD. The increasing number of MS graduates in Aquaculture and Marine Biology is gradually improving the quality of fisheries research. Local courses in Fisheries Economics and Fisheries Management, however, need to be strengthened.

In addition, the education project will set up seven Regional Institutes of Fisheries Technology (RIFT) and the same number of Regional Fishermen's Training Centers (RFTC). This component will take care of non-degree, vocational programs and short-term training. At present, there is only one Fishermen's Training Center, located in Sangley Point, Cavite, a few miles southwest of Manila. Established in 1974 through UNDP assistance and now operated by BFAR, the FTC offers two 6-month courses for skippers, master fishermen, and fishing boat engineers. The seven new regional centers will provide more trained manpower for marine fisheries development throughout the country.

## 3.5 Fishery Regulations

### 3.5.1 Legal Framework

The general fishery laws in effect today are embodied in Presidential Decrees (PD) promulgated by the President of the Republic after the Philippine Congress was dismantled on September 21, 1972. Two decrees pertinent to fisheries were issued : 1) PD No. 704, known as the Fisheries Decree of 1975; and 2) PD No. 1599, signed on June 11, 1978, establishing the exclusive economic zone (EEZ) of the Philippines. The President also issued Letters of Instructions (LOI) with specific directives to agencies concerned for implementing the provisions of the decrees. These LOI's when specifying regulations also have the force and effect of law.

With the convening of the new National Assembly ("Batasang Pambansa") in late 1978, the political normalization process has returned the legislative function to a separate body. Should it be necessary to enact more laws on fisheries, the National Assembly has the power now to do so. However, the Fisheries Decree of

1975, as in earlier laws, already confers upon the Minister of Natural Resources the authority to promulgate fishery rules and regulations, in the form of Fisheries Administrative Orders (FAO), upon the recommendation of the Director of Fisheries (BFAR). For purposes of fisheries management, this provision may be sufficient for now.

Jurisdiction over the municipal waters rests on the municipal or city council ("Sangguniang Bayan" or "Sangguniang Panglungsod"). The council is empowered to issue municipal ordinances affecting fisheries which shall be valid and enforceable only upon approval of the Minister of Natural Resources, again upon recommendation of the Fisheries Director. This power, however, does not cover the gathering of minor aquatic products (aquarium fishes, molluscs, sponges, sea cucumber, sea urchin, sea snakes, and the like), pearling, fishpen culture, and seaweed farming in municipal waters; these activities fall under BFAR jurisdiction.

A basic requirement for any fishery activity in the Philippines is a license, lease, or permit granted by the government. Without this grant no person, association, partnership, corporation, or cooperative can "exploit, occupy, produce, culture, capture, or gather fish, or fry or fingerling of any species of fish, or fishery/aquatic products, or engage in any fishery activity in Philippine or municipal waters."

There are several laws and regulations, with corresponding penalties for their violation, on capture fisheries, aquaculture, processing, fish transport, foreign trade, joint ventures, and other aspects of doing business in fisheries (FIDC 1979a). Discussion here will be limited to the major regulations related to fish capture and gathering of aquatic products. All fishery laws, rules, and regulations cited in the following sections were taken from FIDC (1979a), Perez, E. (1980), Santos (1980), and Smith et al. (1980).

### 3.5.2 General Protective Regulations

Some regulations designed to protect the resources are applied to both commercial and municipal fisheries. These include provisions on illegal fishing methods, minimum mesh size, bans on collecting or catching certain species, water pollution, and fish sanctuaries or similar exclusive areas.

#### Illegal Fishing Methods

One of the earliest regulations was instigated by the rampant use of dynamite in fishing, which is not only wasteful but also dangerous to fishermen. The Fisheries Decree reiterates the then existing ban on the use of explosives, and declares it illegal as well to kill or stupefy fish with poisons and electricity. The use of poisons for collecting aquarium fish became prevalent recently because of the growing domestic and export demand for this commodity. To strengthen the prohibition, the decree also makes it unlawful to possess or sell illegally-caught fish, and presumes it a violation of the law if explosives, poisonous substances, or electric fishing devices are found in a fishing boat or in the possession of a fisherman.

Mesh Size

The decree itself does not specify a minimum mesh size but leaves that to be fixed by regulations promulgated by MNR. A Fisheries Administrative Order prohibits the use of nets with less than 2 cm stretched mesh for catching any kind of fish. The basis for this rule is not stated, but a 2 cm mesh is adequate to capture small fish, such as anchovies and sardines. An exception to this restriction is the use of fine-meshed nets for "gathering fry, glass eels and elvers, and such species which by their very nature are small but already mature."

Fry Fishery and Export

Because of the importance of wild milkfish fry to the country's fishpond industry, bans were imposed on the capture of mature milkfish ("sabalo") and on the exportation of milkfish fry. The export ban, however, has not completely deterred smugglers from shipping milkfish fry, particularly to Taiwan and Hong Kong, as evidenced by occasional confiscations of fry at the international airport. Fry of other species may be exported only after the domestic requirements are met.

Marine Turtles

The capture of marine turtles and collection of their eggs are likewise prohibited. The law initially covered the period from May to August in the Turtle Islands, where turtle meat and eggs are part of the local diet. But turtle consumption has also been noted in some areas of Central Visayas, Mindoro Island, and Western Luzon. As the tourism industry grew during the 1970s, turtle shells became popular souvenir items, stimulating further the exploitation of the resource. This prompted the government to impose a countrywide ban on turtle capture and to create a Task Force "Pawikan" (marine turtle), headed by MNR, assigned to conduct research and save the turtle population.

Stony Corals

Another area of concern that developed recently is the state of the reef-building stony corals. The UP Marine Sciences Center estimates that nearly 75 % of the country's coral cover has been destroyed by illegal fishing methods, drive-in nets (which are legal), siltation, and various forms of pollution; only 10-15 % of the destruction may be due to natural causes (cited in Smith et al. 1980). Coral reefs are known to serve not only as nursery and feeding grounds for many commercial fish species, but also as natural protection for beaches and shore infrastructures against wave action.

