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Fisheries Under the Extended Jurisdiction of Sri Lanka

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FISHERIES UNDER THE EXTENDED JURISDICTION OF SRI LANKA

by

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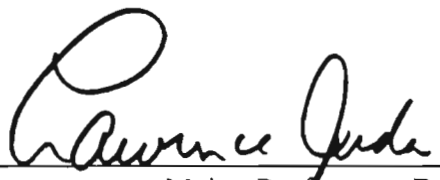
Approved: 

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I. INTRODUCTION

Sri Lanka is predominately an agricultural country with export earnings mainly from tea, rubber, coconut, minor agricultural products, garments and gems. The 1990 mid year population was estimated at 17.0 million people.[1] The per capita gross national product (GNP) for 1990, at 1982 constant prices was 7,457 Sri Lankan Rupees (US$ 186).[2]

Fishing has been an important economic activity in Sri Lanka for generation. Firstly, the fisheries sector provides employment to a substantial portion of the population particularly in the coastal area. Secondly, it provides 65 percent of animal protein consumed by the people of Sri Lanka. Thirdly, the fishing industry has proved its capabilities as an earner of foreign exchange through the export of marine products such as prawns, lobsters and other varieties.

Since independence (1948), successive Sri Lankan government have been taking concerted efforts to develop the fisheries sector. The development programs included credit and subsidy schemes for the mechanization of traditional artisinal craft, introduction of new and more efficient gears made of synthetic material and the introduction of new and better designed fishing craft, extension and training designed to promote new techniques and technologies, and provision of fisheries infrastructure facilities. These programs succeeded mainly in increasing the production from the inshore waters.

In 1977 Sri Lanka declared its 200 miles Exclusive Economic Zone (EEZ) under the new regime for the law of the sea.[3] This gives Sri Lanka sovereign rights over 500,000 square kilometers of the Indian Ocean, which is more than eight times the land area of the country, and the opportunity to utilize and responsibility to manage the living resources lying in the EEZ for the benefit of its people. The government of Sri Lanka formulated and implemented programs with foreign financial and technical assistance to exploit the resources within the EEZ to increase the supplies of proteins to the citizen and to provide better opportunities for income and employment generation and earning valuable foreign exchange for the country. However, even after 14 years after the declaration of EEZ, Sri Lanka has been able to achieve little by way of harnessing fish resources lying in the EEZ beyond the inshore waters.

The purposes of this paper are to:

(i) examine present government policies and efforts

(ii) examine the current status of fisheries with the EEZ and

(iii) make recommendations for future development with the objective of better utilization of the resources within the EEZ.

II. EXPLOITATION OF FISH RESOURCES WITHIN THE EXCLUSIVE ECONOMIC ZONE OF SRI LANKA - AN OVERVIEW

1. PHYSICAL SETTING

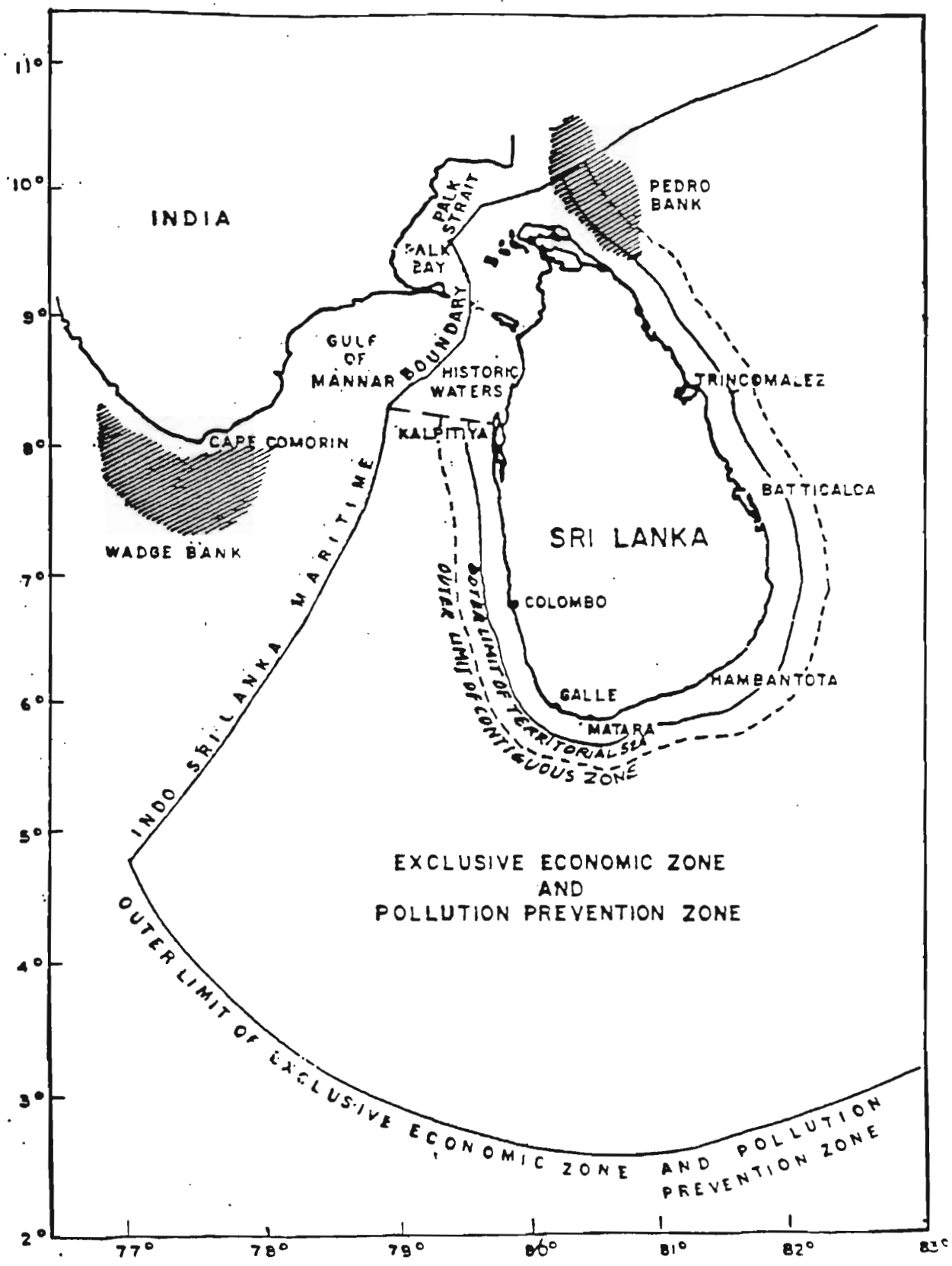
Sri Lanka is an island country, situated in the Bay of Bengal, southeast of India, between 6-10 degrees north latitude and 30-82 degrees east longitude. It has a land area of 65,000 square kilometers and a coastline of 1,561 kilometer. The Continental Shelf is narrow. It has a width rarely extending 40 kilometers and averaging 25 kilometers with a total area of about 30,000 square kilometers. At some points in the east coast the Continental Shelf narrows to a width of 2-3 kilometers. To the north and northeast the Shelf widens to an extensive shallow bank where it forms the floor of the Gulf of Mannar including the resource rich Wadge Bank, Palk Bay and Pedro Bank before merging with the Continental Shelf of India. Since the declaration of the Exclusive Economic Zone in 1978, Sri Lanka has sovereign rights over 500,000 square kilometers of the ocean. The maritime boundaries are shown in Map 1.

2. IMPORTANCE OF FISHERIES TO THE ECONOMY

The fishing industry contributes 1.8 percent the country's gross national product[4] in 1990 and value added by domestic fish production in 1989 was around Rs. 5,000 million (US $125)[5]. But, for several reasons, it is still considered as an important economic activity. Firstly, it is an important source of employment. It provides full-time employment to around 96,000 persons with a dependent population of around 500,000 particularly in the coastal areas of Sri Lanka.[6] In

MAP 1

THE EXCLUSIVE ECONOMIC ZONE AND MARITIME BOUNDARY OF SRI LANKA



addition to direct employment, indirect employment is also provided to some 15,000 people through activities such as fish curing, processing, transport and marketing and other ancillary industries such as ice production and boat and net manufacture. Secondly, the fishing industry is an important provider of food. Fish is the main source of animal protein in the Sri Lankan's diet. Fish contributed 65% of the animal protein consumed in Sri Lanka in 1988.[7] Thirdly, it is an earner of foreign exchange through the export of high value fish products like shrimp, lobster, shark fins, etc. Exports of fish and aquatic products contributed on an average Rs 616 million (US $15 million) in foreign exchange in 1986-1987.[8] This was 2.8 percent of the total export earnings from non traditional commodities which include garments, minor agricultural crops, fishery products, gems and jewelry and manufactured products. In 1989 the total quantity of exports was 3,982 tons valued at Rs. 1,137 million (US $28-4 million).[9] The composition of fishery products exported in 1989 is shown in Table 1. The major sea food items exported consist of shrimps, lobsters and other crustaceans. Some varieties of food fish are also exported mainly in the frozen form. Ornamental fish form the major form of live exports of fishery products. Shark fins and Beach de mar are exported in dried form. The major markets for fishery products are the USA, Germany, Netherlands, France, Belgium and Japan.

Since the local fish production is not sufficient to meet the national fish demand, fish and fishery products in the form of canned fish, maldive fish and dried fish

TABLE 1
VOLUME AND VALUE OF EXPORTS OF FISH AND FISH PRODUCTS 1989

Item	Volume (in tons)	Value (in Rupees million)	(in U.S. Dollars millions)
Shrimps	2,597.92	767.17	19.18
Lobsters	228.47	98.92	2.47
Shark fins	100.65	64.02	1.60
Beach de mar	51.26	26.91	0.67
Ornamental fish	259.59	105.58	2.64
Other crustaceans	729.42	69.71	1.74
Dried fish & smoked fish	1.95	0.38	0.01
Frozen fish	12.98	4.50	0.11
Total	3,982.24	1,137.19	28.43

Source: Export Development Board of Sri Lanka.

are imported. In 1989, 45,620 tons of fish and fishery products were imported.[10] The annual supply per capita of fish in Sri Lanka increased from 11.34 kilogram in 1978 to 15.78 kilogram in 1983 and thereafter fell to 14.61 kilogram in 1986.[11] If this is considered as being equivalent to the per capita consumption of fish, Sri Lanka is still way below developed countries such as Japan and Norway, but favorably well placed with developing countries like Pakistan and India (per capita fish consumption in Pakistan and India are 1.9 and 3.3 kilogram respectively).

