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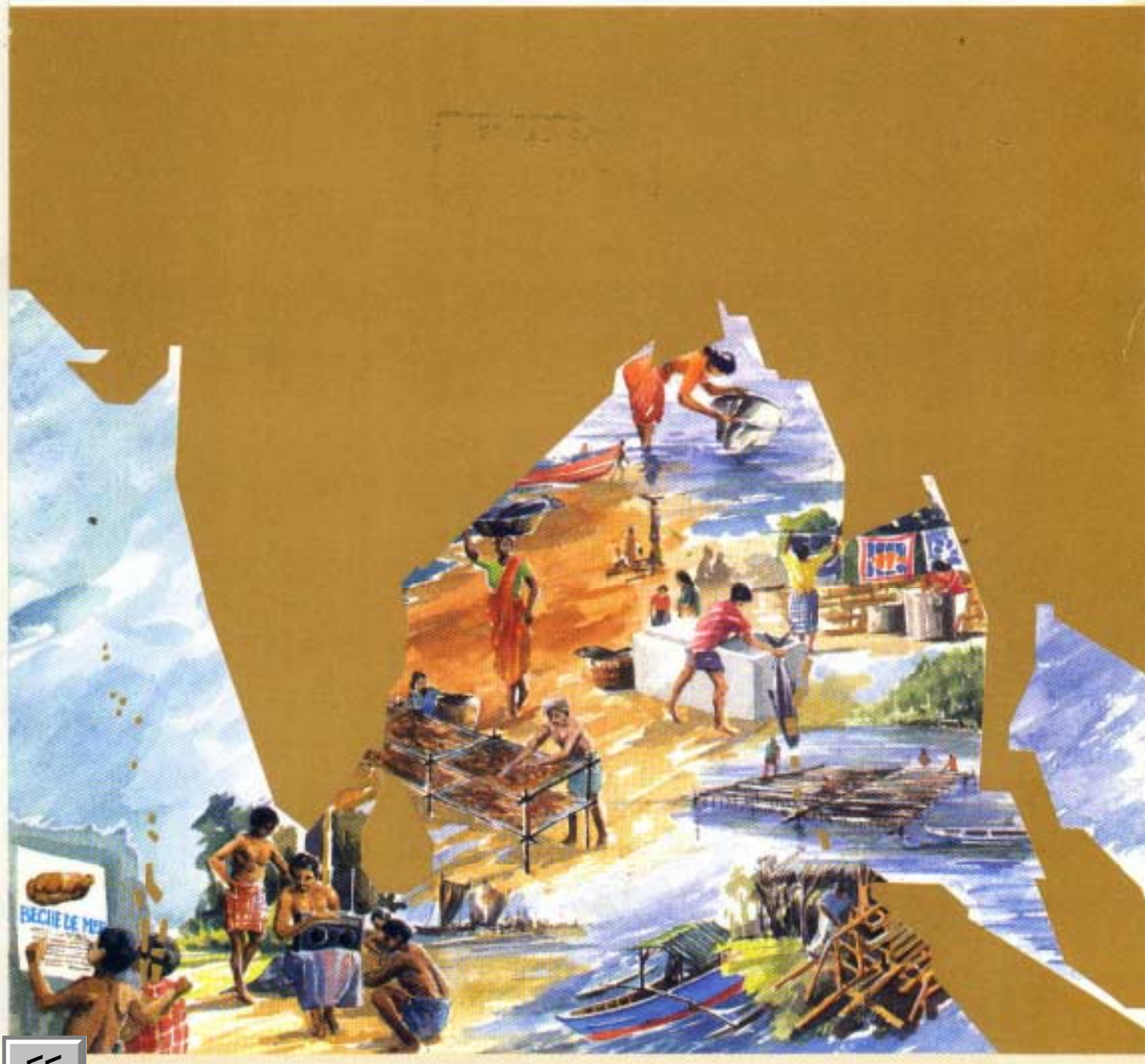
Biosocioeconomics of Fishing for Small Pelagics along the Southwest Coast of Sri Lanka



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BOBP/WP/96

Small-scale Fisherfolk Communities
Bioeconomics of Small-scale Fisheries

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Biosocioeconomics of fishing for small pelagics along the southwest coast of Sri Lanka

by

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BAY OF BENGAL PROGRAMME
Madras, India
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The marine fishery in Sri Lanka is the country's major source of animal protein supply (60%). It also provides employment to around 100,000 fishermen. More than 90 per cent of the fish production comes from the coastal area extending up to about *25* nautical miles from the shore. A group of small pelagic species constitutes more than *45* per cent of this catch.

Before the motorization of fishing craft in the early 1950s, almost the entire production of small pelagics came from the beach seine (BS). After motorization, however, small-mesh gillnets (GN) became popular. With the introduction of synthetic material, the gilinet became the major gear. In the early 1980s, fishermen on the southwest coast of Sri Lanka started using the purse seine (PS) to target small pelagic resources.

The rapid increase in fishing intensity due to motorization gave rise to several fishing disputes. The use of the more efficient purse seine in the southwestern coastal waters led to several conflicts. In 1987, the Ministry of Fisheries and Aquatic Resources (MFAR) framed regulations limiting the area of operation of the PS. However, enforcement of these regulations was not successful. The MFAR thereupon, realized the need to examine the possible interaction between the different fisheries in terms of resources and income distribution among various user-groups. It was expected that the information obtained through a study would assist in arriving at sound management measures. The study was undertaken by the Department of Fisheries and Aquatic Resources and the National Aquatic Resources Agency (NARA) with guidance from the Bay of Bengal Programme's biosocioeconomics team. The reporting was funded by the United Nations Development Programme (UNDP).

The Bay of Bengal Programme (BOBP) is a multiagency regional fisheries programme which covers seven countries around the Bay of Bengal — Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka and Thailand. The Programme plays a catalytic and consultative role: it develops, demonstrates and promotes new technologies, methodologiès and ideas to help improve the conditions of small-scale fisherfolk communities in member countries. The BOBP is sponsored by the governments of Denmark, Sweden and the United Kingdom, and also by UNDP (United Nations Development Programme). The main executing agency is the FAO (Food and Agriculture Organization of the United Nations).

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1. *INTRODUCTION*

The marine fishery in Sri Lanka is important to the nation as it is the country's major source of animal protein supply (60%). It also provides employment to around 100,000 fishermen. More than 90 per cent of the fish production comes from the coastal area extending up to about 25 nautical miles from the shore. A group of small pelagic species constitutes more than 45 per cent of this catch.

Before the motorization of fishing craft in the early l950s, almost the entire production of small pelagics came from the beach seine (BS), the dominant gear operated at the time. After motorization, however, small-mesh gillnets (GN) became popular, as motorized craft could venture further from shore and target fish shoals not accessible to the beach seine. With the introduction of synthetic material for the webbing of gillnets, the catch of small pelagics steadily increased and the gilinet became the major gear.

In the early 1980s, fishermen on the southwest coast of Sri Lanka started using the purse seine (PS) to target small pelagic resources. This was one result of successful experimental purse seining carried out to collect live bait for the pole-and-line fishery. The number of purse seiners increased from 32 in 1984 to 62 in 1990, operating mainly from Hikkaduwa, Ambalangoda and Balapitiya in the Galle District and from Beruwala in the Kalutara District.

The rapid increase in fishing intensity due to motorization gave rise to several fishing disputes. The use of the more efficient purse seine in the southwestern coastal waters led to several conflicts with other resource users employing small mesh gilinets and beach seines. The disputes were further aggravated when the latter groups saw the high catches of the more efficient purse seines. Many expressed their concern that the purse seine fishery would adversely affect their catches and income levels and, thereby, their livelihood.

In 1987, the Ministry of Fisheries and Aquatic Resources (MFAR) framed regulations limiting the area of operation of the PS. However, enforcement of these regulations was not successful, for several reasons, and, in fact, resulted in an increase in the number of fishing conflicts. The MFAR thereupon realised the need to examine the possible interaction between the different fisheries in terms of resources and income distribution among various user-groups. It was expected that the information obtained through a study would assist in arriving at sound management measures to achieve equitable and fair distribution of benefits among the user groups and also ensure the sustainability of the resources of small pelagic fish. The study was undertaken within the framework of the Bay of Bengal Programme (BOBP) project 'Bioeconomics of Small-scale Fisheries'.

2. *THE OBJECTIVES*

The objectives of the study were:

- Biosocioeconomic assessment of the exploitation of small pelagics, the effects on income distribution and the socioeconomic impact of alternative management measures.
- Inservice training/education of national staff in the relevant aspects of bioeconomic and socioeconomic assessment and fisheries management.
- Improvement of awareness among the fisherfolk of the fish resources and their management.

3. *METHODOLOGIES*

3.1 *Preparatory work*

The Department of Fisheries and Aquatic Resources (DOFAR) and the National Aquatic Resources Agency (NARA) teamed together to undertake the study in Sri Lanka. Initially, BOBP staff met several times with the staff of DOFAR and NARA to plan the study. Before commencement of the field work, a series of meetings were held with the fishermen in the study area to explain to them the objectives of the project and to get their co-operation in carrying out the research work in the field. Meetings were held with fishermen in Balapitiya, Hiriwatte and Ambalangoda on October 21, 1991 and in Hikkaduwa and Doddanduwa on October 22, 1991. The District Fisheries Extension Officer (DFEO) of Galle District and the local Fisheries Inspectors assisted in organizing the meetings.

During the planning meetings, the Fisheries Inspectors pointed out that they had practical problems in allocating time for the simultaneous conduct of the bioeconomic and socioeconomic frame surveys. Therefore, the two frame surveys were carried out separately. The bioeconomic survey was carried out by staff of the Marine Biological Resources Division, NARA, while the socioeconomic survey was carried out by Fisheries Inspectors of DOFAR.

3.2 *Bioeconomic sampling*

Of 1215 fishing craft recorded during the frame survey in the study area, at least 1000 were engaged in fishing for small pelagics. Fifteen different types of fishing gear were observed (see Appendix X).

Of the variety of gear used, only five catch small pelagics in coastal waters and these were selected for bioeconomic assessment. The five were:

- Beach seine (BS)
- Purse seine (PS)
- Small-mesh gillnet (GN1)
- Small tuna gillnet (GN2)
- Ringnet (RN)

A large number of species *(55* identified) were found among the catch of small pelagics. However, the dominant species were:

- Frigate tuna (FMT) - *Auxis thazard*
- Mackerel tuna (KAN) - *Euthynnus affinis*
- Bullet tuna (BLT) - *Auxis rochei*
- Mackerel scad (DEM) - *Decapterus macarellus*
- Bigeye scad (SEC) - *Selar crumenophthalmus*
- Indian mackerel (RAS) - *Rastrelliger kanagurta*
- Trenched sardine (AMS) - *Amblygaster sirm*
- Red bait (DIP) - *Dipterygonotus leucogrammicus*
- Sardine (SAA) - *Sardinella* spp.
- Anchovy (STH) - *Stolephorus* spp.
- Squid (SQU) - *Loligo* spp.

Of these, FMT, DEM, SEC, RAS and AMS were the species that showed an interaction with the five fishing gear and, hence, bloeconomic analyses have been restricted to them.

Seven sampling stations — Magonna, Beruwala, Haraspola, Ambalangoda, Peraliya, Hikkaduwa and Doddanduwa — were chosen (see Figure 1 on facing page) to collect bioeconomic data on fisheries that use the gear listed above. Data from each station were restricted to the predominant fishing gear used at the station. Data for beach seine, however, were collected at all the stations.

The bioeconomic data consisted of sample length-frequencies, catch and effort, species composition, departure time, arrival time, number of crew per boat, number of operations, cost of fuel, cost of food, sale value of fish, crew share, boat-owner's share, net-owner's share and the total number of boats operated and sampled on the sampling day. Length-frequency samples of the five dominant species were later raised to the total catch of the boat sampled and then raised to the total catch of the fleet at the particular station. The raised data for each species from each fishery at each sampling station was used as input for the ELEFAN computer programme (Gayanilo Jr., Soriano and Pauly, 1989).

3.3 *Data analysis*

Analysis of data for estimation of biological parameters was carried out using the Compleat ELEFAN (1 .11 version) and LFSA computer programmes (Sparre, 1987). Monthly length-frequency data for each species raised to the total catch for all stations and all fishing gear were pooled to estimate the growth parameters for each of the five species (see Table I). The

Table 1. Growth parameters for small pelagics (pooled data)

Species (abbreviation)	*K*	*L (cm)*	*M*	*Mean F*	*Mean E*
Trenched sardine (AMS)	1.3	24.6	2.24	0.972	0.303
Frigate tuna (FMT)	1.4	45	1.98	2.610	0.567
Mackerel scad (OEM)	0.8	41.2	1.413	2.380	0.630
Bigeye scad (SEC)	0.5	34.75	1089	0509	0.318
Indian mackerel (RAS)	17	36.0	2.4	1.590	0.400

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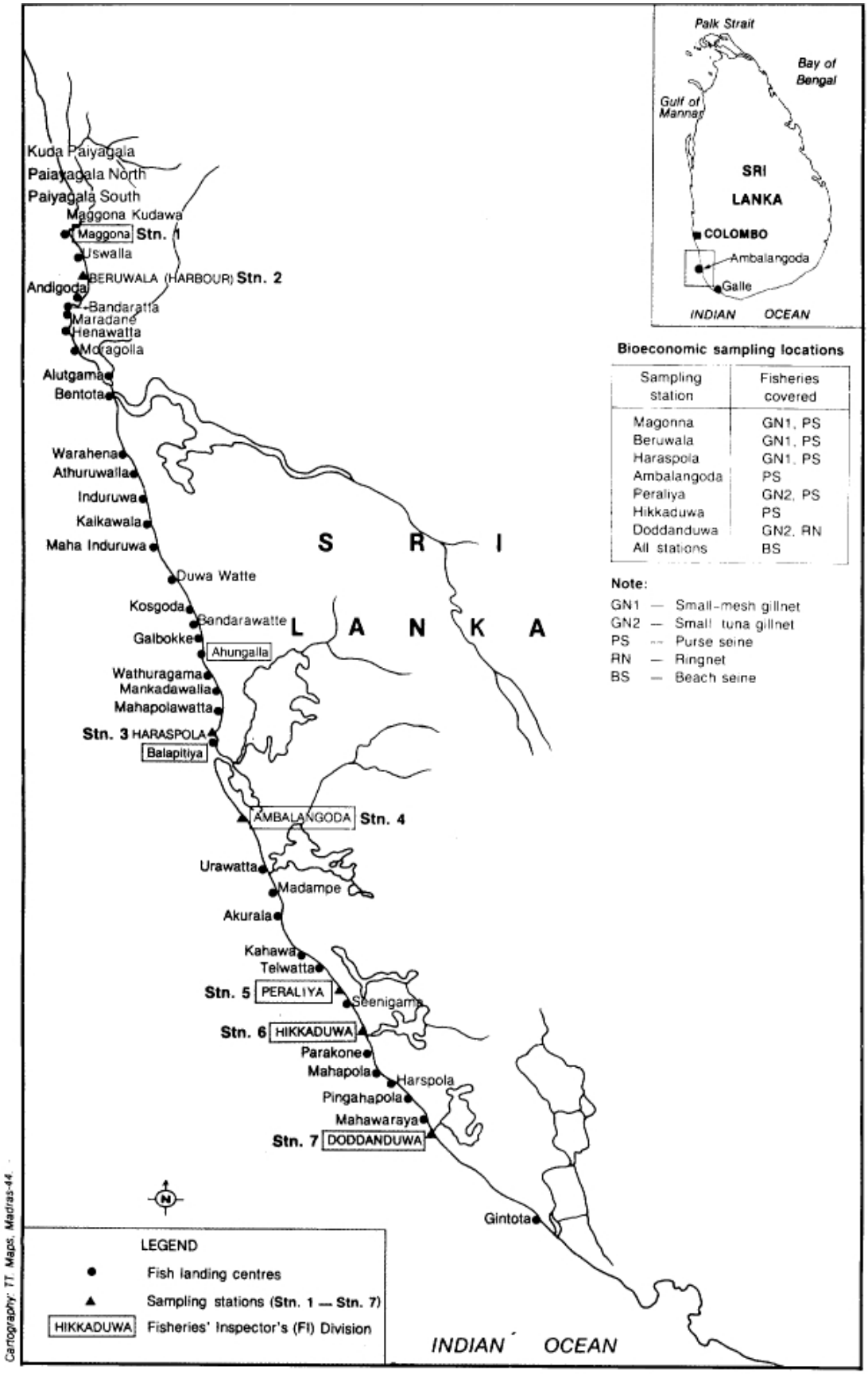
Fig 1. Study area in Sri Lanka with fish landing centres and bioeconomic sampling stations



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natural mortality (M), fishing mortality (F), the lengths at 50 per cent and 75 per cent probability of capture (L_{50} & L_{75}) for each species and for each fishing gear were estimated using ELEFAN II (see Section 4.1) Relative yield per recruit (Y/R) value for each species was obtained using the knife-edge selection method in ELEFAN II.

