



DEPARTMENT OF INDUSTRIES AND
COMMERCE, MADRAS

REPORT ON THE
FISHERIES OF MADRAS

FOR THE YEAR ENDED
30TH JUNE

1941

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CONTENTS

	PAGE
INTRODUCTION	1

PART I.

I. MARINE FISHERIES—	
<i>A. Research—</i>	
<i>(a) Scientific research—</i>	
(i) West Hill Biological Station, South Malabar	4
(ii) Krusadai Biological Station, Gulf of Manaar	13
(iii) Vizagapatam Laboratory	22
(iv) Marine Aquarium Laboratory, Madras	22
(v) Tuticorin Laboratory	22
<i>(b) Technological research—</i>	
(i) Fishing methods	22
(ii) Tanur Experimental Station	22
<i>B. Administration—</i>	
<i>(a) Public fish-curing yards—</i>	
(i) East Coast (Northern Division)	24
(ii) Do. (Central Division)	26
(iii) Do. (Southern Division)	27
(iv) West Coast Division	29
(b) Private oil and guano factories	34
II. MINOR AND MARINE ESTUARINE FISHERIES—	
<i>A. Prawns</i>	35
<i>B. Edible oysters—</i>	
(i) Oyster supply	35
(ii) Shell lease	35
III. INLAND FISHERIES—	
<i>A. Research—</i>	
(i) Research on rural pisciculture	35
(ii) Deep-water fishing experiment	35
(iii) Fish breeding	36
<i>B. Administration—</i>	
(i) Fish farms	38
(ii) Periyar scheme	41
(iii) Nilgiri fisheries	41
(iv) Government House Ponds, Guindy	42
<i>C. Stocking Operations and Results—</i>	
(i) Stocking operations	42
(ii) Sale of fisheries	45
(iii) Disposal of fisheries by private tenders	46
(iv) Fishery rentals	46

	PAGE
IV. CROWN MONOPOLIES (PEARL AND CHANK FISHERIES)—	
A. Research—	
(i) Pearl oyster	46
(ii) Chank marking experiments	46
(iii) Diving experiments	47
B. Administration—	
(i) Routine inspection of pearl banks	47
(ii) Tinnevely Chank Fishery	48
(iii) Ramnad Chank Fishery	49
(iv) Other chank fisheries	50
V. BIOLOGICAL SPECIMEN SUPPLY, ENKUR, MADRAS	50
VI. ANTI-MALARIAL WORK	50
VII. SOCIO-ECONOMIC WORK—	
A. Education—	
(i) West Coast—Village schools	51
(ii) East Coast—Fisheries Technological Institute, Tuticorin	52
(iii) Marine Aquarium, Madras	53
B. Co-operative Societies—	
(i) West Coast—	
(a) South Kanara	55
(b) Malabar	58
(ii) East Coast	61
C. Other Socio-economic Work—	
(i) West Coast	61
(ii) East Coast	62
(iii) Provision of marketing facilities for curers	62
VIII. PROPAGANDA—	
A. Rural pisciculture	63
B. Exhibitions	64
C. Museums	64
IX. FISHERY LEGISLATION—	
(i) Licences for fixed engines	65
(ii) Stake-net fishing	65
(iii) Fishing in Mettur reservoir	65
(iv) Fishing in the Adyar river	65
X. PUBLICATIONS	66
	PART II.
	FINANCE.
Summary of financial results	66

CONTENTS

iii

PART III.	PAGE
STAFF AND EQUIPMENT.	
I. BIOLOGICAL—	
A. Assistant Director (Biology)	67
B. Research stations	67
II. TECHNOLOGICAL—	
Tanur Experimental Station	67
III. EDUCATIONAL—	
(i) Fishery elementary schools	68
(ii) Co-operative societies	68
IV. NAUTICAL—	
(i) "Lady Nicholson"	68
(ii) "Sea Scout"	69
(iii) "Leverett"	69
(iv) "Pearl"	69
(v) "Pinotada"	69
V. ADMINISTRATIVE —	
A. Director's office	69
B. East Coast (Northern Division)	69
C. Do. (Central Division)	70
D. Do. (Southern Division)	70
E. West Coast	70
APPENDICES.	
I. Chank-marking experiments	71
II. Statement of chanks fished	72
III. Statement of Expenditure and Revenue of the Fisheries Section for 1940-41	72

the Kerala Soap Institute, Calicut, where it is filtered and purified, the stearine removed and the oil blended with sufficient refined groundnut oil in order to reduce it to 1,500 international units of Vitamin A per gramme or roughly double the potency of ordinary codliver oil. Four thousand four hundred and sixty gallons of raw oil was sent to the Kerala Soap Institute, from the fish-curing yards during the year. The scope for opening new oil extraction centres on the East Coast where the existing fish-curing yards do not cover all the fishing villages was investigated and new centres at (i) Periathalai in Tinnevely district, (ii) Rameswaram in Ramnad district, (iii) Gopalpatnam and (iv) Negapatnam in the Tanjore district were temporarily opened. Just after the close of the year, Government sanctioned the creation of a post of Inspector of Fisheries temporarily for a period of one year for supervising the purchase of shark liver, the extraction of raw shark liver oil in the fish-curing yards and the transport of the crude oil from the yards to the factory.

3. The revenue realized from Inland Fisheries increased during the year by Rs. 5,263, the fisheries in the lower reaches of the Cauvery and other provincialized waters yielding better rentals than in the previous year. The discovery of a more prolific and cheaper centre for the collection of Catla fingerlings for the annual stocking of tanks and rivers taken over by Government for stocking and development has effected an appreciable economy in the annual Catla stocking operations. The Government approved during the year a scheme for the popularization of Gourami fish in rural areas by demonstrating the operations and results by actually stocking six selected tanks in the Tanjore district with Gourami and Catla fish. The Imperial Council of Agricultural Research sanctioned during the period under review a scheme of research in connexion with freshwater fisheries and the establishment of a Central Fresh Water Biological Station at Madras. The cost of the scheme will be Rs. 78,610 for five years of which the Provincial Government's share will be Rs. 31,040.

4. Valuable laboratory observations were made at the West Hill Biological Station on the spawning seasons of the commercially important fishes. The stomach-contents of various fishes were examined at the Krusadai Biological Station with a view to determining the annual fluctuations and shoaling and migratory habits of the fishes that constitute the commercial fisheries of the coast. A chanos farm for the culture of this economic fish is under development at the Krusadai Station.

5. There was a considerable fall in the surplus resulting from the fish-curing yard operations owing to the poor fishing season on the West Coast. The consumption of salt in the yards as a whole showed a decrease as compared with that of the previous year owing to the reduced fish-curing activities. The East Coast fisheries, however, showed an improvement, the total quantity of

fresh fish brought into the yards increasing from 252,858 maunds in the previous year to 332,307 maunds in the year under review or by 31 per cent.

6. The five chank fisheries off the Tinnevely, Tanjore, South Arcot, Chingleput and Nellore coasts are owned by Government. Of these, only the Tinnevely fishery continued to be worked departmentally, whilst the others were leased out to private contractors. The fisheries taken as a whole yielded a net profit of Rs. 1,00,856 as against Rs. 51,182 in the previous year. The increase in profit was due partly to the larger quantity of chanks sold and partly to the higher sale price obtained for the full-sized chanks.

7. A solution was found for the longstanding dispute in regard to the fishing carried on in the Adyar river, the fishermen of Narayanaswami Garden, after several protracted discussions, agreeing to permit the use of the "Bodi valai" twice a week. It was reported to Government that by restricting the use of the "Bodi valai" there should be no appreciable depletion in the fisheries in the Adyar river as the majority of the catches of fish is composed of fish entering the river from the sea and as the supply will be replenished frequently when the bar in the sea at the river mouth is open every year. In the circumstances, the Government cancelled the prohibitory order issued in 1940 against the use of nets of $1\frac{1}{2}$ inches mesh and issued rules permitting the use of the "Bodi valai" twice a week subject to certain restrictions.

8. The question of opening a Fisheries Technological Institute at Tuticorin received further consideration during the year and it was decided that the Institute should be located on the main land at Tuticorin instead of on Hare Island as originally proposed. The land for the building has been transferred to the department and the construction of the building commenced by the Bharatha Mahajana Sangham. The Institute will provide facilities for the training of teachers in Fishery Technology and will also provide courses of instruction for fishermen and the public in all branches of the fishing industry including navigation. The Institute will be opened in 1941-42.

9. On the last day of the year to which this report relates the Government decided to take the lease of the chank fisheries off the coast of Ramnad belonging to the Ramnad Estate, for a period of five years from the 1st July 1941.

10. Despite the less favourable fishing season on the West Coast, the total revenue of the Fisheries section of the department increased from Rs. 4,85,966 in the previous year to Rs. 5,05,866 in the year under review, whilst the expenditure fell from Rs. 5,86,655 to Rs. 5,78,526. The net cost of the Fisheries section declined from Rs. 1,00,688-11-4 to Rs. 72,659-9-11, a very satisfactory result if regard be had to the prevailing conditions.

PART I.

I. MARINE FISHERIES.

A. RESEARCH.

(a) Scientific Research.

11. (i) WEST HILL BIOLOGICAL STATION, SOUTH MALABAR—*Plankton investigation*.—Surface plankton was collected only on 80 days during the year under report as against 146 days during the previous year owing mainly to the early and violent onset of the south-west monsoon. Off-shore plankton also could not be collected off Chaliyam and Quilandy. The off-shore plankton collections off Tanur were discontinued. The collections of inshore plankton were made opposite the laboratory in latitude $11^{\circ} 18' N$ and longitude $75^{\circ} 43' E$. The plankton has been studied as usual with reference to fish-food and fish-eggs. Collections of fish-eggs obtained in the plankton were successfully hatched in the laboratory and observations on the early developmental stages made. The quantity of plankton was at its maximum in October and April and at its minimum in December.

12. *Phyto-plankton*.—The diatoms which were most abundant this year were *Coscinodiscus spp.*, *Hemidiscus hardmanianus*, and *Chaetoceras sp.* The following table gives the groups of diatoms and their seasonal occurrence :—

Genus.	Occurrence.
<i>Chaetoceras</i>	.. Abundant in October and March ; common in August, September and May ; rare in February, November and December.
<i>Coscinodiscus</i>	.. Abundant in August, September, October and May ; common in February, March and April ; few in November, December and January.
<i>Biddulphia</i>	.. Few in August, September, October and May ; rare in December, January, February and March.
<i>Rhizosolenia</i>	.. Common in August and March ; few in October, February and April ; rare in December.
<i>Hemidiscus hardmanianus</i> .	Abundant in March, April, May ; few in August, October, November and February ; rare in December and January.
<i>Pleurosigma</i>	.. Few in July and August ; rare in February and March.
<i>Thalassiothrix</i>	.. Abundant in October and November ; common in March ; few in August, December and January ; rare in September.
<i>Nitzschia</i>	.. Common in August.
<i>Fragillaria</i>	.. Abundant in August and September ; common in October, November and December ; few in July, January and March.

Genus.	Occurrence.
<i>Lauderia</i>	.. Common in October, April; rare in February.
<i>Ditylum</i> ..	.. Few in October.
<i>Bacteriastrum</i>	.. Few in October; rare in August and September.
<i>Asterionella</i>	.. Rare in August and September.
<i>Trichodesmium</i>	.. Abundant in March and April.
<i>Planktoniella</i>	.. Rare in September.

13. *Zoo-plankton*.—This was more abundant than phyto-plankton. The dominant organisms and their seasonal occurrence were as follows:—

Genus.	Occurrence.
<i>Copepods</i>	.. Abundant from September to May; few in August.
<i>Noctiluca</i>	.. Abundant in August, September and May; rare in November and December; few in March.
<i>Leucifer hansevi</i>	.. Common in October and November; few in August, September and from December to May.
<i>Evadne</i> ..	.. Common in August; few in November and May; rare in February and April.
<i>tenophores</i> , mostly <i>Pleurobrachia glo-</i> <i>bosa</i> .	Few in February, April and May; rare in March, August and October.
<i>Medusoids</i>	.. Rare from August to October and December to May.
<i>Ceratium</i>	.. Few from September to November; rare from February to May.
<i>Sagitta</i> ..	.. Rare from February to April; few in August and from November to January; common in October.
<i>Larval crustacea</i>	.. Common from February to April; rare in October, January and May.
Fish-eggs	.. Few in November, December and May; rare in January to April and in September.
<i>Plutei larvæ</i>	.. Rare in October, November, February and March.
<i>Larval bivalves</i>	.. Few in August and October; rare in October, November, February and May.
<i>Diphyes</i> ..	.. Abundant on 3rd September.
<i>Appendicularia</i>	.. Few in August, September, November; rare in October and March.

14. *Study of fish-eggs*.—Encouraged by the results obtained in the season of 1939-40, laboratory observations on fish-eggs were continued during the season of 1940-41. Five types of fish-eggs came under our observation namely, anchovy, seer-fish, white-bait,

Malabar sole "manathal" and horse-mackerel, all of which yield important fisheries. Only on the eggs of anchovy, seer-fish and of horse-mackerel could hatching experiments be maintained for nearly three days; in the other cases interest in the fish-eggs which were coming in the plankton of the following days prevented a study of them beyond two days. This item of research is expected to throw light on the spawning season of the fishes.