3. FISH RESOURCES AND POTENTIAL

3.1. Inland Resources

a. Fresh water fisheries

The fresh water fisheries potential consists of nearly 162,500 hectares covering large, medium and small perennial tanks and around 100,000 hectares of village tanks and riverain marshes known as "villus."[12] There are also around 150 hectares of fish ponds which were constructed and operated under the government pond subsidy program.[13] Fresh water fish fauna includes around 50 indigenous species and several introduced exotic species such as Chinese carps, silver and big-head carp, the three major Indian carps (Catla, Rohu and Mrigal) and the Tilapia mozambique. Production from this sector for the period from 1979 to 1989 is given in Table 2. Production in 1989 is around 39,000 tons more than double the 17,000 tons recorded in 1979. Contribution by inland fisheries to total fish production has grown from 11 percent in 1979, to 19 percent in 1989. The significant increase has been attributed to the successful introduction of exotic species particularly carp and tilapia into tanks and reservoirs. Production from perennial tanks constituted 90 to 95 percent of the total recorded inland catch, due mainly to government subsidy program.[14] Production from fresh water ponds has varied from 200 kilograms per hectare to 5,000 kilograms per hectare.[15] Stocking of reservoirs and supply of fry/fingerlings to seasonal water bodies

and ponds were made through 11 government operated fresh water fisheries breeding centers and three extension centers.

On the basis of the new policy decision by government, operations of these centers and government direct assistance to the inland sector have been stopped. Village level co-operative societies and the private sector are expected to undertake the activities previously undertaken by the government in this sub-sector in the future.

b. Brackish water and coastal aquaculture

These include shallow salt-water lagoons, estuaries, deep lagoons and tidal mud flats with a total area of over 120,000 hectares.[16] An area of 6,000 hectares of land adjacent to lagoons have been identified as being suitable for coastal aquaculture.[17] Brackish water fish culture is still in its infancy. Only culturing of milk fish has been attempted with promising results, but expansion of this system, did not take place, because most of milk fish fry are collected in the northern province of the country where access is difficult. Culture of other marine fish has not yet started, although there is good potential to develop this sector, in particular cage culture of groupers, mullets, etc.

Pilot scale shrimp farming in Sri Lanka started in the late 1970's as a result of high export price and demand in the world markets. With technical

assistance from Bay of Bengal Program of Food and Agriculture Organization, shrimp culture trials were conducted and by 1985 a few commercial farms were started which resulted in the production and export of 100 tons of farmed shrimps, at the end of that year.[18] These successes gave rise to further investment by private individuals and companies with production based on intensive culture. By 1990 the number of farms and pond area increased to 70 and 325 hectares respectively.[19] The production was 600 tons as against the capture production of a maximum of 4,700 tons in 1989.[20]

3.2. Marine Resources

The government of Sri Lanka for management purposes classified marine fish resources within its EEZ into coastal, offshore and deep sea. Coastal resources includes the resources lying within 40 kilometers from the baseline. Offshore resources are those lying within the area from 40 kilometers to 100 kilometers while deep sea resources lie beyond 100 kilometers.

The principal marine fish resources are within the Continental Shelf and the annual sustainable yield within the Continental Shelf is estimated by "Fridjoft Nansen" surveys conducted in 1977-1978 at 250,000 tons consisting of 170,000 tons of pelagic and 80,000 tons of demersal and semi demersal fish.[21] The main pelagic fish species available in the coastal zone are small pelagics such as sardines, Indian mackerel, herrings and the large pelagics such as Spanish

mackerel, tuna and tuna like fish, barracudas or pompanos. The demersal species include prawns, silver bellies, moon fishes, ribbon fishes and large demersals, such as breams, grouper and snapper. The bulk of the fish production comes from the coastal sector. Production from this sector in 1989 is estimated at 157,411 tons showing an increase of around 9 tons over the 1979 production, (see Table 2). During the period 1977-1989 an average 83 percent of the total production came from the coastal marine fishery. The 1989 production represents 76 percent of the total production. This decline in percentage share has been due to the increase in relative shares of inland and the offshore fisheries sector. This trend is reflected in Figure 1 and Table 2.

The offshore fishery exploits resources up to 100 km and the resources consists of highly migratory species like tuna, bill fishes and sharks. The deep sea fishery covers the areas beyond 100 km up to the outer limit of the EEZ and beyond. The resources are mainly migratory tuna such as yellow fin and skipjack and species such as sharks, marlin, swordfish and sail fish. Sivasubramaniam (1978) estimated the potential yield from offshore and deep sea to be around 29,000 tons.[22] This estimate has been made on the basis of available information from existing fisheries at that time and also results of experimental fishing conducted in offshore and deep sea ranges. A recent estimate made by National Aquatic Resource Agency (NARA) on the exploration survey results indicate a potential yield between 70-90,000 tons of migratory pelagic fish from the offshore and deep sea areas within the Exclusive Economic

TABLE 2
TOTAL FISHERIES PRODUCTION BY SUB-SECTOR (1972-1989) IN TONS

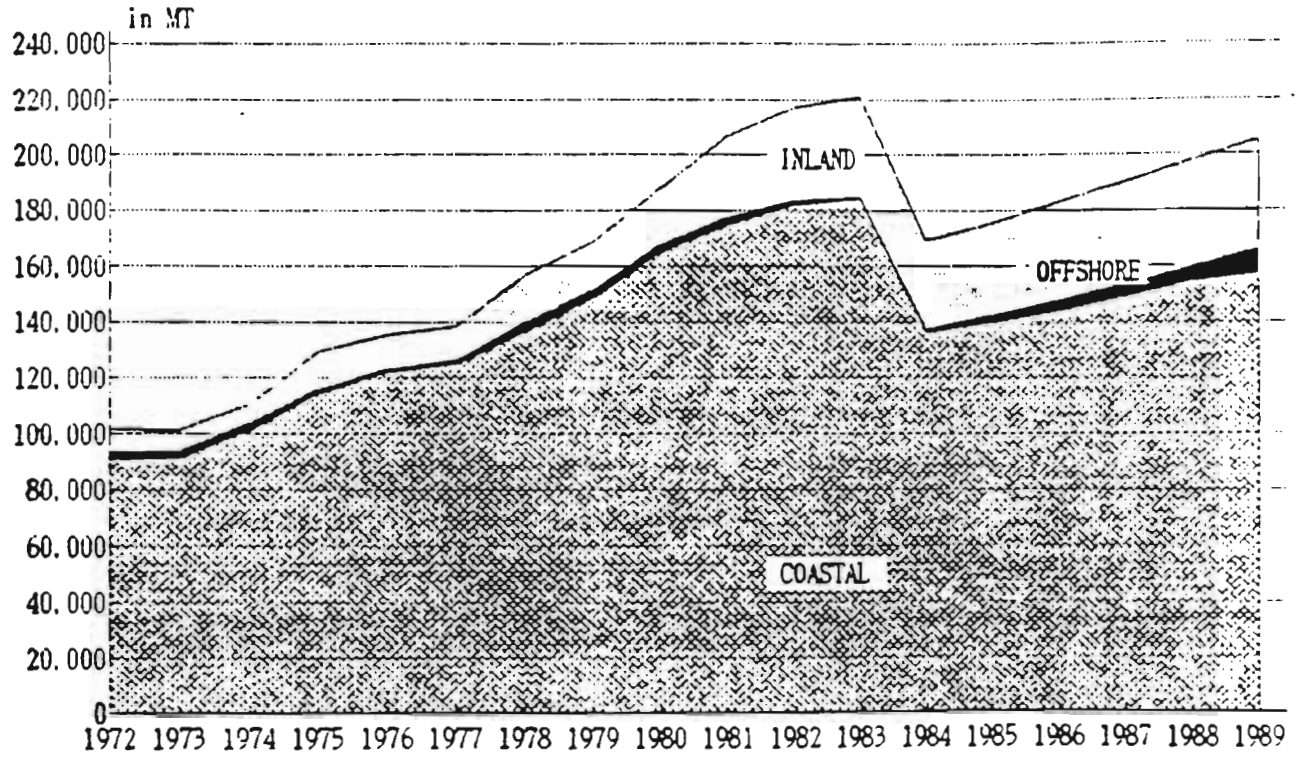
Year	Coastal	Offshore & deep sea	Inland	Total
1972	90,717	2,557	8,438	101,712
1973	91,312	2,385	7,605	100,702
1974	100,805	2,230	7,660	100,695
1975	114,863	970	13,307	129,140
1976	122,783	548	12,540	135,871
1977	125,386	312	13,068	138,766
1978	136,900	2,949	16,738	156,587
1979	148,851	2,099	17,425	168,375
1980	165,264	2,148	20,266	187,678
1981	175,075	2,178	29,590	206,843
1982	182,532	1,078	33,323	216,933
1983	184,049	689	36,068	220,806
1984	136,642	823	31,882	169,347
1985	140,266	2,400	32,743	175,409
1986	144,266	3,400	35,390	183,056
1987	149,278	4,259	36,465	190,002
1988	155,099	4,425	38,012	197,536
1989	157,411	8,155	39,721	205,287

Source: Ministry of Fisheries and Aquatic Resources, Sri Lanka.

Zone of Sri Lanka.23 Production from offshore in 1989 is around 8,155 tons four times the 1979 production which was estimated at 2,000 tons (see Table 2). This is due to the development of national capability in the course of the last

FIGURE 1

Total Fisheries Production by Sub-Sector (1972-1989)



Source: Ministry of Fisheries, Government of Sri Lanka

decade through the introduction of new crafts under foreign funded projects, followed by locally designed boats.

4. INSTITUTIONAL SETTING

A separate Ministry for the overall development, promotion and management of fisheries was established in 1970 before which the subject of fisheries was assigned to a Fisheries Department attached to large ministries such as Agriculture, Industries or Irrigation. The Ministry of Fisheries and Aquatic Resources (MFAR), is directly responsible for formulation, execution and coordination of workplans and programs on the basis of national policies concerning fisheries and aquatic resources, administration of the Fisheries Ordinance and related ordinances, training and extension, provision of welfare services, fisheries survey and research, establishment and maintenance of infrastructure facilities essential for the fishing industry, development and regulation of fishing in marine, brackish and fresh waters.

These subjects and functions were assigned directly to six specialized divisions of the MFAR and four agencies under the MFAR namely the Ceylon Fisheries Corporation (CFC), the Ceylon Fishery Harbors Corporation (CFHC), the National Aquatic Resources Agency (NARA) and the Cey-Nor Foundation, Ltd. (Cey-Nor) till 1989. In 1990 the set up of the MFAR was reorganized with the formation of two new agencies namely the Department of Fisheries and Aquatic Resources and the National Institute of Training, Education and Extension.

Functions carried out by the former six divisions of the MFAR were reallocated among the newly formed two agencies and the two specialized divisions formed within the MFAR namely in Policy Planning Division and the Development Division. In this process Inland Fisheries Division was abandoned on account of the government policy decision to terminate state patronage for inland fisheries. Figure 2 shows the present organization of the MFAR.

