3.3 **Other areas**

3.3.1 East Malaysia

An estimate of potential yield is made for demersal and semipelagic species only based on the results of a single demersal trawl survey in the coastal waters up to about 50 meters. The estimate is 183,000 tons but is more likely to be between 91,500 to 137,250 tons. The potential yield per square nautical mile of 10.6 tons is similar to that of the east coast of West Malaysia, 10.3 tons.

3.3.2 Deeper waters

(a) West coast of West Malaysia

In waters deeper than 50 meters the average catch rate of about 92.0 kg per hour was lower, about 64% of the catch rate in waters shallower than 50 meters which are fairly well exploited, and with a potential yield of 3.0 tons per square nautical mile.

Unless very efficient gear, such as pair trawling, can be employed to exploit successfully this sparse resource it is not expected that major fishery can be developed.

(b) East coast of West Malaysia and East Malaysia

The estimate of potential yield is comprehensively dealt with by Shindo (IPFC/72/19) and as the average density is low, though in some areas it is higher than others, the problem of developing major fisheries for these demersal fish stocks is similar to the one discussed above for the west coast of West Malaysia.

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The country report of the Republic of the Philippines

Technical Seminar on South China Sea Fisheries Resources

by
The Philippine Bureau of Fisheries
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1. INTRODUCTION

Since the inshore demersal and pelagic fisheries of the Philippines are already highly exploited, it is but timely that the country avail itself of the benefits that are expected to be derived from the South China Sea. Moreover, Kvaran (1971) noted that during the last twenty years, the landings from the marine fisheries have largely increased in the Southeast Asian Countries and more so in the Philippines so taht the country is probably already harvesting a large percentage of its potential yield in its inland seas and territorial seas. Thus, the Philippino fisherman should be encouraged to expand fisheries, particularly the trawl fishery, into under-exploited international waters like the South China Sea.

It is envisioned that more knowledge would lead to an optimum utilization of the resources of the South China Sea.

This paper aims to give a picture of the status of the fisheries resources of the Philippines.

1.1 **The Geographical Setting**

The Philippine Archipelago situated in the outer rim of the Western Pacific is composed of 7,100 islands with a land area of 299,404 square kilometers. Eleven large islands make up more than ninety per cent of this area; only 45 islands have areas greater than 100 square kilometers, the largest being Luzon in the north and the second largest, Mindanao in the south. The major portion of the island group lies within an elongated ellipse extending north-northwest to south-southeast. Palawan and the Sulu Archipelago break away from this main body in a southwesterly direction toward Borneo to form the northwest and southwest boundaries of the Sulu Sea.

The whole Philippines is spread within a territorial[1] area of about 1,965,700 square kilometers lying between latitudes 21°25'N and 4°23'N and longitude 116°00'E and 127°00'E. It is bounded on the east by the Pacific Ocean, on the south by the Celebes Sea and the coastal waters of Borneo, and on the west and north by the China Sea, which separates it from the Asiatic mainland.

The Philippines has limited continental shelves, the 200-meter isobar varying from 1 mile to about 60 miles in the Sulu Archipelago. In most parts of the archipelago it is just 31 to 45 miles from the shore.

A number of seas surround the is lands, and these range from deep troughs and trenches to shallow basin and coral reefs. There are four deep regions of the marine area: one off east of Luzon up to the southeast of Taiwan (3000 fathom); another in the Sulu Sea (3.049); a third in the Celebes Sea (2786 fathom); and the fourth, the Philippines deep east of Samar and Mindanao (10.790 meters).

Philippine waters in relation to land area are extensive (about 5 times the land in surface area) but the insular shelves, the present seat of commercial fishing, are narrow and steep. Shallow waters with depths to 200 meters and up to about 165,000 square kilometers which are limited around the islands. Large portions of the shelf cannot be trawled due to the growth of coral reefs. Fishing for pelagic fish species takes place in shallow waters during strong monsoon winds and in most waters during calm weather.

From the standpoint of oceanography, the Philippine

1. Area as defined in the Treaty of Paris in 1898 between the United States of America and Spain.

Archipelago forms a topographic unit separating the South China Sea from the Pacific Ocean. It stands on a roughly triangular platform with its base forming a natural boundary between the Philippine and Indonesian seas, and its apex pointing northward in the direction of Taiwan and the Ryukyu chain of islands with which the Philippine are linked geologically. Within the platform are various depressions or basin seas in which the bottom water is not in communication with that of the Pacific Ocean to the east nor with that of the South China Sea to the west.

These basin seas are themselves separated oceanographically from one another by definite topographical boundaries which are marked off by the submarine ridges which define the respective limits of the eight basins or oceanographic provinces comprising the internal waters of the Philippines.

By and large because of depth of the surrounding water and distance from the mainland of Asia and its great rivers, the waters surrounding the Philippines are biologically poor compared to temperate waters.

1.2 The Importance of Fisheries to the Country's Economy

Fish is one of the basic foods of the Philippines, second only to rice, the leading staple crop, in importance. The daily diet of the people consists therefore of rice and fish, the latter as the main source of animal protein in the country. The per capita consumption of fish is about 36.5 kilograms of fish/year, which is more than twice the world's average.

In 1971, 67% of the animal protein consumed by the people came from fish. The annual production of fish, however, has not met the requirement of the fast-growing population of the country (Table I). In 1971, for example, the total fish output of 1 million metric tons supplied only about 73.8% of the nutritional fish needs of the people. To partly fill the deficiency, the country had to import 19,000 m.t. of fish and fisheries products valued at some US $20 million. More than 90% of the fish produced in the country comes from the marine fisheries.

Fishery is one of the most important elements of Philippine economy. In addition to supplying food, it produces income, provides employment and earns foreign exchange which is badly needed in the economic development of the country. In 1969–1970, the gross value added in fisheries amounting to P1544 million (U.S. $238.3) contributed 3.91% of the national income and formed 10% of the income derived from the agricultural sector of the economy.

About 700,000 persons are employed in the fisheries industry forming about 4.05 of the total labor force of the country. In view of the drive of the Government for increased food production, more capital is channeled into the fisheries investment stream and more opportunities for employment are created.

The Philippines is fast developing its export trade in fish and fisheries products. In 1970, the total export of fisheries products was only U.S. $3 million and reached to almost U.S. $7 million in 1971. During the first half of 1972, the amount of U.S. $5 million was already attained.

1.3 Fishery Resources

The fishery resources of the country consist of more than 2,200 species of fish which may be grouped into bottomliving (demersal) and free-swimming (pelagic) fishes. However, only less than 100 are of economic importance.

The eighteen (18) commercially important fishes by production are divided almost equally between the free-swimming (pelagic) and bottom-living (demersal) groups. Of the pelagic fishes, those that form important fisheries are roundscad (*Decapterus*), sardines (*Sardinella*), anchovies (*Stolephorus*), chub mackerel (*Rastrelliger*) and

Table I

Fish Requirement and Available Supply (Fish Production and Imports)