The population size of the selected species was obtained by the Virtual Population Analysis (VPA II) in ELEFAN III. F values for each length class, the F_{max} (highest fishing mortality of the age/size class) obtained by Jones' Length-Cohort Analysis (see Table 2) in the LFSA package (FAO) and the price per kg recorded for different sizes of each species of fish during the survey were used as inputs for the Thomson and Bell analysis to predict future yields and values for varying fishing effort.

Table 2. Length-cohort analysis of small pelagics

Species (abbreviation)	*Fishing gear*	*Mean exploitation* rate (E)	*Maximum fishing* mortality (F_{max})	*Recruitment number* x 10^6	*Mean size at capture* (L_{50})
Trenched sardine (AMS)	BS	0.763	15.9	32,260.2	3.9
	PS	0.105	5.7	106,259.1	20.2
	GN1	0.102	3.6	2,866.3	19.5
Mackerel scad (DEM)	PS	0.80	18.8	4,094.9	10.1
	GN2	0.246	5.3	2,565.0	29.5
	RN	0.356	5.6	10.9	27.6
Bigeye scad (SEC)	PS	0.378	4.2	6,224.8	11.2
	GN2	0.248	2.7	1,755.6	22.3
Indian mackerel (RAS)	BS	0.400	17.8	170.3	6.9
	PS	0.486	19.5	4,256.5	11.0
	GN2	0.495	14.2	1,703.4	21.7
Frigate tuna (FMT)	GN2	0.390	3.8	2,463.5	23.7
	RN	0.567	14.6	2,677.6	25.6

The catch data recorded for each craft/gear combination from each sampling station were analyzed separately. The catch per operation was assumed as the catch per unit (CPUE) and the production from each fishery was estimated by multiplying the CPUE with the number of operations carried out by the particular craft/gear combination during each month. The species composition of the catch of each craft/gear combination was analyzed for each sampling station. For the beach seine fishery, data from all the stations were pooled together.

3.4 *Socioeconomic survey*

The socioeconomic frame survey was conducted in the Fisheries Inspector's (FI) Divisions of Ahungalla, Balapitiya, Ambalangoda, Hikkaduwa South, Hikkaduwa North and Doddanduwa (see Figure I). Based on the frame survey, a comprehensive survey was planned and conducted in August 1992 and during March-April 1993 by the Marine Biological Resources Division staff of NARA with the help of Fisheries Inspectors from DOFAR. In all, 509 houses were sampled from Ahungalla to Doddanduwa, including households of boat-owners, skippers, crew members and persons not engaged in fishing.

3.5 Linkage of bioeconomic and socioeconomic components

The following methodology was adopted to establish the linkage between bioeconomic and socio-economic findings:

- The stratifications for the bioeconomic sampling were also applied to the socioeconomic survey of the households, including income distribution.
- Monthly income from fisheries was estimated using catch rates, species composition

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and prices of fish species according to size, as this was considered more reliable than estimates obtained through interviews. Incidentally, this also enables a better comparison of the performance of different gear. Monthly income estimation also enables the assessment of seasonal highs and lows, which can be useful to indicate the appropriate time to shift to more profitable fisheries.

- Income **from** particular craft-gear combinations was correlated with income from fishery-related and/or nonfishery activities of each category of household.
- Categories of households were established according to combinations of income-generating activities and the overall income in each category from the relevant income sources was arrived at.

4. FINDINGS

4.1 *Bioeconoinics of interactive fishing for small pelagics*

Analysis of the data gathered reveals that, in terms of fishing effort, taking the number of operations per year with each fishing gear as an index of effort, GN2 contributes to around 40 per cent of the total effort. PS (23%), GNI (14%), RN (12%) and BS (11%) follow in that order (see Figure 2). Monthly variations in fishing effort show (see Figure 3) that only GN2 is operated year-round, whereas fishing with the other gear is discontinued during the South-west Monsoon (May-August).

Fig 2. Fishing operations per year (fishing effort)

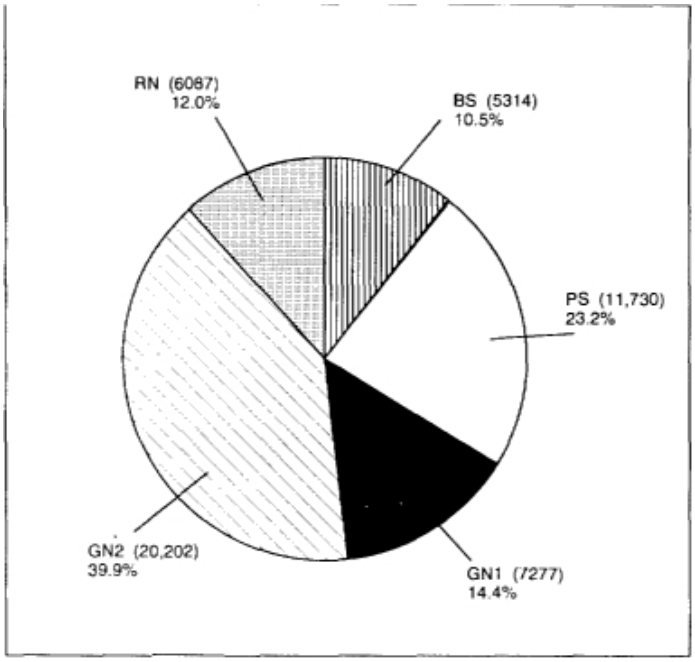
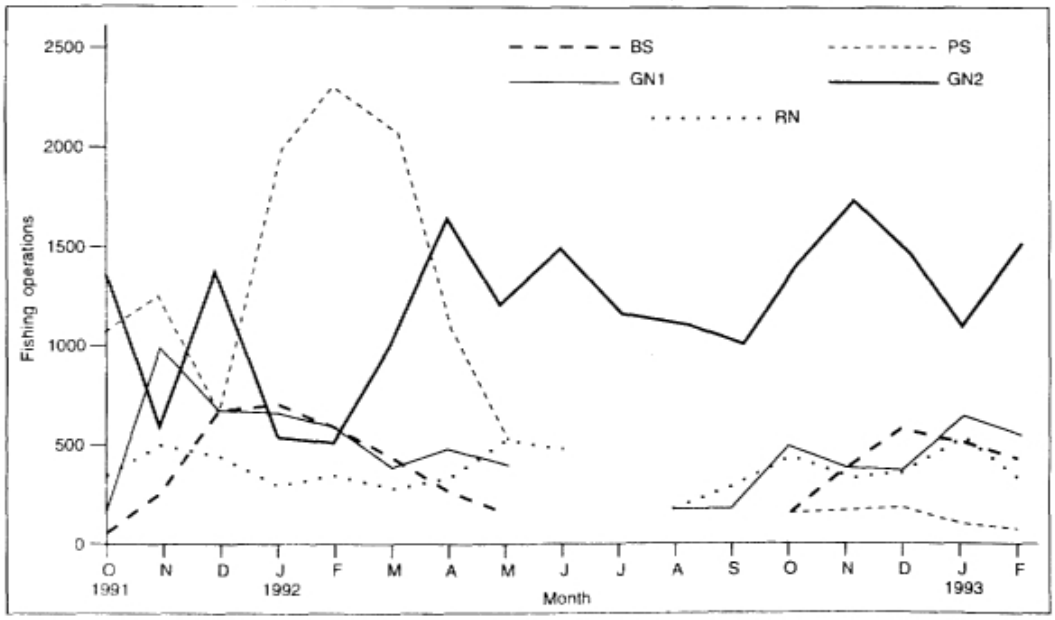


Fig 3. Seasonal variations in fishing effort



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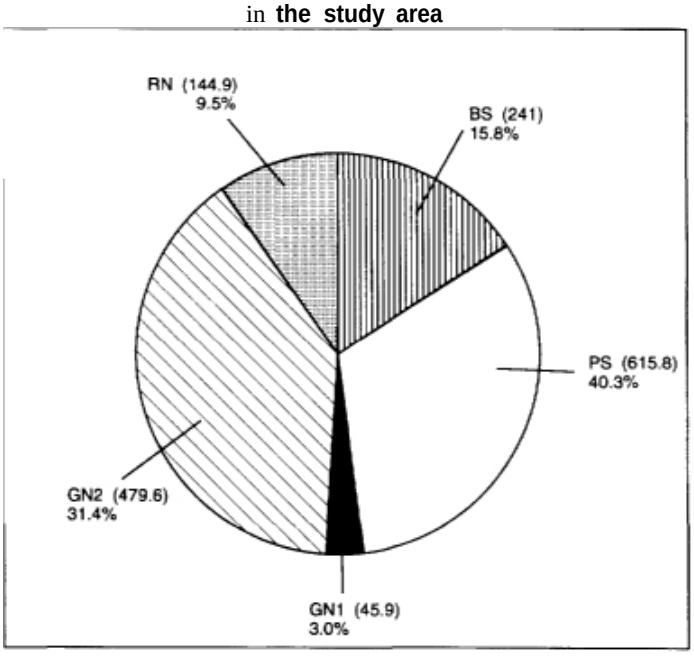
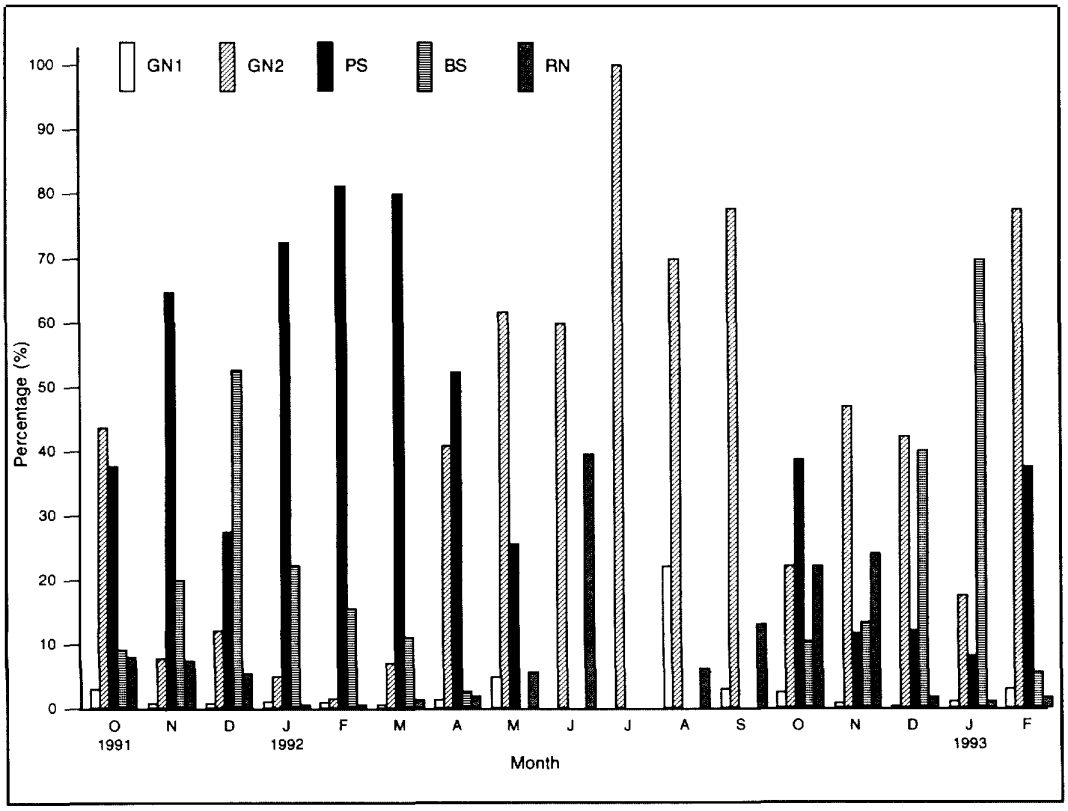
The estimated production **of small** pelagics from October 1991 to February 1993 was 24l8t. The production during 1992 was 1527t. Catches from PS amounted to 40 per cent **of** the production, GN2 (31%), BS (16%), RN (10%) and GNI (3%) (see Figure 4). The peak season for PS is from October-April and for BS November to January; GN2 peaks during May-September, RN in June and GNI in August (see Figure 5)

Fig 4. Small pelagic fish production (t) in 1992 in the study area



The performances of the various gear and their impact on the resource are discussed in the pages that follow (pp 7 - 15). Species composition by weight of the monthly catches by each gear are shown in the Figures 6a-e. Seasonal variation **of** the catch rates (catch per operation) of all species caught by the various gear are shown in Figures 7a-e. Highest catch rates were observed for the PS and BS operations (mean 101 kg and 99.7 kg respectively). And modal lengths of each of the main species studied and that are caught by the various gear studied are presented in Figures 8a-e.

Fig 5. Monthly contribution to total fish production by fishing gear



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Beach seine (BS)

Anchovy (STH) accounted for nearly half the catch (49%). Trenched sardine (AMS) and sardines (SAA) were also caught, but, comparatively, to a very small extent (Figure 6a).

During 1992, eighty units operated in the study area, producing 240t from 5314 operations and giving an average catch rate of about 45 kg/operation. A peak catch rate of 250 kg/operation was achieved in October 1991, while a low of just 6.5 kg/operation was caught in February 1993 (Figure 7a).

It was noted that the bulk of the AMS catch by BS were juvenile fish with a modal length of 6 cm (Figure 8a), whereas the modal length of AMS in the PS and GNI fishery was nearly 20 cm. Restriction of BS during its peak season would improve recruitment to PS and GNI, increasing their yield and value. However, catches of other species during the rest of the season will not significantly affect catches by other fishing gear as they are not caught by them.