The political head of the MFAR is a Cabinet Minister who is assisted by a State Minister. The administrative head of the Ministry is the Secretary who is assisted by a State Secretary. The responsibilities of the two special divisions of the MFAR and six agencies under it are given below:

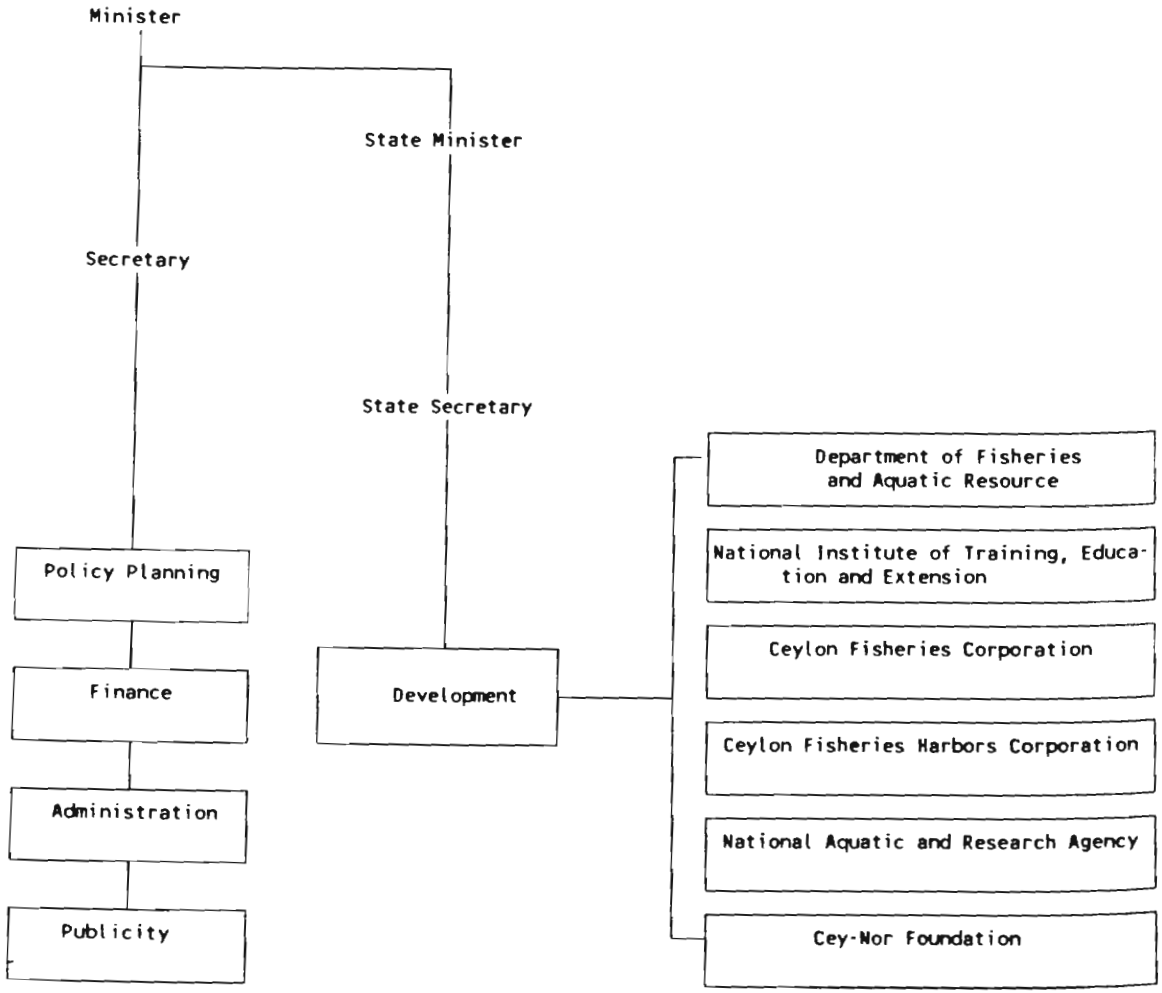
Policy Planning Division: Preparation of fisheries sector plans, policy, feasibility and socio economic studies, liaison with foreign aid, preparation of public investment programs, collection and processing of fishery statistics.

Development Division: Monitoring of the work programs of the agencies under the MFAR viz, the Department of Fisheries and Aquatic Resources, National Institute of Fisheries training, education and extension, CFC, CFHC, NARA and Cey Nor.

Department of Fisheries and Aquatic Resources (DOFAR): Enforcement of the Fisheries Ordinance, implementation of subsidy schemes for boats, engines

FIGURE 2

SRI LANKA
MINISTRY OF FISHERIES AND AQUATIC RESOURCES
ORGANIZATION



and fishing gear, matters related to organization and monitoring of Fishermen's Cooperatives, provision of welfare facilities such as houses, wells, latrines, community centers, day-care centers to fishing communities, conduct of pre-schools and mothers care centers, provision of beacon lights, establishment of income generating projects for fisherwomen, execution of foreign funded special projects for the marine fisheries sector and fisheries components of the rural integrated development programs in the districts.

National Institute of Training, Education and Extension (NITEE): Provision of training facilities for fishermen, personnel of the MFAR and its agencies and personnel of other agencies concerned with fisheries related activities. Training is given at the Sri Lanka Fisheries Training Institute in Colombo and at four regional fisheries training centers.

Ceylon Fisheries Corporation (CFC): The CFC is the state agency established in 1964 under the State Industrial Corporation Act of 1957 to undertake fish production and marketing.[24] It operated a few trawlers, tuna boats and 11 ton boats in the past and in addition purchased fish from the fishermen. The production operations were given up in 1978 and activities were limited to fish marketing. Presently it buys and sells fish in competition with private traders. Its market share is less than two percent of the country's total fish production. The CFC tries to regulate the fish prices by purchasing fish at a higher price from the producers during the glut season and selling it at a reasonably low price

during the lean season compared to the private sector. CFC has never been able in the past to have any influence on the market due to small volume of fish handled by them.

Ceylon Fishery Harbor Corporation (CFHC): The CFHC was established in 1972 under the State Industrial Corporation Act of 1957 and charged with the responsibility for construction, operation and management of fishery harbors and related facilities.[25]

National Aquatic Resources Agency (NARA): The NARA was established in 1981 by an Act of Parliament as the principal national institution responsible for carrying out and coordinating research, development and management activities on the subject of aquatic resources.[26]

Cey-Nor Foundation Ltd. (Cey-Nor): Cey-Nor originally a private company was acquired by the government in 1985 and presently it is functioning as a government owned business undertaking under the supervision of the MFAR.[27] Cey-Nor's main activities are production and sale of fiber glass fishing boats, nets, and ice.

5. THE OBJECTIVES OF FISHERIES DEVELOPMENT

The objectives of fisheries development in Sri Lanka as stated in the National Fisheries Development Plan (1990-1994) are as follow:[28]

- To increase the production of fish in order to increase the nutritional status of the people of Sri Lanka through a higher per capita consumption of fish.

- To increase the incomes and the standards of living of all those dependent on fisheries and fisheries related activities.

- To increase employment opportunities through fisheries and fisheries related activities.

- To increase the foreign exchange earnings through exports of fisheries and aquatic products.

Presently, Sri Lanka is faced with a high foreign exchange deficit. Unemployment is a severe problem. Large quantities of fish and fishery products are imported since the domestic production is not sufficient to meet the demand which has been rising with increasing populations. The fisheries industry in Sri Lanka is predominately small scale and the living standards of a majority of fishermen are low. Therefore, the objectives of the fisheries development in Sri Lanka, are valid goals. But some of these objectives are in conflict with each other. While the high prices to fishermen improves their net incomes, it raises consumer prices. Exports affect domestic fish supply both directly by reducing the domestic fish availability and through overexploitation of fishery resources encouraged by the high export prices.[29] Already shrimp and lobster resources have been subjected

to overfishing. But some fishery export products of Sri Lanka namely ornamental fish, beach de mar and shark fins not being locally consumed do not affect domestic availability. The other export products viz, shrimps, lobsters and fin fish do not constitute a major proportion of domestic fish supply. As seen from

TABLE 3
QUANTITY AND VALUE OF CRUSTACEANS AND FIN FISH EXPORTED IN 1989

Item	Quantity (in tons)	Value (in Rupees million)	Value (in U.S. Dollar million)
Crustaceans			
shrimps	2,597.92	767.17	19.18
lobsters	228.47	98.92	2.47
other crustaceans	729.42	69.71	1.74
Fin Fish			
Dried & smoked fish	1.95	0.38	0.01
Frozen fish	12.98	4.50	0.11
Total	3,570.74	940.68	23.51

Source: Export Development Board of Sri Lanka.

Table 3 the quantity of these categories exported in 1989 was 3,570 tons representing 1.7 percent of the total domestic fish production, which was 205,287 tons in 1989. However, goverment's efforts to promote exports would affect the supplies to consumers in the long run. Shrimp constitute the main fishery export commodity both in terms of value and volume in Sri Lanka (see Table 1). In the process of trawling for shrimps, large quantities of undersized juvenile food fish

are caught as by-catch. This reduces the biological renewability of the resource and limit the supply of fish available to the domestic market.[30]

The main strategy for increasing the production of fish is to increase the capacity utilization of existing boats and introduce new boats. Overexploitation of fish resources in certain parts of the coastal inshore area has been identified in recent times.[31] Presently there is no control on the entry to fishery in these areas. In the absence of any control on the fishery, introduction of more boats may deplete the fish resources. Overexploitation seriously affect employment opportunities and standards of living for small scale fishing households.[32]

6. HISTORY OF SRI LANKAN FISHERIES

Since 1898 the government under the British Colonial rule played a supervisory and regulatory role in the fishery and little attention was paid to the development of small fisheries sector, which remained at a subsistence level.[33] Sri Lanka attained independence in 1948. During this period coastal fishing was confined to 5-10 miles off the coast and was carried out by domestic fishermen using indigenous technology. Sri Lanka was far from being self sufficient in its fish requirements during this period. The beach-seine was the main fishing technique in coastal waters. Handlines, troll lines, cast nets, traps and driftnets made of natural fibers were the other methods used in coastal fishery. The traditional craft used were dugout canoes known as "orus" and "vallams" and small log craft known as "teppams" or "kattumarams." As these craft were propelled by oars

and sails, their range of fishing was limited. Up to around 1957, almost the entire fish catch were from the small indigenous craft and beach seines. In 1957, the fish production was 39,000 tons while 106, 522 tons of dry fish were imported.[34]

In the second half of the 1950's policy makers and development planners began to concern themselves with the development of fisheries sector. A separate Department of Fisheries was set up in 1956. Since that time, successive governments have been formulating and implementing programs for developing the fisheries sector. The major programs for improving the efficiency of the coastal fisheries were the mechanization of the traditional craft, introduction of new craft namely 28 foot mechanized wooden boats, improved fishing gear made of synthetic material and new fishing methods promoted through subsidies and concessionary credit coupled with extension and training. As a result of mechanization, the geographical range of operation was extended. The fishermen carried more gear and stayed at sea for a longer time than earlier. The fish production was nearly doubled to 65,460 tons in 1963 as compared to 1957.[35] Since the early sixties fiberglass boats were introduced beginning with 17-23 foot boats. They became very popular among the fishermen due to their lightness, speed and low maintenance requirements. These boats fished mainly for smaller pelagic fish species in the coastal areas and larger pelagics outside this area. On a limited scale, trawling and other types of fishing for demersal species in the inshore area were also carried out.

