

A PRELIMINARY ANALYSIS OF SMALL MESH GILLNET FISHERY IN THE INSHORE WATERS OF SRI LANKA.

(December 1983 to November 1984)

By

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ABSTRACT

A preliminary analysis of the small-mesh gillnet fishery in the inshore waters of North-West, West, South-West and South coasts of Sri Lanka is presented. The crafts and the range of mesh sizes used vary in different areas. The characteristics of a fishing unit (craft and gear) in certain areas is influenced by the characteristics of the fishing grounds. This is also reflected in the catches, which in most areas, consist mostly of Clupeids. A production of 25,000 MT is estimated from this fishery in the study area. This is around 30% of the small pelagic fish landed in Sri Lanka.

INTRODUCTION

Forty to fifty percent of the marine fish landed in Sri Lanka consist of small fish which are caught mainly by small mesh gillnets and beach seines. The acoustic surveys carried out around the coastal waters of Sri Lanka gave a total pelagic biomass of about 200,000 ton (Anon, 1981). The small pelagic fish biomass as given by the R/V Fridtjof Nansen survey for the area from Negombo to Galle is 25,000 MT (Blindheim and Foyn 1980). The production from beach seines in this area as estimated using the observations made during 1984 was 2500 MT. The maximum potential yield (Y_{max}) as calculated using the modified formula of Gulland's first approximation $Y_{max} = .5 (C + M\bar{B})$ (Where C is the annual production of small pelagics in tonnes in this area and is equal to 15,260; M is the natural mortality rate and was taken as 1; and B is the mean annual biomass of the exploited stocks) was 20,130 MT.

The catches of small pelagic species (mostly in gillnets and beach seines) in Sri Lanka during 1979 was around 70,000 MT (Anon, 1980). The small mesh gillnets contributed to the bulk of this production, the beach seine production having declined considerably during the past few years; the present production from the beach seine fishery being around 10,000 MT per annum.

Since the introduction of small mesh gillnets to the coastal inshore fishery in late 1950's, this fishery has become extremely popular and at present gillnets are being operated by non-mechanised traditional crafts, non-mechanised FRP crafts (FRP Oru), mechanised traditional crafts and 17-23 ft. FRP boats fitted with out-board engines of 5-18 HP.