Hence, two presidential decrees have been issued to develop and conserve coral resources. A ban on coral exports and a moratorium on the gathering of stony corals are now in effect. Because selling ornamental corals to tourists used to be a major source of income for some small fishermen, the MNR is formulating guidelines on coral exploitation for socio-economic reasons. The present moratorium, however, weighs in favor of resource protection. Meanwhile, research on the various aspects of coral biology is going on.

Water Pollution

The worldwide environmental movement made its impact on government policies in the mid-1970s. At least three decrees emerged within the last decade to protect the environment, including marine and inland waters, against pollution. A section in the Fisheries Decree alone specifically states that it shall be unlawful to discharge or deposit any substance or material deleterious to aquatic life. Some of the substances mentioned are petroleum, acid, coal, oil tar, lampblack, aniline, asphalt, molasses, mine and mill tailings, and factory refuse.

Refugia

The MNR is empowered to designate areas permanently off-limits to commercial and municipal fishing. A fishing area may be reserved for exclusive use by the government for educational, research, and scientific purposes. The Minister may also set aside fish refuges and sanctuaries to be administered in the manner prescribed by him. Areas designated as marine parks or sites for turtle, coral, and mangrove research have been closed to fishing and other forms of exploitation. In Laguna de Bay, a 5,000-hectare fish sanctuary in the middle of the lake (Figure 16) was established in response to the overfishing problem there.

3.5.3 Regulations on Commercial Fisheries

Registration and Licensing

Commercial fishing vessels (greater than 3 GT) are required to obtain the following documents before they can operate: 1) an annual Certificate of Inspection from the Philippine Coast

Guard (PCG) certifying that the vessel is seaworthy and fitted for actual fishing; 2) a Certificate of Philippine Registry from the Maritime Industry Authority (MARINA) if the vessel is more than 15 GT (optional if less than 15 GT); and 3) a Commercial Fishing Boat License (CFBL) from BFAR, to be renewed annually. All officers and crew members also have to secure an annual license from BFAR.

The license fee for a commercial vessel is nominal (P100). Licenses cannot be sold nor transferred to another person and can only be issued to Filipino citizens or to partnerships or corporations. Firms with at least 60 % of the capital stock owned by Filipino citizens have to register with the Securities and Exchange Commission (SEC). If the foreign equity share is more than 30 %, the firm has to register with both the SEC and the Board of Investments (BOI). Vessels meeting all these requirements can enter the fishery in any part of Philippine waters, except in areas that the government has designated closed to commercial fishing for various reasons.

Area and Time of Operation

The Fisheries Decree prohibits all commercial vessels to fish in waters less than 7 fathoms (about 13 meters) deep. These shallow areas are thus reserved exclusively for the municipal fisheries. PD No. 1015 (issued in 1976) amending this section of PD No. 704, added two other provisions: 1) the President may, upon the recommendation of the Minister of Natural Resources, "ban the operation of commercial or other fishing gear in waters within a distance of 7 kilometers (3.78 nautical miles) from the shoreline if public interest so requires or if the ecology of the marine resources may be improved;" and 2) the Minister may, upon the recommendation of the Fisheries Director, "establish a closed season in any Philippine water if necessary for conservation or ecological purposes."

Two regulations resulted from these amendments. First, the President issued a Letter of Instructions prohibiting the operation of commercial fishing gears within 7 km of the provinces of Northern Leyte, Southern Leyte, Northern Samar, Eastern Samar, Western Samar, and Sorsogon. Second, the Minister declared a closed season for sardines, herrings, and mackerels from November 15 to March 15 every year in the Visayan Sea, a heavily exploited fishing ground.

The "public interest" rationale has been invoked primarily to resolve the growing conflict between commercial and municipal fisheries: small fishermen largely blame the commercial vessels for their dwindling catch rates. This conflict had prompted the closing of Malampaya Sound in eastern Palawan to commercial fishing vessels starting in 1975. The Leyte-Samar-Sorsogon region receives special attention because it is among the country's most economically depressed areas where insurgency is believed to be growing. By providing municipal fishermen a wider exclusive fishing area, the LOI aims to help improve the living conditions in rural fishing communities, as well as conserve municipal fishery resources.

Resource conservation as a regulation objective is more evident in trawl fishing. Both commercial and municipal trawlers are not allowed to operate in waters 7 fathoms or less. However, baby trawlers of 3 GT or less may operate in waters 4 fathoms deep or more if authorized by a municipal ordinance approved by the Minister. Trawling is prohibited altogether in the shallow Cancabatoc Bay off Tacloban City (Northern Leyte). Trawl and bagnet operations are also prohibited in areas less than 25 fathoms deep within Manila Bay, a traditional fishing ground presumed to be overfished.

### 3.5.4 Regulations on Municipal Fisheries

#### Concessions and Licenses

A municipal or city council is empowered 1) to grant to the highest qualified bidder the exclusive privilege of operating fish corrals and oyster culture beds, or of gathering fry of milkfish or other species; and 2) to issue licenses to qualified persons for operating fishing boats 3 gross tons or less, or for the privilege of fishing with nets, traps, or other fishing gears in municipal waters.

The public bidding process for granting concessions to erect fish corrals, operate oyster beds, and gather fry should result in the municipality receiving the highest resource rent. However, if no bidders opt to lease any fishery zone after two notices, the municipal council is authorized to grant the above rights to individuals upon payment of license fees at rates not exceeding those fixed by national law. In any case, these fees are an important source of revenue for municipalities with very limited income, and is actually a form of taxation. According to Santos (1980), "taxes are for revenue purposes, whereas fees are for purposes of regulation." As a regulatory measure, a license fee "must be only of a sufficient amount to include the expenses of issuing the license and the cost of the necessary inspection or police surveillance, taking into account not only the expenses of direct regulation but also incidental consequences."