During the 1950s a number of local operations had been carried out in offshore and deep sea areas mainly by the Department of Fisheries and a few private companies. A notable feature of these limited activities has been the concentration on bottom trawling. The main reason for this was probably the identification of the "Wadge Bank" (see Map 1) in the 1920's as a productive fishing ground which could support a large fleet for commercial trawling. Another trawling ground known as "Pedro Bank" (see Map 1) was also discovered in the early twenties. The Wadge Bank trawling ground located near the southern tip of India (115 miles from Colombo) were fished by trawlers from Colombo since 1928 by private trawlers as well as trawlers belonging to the Department of Fisheries. Government owned vessels landed an average of 700 tons of fish per year from the Wadge Bank from 1950 to the early 1960s. Pedro Bank is a smaller ground located at the extreme north-east corner of the island and one third of it was lost to India with the establishment of the EEZ boundaries. The Pedro Bank was not exploited commercially until 1965. The trawlable area covers about 1,000 square miles and most of the past fishing activities on Pedro Bank has been sporadic and experimental.[36] A private company with Japanese collaboration operated four tuna longliners in the deep sea areas during the period 1960-1961.

A major expansion of the offshore and deep sea fisheries sector with government investments was proposed in a 10 year development program (1959-68).[37] The Ceylon Fisheries Corporation (CFC) was established in 1964 charged with fishing operations, fish export and import, marketing, boat construction and repair and

provision of other essential infrastructure facilities. It purchased five stern trawlers, 40 boats (11 ton) and two tuna boats for trawling, driftnetting and tuna longlining. These added to the existing fleet taken over by the CFC from the Department of Fisheries. The CFC operated the fleet of six trawlers (250 gross tonnage) from the mid 1960's to mid 1970's on the Wadge Bank. These operations were abandoned in the mid 1970's with the loss of access to Wadge Bank fishery ground with the conclusion of Sri Lanka - India Maritime boundary. In 1967, the CFC commenced longlining for oceanic tuna with its vessels (315 gross tonnage). Operations were concentrated in the equatorial belt, targeting on yellowfin and bigeye tuna. High operational costs and falling tuna prices in the world market affected the operations which were ultimately wound up in mid 1970s. The fleet of 40 boats (11 tons) were introduced with a view to extending local fisheries to the offshore range. This was the first step in developing an offshore fleet after the successful introduction of the 28 feet (3.5 ton) boats in late 1950's. These boats extended the range of operation and encouraged the 28 feet boats to follow suit. As all the boats were made of steel, they corroded pretty quickly and few or none were operating a decade later.

The highest production by the CFC owned boats was recorded at 4,160 tons in 1969.[38] As years went by due largely to poor maintenance and repair, these boats went out of operation. From its inception, the fishing operations of the CFC resulted in financial losses year after year. The planned expansion of deep sea

and offshore fishing operations with direct government investment did not take place.

The functions of the CFC relating to the construction of fishery harbors, anchorage, shore facilities and their maintenance were subsequently transferred to the Ceylon Fishery Harbors Corporation (CFHC) which was established in 1972. Rupees 86 million (approximately US $3.5 million) has been spent by the government on the construction of the fishery harbors and anchorages during this period.[39]

Originally public sector operations were regarded as an interim period until the private sector invest on the offshore and deep sea fisheries. But it did not materialize due to the lack of banking and financial facilities, lack of technology and management, lack of incentives for investment, foreign exchange scarcities and import control from the early sixties and the absence of any clearly defined fisheries development policy.[40]

There have been fishing operations carried out by the distant water fishing nations (DWFN) from Asia since 1952 off the coast of Sri Lanka.[41] Japanese commenced fishing operations with longline in 1952. By 1968, the Japanese fleet was covering the entire Indian Ocean north of 50 degrees south. Fleets from Taiwan and Korea were operated since mid 1950's and mid 1960's respectively. After the declaration of the EEZ, the DWFN's operations were carried out in the high seas.

Even today long line fishery for tuna in the Indian Ocean is primarily carried out by vessels from Japan, Korea and Taiwan. Large tunas (yellowfin, Southern Bluefin, bigeye and albacore) are the target of this fishery. Seventy Korean and 250 longliners were operating in the Indian Ocean during 1985.

7. CHANGING LEGAL SITUATION

In 1977, Sri Lanka declared its Exclusive Economic Zone and other Maritime zones. The EEZ extends to a distance of 200 n.m. from the baseline,[42] except in the region of the Gulf of Mannar and the Bay of Bengal, where it extends to the Maritime boundary between Sri Lanka and India as defined in section 8 of the Maritime, Zones Law No. 22 of 1976.[43] The ocean covered by the EEZ is 500,000 square kilometers which is more than eight times the land area of Sri Lanka.

The declaration of the EEZ has afforded Sri Lanka the opportunity of benefitting from the resources falling within her EEZ and also extending operations to the high seas/international waters outside the boundary of the EEZ. Within the EEZ the Sri Lanka has "Sovereign rights for the purpose of exploring and exploiting, conserving and managing" the fish stocks of the EEZ under UN Convention on law of the sea.[44] These rights are subject to a number of duties. Sri Lanka must take such conservation and management measures to ensure that fish stocks in its EEZ are not endangered by over exploitation, and that such stocks are maintained at or retained at "levels which can produce the maximum sustainable yield, as

qualified by relevant environmental and economic factors... and taking into account fishing pattern, the interdependence of stocks and any generally recommended' subregional, regional or global minimum standards."[45] Subject to this, the coastal states is required to promote the objective of optimum utilization of the living resources of its EEZ.[46] Finally, the coastal state is to establish the allowable catch for each fish stock within its EEZ.[47] If the national fishermen are not capable of taking the whole of the allowable catch, the coastal state has to give access to the fishermen of other states to fish for the surplus.[48] This obligation supports the objective of optimum utilization. In this regard, Sri Lanka has given access to the fishermen of third states to fish in the area of the EEZ beyond 35 miles from the coast under licensing and joint venture arrangements. Details of access to foreign fishermen will be discussed in section 9.

As stated earlier fish resources in Sri Lanka's offshore and deep sea areas, consists mainly of highly migratory species, such as tuna. In the case of highly migratory species, the coastal state's normal fishery management functions are supplemented by an obligation to cooperate with other interested states in conservation and to promote the objective of optimum utilization both within and beyond the EEZ, either directly or through arrangements such as regional fishery commission, which are already in existence according to the UN Convention Laws of the Sea.[49] The Indian Ocean Fishery Commission (IOFC) and Indo-Pacific Fisheries Commission (IPFC) are the two regional fishery commissions existing for the Indian Ocean.

Indian Ocean Fishery Commission (IOFC) and Indo-Pacific Fisheries Commission (IPFC)

The IOFC was established in 1967 at the 48th session of the Council of the Food and Agricultural Organization (FAO) of the United Nations under Article VI-1 of the FAO Constitution.[50] It has 41 member countries as on 1990.[51] The commission assists and coordinates national programs in fisheries development, promotes regional research activities and examines management problems relating to offshore resources. A special committee has been set up under IOFC for the management of Indian Ocean tuna and its work is supported by the FAO/UNDP Indo-Pacific Tuna Development and Management Program (IPTP).[52] This committee has not so far regulated tuna fisheries but acts as an advisory body in the management of tuna fishery resources. The IPTP collects data on fish landings, length frequencies and species composition of several economically important tuna and tuna-like fish. These data are circulated to the member countries for review and study. All scientists from the member countries meet and exchange all information concerned about tuna each year. Steps are being taken by the IOFC to establish a permanent intergovernmental body for tuna fishery management.

The IPFC was created in 1948, within the framework of FAO, under Article XIV of the FAO constitution.[53] The commission has broad responsibility over the research and investigation of the living marine and freshwater resources of the Indo-Pacific region. As of 1990, the IPFC had 19 member countries.[54]

8. ATTEMPTS MADE TO BUILD UP NATIONAL CAPABILITY TO EXPLOIT THE FISHERY RESOURCES AFTER THE DECLARATION OF THE EEZ

Because of the continued decline in offshore and deep sea productions and inefficiencies in state fishing operations, the government that took office in 1977 decided to promote private sector to undertake offshore and deep sea fishing under the new regime. To promote private sector investments, it offered several inducements.[55] To begin with, foreign exchange restrictions were removed and imports were liberalized enabling free imports of capital goods, raw materials and spares. Import duties on certain capital goods and raw materials were reduced. Tax holidays were offered to companies engaged in production of fish from offshore and deep sea areas or in supply of services to the industry.[56] In addition, shareholders of such companies were exempted from taxes on dividends. Lump sum depreciation was permitted. Capital cost subsidies for boats and engines were made available. The government also obtained foreign technical and financial assistance to exploit resources in the EEZ.

A few newly established companies took advantage of the above concessions and purchased 30 medium sized boats (38 feet in length) between 1977-79 introduced under the Southwest Coast Fisheries Project funded by the Asian Development Bank for the exploitation of offshore fish resources.[57] The boats were made of fiberglass and equipped with insulated fish hold, crew accommodations, hydraulic net haulers and radio communications and were well suited for multi-day offshore

fishing. However, this scheme failed mainly because of the design defects in the boats. These boats were imported from India since during that period the local boatyards had no capability to construct such boats.

During 1981-85, a fleet of 80 boats (34 feet in length) were introduced under the Northwest Coast Fisheries Project funded by the Abu-Dhali Fund. Like the 38 foot boats of the ADB project, these boats too were provided with all the facilities/equipment for offshore fishing. Unlike the earlier ventures, these boats were successful in conducting multi-day offshore fishing and paved the way for other smaller boats of 28 foot class to follow suit in the recent years. Unlike the previous project, the boats under this project were constructed at the local boatyards under the supervision of foreign experts, which resulted in building the national capability in the construction of offshore boats.

As a result of the above two projects, the Sri Lankan fishery which was mainly confined to coastal areas, began to expand to offshore areas during the last few years. Various types of locally designed and constructed multi-day fishing boats have been introduced under the above two projects and successfully operated by local fishermen. It is estimated that 650 multi-day vessels (32-34 feet) catching about 20,000 tons per year are presently operating in offshore areas in the range of 100 miles from the coast.[58] Because of the profitability of the offshore fishery, large number of day boats (28 feet), which were earlier operated mainly in coastal waters have also been converted to multi-day boats. But such modifications have

caused instability of vessel problems and several of these boats have been damaged or lost during the last few years.[59] It should be noted that expansion of the offshore fleet has been essentially done by the private sector. Two hundred multi-day boats have been introduced between 1986 and 1990 by entrepreneurs and local boatyards.[60]

Production from the coastal sector increased from 125,386 tons in 1977 to over 157,411 tons in 1989 showing an increase of 20 percent (see Table 2.) In 1989 over 95 percent of the marine fish landings were from the coastal fishery. Offshore fisheries production has increased from 312 tons in 1977 to 8,155 tons in 1989 showing a tremendous increase. The share of offshore fish production in the total marine fish production has increased from 0.3 percent in 1977 to five percent in 1989.

