FISHERY RESOURCES OF THE RAMESWARAM ISLAND

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CONTENTS

INTRODUCTION

THE Rameswaram Island, a comparatively small, 64 sq. mile area lying 3 miles off the coast of Mandapam in the Ramnad District is one of the important fishing centres of South India, fishermen forming the major portion of its population and fishing the main occupation. Surprisingly, however, factors like the fishing conditions in the Island, the fishery wealth of the area or even the order of magnitude of the annual catch hitherto

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remained largely unknown. Obviously, a detailed survey, lasting for a few years, was necessary to study the fishery resources of the Island. The work was taken up early in 1952 at the suggestion of Dr. N. K. Panikkar. Since no information of any kind was available to start with, a preliminary survey was found essential to help planning the design of the actual survey. The results of the preliminary survey are first put down in the next section. Then the design of the actual survey has been briefly described. The rest of the paper contains the results derived from the data collected during the 2 years' survey from July 1952 to June 1954.

Preliminary Survey of the Rameswaram Island

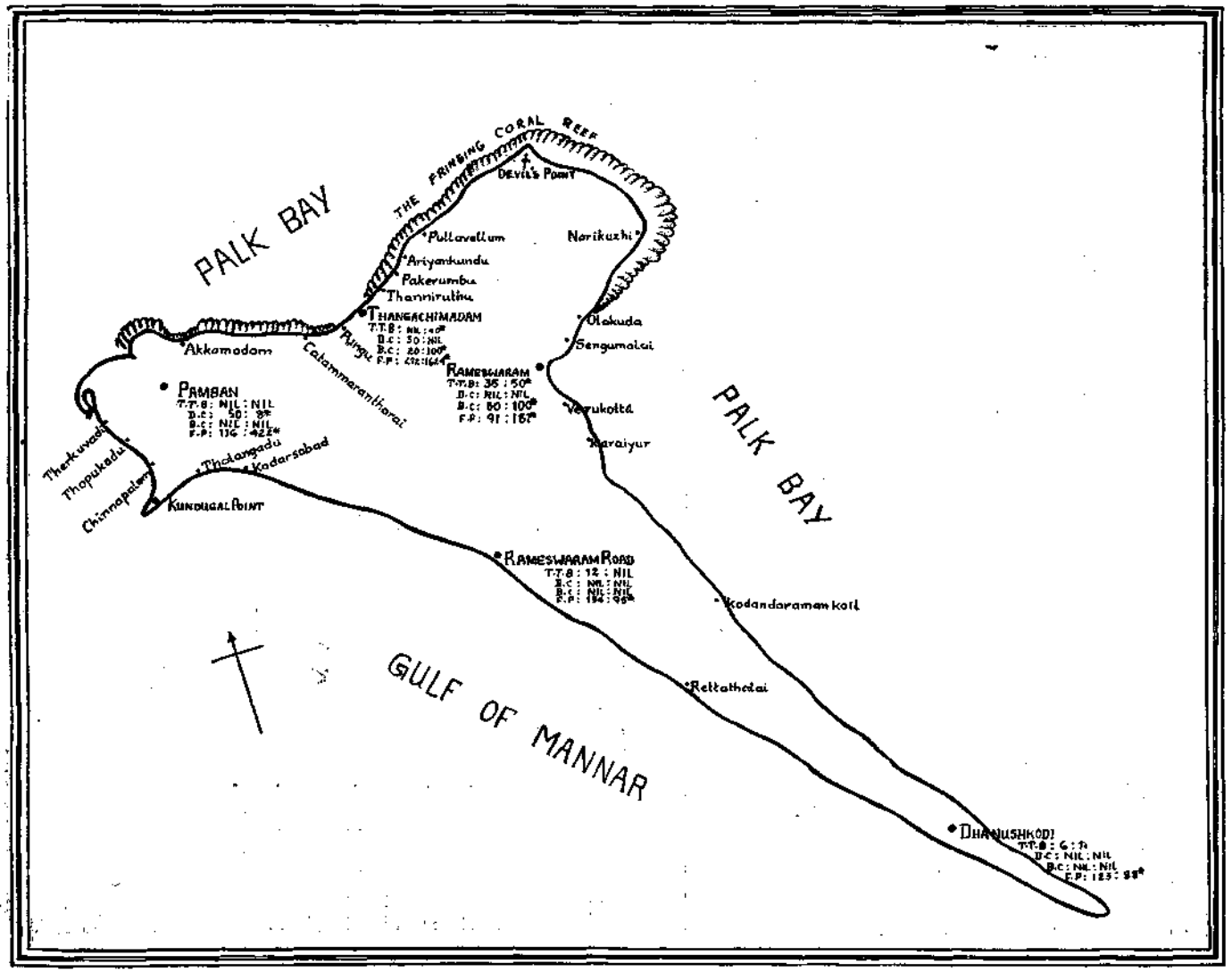
(*a*) *Topography and Climate*

Bounded by the Palk Bay on the north and the Gulf of Mannar on the south, the Rameswaram Island (lat. 9°17′ N., long. 79° 17′ E.) has a triangular shape and is 16 miles long and 4 miles across at its longest and broadest regions. Devoid of any estuaries or inlets, except at Chinnapalam where there is a small creek, the island has an even coast line. While the entire shore from Pamban to Rameswaram on the north coast and Rameswaram Road to Pamban on the south is rocky, the rest of the shore is sandy. Consequently shore-seine operations are restricted to the sandy regions where there is no danger from rocks and coral reefs. The continental shelf on the Palk Bay side is shallow and has a gradual inclination, whereas it slopes abruptly on the Gulf of Mannar side.

The Rameswaram Island, with a mean annual temperature of 84° F. and a mean annual rainfall of 37″, enjoys both the monsoons, the North-East and the South-West. The South-West monsoon, extends from April over a period of 6 or 7 months, whereas the North-East monsoon commences in November and ceases in February or early March. With the onset of the South-West monsoon the Gulf of Mannar becomes rough and choppy, while the Palk Bay is calm. During the North-East monsoon these conditions are reversed. Fishing operations during the year are switched over to that side where it is calm. Thus, while Palk Bay is fished for the larger part of the year fishing is of shorter duration in the Gulf of Mannar. The movements of fishermen populations within the Island are thus entirely governed by changes in the fishing conditions brought about by the monsoons.

(*b*) *Fishing Villages*

There are many small fishing villages in the Island. For convenience, they have been grouped together under the following six names, *viz.*, Pamban, Thangachimadam, Rameswaram, Dhanushkodi, Rameswaram Road and Kundugal Point. While Thangachimadam and Rameswaram are situated



The Map of the Rameswaram Island showing the distribution of the Fishing Centres, Crafts and the Fishermen Population. T.T.B.: Tuticorin Type of Boat; D.C.: Dug-out Canoe; CAT: Catamaran; F.P. Fishermen Population. Scale: 1" = 1½ miles.

on the North Coast, Rameswaram Road and Kundugal Point are situated on the South Coast of the Island. The positions of the others are indicated on the Map.

(*c*) *Craft and Tackle*

Chiefly three types of boats can be recognized in the Rameswaram Island. They are the Tuticorin type, the boat-catamaran and the dug-out canoe.

A typical Tuticorin type of boat can be easily distinguished from a dug-out canoe by its bigger size and difference in construction and design. While the former is never less than 40 ft. in length, 6 ft. in width and 4½ ft. deep, the latter never exceeds a length of 20 ft., a width of 3 ft. and a depth of 1½ ft. Altogether different from the two described types, the boat-catamaran is typically made of three pieces of timber, each measuring 22 ft. in length and 2–3 ft. in girth. The pieces are securely tied together at their broad ends in such a manner that the side logs are at a higher level than the upper surface of the central one and a longitudinal hollow is made (Hornell, 1910).

Altogether there are 542 boats of these three types in the Island distributed as follows (also *vide* Map):

Fishing Centres	Type of Boat						Total
	Tuticorin		Boat-catamaran		Dug-out canoe		
	Residents	Migrants	Residents	Migrants	Residents	Migrants	
Pamban ..	Nil	Nil	Nil	Nil	50	8	58
Kundugal Point ..	Nil	40*	Nil	Nil	Nil	Nil	40
Rameswaram Road	12	Nil	Nil	Nil	Nil	Nil	12
Dhanushkodi ..	6	11	Nil	Nil	Nil	Nil	17
Thangachimadam	Nil	(40*)	20	100	30	Nil	150
Rameswaram ..	35	50	80	100	Nil	Nil	265
Total ..	53	101	100	200	80	8	542

* These 40 boats keep moving their fishing centres according to the fishing seasons. From November to March they operate in the Gulf of Mannar and April to October in the Palk Bay.