Year	Fish Production in Metric Tons	Fish Requirement in Metric Tons	Fish Consumption in Metric Tons	Imports of Fish and Fish Products (M.T.)	Imports of Fish and Fish Products ($)	Population
1952	313,060	527,112	335,711	23,843	7,853,302.00	21,533,000
1953	305,626	537,130	334,810	31,165	9,954,597.00	22,191,000
1954	343,625	547,340	366,722	26,345	5,851,814.40	22,869,000
1955	362,927	552,994	411,183	50,286	10,523,574.40	23,568,000
1956	393,648	563,533	436,458	45,964	8,038,623.57	24,288,000
1957	387,170	579,722	439,393	56,315	9,843,850.00	25,030,000
1958	426,666	590,722	488,301	65,229	10,713,913.33	25,795,000
1959	436,481	635,491	478,710	47,304	7,323,010.00	26,584,000
1960	444,622	740,483	528,033	86,539	12,693,426.28	27,387,000
1961	454,899	774,767	520,008	74,630	8,994,989.00	28,212,000
1962	483,948	800,955	515,947	38,370	9,193,818.00	29,062,000
1963	547,354	830,922	593,137	49,850	13,885,220.00	29,937,000
1964	603,506	954,210	643,278	49,439	14,400,076.92	30,839,000
1965	667,202	991,698	709,471	51,731	15,423,003.00	31,768,000
1966	705,278	1,026,414	746,260	50,120	14,877,148.00	32,725,000
1967	746,063	1,062,553	796,841	67,689	17,733,312.67	33,711,000
1968	937,684	1,309,729	1,001,802	88,291	20,159,243.27	34,726,000
1969	940,792	1,356,267	985,476	71,034	15,549,575.40	35,772,000
1970	998,884	1,338,984	1,040,005	62,746	18,019,829.00	36,648,486
1971	1,023,095	1,386,380	1,076,715	68,883	20,406,703.	37,919,096

tunas (skipjack, yeito tuna, yellowfin tuna and frigate mackerels). Their production formed 53% of the total commercial fish output of the country in 1971.

The most important demersal species are the slipmouth (*Leiognathus*), lizard fish (*Saurida*), *Caesio* and cavalla (*Caranx*). In 1971, their total landing was 83,645 tons corresponding to 21.88% of total commercial production.

The free-swimming fishes are mainly caught by purse seine, bagnet, and round haul seines while the bottom-living species are fishes mainly caught by otter trawl, beach seine, gill net, drive-in-net and hook and line.

Of the 15 most important fishing grounds about one-half are with depths of less than 100 meters. These are the Sulu Sea, Visayan Sea, Manila Bay, Sibuguey Bay, San Miguel Bay, Davao Gulf, Samar Sea, Guimaras Strait, Ragay Gulf, Sarangani Bay, Moro Gulf Tayabas Bay, Batangas Coast and the Babuyan Channel. The poor productivity of the internal waters is closely related to the depth.

Studies undertaken since 1957 indicate the very low catch per unit of effort of our trawl fishery which is about 15 kilos per hours in the most important trawling ground of the country (Manila Bay) and about 35 kilos in other parts of the country.

1.4 **Fisheries Industry**

The fisheries industry of the country is arbitrarily divided into municipal, commercial and inland.

1.4.1 Municipal Fisheries

There are about 50,000 sustenance fishermen using small boats (not more than 3 gross tons) which make up the municipal fishery and produced in 1971 some 542,904 metric tons of fish. These made up 53.06% of the total production that year.

It is estimated that there are probably as many as 271,000 fishing boats in the municipal fishery of which one-fifth is motorized.

1.4.2 Commercial Fisheries

In 1971, there were about 2,180 licensed commercial fishing vessels that were in operation whose tonnages ranged from 31 ot 600 G.T.; they operated from 50 to 800 km from the home port. There were some 1,880 vessels of over 3 gross tons which produced 382,276 metric tons of fish (more than 37%). Roundscad forms one of the most important catones of the fishery totalling some 142,921 metric tons in 1971.

Bagnet and purse seine catches formed more than 53% of the total catch of commercial fishing vessels in 1971.

1.4.3 Inland Fisheries

About 168,000 hectares of swampland have been developed into brackishwater fishponds which are used primarily for the culture of milkfish (*Chanos chanos*).

This produced some 100,000 tons of fish in 1971 valued at about U.S. $41 million and supplied about 10% of the total fish production of the country.About 170,000 people are employed in this fishery.

The development of freshwater fishponds is just beginning, and is given priority by the Government.

2. PELAGIC RESOURCES (OFFSHORE AND INSHORE)

2.1 **Fish Species**

The pelagic (free-swimming) fish species in the Philippines which number more than 25 species are usually caught by purse seines and bag nets. The most common and commercially important of these are roundscads (*Decapterus spp.*); sardines (*Sardinella* sp.); chub mackerels (*Rastrelliger* spp. and *Scomber* spp.); Spanish mackerels (*Scomberomorus commersonii*); anchovies (*Stolephorus* spp. and *Engraulis*); several species of cavallas (Caranx); big-eyed scales (*Caranx crumenopthalmus*); yaito tuna (*Euthynnus yaito*); skipjack (*Katsuwonus pelamis*); yellow fin tuna (*Thunnus albacares*) and frigate mackerels (*Auxis*).

2.2 **Fishing Grounds**

The major grounds of these pelagic species are concentrated in the coastal and shallow seas between the islands throughout the country. These are the northern Palawan area, Manila Bay, Sulu Sea, Visayan Sea, the Sibuyan Sea, Sibugyey Bay, Tayabas Bay, Davao Gulf, Lamon Bay and Samar Sea.

During the South West monsoon months (June to October), fishing for pelagic fishes takes place in shallow waters and during calm weather in most open waters. The tropical storms from June through December usually originate well to the east of the Philippines. This naturally prevents extensive exploitation of the pelagic fish resources in the area east of the Archipelago. In Palawan Area operations are concentrated on the northern section during the southeast monsoon season and to the western coast during the northeast monsoon season. During the trade wind season, March to May, quite a number of bagnetters operate in the southeastern part of Luzon.

2.3 **Fishing Gear**

Commercial pelagic fishing commonly makes use of light. This started with the use of Kerosene lamps in connection with the operation of round haul seine or *sapyaw*. Then in the sustenance fishery in the Visayan Islands, bagnet (*basnig*) and light (pressure kerosene lamps) quickly outpaced the round haul seine by 1935. However, both the round haul seine and the bagnet have been in continuous use until 1960. With the improvement of the bagnet through the use of brighter lights using electric generators and synthetic (*Kuralon*) nets, it became the second most important gear in the country in the late sixties. In 1971, there were more than 700 basinigan uniits of which about 50% is from 3 to 10 gross tons.These landed 85,861 metric tons of fish or 22% of the combined production of all commercial fishing vessels.

In the country, especially in Manila Bay, non-mechanized small purse seiners (the *talakop* and the *ku-kub*) had been used, especially for chub mackerel. But they proved inefficient and were surpassed by the basnigan. An active search for still better improvements in light fishing was made. In 1962, a private operator introduced a modern U.S. West Coast-type purse seiner equipped with Puretic power block. This used similar light methods as those used by the basnig vessels whereby they were used as light boats to concentrate the fish thru light.

In 1963, the purse seine expert of the FAO demonstrated the technical advantages in modern purse seining. This led other bat owners to shift to this type of fishing. In 1971, more than 200 units of modern purse seiners which range from 60 to 180 gross tons operated in the country. It is estimated that 117,684 metric tons of fish had been landed from purse seiners in 1971 which form about 31% of the total production of all commercial vessels of the country.

The rapid expansion of purse seine-basnigan fishing with light throughout the Philippines was made possible by the joint effort of the then Philippine Fisheries Commission and the FAO-UNDP Deep Sea Fishing Development Project with the cooperation of the private sector.