9. ACCESS TO FOREIGN FISHING

Because of the lack of capital and national experience in deep sea fishing, the government of Sri Lanka decided to exploit the resources in the deep sea with foreign assistance. It encouraged collaboration between local sector and foreign interests by offering substantial tax and other concessions such as exemptions from the income tax, etc. and providing infrastructure facilities such as harbors, cold storage.[61] Through joint ventures in deep sea fishing the government expected to increase the fish supplies to domestic market, to earn foreign exchange for the country through processing and other value added shore based operations, to

upgrade the technical and operational skills of domestic fishermen, to provide employment to operators particularly to those trained by the National Fisheries Training Institution and to improve the knowledge on the fish resources in the deep sea.

The Fisheries (Regulation of Foreign Fishing Boats) Act No. 59 of 1979 was enacted to regulate, control and manage fishing and related activities by foreign vessels. Under the foreign fishing regulations, foreign vessels are given access to fishing under licensing arrangements. Fishing operations needs to be carried out beyond 35 miles from the coast in such areas using such gear as specified in the license.[62] In the case of joint ventures, fishing beyond 24 miles from the coast is allowed.[63] This distance limit has been set to protect the interests of local fishermen. Statistical and other information, including data relating to catch and effort needs to be furnished under regulation.[64] The position of the boat also needs to be furnished. To establish communication between the vessel and the shore based communication center, radio signals of the vessels needs to be matched with the shore based communication center. Foreign vessels are required to take national observers on board the vessel.[65] The trans-shipment, transporting or processing is not allowed unless authorized by the permit.[66] Fees payable in respect of license depends on the tonnage of the vessel and intended period of operation.[67]

In spite of the concerted efforts made by the government in this area, response

from the foreign nations was minimal. Several proposals by foreign investors for collaboration with the local private sector or with state sector institutions namely the Ceylon Fisheries Corporation (CFC) and the Ceylon Fisheries Harbors Corporation (CHFC) were approved. However, most of these proposals did not materialize and very little foreign investment in the offshore and deep sea fisheries took place. Only 14 vessels carried out fishing operations under licensing arrangements during the period from 1982 to 1987. Table 4 gives a summary of operations carried out by these vessels. The license fee charged from these vessels amounted to US $70,526.

Absence of reliable data on fish resources, non-agreement by the government to the concessions requested by foreign states, and inability of local collaborators to offer foreign collaborations by way of equity, expertise or support facilities, are among the reasons for minimal foreign collaboration. Another possible reason may be that the terms of collaboration and the investment promotion inducements offered by the government were not attractive enough when compared with those countries in the Indian Ocean, such as Seychelles, which has attracted several French and Spanish companies.[68] It is also likely that these other countries have sizable fish resources within easy reach compared with the resources such as tuna or tuna like species lying within the Sri Lankan EEZ or lying outside.

Since Independence (1948) the successive governments of Sri Lanka has been taking efforts to develop the fisheries sector recognizing its importance in terms

TABLE 4

SUMMARY OF OPERATIONS OF FOREIGN VESSELS UNDER THE LICENSE ISSUED UNDER FOREIGN FISHING REGULATIONS

Foreign Collaborator	Period of Permit	No. of Vessels	Size/Tonnage (LOA/GRT)	Fishing Method	Remarks
1. Thailand	10/15/82 to 10/14/83	2	20.3 m, 50.8 20.3m,46.6	Trawling Driftnet Trap Fishing	Operations Unsuccessful
2. Philippines	7/22/83 to 1/21/84	2	30 m, 155 30 m, 155	Purse seine	Experimental fishing, unsuccessful
3. Thailand	3/5/86 to 4/4/88	2	40.2M, 223.3 30.6 m, 164.9	Trawling	Operations unsuccessful
4. Singapore	4/5/86 to 8/1/86	1	48.8 m, 284.9	Longline	Successful Operations
5. Korea	9/30/86 to 3/14/86	2	43.2 m, 284.1 44.1 m, 299.3	Longline	Successful Operations
6. Australia	N/A	1	23.3 m, 189	Longline Beam Trawling	Terminated due to to illegal activities
7. Thailand	12/1/86 to 2/28/87	4	28.8m, 66.5 28.8m, 66.5 24.3 m, 97.9 22.8 m, 66.5	Purse seine	Terminated for fishing within 10 miles and dispute with local fishermen

Source: Ministry of Fisheries and Aquatic Resources, Sri Lanka.

of its contribution to food production, employment and incomes and foreign exchange earnings. The development programs succeeded in increasing the fish production primarily from inshore waters. The production from inshore waters was doubled during the period from 1957 to 1963. Subsequently it increased at a slower pace. The coastal production in 1989 was 157,411 tons showing an increase of 20 percent over the production in 1977. The government attempts since 1950's to 1970's to exploit the resources in the offshore and deep sea by direct state participation did not succeed. The introduction of new offshore boats under the foreign funded projects after the declaration of the EEZ resulted in expanding the national capability from inshore to offshore areas within 100 miles. The production from offshore fisheries increased from 2,000 tons in 1979 to 8,155 tons in 1989 showing a four times increase. Sri Lanka has been making attempts to get benefits from deep sea areas by giving access to foreign fishing under licensing arrangements. But the success achieved so far is minimal.

III. INSHORE FISHERIES

1. STATUS OF RESOURCE

a. Pelagics

Inshore pelagic resources include small pelagics such as sardines, anchovies and mackerel and medium sized pelagic species which include small sized tuna and tuna like fish such as longtail tuna, frigate mackerel tuna, and seer fish. Detailed resource surveys on small sized pelagics have not been conducted to date. The only systematic survey was carried out by the research vessel Nansen during the period 1978 to 1980, combining acoustic surveys and exploratory fishing. These surveys estimated the total biomass in the region of 400,000 tons excluding that of the shallow areas because of limitation of acoustic equipment and size of vessel. The maximum landings from inshore areas were recorded at about 184,000 tons in 1983 and current landings 157,000 tons. These figures suggest that current exploitation is not in excess of the maximum potential yield, which in general may be expressed as half the biomass.[69] But local overfishing exists in areas where there is a large concentration of coastal fishing boats or over utilization of small meshed gillnets.[70]

b. Demersal

Demersal resources are widely distributed on the Continental Shelves. As mentioned in paragraph one of Chapter I, the Continental Shelf surrounding Sri Lanka is very narrow and the outer edge slopes steeply to the deep sea, except in

the northwest coast where the shelf is somewhat wide and connected to the shelf of the Indian sub-continent. Joseph (1988) estimated the trawlable area in Sri Lanka water at about 7 percent of the total shelf area.[71] The predominant demersal species include finfish such as snapper, grouper, emperor fish, sea bream, as well as demersal sharks and rays and crustaceans such as lobster and shrimps. According to BOBP report BOBP/WP/41 (1985) based on the ad hoc surveys carried over the last few decades there is potential for doubling the present annual yield of about 36,000 tons.[72] However, according to a NARA study near shore lobsters and prawn fishery are showing signs of overfishing.[73]

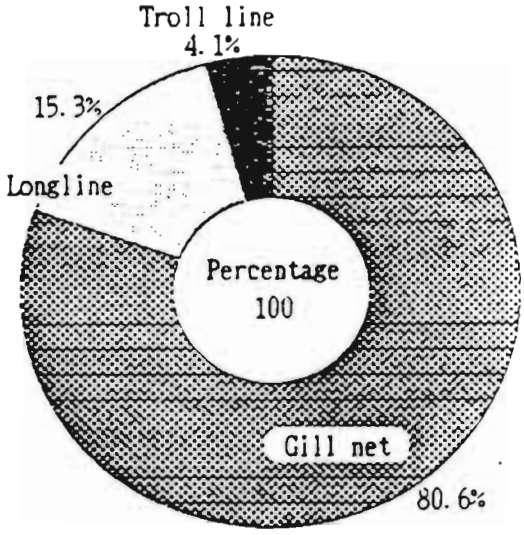
2. HARVESTING METHODS AND VESSELS

Most inshore fishing activities are directed at exploiting pelagics with gillnets, beach seines and trolling lines. Fishing for demersal resources are mainly by bottom set-longlines and handlines because the bottom structure of the shelf is rough and rocky which make the operation of trawling difficult. Trawling operations are carried out in limited areas mainly for shrimps. Figure 3 shows the share of production by gear type in inshore waters. It shows that 70 percent of total inshore landings are from gillnets followed by 15 percent from bottom trawling, five percent by surface trolling and remaining 10 percent by handlining and other miscellaneous gear such as small longline, beach seine, traps, small purse-seine and diving.

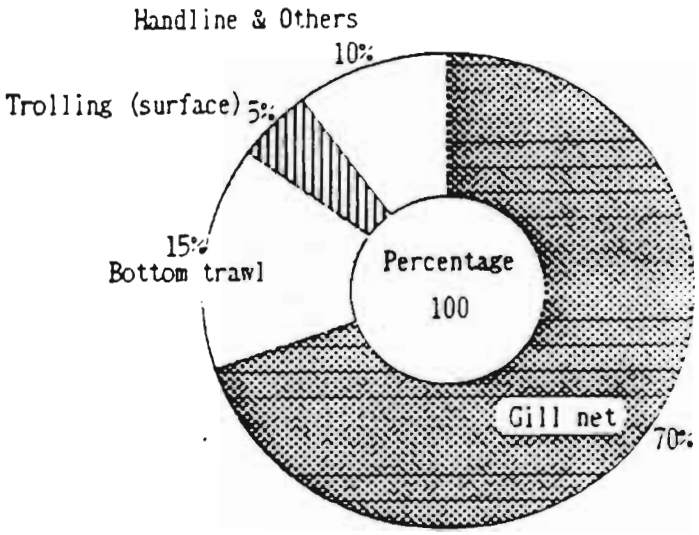
The inshore fleet comprises around 24,000 various craft adjusted to local

FIGURE 3

Share of Production by Type of Fishing Gear



OFFSHORE WATERS



INSHORE WATERS

Source: Offshore waters, based on data from L. Joseph (BOBP7The Desk Study, undated).
Inshore waters, based on data from L. Joseph (1990, unpublished paper.

conditions and built in wood and fiberglass (see Table 5). The craft can be classified as indigenous or introduced.