15. *Oil-sardine investigation.*—At West Hill Laboratory, oil sardines were first examined on 23rd July 1940 and were last examined on 20th February 1941. Stray catches of large sardines 17 to 20 cms. were caught spasmodically; there was no fishery of these sizes worth the name. Fifty-four samples consisting of 3,080 specimens were examined during the year as against 2,493 during the previous year. The size frequency of the samples measured were as follows:—

Length overall.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Total.
3 cm.	52	..	..	..	..	..	..	..	..	..	52
4 cm.	64	..	..	..	..	..	..	..	..	..	64
5 cm.	8	..	..	..	..	..	..	..	..	..	8
8 cm.	10	..	..	..	..	..	..	..	..	10
9 cm.	84	..	..	..	..	..	..	..	..	84
10 cm.	105	13	1	23	..	..	..	..	..	142
11 cm.	58	52	19	46	20	..	..	..	..	195
12 cm.	102	52	61	123	90	..	..	..	..	428
13 cm.	158	122	115	219	103	..	..	..	..	717
14 cm.	65	186	177	284	31	..	..	..	..	743
15 cm.	1	22	37	35	6	..	..	..	..	101
16 cm.	1	14	..	..	..	..	..	..	16
17 cm.	..	1	7	4	..	9	..	..	..	..	..	..	21
18 cm.	..	7	28	12	4	34	103	10	..	..	..	..	198
19 cm.	..	14	9	13	8	60	97	23	..	..	..	..	224
20 cm.	..	1	10	9	17	18	..	17	..	..	..	..	67
21 cm.	1	1	8	1	..	..	..	..	..	..	11
Total	..	22	45	164	605	567	647	730	300	..	..	..	3,080

The size ranged from 3 cm. to 21 cm. and 14 cm. was the size best represented in the catches. Very young sardine were caught in September and on 3rd September 1940, 10 baskets of baby sardines were caught off West Hill. The size of these baby sardines ranged from 3 to 5 cm. It will be seen from the statement that the fishery this year was mainly of young immature oil sardines measuring 13 to 14 cm. These immature sardines were full of visceral fat and hence were suitable material for the oil and guano factories. The fishing of immature sardines will naturally affect the fishery of succeeding years. The oil sardines attain maturity for the first time after they reach a length of 15 cm. and smaller specimens caught in large quantities are thus deprived of spawning even once in their life-time and of adding to the stock.

16. *Mackerel investigation*.—Forty-eight samples consisting of 1,101 mackerels were examined during the year. The size ranged from 11 to 25 cm. The dominant sizes in the catches were 20 cm. and 21 cm. long fish as will be seen from the size-frequency table below:—

Length overall.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Total.	
11 cm.	4	..	..	..	..	..	..	..	..	..	4	
12 "	34	..	..	..	..	..	..	..	..	..	34	
13 "	22	..	..	..	..	..	..	..	..	..	22	
14 "	
15 "	
16 "	9	..	2	..	..	..	..	..	..	..	12	
17 "	44	15	39	..	1	..	..	..	..	..	99	
18 "	7	8	3	1	5	..	..	..	..	..	114	
19 "	3	16	4	14	12	..	..	1	..	112	
20 "	23	25	98	25	15	95	33	..	2	1	317	
21 "	..	7	..	9	40	18	4	97	85	15	24	..	308	
22 "	..	4	..	1	..	2	3	..	11	7	15	22	65	
23 "	..	6	..	..	..	..	..	1	..	1	1	..	9
24 "	..	4	..	..	..	..	..	..	..	..	..	..	4
25 "	..	1	..	..	..	..	..	..	..	..	..	..	1
Total	..	22	120	60	50	336	51	39	216	125	31	50	1	1,101

Off West Hill, mackerels first appeared on 24th July 1940 and disappeared after 13th May 1941. The specimens examined from March to May showed maturing gonads. As the south-west monsoon set in violently with storms and cyclones this season, no catches of ripe mackerels could be expected. The research on the spawning mackerels begins from the last week of May or even earlier and terminates before the middle of June if there are fortunate breaks in the setting of the monsoon which enable the fishermen to venture out occasionally and catch the mackerels. Such gradual and slow onset of the monsoon generally is favourable to research on spawning mackerels. Unfortunately during the last season, the violent setting in of the south-west monsoon prevented the continuance of this research.

17. RESEARCH ON THE FOOD OF FISHES.—(i) *Food of the oil-sardine*.—This has not differed from that recorded previously. That fish-eggs do form a normal item in the food of the sardine has been proved by systematic examination of stomach-contents. Fish-eggs were found on the following dates:—

3rd August 1940	..	Clupeoid eggs, few.
7th August 1940	..	Do.
24th October 1940	..	Engraulis eggs.
15th November 1940	..	Out of 29 specimens, seven had fish-eggs.
19th November 1940	..	} Rare.
21st November 1940	..	
25th November 1940	..	Out of 25 specimens, five had fish-eggs.
30th November 1940	..	Out of 100, three had fish-eggs.
3rd December 1940	..	Rare.
11th January 1941	..	Out of 200, four had fish-eggs.

The diatom *Ornithocircus* was plenty in the stomachs of specimens examined on 4th, 14th, 21st and 26th November 1940.

Specimens of the tiny prawn-like *Leucifer* were found in the stomachs of oil-sardines caught off Calicut, Manjeshwar and Madai. The diatom *Pleurosigma elongatum* was plenty in the stomachs of oil-sardines caught in Beypore on 20th February 1941.

18. (ii) *Food of the mackerel*.—The usual plankton organisms as observed previously were found this year also. Limacina, a pelagic shell-fish; was frequently met with as also *Leucifer hansenii*. *Leucifer* was more common in the food of the mackerel this year especially in May. Pteropods (*Creseis acicula*) were met with this year in small numbers in a few specimens in March... Arrow-worms were found in five specimens in May, an observation first recorded by Sri M. Jayaram Nayudu (1928). The diatom *Fragillaria* were found packed in the stomachs on 20th March 1941 and the alga *Trichodesmium* on 25th March 1941 and 26th April 1941.

19. A systematic examination of stomach-contents during the year under review confirms the view that the mackerel feeds regularly and normally on fish-eggs more so than the oil-sardine. The eggs of the horse-mackerel *Caranx spp.*, the anchovy *Engraulis spp.*, the white-bait *Stolephorus spp.*, and of other clupeoids were found in the stomach-contents as tabulated below:—

3rd September 1940	.	Clupeoid eggs.	
24th September 1940	..	Eight per cent of the specimens had carangoid eggs.	
5th November 1940 (Pudiappa sample)	..	33 per cent had fish-eggs.	
5th November 1940 (Calicut sample).	..	36 per cent had fish-eggs.	
Total number of eggs, 85. There were four <i>stolephorus</i> eggs $1.071 \times .578$ mm. and one clupeoid egg, the rest were carangoid eggs.			
6th November 1940	..	12 per cent of specimens had fish-eggs.	
7th	..	100	of specimens in all stages of development.
8th	..	32	had fish-eggs.
13th	..	100	Do.
16th	..	100	had fish-eggs all macerated.
18th	..	100	had fish-eggs.
19th	..	8	..
20th	..	8	..
29th	..	16	..
4th December 1940	..	32	..
3rd January 1941	..	8	..
27th February 1941	..	4	..
6th March 1941	..	16	..
17th	..	16	..
19th	..	4	there were a few hatched fish larvæ.
20th	..	12	contained anchovy eggs.
25th April 1941	..	36	had fish-eggs. Four specimens had <i>Stolephorus</i> eggs.
26th	..	16	had fish-eggs.

(A fish which habitually feeds on fish-eggs can be said to play a definite part in the fluctuation of the fisheries of the fishes to which the eggs belong. For, this causes a reduction in the number of eggs which will otherwise hatch into larvæ. The mackerel thus enjoys a certain advantage over the other fish which do not feed on fish eggs as the latter do not retaliate by feeding on mackerel eggs. The balance in fluctuation will, therefore, be in favour of the mackerel.) Fish-scales and sand-grains were found in the stomach of the mackerel along with the planktonic organisms as tabulated below :—

8th August 1940	..	Palapatty—fish-scales.
5th November 1940	..	Calicut—fish-scales and sand-grains.
6th November 1940	..	Pudiappa—fish-scales only.
6th November 1940	..	Calicut—fish-scales and sand.
7th November 1940	..	Do.
14th February 1940	..	6 per cent of the specimens had fish-scales.
27th February 1941	..	12 per cent had cycloid scales resembling those of mackerel and ctenoid scales like those of <i>Cynoglossus semifasciatus</i> .
19th June 1941	..	Only one stray specimen obtained had fish-scales and sand-grains. There were eight oil sardine scales, seven stolephorus scales and twenty-three other scales.

In an unpublished report on the food of the mackerel by Sri M. Jayaram Nayudu (1928), a former Research Assistant, the occurrence of fish-scales in the stomach-contents of the mackerel was brought to notice, though no explanation was offered for this. These fish-scales cannot be accidental inclusions from the plankton for fish-scales cannot float and the inclusion of sand-grains indicates bottom feeding. From the analogy of other fishes definitely known to feed on carrion such as the squeaking perches, there is little doubt that the mackerel occasionally resorts to a diet of dead fishes decaying at the bottom of the sea. Though in the early stages, mackerel does feed on live fish (vide paragraph 22 of the Administration Report for 1939–40), it may be concluded that as adults they do not feed on live fish but occasionally augment their planktonic diet by feeding on dead fish, and the view that the mackerel is a pure surface feeder feeding on the plankton is no longer tenable. In his unpublished report referred to, Sri M. Jayaram Nayudu has mentioned also that the bristles of bristle-worms are sometimes seen in the stomach-contents of the mackerel. During the year under report, his observations received confirmation, for entire young specimens of a bristle-worm (spionid post-larvæ) were found packed in the stomachs of mackerels examined on the 12th and 13th May. There is little doubt, therefore, that larval bristle-worms with their setae are occasionally eaten by the mackerel.

20. (iii) *Food of the hilsa*.—Of the food of the hilsa during its sojourn in the sea, nothing was known before; but from researches

made since the close of the year it is now possible to say definitely that it feeds on plankton in the sea like most of the other herring-like fishes.

21. (iv) The tiny prawn-like phosphorescent—*Leucifer hanzeni*.—This plays an important role in the food-chain of the sea. The following fishes in addition to the oil-sardine and the mackerel were found to feed on *Leucifer*.

- (a) The White-Bait, *Stolephorus tri*—one specimen (caught on 13th June 1941) which was 60 mm. long contained 257 specimens of *Leucifer* ranging in size from 7 to 12 mm. Many were intact and a few were broken up in digestion.
- (b) The Sardine, *Sardinella fimbriata*—only rarely found.
- (c) The White-Bait, *Stolephorus commersoniani*—*Leucifer* was a very common item in the stomach-contents examined.
- (d) The Anchovy, *Engraulis spp.*—In the Anchovies examined *Leucifer* was found in the stomach-contents only occasionally.
- (e) The large-scaled Hilsa, *Hilsa kanagurta*.—Out of 22 specimens examined on 14th June 1941, two had fed on *Leucifer*.

The following fishes in addition to those noticed before are probably carrion feeders as fish-scales occur in their stomach-contents :—

- The white sardine, *Kowala thoracata* .. Scales found rarely.
- The silver-belly, *Leiognathus spp.* .. Fish scales are very common.
- The white-bait *Stolephorus spp.* .. Fish-scales occasionally found.
- The bony whiskered cat-fish, *Osteo- .. Common in stomach-contents.*
geniosus militaris.
- The anchovy, *Engraulis kammalensis*.. Packed with scales on 5th
June 1941.
- The Malabar Sole or "Manthal" Found frequently.
Cynoglossus semifasciatus.
- The sole *Cynoglossus brevis* Found frequently.

These fishes probably nibble at the soft parts of decaying dead fish and incidentally take in some fish-scales.

22. *Other fishery investigations.*—Studies on the following fishes were carried out during the year :—

- (a) The White Sardine, *Kowala thoracata*.—Nineteen samples of 893 specimens were examined. The commercial catches are made up of specimens 10 to 11 cm. over all. The spawning season can be fixed from October to February. This fish feeds on dead fish, fish-eggs, sand-grains, mysids and amphipods.

(b) The Malabar Sole or Manthal, *Cynoglossus semifasciatus*.—This is the sole caught in very large quantities on the West Coast. Observations on its food and spawning season are in progress. Its food consists of the following:—

Copepods.	Polychæte worms.
Fragillaria.	Coscinodiscus spp.
Lauderia.	Biddulphia.
Sand-grains.	Small bivalves.
Ossicles of Holothuroidea	Dead fish.

Two hundred and ninety-one specimens were examined from March to May. The size ranged from 10 to 15 cm. The ovaries were yellowish in May, with no free eggs.

(c) The cat-fish, *Arius dussumieri*.—Seventeen specimens were examined. All were females. The gonads were immature. The stomachs were empty. The intestine was found filled with sand and ossicles of holothurians. There were broken bivalve and gastropods. The following were found in the intestines:—

Eucheles sp. a gastropod.

Dentalium sp. a tusk shell.

Pleurosigma and Forminiferans.

(d) The following fishes were also examined periodically: Anchovies (*Engraulis* spp.), White-Bait (*Stolephorus* sp.) Jew-fish (*Otolithus ruber*), Goggler (*Caranx crumenophthalmus*), Silver-belly (*Leiognathus bindus*) and Ribbon-fish (*Trichiurus haumela*).

23. In all 1,200 specimens were examined. Specimens of the Anchovy, *Engraulis hamiltonii*, were found with mature gonads in April and May and its eggs were identified in the plankton.

24. The White-Bait.—The commercial catches are made up of mostly *Stolephorus tri* along with which the following fishes were caught:—

Lactarius lactarius.

Scomberomorus spp. young.

Otolithus ruber.

Engraulis spp.

Caranx sp.

Chorinimum lysan.

Trichiurus haumela.

These follow in the wake of *Stolephorus* shoals for feeding. The stomach-contents of every one of the above fishes contained *Stolephorus*, which shows that they chase shoals of the White-bait and feed on it. The White-bait may, therefore, be said to play an important part in the food-chain of the sea.

25. The silver Bellies.—Present investigations go to show that *Leiognathus bindus* is the dominant species in the catches on the West Coast.

26. The Hilsa.—A notable event in this year's work was the find of the Hilsa or the Indian shad *Hilsa ilisha** in the sea off West Hill on the 17th June 1941 when only three specimens were obtained. More specimens have been obtained since the close of the year and useful data on the food and distribution of this valuable anadromous fish is being gathered.