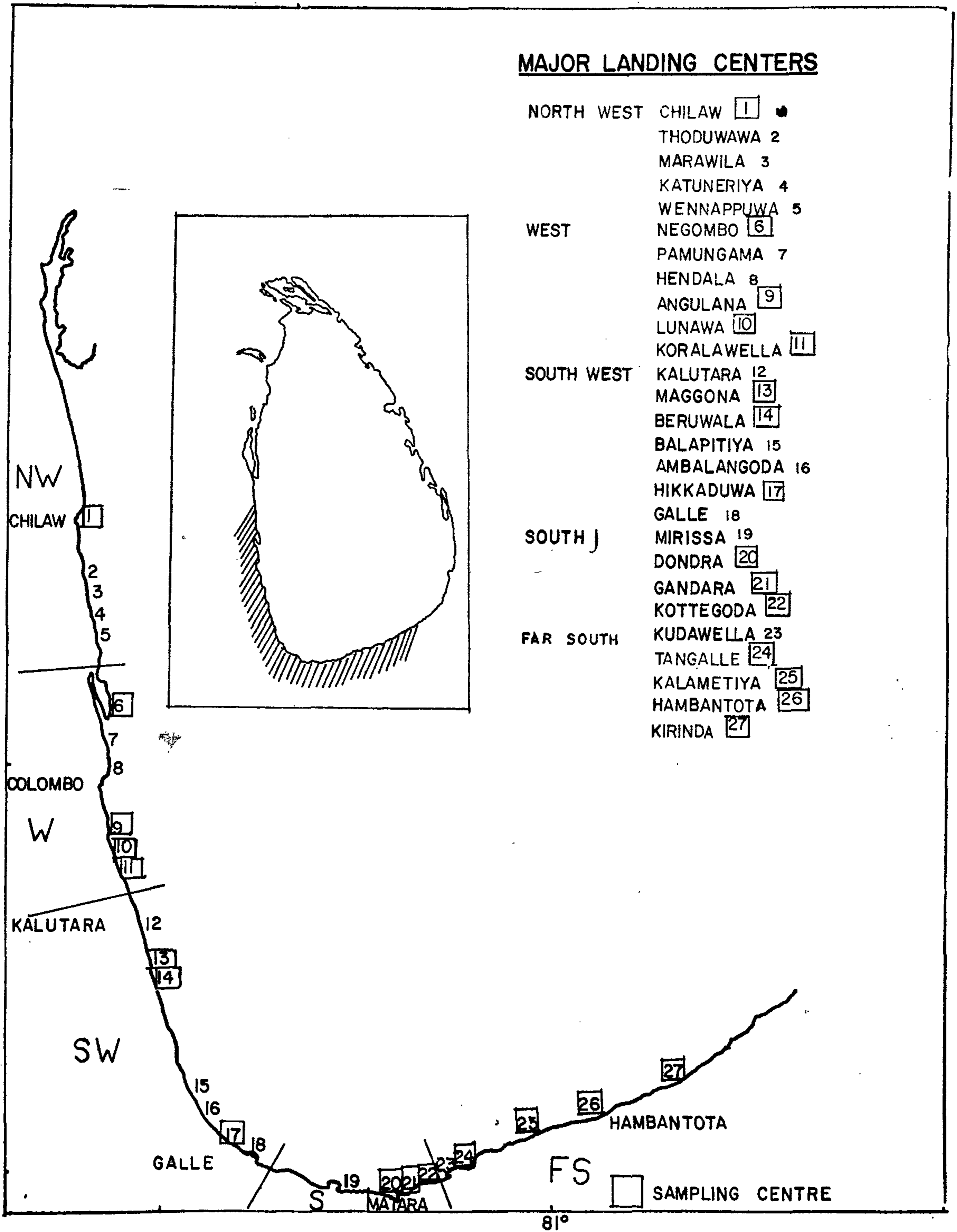


Figure 1: The Landing and Sampling Centres in Small Mesh Gillnet Fishery from Kirinda to Chilaw.

TABLE 1.

A SUMMARY OF THE SMALL MESH GILLNET FISHING OPERATIONS

Area	Type(s) of craft	Maximum recorded daily	Mesh size range(s)	No. of pieces of net	Effective width of net (fathoms)	Depth of fishing (fathoms)	No. of fishing trips/boat 1 day
Far-South	NM oru	487	1 $\frac{1}{8}$ " - 1 $\frac{1}{4}$ "	6 - 14	4 $\frac{3}{8}$ - 7	10 - 15	1
	M oru	63		8 - 24		10 - 15	
	FRP boats			12 - 30		10 - 35	
South	NM oru	395	1 $\frac{1}{8}$ " - 1 $\frac{1}{4}$ "	6 - 14	4 $\frac{3}{8}$ - 7	10 - 15	1
	M oru	185		8 - 24		10 - 15	
	FRP boats			12 - 30		15 - 35	
South-West	NM oru	568	4/8" - 1" } 1 $\frac{1}{8}$ " - 1 $\frac{1}{4}$ " } 1 $\frac{3}{4}$ " - 2" }	4 - 8	2 $\frac{5}{8}$ - 3 $\frac{1}{2}$ }	3 - 5	1 - 2
	FRP oru					6 - 12	
	M oru	47		8 - 16		15 - 35	
West	FRP boats	700	4/8" - 1 $\frac{1}{2}$ "	14 - 24	3 $\frac{1}{2}$	8 - 18	1 - 2
North-West	FRP boats	556	4/8" - 1 $\frac{1}{2}$ "	14 - 24	3 $\frac{1}{2}$	8 - 18	1

NM oru — non mechanised wooden oru. FRP oru — non mechanised FRP oru.
M oru — mechanised oru. FRP boats — 17 - 23' FRP boats.

In almost all areas, the mesh sizes in small mesh gillnets vary according to the availability of different fish species at different periods of time. Nets with mesh size ranging from 1 $\frac{1}{8}$ " to 1 $\frac{1}{4}$ " were the commonest throughout the study area, mostly for the capture of *Sardinella spp.* and other clupeids of the size range 8 to 24 cm. Smaller mesh sizes, ranging from 4/8" to 9/10" are also used in North-West, West and South-West, mainly for the capture of anchovies (*Stolephorus spp.*) and other small Engraulids and Clupeids of the size range 3 to 10 cm. Nets with larger mesh sizes of 1 $\frac{1}{4}$ " to 2" are also used in South-West for the capture of relatively bigger fish such as *Lactarius lactarius*, *Chirocentrus spp.*, *Sphyraena spp.* etc. particularly by the non-mechanised traditional crafts. This is reflected in the percentage species composition for South-West, given in Table 2.