Indigenous Craft

The indigenous craft include the following:

a. The wooden 'paru' or the beach seine flat bottom craft made of planks and ribs with an overall length of 11-12 meters. They are propelled by oars for setting beach seines which are mainly operated in calm waters and where sea bottom has no obstacles;

b. The wooden Madel vallam or the dugout beach seine craft is propelled by oars for setting of beach seines similar to paru, mostly in the eastern and northern part of the country;

c. Dugouts without outrigger are canoes of 3-6 meters in overall length, propelled by oars and sail, used for castnetting, gillnetting, hook and line and trap fishing;

d. The log raft (Kattumaram or Teppam) 3-5 meters in length overall, made from logs pegged together used near shore for gillnetting and hook and line fishing; and finally;

TABLE 5
FISHING FLEET OF SRI LANKA

Province	District	1	2	3	4	5	6	7	8	9	10	Total
Western	Colombo	01	39	38	-	-	-	01	170	55	06	310
	Negombo	31	103	1203	-	-	02	34	577	577	47	2574
	Kalutara	41	94	496	02	01	35	172	-	242	60	1143
Southern	Galle	173	346	2277	61	30	710	78	132	3635	235	7677
	Matara	07	96	582	-	-	-	-	-	151	49	885
	Hambantota	26	111	574	53	151	37	240	237	595	94	2118
Eastern	Trincomalee	06	173	66	26	196	14	12	713	01	41	1248
	Batticaloa	30	357	118	02	47	-	-	549	-	10	1113
	Kalmunai	06	124	89	-	40	33	-	269	03	241	805
North-Western	Chilaw	152	05	810	17	04	14	-	38	631	113	1784
	Puttalam	32	179	1131	11	02	39	08	118	1101	15	2636
Northern	Mannar	05	71	45	-	04	13	93	2211	335	35	2812
	Mullativu	54	82	10	01	76	01	160	229	162	47	822
	Jaffna	18	97	65	-	-	-	-	421	95	68	764
	Total	582	1877	7504	173	551	898	798	5664	7583	1061	26691

1. over 32 feet off-shore boats
2. 28 feet (3 1/2 ton) boats
3. 17-23 feet FRP boats
4. mechanized canoes
5. oru with outrigger mechanized
6. Vallam/Teppam mechanized
7. non-mechanized canoes
8. non-mechanized oru
9. non-mechanized Vallam/Teppam
10. Madel Paru/Vallam

e. The outrigger canoes or the oru with dugout hulls raised with side stakes, sizes ranging from 3 to 11 meters. They are either propelled by oars and sail or in the case of larger one by outboard engines. These are mainly used for coastal gillnetting and pole and line fishing for skipjack in the southern regions.

The total number of these traditional crafts currently in operation are estimated at about 16,700 of which some 1,620 are motorized. All these traditional boats have very low operating costs, but their range of operations and production potential are limited. Most of these craft operate within a zone not more than five miles from the shore with the exception of pole and line fishermen who go as far as 20 miles from the shore.

Introduced craft

a. 17-23 feet Fiberglass reinforced plastic (FRP) boat

These are undecked open boats made of fiberglass reinforced plastic (GRP). Currently there are around 7,500 of these boats. They are propelled by 10-15 HP outboard motor, and used mainly for gillnetting, handlining, set longlining and trolling in coastal waters. Some use 25 HP engines. Catch of these boats could vary from 10 to 12 tons per year. The majority of these boats are engaged in catching small seasonal pelagics using small mesh gillnets, handlining for demersals and trolling for large pelagics such as Spanish mackerel and tuna.

b. 28 feet FRP boat

The FRP 28 footers or the popularly called three and a half tonners, which number around 1,900 currently operating in the far coastal areas using drift longline and bottom gillnets. This vessel is designed to give ample free board operating with a crew of four to five men. Its round hull allows greater carrying capacity, and is incorporated with a timber deck, hatches and hatch covers, a cabin situated over the engine and an uninsulated fish hold. It is powered by an inboard engine of horse power ranging from 26 to 35 and used as a day boat. Its catching capacity ranges from 20-25 tons per year. It was by far the most popular fishing craft in the 70's, and is well adapted to known fishing methods and sufficiently stable for prevailing sea conditions. Construction of this boat has virtually ceased as fishermen are gradually forsaking the 28 feet boats in favor of more modern and multi day offshore boats. Very recently, however, some of these 28 feet boats have been converted by fishermen into multi day boats, by installing a larger insulated box to carry fish on ice, and providing for some make shift bunks for crew rest. These boats operate both inshore and offshore areas depending on the availability of fish.

3. COASTAL HABITAT DEGRADATION

Over the past few decades population increases and development of other sectors such as industry, tourism and agriculture in the coastal zone of Sri Lanka have led

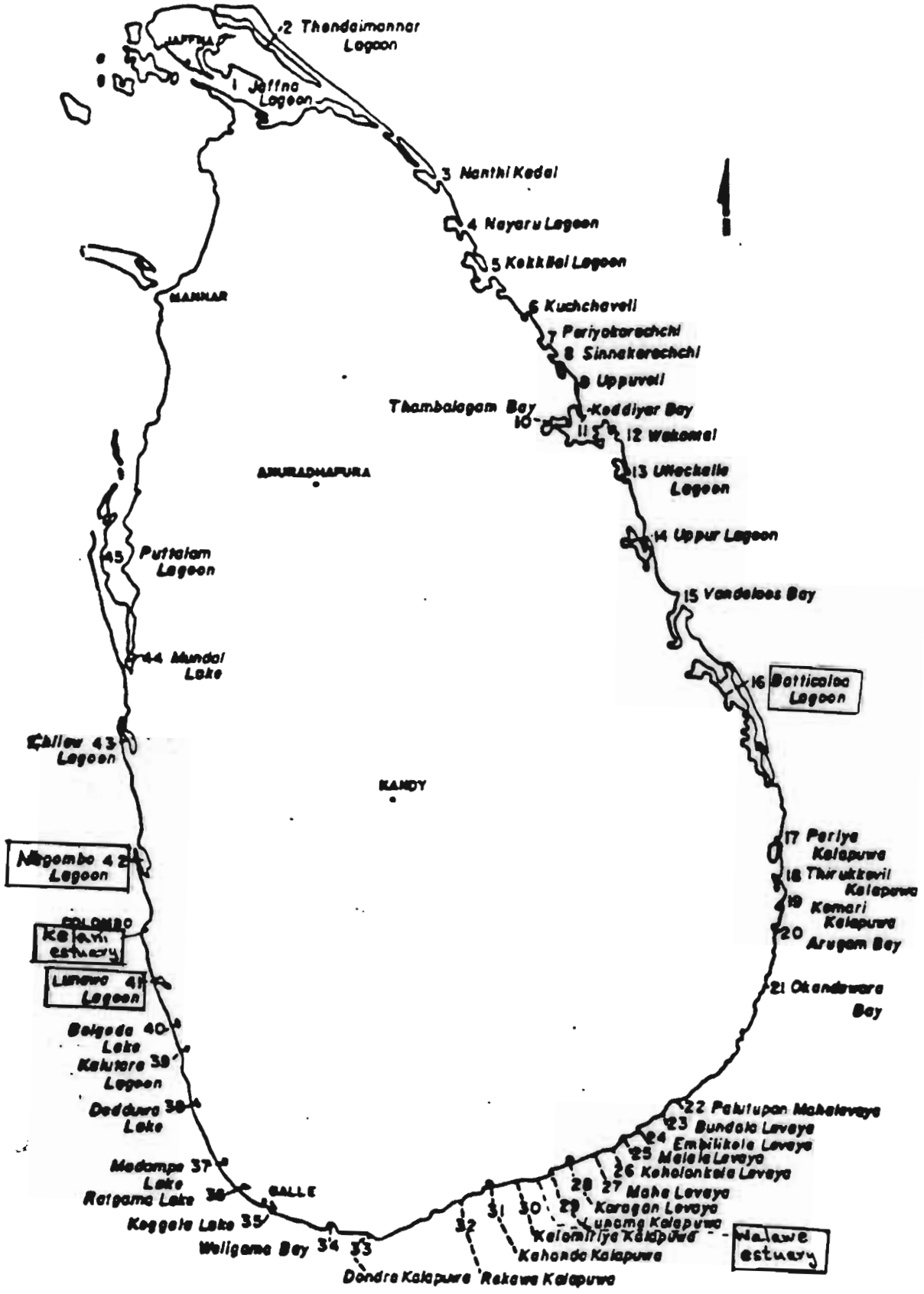
to the degradation of coastal habitats such as estuaries, lagoons and mangroves. There are about 40 lagoons and 45 estuaries that occur along the coast line of Sri Lanka.[74] (see Map 2) These habitats are particularly important to the fisheries sector because they provide protection and nursery ground to the larval stages of commercially important fish species and shrimps in nearshore coastal waters. Presently most of the lagoons, estuaries and mangroves are threatened by urban encroachment, pollutants of various kinds, siltation etc. Domestic sewage, garbage and waste fuel are major causes of the decline in the productivity of lagoons near urban areas. Industrial effluent, agricultural run off and increased sedimentation from poor upstream land water management schemes are also contributing factors.[75]

Estuaries and lagoons already affected by pollution from combined industrial effluent, domestic/municipal sewage and agriculture waste, are the Negombo lagoon, the Kelani estuary and the Lunawa lagoon in the western coast.[76] (see Map 2) Walawe estuary in the southern coast and the Batticaloa lagoon in the east coast are polluted by the effluent from the paper mill factories. Fish kills and tainted fish have been observed in these habitats.[77]

Quantitative data on waste disposal and effects of pollution are limited in Sri Lanka. Colombo is the capital of Sri Lanka and has a population more than 500,000 people.[78] Until recently the sewage from the northern district of Colombo were discharged untreated into the Kelaniya river, flowing to the sea at

MAP 2

BASIN ESTUARIES AND LAGOONS OF SRI LANKA



the northern border of Colombo city. The sewage flow ranged from 70,000 to 90,000 cubic meters per day representing around 55 percent of the total organic load into Colombo's canal network.[79] At present centrally collected sewage from Colombo is discharged untreated to the sea through the recently constructed ocean outfalls transferring the pollution problems to coastal marine environment. The increased volume of sewage raise the possibility of pollution of adjacent coastline. The solid waste generated in Colombo urban area was about 1,200 tons per day in 1970.[80] Per capita generation of solid waste in the Colombo municipality increased from 0.75 kilograms/person/day to 0.98 kilograms/person/day from 1986 to 1990 showing a 30 percent increase and is expected to increase by another 21 percent by 2010.[81]

Lowlying areas mostly adjacent to estuaries and lagoons are used as disposal sites and much of the waste finds its way into adjacent estuaries and lagoons affecting their productivity. In key tourist centers the Hikkaduwa and Bentota in the southern coast sewage disposal is a problem faced by most hotels; all the hotels are septic tank systems, but only a few hotels have treatment plants.[82] Therefore, potential health hazards to the residents and longer term degradation of adjacent coastal water which are rich in ornamental fish are likely to become increasingly serious. The total tourists arrivals to Sri Lanka in 1990 were 297,888.[83]

Presently there are no data on the impact of pollution on the fish productivity of lagoons, estuaries and mangroves. The average fish production for the Negombo

lagoon a highly productive estuary in the western coast declined from 65 kilogram per hectare in 1960 to 15 kilogram in 1983/84 period.[84] But the Negombo lagoon has been subjected to pollution from municipal waste, oil discharge from the fishing boats and boat repair workshops located at the bank of the estuary during last decades. Therefore, the decline in fish productivity may be not due to overfishing alone.