27. *Fish statistics*.—The statistics of the three years from 1936-37 to 1938-39 are under compilation. From a study of the total landings of the oil-sardine during the last ten years beginning from 1929-30, it is seen that the oil-sardine fishery occupied the first rank in 1933-34 (1,923,593 maunds) and in 1937-38 (456,037 maunds); second in 1936-37 (727,726 maunds), fourth in 1930-31 (116,000 maunds); fifth in 1929-30 (72,500 maunds) and in 1938-39 (96,000 maunds); sixth in 1934-35 (58,000 maunds); seventh in 1931-32 (58,500 maunds); ninth in 1935-36 (40,000 maunds); and tenth in 1932-33 (30,000 maunds). In 1933-34, when it occupied the first rank, the size which contributed most to the fishery was 14 cm. immature fish on the verge of attaining maturity for the first time. In 1937-38, however, the size which dominated the catches or the majority size was 17 cm., the next in order being 14 cm., 13 cm. and 18 cm. (The size frequency table worked out in the West Hill Biological Laboratory shows that the ratio in the catches between the immature fish (9 to 14 cm.) and the mature fish (15 to 20 cm.) during that year was about equal. This shows that the exploitation of immature fish continues along with that of mature fish. The meshes of the nets employed by the fishermen, therefore, must be very small for it to be feasible to include small sizes. This needs investigation. The above observations coupled with the fact that in the last season (1940-41) immature fish (14 cm., 13 cm., 12 cm. and 11 cm.) dominated the commercial catches call for a critical examination of the question, whether the fluctuation in the oil-sardine fishery is or is not due to the destruction of immature fish in large numbers.) The remedy that suggests itself at first sight is the prohibition by law of the capture of sizes 14 cm. and below by a regulation of the mesh. The fact that the oil-sardine fishery occupied the tenth rank in 1932-33 is as inexplicable as it is deplorable since considerable distress must have been caused in that year among the fisherfolk. Equally inexplicable at the present state of our knowledge but gratifying to note is the phenomenon that in the next season (1933-34) the oil-sardine fishery reached the first rank from the tenth rank. In the year 1934-35, the fishery again showed an abrupt decline and occupied the sixth rank. (So great are the fluctuations that they render the fisheries unsteady and undependable.)

28. On the contrary, a study of the statistics relating to the mackerel reveals that its fisheries are comparatively steady and dependable. The mackerel fishery occupied the first rank in

* This identification was confirmed by Dr. S. L. Hora of the Indian Museum, Calcutta,

the Malabar fisheries during the years 1929-30 (2,090,603 maunds), 1931-32 (8,426,860 maunds), 1932-33 (2,009,661 maunds), 1934-35 (1,400,648 maunds), 1935-36 (2,235,427 maunds), 1936-37 (1,007,046 maunds), and 1938-39 (488,702 maunds); second rank in 1933-34 (597,757 maunds), and third rank in 1930-31 (149,909 maunds), and in 1937-38 (210,680 maunds). (The mackerel fishery has not taken a rank less than third in any of these five years.) The question of fishing of the immature mackerals does not arise at present, as the commercial catches during the last five years under review consisted mostly of mature fish (20 to 22 cm.).

29. It is surprising to note that the prawn fishery of Malabar, in point of view of weight of landings, occupied the first rank in 1930-31, second rank in 1932-33 and 1935-36, third rank in 1929-30, 1931-32, 1933-34, 1934-35 and 1936-37, fourth rank in 1937-38 and eighth rank in 1938-39.

30. *Hydrographical and meteorological observations.*—The readings are being recorded as usual and the maximum and minimum of the various data were as follows:—

Salinity—Maximum 39.38 ‰ on 19th March 1941. Minimum 15.73 ‰ on 11th June 1941.

Surface temperature—Maximum 32.1° C. on 22nd May 1941. Minimum 23.4° C. on 14th August 1940.

Specific gravity—Maximum 1.0243 on 3rd April 1941. Minimum 1.0116 on 17th July 1940.

pH. value—Maximum 8.5 on 8th March 1941. Minimum 7/6 on 3rd September 1940.

31. *Museum.*—Specimens of the following commercial fishes were added to the museum:—

Hilsa ilisha.

Engraulis purava.

Do. *malabaricus.*

Do. *setirostris.*

Leiognathus splendens.

Do. *blochi.*

32. (ii) KRUSADAI BIOLOGICAL STATION, GULF OF MANAAR.—*Plankton investigation.*—Inshore plankton was collected from Kundugal channel and Bushy Point on 83 days as against 73 in the previous year. Plankton from the open sea, off Pamban lighthouse and off Shingle Island, was collected on 12 days as against 7 last year. As usual, zoo-plankton predominated in the hauls, copepods being the commonest forms. Of the phyto-plankton, *Chætoceras* and *Coscinodiscus* were the dominant genera. The seasonal occurrence of the various forms was as follows.

33. *Phyto-plankton*.—Diatoms were common from July to November. The relative abundance of the dominant groups of diatoms in the different months of the year is shown below:—

Genus.	Occurrence.
Trichodesmium ..	Abundant in July, August, November and March; common in September, October and April; few in February.
Chaetoceras ..	Common from October to February; few in other months.
Rhizosolenia ..	Abundant in July; common from November to February; few in other months.
Coscinodiscus ..	Abundant in February; common in January and March; few in August, September, November and April.
Thalassiothrix ..	Common in October and November; few from July to September and from March to May.
Nitzschia ..	Common in October; few from November to April.

The following diatoms were also met with, but were not dominant:—

Biddulphia, Bacillaria, Bacteriastrum, Ditylum, Detonula, Asterionella and Pleurosigma.

34. *Zoo-plankton*.—This was more abundant than phyto-plankton. The seasonal occurrence of the various forms is noted below:—

Genus.	Occurrence.
Ceratium ..	Common in October; few in the other months.
Noctiluca ..	Plentiful from November to February, common in October and March.
Medusoids ..	Common in October, November and from January to May; few in July, August and June.
Ctenophores ..	Common from February to April; few in July, January, May and June; rare in other months.
Copepods ..	Plentiful in July, January and March; common from August to November, February, and from April to June.
Leucifer ..	Few in July, August, September and from January to April.
Crustacean larvæ ..	Common in September and November; few in July, October, January and February, and rare in other months.
Sagitta ..	Plentiful in October; common in July and from November to February; few in August, September, March and June.
Pteropods ..	Common from November to April; few in May; rare in September, October and June.
Larval bivalves ..	Common from November to March; few in September, October and April; rare in July, August, May and June.
Appendicularia ..	Common from September to November, and in February; few in January and March; rare in other months.
Fish-eggs and larvæ ..	Few in September, November, January and February; rare in the other months.

35. *Research on East Coast food fishes.*—The identification and study of the local food fishes were continued on a larger and a more detailed scale. The special studies made and results obtained on certain fishes are summarized below :—

(a) The big-jawed jumper, *Lactarius lactarius*.—One thousand two hundred and twenty-four specimens ranging in size from 11 to 25 cm. were examined as against 1,193 in the previous year. The bulk of the catches consisted of specimens of 20 cm. in size. The males were smaller in size and number than the females. The fish shoaled from the beginning of June to October. The ovaries begin to grow from July onwards until October. As specimens with quite transparent eggs could not be obtained, artificial fertilization was not possible. The early development of the eggs and larvæ have yet to be ascertained. That *Lactarius* is partial to a diet of other fishes was confirmed by observations made during the last season also. The following fishes were represented in its stomach contents :—

Sardines (*Sardinella gibbosa*);
Soles (*Pseudorhombus arsius*);
Silver-bellies (*Leiognathus* sp.);
Young Ribbon-fish (*Trichiurus savala*); and
White-bait (*Stolephorus indicus*).

But White-bait appears to be its favourite item of diet. The length frequency of 1,224 specimens examined in the laboratory was as follows :—

Length overall.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Total.
11 cm.	11
12 cm.	16
13 cm.	17
14 cm.	42
15 cm.	55
16 cm.	33
17 cm.	53
18 cm.	148
19 cm.	174
20 cm.	243
21 cm.	171
22 cm.	175
23 cm.	64
24 cm.	23
25 cm.	4
Total	1,224

The length of the specimens examined in June 1941 ranged from 17 cm. to 24 cm. In July 1940 a younger generation or generations seem to have joined the shoals whose length ranged from 12 cm. to 16 cm. In both the months 20 cm. happened to be the majority size.

(b) The Rainbow Sardine *Dussumieria hasseltii*.—Two hundred and twenty specimens ranging in size from 11 to 16 cm. were examined. The gonads were only half grown. The stomach-contents were planktonic organisms, chiefly diatoms and copepods.

- (c) The Indian Sprat *Sardinella gibbosa*.—Two hundred and seventy-five specimens, 5 to 16 cm. in length, were examined. This fish attains maturity early in March. Large shoals of young ones ranging in size from 5 to 10 cm. were found in April and May. The food of this fish consisted of plankton elements such as micro-crustacea (*Leucifer hansenii*) larval bivalves, foramenifera and proto-phytes (e.g., *Rhizosolenia*, *Coscinodiscus*, *Detonula* and *Trichodesmium*).
- (d) The flying fish.—Fifty specimens of the flying fish which shoaled in large numbers in February were examined and identified as *Exocoetus bahiensis*. Their size ranged from 17 to 21 cm. Their gonads were nearly ripe.
- (e) The Gizzard Shad, *Anodontosoma chacunda*.—A sample of 80 specimens was examined on the 11th March 1941. All the specimens of both sexes were mature. On enquiry it was found that the fish came in large numbers to the shallow sea off Periathorai, a fishing centre five miles east of Pamban on the 11th and 12th March 1941, but suddenly disappeared. The lunar eclipse occurred on the 13th March 1941. The fish is a pure plankton feeder, the following organisms being found in its stomach: *Trichodesmium*, Copepods, Crustacean eggs, fish-eggs, and fish-larvæ and larval bivalves. Its habit of feeding on *Trichodesmium* and fish-eggs and fish-larvæ is noteworthy. *Trichodesmium* is a pelagic alga which swarms in the seas adjoining Krusadai.
- (f) Other fishes.—In order to study the food and feeding habits of the other economic fishes, samples of all varieties available in this area were examined periodically. Over 2,000 specimens comprising 46 species were examined. The fishes were caught from the seas around Krusadai Island, the neighbouring islets and from the adjoining fishing centres like Pamban, Karsapad, Periathorai, Thangachimadam and Mandapam. From an analysis of their stomach-contents, the fishes of Krusadai can be classified into carnivorous and omnivorous species and plankton-feeders. There are many species which are carnivorous, the chief of them being sharks (*Carcharinus*), the Sabre-fish (*Chirocentrus dorab*), the Gar-fish (*Belone strongylura*), the Jew-fish (*Otolithus ruber*), the Big-jawed Jumper (*Lactarius lactarius*) and the Barracuda (*Sphyræna obtusata*). A purely herbivorous feeding habit is not seen in any of the fishes. Even in *Teuthis marmorata*, a fish closely allied to the Surgeon fishes (*Acanthurus* sp.) whose stomach and intestines are usually gorged with sea-weeds, fish-scales were found indicating thereby feeding on dead-fish. An omnivorous diet is as common as a carnivorous one. A mixed diet was found in the Cock-up (*Lates calcarifer*), the Rock-cod (*Epinephelus boenack*), the Squeaking Perch (*Therapon jarbua*) the Porgy (*Chrysophrys*

datnia) and other fishes. Plankton feeding was commonly met with among the sardines (*Pellona brachysoma*, *Anodontosoma chacunda* and *Dussumieria hasseltii*), the milk-fish (*Chanos chanos*), the Silver-bellies (*Leiognathus brevisrostris* and *Leiognathus insidiatrix*) and the mackerel (*Rastrelliger kanagurta*). The Mulletts (*Mugil troschelii*, *Mugil schelii*, and *Mugil waigiensis*) supplement a diet of plankton with algal filaments and moults of bristle-worms. In the stomach of one specimen of the cat-fish *Arius thalassinus* were found one large entire specimen of a sea-cucumber (*Holothuria scabra*), five crabs, one prawn and abundant remains of crustacea. In the stomach of another specimen were found four large bits of skin of a sea-snake, one barnacle and legs of crab. Bivalve shells and cuttle-fish (*Sepia*) were observed in other specimens. The habit of selective feeding in fishes is noteworthy. Sea-weeds are eaten by *Teuthis marmorata* and by several other fishes. It is observed that the sea-weed *Halimeda* is more commonly eaten than any other. Of the plankton-feeders, the alga *Trichodesmium* is eaten by the sardine *Sardinella gibbosa* and by the Gizzard Shad *Anodontostoma chacunda*, the milk-fish *Chanos chanos* and the mullet *Mugil waigiensis*. Foraminifera were recorded in the sardine *Sardinella gibbosa* and in the anchovy *Engraulis dussumierii*. Arrow worms (*Sagitta spp.*) were recorded from the stomachs of sardines (*Sardinella gibbosa* and *Dussumieria hasseltii*). The habit of eating fish-eggs is found in the Gizzard Shad *Anodontostoma chacunda*, the milk-fish *Chanos chanos* and the Mackerel *Rastrelliger kanagurta*. Fishes that feed on bristle worms are many. The mugils feed on larval bristle-worms and what appear to be moults of bristle-worms. But the Squeaking Perch, *Terapon jarbua*, the Porgy, *Chrysophrys datnia*, and the Whiting, *Sillago sihama*, feed on the adult bristle-worms (*Nereis*, *Perinereis*, and *Marphysa*). In this connexion, it is interesting to observe that *Terapon jarbua* and *Sillago sihama* feed also on Balanoglossids, burrowing worms constituting the lowest rung of the ladder of vertebrates. Bivalves and spire shells are mostly found in the stomachs of the Ray, *Trygon warnak*, the cat-fish, *Arius thalassinus*, the Perches, *Gerres filamentosus* and *G. abbreviatus*, and the Porgy, *Chrysophrys datnia*. It is noteworthy that in the stomach of one specimen of the Tiger Shark, *Stegostoma tigrinum* examined, there were 14 opercula of the chank. The presumption is that 14 live chanks were broken open and the soft parts including the chitinous opercula were swallowed. The Tiger shark must, therefore, be destructive to the valuable chank fishery. Crabs and prawns formed the diet of many fishes, the important among them being the shark, *Carcharinus melanopterus*, the Skate,

Trygon warnak, the Cat-fish, *Arius thalassinus*, and Rock-cod *Epinephelus boenack*, the Snapper *Lutjanus lineolatus*, the Squeaking Perch *Therapon jarbua*, the Sea-Murrel *Elacate nigra* and the Whiting *Sillago sihama*. Predaceous fishes feeding on other fishes are many. The Sabre-fish (*Chirocentrus dorab*), the Jew-fish *Otolithus ruber* and the Big-Jawed Jumper (*Lactarius lactarius*) are the chief enemies of the important fisheries of the sardine *Sardinella gibbosa*, the anchovy *Engraulis*, the Silver-bellies *Leiognathus spp.* and the White-bait *Stolpehorus*. Fish scales were observed in the stomachs of the Cat-fish *Arius sona*, the Sardine *Pellona brachysoma*, the Squeaking Perch *Therapon jarbua*, the Porgy *Chrysophrys datnia* and *Teuthis marmorata*. In these fishes, feeding on dead fishes can be suspected; in the case of *Chrysophrys datnia*, packets of fish scales with decomposing flesh attached to them were observed. Such foul feeding does not detract from their food value as what the decomposing manure is to a fruit tree, dead fish may be to live fish. The nature, composition, places of occurrence and the seasons of abundance and scarcity of the organisms that constitute the diet of the various fishes provide data to enable one ultimately to determine the annual fluctuations and the shoaling and migratory habits of fishes.