Fig 6a. Species composition by weight of the monthly BS catch

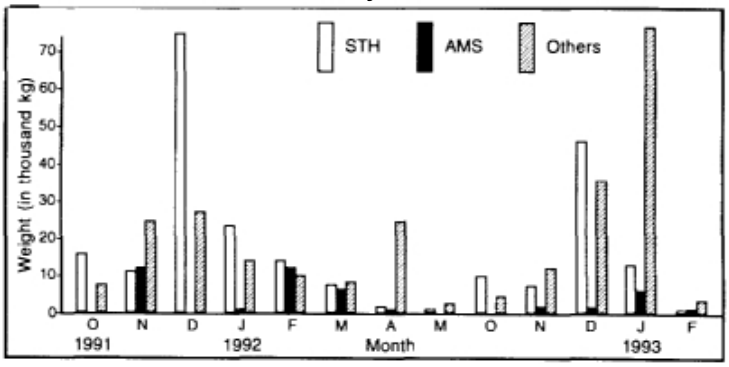


Fig 7a. Seasonal variation in the BS catch rates by main species studied*

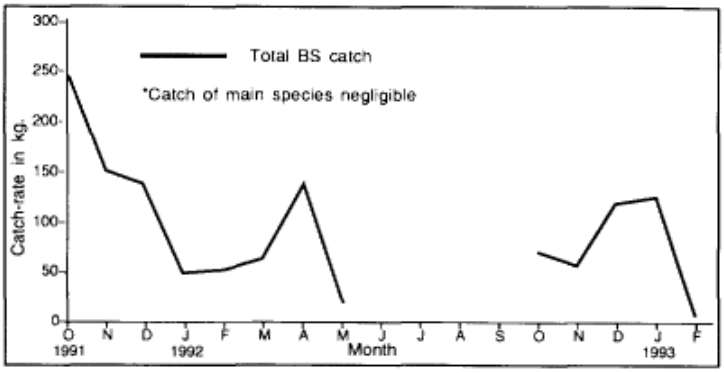
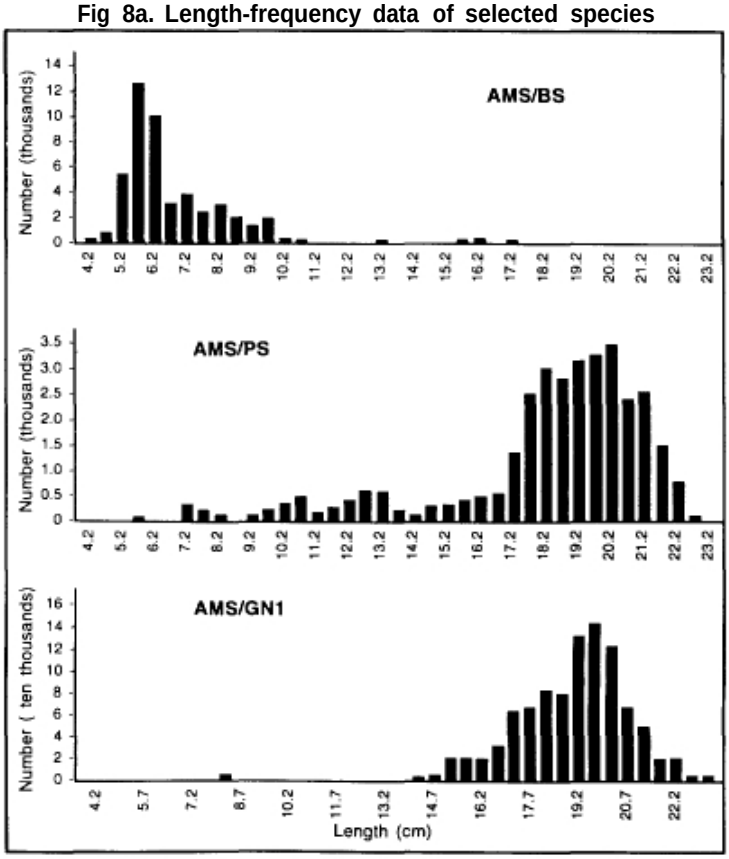


Fig 8a. Length-frequency data of selected species



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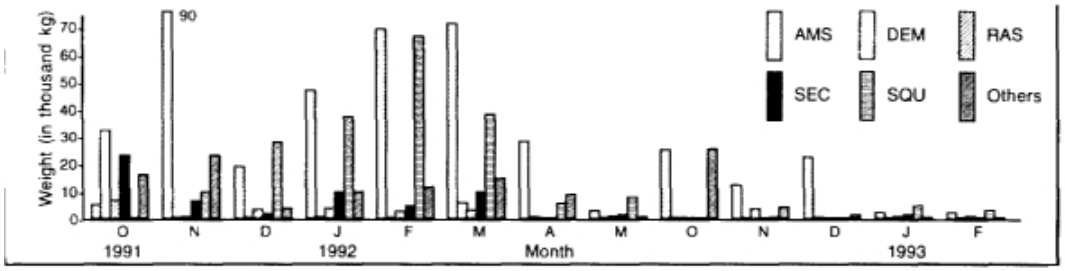
Purse seine (PS)

In 1992, 69 boats conducted 11,730 PS operations in the coastal area, fishing upto 4 km from shore. They caught 615 t of small pelagics, giving an average catch of 52 kg/operation.

Fig 6b. Species composition by weight of the monthly PS catch



Trenched sardine (AMS) accounted for nearly half the catch (48%), followed by squid (SQU) 24%, and Bigeye scad (SEC) 7%. Indian mackerel (RAS) were also caught, but to a lesser extent (Figures 6b and obb). There was, however, a high concentration of RAS during October (Figure 6b), perhaps indicating a migration of this species towards deeper waters. Catches ofjuvenile scad (DEM) were also observed. Squid produced by PS are much sought after by long—line and handline fishermen, who use them as bait for tuna and other large pelagics.

October 1992 saw a peak total catch rate of over 250 kg/operation (Figure 7b on facing page).

Length-frequency data on selected species caught by PS show that while AMS catches are of adult fish, over 17 cm long (see Figure 8b), catches of DEM and RAS, occurring mostly in October, are juvenile (see Figures 8b). Regulating PS catches during this period would allow an increase in recruitment of both to GN2 (see Figure 8b).

Fig 6bb. Species composition by weight of the PS catch in total study area

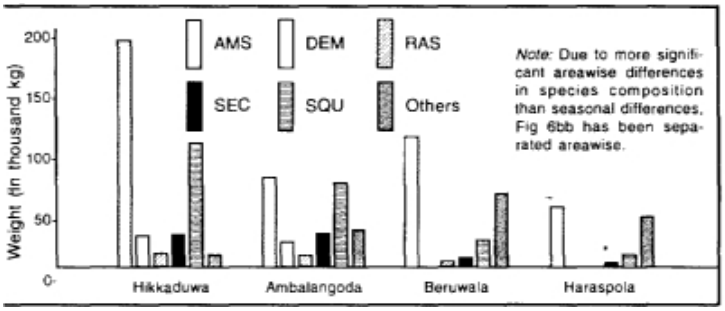
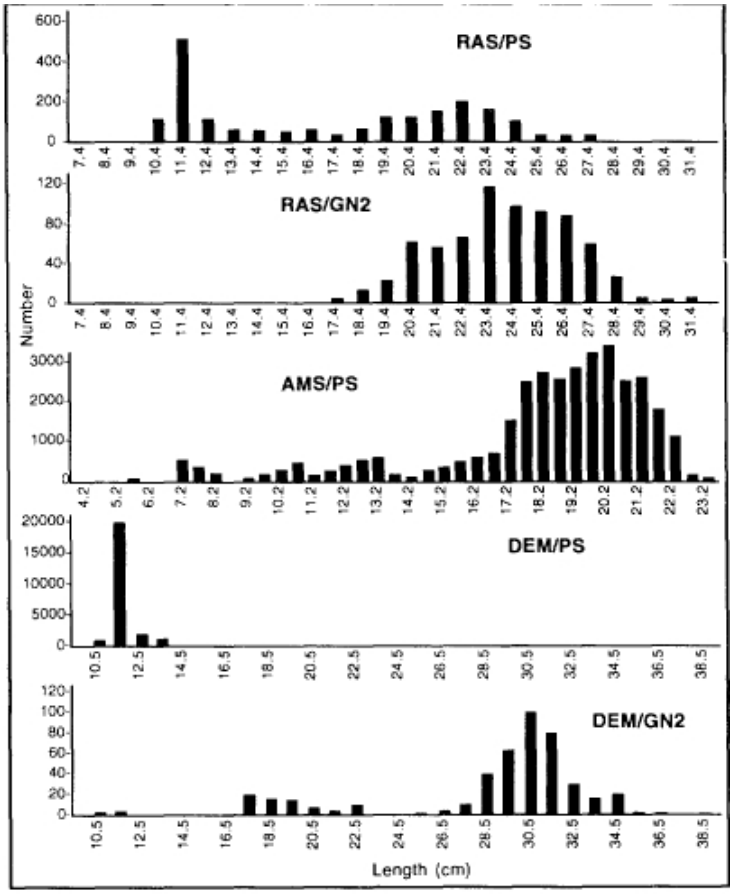


Fig 8b. Length-frequency data of selected species



'The field work for this study was conducted for 1 years from October 1991 to Februar 1993 and the analysis of data and reporting were completed in December 1993. Subsequently. duri ng Jan uary-March 1994 observations were made by NARA field staff of heavy catches of juvenile Trenched Sardine (AMS) (size range 5-7 cm) caught by the purse seine in the study area The catch ot small AMS of this size range were flirt obsersed during the study reported here The heavy catch of small AMS is a mutter to be considered in the future management of the purse seine fishery.

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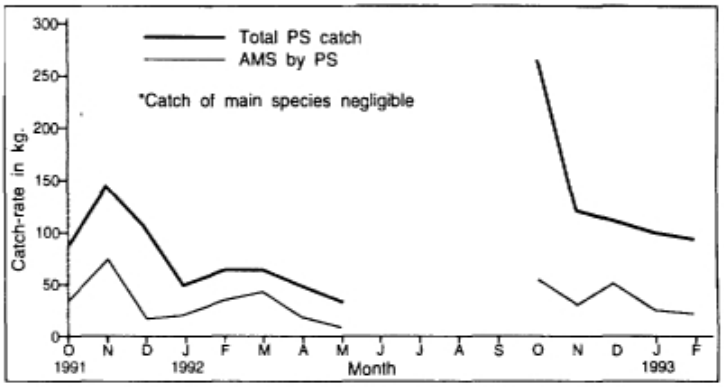
Though the Thompson and Bell prediction analysis (see Table 3 and Figure 9) shows that the present fishing effort could be increased to produce more AMS and attain an MSY of about 1000t and an MSE of SLR5* 40 million, it is not advisable, as it would reduce the CPUE, thereby making the operation less profitable, and may also adversely affect recruitment and yield for other fishing methods.

Fig 7b. Seasonal variation in the PS catch rates by main species studied*



* US 1 = SL Rs 48 (appx.)

Fig 9. Thompson and Bell long-term forecasts of all species combined, by PS

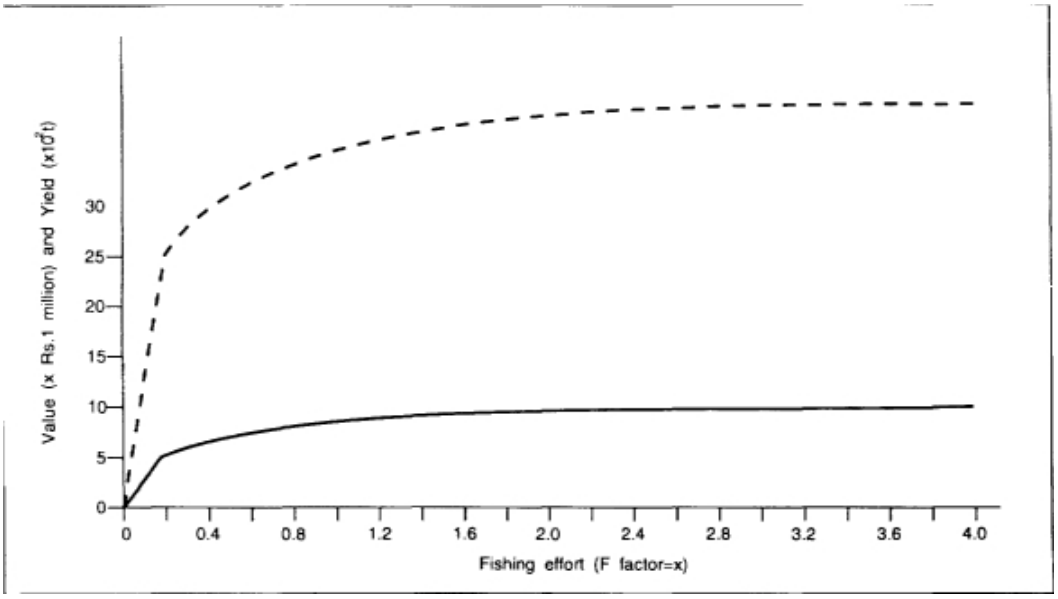


Table 3: Results of T & B Model Analysis

Fishery	Species	*Annual total boat days (1992)*	*MSY* (tonnes)	*Maximum economic yield (MSE) in* SLRs.($x10^6$)	F_{max} **	X_{factor} *corresponding* to MSE	*Yield (tonnes obtained with* the X factor *corresponding* toMSE
PS	AMS		1002	37.5	5.7	4.5	990
	RAS		42	1.96	19.5	0.16	40
	SEC		107	4.46	4.2	0.26	100
	DEM		115	5.36	18.8	0.06	80
	All combined	5430	1256	40.9		3.7	1085
GN_1	AMS	4446	n.f.	n.f.	3.6	>50	n.f.
GN_2	FMT		5435	194.7	3.8	1.8	5290
-	RAS		703	3.6	14	1.11	60
	DEM		116	6.1	5	8.6	110
	SEC		378	18.2	2.7	6.19	120
	All combined	16468	6632	179.5	0.93	0.93	5180
RN	FMT		9207	316.7	14.6	0.31	8850
	DEM		100	n.f.	5.6	>50	n.f.
	All combined	4045	9307	321.1		0.74	8920

n.f. = Not Found

** Maximum fishing mortality for a length class obtained from Jones' Length-Cohort Analysis

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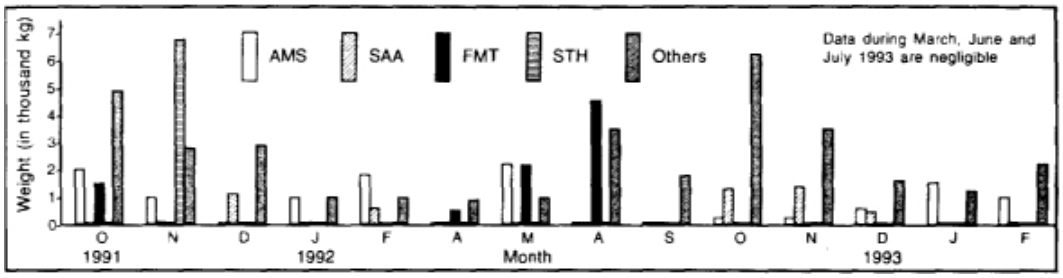
Small-mesh gillnet (GNI)

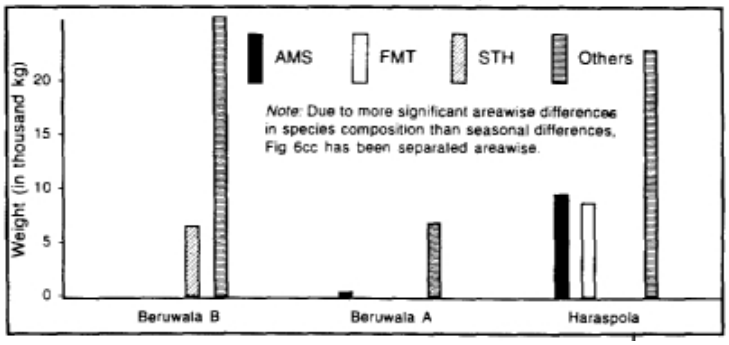
GNI is used mainly by nonmotorized outrigger canoes and a few FRP boats with OBMs. It accounts for only 3 per cent of the total production of small pelagics (see Figure 4) in the study area, 1992 production being a mere 46 t.

Fig 6c. Species composition by weight of the monthly GN1 catch



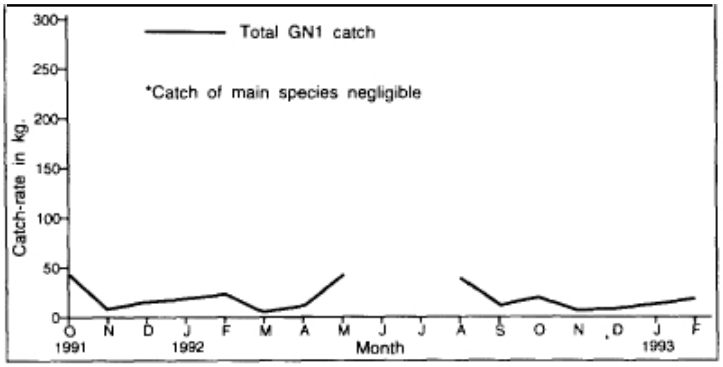
This fishing gear is usually a combination of several panels of varying mesh sizes, from 25.4 to 64.0 mm, the larger meshes catching adult RAS and AMS and the smaller meshes catching sardines (SAA), juvenile frigate tuna (FMT), anchovy (STH) and several other species (see Figure 6cc).