The number of pieces of net taken aboard 17-23 ft. FRP boats in North-West and West is of the range 14 to 24, depending on the economic status of the boat owner. Yet, 80% or more crafts carry 18 to 22 pieces per craft. In Far-South and South, the non-mechanised traditional crafts carry around 6 to 14 pieces of net while the mechanised traditional crafts and 17-23 ft. FRP boats carry 8 to 24 and 12 to 30 pieces of net respectively. In South-West, the non-mechanised traditional crafts and non-mechanised FRP crafts, carry around 4 to 8 pieces of net per craft. The 17-23 ft FRP boats also carry only 8 to 16 pieces of net per craft. The effective length of one net piece is around 14 fathoms and the height or the width is around 3 $\frac{1}{2}$ fathoms. The height of the nets used in Far-South and South is often increased to nearly two times that of an ordinary net piece by connecting another quarter, half or one net piece to the one above. Thus, the increased number of net pieces used in Far-South and South do not necessarily make lengthwise additions to the net. This increase in height of the net is possibly due to the relatively deeper inshore waters in these areas compared to the other areas. On the other hand, in South-West, the height of an ordinary net piece is usually reduced by about twenty five percent due to the relatively shallow waters where the fishing is carried out. In North-West and West, the 17-23 ft FRP boats fish at a depth of around 8 to 18 fathoms. In

The little work published on small pelagic fishery in the coastal inshore waters of Sri Lanka is limited to the beach seine fishery and more recently to the purse-seine fishery trials attempted in early 1970's.

This preliminary report provides a general account on the status of the small mesh gillnet fishery off the Southern and Western coasts of Sri Lanka.

MATERIALS AND METHODS

The study area covers South, South-West, West and North-West coasts, from Kirinda to Chilaw. The stratification to different areas was carried out following the District Fishery Extension Officer's (DFEO's) areas as given by the Ministry of Fisheries. Fifteen fish landing centres were selected for sampling, from around 27 major fish landing centres scattered along the study area (Fig. 1). These were selected to represent the sub-areas, Far-South, South, South-West, West and North-West. The Southern coast was considered under two areas, South and Far-South as the fishing in the Far-South (Hambantota-Kirinda area) was significantly different to the other areas with respect to crafts. Among the traditional crafts only orus were considered for this study as the other types of traditional crafts such as Teppams, Vallams etc., do not operate small mesh gillnets in most of the areas. In Negombo although this fishery is being carried out by teppams their contribution to the gillnet fishery being insignificant as against FRP boats, only the latter was considered here.

Sampling was carried out four days a month on a fortnightly basis at each sub area. The data collected included the total number of crafts operated, the catch, catch composition and size range of nets used in each craft selected for random sampling.

RESULTS AND ANALYSIS

Crafts and Gear

Information regarding craft, gear, depth of fishing and number of fishing trips per day are indicated in Table 1. The types and proportions of crafts involved in this fishery vary in different areas. In North-West and West, 17-23 ft. FRP boats are mainly used in this fishery whereas in South-West, non-mechanised traditional crafts, non-mechanised FRP crafts, mechanised traditional crafts and 27-23 ft. FRP boats are used. In Far-South, the types of crafts mostly used are the non-mechanised traditional crafts and mechanised traditional crafts. Although 17-23 ft. FRP boats are very rarely used in Far-South, these crafts are commonly used in South, in addition to other crafts used in Far-South.

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South-West, South and Far-South, the same crafts operate in more deeper waters ranging from 15 to 35 fathoms. But the mechanised traditional crafts in these areas operate at shallower depths ranging from 10 to 15 fathoms. In South-West, the non-mechanised crafts operate in shallower depths ranging from 3 to 5 fathoms, and in South and Far-South the same crafts operate in much deeper waters, ranging from 10-15 fathoms.

SPECIES COMPOSITION

Thirty species belonging to eight Families were identified from the catches in the small mesh gillnet fishery. A complete list of these species is given in appendix 1 with a number for priority. Clupeidae and Engraulidae were the most dominant. The dominant Clupeids in the small mesh gillnet fishery include *Amblygaster sirm*, *Sardinella albella*, *Pellona ditchells* and *Dussunieria acuta*. Fig. 2 gives the estimated area-wise CPUE for Clupeids along with the others for the mechanised crafts. While Clupeids were the dominant group in most areas, the Engraulids were equally dominant in South-West. Table 2 gives the estimated overall percentage catch composition of major Families of fish for both non-mechanised and mechanised crafts from December 1983 to November 1984. The significant contribution of non-Clupeid fish to this fishery in South-West is also reflected in Table 2. Here the mechanised crafts

TABLE 2.

THE PERCENTAGE CATCH COMPOSITION OF MAJOR FISH GROUPS IN SMALL MESH GILLNET FISHERY, DECEMBER 1983 TO NOVEMBER 1984

Area		<i>Clupeidae</i>	<i>Engraulidae</i>	<i>Leiognathidae</i>	Others
Far South	NM	85.50	3.25	0.25	11.00
	M	93.10	1.26	0.00	5.62
South	NM	72.14	3.70	1.03	23.16
	M	73.00	3.00	1.00	23.00
South West	NM	34.06	34.20	6.84	24.90
	M	36.97	60.00	1.98	1.02
West	M	90.66	4.43	1.75	3.15
North West	M	97.50	0.24	0.34	1.90

NM — Non-mechanised

M — Mechanised

in particular gave relatively higher catches of species such as *Stolephorus spp* and *Thryssa spp*. while the non-mechanised crafts gave higher catches of species such as *Leiognathus spp.*, *Chirocentrus spp.* and *Lactarius lactarius*.