36. *Hydrographical and meteorological data.*—These were recorded throughout the year. In the Kundugal channel, the highest surface temperature of sea water was 30.8° C. on 25th April 1941, and the lowest temperature was 24.3° C. on the 16th January 1941. The highest salinity was 38.62‰ on the 9th June 1941 and the lowest salinity 20.75‰ on the 6th December 1940. The highest specific gravity was 1.0264 on 16th August 1940 and the lowest specific gravity was 1.0154 on 9th December 1940. The pH value ranged from 8.3 to 8.7.

37. *The Pearl Farm.*—The Japanese model rafts and iron cages continued to give satisfaction. The Tuticorin oysters are thriving well in the farm. A wooden cage containing 374 spats was lost in the sea owing to rough weather. One hundred and one spats were collected in April and May from the iron cages and transferred to a separate cage. In June 1941, 21 oysters were received from Tuticorin. At the close of the year there were 1,235 oysters and 101 spats in the farm. The collection of data regarding rate of growth from pearl oysters reared in the farm was continued.

38. *Artificial culture of pearls.*—During the year experiments were conducted on a larger scale in inducing artificial formation of pearls. Altogether 392 oysters were operated between the 11th October and 24th March. Valuable data have been collected.

39. *Research on chank fisheries.*—One of the well-known causes of depletion of any fishery is fishing on a commercial scale an immature generation. The chank fishery cannot be an exception to the rule. The diameter prescribed by the Government for marketable size is $2\frac{1}{4}$ " or 55 mm. The maximum diameter of the large shells usually fished is 95 mm. As 55 mm. is rather a small diameter, it was decided to investigate the diameter at which chanks spawned for the first time. There were two obstacles to this research: (i) the hard shell which when rudely broken by a hammer caused such damage to the gonads in particular as to render them useless for study, and (ii) the irresponsiveness of the animal generally to narcotics; the reproductive elements adhere to the liver and both are in the uppermost whorls or spires and if by any chance, in a narcotised chank, the animal should be rendered unconscious and be pulled out, the animal breaks at the spot where the liver and gonads meet the body and these latter are left behind inside the upper whorls. Extraction of the animal with the gonads intact is essential for the successful conduct of this research. These difficulties formerly baffled all research on the maturity of the gonads. A simple device for this extraction was developed and perfected during the year under review, by which the chank is kept in position by a bench-vice; then a longitudinal and a few circular cuts, coinciding with the circular grooves on the shell are made over the shell by a small hack-saw. A few gentle taps by a hammer are given to the shell which breaks open into three or four pieces, exposing the animal unhurt. The extraction does not take more than five minutes. Altogether 170 specimens were dissected in the laboratory. Their diameter ranged from 20 to 105 mm. and their length from 42 to 200 mm. Nine per cent had a diameter of 64 mm. and those of 70 mm. diameter showed the highest percentage. The diameters 64 mm. and 70 mm. are therefore the majority diameters. Next in order were 60 mm., 57 mm. and 56 mm. The following results are worthy of being recorded:—

- (i) The ratio of the diameter to length is nearly constant.
- (ii) only 25 per cent of the adult chanks retain the proto-conch;
- (iii) the breeding season commences from November and lasts until March; the ovary and testis are found as yellowish or orange coloured layers over the liver mass. In January numerous ova were observed in the ovary and numerous spermatozoa in the testis. Therefore, the chank's reproductive elements may be said to attain ripeness in January;
- (iv) the smallest chank which was found to be mature measured 50 mm. diameter and 90 mm. length. The investigation will have to be continued in the next season before it is possible definitely to fix the length and diameter

at which chanks attain maturity for the first time. The lowest diameter and approximate length fixed by Government for marketable size of chanks are 55 mm. and 107 mm. respectively;

- (v) the collection of chanks examined included a chank whose diameter was 105 mm. and length 200 mm. the largest size on record; and
- (vi) the changes that take place in the genital system of the chank as the breeding season advance were very interesting. The Research Assistant is writing a separate paper on this subject.

40. *Chanos farming*.—The reclamation of a portion of the swamp in the centre of the island for a marine fishfarm has been partly achieved during the year. A sub-pond 60 feet long, 25 feet broad and 4 feet deep was dug out, and a channel 575 feet long, 4 feet broad and 3 feet deep was cut to connect the pond with the sea. At the mouth of this channel in the sea, an improvised dike was built and a sluice gate constructed to allow water to flow in and out of the pond. This swamp fortunately reacted satisfactorily. During the flood tide, water flows in steadily and the sub-pond overflows filling the whole swamp with water to an area of 300 square yards and to a depth of one foot. When the water recedes during the ebb tide, the swamp is drained, but the sub-pond and the channel remain filled with water. The high tide brings into the pond and the swamp numerous fish fry, chiefly those of the milk-fish (*Chanos*) and mullets (*Mugil*). June and July are the months when these fry abound round the island. By keeping the sluice gate open during the high tide, these fry are allowed to enter the swamp but when the water recedes, the sluice gate is closed with a door of small-meshed wire-netting which allows the water to flow back but prevents the fry from escaping. By this means, more than 20,000 fry have been impounded in the farm. The fry are being reared to grow up to a fair size when they will be suitable for consumption. Sheep's offal is deposited periodically in suitable places in the pond and channel to form a food-chain of microscopical animal and plant communities, for the growing larvae. The food, rate of growth and the distinguishing characters of the larvae as they grow are being studied every week. The fry of the milk-fish which enters shallow creeks are at present simply netted and eaten as they are. The fry if allowed to grow in a sea-fed tank, will grow to one or two feet when they will be much more valuable for consumption. This demonstration farm for *Chanos* culture which is being developed is expected to help the fishermen in the coastal villages to copy this method of culture and improve his earnings.

41. *Rearing of Gambusia*.—The exotic larvicidal fish *Gambusia affinis* were reared throughout the year in two special ponds. The fish were fed twice a week with cooked fish. (Only 250 specimens of *Gambusia* were sold during the year for anti-malarial operations.)

42. *Museum*.—The following are the additions made during the year :—

Porifera ..	..	<i>Spirastrella inconstans</i> Dendy.
Corals ..	..	<i>Dendrophyllia aurea</i> (Q & V).
Crab ..	..	<i>Zebrida adamsii</i> (White) (found among the spines of the sea-urchin <i>Salmacis bicolor</i>).
Echinodermata ..	..	<i>Holothuria lubrica</i> (Salenka).
Mollusca..	..	<i>Fissurella</i> .
		<i>Emarginula</i> .
		<i>Xancus pyrum</i> (L) with egg capsule.
		<i>Conus figulinus</i> with egg capsule.
		Egg capsule of <i>Octopus</i> .
Pisces ..	..	<i>Carcharinus melanopterus</i> , embryo with placenta.
		<i>Zygaena blochii</i> , embryo with placenta.
		<i>Chiloscyllium indicum</i> with its egg-capsule.
		<i>Plotosus caninus</i> .
		<i>Exocætus bakiensis</i> .
		<i>Otolithus ruber</i> .
		<i>Elacate nigra</i> .
		<i>Periophthalmus schlosseri</i> .
		<i>Centriasus scutatus</i> .
		<i>Syngnathoides biaculeatus</i> .
Reptilia ..	..	<i>Dendrelaphis tristis</i> .
		Eggs and embryo of <i>Chelonia mydas</i> .

43. *Specimens supply*.—Specimens were sent to Ennur station for supply to colleges, etc. Two green turtles were sent to the Marine Aquarium, Madras, and one large green turtle to the Madras Club. Parasitic worms from fishes were supplied to Professor Dayal of the Lucknow University.

44. *Coconut plantation*.—The three years' lease granted to Janab K. S. M. Abdul Khader was terminated as he expressed his inability to pay the lease for the final year. The plantation was leased to Mr. M. S. Chinnavappa Rowther of Pamban for a period of three years from 1st January 1941.

45. *Fish lease*.—The right of using the shore of the Krusadai Island for catching fish was leased for one year to a fisherman Pakkiri.

46. *Fancy shell lease*.—The right of collecting fancy shells around Krusadai Island was leased for one year to Sri Purushotham Dhanji of Rameswaram.

47. *Visitors*.—The station attracted more than 500 visitors during the year. Of the visitors for scientific purposes, special mention may perhaps be made of Dr. A. W. Herre of the Fisheries Bureau of the United States of America in January 1941. He stayed in the island for two days and made a large collection of reef-fish and sea-snakes.

48. (iii) VIZAGAPATAM LABORATORY.—Specimens of common and economically important edible fishes continued to be collected but a systematic study and identification of the specimens could not be carried out during the year on account of pressure of work in the fish-curing yards.

49. (iv) MARINE AQUARIUM LABORATORY.—Specimens of frogs, sea-snakes, land and pond tortoises were supplied to Dr. A. W. Herre, PH.D., of Stanford University, California. About 500 specimens of sea-urchins (*Salmacis bicolor*) were preserved and sent to the Zoological Supply Section, Ennur, besides 220 other specimens of fishes, snakes, etc. Live specimens of freshwater aquarium fishes, viz., Gold Sword Tails, Silver Sword Tails and larvicidal fishes such as Barbadoes millions (*Lebistes reticulatus*) and small carps (*Barbus vittatus*) were supplied to a number of persons. The following fishes again bred this year:—

Xiphophorus helleri—“Gold Sword Tails.”

Xiphophorus brevis—“Silver Sword Tails.”

Lebistes reticulatus—“Guppy or Millions.”

50. (v) TUTICORIN LABORATORY.—Plankton was collected on the surface of Pullipundu and Tholayiram pars on a few days during the inspection of pearl banks and no pearl oyster spat was seen in any of the hauls collected. Identification of specimens of fish, chank-marking experiments, preservation and supply of marine specimens were carried out. Two rare specimens of fish, unknown to Tuticorin waters before, were identified, one as a large shark “*Lamna spallanzanii*” and the other as “*Nacus unicornis*.”

(b) Technological Research.

51. (i) FISHING METHODS.—The question of chartering a sea-going diesel-engined fishing boat of sufficient size to stand the monsoon for purposes of carrying on experiments in deep sea-fishing has been deferred on account of the difficulty in procuring such a boat at the present time.

52. (ii) TANUR EXPERIMENTAL STATION—*Future of the station*.—As a tentative measure, the Government ordered that the Sub-Assistant Director of Fisheries, West Coast, should be in direct control of the Tanur station. The whole question of the future of the station was under the consideration of Government at the close of the year.

53. Experiments on carbon-di-oxide as a preserving agent, prawn pickling, dry ice and fumigation with carbon-bisulphide could not be continued at the station during the year as the services of the Research Assistant were required at the Government Oil Factory, Calicut, in connexion with the manufacture of shark liver oil on a commercial scale.

54. *Experiments in pilchardising fish for long storage*.—The 1,035 lb. of mackerel cured and pickled for long storage according to the Canadian method and referred to in paragraph 60 of the

previous year's report are still in good condition. Arrangements are being made to sell the fish.

55. *Experiments with the drier.*—The drier continued to be in use for drying prawns during inclement weather.

56. *Experiments with glazed pots.*—The experiment with glazed jar was continued during the year, changing periodically the used brine obtained from the Tanur North fish-curing yard. Except for some blisters and a hair-like crack round the neck, the jar is in order and the glaze in tact.

57. *Vitamin survey of fish oils.*—The shark liver oil extracted at the station and the oil manufactured at the various fish-curing yards was tested for its vitamin potency at the station up to the 30th August 1940 when the Research Assistant was deputed to the Government Oil Factory, Calicut. The Tanur station now manufactures shark liver oil and sends it to the Government Oil Factory, Calicut, for further treatment. (During the year under report, a total quantity of 3,339 lb. of shark liver was treated at the station and 184 gallons, 4½ oz. of oil extracted and despatched to the Government Oil Factory.)

58. *Research on sea-weed manure.*—No appreciable improvement was noticed in the case of the six coconut trees manured with raw sea-weed. They are still in an unhealthy condition like the trees near by which were not treated with sea-weed.

59. *Research to lengthen the life of fishing craft and tackle.*—The 'Ascu' treated fence continued to be in good condition until it was blown off by the cyclone on the 26th May 1941.

60. *Purchase and manufacture.*—A total quantity of 11,821½ lb. of fresh fish costing Rs. 378-7-9 was purchased and cured during the year as against 25,206 lb. of fish costing Rs. 688-14-6 in the previous year. Twenty-five thousand three hundred and thirty-two pounds of fresh fish valued at Rs. 435-9-3 were treated for fish meal as against 106,404 lb. valued at Rs. 1,022-7-9 in the previous year. The total output for the year was 2,032 lb. of cured fish, 4,129 lb. fish meal, 912 lb. pink meal, 4,333½ lb. fish cake, 1,066 lb. fish bones, 3 gallons 2 bottles first-class oil, 1 gallon second-class oil and 32 gallons 2 bottles third-class oil valued at Rs. 1,226-14-2. The corresponding output for the previous year was 4,068 lb. cured fish, 14,358 lb. fish meal, 2,130 lb. pink meal, 21,344 lb. fish cake, 3,577 lb. fish bones, 2 gallons first-class oil, 1 gallon second-class oil, 68 gallons 1 bottle third-class oil and 22 gallons 4 bottles and 20 oz. of fish liver oil valued at Rs. 3,065-15-6.

61. *Sales.*—One thousand nine hundred and eighty-nine pounds of cured fish, 5,512 lb. of fish meal, 61 gallons 3 bottles of fish oil, and miscellaneous articles were sold for Rs. 2,365-2-0 during the year as against 4,775 lb. cured fish, 8,234 lb. fish meal, 44 gallons 4 bottles fish liver oil, 59 gallons fish oil and miscellaneous articles for Rs. 4,590-8-0 in the previous year.