Fig 6cc. Species composition by weight of the GN1 catch in total study area



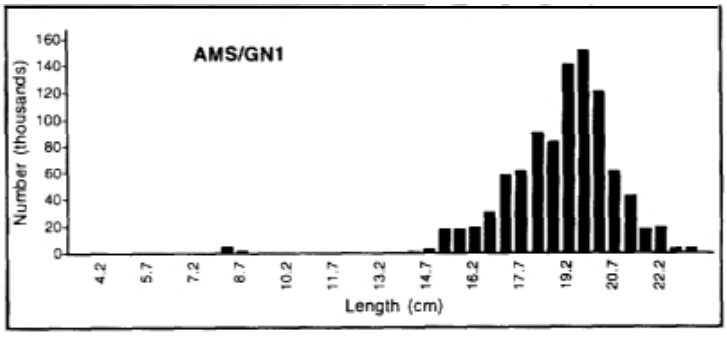
It is ironical that the highest catch rates (50 kg/operation) were at the start of the Southwest Monsoon in May *(50* kg/operation) (see Figure 7c), for, thereafter, fishing had to be discontinued due to the limitations of the small fishing craft.

Fig 7c. Seasonal variation, in the GN1 catch rates by main species studied*



AMS represented only 15 per cent of the catch and nearly all of it adult fish longer than 15 cm (see Figure 8c). It may be possible to increase AMS catches further by deploying more nets than now of mesh size 30 to 35 mm and also by increasing the fishing effort. However, since stock assessments of other species has not been done, any increase in the number of small-mesh nets must be viewed with caution. Increase in fishing effort may also need to be very high to attain yields close to MSY for AMS, due to the relatively poor efficiency of this passive gear.

Fig 8c. Length-frequency data of selected species



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Fishing for small pelagics in Sri Lanka:

Above: *A beach seine (or* **madel)** *being spread out to dry after the day's haul.*

Right: *A catch of small pelagics is brought ashore.*

Below: *An 18-footer with outboard motor, in the foreground, and a 3*1/2*-tonner, in the background. Both craft are used to target small pelagics.*

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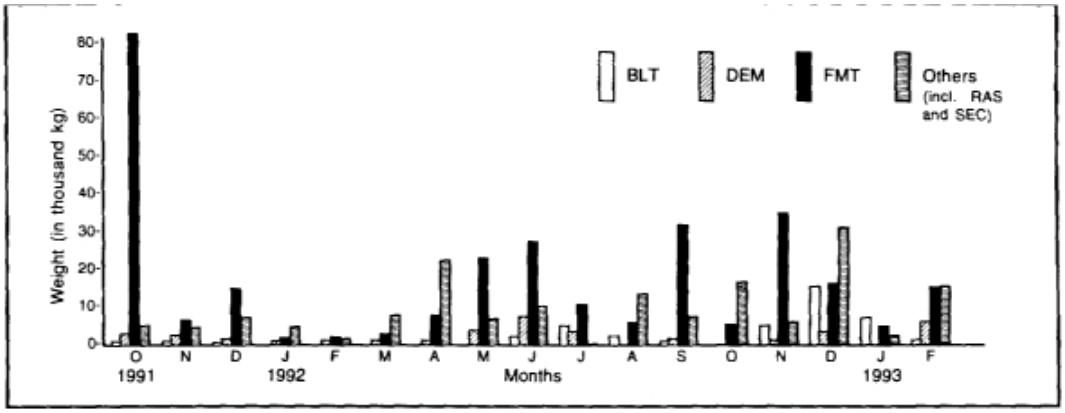
Small tuna gilinet (GN2)

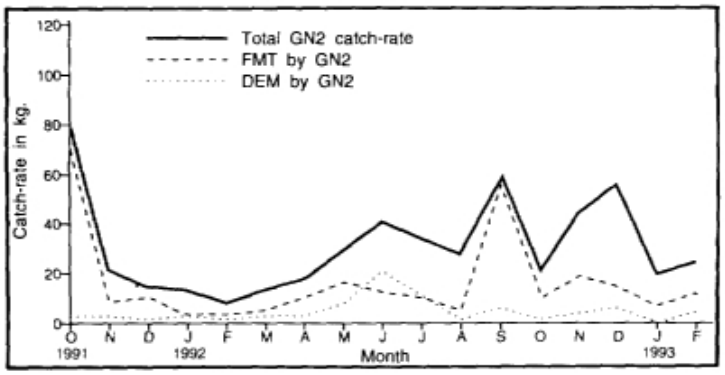
This fishing gear is again a combination of several panels of varying mesh size (63.5 to 101.5mm). It mainly targets small tuna varieties in coastal waters. GN2 is the only gear operated round the year. It is used approximately 8-11 km from the shore at depths of 40-70 m. In the study area, the fleet using this fishing gear was the largest and accounted for 40 per cent of the fishing effort, giving a catch of 480t in 1992. Sixtyfour per cent of the catch was of tuna varieties, with Frigate tuna (FMT) representing 42 per cent, Eastern little tuna (Kawakawa) 16 per cent and Bullet tuna (BLT) 6 per cent (see Figure 6d). Other species of small pelagics incidentally caught included DEM, SEC and RAS.

Fig 6d. Species composition by weight of the monthly GN2 catch



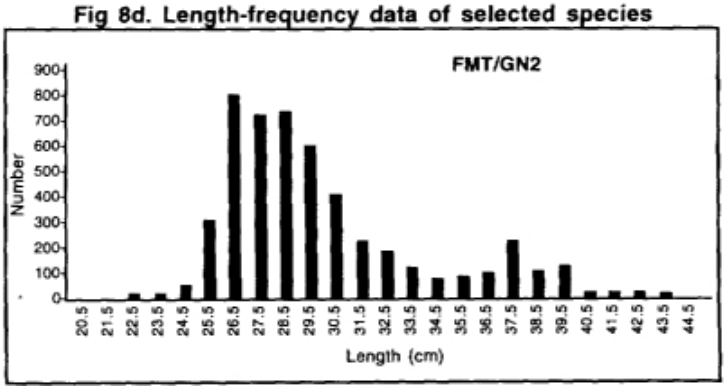
The average monthly catch rate was 30 kg/operation, with a peak of 60 kg/operation being attained in September-October (see Figure 7d).

Fig 7d. Seasonal variation in the GN2 catch rates by main species studied



Length-frequency samples of different species caught by GN2 revealed that the bulk of the (FMT) catch was immature (see Figure 8d). If the number of panels of larger mesh size are increased, better yield and value could be expected. The residual biornass would also increase by reducing the catch of juvenile fish.

Fig 8d. Length-frequency data of selected species



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The Thompson and Bell analysis shows that fishing with GN2 can support an MSY of 5180 t, valued at SLRs 179.5 million (see Figure 10a). Changing the present mesh sizes from 60-100mm to 75-100mm and increasing fishing effort by 80 per cent shows a possible yield of 5490t to give an MSE of SLRs 205 million (see Figure 10b).

Fig 10a. Thompson and Bell long-term forecasts of all species combined, by GN2

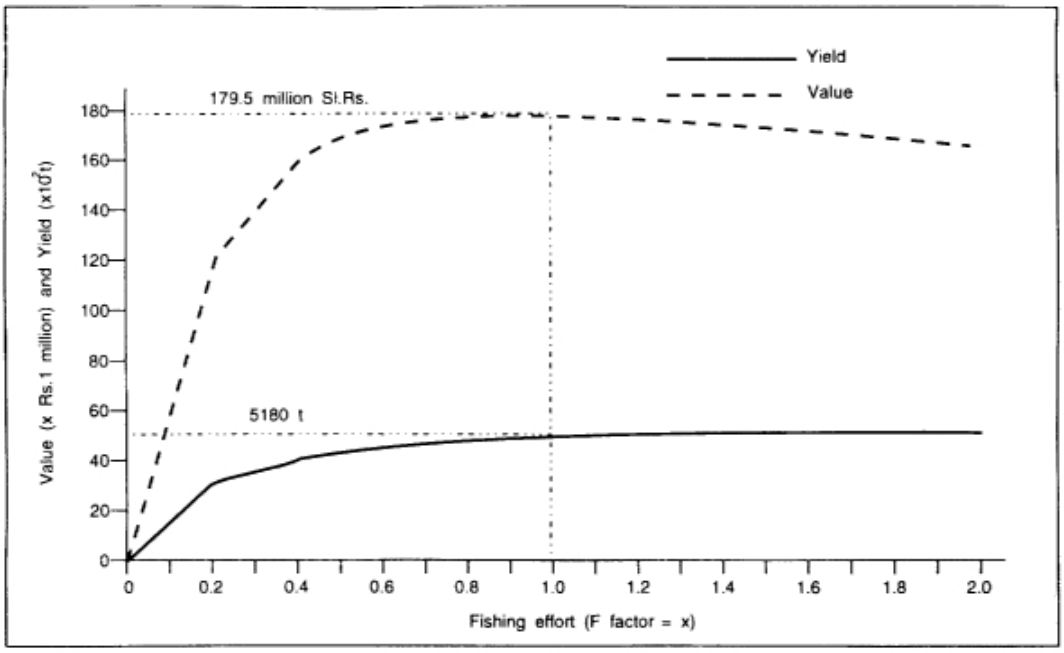
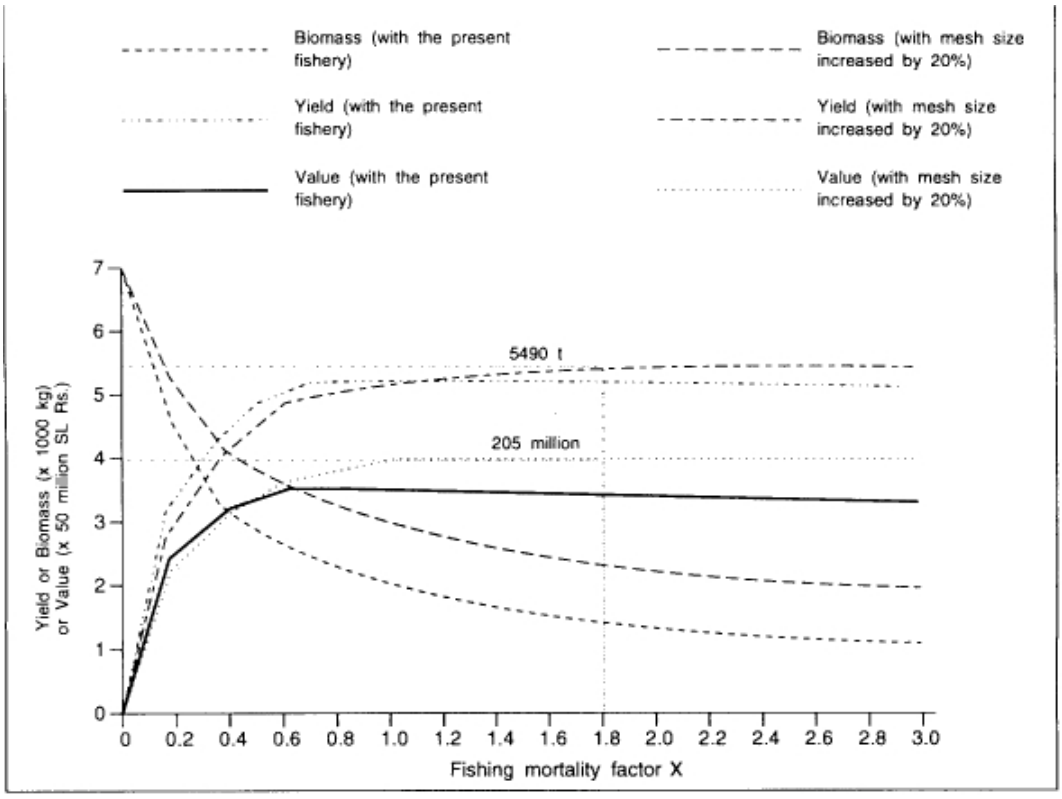


Fig 10b. Thompson and Bell long-term forecast on the retative yield, mean biomass and value of GN2 with the present fishery and mesh size increased by 20%



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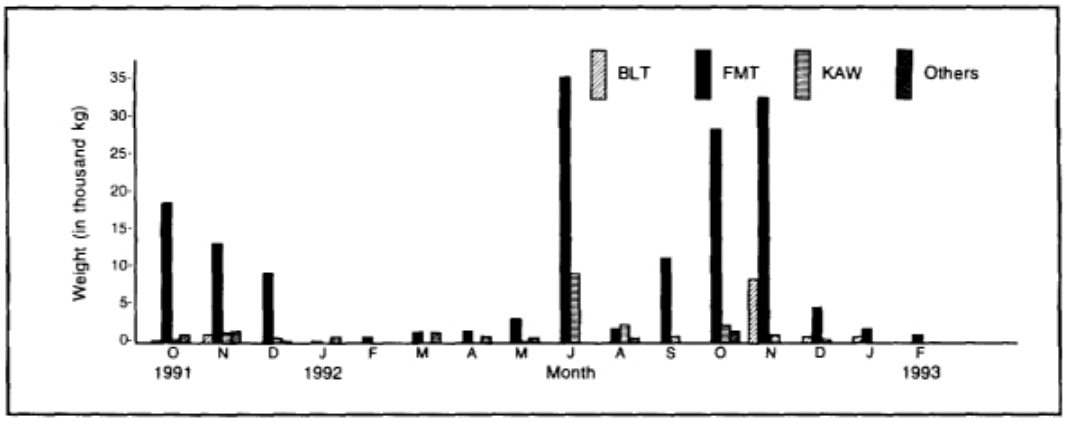
Ringnet (RN)

This fishing gear is used mainly to catch small tuna varieties, particularly FMT. The type of craft used are the same as for GN2. RN production in 1992 was 145 t.

Fig 6e. Species composition by weight of the monthly RN catch



Catch composition too is similar to that of GN2, with Frigate tuna (FMT) accounting for 84 per cent of the catch, Easten little tuna (Kawakewa, KAW) 8 per cent, Bullet tuna (BLT) 6 per cent and other species the remaining 2 per cent (see Figure 6e).

The average catch rate was 30 kg/operation, touching a peak of over 100 kg/operation in June (see Figure 7e).

Here too, the bulk of the FMT caught are immature fish (see Figure 8e).

Fig 7e. Seasonal variation in the RN catch rates by main species studied

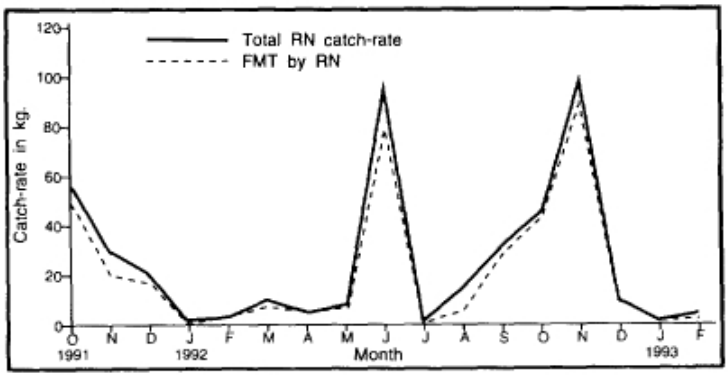
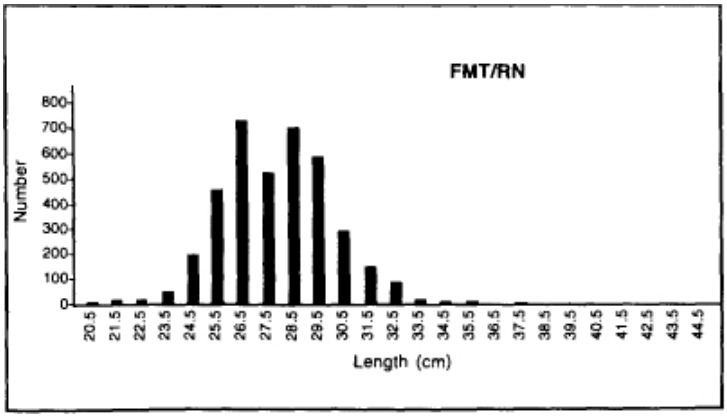


Fig 8e. Length-frequency data of selected species



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Increasing the mesh size should result in better yields and larger residual biomass. Thompson and Bell analysis (Figure 11a) shows that fishing with RN can support an MSY of 8820t, valued at SLRs. 275 million (see Figure 11a). Increasing mesh sizes by 30 per cent could increase the maximum economic yield to over 325 million SLRs and the yield to about 9000 t (see Figure 11b) if the fishing effort was increased by 84 per cent and fishing carried out in deeper waters further offshore where large-sized FMT can be caught.