A note of interest is that all the boats fishing at Kundugal point and the majority of the boats working at Thangachimadam are migrants from Mookur a fishing village South-West of the island on the Gulf of Mannar coast. As will be seen from the table given above, 309 boats out of 542 operating in the Island come from outside and they form nearly 57% of the total number of boats working in the Island. In the

Map the number of these migrant boats at each place has been shown with an asterisk.

The nets that are in active operation all the year round are mainly of three types—the gill-nets, shore-seines and the boat-seines. Occasionally, however, one or two other types of nets are also used, such as the *Kola-valai,* mainly operated for sardines, and the drift-nets, *Ola-valai*, used for *Hemirhamphus* during the seasons of their appearance.

Gill-nets.—These are also known as *Dunlop-valai*† or *Vala-valai.* Each piece measures 240 ft. long and 40 ft. broad and has a fairly big mesh, each eye measuring 3·5 in. from knot to knot when extended. While a thick cord runs all along one side of the net length-wise, the opposite end is free. Floats are attached to the cord and weights to the free end. Normally 15 such pieces are tied together end to end. Sometimes even 20–25 pieces are used. These nets are operated mainly from the Tuticorin type of boats and are in active operation throughout the year.

Boat-seines.—Locally known as *Madi-valai* each piece or seine consists of three portions, *viz.*, (1) The bag; (2) The ' wings ' and (3) The ' rope ' or extension of the wings. The ' bag ' is conical in shape and forms the hind-most part of the seine. A typical bag measures 30 ft. long and 6 ft. wide at the mouth. The narrowest region of the bag, namely, the tip or cod-end, measures only 2 ft. The bag has the smallest mesh, each eye measuring only 0·4 in. from knot to knot. During fishing, floats are attached to one side of the mouth in order to ensure that it remains open. Extending from the mouth are the wings which are made of hemp, each wing measuring 150 ft. in length and 100 ft. in depth. To these wings are attached hemp ropes, which are of the same length as the wings. Generally, this net is operated from a pair of catamarans. When the seine is shot, the craft are further apart each operating one wing of the 'bag'. The 'bag' is now horizontal. As the bag is pulled to the surface the two catamarans come closer and when the bag is surfaced they are together. Now the 'bag' is vertical with the mouth of the 'bag' at the surface and the cod-end further away. This ensures the safe collection of the fish at the cod-end. These boat-seines are operated from March to November.

Shore-seines.—These are similar to the boat-seines in both design and material differing only in the size; the bag, the wings and the rope being much longer. The size of the mesh of the bag is also 0·4″ from knot to knot. These are, however, operated from the Tuticorin type of boats and, unlike the boat-seines, they are hauled to the shore. Roughly 30 fishermen are required to drag the net to the shore during one operation. Locally the net is known as *Kara-valai.* They are in operation throughout the year.

† The material that goes into its making is a fine cotton yarn which is called "Dunlop" yarn. Hence the name.

Kola-valai and Ola-valai.—Locally known as *Kola-valai* and *Ola-valai*, these are just two variations of gill-nets. Each has a mesh of 1·5 in. While a scare-line made of palmyra leaves (known as *Ola-yelai*) is used in the operation of *Ola-valai*, no such scare-lines are used when *kola-valai* are operated. The former are operated from the dug-out canoes and the latter from the Tuticorin type of boats. Unlike the previous types of nets, these are purely seasonal in operation and are mainly used to catch *Hemirhamphus* and sardines respectively.

While the ordinary gill-nets and *Kola-valai* are used throughout the Island, the boat-seines are operated only at Thangachimadam; the shore-seines at Dhanushkodi and Rameswaram Road, and the *Ola-valai* at Pamban.

(*d*) *Fishing Population*

The bulk of the fishing population is composed of the migrants. The total fisherman population is nearly 3146, out of which 1624 belong to Mookur and the rest of the migrants are from Yeruvadi, Thondi, Vedalai, Manakad, Thonithorai and Theedai. The active adult fisherman population at the different fishing centres is as follows:

Fishing villages	Active Adult Fisherman Population		
	Residents	Migrants	Total
Pamban	116	422	538
Thangachimadam ..	272	1,624	1,896
Rameswaram	91	181	272
Dhanushkodi	123	88	211
Rameswaram Road ..	134	95	229
Total	736	2,410	3,146

Design of the Final Survey

The actual survey to determine the fishery resources of the Island was started in July 1952. The chief aim of this survey was to get an estimate of the total fish landings in the Island, month by month, and to have an idea of the composition of the fish-landings. The design of this survey, essentially a multi-stage one, was framed on the basis of information gathered during the preliminary survey. In the first stage, three fishing centres were chosen. Since the fishing in the Palk Bay side is from April to October, the three centres of observation during this period were Pamban, Thangachimadam and Dhanushkodi. During the period from November to March, when the fishing operations are restricted to the Gulf

of Mannar, the three centres of observation were Kundugal Point, Rameswaram Road and Dhanushkodi. In the second stage, each of these 3 places was visited on two fixed days every week. On each day of the visit to a centre, 20% of the operating fishing units of each type were examined. The total weight of fish landed by each fishing unit as well as the weights of various species constituting the catch were recorded. The sampling unit was thus a fishing unit or a boat-net combination. In order to avoid personal bias the landings of every fifth fishing unit of each type were examined.

In addition, the total number of fishing units of different types operating at a centre on the day of observation was noted. A record was also kept of the number of days that a particular fishing unit worked at a centre of observation during a month.

Method of Estimate

The average catch per fishing unit (or boat-net combination) was worked out from the sample observations. The total number of fishing units in the island being known, the average number of each boat-net combination working per day during a month was arrived at from the observations made at the three centres of observation. The product of these two multiplied by the number of fishing days in a month gave the catch for each combination. From the catch records of each combination, the percentages of different fishes were obtained. Therefore from the estimated total catch of each combination absolute quantity of catch of each species was obtained. The sum total for all combinations furnished the quantity of each fish landed in the island.

Analysis of the Data

The results presented in this paper are based on the analysis of data collected over a period of two years, from July 1952 to June 1954. The total estimated amount of fish caught was 1546·57 tons in 1952–53 and 1624·475 tons in 1953–54 (Table I). The contribution of the different fishing units towards the total catch may be seen from the following table:

Fishing unit	Catch in Tons during		Total for two years
	1952–53	1953–54	
Tuticorin Type of Boat/Gill-nets	510·33	555·42	1065·75
Tuticorin Type of Boat/Shore-seines	175·33	110·78	286·11
2 Catamarans/Boat-seines ..	826·47	932·52	1758·99
Dug-Out Canoe/Drift-nets ..	14·55	25·75	40·30
Dug-Out Canoe/Shore-seines ..	19·89	Nil	19·89
Total ..	1546·57	1624·47	3171·04