Whereas concession fees may run to thousands of pesos, the license fee for municipal fishing with or without boats is not to exceed P50, the amount varying according to the type of gear used. Municipal licenses are issued to fishermen; neither boats nor gears are registered or licensed. Residents who are not licensed fishermen are allowed to fish in municipal waters for their home consumption. Unless prohibited by national law, a commercial fishing vessel may also be allowed to operate in municipal waters if licensed by the municipal authorities.

The gathering of aquarium fishes, shells, seasnakes, sea cucumber, abalone, sea urchins, and pearls, as well as mariculture ventures are beyond the jurisdiction of the municipal council. An annual license for the privilege of engaging in these activities has to be obtained from BFAR.

Fish Corrals

The distance between fish corrals should not be lass than 200 meters in marine waters and 100 meters in freshwater (inland) waters. Corrals belonging to the same licensee, however, may be constructed 60 meters from each other. These delimitations, applicable only in waters more than 2 meters deep at low tide, are primarily designed to reserve channels for navigation and to prevent conflicts among licensees. To further safeguard the exclusive rights of fish corral operators, the law prohibits fishing within 200 m of any fish corral. Even if the fisherman himself is the owner of the corral, he can fish only within 60 m of his corral.

Gathering of Fry and Minor Aquatic Products

The area open for fry gathering is demarcated prior to public bidding. The municipal council has to set aside not more than 1/5 of the fry collection zone as government milkfish fry reservation, this portion to be designated by BFAR. For gathering minor sea products, the area covered should not be more than 5 sq km for individuals and 30 sq km for partnerships and corporations. Such areas may not be subleased nor closed to navigation and fishing.

3.5.5 Proposed Regulations

The FIDC staff (1981b) has proposed some regulations on capture fisheries which still need to be studied for their feasibility and potential impacts.

Coral Protection

Two of the proposals are reactions to the pressures from the research community to protect the country's stony corals. One would ban the use of weights in muro-ami (drive-in) nets which are destructive to corals, and the other is to ban permanently, instead of the present moratorium, the gathering and possession of corals. Both regulations have socio-economic impacts on small-scale fishermen dependent on these activities. A single, large muro-ami net employs as many as 100 fishermen. The key is to give special attention to providing the affected fishermen alternative sources of income, in fishing or otherwise.

Gear-Specific Minimum Mesh Size

The other proposals represent an awareness of the overfishing problem. A ban on the catching and possession of juvenile fishes (excluding fry for aquaculture purposes) has been proposed, along with the idea of prescribing specific minimum mesh sizes for trawl and pelagic gears. For tuna purse seines, which are now catching immature yellowfin and skipjack tuna, determining the suitable minimum size may not be a problem. The capture of juveniles by hook-and-line types of gear may be restricted by fixing the hook size appropriate for the target species. Difficulties, however, will arise in regard to trawl, sardine purse seine, and other pelagic gears which catch many commercially valuable species in one haul.

Jones (1983) suggests that the best mesh size for a tropical multispecies fishery has to be a compromise between the best mesh sizes for the individual species. To arrive at the compromise mesh size, biological (e.g., size at first maturity) and economic data on at least the major species caught by each type of gear are required. Priority attention should be given to the most threatened species or the most valuable species.

As in other countries, mesh measurements may be standardized by using special gauges and a standard tension between knots. To avoid legal loopholes the regulation must be clearly worded, stating the minimum or average mesh size for specific types of net, the mesh measurement method, and the state of the net (wet or dry) when measured.

Improved Licensing Scheme

Perhaps the most direct measure of controlling fishing effort being considered at present is the concept of an area- and time-specific licensing scheme. A fishing boat license will be good only for a particular fishery, a traditional fishing ground (or grounds), and a specific period of the year. A general permit will be open to licensed boats to fish in non-traditional grounds. Multiple licenses may be issued to a boat depending on its capabilities and the state of the fisheries.

This scheme aims to limit fishing activities in heavily-fished areas and to enhance fisheries development in less-exploited areas. As the fisheries status in specific areas is continually monitored, the system may be later refined and its implementation adjusted. Biological, economic, and social impacts of this scheme have to be analyzed so that fishermen could appreciate its possible long-term benefits. Implementation and enforcement will obviously pose added complexities and costs (administrative and transaction) and these should be weighed against the projected benefits.

3.5.6 Law Enforcement

Several government agencies and local authorities are empowered to enforce fishery laws and regulations. As lead agency, BFAR maintains a force of fishery law enforcement officers, 268 in 1980, assigned to different provinces and cities (Perez, E. 1980). The Ministry of National Defense (MND) is mandated to assist BFAR, through the Philippine Constabulary (PC), Philippine Coast Guard (PCG), Philippine Navy (PN), and Integrated National Police (INP) consisting of city and municipal police forces. Fishery law enforcement by these agencies, however, occupies a minor portion of their overall functions.

To augment the above enforcement arms, the President has deputized municipal mayors and barangay officials as law enforcers (Santos 1980). (A barangay, covering a barrio or village, is the smallest political unit of local governments.) The MNR coordinates with the MLGCD and the Ministry of the Budget (MOB) in training barangay officials who will serve as deputy fish wardens. The officers of duly recognized fishermen's associations are likewise deputized as wardens in the campaign against illegal fishing. The President has also authorized barangay officials to arrest violators of pollution control and other environmental laws.

According to the BFAR record of fishery law offenses in 1979, the most common violations involved illegal fishing methods and dealing in illegally caught fish (74 cases) and fishing with fine-meshed nets (60 cases). There were 10 cases of commercial trawl fishing in waters less than 7 fathoms deep and 2 cases of fish corrals constructed within 200 meters of each other (Perez, E. 1980).

The procedure for resolving cases of violations is quite circuitous. After the enforcement officer takes custody of the violator and impounds the fishing vessel and the catch, his apprehension report has to go all the way up to the BFAR Central Office. The Director himself either approves or disapproves the recommended action, then turns this over to the Regional Office for implementation.