Fig 11a. Thompson and Bell long-term forecasts of all species combined, by RN

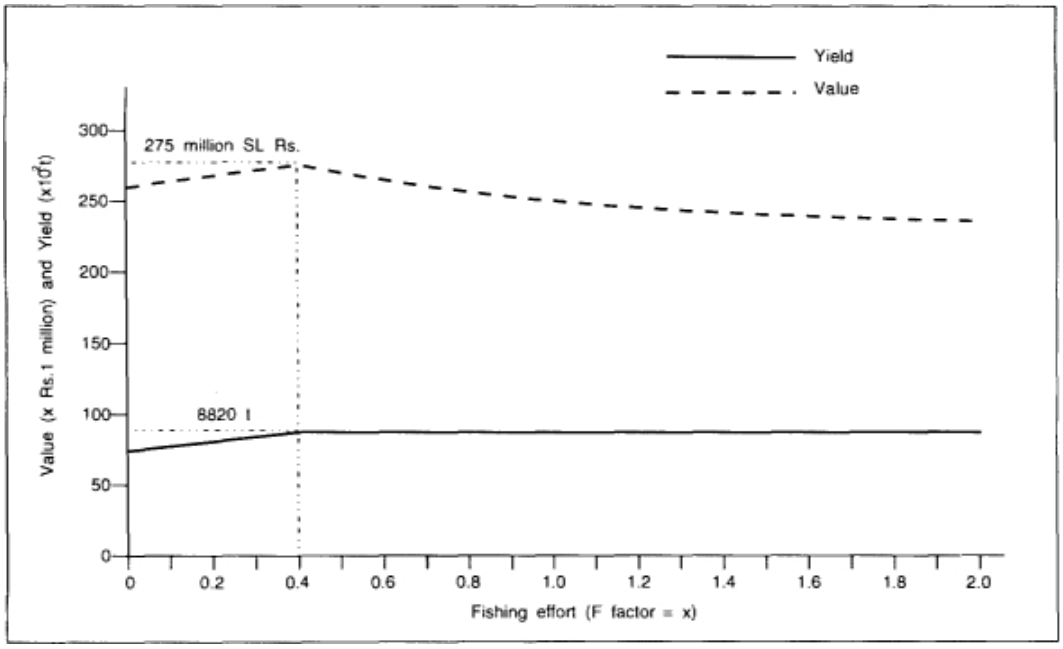
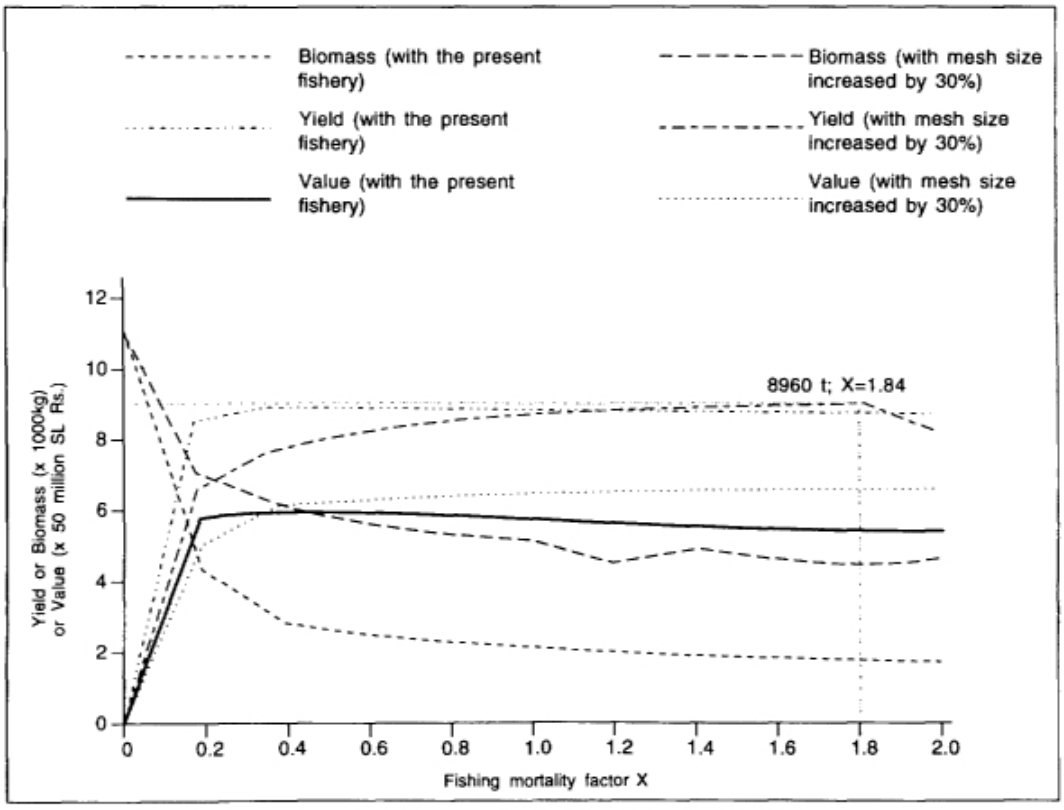


Fig 11b. Thompson and Bell long-term forecast on the relative yield, mean biomass and value of RN with the present fishery and mesh size increased by 30%



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4.2 *Socioeconomics of interactive fishing for small pelagics*

POPULATION

The study area has a predominant fisherfolk population, mostly Sinhalese Buddhists. About a fifth of the population is engaged in nonfishing activities like agriculture (on coconut and cinnamon plantations), small industry, tourism, and general and civil services.

The literacy rate is high, with many having received secondary level school education.

Fisherfolk households can be broadly classified in the following groups:

Owners of nonmotorized craft and fishing gear;
Owners of small motorized craft and fishing gear;
Owners of purse seine boats; and
Boat crew, including skippers.

A majority of the households had a family size of 3-5. Appendices I-VIl give details of population and household profiles.

ECONOMICS

Most of the fishing operations are financed by government subsidies and/or loans from banks and cooperative societies. Repayments have been good and the growing trend of savings is encouraging.

COSTS AND EARNINGS

Fishing for small pelagics

Appendix XII gives details of average monthly costs and earnings per craft. It appears that fishing activities in the area are profitable. Of course, different fishing methods show different. profitability. In all operations, variable costs like fuel and food are deducted from gross income and the balance is shared between owner and crew. The skipper, though part of the crew, receives a higher share than the rest of the crew. There are logical variations when the owner himself takes part in the fishing operation.

BS operation needs, on an average, 20 fishermen, though this could be as high as 80 when catches are good. GNI and GN2 operations are generally by two crew and the owner is invariably one of them. A RN operation needs four crew and a PS needs eight members.

Average earnings, in the study area for each gear type, are given below. Also see Appendix XII.

Fishing gear	*Average monthly income during season (SLRs.)*		
	Owner	*Crew*	*Remarks*
BS	9306	465	20 crew members
GN1	5564	2835	Stn.3 - nonmotorized craft
GN1	4115	1664	At Stn.l and 2 — motorized FRP craft
PS	36045	3463	After deducting variable cost, fuel and food
GN2	10365	4207	Motorized outrigger canoe, year-round operatioh
RN	9352	1553	Only at Stn.7

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Other fishing activities

During the Southwest Monsoon, some of the boats other than those used with GN2 year-round – are used to fish for other species. For instance, the 18-ft FRP motorized boat is used for fishing with handlines, trollinglines and sharknets. Nonmotorized *orus* are sometimes used to fish for lobster and the '31/2-ton' boats are used to fish for shark and tuna with longlines, trollinglines and large-mesh driftnets. These activities generate additional income during the Southwest Monsoon period, considered the offseason for small pelagics. The table alongside gives details of these extra earnings.

Table 4: Average monthly income from other fishing activities from the study area

Type of craft/gear combination	*Crew/ Owner*	*No. of months*	*Avg. monthly fishing SLRs.*
28 ft wooden boat with IBM and sharknet/tuna longline/bottom longline/ trollingline/large-mesh gilinet	Owner	5-12	10300.00
	Crew	5-12	3433.00
32-34-ft wooden or FRP boat with IBM and large-mesh gillnet/ tuna longline/shark longline	Owner	6-12	28200.00
	Crew	6-12	9400.00
FRP 18-ft boat with OBM and GN2/large-mesh gillnet/ sharknet/handline	Owner	5-6	11025.00
	Crew	5-6	3675.00
Nonmotorized FRP oru/Wooden *oru* with handline/lobsternet	Owner	5-6	6525.00
	Crew	5-6	2175.00

Economic performance analysis

The economic performance of the various craft-gear combinations engaged in the fisheries for small pelagics was compared by analyzing the Benefit-Cost ratio (B/C), Internal Rate of Return (IRR) and Net Present Value (NPV at 10%), on the basis that the average lives of the gear and craft-cum-engine were five and ten years, respectively. The values differed not only between fisheries in the same subarea but also between subareas for the same fishery (see table below). The RN and GN2 fisheries exhibited relatively high Benefit-Cost ratios and NPV. The highest IRR was realised by GN1 operations with the traditional outrigger nonmotorized canoe. This was influenced by the longer fishing period (eight months), number and duration of the operations, higher price of fish in that area, very low capital investment in the fishery and the use of nonmotorized craft.

Table 5: Summary of investments, revenue, Benefit-cost ratio, IRR and NPV, for various fisheries for small pelagics in the area studied

Craft-gear combination with fishery		*Initial capital investment SLRs.*	*For ten year period*				
			Total revenue SLRs.	*Total cost (including new gear investment)*	*Benefit /Cost*	*IRR (%)*	*NPV (10%)*
GN_2	21B02 (1)	189,000	2,810,880	l,780,430	1.4	56.89	448,305
	14B02 (2)	189,000	2,912,520	1,922,070	1.3	54.48	423,731
GN_1	14B05 (3)	159,000	570,060	409,810	0.9	0.15	-58,456
	07A05 (4)	54,000	150,800	130,400	0.7	-13.38	-40,757
	05A05 (5)	49,200	1,296,800	811,900	1.5	107.85	251,124
RN	2lB25 (6)	174,000	2,394,600	1,455,210	1.4	56.68	408,679
PS	l5B24 (7)	852,000	5,130,480	4,079,456	0.9	4.33	-177,200
BS	l0A22 (8)	225,000	1,116,780	876,360	0.9	1.38	-66,343

1 - Wooden outrigger canoe with OBM
2 - FRP (18') boat with OBM
3 - FRP (I 8') boat with OBM
4 - FRP outrigger canoe (N. Mot.)
5 - Wooden outrigger canoe (N. Mot)
6 - Wooden outrigger canoe with OBM
7 - Wooden (28') boat with IBM
8 - Wooden craft (N. Mot,)

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The BS fishery, PS fishery and the GN1 fishery with FRP boat fitted with OBM generally operate only six months in a year. Revenue obtained for these fisheries for the six months of fishing for small pelagics indicate a negative value for NPV and extremely poor IRR for the capital invested in these fisheries. However, the income from other fisheries conducted by these craft during the other half of the year (see Table 4 on page 17) provide compensation for the poor economic performance.

FISHERY-RELATED INCOME

Vending fish, ice supply and transporting fish are, generally, year-round activities, but the number of fisherfolk engaged in such activities is very small.

INCOME FROM NONFISHING ACTIVITIES

A few BS households are engaged in agriculture and in the coir- making industry. Some PS owners have invested in small business, generating a regular monthly income. However, by and large, fisherfolk derive their income mainly from fishing.

TOTAL ANNUAL INCOME OF FISHERFOLK HOUSEHOLDS

Income from fishing for small pelagics is above Rs. 9000 annually, except in the case of the crew of the beach seine fishery (see table below). With income from other sources, fisherfolk households generally earn more than 10,000 SLRs/year. This figure could be as high as 100,000 .SLRs/year for a few who derive income from sources other than fishing. Considering that the poverty level has been defined as an annual income below 9000 SLRs, it would appear that fisherfolk are in no immediate financial difficulty.

Table 6: Average yearly income for fishing households (in SLRs.)

Activity	*PS*		*BS*		*RN*		GN2		*GN1 (motorized)*		*GN1 (nonmotorized)*	
	owner	*crew*	*owner*	*crew*	*owner*	*crew*	*owner*	*crew*	*owner*	*crew*	*owner*	*crew*
Fishing only (Main fishery)	158,430	41,556	37,086	2790	85,836	18,636	91,104	49,512	13,374	9984	15,252	9834
Fishing and other fisheries	220,230	62,154	-	23,388	-	-	-	-	79,524	32,034	-	-
Fishing and fishery-related	-	-	-	-	-	-	-	-	-	-	-	-
Fishing, other fisheries and fishery-related	310,230	-	-	-	-	-	-	-	-	-	-	-
Fishing and nonfishery	175,650	48,512	54,306	13,082	92,752	25,552	98,020	56,428	20,290	20,276	25,544	20,826
Fishing, other fishery and non-fishery	282,030	69,110	-	33,680	-	-	-	-	86,440	42,326	-	-
Fishing, fishery-related and non-fishery	225,346	63,902	104,002	25,136	152,752	-	158,020	-	80,290	31,900	-	-
Fishing, other fisheries fishery-related and nonfishery	311,030	-	-	-	-	-	-	-	101,440	57,326	-	-

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The income distribution pattern in the six subareas and the study area as a whole is presented in the table below.

Table 7: Distribution of households by level of annual income

income class	*Households*													
	Ahungalla		*Balapitiya*		*Ambalangoda*		*Hikkaduwa North*		*Hikkaduwa South*		*Doddanduwa*		*Total*	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
<=10,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10,001-20,000	4	6.55	-	-	10	13.15	10	16.12	-	-	13	11.93	37	7.26
20,001-30,000	13	21.32	7	12.5	9	11.84	12	19.35	9	6.21	20	18.35	70	13.75
30,001-50,000	6	9.83	10	17.85	11	14.48	8	12.9	6	4.14	10	9.10	51	10.01
50,000-100,000	13	21.32	12	21.43	14	18.43	16	25.8	93	64.13	31	28.5	179	35.16
100,000-200,000	15	24.59	18	32.14	13	17.10	2	3.22	14	9.66	18	16.52	80	15.71
>200,000	10	16.39	9	16.08	19	25.00	14	22.58	23	15.86	17	15.60	92	18.07
Total	**61**	**100**	**56**	**100**	**76**	**100**	62	**100**	**145**	100	**109**	**100**	**509**	**100**

5. DISCUSSION

Conflicts between fisherfolk operating purse seines and those operating other gear for small pelagics caused the Minister of Fisheries to announce a temporary ban on fishing with purse seines. The bioeconomic study shows that there is very little interaction between the various fishing gear while fishing for the various species of small pelagics. Exploitation rates for the different species show that none of them are being exploited heavily.

Complaints by beach seine fisherfolk that operations with purse seine affect their catch of trenched sardine (AMS) are not justified. AMS catches by beach seine are mostly of juveniles and during November-March. This fishing gear is used in the nearshore area (<2km from shore) and, consequently, has no access to the adult population that is being caught by purse seine. On the contrary, suspension of beach seine operations during these months will benefit fisherfolk using other fishing gear to harvest trenched sardine. As it is, the fishing effort by beach seines is resulting in a yield beyond MSY and MSE.

It is important to note that the high investment in purse seining only for a seasonal fishery targeting small pelagics does not provide satisfactory economic performance.

There is scope to increase fishing effort using small-mesh gillnets to catch AMS. However, the low efficiency of this fishing gear may need an increase of more than fifty times the present effort. To improve the yield of the underexploited AMS, it may be more prudent to reduce the mesh size by 15 per cent and deploy more nets of smaller mesh size (30-35 mm) than now. The catch rate of AMS in GN1 may improve slightly. Optimistically, if the catch rate of AMS increases, from 5 kg/operation to 10 kg/operation, then, if the purse seines are banned, 200 OBM boats will be required to replace the 69 purse seiners to obtain the same catch.

Banning of purse seines would also mean that the squid resource would be underexploited severely, affecting bait used in longlining for large pelagics.