TABLE I

Sl. No.	Scientific name of species	Total estimated amount (tons) of fish during the year				Total for two years
		1952—53	%	1953—54	%	
1	*Leiognathus splendens*	629·36	40·694	739·96	45·55	1369·32
2	*Scomberomorus guttatus*	290·11	18·758	256·30	15·78	546·41
3	*Chirocentrus dorab* ..	144·28	9·329	100·61	6·19	244·89
4	*Scoliodon* sp. ..	79·98	5·171	156·02	9·60	236·00
5	*Sardinella gibbosa* ..	119·54	7·729	96·13	5·92	215·67
6	*Lactarius lactarius* ..	102·77	6·645	67·41	4·15	170·18
7	*Dussumieria hasselti* ..	43·59	2·818	52·44	3·23	96·03
8	*Caranx* sp. ..	41·99	2·715	27·04	1·66	69·03
9	*Hemirhamphus georgii*	18·94	1·225	29·89	1·84	48·83
10	*Gerres filamentosus* ..	12·84	0·830	31·72	1·96	44·56
11	*Arius* sp. ..	15·82	1·023	5·84	0·36	21·66
12	*Sillago sihama* ..	2·43	0·157	16·99	1·05	19·42
13	*Therapon quadrilineatus*	9·29	0·601	7·17	0·44	16·46
14	*Pellona* sp. ..	0·73	0·047	10·64	0·65	11·37
15	*Rastrelliger canagurta*	7·34	0·475	1·95	0·12	9·29
16	Perches ..	..	..	7·69	0·47	7·69
17	*Chorinemus* sp. ..	1·02	0·066	5·03	0·31	6·05
18	*Sciaena indica* ..	1·60	0·104	4·27	0·26	5·87
19	*Anchoviella indica* ..	2·16	0·140	2·39	0·15	4·55
20	*Engraulis* sp. ..	4·07	0·263	..	..	4·07
21	*Upeneus indicus* ..	1·86	0·120	1·04	0·06	2·90
22	*Stromateus niger* ..	1·36	0·088	0·48	0·03	1·84
23	*Kowala koval* ..	1·75	0·113	..	..	1·75
24	*Trichiurus savala* ..	0·93	0·061	0·12	0·01	1·05
25	*Belone belone* ..	0·98	0·064	..	..	0·98
26	*Cypsilurus oligolepis* ..	..	..	0·79	0·05	0·79
27	*Mugil* sp. ..	0·45	0·029	0·33	0·02	0·78
28	*Euthynnus* sp. ..	..	..	0·75	0·05	0·75
29	*Pristipoma maculata* ..	..	..	0·68	0·04	0·68
30	*Sphyraena* sp. ..	..	..	0·55	0·03	0·55
31	*Otolithus ruber* ..	..	..	0·24	0·02	0·24
32	*Chanos chanos* ..	0·13	0·008	..	..	0·13
33	*Lutjanus lutjanus* ..	0·02	0·001	..	..	0·02
34	Miscellaneous ..	11·23	0·726	..	..	11·23
		1546·57	100·000	1624·47	100·00	3171·04

It is seen from the table that both the gill-nets and the boat-seines showed an increase of 45·09 and 106·05 tons of fish respectively during the 2nd year, emphasising the fact that the fishing conditions for these nets were generally good during the 2nd year of the study.

The total estimated amounts of fish caught on the Gulf of Mannar side during the 1st and 2nd years were 226·16 and 279·62 tons respectively; the corresponding figures for the Palk Bay side were 1320·41 and 1344·855 tons respectively.

(*a*) *Total Catches*

The monthly totals of fish landed by all the nets during the three years* of observation are shown graphically (Fig. 1). It will be seen from the

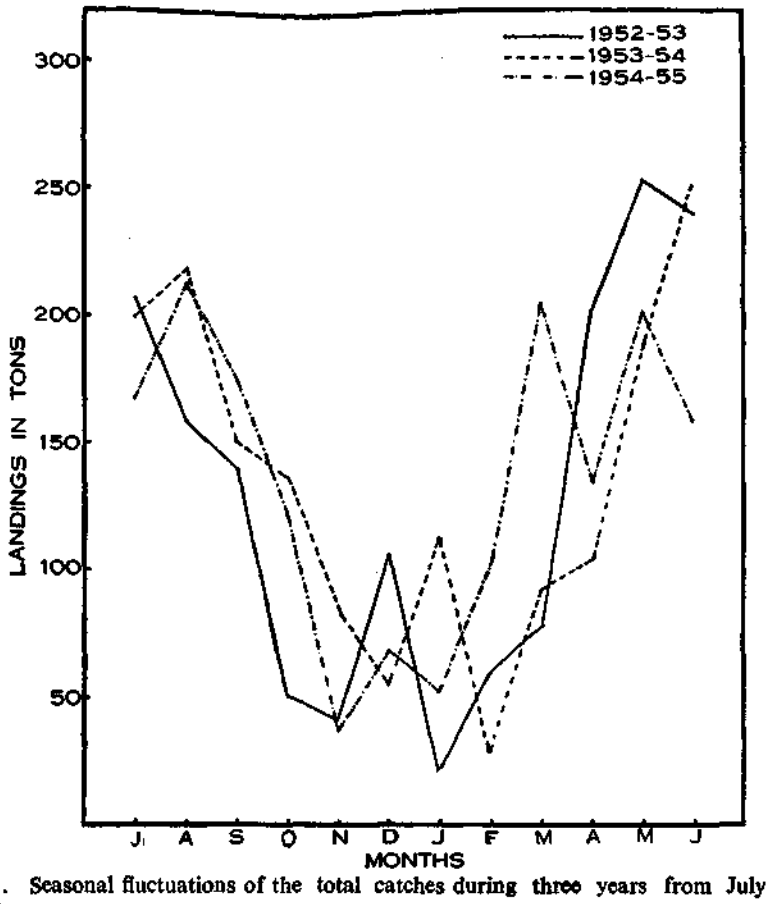


FIG. 1. Seasonal fluctuations of the total catches during three years from July 1952 to June 1955.

* At the time of publication of this paper data for the year 1954–55 were also available, and were included in Fig. 1.

figure that the catches are low from November to February, whereas they are high from April to September. The poor catches in the winter months (November to February) are due to the cessation of boat-seine fishery which contributes largely to the catches of the entire Island. The boat-seines operate on the Palk Bay side from April to September or October. The landings are highest during May and June when maximum number of boat-seines are in operation.

Since the railways are the only means of transport in the Island, by which fish are disposed off and since only a very small quantity of fresh fish is consumed in the Island, the records maintained by the railways, of the export figures of dry and fresh fish, are a valuable source with which the accuracy of the monthly estimates of fish-landings, as obtained in the present survey, can be compared. The following table gives the monthly estimate of landings during 1953–54 and also the figures of export through the railways. For facilitating comparison, the weight of dry fish exported was converted to fresh weight. Considering the pit-curing method in vogue in the island, the conversion factor has been taken as 1 lb. of dry fish = 1¼ lb. of fresh fish. The converted fresh weight of the export figures are given in the last column. The closeness of the estimated figures with the railway figures shows the consistency of the method of estimate. It also justifies the adoption of the conversion ratio.

Month	Estimated Landings (Tons)	Figures (Tons) of Export by Railway		
		Fresh	Dry	Converted Fresh wt.
July 1953 ..	205	43	192	283
August ,, ..	218	35	123	189
September ,, ..	150	36	85	142
October ,, ..	136	30	87	139
November ,, ..	89	26	50	88
December ,, ..	55	36	17	53
January 1954 ..	112	61	38	109
February ,, ..	28	16	9	27
March ,, ..	93	46	37	92
April ,, ..	105	48	45	104
May ,, ..	186	114	57	186
June ,, ..	253	188	51	242

(*b*) *Fisheries*

Altogether nearly 33 species constituted the catch during the two years of observation (Table I). However, only a few of these were important contributors to the fishery of the Rameswaram Island. Only those species which are of importance are considered here. For the sake of convenience all those that contributed 2 or 3% and more to the fishery were considered important, and the rest were grouped as " other-fishes ". Only *Rastrelliger canagurta*, even though its contribution was less, has been included along with the former category since it is marketed at a higher price. Only 12 species were of fishery importance (Diag. 1). They were *Leiognathus splendens*,