Incursions by foreign fishing vessels into Philippine waters are handled by the PCG, following certain guidelines (FIDC 1981b). The encroaching vessel is impounded and its crew detained at the nearest Coast Guard Station, which then reports the matter to the PCG Headquarters and the Ministry of Foreign Affairs. Penalties for the crew include a P100 fine per person and at least 30 days of imprisonment. Upon serving the required penalties, the encroachers are either deported or allowed to leave the country on board their boat.

To effectively police the country's 200-mile EEZ, the PCG has proposed an "operational and resources plan" for a surveillance network. Acquisition of additional equipment and second-hand vessels worth P500 million in all is part of the proposal (FIDC 1981b). An auxiliary force of vessels from the private sector will be formed to assist in patrolling the zone.

Law enforcement has always been regarded as a weak link in the fisheries administration system. The anticipated problem of enforcement is one reason administrators are reluctant to impose more restrictive management measures. Improving surveillance capabilities, deputizing local officials as fish wardens, and soliciting industry participation are positive steps. But a deeper problem remains, that is, the temptation to resort to corruption among government law enforcers who are generally low-salaried and lack motivation to perform their duties. This situation is unfortunately more prevalent in less developed countries. The challenge, as Hardin (1968) points out, is "to invent corrective feedbacks that are needed to keep custodians honest."

# 4.0 RECOMMENDATIONS

## 4.1 Strategic Considerations

The newly-assumed priority status of fisheries has given rise to increasing governmental efforts to develop the industry. There is a danger, however, for the fisheries system to be trapped in what Bell (1978) calls " a vicious cycle of government assistance [that] induces overcapitalization ... and is hardly conducive to effective utilization of the sea as a source of food and recreation." A management dimension has to be injected in the various stages of the policy-making process as soon as possible before the vicious cycle sets in. Government planners and researchers are not unaware of the resource constraints to fisheries development. They realize that as harvests from traditional fishing grounds are likely to stagnate in the 1980s, the government would be pressed to exert greater control over the fishing industry.

Several forms of fishery regulations abound in literature which are available for consideration and adoption, and innovative schemes could develop as more detailed information on the country's fisheries is obtained. Inaction or "intellectual paralysis" often plague fishery managers because of the formidable task before them. But, as Gulland (1983) points out, imperfection will always be a feature of the management system components (objectives, institutions, data, analysis, implementation, enforcement) and "whatever is being done at the moment will have to be changed." Thus, fisheries management is, and should be, a continuing process.

From a strategic perspective, laying the foundations for a broader management regime in the country should focus on at least these areas: 1) education on fisheries management; 2) strengthening the management process; and 3) evolution towards decentralization.

Education

The value of education lies in its long-range effect on resource conservation. Brewer (1980, 1983) has stressed the need for education at all levels and for all participants in the management process, from financing institutions to the general public. As a vital aspect of preventive management, education is particularly needed in developing countries where resource limits are either ignored or not understood. Fishery regulations would stand a better chance of being accepted and enforced if fishing communities are made aware of the benefits that could accrue from such regulations.

Publications, films, and other media have always been effective in mass education, an undertaking in which inter-agency cooperation has worked before. The Ministry of Natural Resources may tap the assistance of the Ministries of Public Information, Education and Culture, and Local Government and Community Development for publicizing fishery policies. At the technical level, fisheries colleges should incorporate in their teaching curricula courses covering the whole spectrum of fishery management concerns to prepare students for future decision making. Sensitivity to issues may be developed by analyzing fishery management case studies.

Management Process

Management, in general, involves four main stages: 1) policy development -- problem identification, evaluation of alternative policies, decision, policy declaration; 2) communication; 3) implementation; and 4) evaluation (Sokoloski 1980; ACMRR 1980). These steps are basically followed in the traditional fisheries management paradigm discussed by Rothschild (1983a) and Anderson (1983).

Essentially, the process involves: 1) evaluation of the fishery; 2) setting of management objectives; 3) selection of the control variables (landings, catch composition, quality) to be regulated; 4) decision on appropriate regulatory scheme and implementation procedure; 5) enforcement; 6) monitoring of the fishery under the regulatory program; 7) periodic evaluation of program performance against the stated objectives; and 8) corresponding adjustments in any of the above stages.

This process is familiar to management experts in fisheries agencies. Development planning has improved in recent years largely due to the government's reorganization program. More active fishery regulations, however, would require a higher level of management. This entails strengthening the institutional arrangements, mechanisms for communicating policies to all affected parties, and capabilities for implementation, enforcement, and evaluation.

Decentralization

There are advantages and disadvantages in decentralized planning and administration (Larkin 1983). Closer rapport with resource users and greater appreciation of local realities are lost in an overburdened, complex centralized system. However, a central government control is needed in managing a resource that knows no political boundaries. In the Philippines, BFAR has a regional administrative setup, with policy guidelines spelling out central and regional responsibilities; the jurisdiction of municipal governments is also defined. At this stage, regulatory management would be better served if planning is conducted in a centralized mode, as it is present.

Another system of management is industry self-regulation. In concept, autoregulation would eliminate enforcement problems, minimize administrative costs, and reduce the government's role to data analysis, scientific advice, and supervision (Rothschild 1983; Larkin 1983). To be successful, industry-managed fisheries require a strong leadership, cooperation among fishermen, and a highly knowledgeable fishing community. Like decentralization, autoregulation may evolve in the long run as technical capabilities and resource consciousness widely develop. For example, the success of Japanese cooperatives in self-management (one of the few existing cases) was achieved about half a century after they were granted exclusive fishery rights (Oka et al. 1962).

## 4.2 Institutional Arrangements

The institutional framework for fisheries administration in the Philippines was described earlier. For policy formulation, the FIDC has been designated as the umbrella organization that has the power to engage the services of other agencies. The following areas relating to the institutional aspect of fisheries management would need attention: 1) creation of a permanent body for fishery regulation planning; and 2) active participation in regional (multinational) fisheries organizations.