Increasing mesh size of small tuna gillnets and ringnets will improve yield and value as well as increase the residual biomass.

The study also shows that the purse seine operations could achieve yields close to MSY by trebling the present effort, but with a considerable drop in catch rate. This may make the operation unprofitable. One measure that may benefit those fishing with other gear is to influence PS operators to concentrate on catches of trenched sardine and avoid catches of juvenile species such as Indian mackerel, Mackerel scad and Bigeye scad, as these species can be caught by small-mesh and small tuna gillnets.

In conclusion, it can be said that the conflict is not **due to a fish resource problem but may be due to social reasons and that it needs to be solved by measures equitable to all and sundry in the fishing community.**

6. *RECOMMENDATIONS*

- If purse seining is to be continued, then, to avoid problems within fisherfolk communities on the southwest coast, licences to operate purse seines may be given through fishermen's cooperative societies. The other, less beneficial, option is to introduce more boats to operate gillnets.

- If gillnets are to be promoted, they should target Trenched sardines, for which the recommended mesh size is 30-38 mm, operated with suitable craft in 27-45 m depth ranges.

- If purse seining is suppressed, squid jigging or alternative fisheries to exploit squid, a very valuable catch, should be introduced.

- If purse seining is suppressed, the owners should be encouraged and assisted to own and operate multiday boats to catch large pelagics. Some of them may be doing this already, at least seasonally. The crew members on purse seiners also need to be absorbed as crew for the multiday offshore boats fishing for large pelagics.

- Beach seine operators should be discouraged to fish in seasons when juveniles of sardines are abundant in inshore waters.

- The mesh size in the bunt (38 mm) of the ringnet should be increased to 50 mm (2") to achieve maximum sustainable economic value from the fishery. The area of operation should also shift further out, to target the larger size of Frigate tuna. If these changes are not made, then the number of boats should be reduced to 30. Comparing the relative performance of RN and GN2 fishing for FMT, it would be better to develop the RN fishery than GN2 fishery.

- Fishermen need to be trained in net and engine maintenance and repair, as there is shortage of skilled personnel.

- Better anchorages/jetties at Doddanduwa, Hikkaduwa and Ambalangoda for multiday boats and other craft are needed for shelter during the Southwest Monsoon.

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APPENDIX I

Number of villages, households (HHs) and population in each Fisheries Inspector's (FI) Division surveyed

FI Division	No. of villages	Total no. of HHs	Total no. of fishing HHs	Total no. of non-fishing HHs	Total fisherfolk population			Total nonfishing population		
					Male	Female	Total	Male	Female	Total
Ahungalla	13	5605	276	5329	672	566	1238	15116	14776	29892
Balapitiya	11	4367	356	4011	953	862	1815	10746	11088	21834
Ambalangoda	11	3792	197	3595	449	474	923	10554	10259	20813
Hikkaduwa North	10	3988	297	3691	784	707	1491	9143	9798	18941
Hikkaduwa South	21	6816	510	6306	1307	1214	2521	16337	15737	32074
Doddanduwa	9	3341	305	3036	796	691	1487	7802	8319	16121
Total	75	**27909**	**1941**	**25968**	**4961**	**4514**	9475	69698	69977	139675

* *Source:* Galle District Report - Department of Census and Statistics

APPENDIX II

Distribution of sample households and population in each Fisheries Inspector's (FI) Division surveyed

Income class	Sample households						Fishery population				Nonfishery population					
	Fishery		Nonfishery		Total		Male		Female		Male		Female		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Ahungalla	43	70.5	18	29.5	61	100	109	37.7	107	37.0	40	14.2	33	11.1	289	100
Balapitiya	51	91.1	05	8.9	56	100	114	47.9	96	40.3	15	6.3	13	5.5	238	100
Ambalangoda	58	76.3	18	23.7	76	t00	132	37.5	126	35.8	40	11.4	54	15.3	352	100
Hikkaduwa North	47	75.8	15	24.2	62	100	122	42.1	103	35.5	33	11.4	32	11.0	290	100
Hikkaduwa South	123	84.8	22	15.2	145	100	265	42.7	244	39.3	52	9.0	60	9.0	621	100
Doddanduwa	90	82.6	19	17.4	109	100	213	43.9	191	39.4	41	8.5	40	8,2	485	100
Total	412	80.9	97	19.1	*509*	**100**	955	42.0	867	38.1	221	9.8	232	10.1	2275	100

APPENDIX III

Distribution of households (HHs) by family size

Size of family	Villages													
	Ahungalla		Balapitiya		Ambalangoda		Hikkaduwa North		Hikkaduwa South		Doddanduw'a		Total	
	No. of HHs	%	No. of HHs	%	No. of HHs	%	No. of HHs	%	No. of HHs	%	No. of HHs	%	No. of HHs	%
1-2	3	4.9	12	21.4	5	6.6	4	6.5	31	24.1	14	12.8	69	13.6
3-5	38	62.3	37	66.1	52	68.4	41	66.1	79	54.5	17	70.7	324	63.6
6-7	20	32.8	7	12.5	19	25.0	17	27.4	35	24.1	18	16.5	116	22.8
Total	61	100	56	100	76	100	62	100	145	100	109	100	509	100

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APPENDIX IV

Age and sex distribution of the population surveyed in the study area

FI, Division

	Ahungalla		*Balapitiya*		*Ambalangoda*		*Hikkaduwa (N)*		*Hikkaduwa (S)*		*Doddanduwa*		*Total*	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
0—16														
Male	24	8.3	18	7.6	25	7.1	29	10	58	9.3	52	10.7	206	9.1
Female	35	12.1	16	6.7	25	7.1	27	9.3	65	10.5	39	8	207	9.1
Total	59	20.4	34	14.3	50	14.2	56	19.3	123	19.8	91	18.8	413	14.9
11 — 14														
Male	'22	7.6	9	3.8	24	6.8	21	7.2	39	6.3	26	5.4	172.7	6.2
Female	17	5.9	9	3.8	16	4.5	10	3.4	37	6	26	5.4	138.6	5
Total	39	13.5	18	7.6	40	11.4	31	10.7	76	12.2	52	10.7	311.3	11.2
15 — 20														
Male	11	3.8	16	6.7	21	6.0	18	6.2	33	5.3	24	4.9	151	5.4
Female	13	4.5	20	8.4	23	6.5	24	8.3	55	8.9	30	6.2	201.6	7.3
Total	24	8.3	36	15.1	44	12.5	42	14.5	88	14.2	54	11.1	352.6	12.7
21 — **30**														
Male	29	10	29	12.2	29	8.2	29	10	51	8.2	52	10.7	267.7	9.6
Female	22	7.6	24	10.1	44	12.5	23	7.9	52	8.4	59	12.2	270.5	9.7
Total	51	17.6	53	22.3	73	20.7	52	17.9	103	16.6	Ill	22.9	538.2	19.4
31 — **40**														
Male	24	8.3	26	10.9	27	7.7	15	5.2	55	8.9	51	10.5	238.9	8.6
Female	27	9.3	17	7.1	31	8.8	23	7.9	49	7.9	36	7.4	224.1	8.1
Total	51	17.6	43	18.1	58	16.5	38	13.1	104	16.7	87	17.9	463	16.7
41 — 50														
Male	17	5.9	12	5	23	6.5	23	7.9	43	6.9	21	4.3	171.3	6.2
Female	13	4.5	13	5.5	20	5.7	19	6.6	22	3.5	16	3.3	128.7	4.6
Total	30	10.4	25	10.5	43	12.2	42	14.5	65	10.5	37	7.6	300.1	10.8
51 — **60**														
Male	13	4.5	6	2.5	17	4.8	15	5.2	21	3.4	14	2.9	106.4	3.8
Female	8	2.8	6	2.5	14	4	4	1.4	14	2.3	17	3.5	75.9	2.7
Total	21	7.3	12	5	31	8.8	19	6.6	35	5.6	31	6.4	182.3	6.6
> 60														
Male	9	3.1	13	5.5	6	1.7	5	1.7	17	2.7	14	2.9	78.7	2.8
Female	5	1.7	4	1.7	7	2	5	1.7	10	1.6	8	1.6	47.7	1.7
Total	14	4.8	17	7.1	13	3.7	10	3.4	27	4.3	22	4.5	126.5	4.6
All age groups														
Male	149	51.6	129	54.2	172	48.9	155	53.4	317	51.0	254	52.4	1176	51.7
Female	140	48.4	109	45.8	180	51.1	135	46.6	304	49.0	231	47.6	1099	48.3
Total	289	100	238	100	352	100	290	100	621	100	485	100	2275	100

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APPENDIX V

Number of households (HHs) surveyed by economic activities

	Ahungalla		Ambalangoda		Balapitiya		Hikkaduwa (N)		Hikkaduwa (S)		Doddanduwa		Total	
Activity	HHs.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Fishing only	13	21	2	3	9	16	1	2	28	19	3	3	56	11.0
Fishing and fishery-related	1	2	0	0	0	0	0	0	0	0	0	0	1	0.2
Fishing and nonfishery	27	44	44	58	39	70	42	68	83	57	71	65	306	60.1
Fishing, fishery-related and nonfishery	0	0	10	13	2	4	4	6	3	2	4	4	23	4.5
Fishery-related only	0	0	0	0	0	0	0	0	0	0	1	1	1	0.2
Fishery-related and nonfishery	2	3	2	.3	1	2	0	0	9	6	11	10	25	4.9
Nonfishery only	18	30	18	24	5	9	15	24	22	15	19	17	97	19.1
Total	61	100	76	100	56	100	62	100	145	100	109	100	509	100.0

APPENDIX VI

Distribution of fishing households (HHs) by ownership

	Ahungalla		Ambalangoda		Balapitiya		Hikkaduwa (N)		Hikkaduwa (S)		Doddanduwa		Total	
Activity	H/Is.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Motorized														
>Two craft + fishing gear	0	-	1	1.7	0	-	1	2.13	3	2.44	4	4.44	9	2.18
Two craft + f. gear	0	-	4	6.9	2	3.9	1	2.13	11	8.94	11	12.22	29	7.04
One craft + f. gear	4	9.3	19	32.8	12	23.6	20	42.55	41	33.33	0	-	96	23.30
At least one craft but no fishing gear	0	-	0	-	0	-	0	-	4	3.25	3	3.34	7	1.70
Subtotal	4	9.3	24	41.4	14	27.5	22	46.81	59	47.96	18	20	141	34.22
Nonniotorized														
> Two craft + f. gear	1	2.3	0	-	0	-	0	-	0	-	0	-	1	0.24
Two craft + f. gear	3	7.0	0	-	2	3.9	0	-	0	-	5	5.56	10	2.43
One craft + f. gear	17	39.5	6	10.2	9	17.6	3	6.38	1	0.81	1	1.11	37	8.98
At least one craft but no fishing gear	0	-	0	-	0	-	0	-	2	1.63	0	-	2	0.49
Subtotal	21	48.8	6	10.2	11	21.5	3	6.38	3	2.44	6	6.67	50	12.14
Motorized and nonmotorized														
> Two craft + gear	2	4.7	0	-	1	2.0	1	2.13	0	-	0	-	4	0.97
Two craft + Gear	1	2.3	2	3.5	4	7.8	0	-	1	0.81	0	-	8	1.94
Subtotal	3	7.0	2	3.5	5	9.8	1	2.13	1	0.81	0		12	2.91
No craft														
Fishing gear only	1	2.3	2	3.5	2	3.9	0	-	6	4.89	3	3.33	14	3.40
No gear	14	32.6	24	41.4	19	37.2	21	44.68	54	43.90	63	70	.195	47.33
Subtotal	15	34.9	26	44.9	21	41.2	21	44.68	60	48.79	66	73.33	209	50.73
Total	43	100	58	100	51	100	47	100	123	100	90	100	412	100

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APPENDIX VII

Distribution of persons involved in various activities

Activity/Job type	*Ahungalla*		*Ambalangoda*		*Balapitiya*		*Hikkaduwa (N)*		*Hikkaduwa (S)*		*Doddanduwa*		*Total*	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
Fishing														
Crew	23	15.2	36	20.4	24	19.1	25	14.5	48	13.7	55	20.5	211	16.9
Owner	27	17.9	51	28.8	42	33.3	41	33.8	97	27.6	48	18.0	.306	24.6
Skipper	4	2.6	12	6.8	12	9.5	Il	6.4	26	7.4	19	7.1	84	6.9
Subtotal	54	35.7	99	55.0	78	61.9	77	44.7	171	48.7	122	45.6	601	48.4
Fishery-related														
Fishing vendor	3	2.0	.	.	4	3.2	2	1.2	5	1.4	9	3.5	23	1.8
Fishery labourer	3	2.0	5	2.8	2	1.6	2	1.2	9	2.6	3	1.1	24	1.9
Ice supplier	2	1.3	-	-	-			.	1	.3	1	.3	4	.4
Wholesale trader	1	7	.	.	-	-	-	-	1	.3	1	.3	3	.2
Subtotal	9	6.0	5	2.8	6	4.8	4	2.4	16	4.6	14	5.2	54	4.3
Nonfishery-related														
Agriculture	6	4.0	-	-	.	-	1	.6	1	.2	2	.7	10	.8
Business activity	9	6.0	10	5.6	5	.4	9	5.2	13	3.7	13	4.9	9	4.7
Carpentry	1	.7	1	.6	2	1.6	.	-	2	.5	-	-	6	.5
Coir industry	11	7.3	1	.6	7	5.6	10	5.8	13	3.7	19	7.1	59	4.7
Construction labourer	2	1.3	6	3.4	4	3.2	-	.	1	.2	1	.3	14	1.1
Foreign employment	1	7	5	2.8	6	4.8	3	1.7	3	.8	3	1.1	21	1.7
Government servant	3	2.0	7	4.0	5	4.0	12	7.0	17	4.9	13	5	57	4.6
Other labour worker	11	7.3	5	2.8	2	1.5	1	.6	6	1.7	4	1.5	29	2.3
Staff in private sector	4	2.7	10	5.6	-	-	2	1.2	7	2.0	16	6.1	39	3.1
Other NFR activity	40	26.3	28	15.8	11	8.8	53	30.8	101	29	60	22.4	293	23.6
Subtotal	88	58.3	73	41.2	42	33.3	91	52.9	164	46.7	131	49.2	589	47.3
Total	**151**	**100**	**177**	**100**	**126**	**100**	**172**	**100**	**351**	**100**	**267**	**100**	**1244**	**100**

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APPENDIX VIII

Distribution of households (HHs) owning various craft-gear combinations in the study area

Sector details	*Craft-gear combination*	*Ahungalla*		*Ambalan-goda*		*Bala-pitiya*		*Doddan-duwa*		*Hikka-duwa (N)*		*Hikka-duwa (S)*		*Total*	
	HHs	*No*	*%*	*No*	*%*	*No*	*%*	*No*	*%*	*No*	*%*	*No*	*%*	*No*	*%*
Small pelagic non-motorized sector	a) Beach seine net with *paru*	13	21.3	1	1.3	6	10.7	2	1,80	1	1.6	1	0.7	24	4.7
	b) Small-mesh gilinet with nonmotorized wooden big *oru*	3	4.9	-	-	1	1.8	2	1.80	1	1.4	-	-	7	1.4
	c) Small-mesh gillnet with FRP small *oru*	4	6.6	2	2.6	2	3.6	-	-	-	-	2	1.3	10	2.0
Small **pelagic motor-zed** sector	a) Ringnet with wooden out-rigger *vallam* with OBM	-	-	-	-	-	-	8	7.30	-	-	10	6.9	18	3.5
	b) Small tuna gillnet with **wooden outrigger** *vallam* with OBM	-	-	-	-	1	1.8	10	9.2	-	-	24	16.6	35	6.9
	c) Small tuna gillnet with FRP l8ft boat with OBM	1	1.6	1	1.3	2	3.6	0	-	14	22.5	-	-	18	3.5
	d) Small-mesh gillnet with l8ft boat with OBM	-	-	2	2.6	-	-	-	-	-	-	-	-	2	0.4
	e) Purse seine net with 28ft wooden boat with IBM	2	3.3	10	13.2	4	7.10	0	-	3	4.8	16	11.0	35	6.9
Mixed sector **involved in** small fishing	Owning motorized and nonmotorized craft with gear for small pelagic	3	4.9	2	2.6	5	8.9	01	-	1	1.6	1	0.7	12	2.4
Subtotal		26	42.6	18	23.7.	21	37.5	22	20.2	20	323	54	37.2	161	31.6
Including other fisheries	Owners with other craft and gear targeting small pelagics as well as other species	1	1.6	3	3.9	2	3.6	2	1.80	1	1.6	-	-	9	1.8
Only other fisheries	Households with craft and gear targeting only species that are not small pelagics	1	1.6	Il	14.5	7	12.5	0	-	5	8.1	9	6.2	33	6.5
With gear only		1	1.6	2	2.6	2	3.6	3	2.8	0	-	**6**	**4.10**	**14**	**2.8**
Skipper and crew households only		14	22.9	24	31.7	19	33.9	63	57.9	21	33.9	54	37.2	195	38.1
Nonfishery households		18	29.7	18	23.7	5	8.9	19	17.4	15	24.3	22	15.2	97	19.1
Total		**61**	**100**	**76**	**100**	**56**	**100**	**109**	**100**	**62**	**100**	**145**	**100**	**509**	**100**