2.4 Fishing Seasons of the Major Species

The fishing operations for the different pelagic species vary in different places. These are shown below:

Pelagic Fishes and Their Fishing Areas and Seasons

Fishes	Fishing Areas	Fishing Seasons
Roundscads (*Decapterus* spp.)	Palawan waters	March to August
	Batangas Bay	(April and May, peak)
	Tayabas Bay	
	Northern Zemboanga	
Sardines (*Sardinella* spp.)	Manila Bay	December to May
	Visayan Sea	Throughout the year (May to October, peak)
	Cynthia Bay and adjacent Islands, Palawan	December to May
	Brooks Point and Panacan, Palawan	May to September
	Malampaya Sound	Throughout the year
	Southern Zamboanga	December to May
	Sulu Archipelago	Throughout the year
	Panay Gulf	– Ditto –
Mackerels		
Into-Pacific Mackerels (*R. brachysoma*)	Manila Bay	May to December
	Malampaya Sound and vicinity	May to September
	Southern Samar	February to May
	Gigantes and Bantayan (Visayan Sea)	April to October
Indian Mackerels (*R chrysozonus*)	Eastern and Northern Palawan and vicinities	December to June
	Northeastern Palawan and Cuyo group	April to November
	Southern Zamboanga and Sulu Archipelago	December to May
	Visayan Sea	April to October
Scomber spp.	Manila Bay	Throughout the year
Scomberomorus commersonii (Spanish mackerel)	Manila Bay	January through April
	Cynthia Bay	– Ditto –
	Malampaya Sound	– Ditto –
	Visayan Sea	Throughout the year
	Guimaras Strait	– Ditto –
	Mindanao Area	– Ditto –
	Zamboanga area	– Ditto –
Cavallas (*Caranx* app.)	Northern and Eastern parts of Palawan	March to October
	Panay Gulf	Throughout the year
	Visayan Sea	– Ditto –
Big-eyed scads (*Caranx crumenophthalmus*)	Lingayan Gulf	December to May
	Batangas Bay	– Ditto –
	Balayan Bay	– Ditto –
	Tayabas Bay	– Ditto –
	Northern Palawan	May through October
	Visayan Sea	Throughout the year
	Southern Zamboanga	– Ditto –
	Sulu Archipelago	– Ditto –
Anchovies (*Stolephorus* spp.)	Manila Bay	November to May
	Balayan Bay	February to June
	Batangas Bay	– Ditto –
	Coron and Gutob Bays	Throughout the year
	Taytay Bay	May to September
	Tayabas Bay	November to May
Tunas bonitos and frigate mackerels	Northern Palawan	December to June
Yellowfin tunas	Zambales Coast	January to April
	Balayan Bay	November to June
	Batangas Bay	– Ditto –
	Off Lubang	– Ditto –
Skipjack or oceania bonitos	West coast of Panay	February to May
	West Visayan Sea	March to June
	South Solu Sea	Throughout the year
Blue bonitos or yaitotunas	Off-Corregidor to Lubang and west coast of Mindoro	January to May
	Solu Sea	Throughout the year
	Davao Gulf	– Ditto –
Frigate mackerels	Northern and northwestern Zambales Coast	January to May
	Sulu Archipelago	– Ditto –
	Manila Bay	December to May
	Bantagas Bay	November to May
	Balayan Bay	November to May

2.5 Fish Production

The bagnet and purse seine fishermen, numbering 19,136 in all, made up one-half of the total number of fishermen engaged in commercial fishing in 1971. Bagnet and purse seine catches of pelagic fish constituted more than 53 per cent of the total catch of the commercial fishing vessels in 1971.

The roundscads since 1963 have become the principal catch of the bagnet and modern purse seines. In 1971, some 142,921 metric tons or 37 per cent of the catch of commercial fishing vessels were roundscads. Based on the yearly production, the Sulu Sea was the richest fishing ground for this fish group forming 87 per cent of the total commercial fish production in 1971 (Table II).

The total catch of sardines which rank next in importance to the roundscads amounted to 44,086 metric tons or 11.5 per cent of the total commercial fish landed in 1971. Again the Sulu Sea was the richest fishing ground for this fish group with its production forming about 84 per cent of the total commercial fish production also in 1971.

As in the roundscads and sardines,the Sulu Sea was the principal fishing area for chub mackerels in 1971. Their production amounted to 19,992 metric tons or 5.2 per cent of the total commercial fish production.

Landings of the big-eyed scads (*Caranx crumenophthalmus*) amounted to 18,414 metric tons which are equivalent to 4.8 per cent of the total production of the commercial fisheries in 1971. Most of these landings were from the Visayan Sea and the Sulu Sea.

Among the pelagic fishes the anchovies mostly (*Stolephorus*) occupy only the fifth place in 1971, with a production of 7,400 metric tons or 1.9 per cent of the total production. This group which used to occupy the first place during the 1950's was mostly landed from Coron Bay, Manila Bay, Taytay Bay, and Sulu Sea.

In 1971, the Visayan Sea, Sibuguey Bay, Sibuyan Sea, and the Sulu Sea yielded most of the catch for herrings, amounting to 1,543 metric tons or 0.4% of the total landings of the commercial fisheries.

Table II

Pelagic Fish Production in Metric Tons by Fishing Grounds (First Ten Highest) in 1971

Fishing Grounds	Roundscads	Sardines	Chub Mackerels	Big-eyed Scads	Anchovies	Herrings
Sulu Sea	125,728	37,974	11,593	5,278	663	427
Visayan Sea	3,677	2,483	701	8,205	220	152
Manila Bay	1,799	374	2,192	316	941	38
Davao Gulf	4,080	148		1,474		
Sibuguey Bay	2,236	893	821	1,093	480	187
Tayabas Bay	1,205		427		270	
Sarangani Bay	946	714	288	292		
Lamon Bay	524					
Batangas Bay	405					56
Sibuyan Sea		101	161			103
Coron Bay					1,364	
Burias Pass	252					
Taytay Bay					826	
Iloilo Strait		218		263		147
Moro Gulf		238	254			
Samar Sea			187		334	
Guimaras Strait				550		182
Tawi-Tawi		152				
Maqueda Bay			206			
Capiz Coast				298		
Illana Bay				103		
Babuyan Channel					439	
Malampaya Sound					253	
Asid Gulf						48
Ragay Gulf						74

3. DEMERSAL RESOURCES (OFFSHORE AND INSHORE)

3.1 Fish Species

The exploitation of the demersal (bottom) resources of the country depends to a large extent on the trawl fishery which in turn depends on 30 families of fishes which include some 98 species. However, only a few species are caught in sufficient commercial abundance. These are the slipmouths (*Leiognathus* spp.); threadfin breams (*Nemipterus* spp.); lizard fishes (*Saurida* app.); and croakers (*Pseudosciaena* spp. and *Sciaena* spp.). Shrimps and crabs also form a part of the demersal resources.

Some 20 families consisting of 55 species of reef fishes are also considered demersal. The most important are the caesios, porgies, surgeon fishes, snappers and siganids.

3.2 Fishing grounds

The principal trawling areas are Lingayen Gulf, Manila Bay, Visayan Sea, Sibuguey Bay and Palawan waters especially Bacuit Bay, Coron Bay, Taytay Bay and outer Malampaya Sound.

For reef fishing, the principal areas include Stewart Banks, Scarborough Reef and Apo Reef; also the areas around Fortune, Lubang, Marinduque, Cuyo, Busuanga, Polillo, Ticao, Burias and Masbate Islands.

3.3 Fishing Gear

Presently, the demersal resources of the country are mostly vulnerable to the otter trawl, the muro-ami and the hook and line and occasionally to the gill nets. Some first and second-class fish are also caught by the simple and multiple handlines, fish corrals and deep-water fish ports.

Of these, the otter trawl which was introduced in Manila Bay in 1947, is most important commercially. In 1953, it was observed that the otter frawl fishery in Manila Bay was the most important fishery in the country. From then on there was an increase in the number of trawling vessels operating in Manila Bay as well as in other trawling grounds. Correspondingly, there has been a general over-all decline in the average catch per trip, even with the increase in space and depths of commercial operations.

In 1971, there were 652 units of otter trawls ranging in size from 3 to more than a hundred gross tons. These gave

employment to 10,432 fishermen.