### Management Planning Committee

The FIDC has initiated a concrete step towards a management orientation by organizing an *ad hoc* committee, composed of specialists from other government agencies, the academia, and research community, to plan a comprehensive stock assessment program. The identified activities and areas of responsibilities will be farmed out to research institutions. A logical spinoff should be to institutionalize a working committee under the FIDC solely for the purpose of planning (including data analysis and stock assessment), monitoring, and evaluating fishery regulations. The FIDC link-up is strategic because of its attachment to the Ministry of Natural Resources which has the overall responsibility for policy decisions on fishery matters.

The committee should have an inter-agency and multidisciplinary composition. At least the following agencies should be represented: FIDC Secretariat to provide support staff for the committee, BFAR for statistical collection and field implementation, and PCARRD for coordination with the national research network, in addition to their inputs in committee deliberations. The rest of the members should be chosen on the basis of their individual expertise, representing the biological, economic, social, and legal aspects of fisheries management.

Depending upon the need, experts from Philippine-based international bodies and knowledgeable industry representatives may be invited to join in the planning process. The possibility of contracting out the preparation of specific management plans or specialized studies may also be explored. The committee has to establish or have access to a data bank, possibly within the BFAR Statistics Division, which has plans of developing computer capabilities.

Consultative and feedback mechanisms should be an important feature of the management process, patterned after existing practices in the U.S. and other developed countries. The review process should include public hearings with all affected parties and consultations with regional/local officials and other experts to ensure a mutually agreed-upon regulation. A useful management tool is the use of operational flow charts, identifying the steps, offices, expected decisions, and time frame involved in the planning process. The committee output should be embodied in a document (a management plan with an environmental impact statement) for every regulated fishery unit, to serve as guide for implementation and enforcement.

International Fisheries Organizations

The Philippines is an active participant in multilateral fisheries bodies in the region: IPFC, SCSP, SEAFDEC, ICLARM, and ASEAN. Marr (1976) has reviewed the functions of each of these organizations (except ICLARM which was being formed then) and noted that in their present form none of these bodies could assume regional fisheries management responsibilities. His proposal to form a South China Sea Commission for research, formulation and adoption of regulations, their enforcement, and allocation has not materialized. However, ASEAN has taken an initial step in this direction by sponsoring consultative meetings on the impact of extended maritime jurisdictions.

The need for multilateral arrangements in fisheries management has been raised in recent years, especially in regard to the highly migratory tunas and shared stocks of small pelagic species. Indonesia and the Philippines are currently undertaking tuna sampling programs with SCSP assistance and have plans of cooperating in tuna tagging studies. The realization that no one country can unilaterally deal with the management needs of transboundary stocks will likely draw neighboring states into more cooperative arrangements. Philippine fisheries authorities have been amenable to any multinational forum for information exchange, research collaboration, and joint management.

## 4.3 Management Goals and Objectives

The broadly-stated goals of fisheries development embodied in Philippine statutes are typical for most fisheries in developing countries: 1) to attain domestic self-sufficiency in fish; 2) to increase export earnings from the fisheries; 3) to provide employment opportunities; and 4) to maintain the resources in optimum condition. These conventional objectives are often found conflicting or incompatible in practice and may be resolved in two ways: 1) giving weights on each objective, and 2) stating some objectives with a form of constraint, e.g. maximizing net revenue while setting a limit to foreign exchange earnings from the same fishery (ACMRR 1980; Anderson 1983).

### Minimization of Conflicts

As more information on the evolving fisheries system is gained, management objectives may need to be redefined or their relative weights altered as part of an iterative process (Mercer 1982). At any time, however, it is imperative that the resources be maintained in a productive state if other social and economic benefits are to be derived on a sustained basis. Development efforts should not lose sight of biological considerations by closely monitoring the state of the resource.

Within the limits of resource use, fisheries management is further complicated by a number of socio-economic issues. An important, though implicit, objective of management is to minimize conflicts and maintain order in the system (ACMRR 1980). In the Philippine context, these issues include: 1) export development against domestic consumption; 2) increasing employment and fleet expansion versus economic efficiency; and 3) competition between commercial and municipal fisheries for the same resource. A common element in these issues is the general conflict between short-term and long-term interests.

Fish deficiency, malnutrition, and undernutrition exist in many parts of the country. Government programs to develop infrastructure facilities are designed not only to accommodate fish production increases, reduce post-harvest losses, and improve fish distribution, but also to bring fishery products closer to export outlets. The current drive to promote exports is typical of programs that may prove self-defeating in the long run. Bell (1978) predicts that increasing prices due to a "crisis of supply ... will act as a mechanism to divert most of the fishery resources of the oceans to a small group of affluent nations," offering developing countries "less chance to improve their direct food consumption." Although Philippine fishery exports make up only 4 % of total fish production at present, an upper limit to export expansion may have to be established at some point.

Economic efficiency was rarely a fishery management objective in most countries until recently. From an economist's point of view, overcapitalization and the accompanying increased labor participation represent an inefficient use of scarce resources (Anderson 1983). In developing countries, increasing employment in fisheries is still a valid objective for social reasons and political expediency, especially in the face of uncertainty on the potential yield from the resources. However, in specific fishing areas where there are clear indications from fishermen's accounts themselves that total catch has been declining, the cost of further increases in employment may be too high. In such cases, new entrants should not be allowed.

Existing fishery regulations prohibiting large commercial boats from operating in municipal or shallow waters are intended to reduce conflicts with small-scale fisheries as well as conserve the resources. The 7-km and 7-fathom boundaries, however, can give rise to conflicts on biological grounds: commercial fishermen catching the older fish offshore may reduce the younger stock inshore exploited by artisanal fishermen, which in turn may decrease the recruitment to the parent stock dominating the offshore catches (Pauly 1979). Measures, such as increasing the minimum mesh size, with strong biological objectives have, directly or indirectly, income distribution effects, i.e. decreased catch inshore, increased catch offshore (Anderson 1983). The choice of management measures will depend on the relative weights of the objectives for a specific fishery, area, and time.