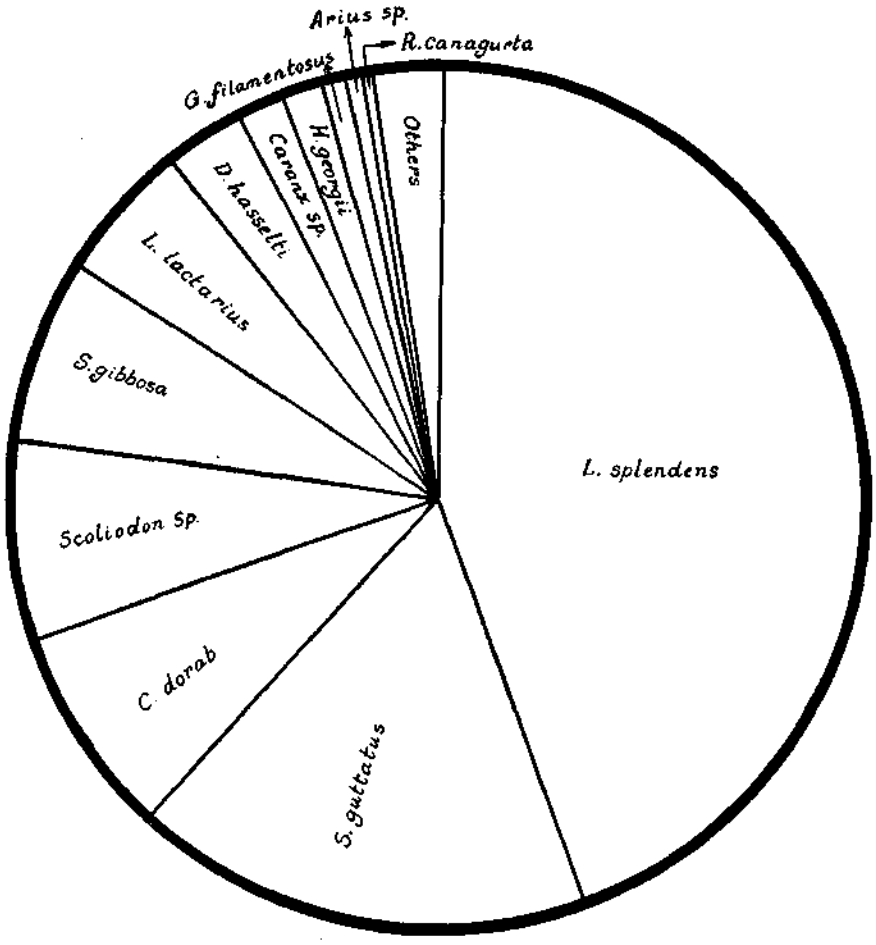


DIAGRAM 1. Representing the relative contribution, based on the average of two years, of the 12 different species of fish to the fishery wealth of the Rameswaram Island.

Scomberomorus guttatus, *Chirocentrus dorab*, *Sardinella gibbosa*, *Lactarius lactarius*, *Scoliodon* sp., *Dussumieria hasselti*, *Caranx* sp., *Hemirhamphus georgii*, *Arius* sp., *Gerres filamentosus* and *Rastrelliger canagurta*. During both the years, *L. splendens* topped the list, being 40·694% and 45·55% of the total catches in the 1st and 2nd years respectively. Next in importance was *S. guttatus* in both the years. *C. dorab*, *S. gibbosa*, *L. lactarius*, *Scoliodon* sp., *D. hasselti*, *Caranx* sp., *H. georgii*, *Arius* sp., *G. filamentosus*, and *R. canagurta* followed in the order of importance mentioned during 1952–53. But during 1953–54 a good amount of *Scoliodon* sp. were caught. Except for this unusual catch there was no variation in the catches.

Leiognathidæ.—This family was represented by *G. filamentosus*, *L. bindus*, *L. tristriatrix*, *L. equulus* and *L. splendens*, the last named species being the most dominant.

Leiognathus splendens.—The total landings of this species were, in 1952–53, 629·36 tons and in 1953–54, 739·962 tons. These respectively formed 40% and 45% of the total catches in 1952–53 and 1953–54. This species is therefore the largest contributor to the fishery of the Rameswaram Island. This was caught throughout the year but the maximum amount was landed during April to October (Fig. 2), when the boat-seines were in operation. With the onset of the North-East monsoon, fishing by boat-seine ceases and accordingly very little of *L. splendens* is caught during November to February.

G. filamentosus, another genus of the family, formed 0·83% and 1·96% of the total catches in 1952–53 and 1953–54 respectively. The size ranged between 8 and 15 cm. They reached the peak season in the months of June and July during both the years.

Cybiidæ.—This family was representeo by two species namely, *Scomberomorus guttatus* and *Scomberomorus commersoni*; the latter species being caught very rarely. These fish are mainly landed by gill-nets and occasionally by shore-seines. It is second in importance in the fishery of the Island, the total landings being 290·11 tons in 1952–53 and 256·30 tons in 1953–54. Expressed in percentages, the landings were 18% of the total catch in 1952–53 and 15% in 1953–54. They reached the peak season in March during both the years. A miror peak was also noticed in the month of October during 1952–53 and in December in 1953–54 (Fig. 3).

Chirocentridæ.—The sole representative of this family was *Chirocentrus dorab*. It was landed both by gill-nets and shore-seines. During 1952–53, 144·28 tons, constituting 9·33% of the total catch, were landed. The corresponding figure for 1953–54 was, 100·608 tons, or 6·19%. Although this species was landed throughout the year, it reached the peak season in December during 1952-53 and in November during 1953–54 with, in both the years, a minor rise in March (Fig. 4). The size of the fish landed ranged between 20 and 70 cm.

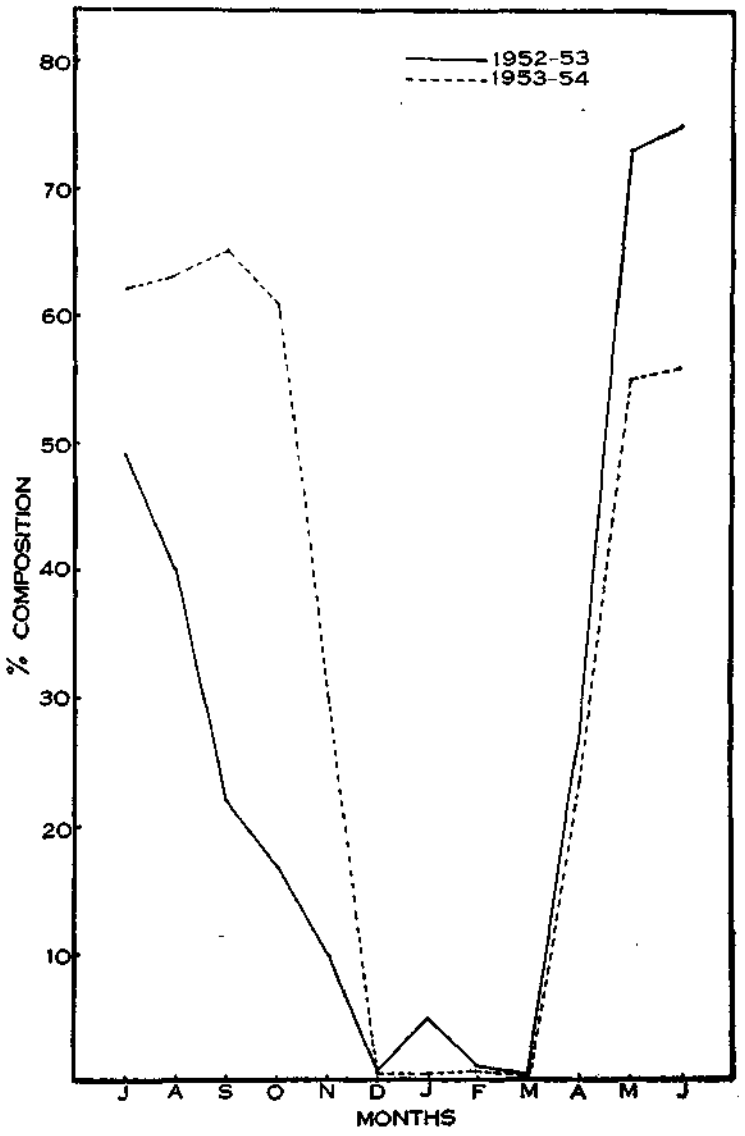


FIG. 2. Seasonal fluctuations of *Leiognathus splendens*.

Elasmobranchs.—This was the largest group of fish and was well represented in the fishery wealth of the Rameswaram Island. The common forms landed were *Scoliodon* sp.; Rays, Skates, Tiger-sharks, Saw-fish and the Hammer-headed Sharks were also landed from time to time. Hence it was impossible to collect data with regard to a particular species and data collected, as and when the group was landed, were clubbed together and treated under a single head namely, the Sharks.