62. *Stock*.—The year closed with a stock of 39 lb. small prawns, 3,795 lb. fish meal, 330 lb. pink meal, 6,296 lb. fish cake, 3,637 lb. fish bones, 47 gallons fish oil and 12 gallons of stearine as against 5 lb. small prawns, 14 lb. podimeen, 5,556 lb. fish meal, 7,502 lb. fish cake, 2,571 lb. fish bones, 123 gallons, 5 bottles fish oil and 6 gallons 5 bottles and 6 oz. of fish liver oil.

63. *Receipts and expenditure*.—The receipts during the year amounted to Rs. 2,569-12-0 as against Rs. 4,657-6-11 in the previous year. The expenditure, excluding the establishment charges of Rs. 2,159-7-0, amounted to Rs. 3,608-14-8 as against Rs. 6,244-2-11 in the previous year.

64. *Advertisement*.—The products of the station were, as usual, advertised in the Villagers' Calendar, the Commercial and Industrial Museums at Calicut and Mangalore, the Central Industrial Museum at Madras and the District Museum at Chittoor.

65. *Miscellaneous*.—The station suffered damage as a result of the disastrous cyclone of the 26th and 27th May 1941. Good bearing coconut trees were uprooted, zinc sheets of the roofing of the oil and guano shed were blown off; the dry thorn fence of the station and of the travellers' bungalow were completely destroyed and damage was caused to the buildings.

B. ADMINISTRATION.

(a) Public Fish-curing Yards.

66. The number of fish-curing yards at the beginning of the year was 105. The yard at Elathur was closed with effect from 1st June 1941 and no new yard was opened. Thus, at the close of the year, there were 104 yards in operation. Of these, 12 were in charge of Sub-Inspectors, 91 in charge of petty yard officers and one (private yard) in charge of a peon.

67. A report was submitted to Government during the year on the working of the yards in the northern and southern divisions of the East Coast. It was recommended that as the fish-curing yards are, and must continue to be, the mainstay of fish-liver oil production until the industry is handed over to private enterprise for further development, all the fish-curing yards working at a loss be continued for another year and that the question whether they should be retained or closed be reviewed after the end of this period. In G.O. Ms. No. 2734, Development, dated 29th November 1940, the Government observed that in view of the development of the fish oil industry, it was necessary to retain all the fish-curing yards on the East Coast for the present. They asked that the position be reviewed after a year and a report submitted to Government by the end of December 1941.

68. (i) **EAST COAST (NORTHERN DIVISION)**.—The number of fish-curing yards in this division continued to be 26. Proposals for opening yards at Suryaraopeta and Edupur did not materialize on account of the failure of the fishermen of the former place to secure

the site and of the President of the Edupur Fishermen Co-operative Society to furnish statistics of salt locally purchased for curing fish.

69. *Review of the chief coastal fisheries.*—The fishing season this year was satisfactory. The sardine fishery was specially successful and, the 109 villages for which statistics were collected, gave an estimated outturn of 109,475 maunds of fish valued at Rs. 2,69,201 against 83,576 maunds valued at Rs. 1,75,449 in the previous year. As usual, the fishery commenced in October and the season was at its peak in May and June. The ribbon fish fishery continued to be second in importance and gave an estimated yield of about 103,516 maunds valued at Rs. 2,39,395 against only 81,153 maunds valued at Rs. 2,09,355 in 1939-40. The Jew and Pomfret fisheries were poor whilst the white bait fishery gave a bumper yield.

70. *Transactions.*—The year under report was a favourable one for the fish-curing industry and there was a general increase in the quantity of fish cured in most of the yards. The total quantity of fresh fish brought into the yards in the Northern Circars was 221,941 maunds 6 seers, the salt issued for curing was 28,845 maunds 7 seers and the quantity of cured fish removed from the yards was 121,721 maunds 23 seers against 167,326 maunds 34 seers of fresh fish, 23,045 maunds 23 seers of salt and 91,864 maunds 37 seers of cured fish during the previous year. The fish brought into the yards represented about 43 per cent of the total catches against 38 per cent in 1939-40 and 30 per cent in 1938-39. The number of ticket holders at the beginning of the year was 1,053 and at the close of the year 925, the fall being due to the cancellation of the tickets of certain curers who went to Rangoon and did not resort to the yards for a long time. The curers who are curing outside the yards are being encouraged to resort to the yards.

71. *Supply of salt.*—The quantity of salt purchased and supplied to the yards was 600 maunds monopoly salt and 27,764 maunds excise salt against 3,888 maunds and 19,718 maunds respectively last year. (The rate paid for monopoly salt was As. 5 per maund whilst that for excise salt ranged from Re. 0-3-3 to Re. 0-8-3 per maund.) The increased rate paid for the excise salt was due to the wholesale destruction of salt by heavy rains in 1939-40, just at the manufacturing time. The small quantity of monopoly salt purchased was due to the shortage of salt in the Polavaram factory. The average cost of salt, including conveyance charges to the yards, worked out at Re. 0-9-4 per maund against Re. 0-7-7 per maund in 1939-40 and Re. 0-8-5 in 1938-39.

72. *Wastage of salt.*—There was no wastage of salt in the year under report.

73. *Balance of stock of salt.*—The stock of salt in the yards on 30th June 1941 was 1,614 maunds 8 seers against 2,095 maunds 15 seers on the 30th June 1940.

74. *Fence*.—Live fencing has become difficult on account of the destruction of prickly-pear by cochineal insects. Efforts are, however, being continued to plant fresh aloes and screw-pines in the yards where the fencings are weak. (Some yards, where the soil is swampy, are still without a good fence.) Such yards could not be provided with barbed wire fencing on account of the high cost of the wire. There was no necessity to provide concrete gate posts to any of the yards.

75. *Improvement to yards*.—The cost of petty construction and repair works carried out during the year amounted to Rs. 1,549-7-3 against Rs. 1,912-15-10 in 1939-40, Rs. 2,036-15-6 in 1938-39 and Rs. 3,045-10-4 in 1937-38. There has thus been a steady decrease since 1937-38.

76. *Fish-oil*.—A total quantity of 241 gallons and five bottles of fish-oil was manufactured during the year. The season when a large number of sharks could be caught was found to be from January to September and the largest catches occurred in May and June. A study of the conditions under which the fishing of sharks in the Northern Circars can most advantageously be conducted has revealed the possibilities of using long lines similar to those used in Palk Bay. These lines are proposed to be introduced as an experiment.

77. (ii) *EAST COAST (CENTRAL DIVISION)*.—There were nine yards in this division as in the previous years and all of them were in charge of petty yard officers.

78. *Review of the chief coastal fisheries*.—The fishing season was more favourable during the year under report than was the case in the previous year except in the centres under the jurisdiction of Kondoorpalayam yard in the Krishnapatam Circle. The important shoaling fishes that were common during the year were sardines, mackerel, ribbon fish, white-bait, pomfrets, and mullets. The prawn fishery was also equally important. Sardines were landed off Kadapakkam from October to February and in June, off Sattankuppam in March and off Pulianjerikuppam in November and from January to June. Mackerel was available off Kadapakkam and Nelaturpalayam from September to December, off Sattankuppam in April and September, off Pulianjerikuppam in September and June, and off Kondoorpalayam in February. Ribbon fish was available in Kadapakkam from July to February in Sattankuppam and Pulianjerikuppam from July to November, in Kondoorpalayam from September to November and in June in Kothapatnam from January to March and in Nellathurpalayam in December. Pomfrets appear in fair quantities off Pulianjerikuppam in July, September, October, January and May, off Kondoorpalayam from January to April and June, off Kothapatnam from January to March, and off Nelathurpalayam from January to June. Mulletts were netted off Mongodu, Medicalkuppam and Irakkam throughout the year, off Pulianjerikuppam in July,

September, December, January and June, off Kondoorpalayam in July, August, January, March and June and off Kothapatnam in November. Prawns were caught in fair quantities at Kadapakkam in July and December, in Mongodu, Medicalkuppam and Irakkam from January to March and at Pulianjerikuppam in July, August and from October to January. Besides these, two other shoaling fishes, viz., silver-bellies and white-bait were also available at Kadapakkam, the former at Kadapakkam in July and August and the latter from January to May at Kadapakkam and from September to April at Sattankuppam.

79. *Transactions.*—The total quantity of fresh fish brought to the yards was 37,913 maunds 26 seers, the quantity of salt issued was 5,955 maunds 10 seers and the quantity of cured fish removed from the yards was 21,838 maunds 10 seers. The corresponding figures for the previous year were 21,237 maunds 24 seers, 3,188 maunds 30 seers and 11,650 maunds and 12 seers respectively. In spite of private curing with swamp salt, there was a rise in transactions due chiefly to the attempts made to discourage private curing from the point of view of public health and general sanitation and the vigilance of the Salt department.

80. *Supply of salt.*—The total quantity of salt supplied to the nine fish-curing yards during the year was 5,970 maunds as against 3,350 maunds in the previous year. No monopoly salt was available and the entire quantity of salt purchased was, therefore, excise salt. (The rate paid per maund of salt and the transport charges remained the same as in the previous year, viz., two annas to four annas and one anna seven pies to two annas ten pies, respectively.)

81. *Wastage of salt.*—A wastage of seven maunds and seven seers of salt occurred at the Kothapatnam yard during the year due to long storage.

82. *Balance of stock of salt.*—The stock of salt in the yards at the close of the year was 951 maunds 37 seers as against 949 maunds 19 seers in the previous year.

83. *Transport of salt.*—As in the previous year, salt was transported to all the fish-curing yards by contractors. A second hand ten-ton boat was purchased during the year. Tenders will be invited for transporting salt by this boat to the yards in the Krishnapatam circle after the existing contract for supply by private boats expires.

84. *Fence.*—Barbed wire fencing could not be provided in the yards owing to want of funds and the prevailing abnormal conditions. Attempts are being made to raise a live fence and seeds of 'Korukappulli' have been supplied to the yards.

85. *Improvements to yards.*—No attempts were made to construct model sheds owing to lack of funds.

86. (iii) EAST COAST (SOUTHERN DIVISION).—The number of yards in this division continued to be 14, and all of them were in charge of petty yard officers.

87. *Review of the chief coastal fisheries.*—The fishing season during the year was better than in the previous year. Catches of soodai, chalai, parai and seer fish were poor. Nethali (white-bait) and hilsa were abundant in the Tanjore district. Sabre fish, cat-fish, mackerel, thondan, and kala were also available more especially in the Tanjore district. The catches of jew fish and mullet were good. Pomfrets were available both in the Tanjore and Tinnevely districts. Large numbers of flying fish, parla fish, sharks, rays and skates were caught. Miscellaneous small fishes were caught in plenty in the Tanjore, Ramnad and Tinnevely coasts.

88. *Transactions.*—The total quantity of fresh fish brought to the yards was 72,452 maunds 4 seers against 64,293 maunds 9 seers in the previous year. The quantity of salt issued was 14,968 maunds 30 seers against 14,268 maunds 28 seers last year. The weight of cured fish removed from the yards amounted to 50,529 maunds 2 seers against 46,595 maunds 33 seers in the previous year. Transactions in the yards at Tranquebar, Arcot Thurai, Point Calimere, Muthupet, Sethubavachathram, Nambuthalai, Attankarai, Mukkur and Sippikulam showed an increase over those of the previous year. Owing to adverse weather conditions and the generally poor season, there was a decrease in the transactions in the yards at Vanagiri, Adirampatnam, Punnakayal, Uvari and Idinthakarai.

89. *Supply of salt.*—A total quantity of 14,368 maunds of salt was supplied to all the yards from Neidavasal, Tranquebar, Vedaranyam, Adirampatnam, Vattanam, Morekulam, Keeranur and Tuticorin headquarter factories. The quantity supplied during the previous year was 15,108 maunds. The transport of salt to the yards at Mukkur Sippikulam, Uvari and Idinthakarai was effected from Tuticorin by boat and the charges for transport worked out to three annas seven pies, two annas eleven pies, five annas two pies and four annas three pies per maund respectively. The transport to the other yards was done by bullock cart and the charges ranged from eleven pies to five annas eight pies per maund.

90. *Wastage of salt.*—No wastage occurred during the year.

91. *Balance of stock of salt.*—The stock of salt in all the yards at the close of the year was 5,174 maunds 38 seers against 5,775 maunds 28 seers last year.

92. *Reforms in yards.*—There was no sea erosion during the year at Point Calimere, and the question of shifting the yard has not arisen as a slight increase in the transactions was noticed.

93. *Fence.*—Live fence in all the yards except Punnakayal and Sippikulam is effective. Live fence in the two yards mentioned does not thrive in the sandy soil. Seeds of palmyra were planted in the Sippikulam yard in order to form a fence, but this is not practicable in the yard at Punnakayal where the seeds when they sprout are likely to be washed away by floods.

94. *Miscellaneous*.—There was a fire in the Vanagiri fish-curing yard and the cadjan roofing of the petty yard officer's hut was burnt. It was renewed at a cost of Rs. 49-8-0. The usufructs of the palmyra and coconut trees in the yards were as usual leased out, an amount of Rs. 16-11-0. being realized against Rs. 18-8-0 in the previous year.

95. *Fish-oil*.—A quantity of 1,019 gallons four and a half bottles, i.e., 9,177 $\frac{3}{4}$ lb. of fish-oil was extracted during the year under report from 12 fish-curing yards and 5 oil-collecting centres. A total quantity of 33,877 lb. of fish-livers was purchased at a cost of Rs. 1,190-8-5. The total charges incurred amounted to Rs. 1,471-2-0.

96. (iv) WEST COAST DIVISION.—There were 56 fish-curing yards at the commencement of the year including the three private yards at Malpe, Padutonse and Kidiyur. The yard at Elathur was closed with effect from 1st June and so the number was reduced to 55 at the close of the year. Of these 55 yards, 12 are in charge of Sub-Inspectors, 42 in charge of petty yard officers and 1 (private yard) in charge of a peon.