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APPENDIX IX

Fishing gear and craft combinations in different fisheries in the study area

A. Details of the fishing craft used in the study area

Fishery	*Craft*	*Engine type (HP)*	*Depth of gear operation (m)*	*Number of craft registered in the study area*	*Number of craft operated for this fishery*	*Percentage of craft sampled among the operated craft*
BS	Nonmotorized, wooden *Paru* (Length 10.82 m, Width 1.52 m)		2-18	114	80	20-80
PS	Wooden boat with inboard engine (Length 8.53 - 9.75 m)	Inboard engine *(35)*	36-62	212	69	60-100
RN	Wooden outrigger canoe (Length 7.93 m)	With outboard engine (15-20)	36-73	146	50	50-80
GN2	Wooden outrigger *vallam* (Length 7.9 m)	Outboard engine (15-20)	46-82	146	90	50-80
	FRP (18ft) boat (Length 5.5 m)	Outboard engine *(15-25)*	46-82	239	50	50-80
GN1	FRP (18ft) boat (Length 5.5 m)	Outboard engine (15-25)	27-46	239	35	30-50
	Nonmotorized wooden outrigger big *oru* (Length 6.7 -7.4m)		15-36	178	50	30-60
	Nonmotorized FRP outrigger small *oru* (Length 6.7 m)		15-36	280	70	30-80

B. **Details of the fishing gear used in the study area**

Fishery	*Depth of gear operation (m)*	*Number of gear registered in the study area*	*Fishing gear details*
BS	2-18	110	0.95 cm - 1.59 cm (Codend - Kuralon) Wing size - 15.24 cm - 1.83 m (Coir rope)
PS	36-62	69	Length - 1500 meshes - 23 mm; Depth - 2100 meshes - 23 mm; Length - 2500 meshes - 16 mm; Depth - 2300 meshes - 16 mm; Depth - 875 meshes - 16 mm
RN	36-73	79	Mesh size - 38 mm - 60 mm; Length - 210 m - 246.8 m; Depth - 29.2 m - 246.8 m; Length - 1500 meshes - 60 mm; Depth - 554 meshes - 60 mm; Length - 1500 meshes - 38 mm; Depth - 875 meshes - 38 mm
GN2	46-82	252	Mesh size - 63 mm - 5 pieces; Mesh size - 76.0 mm - 4 pieces; Mesh size - 82.5 mm - 2 pieces; Mesh size - 88.9 mm - 4 pieces; Mesh size - 101.5 mm - 2 pieces.
GN1	27-46	188	**Sardines Net: Mesh size** - 25.4 mm - 4 pieces; Mesh size - 28.6 mm - 4 pieces; Mesh size - 30.0 mm - 4 pieces; Mesh size - 38.0 mm - 2 pieces; Mesh size - 45.0 mm - 2 pieces
	15-36		Mackerel Net: Mesh size - 50.0 m - 3 pieces; Mesh size - 57.0 mm - 8 pieces; 64.0 mm - 2 pieces.

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APPENDIX X

The gear distribution in the study area

Gear (units)

Place	*BS*	*PS*	*RN*	*GN2*	*HL*	*BSN*	*GN1*	*PL*	*TL*	*TN*	*CN*	*LMGN*	*BLL*	*SN*	*MN*
Uswella	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maggona	4	-	-	-	60	10	45	-	-	36	6	-	8	3	-
Tikkapola		-	-	3		-	-	-	-	-	-	-	-	-	-
Idapola	4	-	-	-	-	-	-	-	-	-		-	-	-	-
Ambalapola	6	-	-	-	3	1	1	-	-	1	-	-	-	-	-
Hirigalpola	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beruwala	-	10	-	-	85	5	85	-	-	33	-	75	8	-	-
Karawalagala	5	-	-	-	-	-	-	17	15	-	-	-	-	-	-
Maradane	-	-	-	-	44	20	7	-	-	-	-	-	4	8	
Bentota		-	-	-	10	9	-	-	-	-	-	-	-	-	-
Warahena	2	-	-	-	-	-	-	-	-	-	-				-
Athuruwella	6	-	-	1	10	9	-	-	-	-	-	-	-	-	-
Kaikawala	1	-	-	-	9	2	-	-	-			-	-	-	-
Mahainduruwa	2	-	-	-	12	15	-	3	-	-	-	-	-	-	
Duwawatta	-	-	-	-	3	3	-	1	-	-	-	-	-	-	-
Bandrawatta	2	-	-	-	1	1	-	3	-	-	-	-	-	-	-
Galbokka	5	-	-	-	-	5	-	-	-	-	-	-			
Egodamulla	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
Ahungalla	-	1	-	-	3			-	-	-	-	2	-	-	-
Pitiwella	2	-	-	-	-	-	-	-	-	-	-	-	-		
Wathurugama	20	-	-	-	-	-	-	-	-	-	-	-	-	-	
Mankadawella	4	-	-	7	24	-	26	3	-	-	-	-	-	-	
Mahapolawatta	5	-	-	-	-	-	-	-	1	-	-				
Haraspola	-	5	1	6	37	6	20	-	-	1	1	6	-	-	
Balapitiya	1	-	1	35	53	1	-	-	17	-	-	17	-	-	2
Walagedara	-	-	-	-	6	6	1	-	-	-	-	-	-	-	-
Patabedimulla	-	3	-	23	49	5	3	5	5	-	-		-	-	
Ratahalbokka	-	-	-	-	8	-	-	-	-	-	-	-	-	-	
Ambalangoda	-	19	-	10	12	-	-	2	15	-	-	5	-	-	
Urawatta	6	-	-	-	35	-	-	-	-	3	-	-	-	-	-
Madampe	-	-	-	2	14	2	-	-	-	-	-	-		-	-
Akurala	-	-	-	-	16	7	-	10	-	-	-	6	-	-	-
Kahawa	1	-	-	-	7	5	-	-	6	-	-	-	-	-	-
Telwatta	4	-	-	-	-	-	-	-	-	-	-	-	-		
Peraliya	-	4	-	15	37	-	-	-	-	-	-	-	15	-	-
Seenigama	-	-	5	5	17	-	-	-	-	-	-	1	-	-	-
Hikk. Har.	-	18	7	-	51	1	-	3	6	-	-	38	6		
Hikk. PST.	-	8	-	4	48	-	-	-	37	-	-	38	-	-	-
Parakona	3	-	-	-	-	-	-	-	30	-	-	-	-	-	-
Mahapola	3	-	-	-	-	-	-	-	-		-				
Pingahapola	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mahawaraya	3	-	-	-	-	-	-	-	-	-	-	-	-	-	
Modarawaraya	2	-	-	-	-	-						-	-	-	-
Doddanduwa	5	-	65	141	181	-	-	-	-	-	-	-	37	-	17
	110	69	79	252	836	113	188	44	135	74	7	217	78	11	20

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APPENDIX XI

The craft distribution in the study/extended study area

Place	Types of crafts											
	Wooden NM oru	FRP NM oru	Mec./FRP oru	FRP 18' boats	3.5t boats	34' boats	B.S paru	BOBP boats	Bala oru	Wooden mec./ oru	Wooden mec./ vallam	BS am
Uswella	-	-	-	-	-	-	3	-	-	-	-	-
Maggona	11	27	-	24	-	-	5	-	-	-	-	-
Tikkapola	-	-	-	-	-	-	2	-	-	-	-	-
Idapola	-	-	-	-	-	-	4	-	-	-	-	-
Ambalapola	2	3	-	-	-	-	5	-	-	-	-	-
Hirigalpola	-	I	-	-	-	-	2	-	-	-	-	-
Beruwala	4	29	-	52	68	7	-	-	-	-	-	-
Karawalagala	2	15	-	-	-	-	5	-	-	-	-	-
Maradane	3	24	-	17	-	-	-	-	-	-	-	-
Bentota	1	9	-	-	-	-	-	-	-	-	-	-
Warahena	-	-	-	-	-	-	2	-	-	-	-	-
Athuruwella	9	-	-	1	-	-	6	-	-	-	-	-
Kaikawala	6	1	-	2	-	-	1	-	-	-	-	
Mahainduruwa	12	-	-	-	-	-	2	-	3	-	-	-
Duwawatta	3	-	-	-	-	-	-	-	1	-	-	-
Bandrawatta	I	-	-	-	-	-	2	-	-	-	-	-
Galbokka	5	3	-	1	-	-	7	-	-	-	-	-
Egodamulla	3	-	-	-		-	-	-	-	-	-	-
Ahungalla	2	1	-	-		-	-	-	-	-	-	-
Pitiwella	-	-	-	-	-	-	2	-	-	-	-	-
Wathurugama	-	-	-	-	-	-	22	-	-	-	-	-
Mankadawella	16	2	-	7	-	-	4	-	3	-	-	-
Mahapolawatta	-	-	-	-	1	-	5	-	-	-	-	-
Haraspola	20	1	-	16	6	-	-	-	-	-	-	-
Balapitiya	18	3	3	29	17	-	1	1	-	-	-	-
Walagedara	3	3	-	-	-	-	-	-	-	-	-	-
Patabedimulla	3	23	-	18	5	-	-	-	-	-	-	-
Ratahalbokka	-	4	4	-	-	-	-	-	-	-	-	-
Ambalangoda	2	22	-	25	28	-	-	-	-	-	-	-
Urawatta	1	32	2	-	-	-	6	-	-	-	-	-
Madampe	1	11	-	2	-	-	-	-	-	-	-	-
Akurala	3	7	-	-	6	-	-	-	4	-	-	-
Kahawa	2	5	-	-	-	-	1	-	-	-	-	-
Telwatta	-	-	-	-	-	-	4	-	-	-	-	-
Peraliya	8	3	-	25	4	-	-	-	-	1	-	-
Seenigama	-	6	-	5	1	-	-	-	-	-	5	-
Hikk. Har.	1	24	1	7	37	1	-	-	-	-	-	-
Hikk. PST.	3	14	-	4	37	1	-	-	-	-	-	-
Parakona	-	2	-	-	-	-	-	-	-	-	-	3
Mahapola	-	1	-	-	-	-	-	-	-	-	-	3
Haraspola	-		-	-	-	-	-	-	-	-	-	3
Pingahapola	-	1	-	-	-	-	-	-	-	-	-	4
Mahawaraya	-	-	-	-	-	-	-	-	-	-	-	3
Modarawaraya	-	-	-	-	-	-	-	-	-	-	-	2
Doddanduwa	33	3	-	4	-	-	-	13	-	1	141	5
Total 1215 :	178	280	10	239	212	9	91	14	11	2	146	23

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APPENDIX XII

Average income and expenditure per month per craft

Craft-gear combination	Avg. mon. inc.	Avg. add. inc.	In-come	Exp-endi-lure	Profit	Each crew	Skip-per	Gear-owner	Craft. owner	Owner	Depre-ciation	Insu-rance	Balance to owner
	1	2	3=1+2	4	5=3-4	6	7=6x1.5	8=5÷4	9=5÷4	10=5÷2	11	12	13=10—(11 + 12)
B.S. with NM wooden craft	**18613**	**0**	**18613**	**0**	**18613**	**465**	* 0	4653	4653	9306	3125	0	6181
GN1 with NM outrigger canoe (wooden)	12678	289	12968	1840	11128	2835	0	2782	2782	5564	660	0	4904
GN1 with NM (FRP) canoe	1860	25	1885	126	1758	443	* 0	440	440	879	700	0	179
GN2 with OBM FRP (18') boat	21344	2928	24271	4591	19680	4045	6067	4920	4920	9840	2075	436	7329
GNI with OBM FRP (18') boat	9499	3	9501	1271	8230	1664	2497	2058	2058	4115	1575	311	2229
GN2 with OBM wooden outrigger canoe	21518	1906	23424	2694	20730	4207	6311	5182	5182	10365	2075	436	7854
PS with IBM wooden (28') boat	**81776**	**3732**	**85508**	**13291**	**72214**	**3463**	**5194**	**18022**	**18022**	**36045**	**8100**	**1540**	**26405**
RN with OBM wooden outrigger canoe	**19955**	**0**	**19955**	**1251**	**18704**	**1553**	**2330**	**4676**	**4676**	**9352**	**1825**	**374**	**7153**

* Below poverty line

Note: a) The column headings in Appendices XII and XIII should be read as follows:

1. Average monthly income from fishing
2. Average additional monthly income
3. Total monthly income
4. Monthly expenditure on fishing
5. Profit
6. Earnings by each crew member (for number of crew see p. 16)
7. Skipper's income
8. Gear-owner's income
9. Craft-owner's income
10. Owner's income
11. Depreciation
12. Insurance
13. Balance (net profit) to owner

