

THE STATUS OF THE BEACH SEINE FISHERY IN THE SOUTHWEST COAST OF SRI LANKA DURING SEPTEMBER 1983 TO APRIL 1986*

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ABSTRACT

Beach seine fishery is carried out at 17 centres in the area between Moratuwa and Beruwala which covers 39 km of the Southwestern coastline of Sri Lanka. There are altogether 62 registered Beach Seine crafts in this area. This fishery is carried out only during the calm non-monsoonal months of September/October to March/April. The operation of a beach seine requires about sixty active men. Around 470 tonnes of fish are produced annually in this area by this fishery which catch a variety of fishes that include engraulids, leiognathids, clupeids, etc. Catches towards Beruwala consist mostly of engraulids which contribute around 33.9%, while the catches towards Moratuwa consist mostly of leiognathids which contribute around 46.7% to the total small pelagic fish production. The mean catch per haul towards Beruwala is around 336.1 kg while that towards Moratuwa is around 177.4 kg.

INTRODUCTION

BEACH SEINE is a kind of a drag net which is operated from shore and the operations are limited to a narrow coastal belt of one to two miles.

This fishery is seasonal and in the study area it is confined to calmer non-monsoonal months of September to April.

The earliest record of the presence of beach seining in Sri Lanka is given by Pearson (1922).

The first record on the fishery, the structure of a beach seine and its operation, was given by Canagaratnam and Medcof (1955, 1956). They also stated that during early fifties this was the principal method of catching fish in

Sri Lanka. Beach seines have produced 40% of the total island production at that time.

The estimated production by beach seines in Sri Lanka during 1982, 1983 and 1984 were about 5 to 10% from the total island production (Anon., 1983, 1984, 1985). If the recorded production of shore seine varieties during 1952-1957 period is considered as came totally from beach seines then the two areas Beruwala and Colombo to Moratuwa have annually produced an average of 436.18 tonnes and 260.18 t respectively (Anon., 1953, 1954, 1957, 1958). This paper aims at giving an updated account of the beach seine fishery in the coastal area between Moratuwa and Beruwala during the years 1983 to 1986.

MATERIALS AND METHODS

There are seventeen beach seine fishing centres scattered in the coastal area between

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Moratuwa and Beruwala (Fig. 1). Out of these nine fixed centres were visited on four days per month based on the fishing intensity at these centres. On each day of sampling three to four landing centres were visited. It was usual to sample centres 2, 3, 4 and 5 on two days in a month and centres 8, 13, 14, 16 and 17 one day in a month. Data on the condition of the sea

RESULTS AND ANALYSIS

Sea and surroundings

The landing sites other than Maggona/Uswalla and Beruwala are not sheltered by bays and are opened directly to the sea. Among landing centres there are differences with respect to bottom conditions as well as the facilities for operation. Those places which are close to river or lagoon or estuaries have more of muddy soil whereas other places have more of sandy soil. However, the coastal area southward of the Kalu Ganga Estuary with more of muddy soil compared to the northward area (Fig. 1). The presence of rocks is another hindrance to the operations and at such places the positioning of those under water boulders are taken by capable master fishermen with the aid of land marks. The strength and direction of currents also interfere the operations. Unless the currents near the beach and those away from the beach have a similar velocity the positioning of the net becomes difficult and thereby help the fish to escape which results in lowering of catch.

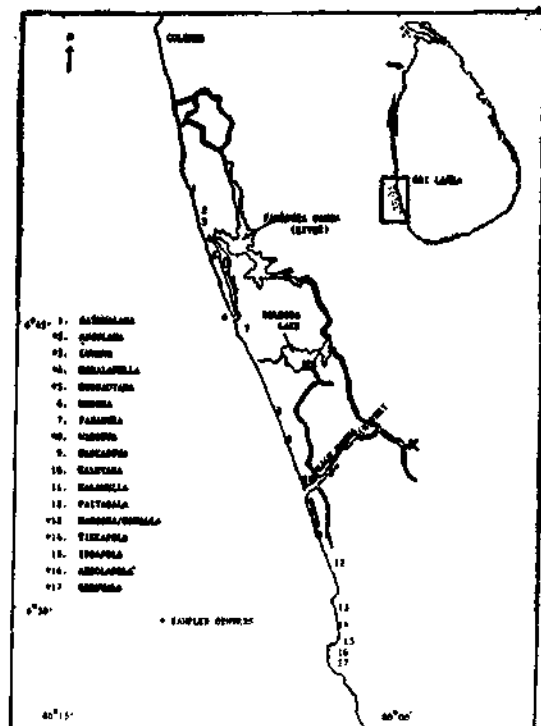


Fig. 1. Beach seine centres in the study area.