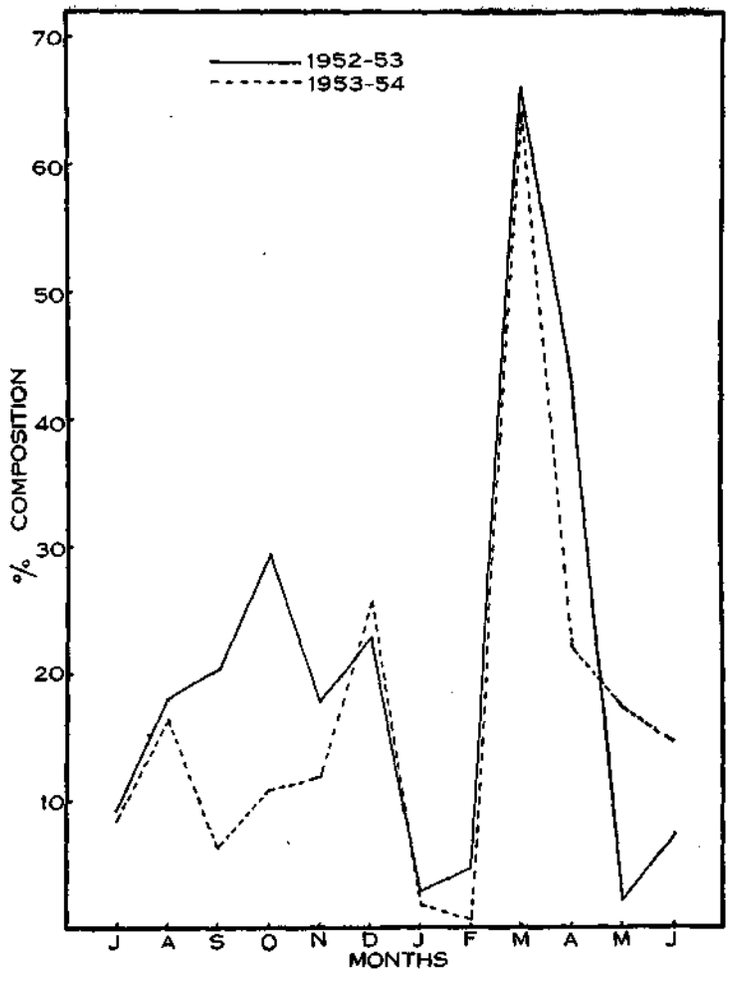


FIG. 3. Seasonal fluctuations of *Scomberomorus guttatus*.

They were mainly caught by gill-nets, but also occasionally by shore-seines. During 1952–53, about 79·98 tons, forming 5·17% of the total catch, were landed. But during 1953–54 the Shark fishery showed considerable increase and about 156·02 tons, which constituted 9·60% of the total catch, were landed. They were caught throughout the year but reached the peak season in the month of January during both the years (Fig. 5).

Clupeoids.—This family, like Sharks, was represented by many species, but only two species namely *Sardinella gibbosa* and *Dussumieria hasselti* were of importance from the fishery point of view. The major contribution for the fisheries was made by shore-seines. Occasionally they were landed by *Kola-valai*. *Sardinella gibbosa*

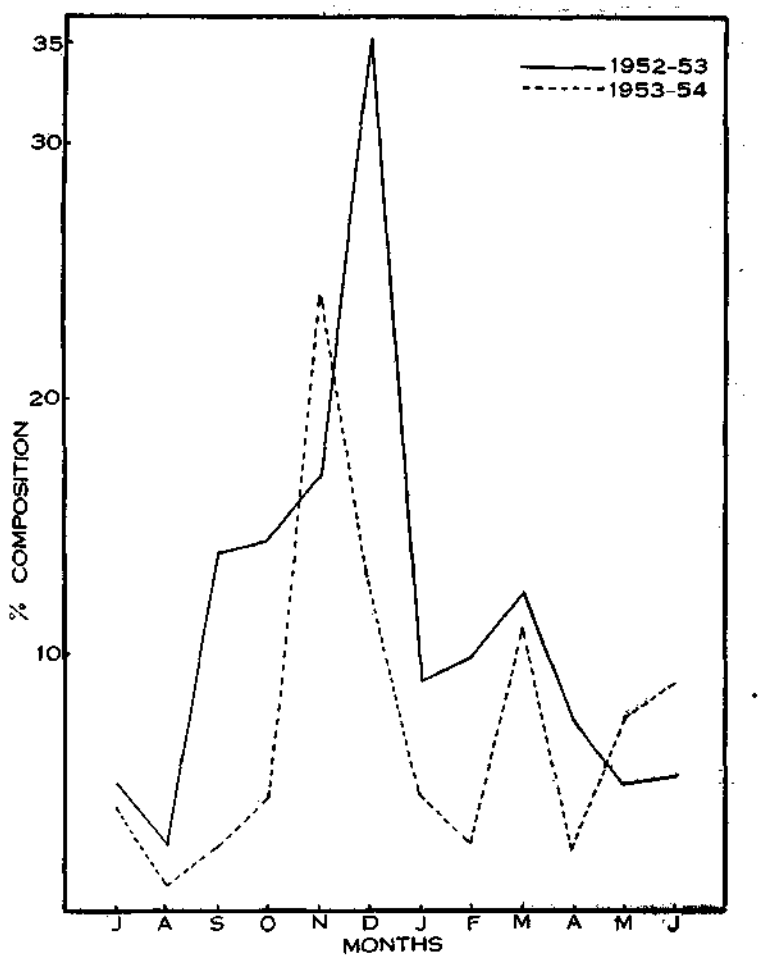


FIG. 4. Seasonal fluctuations of *Chirocentrus dorab.*

dominated the catches during the month of February in both the years. Hence February can be considered the peak season for this species, although it was caught throughout the year (Fig 6). *D. hasselti*, was also caught throughout the year 1952–53 but never appeared in the months of November to March in 1953–54. It seems justifiable to conclude that the months of September, November and April were the peak seasons for this species (Fig. 7). *S. gibbosa* ranged between 5 to 12 cm. and *D. hasselti* ranged between 8 to 16 cm. 119·54 and 96·127 tons of *S. gibbosa* were landed respectively during 1952–53 and 1953–54. Landings for *D. hasselti* were 43·59 tons in 1952–53 and 52·437 tons in 1953–54.

Lactariidæ.— This family was represented by a single species namely, *Lactarius actarius.* Although it was caught by shore-seines in small quantities, the main

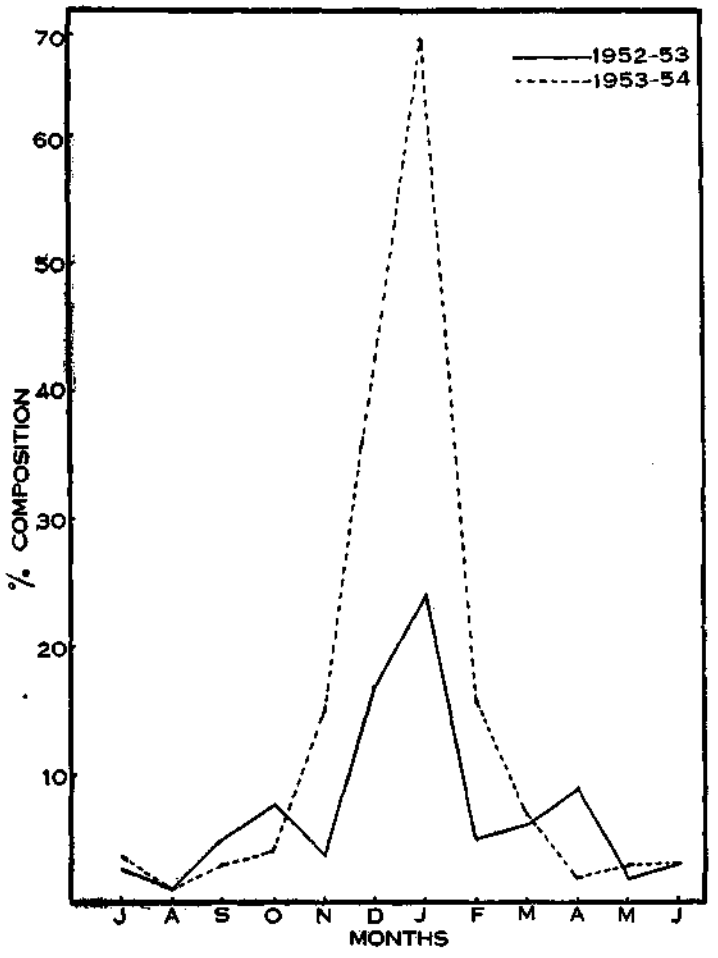


FIG. 5. Seasonal fluctuations of *Scoliodon* sp. & other Sharks.

contribution to the fishery was made by boat-seines. During 1952–53, 67·413 tons, representing 4·15% of the total catch, were landed; but during 1953–54, the fishery showed an improvement and 102·77 tons, constituting 6·64% were landed. The size of the fish ranged between 5 and 26 cm. in both the years. The fish was not represented in the catches during the months of December to April in 1952–53 and from November to April in 1953–54. It reached the peak during August in 1952 (Fig. 8), but the months, May to August, formed the season when they were landed in large numbers during both the years.