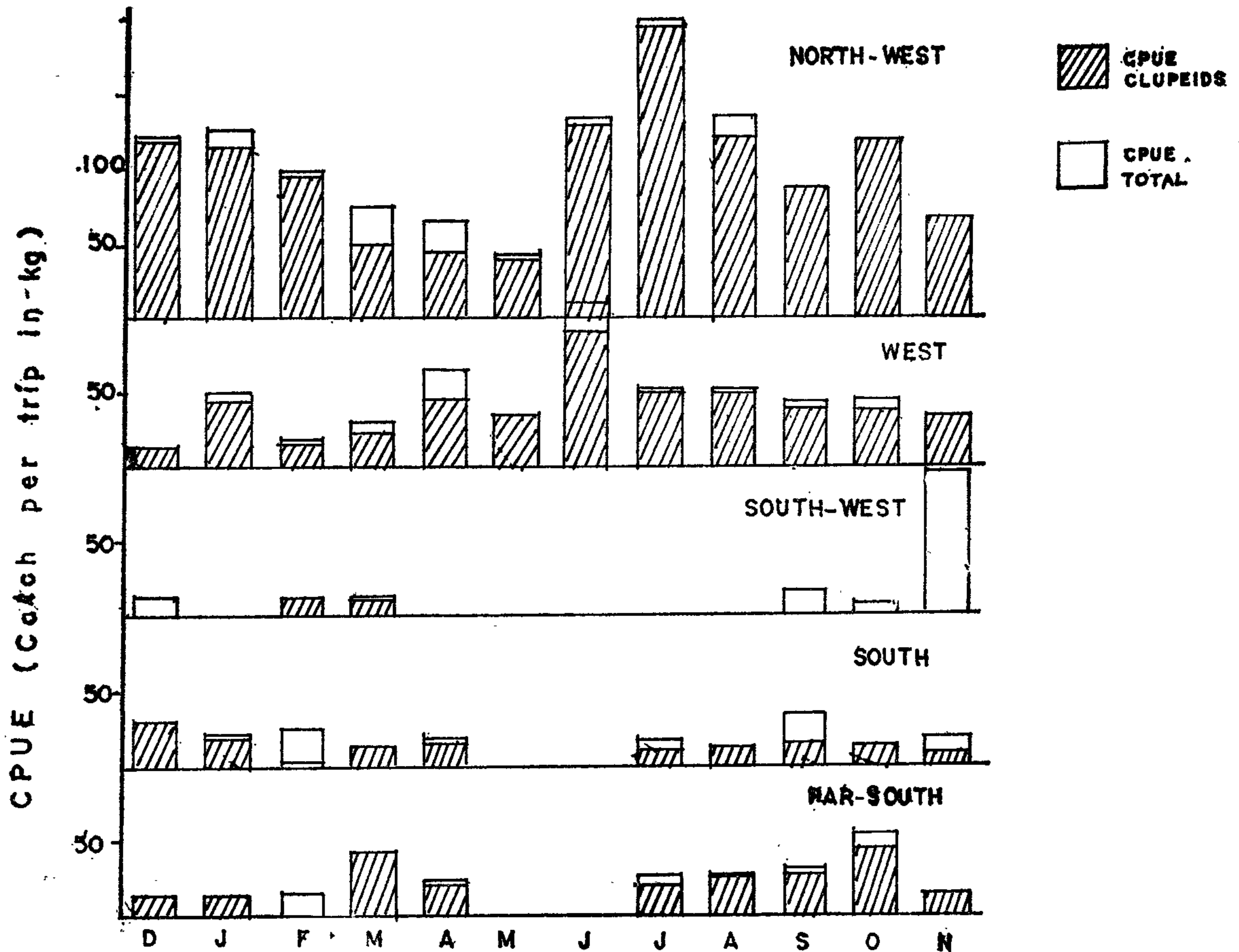


Figure 2 : The estimated CPUE for Clupeids along with the others for mechanicalised crafts.