97. *Yards newly opened or closed*.—The question of opening new yards at Punjavi, Tarapathy and Pallikere in South Kanara district and Edakkazhiyur in South Malabar is still under consideration. Proposals for opening yards at Kottikulam, Dharmadam and Kurichi were dropped. The District Health Officer, Malabar, objected to the opening of a yard at Kallai on grounds of public health. Proposals are under consideration for the opening of yards at Marwante, Mannur and Udinur Kadapuram in South Kanara district. There was no scope for reopening the Kaipamangalam yard, which was closed last year, and the Government ordered the closure of the yard permanently and the disposal of the site and building. The yard at Elathur which was working at a loss was closed as the curers did not deposit the security demanded of them.

98. *Review of the chief coastal fisheries*.—The oil sardine appeared all along the coasts of South Kanara and Malabar in South Kanara from August to December and in Malabar from July to March. (The maximum catch was at Gangoli where 101,967 maunds of the fish were caught during the season. Mackerel was fairly abundant in South Kanara almost throughout the year, whilst in Malabar the fishery was poor.) Cat-fish (*Arius spp.*) were caught throughout the South Kanara coast, except at Udayavar and Thaikadapuram. In Malabar, the fish occurred throughout the coast except at Azhicode, Cannanore, Edakkad and Meladi. The fishery, however, was not so good as last year. The chamban (*selar crumenophthalmus*) fishery was a failure in South Kanara the fish appearing only in small quantities off Kumbala, Adakathbail and Kasaragod, whilst in Malabar, the fish occurred almost throughout the coast though the catches were poor. Silver-bellies (mullan) appeared all

along the South Kanara coast, except at Kirimanjeshwar and Hungarcutta, from July to September. In Malabar, the fish appeared from July to October and from April to June. Sole (*Cynoglossus semifaciatus*) were caught all along the South Kanara coast except at Kirimanjeshwar and Gangoli. In Malabar they were present almost throughout the coast from August to December. The other important shoaling fishes occurring on the coast were prawns, appearing from July to March on the South Kanara and North Malabar coasts, and almost throughout the year in the southern section of Malabar. Chalamathi and Tholianmathi (*sardinella spp.*) occurred from July to April in South Kanara and from October to April in Malabar, and Thalayan (*Trichiurus*) appeared in July and September in South Kanara and from July to September and in March and June in Malabar.

99. *Transactions*.—The total quantity of fresh fish brought to the yards during the year was 930,432 maunds 19 seers, salt issued was 148,764 maunds 39 seers and cured fish removed 595,742 maunds 24 seers. The corresponding figures for the previous year were 1,119,958 maunds 31 seers fresh fish, 176,229 maunds 22 seers of salt and 720,856 maunds 10 seers of cured fish. The fall in transactions was due to the poor fishing season. In the South Kanara district there was an increase in the consumption of salt at Malpe I, Malpe II, Kidiyur, Udayavar, Moolky, Thannirbavi, Bekal and Hosdrug yards, which was due to better catches of mackerel in the jurisdiction of the first four yards, and cat-fish and small fish at the other yards. There was a heavy fall in transactions in the fish-curing yards of Malabar owing to the poor catches of shoaling fishes such as cat-fish, sardines, chamban, thalayan, mackerel, mullan and manthal. The only yards in Malabar where there was some increase in the consumption of salt were Madai, Badagara, Meladi and Quildandi. This was due to good catches of oil sardine, mackerel, sole and silver-bellies in the area.

100. *Systems of curing*.—In all the fish-curing yards in the Malabar district, only the local curing system is adopted. The concession to remove fish in a moist condition is being availed of by the curers. The use of bamboo flakes for drying fish does not find favour with them. In the South Kanara district the local system of curing is in vogue in all the yards. There were operations under the Colombo system at Kirimanjeshwar, Gangoli, Hungarcutta, Padutonse, Malpe I and Malpe II, Kidiyur and Udayavar yards and under the Ratnagiri system in all the yards mentioned above, except Padutonse and Kidiyur. A large quantity of fish was cured under the Colombo system during the year.

101. *Demonstration curing sheds*.—The demonstration curing sheds at the Malpe I and the Calicut North yards were used during the year for the extraction of shark-liver oil. No demonstration curing was conducted in any of them.

102. *Standard curing sheds.*—The number of standard curing sheds at the commencement of the year was 718. During the year 23 sheds were constructed and 14 cancelled, so that at the end of the year there were 727 standard curing sheds.

103. *Damage to yards.*—As the Hungarcutta yard was being encroached on by the sea a new site adjacent to the yard measuring 3.71 acres was acquired at a cost of Rs. 3,897-10-3 and taken over from the Revenue Department on 19th April 1941. There was a sudden inundation of the sea at the Vadanapalli yard on 17th May 1941, and the salt bags in stock were, therefore, transferred to a temporary shed which was constructed near the staff quarters. As a result of the heavy rains and cyclone of the 26th May 1941 all the buildings in this yard collapsed, the fence was blown down and a number of coconut trees were uprooted. A few of the furniture and store articles were damaged and a quantity of 24 seers of salt which was in the measuring tray was lost. The cyclone also caused slight damages such as blowing away of tiles and portions of fence in the Parappanangadi, Tanur North and Pudiakadapuram yards in the Central section and in all the yards in the Southern section, except Ponnani, Puduponnani, Kootayi and Paravanna. An additional store shed at Puduponnani also collapsed as a result of the cyclone. A few curing sheds in the Pudiakadapuram yard also suffered substantial damage. Owing to the unusually heavy rains of the 9th June and consequent accumulation and rush of water into the salt store sheds, 207 salt bags at the Tellicherry yard got wet and suffered wastage, which was subsequently ascertained to be 121 maunds 24 seers. The fence of this yard was slightly damaged by sea erosion. The rains and wind destroyed portions of the fence at Mattool and Badagara yards. On account of sea erosion the fence on the western side of the Madakara yard was washed away.

104. *Supply of salt.*—A total quantity of 159,200 maunds of salt was transported to the West Coast from Tuticorin during the year as against 175,920 maunds in the previous year. At Moolky, there was depletion of salt from 8th December to 9th December and approximately 60 maunds of salt would have been consumed had there been salt in the yard. There was no depletion of salt in any other yard.

105. *Supply of salt to other institutions.*—The following institutions were supplied with salt as noted below :—

		Maunds.	Seers.
Sub-Jail, Mangalore	.. ..	36	0
Central Jail, Cannanore	.. ..	300	0
Mental Hospital, Calicut	.. ..	130	0
Sub-Jail, Calicut	.. ..	42	0
Tanur Experimental station	.. ..	10	0
Fisheries schools	.. ..	0	5
		<hr/>	<hr/>
Total	.. ..	518	5
		<hr/>	<hr/>

Thirty-seven seers of salt were utilized for preserving shark liver oil sediment.

106. *Wastage of salt.*—There was a wastage of 107 maunds 5 seers of salt during the year as against 266 maunds 10 seers last year. Of this wastage, 79 maunds 39 seers was caused by the sinking of a boat-load of salt at Kasaragod. Ninety-five maunds 25 seers of the wastage was disposed of during the year and the balance of 11 maunds 20 seers remained to be written off at the end of the year. The flood and cyclone were responsible for the wastage of 121 maunds 24 seers at the Tellicherry yard and 24 seers at the Vadanapalli yard. But as these were ascertained only in July 1941 they are not shown in the accounts of the year.

107. *Balance stock of salt.*—The stock of salt remaining in the fish-curing yards and salt gollahs on the West Coast at the end of the year was 183,600 maunds 31 seers as against 173,781 maunds 36 seers in the previous year.

108. *Improvements to yards.*—A new kutchra store shed to store about 4,000 bags of salt was constructed during the year in the Malpe I yard. It is expected that this will obviate the necessity for transport of salt by rail to this yard from Tuticorin during the early part of the fishing season when transport by sea is impossible. The additional store sheds sanctioned for the Kootayi and the Mannalamkunnu yards are under construction by the Public Works Department. The question of providing additional store sheds at Kumbla, Thalayi and Badagara is under consideration. Three wells were sunk during the year at the Pudiakadapuram, Blangad and Kootayi yards. The office building of the Inspector of Fisheries, Chowghat, which was taken over from the district board, was repaired at a cost of Rs. 373 during the year.

109. *Miscellaneous—Pit manure.*—The sale-proceeds from brine manure collected in the pits at Malpe I yard amounted to Rs. 170 against Rs. 66 in the previous year.

110. *Fence.*—Experiments in growing live fence with Korakapulli were continued. At Bokkapatnam and Kumbla, the plants are thriving well, whilst at Manjeshwar the experiment failed. In most of the yards in the Central section, the plants are thriving fairly well, but in the Southern section yards, the plants are not growing satisfactorily in spite of the best care. The cactus planted at Kumbla, Ullal, Baikampadi, Hosabettu and Malpe are thriving well.

111. *Departmental salt factory on the West Coast.*—The experiments on the manufacture of salt so far carried out have been only on a laboratory scale and cannot be considered as final. The economics of salt manufacture at Payyanur can only be determined by conducting further experiments in order to test the length of the season, the rate of crystallization, the frequency with which the bitters have to be emptied out, the cost of production and the suitability of the soil with regard to percolation. Manufacture

for a full season is necessary in order to yield sufficiently reliable data on the above points. The cost of conducting further experiments for a full season of five months has been estimated at Rs. 700. Before undertaking further experiments for a full season, it was considered desirable to determine what would be the approximate capital expenditure involved in the establishment of a factory at Payyanur and this has been estimated roughly at Rs. 40,000 for a factory of the size required for manufacturing from one and a half to two lakhs of maunds of salt, the annual average requirements of the West Coast yards. Statistics have been collected with a view to comparing the charges for conveyance of salt from the Payyanur factory to the several fish-curing yards on the West Coast, both by rail and sea, with those of conveying salt from Tuticorin to these yards by both means of transport. It was found that the charges for transporting salt either by sea or rail from Payyanur to the West Coast yards would be more than the charges on the transport of salt from Tuticorin for the reason that the cost of transport from the Payyanur factory to the ship-side and to the Payyanur railway station are high and that there is practically no difference between the schooner freight from Tuticorin to the West Coast yards and from Payyanur to those yards. The scheme was of course proposed on the presumption that the transport charges either by rail or sea would be much lower than the charges incurred on the conveyance of salt from such a long distance as Tuticorin and before proceeding further it will have to be examined whether the rail and sea rates from Payyanur are capable of revision and reduction. Enquiries have therefore been instituted of the Chief Commercial Superintendent, South Indian Railway, as to whether special rates of freight could be quoted for the transport of salt from Elimala railway station near Payyanur to the stations nearest to the several fish-curing yards on the West Coast. The question whether there is any prospect of bringing down the transport charges by sea from Payyanur to these yards is also under investigation.

112. *Private curing*.—Seventy maunds of bazaar salt were used for curing 400 maunds of fish at Vadanapalli yard in June 1941, as the yard was not functioning after the cyclone disaster. About 200 maunds of nethel (*stolephorus*) at Beypore South and 2,000 maunds of prawns at Pudiakadapuram are reported to have been dried for edible purposes.

113. *Fish-oil*.—The manufacture of shark liver oil was undertaken at 43 fish-curing yards and one school on the West Coast. It was discontinued in the Moolky and the Kirimanjeshwar yards as the cost of production was found excessive. Three thousand one hundred and ninety-nine gallons, three bottles and nine and a half ounces of oil were manufactured at a cost of Rs. 8,692-8-11 and sent to the Kerala Soap Institute for purification and blending. The Tellicherry yard manufactured the largest quantity of oil, namely, 314 gallons 12 oz. during the year. (The introduction of

the manufacture of shark liver oil appears to have improved the lot of the fishermen to an appreciable extent. Long line fishing for sharks is becoming increasingly popular among the fishermen. A leading fisherman at Pallikere in South Kanara who owned seven long line fishing boats last year has now 21 such boats. He has been supplying shark liver regularly to the neighbouring Bekal yard which is one of the best-oil-extraction centres on the West Coast.

114. *Levy of licence fees by Gangoli Panchayat Board.*—The Gangoli Panchayat Board in the South Kanara district levied a licence fee of Rs. 10 per annum on fish-curing yards and Rs. 5 per annum in respect of private store houses of fish. The Board justified the levy of licence fees in excess of the amount fixed in the rule issued with G.O. No. 1883, P.H., dated 28th September 1927, on the ground that the words 'on such units' in section 212 (2) of the Madras Local Boards Act, 1920, give ample discretion to the local board. The matter was brought to the notice of Government who informed the Panchayat Board that the rule issued with G.O. No. 1883, P.H., dated 28th September 1927, lays down in clear terms that the fee for any licence should not exceed the limits mentioned therein and that it was not open to the panchayat to charge a higher fee for any increase than the maximum fixed in that rule. In order to remove any doubts as to the scope of the rule in question and to amplify the rule suitably so that all the operations carried on in a public fish-curing yard, including the production of fish liver oil, are subject to a single maximum fee, the Government issued (in G.O. No. 2711, P.H., dated 28th June 1941), the necessary amendments to the rule issued with the Government Order, dated 28th September 1927.

(b) Private Oil and Guano Factories.

115. In the South Kanara district, 163 factories worked during the year against 28 in the previous year. About 300 tons of oil and 1,178 tons of guano were manufactured as against 22 tons of oil and 50 tons of guano produced in the previous year. The increased output was due to better catches of oil sardines on the coast. The price of oil ranged from Rs. 140 to Rs. 340 per ton and that of guano from Rs. 20 to Rs. 50 per ton. One thousand three hundred and forty-five tons of beach-dried manure were produced during the year, the price of which varied from Rs. 20 to Rs. 70 per ton.

116. In Malabar, 40 factories worked during the year against 41 in the previous year, producing about 151 tons of oil and 878 tons of guano. The quantities of oil and guano produced in the previous year were 76 and 355 tons respectively. Only about 56 tons of beach-dried manure was manufactured during the year as against 2,365 tons in the previous year. The price of oil ranged from Rs. 150 to Rs. 400 per ton and that of guano from Rs. 40 to Rs. 60 per ton. Beach-dried manure was sold at Rs. 12 to Rs. 30

per ton. The increase in output of oil and guano was the result of better catches of oil sardine. The remarkable decrease in the quantity of beach-dried manure produced was due to the scarcity of chamban (*Selar crumenophthalmus*) nethal (*Stolephorus*) and mackerel.