Carangids.—Like the clupeoids and the sharks, this family had a fairly large representation. *Caranx kalla, Caranx hippos* along with *Caranx leptolepis* were recorded throughout the year. But *C. leptolepis* was the most common.

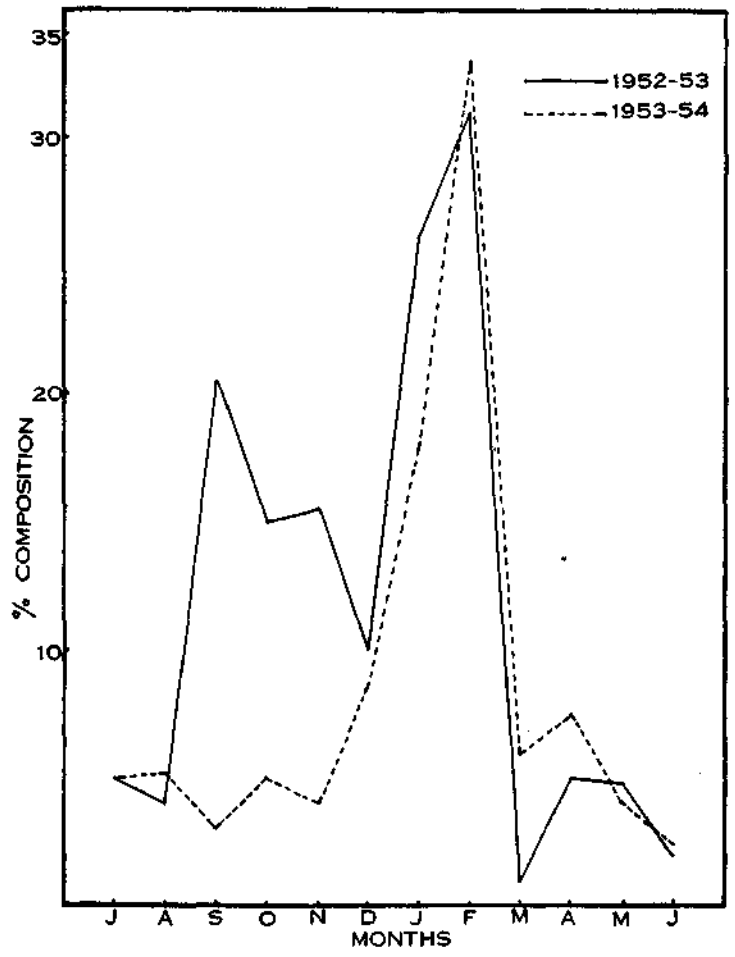


FIG. 6. Seasonal fluctuations of *Sardinella gibbosa*.

They were caught throughout the year mainly by shore-seines. Ranging from 3 to 14 cm. in size, about 41·99 and 27·037 tons were landed in 1952–53 and 1953–54 respectively. In 1952–53 they formed 2·72% of the total catch and 1·66% in 1953–54, and thus held the 8th and the 10th ranks in the fishery of the Island. Although they were caught throughout the year, they reached the peak season in the month of February during both the years (Fig. 9).

Other Fishes and Fisheries.—The above-discussed species are important from the point of view of their contribution to the fishery of the Rameswaram Island, but *G. filamentosus*, *Therapon quadrilineatus*, *Engraulis* sp., *Sillago sihama*, *Anchoviella indica*, *Upeneus indicus*, *Kowala koval*, *Sciaena indica*, *Stromateus niger*, *Chorinemus* sp., *Belone belone*, *Trichiurus savala*, *Pellona* sp., *Mugil* sp., *Chanos chanos*, *Lutjanus*

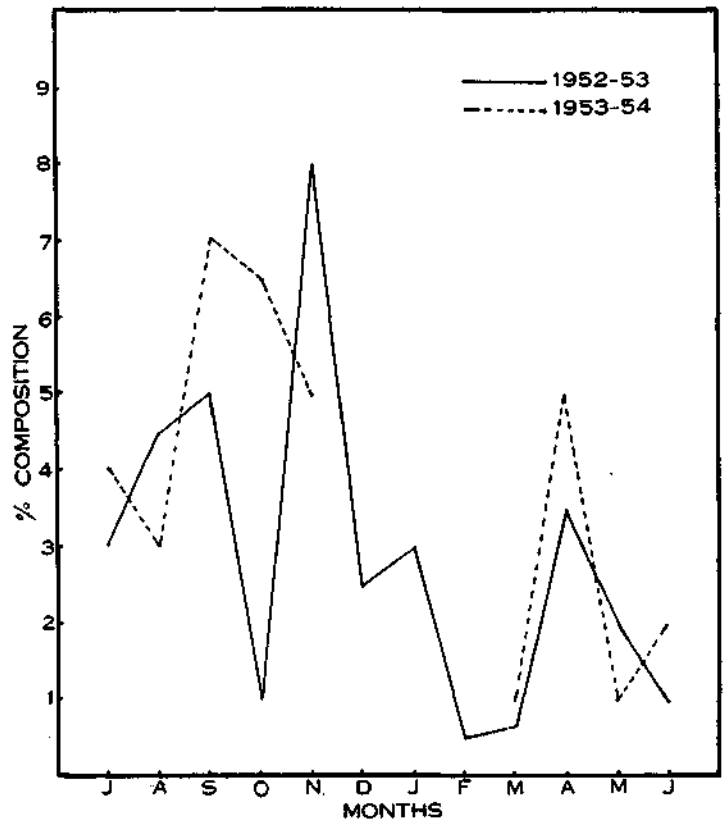


FIG. 7. Seasonal fluctuations of *Dussumieria hasselti.*

lutjanus, Otolithus ruber, Arius sp., *Cypsilurus oligolepis, Pristipoma maculata* and *Euthynnus* sp. were also recorded from time to time. All of them made sporadic appearances, and together contributed 2% of the total catch. Since a sustained yield of a species in a fishery is more important from the point of view of their contribution to the fishery, the sporadic appearances of the latter species have only increased the variety and not the quality of the fishery of the Island.

The Trepang Fishery.—This fishery was once very flourishing but declined in the recent years. The reasons for the decline, as Hornell (1917) points out, may be due more to the carelessness shown by the merchants in processing the animals for the market than to lack of material. Although two species of sea-cucumbers are found in the Island, only *Holothuria scabra* or " Vellai attai " (Tamil) is found in abundance and contributes most to the industry. The less common species is the " Black-fish" *Holothuria atra.* During the North-East monsoon they are fished along the mud flats of Pamban where they are found at a depth of 3 to 4 ft. But during the South-West monsoon, fishing for this species is done off the coast of Rameswaram where they are found at a depth of 1 to 2 fathoms. At Pamban this