Operational Objectives

Management principles dictate that objectives to be operational should have the following characteristics: 1) a quantifiable set of criteria to measure their success or failure, e.g. costs, earnings, catch rate; 2) relative values compared to conflicting objectives and management options; 3) a time frame for achieving them; and 4) a range of issues or "accounting stance" used in setting the policy, e.g. effects on the fishery alone or including those on related industries like processing, boat building, net making (Anderson 1983; ACMRR 1980).

Objective setting in this way would be very helpful in selecting the appropriate regulation for a particular management unit and in evaluating the regulatory performance. The present integrated approach in development planning necessitates a general accounting stance. A less broad stance may have to be adopted for simplicity in planning regulations for specific fishery units.

## 4.4 Management Units

### Administrative Units

Various fishery units or boundaries have evolved in the Philippines for different purposes. Mainly for socio-economic and political reasons, Philippine waters have been divided into the 3-mile municipal marine waters, territorial waters beyond the 3-mile boundaries, and the 200-mile EEZ not covered by territorial waters. Different sets of policies, laws, and regulations apply to each of these units to avoid conflicts and other considerations. For fisheries administration, BFAR operates 13 regional offices following the government's regional organization.

Some regulations are directed at specific areas and fisheries for conservation and socio-economic purposes, e.g. seasonal closure for commercial fishing of sardines, herrings, and mackerels in the Visayan Sea; area closure for all types of commercial fisheries in Malampaya Sound; prohibitions of trawling within 7 km of Leyte, Samar, and Sorsogon; and a ban on trawl and bagnet fishing in areas less than 25 fathoms deep in Manila Bay.

Biological Units

The above management units rarely coincide with the distributional extent of the resources. Management in most developed countries has been traditionally related to biological units or stocks. The definition of stocks vary, but in any case management by unit stocks presents some difficulties in the Philippines. The multispecies catch composition would require considerable research in identifying the various stocks in the strict biological sense. A possible approach is to define functional groups or stocks based on frequently fished areas.

Biologists have classified the Philippine fisheries into the following groups: 1) tuna fisheries (skipjack, yellowfin, bigeye, frigate, eastern little tuna); 2) small pelagic fisheries (roundscad, mackerel, sardines, anchovy, other carangids, squids, etc.); 3) soft-bottom demersal or trawl fisheries (slipmouth, threadfin bream, lizard fish, cavalla, shrimp, etc.); 4) hard-bottom demersal or reef fisheries (grouper, snapper, fusilier, siganid, etc.); 5) invertebrates or minor sea products (sea cucumber, sea urchins, lobster, crabs, snails, clams, etc.); and 6) seaweeds (*Eucheuma*, *Gracilaria*, etc.). This grouping may suffice as biological units for management at this stage.

A common question raised in planning workshops is whether to manage by area or by species group. The problem may be appropriate for tuna and small pelagic fisheries, but even for these species the traditional fishing grounds are known to fishermen. A broad accounting stance would consider the interregional and intertemporal effects of fishing on these groups, if biological unit stocks could be ascertained. The skipjack and yellowfin tuna in Philippine waters are believed to be part of the Western Pacific stocks, and thus would require international cooperation. Some of the small pelagics may also be transboundary stocks. Demersal groups, invertebrates, and seaweeds are more limited in their distribution, and specific areas for their management may be readily defined.

In general, fisheries management is conducted on an experimental mode. Defining the management units is one of the first decisions to be made, but these may change in time as more knowledge of the system is obtained. For a starter, the country may be divided into six fishing regions (after Buzeta 1977) for tuna and pelagic fisheries management, and specific areas identified for demersal fisheries management. These boundaries would encompass or cut across existing administrative units, necessitating a coordinative mechanism, especially when allocation problems arise. The most heavily-exploited fishery areas may be designated as priority units for management planning on a pilot basis.

## 4.5 Management Options

Several authors have reviewed the various regulatory schemes used in fisheries management, e.g. Bell (1978), Anderson (1980, 1983), Caddy (1983). Management policy decisions are not confined to restrictive measures but also include fisheries development actions and preservation of the *status quo* (ACMRR 1980). The available information on the current state of Philippine fisheries suggests that there are wide offshore areas still open for further exploitation. Development efforts should, therefore, be designed to encourage fishing activities in non-traditional grounds.

Control measures may be classified into: 1) indirect methods (including incentives) to enhance the resource within the common property framework; and 2) direct methods of retrenchment (limited entry schemes) to prevent overfishing or restore an overfished stock. In selecting the appropriate measure, or combination of measures, to achieve management objectives, Anderson (1980) presents a framework for judging regulatory schemes, covering four main problem areas: management operations, socioeconomic effects, biological effectiveness, and economic efficiency. Among the judgment sub-areas, the following are more relevant to the present situation in the Philippines: implementation and enforcement capabilities; resolution of intrafishery conflicts; effects on income distribution, prices, and employment; and research and regulation costs.

Indirect Methods

A major obstacle to applying more sophisticated methods of controlling fishing effort is their high cost of enforcement. This is one reason for adopting simple indirect measures in the Philippines, such as establishment of coastal belts based on minimum depth or distance, closed areas, seasonal closures, refugia, and bans on illegal fishing methods. Mesh size regulation is also being considered. Most of these regulations do not guarantee resource conservation unless combined with some entry restrictions; their effects are also less quantifiable (Caddy 1983).

Indirect approaches outside the harvest sector are also gaining attention and may prove more effective and less expensive in controlling fishing effort. Investments on new fishing boats may be regulated by influencing the lending policies of government and private banks (ACMRR 1980). Government-sponsored credit assistance programs should be more judicious in selecting target areas for development; pumping more credit inputs in overfished areas, aside from the financial risk involved, can only worsen the resource situation.