b) All figures rounded off

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APPENDIX XIII A

Income and expenditure by fishery, craft and gear

Gear and craft	*Site*	*Month and year*	1	2	3	4	5	6	7	8	9	10	11	12	13
	SA	10.91	61798	0	61798	0	61798	1545	0	15450	15450	30899	3125	0	27774
Beach	SA	11.91	12883	0	12883	1	12882	322	0	3221	3221	6441	3125	0	3316
seine with	SA	i2.9I	10098	0	10098	0	10098	252	0	2525	2525	5049	3125	0	1924
traditional	SA	01.92	3876	0	3876	0	3876	97	0	969	969	1938	3125	0	-1187
wooden	SA	02,92	3486	0	3486	0	3486	87	0	871	871	1743	3125	0	-1382
craft (NM)	SA	03.92	5228	0	5228	0	5228	131	0	1307	1307	2614	3125	0	-511
	SA	04.91	21988	0	21988	0	21988	550	0	5497	5497	10994	3125	0	7869
	SA	05.92	6072	0	6072	0	6072	152	0	1518	1518	3036	3125	0	-89
		Avg.	15679	0	15679	0	15679	392	0	3920	3920	7839	3125	0	4714
	SA	10.92	68919	0	68919	0	68919	1723	0	17230	17230	34459	3125	0	31334
	SA	11.92	7225	0	7225	0	7225	181	0	1806	1806	3613	3125	0	488
	SA	12.92	17120	0	17120	0	17120	428	0	4280	4280	8560	3125	0	5435
	SA	01.93	21919	0	21919	0	219919	548	0	5480	5480	10959	3125	0	7834
	SA	02.93	1355	0	1355	0	1355	34	0	339	339	678	3125	0	-2447
		Avg.	23308	0	23308	0	23308	583	0	5827	5827	11654	3125	0	8529
	HA	10.91	68380	0	68380	12320	56060	14505	0	14015	14015	28030	660	0	27370
GN1 with	HA	11.91	2449	242	2691	227	2464	622	0	616	616	1232	660	0	572
wooden	HA	12.91	3919	291	4210	492	3718	936	0	930	930	1859	660	0	1199
outrigger	HA	01.92	4805	243	5047	180	4868	1217	0	1217	1217	2434	660	0	1774
canoe (NM)	HA	02.92	8762	498	9260	660	8600	2164	0	2150	2150	4300	660	0	3640
	HA	03.92	1788	0	1788	207	1581	395	0	395	395	790	660	0	130
	HA	04.92	6954	157	7111	1666	5445	1458	0	1361	1361	2723	660	0	2063
	HA	05.92	24302	1448	25750	3859	21891	5473	0	5473	5473	10945	660	0	10285
	HA	08.92	36295	0	36295	5484	30811	7866	0	7703	7703	15406	660	0	14746
	HA	09.92	14270	330	14600	1509	13091	3273	0	3273	3273	6545	660	0	5885
		Avg.	17192	321	17513	2660	14853	3791	0	3713	3713	7426	660	0	6766
	HA	10.92	7455	0	7455	458	6997	1753	0	1749	1749	3499	660	0	2839
	HA	11.92	724	97	822	126	695	179	0	174	174	348	660	0	-312
	HA	12.92	1248	294	1542	156	1387	347	0	347	347	693	660	0	33
	HA	01.93	4639	273	4912	86	4825	1206	0	1206	1206	2413	660	0	1753
	HA	02.93	4183	466	4650	163	4487	1126	0	1122	1122	2244	660	0	1584
		Avg.	3650	226	3876	198	3678	922	0	920	920	1839	660	0	1179
	AM	11.91	7058	0	7058	0	7058	1765	0	1765	1765	3529	700	0	2829
	AM	01.92	48	0	48	0	48	12	0	12	12	24	700	0	-676
		Avg.	3553	0	3553	0	3553	889	0	889	889	1777	700	0	1077
	BE	11.91	3830	0	3830	508	3322	831	0	831	831	1661	700.	0	961
	BE	12.91	3271	8	3279	122	3157	789	0	789	789	1579	700	0	879
GN1 with	BE	01.92	579	0	579	1	577	144	0	144	144	289	700	0	-411
FRP	BE	02.92	1073	0	1073	20	1053	263	0	263	263	526	700	0	-174
outrigger	BE	03.92	144	0	144	30	114	30	0	29	29	57	700	0	-643
(NM)	BE	04.92	776	0	776	73	702	177	0	176	176	351	700	0	.349
	BE	05.92	1653	0	1653	0	1653	413	0	413	413	826	700	0	126
		Avg.	1618	1	**1619**	**108**	**1511**	**378**	**0**	**378**	**378**	**756**	**700**	**0**	**56**
	BE	10.92	213	0	213	165	48	32	0	12	12	24	700	0	-676
	BE	11.92	584	0	584	450	134	53	0	33	33	67	700	0	-633
	BE	12.92	3698	0	3698	178	3520	880	0	880	880	1760	700	0	1060
	BE	01.93	2180	0	2180	186	1994	498	0	498	498	997	700	0	297
	BE	02.93	931	340	1272	37	1235	309	0	309	309	618	700	0	-82
		Avg.	1521	68	1589	203	1386	354	0	346	346	693	700	0	-7

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(Contd. Appendix XIII)

Gear and Craft	*Site*	*Month* and year	J	2	3	4	5	6	7	8	9	10	U	12	13
	AM	12.91	2163	0	2163	6600	-4437	0	0	-1109	-1109	-2218	2075	436	-4729
	AM	10.92	118910	0	118910	8800	110110	22022	33033	27528	27528	55055	2075	436	52544
GN2 with	BE	09.92	26400	0	26400	6050	20350	4070	6105	5088	5088	10175	2075	436	7664
FRP (18′)	PE	01.92	2654	4998	7652	1559	6093	1219	1828	1523	1523	3047	2075	436	536
boat with	PE	02.92	759	472	1231	1329	-98	90	135	-25	-25	-49	2075	436	-2560
OBM	PE	03.92	5716	2374	8090	4070	4020	968	1452	1005	1005	2010	2075	436	-501
	PE	04.92	6483	2530	9013	2629	6384	1387	2080	1596	1596	3192	2075	436	681
	PE	05.92	29684	4950	34634	8800	25834	5167	7750	6458	6458	12917	2075	436	10406
		Avg.	9059	3065	12124	3677	8447	1766	2649	2111	2111	4223	2075	436	1712
	PE	11.92	17102	2758	19860	3575	16285	3273	4909	4071	4071	8142	2075	436	5631
	PE	12.92	13738	2161	15900	3530	12370	2478	3717	3092	3092	6185	2075	436	3674
	PE	01.93	26368	4708	31076	4898	26177	5242	7863	6544	6544	13089	2075	436	10578
	PE	02.93	6145	10181	16326	3251	13075	2620	3930	3269	3269	6538	2075	436	4027
		Avg.	15838	4952	20791	3814	16977	3403	5105	4244	4244	8489	2075	436	5978
	BE	11,91	18073	0	18073	1119	26954	3401	5102	4239	4239	8477	1575	311	6591
	BE	12.91	3550	20	3570	940	2630	541	812	658	658	1315	1575	311	-571
GN1 with	BE	02.92	4888	0	4888	660	4228	846	1269	1057	1057	2114	1575	311	228
FRP (18)	BE	09.92	30367	0	30367	3898	26469	5294	7941	6617	617	13234	1575	311	11348
with OBM		Avg.	14220	5	14225	1654	12570	2521	3781	3143	3143	6285	1575	311	4399
	BE	10.92	4573	0	4573	708	3865	793	1190	966	966	1933	1575	31!	47
	BE	11.92	3847	0	3847	510	3337	677	1016	834	834	1668	1575	311	-218
	BE	02.93	1192	0	1192	1063	128	99	149	32	32	64	1575	311	-1822
		Avg.	3204	0	3204	760	2443	523	785	611	611	1222	**1575**	**311**	**-664**
GN2	DO	10.9!	86701	0	86701	5264	81438	16642	24963	20359	20359	40719	2075	436	38208
with	DO	11.9!	13034	0	13034	2927	10107	2142	3213	2527	2527	5054	2075	436	2543
wooden	DO	12.91	11959	459	12418	2816	9601	1949	2923	2400	2400	4801	2075	436	2290
outrigger	DO	01.92	2149	4	2153	483	1670	347	521	418	418	835	2075	436	-1676
canoe	DO	02.92	2282	403	2685	726	1959	408	611	490	490	980	2075	436	-1531
with OBM	DO	03.92	2795	204	3000	901	2099	450	676	525	525	1049	2075	436	-1462
	DO	04.92	18614	89	18703	2694	16009	3248	4873	4002	4002	8005	2075	436	5494
	DO	05.92	18607	Ill	18718	3428	15289	3072	4608	3822	3822	7645	2075	436	5134
	DO	06.92	23561	0	23561	3316	20245	4057	6085	5061	5061	10123	2075	436	7612
	DO	07.92	17363	148	17511	3432	14079	2830	4245	3520	3520	7039	2075	436	4528
	DO	08.92	9626	26	9652	3598	6054	1393	2089	1513	1513	3027	2075	436	516
	DO	09.92	7410	1559	8969	1288	7681	1547	2320	1920	1920	3841	2075	436	1330
		Avg.	17842	250	18092	2573	15519	3174	4761	3880	3880	7760	2075	436	5249
	DO	10.92	19459	19738	39197	5050	34147	6913	10369	8537	8537	17074	2075	436	14563
	DO	11.92	83080	4362	87442	2774	84667	16946	25419	21167	21167	42334	2075	436	39823
	DO	12.92	23736	62	23798	3229	20569	4123	6184	5142	5142	10284	2075	436	7773
	DO	01.93	5915	1605	7520	1499	6021	1255	1882	1505	1505	3010	2075	436	499
	DO	02.93	19519	3627	23146	2377	20768	4199	6298	5192	5192	10384	2075	436	7873
		Avg.	30342	5879	36221	2986	33234	6687	10030	8309	8309	16617	2075	436	14106

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(Contd. Appendix XIII)

Gear and Craft	*Site*	*Month and year*	1	2	3	4	5	6	7	8	9	10	11	12	13
PS with	AM	10.91	72945	0	72945	37950	34856	1660	2490	8749	8749	17497	8100	1540	7857
wooden	AM	11.91	25312	482	25795	10778	15017	715	1073	3754	3754	7508	8100	1540	-2132
(28) boat	AM	12.91	69249	3003	72252	11220	61032	2906	4359	15258	15258	30516	8100	1540	20876
with IBM	AM	01.92	78315	603	78917	11513	67405	3210	4815	16851	16851	33702	8100	1540	24062
	AM	02.92	69658	3845	73503	8889	64614	3077	4615	16154	16154	32307	8100	1540	22667
	AM	03.92	54886	7100	61986	16715	45271	2156	3234	11318	11318	22635	8100	1540	12995
	AM	04.93	21204	4634	25838	14341	11498	548	821	2874	2874	5749	8100	1540	-3891
	AM	05.93	25609	0	25609	17861	7748	369	553	1937	1937	3874	8100	1540	-5766
		Avg.	52147	2458	54606	16158	38430	1830	2745	9612	9612	19224	8100	1540	9584
	BE	11.91	152429	2616	155045	19250	135795	6466	9700	33949	33949	67898	8100	1540	58258
	BE	12.91	0	0	0	19800	-19800	0	0	-6200	-6200	-12400	8100	1540	-22040
	BE	01.92	25085	904	25988	10128	15860	755	1133	3965	3965	7930	8100	1540	-1710
	BE	02.92	59823	1241	61064	8491	52573	2503	3755	13143	13143	26287	8100	1540	16647
	BE	03.92	68239	2884	71123	10049	61074	2908	4362	15268	15268	30537	8100	1540	20897
	BE	04.92	21939	10095	32034	4379	27655	1317	1975	6914	6914	-13828	8100	1540	4188
		Avg.	54586	2957	57542	12016	45526	2325	3488	11173	11173	22347	8100	1540	12707
	BE	10.92	143974	5640	149614	9268	140347	6683	10025	35087	35087	70173	8100	1540	60533
	BE	11.92	120931	1069	121999	12886	109114	5196	7794	27278	27278	54557	8100	1540	44917
	BE	12.92	115207	0	115207	15329	99878	4756	7134	24969	24969	49939	8100	1540	40299
	BE	01.93	41342	4058	45399	11024	34375	1637	2455	8594	8594	17188	8100	1540	7548
	BE	02.93	86460	13493	99953	21267	78687	3747	5620	19672	19672	39343	8100	1540	29703
		Avg.	101583	4852	106434	13955	92480	4404	6606	23120	23120	46240	8100	**1540**	**36600**
	HA	10.91	855655	0	855655	16280	839375	39970	59955	209844	209844	**419687**	8100	1540	410047
	HA	11.91	66124	2489	68613	9036	59578	2837	4256	14894	14894	29789	8100	1540	20149
	HA	12.91	134481	22248	156728	21725	135003	6429	9643	33751	33751	67502	8100	1540	57862
	HA	01.91	16346	2964	19310	10267	9043	431	646	2261	2261	4522	8100	1540	-5118
	HA	02.92	58926	2640	61566	8250	53316	2539	3808	13329	13329	26658	8100	1540	17018
	HA	03.92	53228	8635	61863	8219	53644	2554	3832	13411	13411	26822	8100	1540	17182
	HA	04.92	40336	8807	49143	8422	40721	1939	2909	10180	10180	20360	8100	1540	10720
		Avg.	175014	6826	181840	11743	170097	8100	**12150**	**42524**	**42524**	**85049**	**8100**	**1540**	**75409**
	HI	10.91	75929	9	75929	21164	54765	2608	3912	13691	13691	27383	8100	1540	17743
	HI	11.91	59629	4510	64139	12279	51860	2470	3704	12965	12965	25930	8100	1540	16290
	HI	12.9!	23598	5046	28644	11466	17178	818	1227	4294	4294	8589	8100	1540	-1051
	HI	01.92	65722	2033	67755	12100	55655	2650	3975	13914	13914	27828	8100	1540	18188
	HI	02.92	79031	8375	87406	10145	77260	3679	5519	19315	19315	38630	8100	1540	28990
	HI	03.92	67184	3226	70410	10363	60047	2859	4289	15012	15012	30023	8100	1540	20383
	HI	04.92	25571	6993	32564	10451	22113	1053	1580	5528	5528	11057	8100	1540	1417
	HI	05.92	51119	1403	52521	20827	31695	1509	2264	7924	7924	15847	8100	1540	6207
		Avg.	55973	3948	59921	13599	46322	2206	3309	11580	11580	23161	8100	**1540**	**13521**
	PE	02.92	49002	1391	50393	7621	42771	2037	3055	10693	10693	21386	8100	1540	11746
	PE	03.92	92070	0	92070	8160	83910	3996	5994	20977	20977	41955	8100	1540	32315
	PE	04.92	12994	0	12994	8525	4469	213	319	1117	1117	2234	8100	1540	-7406
	PE	05.92	48400	0	48400	**19520**	29150	1388	2082	7288	7288	14575	8100	1540	4935
		Avg.	50617	348	50964	10889	40075	**1909**	**2863**	10019	10019	20038	**8100**	**1540**	**10398**
	PE	11.92	61325	3113	64438	12650	51788	2466	3699	12947	12947	25894	8100	1540	16254

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(Contd. Appendix XIII)

Gear and Craft	*Site*	*Month and year*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
RN with	DO	10.9!	16150	0	16150	1553	14597	1327	1991	3649	3649	7299	1825	374	5100
wooden	DO	11.91	8013	0	8013	534	7479	680	1020	1870	1870	3739	1825	374	1540
outrigger	DO	12.91	8433	0	8433	1048	7385	671	1007	1846	1846	3692	1825	374	1493
canoe with	DO	01.92	7944	0	7944	461	7483	0	0	1871	1871	3742	1825	374	1543
OBM	DO	02.92	8608	0	8608	1582	7026	0	0	1756	1756	3513	1825	374	1314
	DO	03.92	11704	0	11704	1381	10323	938	1408	2581	2581	5161	1825	374	2962
	DO	04.92	10007	0	10007	623	9384	853	1280	2346	2346	4692	1825	374	2493
	DO	05.92	61844	0	61844	1728	60116	5465	8198	15029	15029	30058	1825	374	27859
	DO	06.92	64118	0	64118	2404	61714	5610	8416	15428	15428	30857	1825	374	28658
	DO	08.92	40498	0	40498	1727	38771	3525	5287	9693	9693	19385	1825	374	17186
	DO	09.92	12834	0	12834	970	11864	1079	1618	2966	2966	5932	1825	374	3733
		Avg.	22741	0	22741	1274	21467	1832	2748	5367	5367	10734	1825	374	8535
	DO	10.92	18172	0	18172	1287	16885	1535	2302	4221	4221	8442	1825	374	6243
	DO	11.92	29048	0	29048	937	28111	2556	3833	7028	7028	14055	1825	374	11856
	DO	12.92	7642	0	7642	937	6705	610	914	1676	1676	3352	1825	374	1153
	DO	01.93	3577	0	3577	1068	2509	0	0	627	627	1255	1825	374	-944
	DO	02.93	10682	0	10682	1776	8906	0	0	2227	2227	4453	1825	374	2254
		Avg.	13824	0	13824	1201	12623	940	1410	3156	3156	6311	1825	374	4112

SA = Sampling area
AM = Ambalangoda
BE = Beruwala
DO = Doddanduwa
HA = Haraspola
HI = Hikkaduwa
PE = Peraliya

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PUBLICATIONS OF THE BAY OF BENGAL PROGRAMME (BOBP)

The BOBP brings out the following types of publications.'

Reports (BOBP/REP/...) which describe and analyze completed activities such as seminars, annual meetings of BOBP's Advisory Committee, and subprojects in member-countries for which BOBP inputs have ended.

Working Papers (BOBP/WP/...) which are progress reports that discuss the findings of ongoing work.

Manuals and Guides (BOBP/MAG/...) which are instructional documents for specific audiences.

Information Documents (BOBP/INF/...) which are bibliographies and descriptive documents on the fisheries of member-countries in the region.

Newsletters *(Bay of Bengal News)* which are issued quarterly and which contain illustrated articles and features in nontechnical style on BOBP work and related subjects.

Other publications which include books and other miscellaneous reports.

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NOTE: Apart from these publications, the BOBP has brought out several folders, leaflets, posters etc., as part of its extension activities. These include Post-harvest Fisheries folders in English and in some South Indian languages on anchovy drying, insulated fish boxes, fish containers, ice boxes, the use of ice etc. Several unpublished reports connected with BOBP's activities over the years are also available in its Library.

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