FISHING EFFORT AND CATCH PER UNIT EFFORT

While some crafts in certain areas and at certain times conduct more than one fishing trip per day, the duration of each fishing trip also vary considerably in different areas. It was therefore decided to estimate fishing effort in terms of number of fishing trips and the catch per unit effort in terms of catch per fishing trip. The fishing effort estimated at the sampling centres in each sub area was used to obtain the total effort for the whole sub area. The average number of fishing days per craft per month was taken as 22. Therefore, the total effort per craft per month in terms of fishing trips is 22 or more depending on the mean number of trips per craft per day in each area. The area-wise variation of estimated fishing effort by non-mechanised and mechanised crafts are shown by Figs. 3(a) and 3(b) respectively and the same is given in a tabulated form in table 3. For non-mechanised crafts, the variation in effort on a monthly basis is shown only for Far-South, South and South-West. The effort is generally low in some months of the South-West monsoon period as fishing is carried out only on calmer days during this period. For mechanised crafts, the effort is relatively high throughout the year in West and North-West areas compared to the other areas. This is so even during the South-West monsoon period. Table 4 gives the variation of estimated catch per unit effort (CPUE) in different sub areas. The mean average CPUE value for mechanised crafts from

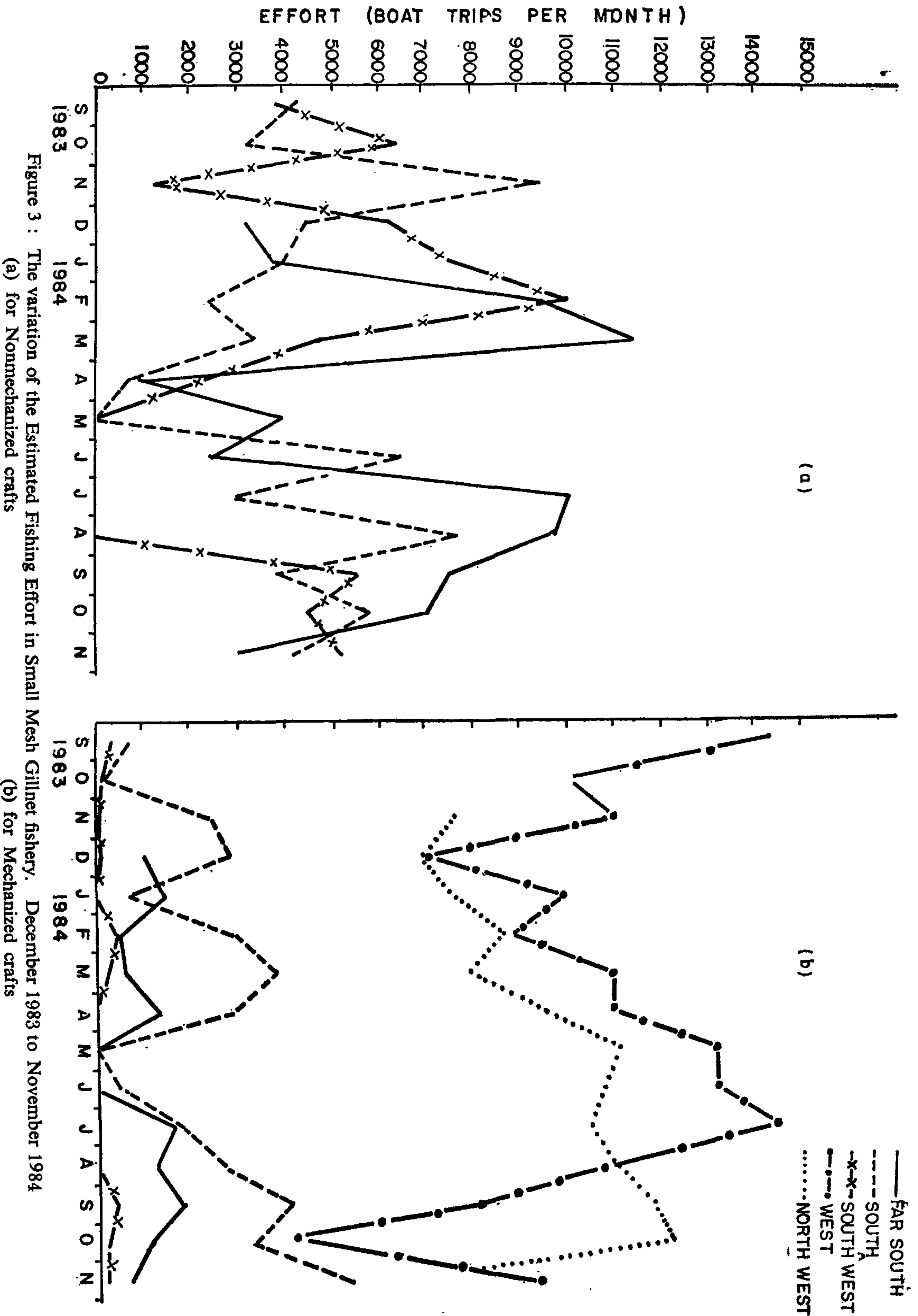


Figure 3 : The variation of the Estimated Fishing Effort in Small Mesh Gillnet fishery. December 1983 to November 1984
 (a) for Nonmechanized crafts
 (b) for Mechanized crafts