II. MINOR AND MARINE ESTUARINE FISHERIES.

A. Prawns.

117. No investigation on the prawn fishery of the Kollair lake was carried out during the year under review.

B. Edible Oysters.

118. (i) OYSTER SUPPLY.—Throughout the year under review, oysters were supplied from the Ennur oyster beds. The total number of oysters supplied during the year was 49,350 as compared with 45,846 in the previous year. The sale-proceeds amounted to Rs. 1,000-8-0 as against Rs. 764-0-8 in the previous year.

119. (ii) SHELL LEASE.—The right to collect dead 'matti' shells for lime burning from the Ennur oyster beds was leased out for a year from 1st August 1940 for Rs. 357 and that from the Pulicat oyster farm for one year from 1st December 1940 for Rs. 155.

III. INLAND FISHERIES.

A. Research.

120. (i) RESEARCH ON RURAL PISCICULTURE.—The Imperial Council of Agricultural Research has sanctioned the scheme of rural pisciculture and the Government of Madras have sanctioned the employment of the necessary staff with effect from 1st September 1941 for work connected with the scheme. Arrangements are in progress for the construction of the necessary buildings.

121. (ii) DEEP-WATER FISHING EXPERIMENT.—The lessees of the fisheries in the Mopad reservoir failed to take advantage of the facilities offered by the department and little fishing worth the name was done. The second instalment of rental was not paid and therefore the lease was cancelled. Unprecedented rains filled the tank to its maximum level which rose to 29 feet in September and October 1939, the lowest level being 14 feet in July and August 1940. For want of adequate staff no fishing could be done by the department. At Mettur, however, experiments were continued with the available canoes and coracles. Systematic fishing with long-lines and drift nets were conducted every night in different localities to test their comparative effectiveness. The experiments so far carried out indicate that with the cotton 'Oosavalai' good results could not be expected. A speedy power boat for accelerating encircling movements might increase the catches. The experiments yielded a total catch of 1,250 lb. of fish from which a sum of Rs. 73-1-8 was realised. One big *catla catla*, weighing nine lb. and measuring 29 inches long and nine inches high, was caught in the course of one of the experiments conducted since the close of the year.

122. (iii) FISH-BREEDING—*Avalanche hatchery for trout.*—The Avalanche hatchery was worked as usual during the year by the Nilgiri Game Association and had a satisfactory season. Five thousand six hundred and forty-five fish and 22,000 thoroughly fertilized ova from the Mukerti were put out into the rivers. Thirty thousand fry were hatched out and put into the fry ponds at the hatchery early in the year for next season's restocking. The fry are doing well.

123. *Introduction of mirror carp into the Nilgiri waters.*—The fish are thriving well in the crescentic pond at the Government Botanical Gardens, Ootacamund, though as the pond is rather shallow it has been found to be too small for the normal growth of the fish. In fact the fish have already outgrown the pond and the question of their transfer to a more suitable pond in Sim's Park, Coonoor, is pending improvements to the latter pond. An estimate for Rs. 3,130 has been sanctioned and the Public Works Department have been advised of the necessity for carrying out the improvements without delay.

124. *Revival of the scheme for rural pisciculture.*—In G.O. Ms. No. 581, Development, dated the 22nd March 1941, the Government approved the scheme for the popularisation of Gourami fish in rural areas by demonstrating the operations and results by actually stocking six selected tanks in the Tanjore district with Gourami and Catla fish. The scheme has been sanctioned for a period of three years from the 1st April 1941 with a staff of one assistant inspector, one fisherman and six watchmen. The following six ponds have been selected for the demonstration: (i) Aye-kolam, Kumbakonam Municipality, (ii) Senkulam, Mannargudi Municipality, (iii) Eechankulam, Negapatam Municipality, (iv) Tanjore West Moat, Tanjore Municipality, (v) Thatchenkulam, Tiruturaipundi Panchayat Board, (vi) Sakkedikulam, Adirampatnam Panchayat Board. The ponds are being drained, cleared of silt to eradicate all predaceous fish such as murrel, eel, cat fish, etc., and other undesirable matter preparatory to stocking them with fish.

125. *Hilsa hatchery.*—The hatchery at Bobbarlanka was worked from 27th September to 24th October. Though a number of males with milt were available, 'oozing' females were rare. The males were mostly small in size ranging from 11½ to 14 inches and the females were large, the sizes ranging from 15 to 21 inches. On 11th October, one 'oozing' female was obtained at 5 p.m. and at 5-20 p.m. a male with milt was obtained. The eggs stripped from the fish were fertilized on the spot in the river and the fertilised eggs were placed in the jar at 6-20 p.m. and they were hatched at 8 a.m. the next day. About 110,000 hatched fry were liberated in the Godavari river at some distance above the Maddur anicut.

126. *Hilsa marking experiments.*—On the data obtained in the previous year on the occurrence of Hilsa in the various rivers, proposals for marking experiments with those caught in the sea with

a view to studying their migratory movements, growth, etc., have been drawn up. Owing to war conditions, suitable marking tags could not be obtained from abroad. Attempts to secure celluloid tags locally have not been successful.

127. *Gourami* continued to thrive and breed well in the Sunkesula Fish Farm. At the Ippur Fish Farm, the fact that the fish breeds well under protected conditions has been proved beyond doubt. The Assistant Director (Inland) netted the protected pond in the farm on the 25th January and found a number of fish ranging in size from $2\frac{1}{2}$ inches to 23 inches. With the bringing in of some more ponds for the culture of this fish, the Ippur farm should serve as an additional centre for the fry of gourami for distribution to provincialised tanks in the neighbourhood. In the Vellore Fort Moat, the gourami section was damaged during the last floods and water is being pumped out with a view to clearing the section of all predaceous fish prior to restocking it with the fish for cultural operations. As stated in the previous year's report, 100 gourami were released into the Mettur reservoir in April 1940 and their appearance or capture has not been noticed. The capture of this fish from the reservoir has been prohibited under the orders of Government. Gourami introduced into the Chetput farm are thriving well. Two hundred and sixteen more fingerlings were put into the long pond in the old Brickfields at Chetput on 22nd November 1940 in order to study the breeding and other habits of this fish, as well as to meet the demand of the public. The fish in the ponds in Guindy Park are thriving satisfactorily. In the irrigation well at Mopad, the fish has not bred because of lack of facilities to build nests and weeds for food. Earthen pots planted with grass and ceretophyllum and water lilies have been sunk at a suitable depth with due consideration to the penetration of sun light on the sides of the pond. This, it is hoped, will improve the conditions of breeding. The fish are growing well in the experimental pond at Satyavedu. Proposals to extend the experiment to another pond are under consideration.

128. *Catla*.—This fish has established itself in the whole of the Cauvery river system and the connected tanks. A garden tank in the premises of the Annamalai University was stocked with this fish which are reported to have grown to a good size and a demand has been made by the garden superintendent for a further supply of a thousand fish. There has been no sign of the fish having bred in the Sathiavedu spring pond. On account of the severe drought, four fish died, but subsequent casualty was arrested by the prompt removal of the thick growth of weeds in the pond which brought the pH of the water to a favourable range.

129. *Etroplus*.—This fish is thriving well in all the fish farms, particularly at Sunkesula and Ippur, the out-put of fry of which is being used in stocking the various provincialised waters.

130. *Mulletts*.—*Mugil cephalus* and *Mugil dussumeria*.—The species of mullets that grow to a fairly large size and are susceptible of acclimatization in fresh water, were used for stocking operations. The results of the experiments are being watched.

131. *Chanos chanos*—*Milk fish*.—The fish brought from Krusadai Island and introduced into the pond at Ippur, referred to in paragraph 147 of the report for 1939–40 are thriving well and showing satisfactory growth. A sluice in the Kodi tank in the Coondapur taluk of the South Kanara district has been constructed to permit of the free flow of tidal water with a view to conserving and protecting the valuable milk fish found in the tank.

B. Administration.

132. (i) FISH FARMS—*Sunkesula*.—The farm continued to work satisfactorily. Five tanks were stocked each with a hundred *Etroplus* obtained from this farm. Experiments with a view to the determination of the rate of growth of Gourami were undertaken. Forty fry of six inch size introduced in stock pond number 1 on 4th December 1939 showed an average size of 10 inches on 13th November 1940. A marked disparity was noticed in the crop of Gourami between pond number 1 and pond number 2, the output in the latter being only a fourth of the former. On investigation it was found that the temperatures and pH value (hydrogen-ion-concentration) differed in these two ponds. There was noticed also about a foot of silt in pond number 2 of decaying organic matter. The pond was drained completely and the silt removed before refilling the pond and this improved the pH value. The draining of the two ponds afforded an opportunity of measuring all the fish in them and the data collected show that (i) the males are larger than the females, (ii) the majority size of the males is round 13 inches and of the females round 12 inches in length, (iii) the proportion of males to females is in the ratio of 40 to 60 in pond number 2 and 55 to 45 in pond number 1, (iv) there were two broods of young ones with a majority size of seven inches and the other of three inches, the former seem to be one year old and the latter six months old. In view of the fact that it is essential for the person in charge to have a knowledge of pisciculture, Government agreed in G.O. Ms. No. 2589, Development, dated 8th November 1940, to the retention of the post of assistant inspector for the supervision of the farm.

133. *Ippur fish farm*.—In G.O. Ms. No. 2310, Development, dated 27th September 1940, the Government approved the proposal to retain this farm with a staff of one assistant inspector, one fieldman and four menials. Gourami is breeding well here. Other varieties of fish such as *Etroplus*, Mulletts, *Chanos* are also under culture. *Etroplus* has bred very well and arrangements have been made for the systematic stocking of the low ponds with this fish so that they may be sold to advantage in summer when fish are scarce.

134. *Mopad stocking centre.*—The Mopad reservoir was stocked during the year with 2,780 fingerlings of Catla brought from Nidadavole and Samalkot. Two of the abandoned ponds have been used after slight repairs for the stocking of Labeo and Gourami and Etroplus. The staff assisted the fishery lessees in deep water fishing experiments, but, on account of the inexperience of, and to some extent also to the indifference exhibited by, the lessees the catches were poor: practically no fishing being done for the major part of the year. A total of 9,250 fry of mullets collected from Thummalapenta near Kavali was used for stocking tanks in the Kavali and Kandukur taluks. Two tanks in the Kanigiri taluk were stocked with 136 fingerlings of Labeo collected from the reservoir.

135. *Vellore Fort Moat Fish Farm.*—The fort moat has been stocked with a large number of larvicidal fish and with a good number of food fish, viz., Etroplus and Gourami. The fisheries in the moat except in section B were leased out to Abdul Khudus Sahib of Vellore for a period of three years ending with 30th August 1943. The Government did not consider that any portion of the Vellore Fort belongs to the Central Government by virtue of its having been used by the Central Government immediately before 1st April 1937, except the church which was used by the Ecclesiastical Department. The question of improvements to the fort moat was again raised. The Director of Public Health wrote to Government recommending measures to reduce the nuisance due to mosquitoes. The measures recommended were that (i) the edge of water touching the outerwall of the moat should be kept clean wherever scrub and grass are found growing. This will necessitate the removal of earth which has come down between the crevices in particular places; (ii) the south-east corner of the moat which is only partially dry should be either completely filled up to a level at least one foot or one foot six inches above the maximum level of water leaving a stone-lined channel for carrying the water from the inlet, or be fully excavated to the same depth as the bed of the moat on either side. As an alternative to the above, it was suggested that a broad and deep drain sufficiently deep to provide for silting for some years should be cut through the middle of the south-east corner of the moat thus connecting the water on either side. The Chief Engineer, Public Works Department whom the Government consulted in the matter, was of the opinion that the alternative proposal was the cheaper one and that it could be carried out at a cost of about Rs. 2,000. When the trench is constructed and filled with water, it will be heavily stocked every year with larvicidal fish so that the area may not afford a breeding place for mosquito larvae.

136. *Chingleput Fort Moat Fish Farm.*—The Catla introduced into the moat in 1939 were sold and a sum of Rs. 125 was realized. Proposals have been approved for deepening two of the sections of the moat. The moat was stocked with larvicidal fish as an

anti-malarial measure. Regular collections of fingerlings of Carp were made from the Palar and distributed to the provincialized waters in the district.

137. *Chetput Brickfields Fish Farm.*—Catla, Gourami and Etroplus are stocked in the long pond in this farm and the fry of Catla received from Samaikot were kept in the pond before their despatch elsewhere. The circular pond continued to be utilized by the Public Health department for experiments on Cyclopæcidal fish with a view to combating guinea worm disease. Chanos introduced into the farm last year have grown. With the commencement of work on rural pisciculture under the scheme sanctioned by the Imperial Council of Agricultural Research this farm should develop into one of great importance.

138. *Mettur Fish Farm.*—The fish ponds have not yet been made ready as their leaky condition still remains to be remedied. Trials made by the Public Works department to remedy the defects in one pond by the application of non-erodable cement plaster to the beds and slopes of the bund did not produce satisfactory results and observations revealed a leakage of water from the pond. The shade and fruit trees planted on the bunds of the ponds are thriving well.

139. *Patrolling the Mettur reservoir.*—The engine of the coble "Pinctada" which used to be employed on patrol work in the reservoir went out of order and the launch could not be used for want of spare parts required for the engine. Since the introduction of the system of licensing the fishery in the reservoir, patrol work has become important. The object of conservancy below the Stanley Dam and the development of the fishery in the reservoir is to improve the fisheries of the Cauvery lower down and to revive the rental to its original level. That this object is being achieved is evident from the increased rentals forthcoming in most instances, though this is not always a criterion as the rentals are liable to be kept down by combination.

140. *Poaching.*—Thirty-three cases of poaching in the Mettur reservoir were charge-sheeted during the year, of which 31 ended in conviction. The value of the fish confiscated amounted to Rs. 208-2-6. The total amount of fines realized by the court in the cases convicted was Rs. 518.