Diversification of fishing community activities by creating alternative employment opportunities for small-scale fishermen can reduce fishing pressure in heavily-exploited areas (FAO 1980). This approach has been recognized by fisheries planners as part of the rural development framework. Within the fisheries setting, municipal fishermen are encouraged to engage in small-scale aquaculture, like seaweed farming and tilapia cage culture, to reduce their dependence on full-time fishing.

Restrictions on exports and limitations on processing capacities may have to be considered eventually for resource conservation purposes.

Direct Methods

Restrictive measures are usually painful, resulting in "a constant battle between fishermen and the regulatory authority to outwit each other as regulations are piled on regulations in order to keep fishing effort in check" (Bell 1978). This need not be the case if adequate preventive management is instituted early in the development process (Gulland 1978). Nevertheless, various schemes have been applied and proposed to solve a severe overfishing problem.

Setting an annual catch quota based on MSY is one of the earliest methods used, but the open access nature of the fisheries invariably leads to overcapitalization, a decline in vessel productivity, and financial losses, especially for smaller boats (Bell 1978). The common property problem is dealt with through limited entry schemes which grant property or quasi-property rights to exploit the resource. Anderson (1980) compared four such schemes, based on the judgment criteria mentioned earlier. He concluded that the landing tax and the individual fisherman's quota appear to be superior to an effort tax and an effort share program, respectively, because of the difficulty in measuring effort. None of these schemes, however, can be applied in the Philippines at this stage due to their complex implementation requirements.

Exclusive rights are granted at present through competitive bidding to purchase milkfish fry in designated zone and to set up fish corrals and oyster beds in municipal waters. The licensing system can be utilized to regulate the deployment of commercial fishing vessels and the number of municipal fishing boats. A proposed scheme, currently under study, will involve fishing license permits for a specific fishery, area, and period. This measure is a step towards entry restrictions, although experience in other countries with similar schemes has shown an increasing need to regulate other aspects of fishing effort, such as gear, fishing aids, vessel tonnage, and hold capacity. However, coupled with other strategic preventive measures, a licensing scheme can create a better order in the harvest sector for future management.

Criteria for granting vessel licenses may include proximity to the fishing ground, record of compliance with regulations (e.g., submission of log books), capacity to exploit, and previous participation in the fishery. In overfished areas, a moratorium on the issuance of licenses may be imposed. Competitive bidding for exclusive rights to fish in specific areas may later be considered. This method has the advantage of minimizing the corruption problem in enforcement.

## 4.6 Data Requirements and Research Priorities

A more active management regime implies a greater demand for data, information, and research. The Philippine fisheries statistics in their present form are difficult to reorganize according to the prescribed management units (fishery type and area). This should be less of a problem if statistical data are stored in a computer, which could also reduce the time lag in consolidating data reports from the regions; it takes at least two years now to have the national statistics published for general circulation. Delays in data retrieval also mean lost time for evaluating field conditions and providing timely scientific advice.

The monthly catch record required of commercial fishing vessels, if assiduously accomplished, could provide estimates of fishing effort in specific fishing grounds. Researchers, however, find these records not helpful in this respect. Students may be tapped for an observer program, and more coercive methods (license suspension) may be tried.

The communication of research results also leaves much to be desired. A lot of raw data on biology and oceanography remain in shelves of research institutions waiting to be analyzed. The first task of a management planning committee is to sift through these data for materials relevant to fisheries management and to conduct a review of fragmentary research results. Policy studies undertaken in high level offices oftentimes do not undergo public scrutiny. The idea of documenting fishery management plans, subjecting them to a review process, should satisfy for the most part communication needs in fisheries research and policy.

The extent of the data base and research activities is limited by the country's institutional capabilities in terms of funds, research manpower, and facilities. Many information and research gaps exist even though the national research system managed by PCARRD has identified the major problem areas to be addressed. FAO manuals and Stevenson et al. (1982) offer comprehensive guides to the range of data and information necessary for fisheries management. Depending upon the management objectives and capabilities, a minimal requirement for research data may be defined.

Fishery/Biological Data

Stock assessment will occupy much of the work for planning and monitoring purposes. The type of yield model used determines the set of data needed. For assessment of tropical multispecies fisheries, simplified versions of the surplus production (Schaefer) models and dynamic pool (Beverton and Holt) models have been used (FAO 1978; Pauly 1979, 1980b). The Schaefer model treats the multispecies assemblage as a unit stock and requires a time-series record of any two of the following: total catch, total effort, and catch-per-effort. Pope (1979) developed an interactive production model to account for inter-species competition or predation. A major drawback of this model is the large number of parameters to be estimated, i.e. for n number of stocks, the parameters would be $(n + 1)^2 - 1$ (Hongskul 1980).

Pauly (1979, 1980b) makes use of the yield-per-recruit model by extracting the parameter values for growth (K), fishing mortality (F), natural mortality (M), and total mortality (Z) from the length-frequency data of individual species comprising the catch. Length-frequency analysis can be done using program packages for hand calculators and computer programs for personal computers (Pauly 1981). Where primary data are not available, Pauly (1980a) has proposed some "temporary solutions" for obtaining rough parameter estimates based on empirical relationships he has derived. These length-structured models are useful in determining appropriate mesh size regulations.

Other approaches to stock assessment may be attempted if funding could be programmed ahead of time. These include trawl surveys, acoustic surveys, ichthyoplankton surveys, and tagging studies. Basic biological research should concentrate on migration, spawning, life histories, growth, species interaction, availability of food, stomach content analysis, primary and secondary productivity.

Economic Data

Priority should be given to the collection of primary data on the harvest sector. These include fixed and variable costs, prices, and rate of capitalization. For regional planning, the data needs are more extensive: price changes, net income, employment, labor income, regional income, consumer surplus, management and enforcement costs, and trade flows (Mueller and Wang 1981). The administrative costs include the costs of data collection, scientific research, rule making, and enforcement (Huppert 1982). Accounting public costs would help in evaluating alternative regulatory schemes and management institutions.