TABLE 3.
THE ESTIMATED MONTHLY EFFORT (BOAT TRIPS PER MONTH) IN SMALL MESH GILLNET FISHERY, DECEMBER 1983 TO NOVEMBER 1984

Area		D.'83	J.'84	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.
Far South	NM	3256	3850	9592	11484	1045	4026	2570	10032	9740	7506	7084	3102
	M	1078	1474	541	612	1366	—	—	1657	1260	1890	1162	737
South	NM	4518	4060	2409	3489	783	22	6578	2992	7720	3938	5885	4202
	M	2914	736	2926	3806	2988	29	546	1844	2720	4136	3362	5410
South-West	NM	12584	15180	20064	9636	4708	—	—	—	—	11220	9108	12496
	M	—	—	2046	924	—	—	—	—	—	2156	1258	103
West	M	2860	9900	8800	11000	11000	13200	13200	14520	11000	8250	4180	94604
North-West	M	6930	7524	8690	7942	9548	11153	10845	10538	11044	11858	12232	7898

NM Non-mechanised M — Mechanised

Far-South and South-West was 1.96 times greater than that of non-mechanised crafts from these areas. In South the mean average for mechanised crafts was almost similar to that of non-mechanised crafts with a ratio of 1.08 to 1.00. The monthly variation of CPUE for non-mechanised and mechanised crafts is shown in Fig. 4(a) and 4(b), together with the total estimated monthly effort. For non-mechanised crafts in South-West, the effort and the CPUE follow more or less the same trend. In South even though the effort is high in June, July and August, the CPUE does not show a relative increase compared to the previous months. In September, a reduction in total effort has resulted in an increase in CPUE which again declines in October and November in spite of a high total effort. In Far-South, the CPUE has shown no increase, although there was an increase in effort from December 1983 to March 1984. Again from July onwards the effort has increased, but the CPUE has only slightly increased. For mechanised crafts in North-West, the effort is more or less consistent during the period under consideration. The CPUE shows high values from July to January. In West, the effort and the CPUE follow the same trend, except for a few months of the South-West monsoon period of June to November.

TABLE 4.
CATCH PER UNIT EFFORT (Kg.) IN SMALL MESH GILLNET FISHERY, DECEMBER 1983 TO NOVEMBER 1984.

Area		D.'83	J.'84	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	Mean
Far South	NM	6.3	8.6	5.4	7.7	10.0	4.9	1.7	21.5	11.9	6.9	31.9	15.3	12.3
	M	5.2	8.6	9.9	35.4	16.4	—	—	22.7	15.0	28.6	45.7	6.1	24.18
South	NM	16.5	9.1	8.2	6.0	8.1	1.6	5.4	6.1	9.8	31.1	6.3	0.7	8.9
	M	26.0	16.6	16.6	5.7	11.0	—	6.0	10.8	7.9	27.2	7.6	16.2	9.7
West-South	NM	26.2	7.2	11.4	2.1	3.3	—	—	—	—	5.9	6.1	11.3	9.67
	M	10.0	—	6.7	7.2	—	—	—	—	—	11.7	3.3	92.2	19.0
West	M	11.6	49.8	15.5	28.1	61.4	33.5	107.7	45.0	45.4	40.0	40.3	33.1	42.4
North-West	M	115.0	126.2	94.8	72.3	56.0	39.7	118.7	197.8	134.3	83.3	127.0	111.4	153.7