In the early 1930's the Japanese trap net or muroami was introduced in the Philippines. This started the demersal reef fishery. There were 16 Japanese trap-net fishing vessels in operation at the outbreak of World War II. This decreased to 2 units in 1950 due to the use of explosives in the fishing grounds. In 1971 there were registered 37 units which were manned by 962 fishermen.

3.4 Fishing Seasons

As those of the pelagic fisheries, the trawl fishing operations are affected by the monsoon seasons. The trawl fishery is conducted almost throughout the year in the different trawling areas, the operation being shifted from one sheltered coast (productive areas) to another, avoiding the prevailing monsoon.

For reef fishing, the principal operation is conducted during the calm months of December through May.

3.5 Fish Production

In 1971, the otter trawl production was 146,358 metric tons which was 38 per cent of the total commercial catch. This surpasses the production of the purse seine and even that of all the major fishing gear. However, as was mentioned before, it was observed that with an increase in the number of trawlers operating in the various fishing grounds, there was a resulting decrease in the average catch per trip. In 1969 there was a decrease in the total production which may be explained by the decrease in the country's trawlable areas and the more rigorous enforcement of prohibitions on trawling in waters less than 7 fathoms deep.

Thirty-seven units of Japanese nets or *muro-ami* caught 17,894 metric tons of fish which made up 4.6% of the total commercial fish landing in 1971. The hook and line, on the other hand, landed 7,638 metric tons of fish or 1.9 per cent of the total production of the commercial fishing vessels.

An analysis of the production by kind of the most important demersal species showed that slipmouths predominated in the 1971 catch (Table III). This amounted to 32,579 metric tons or 8.52 per cent of the total commercial fish production. The slipmouths were mostly taken from the Visayan Sea making 4.5% of the total commercial fish landed in the countryThe next productive fishing ground was the Sulu Sea; Manila Bay come third.

The nemipterids rank second. Their production in 1971 was 16,655 metric tons which are equivalent to 4.36 per cent of the total production. The amount which was mostly landed from the Sulu Sea was 7.898 metric tons. The Visayan Sea and Manila Bay rank second and third, respectively, in the production of this fish group.

The production of lizard fishes which came third was 12,305 metric tons or 3.22 per cent of the total fish production. Again the Visayan Sea was the most productive, followed by the Sulu Sea and then by Manila Bay.

Fourth in production by kind were the croakers which amounted to 9,404 metric tons or 2.46 per cent in 1971. The Visayan Sea, the Sulu Sea and Manila Bay were the first three productive fishing grounds for these fishes.

Of the invertebrates, shrimps constituted 3.32 per cent of the total fish production. This amounted to 12,702 metric tons. The Sulu Sea was the most productive, followed by the Visayan Sea and then by Manila Bay. The crabs were mostly caught from the Visayan Sea and Manila Bay. Those caught by the otter trawl amounted to 1,737 metric tons in 1971.

Table III

Demersal Fish Production in Metric Tons by Fishing Grounds (First Ten Highest) in 1971

Fishing Grounds	Slipmouth	Nemipterid	Lizard Fish	Croaker	Shrimp	Crab
Visayan Sea	17,480	3,472	7,697	6,018	6,017	1,134
Sulu Sea	7,162	7,898	1,861	1,258	3,671	2
Manila Bay	2,751	2,363	687	366	1,325	22
Sibuguey Bay	272	847	17	6	84	2
Lingayen Gulf	191	57	92	30	57	1
Sibuyan Sea	141	4	26	9	11	
Panay Gulf	142	44	53	99		
Batangas Bay	67	48				
Davao Gulf	36	11	2		4	0.2
Tawi-Tawi Bay	20					
Sarangani Bay	10	4				
Taytay Bay	2					
Cuyo Pass	0.3					

3. OTHER RESOURCES INCLUDING AQUACULTURE AND MINOR SEA PRODUCTS

3.1 Aquaculture

Aquaculture or fish culture in the Philippines included cultivation of fish both in the brackishwater areas and inland bodies of water. It is quite well developed and extensive on the brackishwater areas while in the inland areas it is just beginning.

There are about 168,400 hectares of developed fishponds, 365,318 hectares of undeveloped salt and brackish water mangrove swamps and 126,248 hectares of potential freshwater fishponds available for development and about 150,000 hectares of inland bodies of water as lakes and dams..

In 1971, 10% of the total fish production of the country or oughly, 100,000 metric tons of the total 1,000,000 metric tons produced was from fishponds.

Fishes harvested from lakes, rivers and other inland bodies of water most probably comprised a small percentage of the total 543,000 metric tons of fish produced by the municipal and sustenance fishing.

The average annual production of the developed fishponds is about one-half ton per hectare which is low five compared to other countries where production is about five times more. This represents a total investment of about P340,000,000 (US $2,278,000,000).

3.1.1 Brackishwater pounds

About 150,000 hectares of swamp lands have been developed primarily for the culture of milkfish or bangos (*Chanos chanos*). The techniques of bangos culture are based on the fact that the bangos or *Chanos chanos* spawns in the sea and the fry drift with the current to coastal areas. The fry are caught by professional collectors and sold to pond operators who grow them to the fingerling stage. Table IV shows the number of bangos fry which were gathered for the year 1971 from the different regions in the country and which were sold to fishpond operators for stocking purposes. The stocking rate varies widely from 2,000 to 12,000 per hectare of pond.

3.1.2 Freshwater ponds

Although not yet common in the Philippines, yet attempts have already been made on the aquaculture of commercially important species like bangos (*Chanos chanos*), hito (*Clarias* sp.) and the common and Asiatic carps so that areas of developed fishponds may be expended.The fish seeds of the common carp can be produced by local hatcheries but Asiatic carps require a special technique, namely the injection of pituitary hormone, to induce them to spawn.

Even with the very few data on the freshwater fisheries that are available, it is estimated that freshwater fishponds can yield 300–500 kilograms on the average.

The use of fish pens which is the most recent innovation in aquaculture was started commercially in 1972. This is a cheap and feasible method of culturing fish especially bañgos, carps and tilapia in our freshwater areas. This makes use of the principle that fishes utilize the available food organising in an enclosed area of any inland body of water as lakes and dams.

This method of culture is being done in Laguna de Bay, Sampaloc Lake, San Pablo, Taal Lake in Batangas and Lake Bato in Camarines Sur. Lake Lanao in Lanao and Lake Buluan in Cotabato are also being considered for fish pen operation. In Laguna de Bay there are 252 fish pen units ranging from 1/5 of a hectare to 24 hectares. As much as 8–12 metric tons can be harvested from one hectare per season.

3.2 Minor Sea Products

The territorial marine waters of the Philippines abound in aquatic life other than fish. These are mollusks, crustaceans, echinoderms, reptiles, sponges, corals and seaweeds.

3.2.1 Moolusks

Of all the countries in the Indo-Pacific Region, the Philippines produce the greatest variety of sea shells.

The mother of pearl oysters include two important species, the gold lip (*Pinctada maxima*) and the black lip (*P. margaritifera*) shells. Both species are found in many parts of the country but especially around Basilan and the Sulu Archipelago, Illana Bay, Palawan waters, the Visayan Sea especially around Bantayan Island and the waters around Natanes Group. Besides being used for the culture of pearl, a valuable export product, the pearl oyster shells are also used in the manufacture of pearl buttons and shellcrafts. *Pinctada martensii* is found in commercial quantities in Davao Gulf for the culture of Japanese pearls.

The smooth top shells (*Trochus niloticus*), the rough top shells (*T. maximus*) and the turbo shells (*Turbc marmoratus*) are those that constitute the so-called button shells. The trochas are found in littoral shallow reefs around the Batanes Islands, Pangasinan, Bical provinces, Palawan, Eastern Samar, Masbate and Eastern Davao Gulf. The turbo shells abound around the islands of Masbate, Cebu, Tawitawi and Sitankai, the coasts of Negros and northern Palawan. These button shells are made into buttons; their meat is used for food.