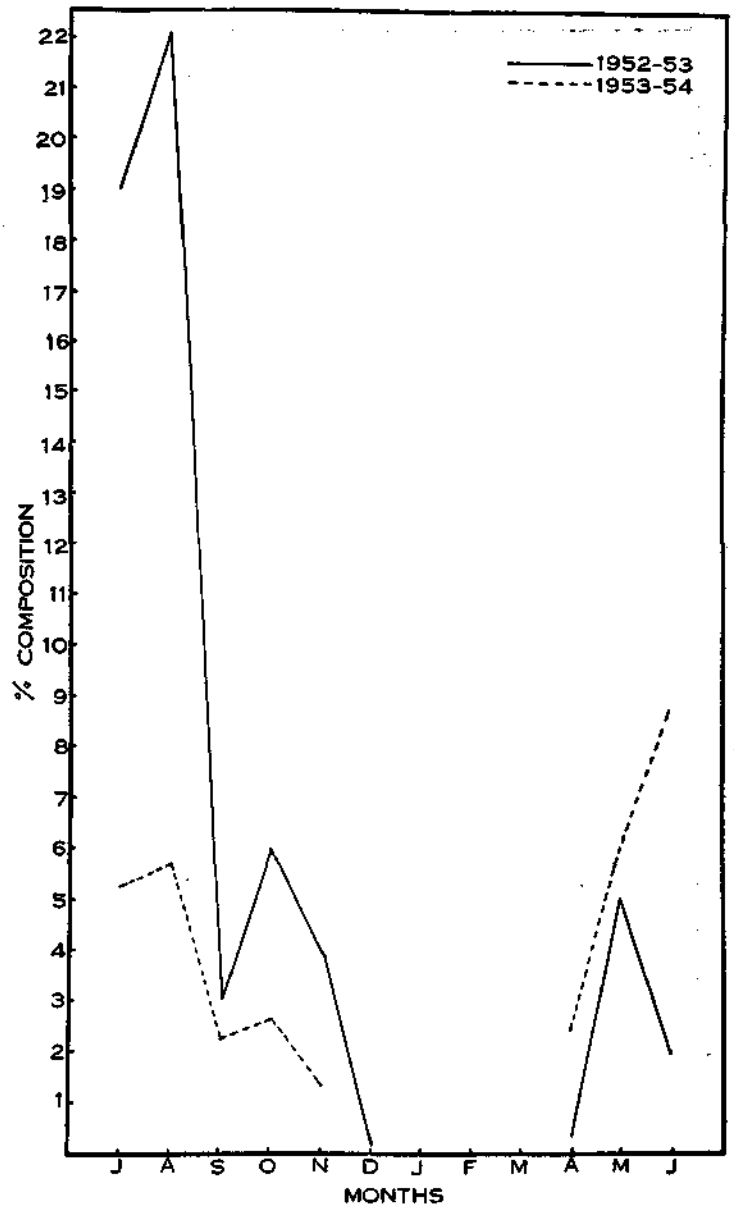


FIG. 8. Seasonal fluctuations of *Lactarius lactarius*.

fishery extends barely over a period of 1 to 1½ months (March to April). But at Rameswaram they are fished for nearly three months (May to August). During the season nearly 150 to 200 fishermen are engaged by 5 merchants of Kilakarai. On an average 1,00,000 sea-cucumbers per month are caught. They are

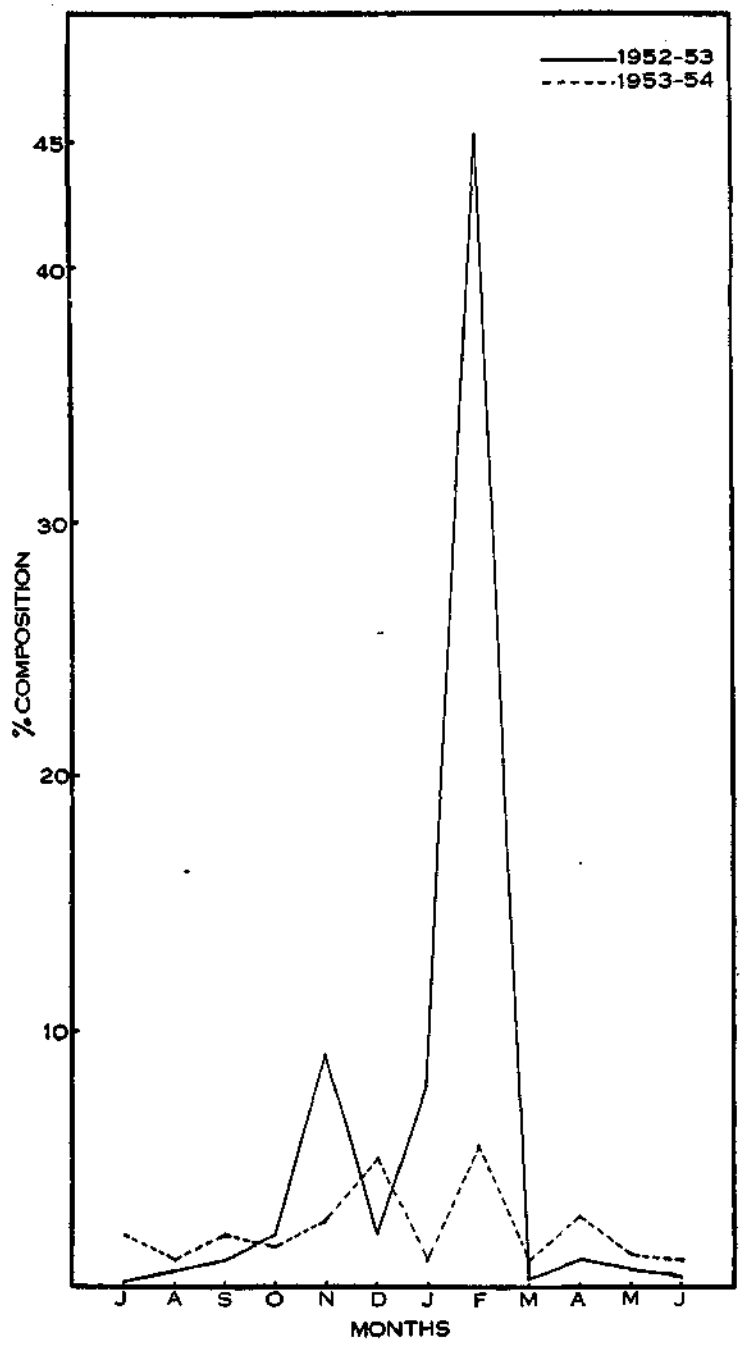


FIG. 9. Seasonal fluctuations of *Caranx* sp.

priced at Rs. 3 per 100. Nearly Rs. 12,000 worth of trepang are thus caught in every season. They are exported mostly to Penang and Hong Kong.

The Squid Fishery.—Among the edible molluscs of the Rameswaram Island the squid (*Loligo*) is the most common. They appear in shoals in the shallow waters off the coast of Rameswaram during April and reach the peak season during the month of June, when they come to the shore to deposit egg capsules among the sea-weeds. Two methods are employed in catching them (Hornell, 1917). They are mostly caught by shore-seines and during the peak season they may range up to 5000 per haul. The bulk of the squid caught are sold to merchants of Pamban, Kilakarai, Vedalai, etc., and the rates range from Rs. 3 to Rs. 6 per 100. About 20 to 30 fishermen are engaged in this fishing, during the season.

The Chank Fishery.—The environs of the Rameswaram Island have proved an excellent reserve for the establishment of the Chank Fishery. Fishing for chanks is done during March to June in the Palk Bay off the coasts of Thangachimadam and Rameswaram. From October to February, fishing for Chank is done in the Gulf of Mannar, off Kundugal Point. Fishermen from Periapatnam, Kilakarai, Vedalai, Pamban, Rameswaram and Thangachimadam are engaged for this fishing, by a single merchant of Kilakarai, and about 500 fishermen take part in the operation during the season. Nearly 30,000 Chanks per month are fished. The price of each Chank is annas six. Thus roughly about Rs. 12,000 worth of Chanks are fished every month. Besides this, at Rameswaram there are many shops where varieties of fancy shells are obtained. There is a good opening here for a cottage industry.

The Chanos Fishery.—The Chinnapalam Creek at Pamban in the Rameswaram Island has proved a very good centre for the collection of *Chanos* fry and fingerlings. This is under the exclusive control of the State Fisheries who employ fishermen during the season for the collection of the fry. Before they are exported to various places like Vellore, Trichinopoly, Vriddhachalam, Salem, etc., they are acclimatised in the nurseries maintained by the Department of Fisheries. The season commences early in March and extends up to June. About fifteen fishermen are engaged for the season. On an average 12,00,000 fry and fingerlings are collected every year. They occur in abundance for four or five days after every fullmoon and newmoon, when the collection for fry is very brisk. Fry are collected with the help of very fine mosquito nets. But the fingerlings are scared into velon screens. While the cost of fry and fingerlings ($\frac{1}{2}$" to 3") is annas 8 per dozen, the stock size (above 3") costs annas 4 per dozen. Besides the Chinnapalam Creek, Kakayan Gundu, Anai Gundu, Kadarsabad Creek and the creeks at Krusadai and Shingle Islands have also proved good centres for the collection of fry and fingerlings.