IV. OFFSHORE FISHERIES

1. STATUS OF RESOURCES

The offshore and deep sea fisheries resources constitute the large sized migratory species such as yellowfin tuna, skipjack tuna, bigeye tuna, albacoRe, billfish, and pelagic sharks, which are spread over the Indian Ocean. The National Aquatic Resources Agency (NARA) has estimated the potential exploitable offshore resource at around 40,000 ton and the present catch at 20,000 tons.[85] These data suggest that there remains scope for exploitation of the offshore areas. While Yellowfin stocks in the Western Indian Ocean can easily support current level of exploitation without damage to the resource, skipjack stocks are considered to be in a healthy condition.[86] Deep long line fishing for deeper swimming tuna has led to good results in the other parts of the Indian Ocean.

2. Harvesting Methods and Vessels

In contrast to the coastal fishery which has been practiced for centuries along the coast, offshore fishing has been carried out only since early 1970. In the early stages the expansion of this fishery was rather slow, but during the last 10 years development has been speeded up because of foreign investment programs and due to various subsidies offered by the government. At the same time local boat yards started developing craft using their designs for multi day fishing and encouraging fishermen to use them.

Drift gillnets are the predominant gear used by Sri Lankan fishermen to exploit the offshore resources. Around 80 percent of the total offshore catch is from drift gillnet fishery followed by 15 percent from longlines and four percent from trolling (see Figure 3). The fishing fleet presently operating in the offshore consists of 80 numbers of 34 feet boats (11 tonners) introduced under the Abudhabi funded project, 120 number of 28-32 feet boats (3 1/2 tonnes) designed by the local boatyards and 1,800 number of 28 feet day boats which operate both in inshore and offshore areas. All the offshore vessels are powered with inboard diesel engines of 30-40 HP and made of fiberglass with insulated fish hold varying from 3.0 to 3.5 ton capacity to carry fish on ice, water and fuel tanks. Wheel house and the engine room are located aft of the vessel below the wheel house. They are provided with basic electrical equipment, and steering gear. Modifications are required for more deck working space, and provision of adequate tank capacity for fuel, water and ice to improve the efficiency of these boats. Boats are operated mostly by private entrepreneurs, a few by cooperatives and companies.

Fishing trips by the multi day boats last an average from four to six days, while some extending the trip up to ten days. A normal daily fishing operation would start at dusk hours by setting the nets and the longlines, and hauling in the following morning. The most common fishing gears used are the drift gillnets combined with drift longline. Troll line fishing is also carried out for seerfish, mackerel and tuna, while reaching the fishing grounds and back to base. During

certain periods, fishermen in the southern part of the country carry out pole and line fishing with live bait around continental edge for skipjack. The boats introduced under the Abu Dhabi project have net and line haulers. In other boats nets are pulled by hand. The gillnet and longline catches consist mainly of skipjack (54%), yellowfin (15%), small tuna (7%) and bill fish (7%). Trolling line catches are mostly spanish mackerel, mackerel tuna and rainbow runners. Boat carry around 40 to 50 pieces of nets (24-27 ply, 500 meters long) of mesh sizes 5" to 7" and 30 to 40 bundles of longlines and hooks. Bait used for longlines are pieces of tuna, and sometimes small pelagics. The catch rates recorded by the smallest offshore boat (32 footer) for gillnet alone vary from around 110 kg/day to around 200 kg/day. For a combination of drift gillnets and longline, which is the most common fishing method, the catch rates have varied from 180 kg/day to 370 kg/day. Records also indicate that the monsoon period July-October had peak landings. On average existing offshore boats catch from 30 tons per year for a 32 footer, to 60 tons for a 34-35 footer.

Although the boats started going further offshore than before and on longer voyages, upgrading the safety of the boats was not taken up seriously. Most boats lack adequate safety and communication equipment. Most of the fishermen have not undergone training in navigation, seamanship etc. As a result boats subject to engine failure, natural causes such as storms, winds, waves etc are available to contact other boats or shore based rescue centers. In the past several offshore boats have drifted and many lives have been lost. During the period 1988 - 1989,

39 vessels were drifted and some of them reached countries like India, Mynmar, Maldives, Bangladesh and Indonesia.[87]

During the last ten years offshore fisheries have expanded rapidly. The current fleet consists of three categories of 28 - 32 foot long boats and capable of exploiting an increasing portion of the offshore resource potential. Safety of boats and fishermen has become a problem since upgrading the safety of the boats was not taken seriously in the process of building the national capability in offshore fisheries.

V. FISHERIES MANAGEMENT, SURVEILLANCE AND ENFORCEMENT

1. Fisheries Management

The limited nature of fish resources and their vulnerability to overexploitation requires proper management to ensure sustainable harvests. Overexploitation of fish resources in certain parts of the coastal inshore areas of Sri Lanka has been identified in recent time. The government of Sri Lanka had adopted some management and regulatory measures such as prohibition of fishing by explosives, regulation of purse-seine fishery and lobster fishery in inshore waters and others stated in the Fisheries Ordinance,[88] the principal fisheries legislation in Sri Lanka. The capacity of the Department of Fisheries for effective enforcement of these regulations is limited because of the scarcity of the equipment such has patrol boat, manpower and operating funds, and the scattering of landing centers right around the island. Presently, there are no restrictions on access to fisheries except purse-seine fishery. In other words access to the fish resources within the EEZ remain open to domestic fishermen. Absence of restrictions on the access may result in Hardin's tragedy of common even in areas where stocks are not heavily exploited.[89] In the past, the coastal fishermen in Sri Lanka established customary property rights over sections of coast around their community.[90] These unwritten property rights have effectively limited entry and saved the fishery from tragedy of commons. Increased in population and the introduction of technology over the time leads to the intra-community conflicts and eventual breakdown of traditional customary management system.

Limitations on research on fish resources and capabilities within the government institutions have led to uncertainties in making firm management decisions. The Fisheries Development and management decision are based on factors such as overall operating capacities of the existing boats, land based support services, income levels of the fishermen and limited information on the fish stocks, which are outdated. Important data necessary for scientific stock assessment such as statistics on fishing effort, landings by species and by fishing ground and by type of gear are absent in the national statistics.[91] Many of the assessment made in the past are therefore of a qualitative nature. Development and management decision made on uncertain scientific data do not give the desired results. In the past the issuing of subsidized boats have been governed by factors other than the availability of fish resources and of infrastructure facilities resulting in pockets of overexploitation of resources and underutilization of facilities.[92]

2. SURVEILLANCE AND ENFORCEMENT

The purpose of surveillance is to ensure that foreign fishing vessels comply with the requirements of Sri Lanka law and to protect the resources from poaching or illegal activities. Under Fisheries (Regulations of Foreign Fishing boats) Act , No. 59 of 1979 of Sri Lanka regulations, all foreign fishing vessels operating in the EEZ have to comply with the following requirements.

a) Foreign fishing vessels shall not engage in fishing activities in the EEZ of Sri Lanka without a permit issued by the Sri Lankan government;[93]

b) Foreign fishing boats entering Sri Lankan waters without a permit shall, at all times while it is in Sri Lankan waters, keep fishing gear stowed as prescribed in the regulations;[94] and

c) Foreign boats fishing under access arrangements shall carry out such fishing operations in such areas during such periods as may be specified in the permit.[95]

At present, the government of Sri Lanka control fishing operations carried out by (a) Placing Ministry officials on board the vessel as observers; b) Monitoring fishing activities by radio communication; and (c) Patrolling carried out by the Sri Lankan Navy.

But the effectiveness of these measures have been reduced due to the following reasons: (a) The Ministry officials placed on board the vessel as observers are not trained for the purpose. Often they are reluctant to go; b)Although there is a communication link between the foreign fishing vessel and the Ministry's shore based communication center, it is not possible to locate the exact position of the vessel with the present communication equipments; and c) Surveillance and enforcement carried out by Sri Lankan Navy is minimal due to the lack of resources and operating cost. The cost necessary for effective surveillance is very high since the oceanic area is to be surveyed and patrolled is vast. In the absence of an effective surveillance, poaching may occur.

3. SUMMARY OF PROBLEMS AND OPPORTUNITIES:

With the exception of some species such as prawns and lobsters the existing resources in inshore waters are not fully exploited and there is potential to increase the present production substantially. The present potential annual yield for offshore fisheries is around 40,000 tons and the present production of 20,000 tons could be doubled. These estimates are based on surveys carried out by NARA.[96] The resources in the deep sea area which are hardly exploited has a great potential to benefit Sri Lanka. Thus, Sri Lanka has opportunities to improve nutrition of its people, earn foreign exchange, create new employment opportunities and improve the living standards of fishermen by utilizing the fish resources with its EEZ.

Management and development problems with regard to Sri Lankan fisheries under the extended jurisdiction can be summarized as follows:

- lack of reliable information to make firm management and development decisions;

- inadequate management of living resources (threat of overfishing in inshore areas, degradation of resources in estuaries, lagoons and near inshore waters due to other uses of the coastal zone, and lack of effective management system;)

- inadequate safety of boats and fishermen engaged in offshore fisheries;

- the need to promote promotion of optimum utilization of resources by estimating total allowable catch and by other means to obtain the maximum use of the available resources and;

- inadequate surveillance and enforcement in the EEZ.

A program which responds to the problems identified above is provided in the next chapter of this study.

VI. FUTURE PLANNING/POTENTIAL DEVELOPMENT

1. FISHERIES INFORMATION

A sound national policy which is necessary for a rational and healthy development of the fishery has to be based on reliable information on both production and fish stock. To improve data collection and stock assessment the following is considered necessary.

- to record data for different categories in the sector: inshore, offshore, deep sea and demersals. Records should indicate catch by location/fishing ground and by different types of gear.

- to classify fisheries into inshore, offshore and deep sea to get a clear picture about the resources and the current level of effort. As the distribution of the living resources are more often related to natural boundaries in the sea, it is necessary to consider the inshore as extending up to the Continental Shelf instead extending upto 25 miles and the offshore as an area extending beyond the shelf up to 100 miles and deep sea beyond 100 miles.

- to introduce a fishing master's log book for all offshore boats in order to provide data on steaming and fishing time (casting and hauling time for each operation), catch per haul by gear type (e.g. drift, gillnets and longlines etc), fishing locations, species composition, fuel and oil consumption, etc.

- to conduct exploratory fishing and surveys regularly to determine migratory habits of fish, including seasonalities, to locate new fishing areas and grounds and to develop new techniques by NARA with the assistance of international development agencies.