Twelve species of oysters are commonly found in Philippine waters. But three are commercially cultivated in bays, coves and estuaries in Luzon, Visayas and Mindanao. These are *Ostrea malabonensia* (*Kukong kabaya*), *O. iredalei* (*talabang chinelas*) and *O. cuculata* (*pulid-pulid*). Oyster meat is a favorite culinary item among Filipinos while the shells are used for clutch, lime, paints and poultry grit.

The *tahong* (*Mytilus smaragdinus*) is also widely distributed throughout the Philippines in the littoral zones, in shallow coves, bays and mouths of estuaries where the water is strictly brackish and not subject to heavy silting. It is cultivable. *Mytilus* farms have been established in Manila Bay along the coast of Bacoor, Cavite. The meat of this mussel has a flavor that is comparable to may edible mollusks.

The window pane shell which is called the *Placuna placenta* is the main source of shells for window panes, screens and various kinds of shellcrafts both in the Philippines and the Asiatic mainland. It is widely distributed at the eastern part of Manila Bay and the waters bordering the provinces of Pangasinan, Bohol, Negros, Capiz, Iloilo, Masbate and Mindanao. It can be cultivated like the oysters and green mussels especially in shallow brackish waters with muddy bottom. Its meat can also be used for food.

Marine decorative shells like the papal mitra, imperial harp, tapestry, courtire volute, imperial volute and scallops are fairly well distributed throughout the country's coastal sea reefs and deeps. Rare shells can be gathered from Samar, Marinduque, Mindoro, Masbate, Hundred Islands in Pangasinan, Catanduanes, Quezon, Palawan, Antique and the Sulu Archipelago. The *Conus gloria maris* which is the most beautiful and famous is very rare and costly.

Other edible shells like the clams, saltwater mussels, whelks and the chambered nuatilus are found along the shores of Lubang, Mindoro and the provinces bordering Manila Bay, Lingayen Gulf and Babuyan Channel.

The squids (*Loligo* spp.), cuttle fish (*Sepia* spp.) and

octupuses (*Octopus* spp.) are pelagic in fishing banks, bays, coves, open seas and reefy areas especially around Mindanao, Bantayan Island, Manila Bay, Lingayen Gulf and the Bicol region. Those species suitable for marine culture are used for food and fish bait.

3.2.2 Crustaceans

The fresh shrimps and lobsters found in Manila markets are mostly of the three genera, namely: *Palaemon, Penaeus* and *Palinurus*. The first genus includes both brackish and freshwater shrimps. The second genus refers to marine and brackishwater forms while the third includes only the marine spiny lobster or **banagan**. These come from Manila Bay, Lingayen and Ragay Gulfs and from fishponds and fish corrals being operated in various parts of the Philippines. They are usually utilized as food but the sugpo (*Penaeus monodon*) has become popular because supplying sugpo fry to fishpond operators is now a distinct and lucrative industry in many places in the Philippines.

The crabs are mostly marine and brackishwater forms. The most popular edible species are *Neptunus pelagicus* (*alimasag*) and *Scylla serrata* (*alimango*). They are abundant in almost all fishing banks like Manila Bay, Panay Gulf, Zamboanga waters especially Sibuguey Bay, Visayan Sea and Samar Sea.

3.2.3 Echinoderms

Among this group of animals, the holothurians, known as trepang or **balatan** or **beche-de-mer** are the most important and popular. These sea cucumbers are gathered from the deep seas and reefs of the Sulu Archipelago, Mindanao, the Bicol provinces, Leyte, Palawan Batangas, Lingayen and Quezon. Cured trepang is used in Chinese cuisine in preparing savory soups and meat stews.

Other echinoderms like starfishes and sea urchins are also found in reefs. They are gathered and dried for decorative purposes. The gonads of sea urchins are cooked and eaten like fish roe.

3.2.4 Reptiles

Sea snakes of the genus *Lacticauda* are common in harbors, bays, rock shelves and reefs. *Hydrophis inormatus* is common in Manila Bay and other bays of the Philippines. Tanned snake skins are manufactured into bags, belts and shoes for local use and export.

The marine turtles that are common in warm waters of the Philippines are the hawksbill (*Eretmochelys imbricata*), the green turtle (*Chelonia mydas* and *C. japonica*) and the loggerhead (*Thalassochelys caretta*). The tortoise shell of commerce is supplied by the first species; meat and eggs by the second species and turtle oil of commerce in addition to eggs and meat by the third one. The Turtle Islands near Borneo are the known turtle breeding grounds.

3.2.5 Sponges

The commercial species of sponges that occur in Philippine water beds are the sheep wool sponge, elephant ear simocca sponge, rock sponge, reef sponge, grass sponge and silk sponge. These are gathered in the shallow waters of Sitankai reefs, Tawi-tawi reefs. Seasi and Sacol Island in the Sulu Archipelago and in the sponge beds of Zamboanga, Basilan and Cebu. Sponges are processed and used in industries for absorbent materials.

3.2.6 Corals

The corals due to their graceful forms and soft colorations serve as the chief attraction of tropical and subtropical "submarine gardens". The red or horny corals (*Corallium* spp.) are precious and are found in Davao Gulf and in the continental shelf northeast of the Babuyan Islands. The black corals (*Anthipathes* sp.) are found in shallower waters around the Sulu Archipelago, around Mindanao, Palawan and the western coast of Luzon. They are made into jewelry such as bar pins, bracelets and earrings.

3.2.7 Seaweeds

The thallophytes or seaweeds (green, brown and red algae) play an important part in the economy of both orientals and occidentals. In the Philippines, these abound in the shallow waters around Batanes Islands. Babuyan Islands, Luzon, Lubang Islands, Palawan, Visayan Islands, Northern Mindanao and the Sulu Archipelago.

Eucheuma sp. (**ruprupuuc** or **guso**) is a red alga which is the most important commercial seaweed in the country.This alga grows on coral reefs and inthe rocky and sandy bottom of marine inter-tidal or subtidal zones where the water is very salty, clear and fast moving. In the Visayas and Mindanao areas, it is eaten raw as salad. From it is extracted "carrangeenin", a valuable substance used in products that need gelling, suspending, thickening or water holding properties like ice cream, peanut butter, paints, cosmetics, textile rubber products, etc. This alga grows in great abundance in the Sulu Archipelago, Zamboanga, Palawan, Cebu, Bohol, Samar, Surigao and Polillo. It may also be found in Pangasinan, Mindoro, Negros,Panay, Batangas, Masbate, Leyte, etc.

Cracilaris conferviodes (**gulaman dagat**) is the species most extensively found in Manila Bay especially from November to May. Other sources of Gracilaria are Zamboanga, Sulu and Cagayen. These seaweeds are the main source of agar-agar or gulaman which is used in some bakery and dairy products, candy, jelly, canned foods and other items; its most important service is as a bacteriological culture medium. Gracilaria is also used as supplemental food for the bangos. Japan, quite recently, has become our biggest importer of this seaweed.

Gelidium sp. or agar weed abounds in the inter-tidal and subtidal littoral zones. It is one of the sources of high quality agar and is very much in demand in Japan.

Hypnea, a red seaweed, is a source of commercial agar. It is also being utilized directly as food in many parts of the country like Manila Bay area, Nindoro, Zamboanga and Cagayan (Santa Ana).

Sargassum – This is a brown alga and is most abundant in the coral reef areas like the Hundred Islands in Pangasinan, the Palswan area, Mindoro, Cebu and Batangas. It was found to have a high content of alginic acid ad may be used in the production of commercial alginate chemicals. It may be also be utilized as fertilizer.