and surroundings, gear, labour involved, specie, composition and catch were recorded. Catch per unit effort was calculated as catch per haul as well as catch per man hour and the comparison of the two was carried out using a pairwise parametric correlation (Zar, 1974). Kruskal Wallis non parametric test (Zar, 1974) and, non-parametric multiple comparison test (Zar, 1974) were used to analyse the catch data.

Gear and labour

An average beach seine in the study area measures about 2000-3000 m in length although there are minor changes with space and time as the number of ropes used and the length of the wings may vary. The length of ropes is around 500-1000 m and that of wings is around 1500-2000 m. Besides these, there is about 30-50 m of body or mouth and a bag or cod end which measures around 7 m. The ropes are made of coir fibre whereas wings are made of coir rope meshes as well as kuralon meshes. The mouth and bag are totally made of kuralon.

The net is set in water with the use of a wooden craft which is known as 'Madal Paruwa' and this measures around 8 m. Those crafts from Moratuwa upto Kalu Ganga Estuary carry an outrigger while the crafts beyond this are operated without an outrigger

TABLE 1. A list of species in Beach Seine catches from Beruwala to Moratuwa during September 1983 to March 1985, in the order of occurrence

Family	Rank of occurrence		Species
	Kalutara	Moratuwa	
Carangidae	32	26	<i>Alectis indicus</i>
	19	17	<i>Chorenemus</i> spp.
	21	19	<i>Megalaspis cordyla</i>
	19	17	<i>Selaroides leptolepis</i>
Carcharinidae	32	24	<i>Scoliodon</i> sp.
Chirocentridae	5	9	<i>Chirocentrus</i> sp.
Clupeidae	39	26	<i>Amblygaster sirm</i>
	4	21	<i>Dussumieria acuta</i>
	35	37	<i>Herklosrichthys punctatus</i>
	35	37	<i>Nematolosa nasus</i>
	30	23	<i>Opisthopterus tardoore</i>
	3	21	<i>Pellona ditchella</i>
	31	28	<i>Sardinella albella</i>
	39	40	<i>Sardinella gibbosa</i>
	39	40	<i>Coryphaena hippurus</i>
	Cynoglossidae	21	19
Engraulidae	2	6	<i>Stolephorus batavicus</i>
	28		<i>Stolephorus buccaneeri</i>
	1	5	<i>Stolephorus heterolobus</i>
	28	31	<i>Stolephorus indicus</i>
	14	7	<i>Thryssina baelama</i>
	40	31	<i>Thryssa malabarica</i>
Hemiramphidae	13	7	<i>Thryssa setirostris</i>
	35	37	<i>Hemiramphus</i> sp.
Lactariidae	5	9	<i>Lactarius lactarius</i>
Leiognathidae	15	1	<i>Gazza minuta</i>
	16	1	<i>Leiognathus equulus</i>
	16	1	<i>Leiognathus splendens</i>
	16	1	<i>Secutor ruconius</i>
	25	31	<i>Upeneus vittatus</i>
Mullidae	32	26	<i>Mene maculata</i>
Penaeidae	39	42	<i>Penaeus</i> spp.
Portunidae	39	43	(Crabs)
Rajidae	38	31	(Skate)
Scombridae	25	40	<i>Auxis thazard</i>
	25	31	<i>Euthynnus affinis</i>
	21	25	<i>Rastrelliger kanagurta</i>
Sciaenidae	5	9	<i>Otolithus ruber</i>
Sillaginidae	21	31	<i>Sillago sihama</i>
Sphyraenidae	5	9	<i>Sphyraena jello</i>
	5	9	<i>Sphyraena obtusata</i>
	44	44	<i>Arothron</i> sp.
Tetraodontidae	5	9	<i>Therapon jarbua</i>
Theraponidae	5	9	<i>Lepturacanthus savala</i>
Trichuridae	5	9	

There are altogether 62 registered beach seine crafts in the study area. The craft is paddled by four oars, two on either side and each oar is paddled by two men. Other than paddling and the manipulation of the rudder there are two men to set the net and one more known as 'Mandadiya' to make all directions and coordinating activities. Therefore altogether 12 people are involved in the operation of the craft and the setting of the net. Another batch of 35 to 45 men are employed for the hauling of the net which is done in a particular rhythm. From the time the craft is set in water around three hours are needed to complete the hauling. Another half to one hour is required to sort out the catch and to set the net on the beach for drying.