NM — Non-mechanised N — Mechanised

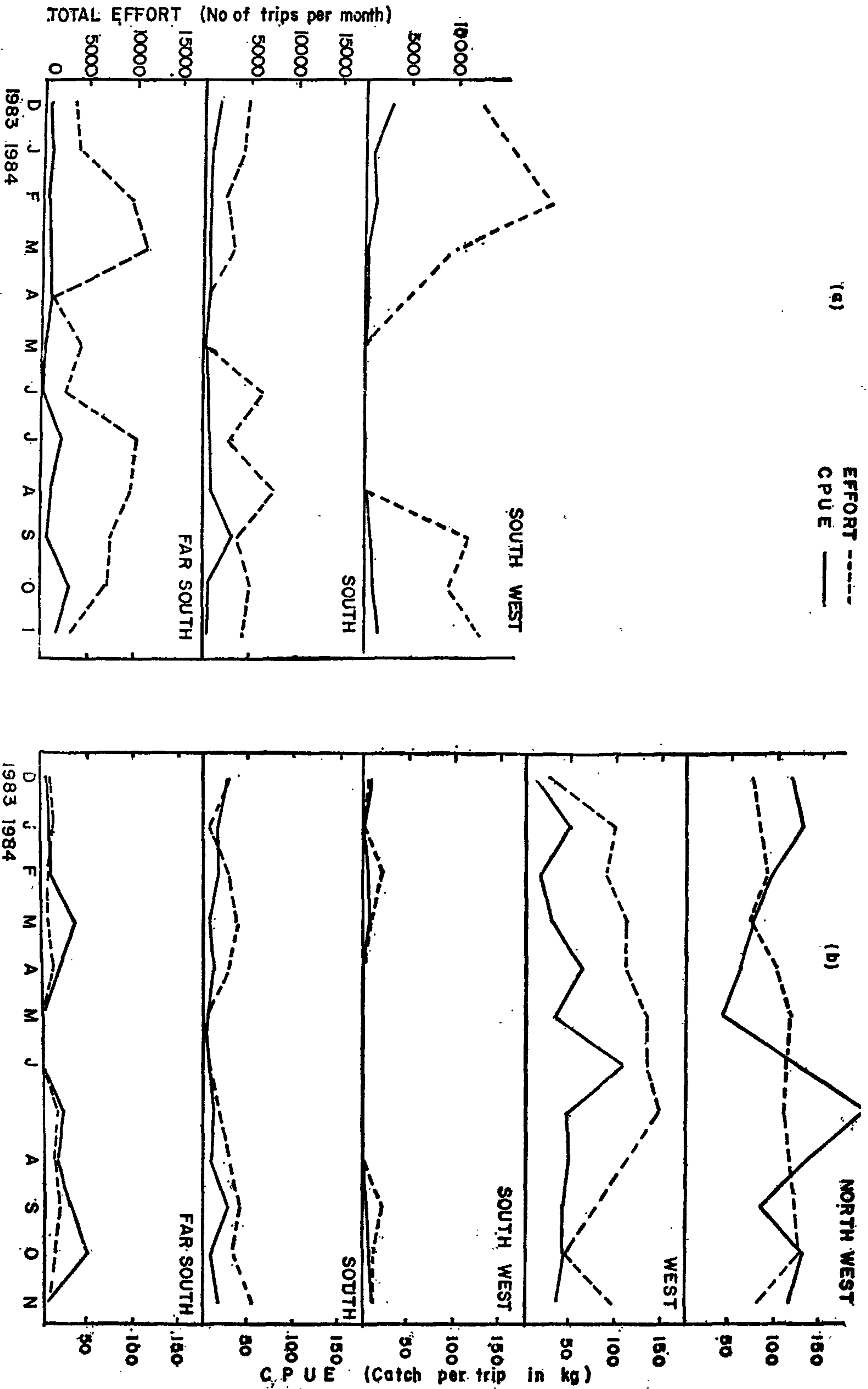


Figure 4 : The variation of the estimated fishing effort and the CPUE in small mesh gillnet fishery, Dec. 1983 - Nov. 1984.
 (a) Non mechanized crafts
 (b) mechanized crafts.

During this period, the CPUE is more or less consistent inspite of changes in the total effort. Both the effort and the CPUE are low and follow the same trend in South-West where fishing effort is practically nil during the South-West monsoon period. The CPUE is low during February to April, while the effort remained high during the same period in South. During most of the other months an increase in total effort generally gave a high CPUE. In Far-South, increase in CPUE is shown in certain months like March and October during which the effort is the same as for the other months.

PRODUCTION

The total effort and the CPUE were used to estimate the total monthly production from the small mesh gillnet fishery during the study period. These estimates are given in tables 3, 4 and 5 respectively. The highest mean catch per unit effort for non-mechanised crafts was recorded from Far-South. Yet the estimated total production for the study period was highest for South-West due to high total effort. For mechanised crafts a relatively high production was recorded for North-West and West coasts. This is reflected in the high CPUE and total effort recorded from these areas. The estimated total production for the non-mechanised and mechanised crafts during the study period was around 25,000 MT which is about one eighth of the total marine fish landed in Sri Lanka per annum in recent years. This is also about 25-30 percent of the total small pelagic fish produced by the coastal inshore fisheries in Sri Lanka.

TABLE 5.