Digenea simplex (**bodo-bodo**) – This seaweed is found in the northern coast of Luzon and is an efficient vermifuge. It is also eaten fresh or dried by some people.

4. ECONOMIC AND SOCIAL ASPECTS OF THE RESOURCES

4.1 Fish Marketing

In the Philippines fish marketing is entirely carried out by private enterprises without any government intervention, in market sheds in bigger coastal cities and towns and in most places just on the beach. The wholesale of fish takes place at night during the very early morning hours so that fish can be distributed to the retail markets before the temperature goes too high. The sale of fish is mostly done by women who sell them either by secret bidding (whispering) or by open bidding.

4.1.1 Fish Handling

In the Manila area, the most important landing place for fish is the Navotas Fish Landing where more than 50 per cent of the total catch fromthe commercial fishing is landed. Here, the market itself consists of a long shed on the beach. The fish are placed on the bare sand in various containers mostly tubs (bañeras) containing 35 to 40 kg. of fish and small boxes made of bamboo strips containing about 6 kg. of small trawl fish and shrimps.

In many instances,the brokers have constructed an elevated concrete floor from the roadside to the waterfront where fish are chuted down from the amphibians to the ground and carried by hand further up in te market.

The then Philippine Fisheries Commission (now Bureau of Fisheries) had started constructing a 4,000 sq.m. market hall with 3 m. x 20 m. stalls on the 2.5 hectare site in Navotas. Although it is not yet complete, it has somehow facilitated the marketing process with the expansion of the deep-sea fishing fleet.

The other wholesale fish market is at the Divisoria central market in Manila. The wholesale of fish takes place in the open in the street and sidewalks alongside the retail market. The fish is brought in by trucks from other landing places in the south as well as by railway from the Bicol area. Fish especially milkfish brought in by inter-island vessels to Manila are also sold here. The sale procedure is similar to that in Navotas although the fish are sold by weight (kilos).

In the provinces, the wholesale fish markets are in a better condition than those in the Manila area. Most of them have at least concrete flooring and better sanitary conditions. However, they are hampered very much by lack of ice which, if available, is priced very high, almost three times as high as in Manila.

4.1.2 Transport and Distribution.

Transport of fish by land is carried out by ordinary trucks and jeepneys and by railroad and public buses on a small scale. Sea transport is almost always carried out by private vessels. Only small quantities are transported by inter-island vessels. Air transport is also carried out either by the regular passenger flights or at times by chartered cargo planes.

When fish are landed at some landing points, these are transported by trucks to the Manila markets. Such trucks are of the ordinary openbodied type without insulation or any form of refrigeration. If the fish are packed with ice and the temperature in the fish is about 8°to 10°, it is obvious that the flow of warm air over the fish raises the temperature and accelerates the melting of the ice. The same type of truck is used for distributing fish from the wholesale markets in the city and suburbs.

The fish carriers are actually ordinary fishing vessels which can be used not only for transporting fish but also for fishing. These are provided with insulated holds for ice and fish.

4.1.3 Ice Plants and Cold Storages

In Manila as a whole, the ice plants can produce about 1300 tons of ice a day, of which about 30 per cent is available to the fishing industry and can therefore meet its demands. However, during the peak season of galonggong or roundscads which coincides with the hot season, the vessels sometimes wait for more than a week getting ice because the production of ice is hampered to some degree by water shortage. Despite all these the ice operators are doing their best to increase production by expanding their plants.

In the provinces, ice production is intended more for consumption by hotels and restaurants and other purposes. Several plants roduce ust enough ice for the normal daily sale and during the summer season do not produce a stock of ice to meet the demand. Thus, there is almost a permanent shortage of ice for the fishing industry.

The then Fisheries Commission started putting up small units of flake ice plants at various places wholly to supply ice to the fishing industry in remote areas where ice had not been available. At present there are 14 ice plants that have been completed and are operating at strategic points all over the country.

The Bato-Bato ice plant in Tawi-Tawi, Sulu now enables the Sulu fishermen to deposit their catch at the

Table IV

Bongos Fry Production for 1971

Sources	April	May	June	July	August	September	Total
Regional Office No. I		5,955,000	33,015,000	7,115,500			46,085,500
Regional Office No. II							No report
Regional Office No. III		628,000	325,000	200,944,800			201,897,800
Regional Office No. IV	100,000	1,803,200	885,000	23,500	520,000	2,515,000	5,846,700
Regional Office No. V				34,702,400			34,702,400
Regional Office No. VI			330,000	17,680,000			18,010,000
Regional Office No. VII							No report
Regional Office No. VIII	44,000	237,000	130,000				411,600
Grand total	144,000	38,623,800	234,685,000	260,466,200	520,000	2,515,000	306,954,000

ice plant to be accumulated to bigger commercial quantity and await better price or to be sold to some of the fishing vessels and carriers from Luzon, the Visayas or Mindanao, plying in that area. Besides, commercial fishing boats which used to travel far to go fishing and return for ice supplies would now be able to fish the whole year round in the Sulu seas.

The new ice plant in Enrique Magalona, Negros Occidental is well situated to serve the storage of dried and fresh fish for local consumption and transhipment of bangos to Manila through Bacolod.

These 14 ice plants have a combined ice-making capacity of 168 metric tons per day and total fish storage capacity for 1,145 tons per day.

The then National Economic Council (now National Economic Development Authority), following President Marcos' directive, approved an allocation of 14 additional ice plants and cold storages to be acquired through Japanese reparations for the Bureau of Fisheries. These additional cold storage plants are expected to increase the incremental production goal of the Bureau from 90,000 metric tons to 110,000 metric tons of fish annually.

4.2 Fisheries Cooperatives

The Bureau of Fisheries has started organizing fisheries cooperatives in strategic areas throughout the country. Of the 16 fisheries cooperatives that were targetted in 14 provinces of the Philippines by the Bureau, four cooperatives have been formed. These are the Cavite City Small Fishermen's Cooperative and Marketing Association and the Naic Small Fishermen's Cooperative and Marketing Association in Cavite, the Bocawe Fisheries Cooperative Association in Bulacan and the San Jose Fishermen's Cooperative and Marketing Association in Mindoro Occidental.

Other fisheries cooperatives now under organization are those in Bacoor, Cavite; Bulacan, Bulacan; and Sexmoan, Pampanga.

The Bureau of Fisheries together with the ACA, APC, CBRB and NFAC is helping fishermen in various towns and barrios form cooperatives.

The government has slso made available to the fishery cooperatives low-interest loans to enable small fishrmen to buy better fishing bancas, motor engines and nets. Fishermen are considered small-time fishers if their boats do not weigh more than tons. The combined catch of this group in 1971 accounted for almost one-half (46 per cent) of the total national harvest.

A fisherman may borrow as much as P5,000* without collateral but he must be a member of a Fishery Cooperative and his project certified as viable by government technicians. Loans are payable in three years.

There was formed a fish marketing action committee with members from six government agencies and headed by the chief of the Bureau of Fisheries' Market Assistance Section in order to speed up the forming of cooperatives and the processing of loan applications.

The committee intends to organize and help finance fishery cooperatives in marine barrios especially in Luzon Island.

* U.S. $1.00 – P6.70

4.3. Fisheries Statistics

In the formulation of fishery development, management and conservation programs, statistics on fisheries is a basic requirement.

In May 1966, a systematic collection of fishery statistics was launched under the guidance of Mr. Tsugiharu Shimura, former FAO Fisheries Statistician so as to cover all phases of the inland and marine fishery industries.

Mr. Shimura initiated a sampling survey of fish landed in Navotas, independent of the fish catch reports submitted to the Fisheries Commission by fishing boat operators and encargadores.