Species composition

Around 45 species of finfish belonging to twenty families and shellfish belonging to two families were identified from the catches. A complete list of species that come across this fishery in both areas is given in Table 1 in the order of their abundance. The percentage contributed by the major fish groups during 1983/84 and 1984/85 seasons are given separately for Kalutara and Moratuwa in Table 2. In Kalutara the dominant family was Engraulidae while in Moratuwa it was Leiognathidae.

TABLE 2. The percentage contribution by dominant groups of fish in the beach seine fishery during September 1983 to March 1985

	Clupeidae	Engraulidae	Leiognathidae	Others
Kalutara				
1983/84	22.29	35.18	9.62	32.78
1984/85	13.99	32.56	3.57	49.89
Moratuwa				
1983/84	2.51	21.75	56.88	18.85
1984/85	11.78	31.84	36.48	19.89

At certain instances the catch consisted more than 90% of a single species. These kind of catches were encountered mostly with *Stolephorus* spp., especially *S. heterolobus* and *S. bataviensis*. Among leiognathids, *Gazza* sp. and *Leiognathus* spp. were dominant. The percentage contribution by clupeids was quite low at Moratuwa compared to Kalutara. Even at Kalutara, clupeids were represented mostly by *Pellona* spp. and *Dussumieria* sp. The fish such as *Chirocentrus* sp., *Sphyræna* spp., *Trichurus* sp., skates, *Rastrelliger* sp. and carrangids also frequented the catches. But their individual contribution to the total catch hardly exceeded one per cent.

Catch and effort

The monthly catch per haul data from the study area were analysed to find out the differences between the samples during 1983/84, 1984/85 and 195/8 fishing seasons (Table 3).

TABLE 3. Estimated Mean catch per haul (kg) for Kalutara and Moratuwa during September 1983 to April 1986

	Kalutara	Moratuwa
1983/84	221.5	54.5
1984/85	108.8	170.8
1985/86	633.6	66.7

The Kruskal Wallis non-parametric test (Zar, 1974) performed on catch data indicated that during 1984/85 the monthly catch per haul figures were significantly different and during the other two seasons there was no significant difference between the monthly samples. The 1983/85 and 1985/86 samples for Kalutara were accepted equal with a probability of $.1 < P < .25$ and $.25 < P < .5$ respectively. The probability of acceptance of equal samples for Moratuwa for the same seasons were $.25 < P < .5$ and $.5 < P < .75$ respectively.

The non-parametric multiple comparison test (Zar, 1974) on Kruskal Wallis rejected samples indicated that the rejection of equal sample hypothesis for 1984/85 period in Kalutara was due to the data during November which has recorded a low mean catch per haul of 11.67 kg. Likewise in Moratuwa the rejection was due to the data during December which has produced a mean catch per haul of 10.3 kg.

The catch per unit effort (CPUE) was analysed using both catch per haul and catch per man hour. A comparison of these two sets of figures using pairwise parametric correlation (Zar, 1974) gave a relationship of $r = 0.913$ and $r = 0.949$ for the two areas Kalutara and Moratuwa respectively indicating the relationship is significant at 99.9% level. Therefore the catch per haul or catch per man hour were adopted for the calculation of CPUE as and when necessary. The mean catch per haul for Kalutara and Moratuwa are 336.1 kg and 177.4 kg respectively. The mean man power involved per haul for the two fishing seasons 1983/84 and 1984/85 are given in Table 4.

TABLE 4. Estimated mean man power per haul in man hours for Kalutara and Moratuwa during September 1983 to March 1985

	Kalutara	Moratuwa
September 1983/ March 1984 ..	144.5	167.5
September 1984/ March 1985 ..	107.1	133.7

The mean catch per man hour for the same seasons is given in Table 5.

TABLE 5. Mean catch per manhour in kg for Kalutara and Moratuwa during September 1983 to March 1985

	Kalutara	Moratuwa
September 1983/ March 1984 ..	1.53	0.32
September 1984/ March 1985 ..	1.02	1.13
Average ..	1.275	0.725

An average of 15 days fishing was carried out per month throughout the study area. Table 6 gives the estimated total annual production by beach seines in the study area during September 1983 to March 1986.