Sociocultural Data

Considerable information is available on the socio-economic aspects of municipal fishermen in the Philippines. Future surveys should focus on attitudes and values of fishermen relating to fisheries management. Of particular relevance are attitudes towards fishing effort reduction, formation of cooperatives, technological change, and alternative sources of income (Smith et al. 1980). Sociocultural research should be able to identify the factors determining the success or failure of cooperatives and to study the possible role of cooperatives in resource conservation.

## 5.0 SUMMARY

The Philippine fisheries system may be viewed as a natural-cultural system. It entails several subsystems (biological and human elements) and performs as a subsystem itself of a larger system -- the Philippine social, cultural, economic, political system. The society, in turn, evolves in relation to world events, as it did in the past and will continue to do so in the future. All systems, their elements and contexts, continuously interpenetrate and interact, thereby bringing about qualitative changes inward and outward of their domains (Warren and Liss 1983).

In the context of a developing country, the Philippine government assumes the strategic role of a change-agent in fisheries management. Policy makers and planners need a better understanding of the various system components which may lead to management changes favoring the persistence of a "good" fisheries system. This report describes the major elements of the Philippine fisheries system and the governmental efforts to develop and manage this system.

The relatively small, short-lived, and diverse species found in Philippine waters are concordant with their tropical environment. Exploiting this natural resource satisfies a basic human need. The Philippines being an archipelago, fish is a readily available resource for human consumption, and fishing in the shallow coastal areas is an old industry in the islands.

Various fishing gears and fish preservation methods evolved: many are indigenous, some are introduced or modified through foreign influences. Distribution systems, marketing practices, and markets are also developing in time.

Hence, to most Filipinos, fish together with rice is still the staple food; to the fisherman, fishing is both a way of life and a means of livelihood; and to the nation, the fishery industry is a source of foreign exchange earnings. Given this natural-cultural setting, the Philippines ranks among the leading fishing countries in the world. However, the development and evolution of the Philippine society as a whole and the fisheries system in particular threaten the maintenance or persistence of this system.

The country's population growth rate is among the highest in the world. This means an increasing demand for food and employment, which if not satisfied leads to undernutrition, poverty, politico-economic instability, more widespread undernutrition, poverty, and so on. Such cyclical tendency may be traced to causes not only internal but external as well to the Philippine society: foreign control of trade and industry, worldwide recession, and growing export demand for basic commodities, among others.

As consumer demand increases, fishing pressure likewise increases. In an open-access fishery, fleet expansion and technological improvements are essentially uncontrolled, even encouraged. Commercial fishing vessels concentrate in shallow bays and protected internal seas for technological and economic reasons. Small fishermen fish harder to improve their impoverished living conditions. Insufficient ice supply and consumer preference for fresh fish limit fishing operations in areas close to shore and market centers. All these contribute to the apparent slowing down of harvest from the capture fisheries in shelf areas during the past decade.

The government has an interest in developing the fisheries as well as in conserving the resources. The history of fisheries administration in the Philippines attests to this governmental concern. Fishery institutions, research, and laws began to shape up during the early 1900s under the American regime. Philippines-U.S. collaboration in research and development continues to this day, and assistance from international bodies and other countries have grown in recent years. Regulations to protect the resources from overexploitation and to create order in the fishery industry have been promulgated.

During the 1970s, political reforms elevated fisheries to a priority area of concern. Fishery laws were consolidated and revised, spelling out policies and objectives. Fisheries agencies were created or strengthened, while international organizations came to establish research institutions in the country. Plans and programs for fisheries research and development were drawn in line with the goals set in the national development plan. Self-sufficiency in fish, increased export earnings, resource conservation, employment generation, and upliftment of fishermen's living conditions are major objectives of the Integrated Fisheries Development Plan. An increasing awareness of the overfishing problem in traditional fishing grounds and the establishment of an exclusive economic zone (EEZ) under Philippine maritime jurisdiction are demanding more of a management perspective in the fisheries planning process.

Crises in fisheries science and management are increasingly being felt in the research and planning communities. The four kinds or levels of crises expounded by Warren and Liss (1983) are becoming evident: 1) resource or environmental crises; 2) scientific and management crises; 3) crises in interpretive and communicative understanding; and 4) crises in individual, institutional, and cultural self-understanding. A crisis occurs when expectations become incoherent with possibilities. When people's expectations from their resource are not possible, intensifying the fishing effort endangers the resource system's persistence. When science cannot adequately understand the behavior of multispecies, multigear fisheries, and when management cannot resolve conflicts and interests, frustration and instability arise. Resource, science, and management crises may be caused by incoherences in communicative understanding and self-understanding. Real intentions may be distorted by both scientific and political considerations, giving rise to a self-deception that is difficult to recognize, admit, and surmount.

Since the goal of fisheries management may be taken to be the maintenance of the fisheries system, its biological and human elements, resolution of these crises must be a continuous process. Resource crises may be resolved by changing either expectations or possibilities. Biological research, to gain a better understanding of the nature and behavior of the resource, may partly determine a more coherent direction in fisheries development. But a deeper approach is to constantly engage in "critical self-reflection," a human activity in which the social sciences can play an important role. A higher level of self-understanding that may be useful in attaining the desired system performance may be achieved through socio-economic and policy studies. Sociocultural values and attitudes of fishermen and other participants, dynamics of community development, institutional organization and behavior, and socio-economic impacts of policy options are some areas relevant to management.

In a less developed country, education and public awareness are of strategic importance. The key to the resolution of crises in fisheries management is communication among all parties affecting the performance of the system and among scientists from various disciplines. This means a wider participation in the crucial steps of the management process -- setting of goals and objectives, regulatory measures, and operational schemes; implementation; and evaluation. All management decisions are "value-laden," and where values differ, a consensus among participants should guide action. The role of government then is to foster this communication, with a mutual agreement among all concerned that their primary goal is the persistence of the fisheries system.

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