A statistical survey team composed of four members has been working in shifts since July 1966 at the Navotas fish landing counting the number of amphibian boats (U.S. Surplus DUKW) and smaller boats ferrying fish from fishing boats anchored a short distance from the shore. One amphibian boat carries a regular load of 80 beneras, each banera weighs 35 to 40 kilos.

A sampling survey of marine sustenance or municipal fisheries was another innovation started by Mr. Shimura. This involved an enumeration of marine barrios, fishing families, fishing boats, fish corals in operation, fishermen engaged in bangos fry gathering and families engaged in oyster raising.

Surveyed in Northern, Central and Southern Luzon were : Ilocos Norte, Ilocos Sur, La Union, pangasinan, Zambales, Cagayan, Bataan, Pampanga, Bulacan, Rizal, Cavite, Batangas, Quezon , Marinduque and parts of Palawan and Masbate. Other places surveyed were those of the other fisheries regions like the Bicol Peninsula, the Eastern and Western Visayas, Zamboanga, Davao and Occidental and Oriental Misamis putting the survey coverage at 82.2 per cent.

With about 6,000 marine barrios in the Philippines, it is estimated that in 1970 the marine municipal fisheries involved about 574,330 small fishermen equipped with about 271,292 fishing bancas of which only about 20 per cent are motorized.

The latest issue of the Fisheries Statistics of the Philippines (1971) came off the press recently. The outstanding statistical data that were culled from this publication follow:

Fish produced for 1971 by sources of production showed that commercial fishing vessels produced 382,276 metric tons valued at P879,235. Fishponds produced 97,915 metric tons worth P328,016 while municipal and sustenance fishing amounted to 542,904 metric tons valued at P1,406,121. The total production, therefore, was 1,023,095 metric tons with a value of P2,613,372.

The 1971 fish production is about 34,211 metric tons more than the 1970 production or showed an increase of only 3.5 per cent over the previous year. Perusal of the 1971 publication shows that fish production has steadily increased through the last 5 years (1967–1971) although not remarkably. However, despite this, the increases are not sufficient to cope with the population increase of the country.

In 1971 the per capita fish consumption of the country was 28.35 kilograms while the per capita fish allowance

per year was 36.5 kilograms. It can be seen that Filipinos do not have enough fish as the per capita consumption is lower than the fish requirement established by the Food and Nutrition Research Center n 1969. The same relationship between per capita consumption and fish requirement can be observed through the last five years (1967–71).

To fill in the pressing consumption deficiency for fish the country imported 68,883 metric tons of fish and fish products in 1971 with a total value of P142,846,921. The average annual importation of fish and fish products, from 1967 to 1971 was P101,458,794. The 1971 fish importation is about 34,728 metric tons more than the 1970 importation. This is an increase of 32.1 per cent over the previous year. This dependence on fish importation to augment the much-needed protein in our diet is a virtual subsidy for foreign fishing operations and fishermen.

On the other hand, as opposed to the huge imports, our exports of fish and fishery products in general have been negligible but there is also an increase in quantity and value from 1967 to 1971 (except 1968). In 1971, the country exported 7,300 metric tons of marine fish and fishery products with a value of P40,052,528. There exports surpassed all records since 1948. In 1970 the total fishery exports reached about P18 million. The percentage increase in1971 over the 1970 figures reached 55 per cent.

The top money makers for the 1971 exports were the frozen shrimps which reached a total of P20.4 million for 1,454 metric tons exported. Frozen tuna ranked second earning P8.2 million for 2,293 metric tons and tiny marine fishes claimed the third place with total earnings of P1.6 million for 184 metric tons (See Table V).

In 1971 there were 2,180 fishing vessels registered with an aggregate gross registered tonnage of 90,550 metric tons as compared to the registered fishing vessels of 2,361 with a total gross tonnage of 81,268 metric tons in 1967.

The 1971 statistical publication contains other data on fisheries.

In June 1971, Dr. Todashi Yamamoto, FAO Regional Fisheries Statistician (Bangkok), conferred with the then Fisheries Commissioner and other ranking officials. His purpose was to follow up the recommendations made by Mr. Shimura regarding improvements of fisheries statistical activities so as to accelerate the pace of their development. Dr. Yamamoto initiated the improvements in fisheries statistical work especially in the gathering and processing of data secured during the 1971 fisheries census.

Table V

Value of Fishery Products Exports in Pesos
(1969 – 1973)

Note: Listing includes only the 15 highest values for each year. 1 Philippine Peso = 0.148 U.S. Dollar

Product	1969	1970	1971	1972	1973 (January to March)
1. Frozen Shrimp	2,290,832.20	7,828,444.84	20,431,408.29	34,186,368.89	9,620,999.67
2. Frozen Tuna	1,286,651.47	2,519,782.42	8,205,261.94	18,358,301.03	2,652,889.06
3. Shellcraft Articles	1,086,205.94	394,529.50	702,339.79	801,693.44	88,085.70
4. MOP Shells	551,699.24	982,555.88	834,569.13	742,171.48	321,960.80
5. Seaweeds	436,609.98	488,730.78	533,977.00	1,633,586.25	563,519.00
6. Live Tiny Marine Fish	428,695.36	1,000,242.77	1,693,365.28	3,377,780.64	1,710,026.90
7. Salted Fish	364,395.19	446,558.00	792,267.83	1,421,804.38	248,496.71
8. Finished Buttons	264,802.60	323,691.10	169,559.80		
9. Sponges	194,213.60	160,620.00			99,198.00
10. Kapis Shells	188,373.20	98,332.35			
11. Fish Sauce	107,626.96	171,570.91	381,576.66	458,508.12	219,801.80
12. Frozen Bangos	105,780.10	387,866.06	1,109,323.28	274,878.00	
13. Ornamental Shells	93,320.68	145,221.56	177,673.80		125,413.00
14. Reptile Skins	65,026.81		381,150.40	362,493.68	525,228.07
15. Frozen Cuttlefish	48,241.53				
16. Button Blanks		255,142.00			
17. Frozen Fish		150,644.20	421,240.72	1,929,802.15	1,304,898.51
18. Frozen Lobster			336,820.54	2,190,291.19	373,040.28
19. Dried Fish			169,227.20	247,726.85	
20. Eel Fry				443,814.70	
21. Frozen Shark				357,470.00	
22. Dried Shrimps					171,768.87
23. Trocas Shells					63,340.00

5. IDENTIFICATION OF PROBLEMS AND POSSIBLE ACTIONS

5.1 Problems

The development of marine fisheries during the last decade has been spectacular, especially with the expansion of the purse seinebasnigan fisheries in the early 1960's. All of a sudden the pelagic fisheries appeared to be over-capitalized. However, production is still low and the yield is declining. The resulting reduction in catch per unit of effort may attributed to the fact that only the country's coastal and inshore waters are being expolited, and over

exploited at that. Hence, there is always a yearly deficiency in our fish production although the country's territorial marine waters are six times its land area. In 1971 the Philippines occupied the 14th place among the top fish-producing countries in the world and the fourth leading fishing nation in Asia. This indeed is paradoxical.

In order to cope, therefore, with the fish consumption needs of the people, our Government has to depend on foreign markets for the much-needed supply of fish. Philippine imports in 1971 amounted to U.S. $20,406,703.

Another reason for our low fish production is the lack of information on factors controlling distribution, abundance and availability of fisheries resources in spite of the great studies undertaken in biological researches. This may be partly explained by the fact that there is a difficulty in studying the age groups of our fishes. For example, the adult breeding stock in the case of *Decapterus* is not fished to any extent.

This problem is aggravated by the absence of complete catch and effort statistics that can be used as a basis for estimating future potentialities of the pelagic fisheries.