TABLE 6. Estimated annual beach seine production (t) for Kalutara and Moratuwa during September 1983 to March 1986

	Kalutara	Moratuwa
September 1983/ March 1984 ..	365.7	20.2
September 1984/ March 1985 ..	219.2	57.1
September 1985/ March 1986 ..	647.3	102.2

The study area has produced an average of 470.5 t annually by this fishery.

DISCUSSION

Beach seine fishery has been the highest single contributor to the total fish production of Sri Lanka before 1958, although the percentage contributed by this gear started to decrease in the presence of newer techniques of catching fish (Weerakoon, 1965). During 1953 and 1954 this fishery produced an average of 30 million pounds or 13000 t per year which was approximately 40% of the islands total fish catch

(Canagaratnam and Medcof, 1955). Recent records indicate that the contribution by beach seines during 1982 to 1984 has varied between 12000 and 13000 t which is about 5 to 10% of the total fish production of the island (Anon., 1983, 1984, 1985). The average annual shore seine fish production during 1952 to 1957 period in Kalutara and Moratuwa were 436.2 t and 260.2 t respectively. This is about 3 and 1.8% respectively of the total small pelagic fish production of the island which can be considered almost equal to the total beach seine production during that time. The estimated average production of these varieties by beach seines in these areas during 1983 to 1986 were 410.8 and 59.8 t respectively. This is about 3.1 and 0.45% of the beach seine production in the island. This indicates that the proportion contributed by beach seines in Kalutara to the total beach seine production in the island has remained same while that of Moratuwa has decreased by 75%.

Beach seine records during 1964-65 period (Canagaratnam, 1965) give the catch per man hour for Lunawa, Moratuwa as 2.36 kg. However, the present study shows that the average catch per man hour at Moratuwa during 1983 to 1985 as 0.725 kg. Presently there is no other established fishery at Moratuwa. Therefore it can be presumed that the fish production in this area has decreased by about 70% during the past 20 years. On the basis of catch per haul Kalutara can be considered as 1.89 times more productive than Moratuwa.

There was no significant difference between the monthly samples of the two seasons 1983/84 and 1985/86 for both Kalutara and Moratuwa. However, the monthly catch per haul figures from Kalutara and Moratuwa were significantly different during 1984/85 season. Although it has been statistically shown that differences occurred during the months of November and December respectively for the

two areas, it is not possible to come to a definite conclusion for the reasons behind this phenomenon.

According to Canagaratnam (1965), *Sardinella* spp. have been among the major varieties that came across the beach seine catches in Moratuwa. The present survey revealed that clupeids especially *Sardinella* spp. were poorly represented in the catches from Moratuwa and Family Leiognathidae has become the dominant group. As there is no other established fishery for clupeids in this region now, the absence of this group may be due to one or several reasons. Sometimes they may have become vulnerable to the beach seine during the recorded period (1965) due to a kind of a migratory pattern or they might have driven towards during shore due to a kind of current pattern that existed during that time or they may have got over-fished and stocks have not yet recovered. However, the gillnet catches from Kalutara during 1985 (Karunasasinghe and Dayaratne, 1986) indicate that there is a contribution of 40% by clupeids in the catches although the percentage contributed to beach seines is about 18%.

A common view among beach seine fishermen is that the reduction in catch rates is due to the gill netting in the adjacent areas. Although this cannot be totally rejected one cannot totally accept this either. A report by Weerakoon (1965) indicates that although the percentage contributed by beach seines decreased after 1958, there was an overall increase in the production by beach seines by 83% from 1952 to 1963. Therefore he has not agreed with the view that the extra catch brought in by small boats were porched from beach seines through the use of nylon gill nets. This view is further supported, as the total beach seine fish production in the island has remained more or less the same at around 13000 t (Anon., 1983, 1984, 1985). The contribution by beach seines at Kalutara to the total beach seine production in the island has remained same at 3% for both 1952-1957 period as well as

1983-1986 period (Anon., 1953, 1955, 1957, 1958, 1983, 1984, 1985) indicating that the fishery in this region is carried out on a sustainable basis. However, the reduction in contribution by beach seines in Moratuwa area needs further investigation.

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