Besides this, the Fisheries Department also collects 1,750 lb. of shark liver from the local fishermen and extracts 1,090 lb. of crude oil on an average per

annum. This crude oil is later sent to Calicut where it is refined and subsequently sold. A bottle (16 oz.) of refined shark liver oil is sold at Rs. 3–8–0.

The Turtle Fishery.—There are four merchants at Pamban and two at Rameswaram whose chief occupation is the collection and the export of the turtles that are landed in the Island. Annually 2,000 turtles are being exported by the four merchants from Pamban and 400 turtles by the two merchants from Rameswaram. All the turtles are being exported to Ceylon, by country crafts, 11 in number, at an interval of 15 days. The annual revenue of the four merchants at Pamban is roughly Rs. 40,000 and for the merchants at Rameswaram about Rs. 8,000. The merchants at Pamban get a yearly revenue of Rs. 10,000 each. Each turtle of the usual size (20" to 27" across the carapace) is priced at Rs. 20. Although a few of them are caught off Rameswaram, maximum numbers are caught off Musal Theevu. About 30 fishermen are engaged in this fishing at Pamban and 20 fishermen at Rameswaram. Whereas turtle fishing extends over a period of 7 months, from September to March, at Musal Theevu, it is for only 3 months, from May to July, at Rameswaram.

Sea-weed Resources.—The Rameswaram Island is also rich in sea-weeds of economic importance. The fringing coral reef extending from Pamban eastwards to Devil's Point and then southward to Olakuda and Rameswaram has, in abundance, *Gelidium micropterum* and various species of *Gracilaria*, which are among the chief Indian agar-yielding sea-weeds (Thivy, 1951). The lagoons between the reef and the shore exhibit a rich growth of *Gracilaria lichenoides* (commonly known as 'kanji-pasi'). The reefs also yield in abundance *Sargassum* and *Turbinaria* which are good sources of algin. Further, sea-weed and sea-grasses are available in large quantities for use as sea-weed manure in many places along the shores of the Island.

Income from the Fishery

The fish fetching the highest value in the island is *Scomberomorus guttatus* which is usually sold at annas 6 per lb. Other species are marketed at various rates from annas 2 to 4 per lb. By taking into consideration the rates at which these species are sold, it is possible to arrive at the total value of the fishery. During 1952–53 the total income was Rs. 7,75,878. The income during 1953–54 increased to Rs. 7,77,724 (Table II). *L. splendens* yielded the largest amount during both the years, it being Rs. 2,81,951·22 and Rs. 3,31,503·06 in 1952–53 and 1953–54 respectively. Diagram 1 indicates the yield of each species during the respective years. A comparison of Diagram 1 and Table II is of interest in that although the amount of *S. guttatus* landed was less than *L. splendens*, the return in terms of money was almost equal to that of *L. splendens*. Similarly *L. lactarius* gave better monetary returns than either *S. gibbosa* or *Scoliodon* sp.,

although the amount, by weight, of fish landed was less in the former case. Likewise, *Caranx* sp., yielded more than *D. hasselti*, *Arius* sp., yielded more than *H. georgii*, and *R. canagurta* yielded more than *G. filamentosus*.

TABLE II

Scientific name of species	Total yield in rupees				Prices
	1952—53	Rank	1953—54	Rank	
Leiognathus splendens ..	2,81,951·22	1	3,31,503·06	1	Rs. 16 per maund
Scomberomorus guttatus ..	2,43,691·83	2	2,15,291·07	2	As. 6 per lb.
Chirocentrus dorab ..	70,699·60	3	49,297·70	4	As. 3½ per lb.
Lactarius lactarius ..	57,552·13	4	37,551·11	5	Rs. 5 per 20 lb.
Scoliodon sp. ..	27,992·83	5	54,606·94	3	As. 2½ per lb.
Sardinella gibbosa ..	26,777·89	6	21,532·38	6	Rs. 8 per maund
Caranx sp. ..	23,514·53	7	15,140·91	8	Rs. 20 per maund
Dussumieria hasselti ..	14,645·39	8	17,619·31	7	Rs. 12 per maund
Arius sp. ..	6,638·19	9	2,451·11	10	As. 3 per lb.
Hemirhamphus georgii ..	6,364·89	10	10,044·00	9	Rs. 1½ per 10 lb.
Rastrelliger canagurta ..	1,644·73	11	436·57	12	Rs. 3 per 30 lb.
Gerres filamentosus ..	958·76	12	2,368·80	11	Re. 1 per 30 lb.
Others ..	13,445·91		19,830·57		Rs. 12 per maund
Total ..	7,75,877·89		7,77,723·53		

1 Maund = 80 lb.

MARKETING AND DISPOSAL

Only a small fraction of the fish in the island is consumed locally in the fresh state. There is a very good market for the fish outside the Island, and the demand for the fish always exceeds the supply. Since there are not enough facilities* for preserving them in a fresh condition, much of the fish is either pit-cured or sun-dried. In the former case a slit is made on the dorsal side, from the region of the operculum up to the base of the dorsal

* Since writing this account an ice plant has been started at Rameswaram Road. There is no provision in the plant for the storage of fish in fresh condition. But it supplies ice to merchants who are engaged in sending iced fish to out-stations.

fin and the slit is packed with salt. These salted fish are wrapped up in a mat, made of ' palmyrah ' leaves, and buried in the sand. They are left in this state for two days and after the expiry of this time they are usually found processed. The second method is much simpler. The fish are cut into 4 to 5 bits or ribbons and soaked in salt water for one complete day. The next day they are left in the sun until completely dry. This method is applicable when the fish is big in size. The small sized specimens are, however, just soaked in brine without being cut into ribbons, and dried. After they are completely dry they are packed into bundles and sent to outside stations like Paramakudi, Madura, Tuticorin, Ceylon, etc., from where there is a regular demand. There are no regular and well maintained roads. Usually the fish bundles are removed from the landing place, by means of carts or head-loads to the railway stations from where they are exported out of the Island by trains.

There are no co-operative societies to aid the fishermen in realizing the full benefits of their hard labour. This lack of recognized bodies is being fully exploited by the merchants and the contractors who dictate terms with regard to finding of a suitable market for the fish landed. Evidence of this exploitation by the " middle-man " was not wanting and unless fishermen's co-operative societies are soon formed there is hardly any possibility for the improvement of the economic situation of the fishermen. As it is, living completely at the mercy of the merchants, their labour is hardly remitting any worth-while dividends. Not a single boat being mechanised, fishing methods can hardly be said to be of a high standard. There are thus immense possibilities to check the crude methods and to improve the methods of fishing. Only such attempts can raise the standard of living of the fisherman and bring a ray of hope into his life which, otherwise, is one series of unremitting labour and wasted energy.

Summary

As very little was known about the fishery resources of the Rameswaram Island, a survey to ascertain the fishery resources and to determine the magnitude of fish landings in the Island, was commenced in 1952. A preliminary survey was undertaken first to assess the number of fishing villages, the number of fishermen engaged in fishing and the number of various types of craft and tackle engaged in fishing in the Island. The results are given in this paper along with a short description of various types of craft and tackle employed in fishing in the Island. The design of the survey to estimate the annual landings of fish in the Island is also indicated.

Annually on an average of 1,585·53 tons of fish were landed in the Island. Fish catches were generally poor during the winter months. This was due to the cessation of the Boat-Seine fishing. Altogether 33 species were recorded during the two years. But only 12 species, *viz.*, *L. splendens*, *S. guttatus*, *C. dorab*, *S. gibbosa*, *L. lactarius*, *Scoliodon* sp., *D. hasselti*, *Caranx* sp., *H. georgii*, *Arius* sp., *G. filamentosus* and *R. canagurta* were of fishery importance. *L. splendens* topped the list during both years with *S. guttatus* holding the second rank. The seasonal fluctuations of these fishes are indicated. Very little of fish is consumed within the Island. Consequently much of it is exported as cured fish to various places such as Ceylon, Madura, Paramakudi, etc. Two types of curing were noticed. Both of them are described. The costliest fish in the Island is *S. guttatus*. The relative yield of all the important species of fish is given.

The extent of the Turtle fishery, the Trepang fishery, the Chank fishery, the Squid fishery and the Chanos fishery in the Island is also discussed. Their contribution to the fishery wealth of the Rameswaram Island is indicated.

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