There is also a lack of knowledge among fisherman to operate big fishing vessels in the open seas. Because of this, there exists that timidity in most fishermen with the mistaken belief that to engage in deepsea fishing is risky. Furthermore, the fishing ethods used re still antiquated because of the high cost of modern fishing vessels and gear.

Over and above all these problems is the lack of capital which is very necessary if the facilities of deepsea fishing are to be provided for.

Among the fishermen engaged in the demersal fisheries, disputes and differences between different types of fishing operators constitute the predominating problem. These disputes and differences arise from encroachment of fishing areas, unequal gear efficiencies and the advantages of mechanization and craft size.

Then, as in pelagic fishing, there is the difficulty in making an estimate of the potential yield of the fisheries. This is so, because almost everywhere, fishing operations result in a mixed catch. In temperate and artic fisheries, usually one species dominates a given fishery at a given time and place so that the fishery can be manged as to maximize the catch of this particular species of fish. In tropical waters, this is often not the case.

Along the line of freshwater aquaculture, problems also do exist. First and foremost is the insufficiency of biological information that may support the applied studies being done to increase fish production. Again, too, there is the lack of scientists in fish biology and fish breeding. Good research facilities are likewise limited. Finally, financial support from the government of basic studies in fish biology and fish breeding is inadequate.

In the case of brackishwater aquaculture, similar problems as the above exist. These are limited facilities in research equipment and research stations in estuarine areas, lack of technical manpower, and limited funding support.

On mariculture, very little work has been done in the Philippines. Although there are studies in growing oysters (*Crassostrea*), *tahong* (*Mytilus*), gamet (*Porphyra*) and some marine algae (*Eucheuma*), no comprehensive economic or biological study has been done on any marine resource. More studies on the successful practices of mariculture are therefore needed now for there is a great demand for knowledge on all marine fauna and flora of the sea, as a source of food and for export. Hand in hand with this need is the lack of expertise and skilled manpower ho can undertake research and the subsequent application and/or exploitation as well as of venture capital.

Studies on crustacean culture are incidental cultures of these organisms with bañgos in brackishwater ponds. In spite of a lot of publicity on successes in sugpo breeding and sugpo culture, technical papers on these are still scanty.

The statistics of our country and those of other Southeast Asian countries are still very inadequate as a basis for estimating future potentialites of the various fisheries. This can be explained by the lack of necessary manpower and funds to undertake exhaustive and indepth data collection and research and by the duplication of effort. There is also the lack of updated technical information.

5.2 Government Action and Possible Solutions

For pelagic fishery to become successful in this country, the most important pre-requisite that should be satisfied is capital. The Government should provide funds so taht all projects that are proposed by the private sector may be carried out adequately for the development of the fishery. Additional sources of funds should also be sought for. There are done by making representations with world banking agencies which are especially interested in the development of agriculture and fisheries. The private sector, especially the moneyed group who are engaged in commercial fishing, is also being encouraged to invest in the pelagic fisheries so that the fishing sites in the open seas beyond the three-mile limit may be properly harnessed. This is possible through the integration of the activities of the Bureau of Fisheries with the private sector thru the recently created Fishing Industry Development Council.

With the limited funds available, the Bureau of Fisheries should undertake the research program of studies which normally cannot be undertaken by the private sector. But as much as possible the private sector must be inolved by using its facilities as fishing vessels and making available to the government its catch data while undertaking fishing activities in both pelagic and demarsal fishing grounds. At the same time technical assistance should be continually extended by the Bureau on the improvement of fishing gear, fishing operations and the acquisition of new fishing outfits.

The World Bank through the Development Bank of the Philippines would soon give loans of more than 100

million pesos for the fishpond and deepsea fishing industries.

Furthermore, it is probably high time now that the Government adopt an insurance scheme for the fishing industry whereby diseaster and losses to fishermen could be guaranteed and adequately compensated.

With the Government's policy to increase fish production is the program to expand areas of development of fishponds. To do this, the Bureau will deploy more extension workers to the provinces where they will guide new fishpond operators on the proper construction and layout of fishponds and improvement of production techniques. It also intends to lease some 8,800 hectares of swamp lands yearly to the private sector for development into fishponds.

At the same time, more knowledge on the commercially important freshwater and brackishwater fishes especially their life history, spawning, population, ecology and on other commercially important invertebrates are to be secured in accordance with set priorities for the proper management and conservation of our lakes, rivers and estuaries.

Funds given to fish biology and breeding studies should depend on the priority areas of research. These studies should be through team efforts or through agencies with facilities for this purpose. In the case of estuarine biology and ecology studies, the research activities need expensive equipment. Because of this, the funding must be shared by the different agencies involved in the research.

The SEAFDEC is establishing through the Bureau of Fisheries and the Mindanao State University (MSU), an Inland Fisheries Center, a regional center especially in shrimp culture. The MSU also has a shrimp hatchery center in Naawan, Misamis Oriental, Mindanao. Both these projects are well-funded, ranging into millions of pesos.

The University of the Philippines has just started an NSDB/AID assisted Inland Fisheries Project at Leganes for brackishwater fish culture and the Central Luzon State University for freshwater fish culture with multi-million pesos funding.

Scientific personnel contributions may be tapped from different agencies, if necesaary. To alleviate the lack of technical manpower, scholarships must be secured to send abroad for training or graduate studies deserving Filipinos who are inclined to these disciplines including mariculture.

The Fishermen's Training Center which will train deck officers and master fishermen in marine fisheries through the Bureau of Fisheries and FAO, has been approved for implementation by the United Nations Development Program.

In connection with marketing, the National Food and Agriculture Council (NFAC) through the Fish Marketing Action committee for 1972–75 has proposed to complete the Navotas fishing harbor project this year. Feasibility studies on the proposed establishment of a Fish Port in Lucena, Quezon as well as in other areas like Bacolod; Iloilo; Sta, Ana, Cagayan; Poro Pt., La Union; Legaspi, Albay; Dumaguete City; Davao; and Zamboanga have been considered. Assessments of transport used in the distribution of fish from Navotas-Malabon-Divisoria launching points to evolve improvements were scheduled as well as for Damortis, La Union; Lucena City; Mercedes, Camarines Norte: Iloilo City; Bacolod City; Cadiz, Occidental Negros; and Zamboanga City.

It may be recommended that research on the improvement of marketing infrastructure and transport facilities should be conducted with the end in view of facilitating the flow of fish distribution, reducing market costs and excessive profit margins. It is also necessary to bring to barrio level the knowledge that there is on fish handling and preservation including the use of new techniques to produce improved fishery products for both the domestic and export markets.

Aside from tapping the private sector and the agencies interested in fisheries development for assistance, the Central Bank is extending credit to municipal fishermen in kind like marine engines, nets and other fishing paraphernalia.

Because the number of fishing barrios is great, more feasibility studies are being undertaken to determine which barrios can qualify in this credit scheme. This financial assistance would also be extended to the fish processing and handling sector of the industry and feasibility studies would also include this sector.

Lastly, for the improvement of the statistics on fisheries, collection, updating, consolidation and interpretation of fisheries data and information are being made more systematic. Past studies of major fisheries should be reviewed and updated to cope with the recent innovations and changes. Studies on new and/or little-known fisheries and fishing industries to complement existing fisheries and industries should be initiated. Through these, all fisheries data and information can serve as a basis for the scientific analyses of our fisheries and for the formulation of policies regarding their proper development and management and their wise conservation.

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The country report of the Republic of Singapore
Status of Fisheries Development in Singapore

by
Primary Production Department
Republic of Singapore

With increasing conflict in the utilisation of limited land resources for industrialization, urbanisation, water conservation, recreation and farming, Singapore, an island of 585 sq. km. and approximately 2.1 million population,