- to provide all enumerators of MFAR and NARA with a manual to facilitate the collection and submission of appropriate data. Furthermore, for the compilation of tables and improving the database, a supply of adequate computers and training of local staff is necessary. The cooperation of fishermen is necessary in collection of data. This can be obtained by convincing the fishermen by education about the benefits they can get from data. The number of computers required may be few since already there are a fair number of computers used for data compilation.

- to conduct a fisheries census as the last census was carried out in 1972. Such censuses need to be carried out at intervals of 4-5 years.

2. INSHORE FISHERIES

Further expansion of fishing effort in inshore area needs to be carried out with precaution because already in some areas like south-western coast fishing effort is highly concentrated and shows signs of overfishing. Therefore, attention has to be paid to increase the fishing effort in areas where resources are not under heavy pressure, like the northern and eastern coast. In allocating government

incentives like subsidy, the criteria such as the status of resources in the areas should be taken into consideration.

Since there is an overconcentration of pelagic gillnetting in the inshore fishing in certain areas which has led to conflicts and decline in catching rates the fishermen need to be encouraged to take up other fishing methods, such as bottom set nets, bottom longlining, trap fishing for lobsters, squid jigging and the use of fish aggregate devices in such areas. An appropriate extension program needs to be initiated for this purpose. Another way to offset the falling incomes due to declining catch rate is to reduce the operating cost mainly on fuel. This can be achieved by encouraging fishermen to use engines of appropriate power and sails for fuel saving. The government subsidy programs have to be adjusted accordingly.

Since the limitations on the possible further expansion of the inshore fishing fleet in areas where there is high concentration of effort and the trend in the offshore fishery is towards larger vessels with relatively fewer crew members there is a need to create alternative employment, particularly for youths. Generation of employment in post-harvest sector, fisheries services sector and non fisheries sector is necessary as a means of diversifying the employment opportunities for the increasing populations of fishing villages.

As indicated earlier the developments in other sectors of economy such as

agriculture, housing, tourism and industries have a negative impact on inshore fisheries development. Destruction of mangroves, pollution of estuaries, diversion of irrigation canals to the lagoons have resulted in lower fish yields. In such cases, integrated management plans need to be developed for such water bodies, taking into consideration the importance of different uses to maintain the sustainability of fishery resources. Interagency coordination needs to be strengthened for their effectiveness.

The other sectors in the coastal zone also play important role in the Sri Lankan economy. Manufacturing industry accounts for less than 20 percent of Sri Lanka's GDP in 1990, while the contribution of agriculture to the GDP was estimated at 23 percent in 1990.[97] Tourism in Sri Lanka is a growing industry and plays an important role in the economy. The total tourists arrivals in 1990 were 297,888.[98] The gross foreign exchange earnings from tourism have been estimated at Sri Lankan Rupees 4,800 million (U.S. $ 40 million) in 1990.[99] The total employment provided by the tourist industry has been estimated at 60,000.[100] Out of this total, about 25,000 were directly employed in the industry, while the balance 35,000 were employed in ancillary activities. Although fisheries is still the most important sector in the coastal zone in terms of value, employment and foreign exchange earnings, at the national level, choices for different uses need to be based on cost-benefit analysis and in relation to national development objectives.

3. OFFSHORE FISHERIES

As indicated in Chapter IV, the offshore resource potential is around 40,000 tons. To exploit these resources up to around 400 more boats could be introduced into this fishery, and efficiency of the existing boats have to be improved by modifying the deck layout. The capacity of boatyards and availability of credit needs to be strengthened for this purpose. While introducing more offshore boats, it is necessary to establish a system for continuous monitoring of fish landings from these vessels and resources to avoid overfishing and promote a healthy development of fishing.

The main gear used for offshore fishing is drift gillnet and further increases in gillnets would not give better results because the increasing soaking time with increase in the amount of gillnets in the warm tropical water would result in bad quality fish. On the other hand, expansion of drift gillnets may be detrimental to fish resources and marine ecosystems. The problems of driftnet has been addressed in the U.N. Resolution on the large scale pelagic driftnet fishing and its impact on living marine resources of the world's ocean and seas.[101] Therefore it would be necessary to encourage the offshore fishermen to take more long line for better utilization of the offshore resources. This would allow the exploitation of sub-surface and deep swimming tuna which are not sufficiently exploited by the domestic offshore fishing vessels. On the other hand fish caught by longline are fresh and can be kept for longer periods and could be sold for better prices.

To improve the safety of offshore vessels it is necessary to import communication electronic and life saving equipment and provide them to fishermen under concessionary bank loans, and carrying of such equipment on board the vessel should be made mandatory. The fishermen should also be trained in basic navigation, safety and survival at sea, overall management of safety of boat and trouble-shooting of engines at sea.

The present system of receiving distress calls, search and rescue activities carried out by four regional center and central unit of the Ministry of Fisheries and Aquatic Resources is inadequate for an expanding offshore fishery. Because of old and out-dated equipment, relaying messages to fishing vessels and receiving signals in case of distress are difficult and often impossible. It is necessary to strengthen these stations by providing the necessary equipment and staff training.

It is also necessary to introduce a boat licensing system and certificate of competence for fishermen operating boats fitted with a radio and satellite navigator. Periodic inspection of boats and equipment and issue of a seaworthiness certificate needs to be carried by a qualified surveys. Finally guidelines for the design construction and equipment of fishing boats operating in offshore needs to be established.

Under Foreign Fishing Act, foreign fishing is allowed in the areas beyond 35 miles from the base. Since the present national capability has extended up to 100

miles, the area for foreign fishing needs to be limited to the area beyond 100 miles to safeguard the interest of domestic fishermen. Therefore the Act needs to be amended.

4. DEEP SEA FISHERIES

As indicated in Chapter I the resources beyond the 100 miles remains more or less underexploited due to minimal foreign participation and absence of national capability to exploit these resources. The main problem is the lack of data concerning fish resources and other technical and economic parameters for a viable fishery. Hence, there is a need to conduct exploratory fishing operations and a resource survey before making a major investment decisions, particularly in industrial scale fishing operations.

If the development of commercial fisheries is justified by survey work, then it is necessary to develop programs to build the national capability to exploit the resources in the deep sea with technical and financial assistance from the international development agencies. Until the national capability is developed, greater incentives may be given to attract more foreign fishermen to tap the deep sea resources under joint ventures or licensing arrangements. But it is necessary to ensure that such programs would benefit Sri Lanka by increased fish supplies to domestic market, training local fishermen and giving access to foreign markets.

5. FISHERIES MANAGEMENT

The major cause of overexploitation in inshore fisheries in certain areas is the condition of free and open access to the resources. Access can be closed by several different techniques, such as license limitation, individual quotas and exclusive territorial use rights. The first two are difficult to enforce in Sri Lanka mainly because of the dispersion of fish landings centers along the coastal belt and the limited capacity of the government institution (Department of Fisheries and Aquatic Resources) to enforce such measures. Therefore, it is necessary to examine the possibilities of providing exclusive use rights to the village level fishermen's societies to manage the fisheries in the areas adjacent to their villages. When there is use rights in fisheries, the village level organization can determine how best it wishes to use the resources in the area. It can fulfill all the functions of fisheries management: control entry, allocate capital and labor, determine how much and what kind of fish to harvest, regulate fishing gear, extract rents if desired and distribute benefits whatever manner it wishes. In past the traditional use rights played a vital role in managing the resources that contribute to socio-economic development of the traditional fishing communities on a sustained basis.

Since the management of resources pivots upon the management of uses, it is necessary to get them involved in developing management polices. This can be achieved by setting up of a resource management group consisting of scientists, administrators, and representatives from Fisheries Cooperative Societies and

private sector. It is also necessary to educate the fishermen on the benefits they can achieve on better management of resources.

6. SURVEILLANCE AND ENFORCEMENT

The oceanic area within the EEZ to be surveyed and patrolled by Sri Lanka is immense on one hand and on the other the resources available to Sri Lanka for even the most minimal level of surveillance and patrol are quite limited. In these circumstances, it is possible for poaching to take place. In fact in the past a number of foreign vessels have been detected poaching in the Sri Lankan waters. Increased surveillance involves extra cost whereas the marginal benefit from it may be low.[102] However, when detections are made there will be some direct benefits especially from the fine imposed or from the auction of vessels caught poaching. However, these are unlikely to outweigh the costs of surveillance.

The problems of poaching might be overcome to some extent once the Sri Lanka builds its national capability in the deep sea areas because the national fishermen generally have an interest in reporting unauthorized fishing vessels in their area of jurisdiction. Neighboring countries like The Maldives are also faced with the problem of surveillance and enforcement in its EEZ. Since Sri Lanka too has no capability to survey and patrol in its EEZ, regional cooperation is necessary in this area. The example of the South Pacific Regional Register of Foreign Fishing Vessels set up by the South Pacific Forum Fisheries Agency to monitor the activities of the many distant water fleets operating in the Exclussive

Economic Zones of member countries might be examined to see if the lessons learned there could be applied in this region.[103] The regional organization available for this is the Indian Ocean Marine Affairs Cooperation (IOMAC) which was established within the framework of UNCTAD in 1985.

VII. CONCLUSION

Before the declaration of the EEZ, the development efforts taken by the Sri Lankan government were mainly concentrated in coastal inshore fishery development. After the declaration of the EEZ in 1977, the government embarked upon ambitious plans and program with technical and financial assistance from international development agencies to build up national capability to harness the resources in the offshore areas, and access was given to foreign fishermen to tap resources in the areas where the Sri Lanka lacks national capability. As a result of development efforts, the fishing fleet which was confined to coastal fishery expanded to offshore area initially at a slow pace and rapidly during the last few years. Foreign participation was minimal in spite of the efforts taken by the government to attract them.

With the development of other sections in the coastal zone, the inshore fisheries resources has been subject to the threat of degradation in some areas in addition to the threat of overfishing. Offshore fishery is expanding, but safety at sea has become a concern. Under the present conditions, the inshore fishery needs to be managed. Management of inshore fisheries may be improved by giving use rights to the village level cooperations societies, education of the fishermen on management and involving the fishermen groups in making management decisions. Development plans for inshore fisheries should not be made in isolation as in past. Since there are other sectors which are competing with fisheries integrated planning is necessary.

While taking efforts to increase the offshore fleet, it should be closely monitored to avoid overfishing. Safety of the offshore vessels need to be improved urgently. Steps to expand national capability to deep sea areas have to be taken urgently beginning with exploratory fishery surveys to assess the viability. Surveillance of the EEZ needs to be effected through regional cooperation. Since the declaration of the EEZ, many changes have taken place in the Fisheries Sector, an inventory of all the components of the Fisheries Sector should be undertaken to update and improve the fisheries database for future planning.

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[67] Fees payable in respect of foreign fishing boats permits.

Tonnage of vessel:			Fee payable per month for gross registered tonnage (GRT) in US Dollars:
0	and less than	100	5
100	and less than	500	4
500	and over		3

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