THE ESTIMATED MONTHLY PRODUCTION (MT) IN SMALL MESH GILLNET FISHERY,
DECEMBER 1983 TO NOVEMBER 1984

Avea.		D.'83	J.'84	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	Total
Far South	NM	20.50	33.10	51.80	88.40	104.50	19.90	4.40	215.90	100.00	51.30	225.90	47.50	874.70
	M	5.60	12.70	5.36	21.60	22.40	—	—	118.90	18.90	54.00	53.10	4.50	317.90
South	NM	74.50	37.00	21.50	20.90	6.30	0.73	35.30	18.20	75.50	122.50	37.10	3.10	452.60
	M	75.80	12.20	48.60	21.80	38.00	—	3.30	19.90	21.50	112.70	25.70	55.40	434.90
South-West	NM	329.70	109.20	227.90	20.20	15.50	—	—	—	—	66.90	56.00	147.40	972.80
	M	5.40	—	13.70	6.60	—	—	—	—	—	25.20	4.10	95.30	150.30
West	M	33.10	479.40	136.30	309.30	675.40	4429.00	1421.80	653.69	649.20	288.50	168.50	313.00	9557.00
North-West	M	797.50	949.50	824.00	574.00	675.40	442.80	1421.00	2084.00	1483.20	987.70	1553.50	879.80	12672.50

NM Non - mechanised

M — Mechanised

DISCUSSION

The maximum potential yield estimated from biomass figures for the area from Negombo to Galle was 20,130 MT as against the present annual production of 15,260 MT (12,760 from gillnets; 2,500 from beach seines) in this area. If the biomass estimate is correct then there is a surplus small pelagic yield of about 4,870 MT (around 23% from the potential yield) in this area.

Although biomass estimates for North-West was not compared with the production figures, as the production figure is given only for Chilaw DFEO's area, this area alone has produced 12672.5 MT which is around 50% of the total production in the study area.

The mean CPUE for mechanised crafts is nearly two times greater than that of non-mechanised crafts in Far-South and South-West areas, whereas it is almost equal in South. The CPUE for West and North-West areas were higher than that of any other area, probably due to the relatively high productivity in the shelf region that extends over larger areas in these regions.

This study revealed that Clupeids constituted as much as 100% of the catch in the small mesh gillnet fishery, and other than for Engraulids, there was only a little contribution by the other small pelagic varieties to this fishery. However, it should be mentioned that Leiognathidae and Engraulidae too contributed significantly to the catches in South-West.

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APPENDIX I.

THE SPECIES OCCURRING IN THE SMALL MESH GILLNET FISHERY

Family	Species (priority number)	Vernacular names
Clupeidae	<i>Amblygaster sirm</i>	(1) Hurulla, Spotted sardinella, Kirimeen chalai
	<i>Sardinella albella</i>	(2) Sudaya, White sardinella, Chudai
	<i>Sardinella melanura</i>	(6) Salaya, Black tip sardinella, Salai
	<i>Sardinella longiceps</i>	(6) Pesaleya, Oil sardine, Pesalai
	<i>Sardinella sp.</i>	(2) Matta Salaya
	<i>Sardinella sp.</i>	(2) Yak salaya
	<i>Amblygaster clupeoides</i>	(3) Gal Hurulla, Sharp-nose trenched sardine
	<i>Dussumieria acuta</i>	(2) Thondaya, Rainbow sardine, Tondai
	<i>Pellona ditchella</i>	(2) Wenganawa, Indian Pellona
	<i>Opisthopterus tardoore</i>	(4) Thottawa, Tardoore, Vellai schudai
	<i>Coval coval</i>	(3) Sudu sudaya, White sardine
	<i>Nematalosa nasus</i>	(6) Katu goiya, Koimeen, Blochs gizzard-shad
	<i>Herklotsichthys punctatus</i>	(4) Kolamuru salaya, Spotted herring
Engraulidae	<i>Thryssa setirostris</i>	(4) Ravul lagga, Long jaw anchovy
	<i>Thryssa malabarica</i>	(5) Balal parattaya
	<i>Thrissina baelama</i>	(4) Bilee lagga, Short jaw anchovy, Netholi
	<i>Stolephorus indicus</i>	(5) Hadalla, Indian anchovy
	<i>Stolephorus bataviensis</i>	(2) Potta halmassa, Batavian anchovy, Netholi
	<i>Stolephorus heterolobus</i>	(2) Halmassa, Short head anchovy, Netholi
	<i>Stolephorus buccaneeri</i>	(4) Halmassa, Buccaneer anchovy, Netholi
Leiognathidae	<i>Gazza minuta</i>	(3) Pulunnu karalla, Toothed pony fish
	<i>Leiognathus splendens</i>	(3) Katukaralla, Splendid pony fish
	<i>Secutor ruconius</i>	(3) Salli karalla, Deep pugnose pony fish
Chirocentridae	<i>Chirocentrus dorab</i>	(5) Katuwalla, Dorab wolfherring
Sphyraenidae	<i>Sphyraena obtusata</i>	(4) Theliya, Obtuse baracada
	<i>Sphyraena jello</i>	(4) Silava, Banded baracuda
Lactaridae	<i>Lactarius lactarius</i>	(5) Pulunna
Trichuridae	<i>Lepturacanthus savala</i>	(5) Savalaya, Small head hair tail
Carangidae	<i>Decapturus sp</i>	(3) Linna