141. *Licensing of fishing in the Mettur reservoir.*—During the year under report, a total of 564 licences for fishing in the reservoir was issued out of which 151 were new ones, the rest consisting of renewals. A sum of Rs. 1,270-4-0 was realized from the licences. Coracles plying in the reservoir for purposes other than fishing do not fall within the scope of the rule-making power under section 6 (4) of the Indian Fisheries Act and consequently no licence can be prescribed for such coracles under this Act. But, it was found desirable to provide against these coracles poaching under the guise of carrying passenger. It was, therefore, decided that a

system of free permits should be introduced and that coracles, boats, etc., used for purposes other than fishing, including those plying in the ferry limits managed by the district board should be granted free permits by the department. Accordingly, the Government approved the draft form of permit and the conditions under which the permits should be issued. They also directed that the coracles should be classified under three heads, viz., (a) ferry, (b) public transport, and (c) private use, and that the permits in each case should be printed on a paper of different colour. The question of dealing with offenders who persist in plying their coracles even after their permits have been cancelled in accordance with the conditions under which they are issued for violation of any of the conditions of the permit, is under consideration.

142. *Stocking of the Mettur reservoir.*—One thousand eight hundred and seventeen fingerlings of Catla from Samalkot have been put into the reservoir. It was reported that ripe adult Catla now ascend the river from below the Hogainakall falls in large numbers, when the river is in floods due to the height of the fall having been reduced consequent on the rise of the water level in the reservoir after the construction of the dam, the fish using the three natural falls as "fish passes." The stranded fish below the dam were scared down by two men dragging a rope along the bed of the channel preceded by two men casting a kind of net known "Kallu valai" and many fish, including all adults and about 80 per cent of the young, descended. This successful device experimented on during the year should enable stranded fish to be rescued when sluices are closed suddenly.

143. *Fish identification.*—Various kinds of fish available both in the Cauvery river and in the Nilgiris were identified and preserved specimens have been exhibited in the museum, which also contains specimens obtained from Tanur, Tuticorin and Ennore. These exhibits are becoming popular with visitors.

144. (ii) *PERIYAR SCHEME.*—The proposal to open a fish farm in the Suranganar valley and to provincialize the waters of the Periyar system, with the object of augmenting the supply of fish food to the people in the rural areas of the Madura district though a desirable one, did not appear to satisfy the standard of imperative and immediate necessity. The question was, therefore, dropped.

145. (iii) *NILGIRI FISHERIES.*—The Ootacamund lake, which affords free sport to the visitors to Ootacamund, was watched and two cases were detected of poaching in the lake. The two cases ended in the conviction of the accused who were fined Rs. 20 in one case and Rs. 5 in the other. The fisheries of the Moyar and Bhavani were patrolled by the watchers at Sundapatti. One case was detected and charge-sheeted. On the question of the recovery from the Nilgiri Game Association of fees realized from licences issued for coarse fishing in the Moyar and Bhavani rivers, referred to in paragraph 167 of the previous year's report, the Government

declined to grant to the association a remission of ten per cent of the licence fees and ordered the recovery of the arrears due from the association for the years 1927-28 to 1939-40 amounting to Rs. 364 in three annual instalments. The first instalment of the recovery was effected during the year under report. As regards the regular recovery in future of licence fees due from the association, the Government accepted the suggestion of the Collector of the Nilgiris that the existing practice should be continued.

146. *Conservancy of Moyar fisheries.*—The fisheries in the Moyar were guarded by the two watchers appointed by Government for patrol work. The "Ladapetta" tree, the bark of which is used by the villagers for killing fish referred to in paragraph 168 of the previous year's report, was identified by the Forest Botanist of the Forest Research Institute, Dehra Dun, as "*Laciosiphon eriocephalus*." The Director of the University Botany Laboratory, Madras, states that this is a powerful vesicant and that the leaves and bark are acrid and poisonous and are frequently used to poison fish. Instructions have been issued, since the close of the year, to the departmental staff to prosecute the villagers who resort to the practice of poisoning the water by the use of the bark of this tree.

147. (iv) GOVERNMENT HOUSE PONDS, GUINDY.—Gourami introduced into the two ponds have been thriving well. The three ponds, viz., Duck's pond, Kathankoil tank and Velacheri tank, were stocked with fry of Catla during the year. Water lilies, lotus and other weeds planted as food for the Gourami were consumed rapidly by the fish and had, therefore, to be replenished. Summer shade screens were also provided as usual.

C. Stocking Operations and Results.

148. (i) STOCKING OPERATIONS.—Catla were stocked in the waters mentioned below during the period from August to November:—

	Number of fish.
(i) Mettur reservoir	1,817
(ii) Coleroon river at Lower Anicut	694
(iii) Dusimamandur tank	851
(iv) Cauvery river at Grand Anicut	689
(v) " " at Bhavani	594
(vi) Mopad reservoir	2,780
(vii) Attigunta tank, Nellore	409
(viii) Ippur fish farm	145
(ix) Vellore Fort moat farm	1,952
(x) Chingleput Fort moat farm	715
(xi) Willingdon reservoir	800
(xii) Tippapalayam tank	504
(xiii) Madurantakam tank	235
(xiv) Government House ponds at Guindy	80

In addition to the above with a view to augmenting the fish food supply in the Ceded districts where fresh fish is scarce, provincialized tanks there were stocked with 500 Catla.

149. Catla collected from the Edurur swamp were introduced into the following tanks :—

(i) Nandyal tank ..	140	(iv) Kamalapuram ..	200
(ii) Daroji tank ..	100	(v) Markapur ..	100
(iii) Venkatapuram ..	100		

Seven gentlemen and institutions were also supplied with fingerlings of this fish.

150. Catla collecting operations were commenced at Nidadavolu on the Godavari on the 7th August and continued until the 25th October when fry became scarce. Conditions at this place were not found favourable as most of the pools and puddles from where the fish were caught were so full of water that fishermen experienced difficulty in using the drag nets on account of the depth. As a result of an extensive survey conducted by the Inspector of Fisheries, Vizagapatam, with a view to finding prolific collection grounds of this fish, one was located at Samalkot. Work commenced here on the 28th August and continued until the 19th November. It was noticed that a number of spawnings occurred in a year whenever there were rains and even as late as the middle of November when the size of the fish was about six inches, there were always small ones about two to three inches mixed up with large ones. The cost of collection was also noticed to be less here than at Nidadavolu. The total fry collected from both the places during the year was 17,083 against 10,103 during the previous year, and the number of fry put into the provincialized waters was 12,465 during the year, as against 7,247 in the previous year.

151. *Provincialization of river fisheries.*—In regard to the provincialization of the fisheries of the Godavari, Kistna and Tungabhadra rivers, reports were received from the Collectors of Bellary, West Godavari, East Godavari, Guntur, Kurnool and Kistna. All the Collectors stated that they were unable to trace the origin of the existing practice under which free fishing is allowed in these rivers, but they differed on the question as to whether having regard to the existing practice, the State could control the fisheries in the rivers by a system of lease. A report was submitted to Government in which it was pointed out that fisheries have been a source of Government revenue from the earliest dates traceable. In 1864, the transfer of fishery rents to local funds was sanctioned as an inducement to local authorities to protect and cultivate the fisheries. Finding that this hope had not been realized and in view of the fact that the development of the fisheries must be in the hands of expert officers of the Fisheries Department, the Government adopted the policy of gradually acquiring the fisheries of all the important tanks and rivers from local bodies. Since the grant of the fishery rentals by Government to the local bodies was an act of grace on the part of the Government and since the district boards had no concern

whatever either with the upkeep of the rivers or the conservancy of the fisheries, there should be no injury to these funds in resuming the grant on payment of compensation. Thus the fisheries of the Cauvery and Coleroon rivers began to be re-acquired. These rivers pass mostly through populous plains in low lying districts where there are several important towns, the presence of which contributed to the progressively substantial revenue from these fisheries. In the case of the Godavari and Kistna rivers, the conditions are different. These rivers run through hills and poorly inhabited forest tracts, especially in the upper reaches. The small villages on the banks of these rivers are few and far between; the fishing population among them are still fewer and their fishing tackle are quite primitive. Fishing would appear to have been resorted to only as a subsidiary occupation during the off season mostly for individual consumption. Facilities for easy transport of fish to distant places where good prices could be secured have also been lacking. Owing to all these causes the fisheries of the Godavari and Kistna rivers were not exploited either by the fishermen themselves or by the capitalists, as is the case in those of the Cauvery and Coleroon rivers in the south. Hilsa is one of the important fisheries of the main rivers. The departmental working of the Hilsa hatchery from 1926 at Bezwada and from 1934 at Bobberlanka and the liberating of the hatched fry of this fish in successful years, indicates that the yield from these rivers might be expected to be substantial. Carps and exotic fish such as Gourami, Etroplus, etc., could also be stocked in the rivers and by conservancy, observance of "close time" and prevention of indiscriminate destruction of immature fry, it should be possible to increase the fish food supply in the waters. Better and up to date methods of fishing, which would incidentally improve the economic condition of the fishing folk could be demonstrated. If improved means of transport were introduced, facilities would be afforded for the disposal of fish at distant markets where a considerable demand could be anticipated. If the Government were satisfied from the opinion of their legal advisers that no prescriptive rights to the fishery could be established against the Crown and if, after discussion with the authorities of His Exalted Highness the Nizam's Government in regard to defining the area of the fishing portions in the rivers, a reasonable arrangement could be arrived at, it was concluded that there did not appear to be any serious obstacle in the Government controlling the fisheries by a system of lease. It was suggested that, as a first step, the Government should issue a notification under section 6 (4) of the Indian Fisheries Act of 1897, as amended by the Madras Act II of 1929, prohibiting fishing in the Kistna and Godavari rivers up to the limit to which the rivers lie within the confines of the Provincial Government and that, if, after negotiations with the Government of His Exalted Highness the Nizam, an arrangement be arrived at, the notification could be extended to the Tungabhadra and other sections of the other two rivers, viz., the Kistna and Godavari beyond the border.

152. *Fishing stakes in the Sankaraguptam drain.*—The Collector of East Godavari reported to the Board of Revenue that it was unnecessary and undesirable to interfere with the existing system of fishing in the Sankaraguptam drain and suggested that stakes and traps might be regularized by entry in village accounts of the traps that are found at particular positions in the villages and that thereafter any increase in the number of such traps or any change in their structure could be prohibited. The Board approved these proposals and asked the Collector to take action accordingly.

153. *Fisheries of Kollair lake.*—The question of controlling the fisheries of the Kollair lake with the object of developing them engaged the attention of the Fisheries department so far back as 1913, when at the instance of the late Mr. H. C. Wilson, the Government ordered that basket traps, etc., should be prohibited in public waters. The proposal to regulate the fishery in the lake by leasing channels and pools in the lake in order to eliminate fixed engines such as "Kattus" which cause undue destruction of fish, it was suggested to the Board of Revenue, would enable fishing to be controlled in the important pools and channels within the lake. The Board has called for a further detailed report from the Collectors of Kistna and Godavari as to the extent to which a right to fish freely without payment has been actually enjoyed and whether the validity of the custom is denied only in respect of the particular forms and methods of fishing or in respect generally of the right of fishing without special permission on payment. The Board considered that a more precise survey of the present position and future possibilities of the fishery in the Kollair lake would be necessary and that a change could not be recommended unless it could be clearly shown that something is intended to be done which would increase the fish output without decreasing the present earnings of fishermen. The reports of the Collectors of Kistna and West Godavari on these points have been received since the close of the year and are under consideration.

154. (ii) *SALE OF FISHERIES.*—There were no bids for the fishery of the Valamadugu and Paraval items of the Viranam tank in the South Arcot district in the first two sales and the amount of the highest bid at the third sale was less than the annual compensation and the average revenue. As collusion and combination on the part of the bidders was indicated and as a fourth sale was not likely to prove successful, the sanction of the Board of Revenue was sought, and accorded, for the fishing departmentally of the tank, as, by so doing, the combination among the bidders in future auctions might be broken, whilst an opportunity would be afforded to the department to gain a first hand knowledge of the income that could be derived from the fishery in question. Owing to the high water level in the tank, difficulties were experienced in carrying out fishing operations and, as a special case, the Public

Works Department allowed the water in the tank to be depleted in order to facilitate fishing operations. But, in spite of this concession, the catches were not satisfactory.

155. The power of granting the right to lease the fisheries in provincialized waters delegated to the Collectors was exercised by the Collector of Trichinopoly in the case of the fisheries of the Cauvery, Coleroon and Ullar rivers.

156. (iii) DISPOSAL OF FISHERIES BY PRIVATE TENDERS.—The fisheries in six of the provincialized waters were leased out without bringing them to auction, in five cases to the local panchayat boards, and in the other case to a private individual.

157. (iv) FISHERY RENTALS.—The income from Inland fisheries increased from Rs. 81,123-15-9 in the previous year to Rs. 86,386-15-1 in the year under report.

IV. CROWN MONOPOLIES (PEARL AND CHANK FISHERIES).

A. Research.

158. (i) PEARL OYSTER.—Fourteen pearl oysters (both big and small) were collected from divers who found the oysters attached to the chanks fished by them. During the inspection of the pearl banks lying in the extreme south off the coast from Tuticorin to Cape Comorin, 53 pearl oysters were fished. In all, therefore, 67 pearl oysters were collected of which 21 live oysters were transferred to Krusadai Island for experimental purposes. During the inspection of the pearl banks, plankton was collected and the dominant organisms found were as follows:—Leucifer, Copepods, Ctenophores, Ceratium, and Spadella. Among phytoplankton, Trichodesmium alone was dominant.

159. (ii) CHANK MARKING EXPERIMENTS.—Four hundred and thirty-two chanks were marked and liberated during the year as against 484 during the previous year. The beds on which these chanks were liberated are noted below:—

Name of bed.	Depth in fathoms.	Numbers marked on chanks.	Total.
Passi par	9	F. 552 to F. 576	25
Neelankalpathu	11	F. 577 to F. 624	48
Pulipundu par	9	F. 625 to F. 671	47
Vada Onpathu	9	F. 672 to F. 725	54
Vadaalipathu	10	F. 726 to F. 775	
		F. 851	
		F. 853 to F. 855	
		F. 873	
		F. 881 to F. 882	
		F. 893 to F. 897	
		F. 901	84
		F. 903 to F. 907	
		F. 909 to F. 917	
		F. 919	
		F. 921	
		F. 922	
		F. 924 to F. 927	

Name of bed.	Depth in fathoms.	Numbers marked on chanks.	Total
Melaonpathu	10	F. 776 to F. 850 F. 852 F. 856 to F. 872 F. 874 to F. 880 F. 883 F. 885 F. 887 to F. 888 F. 890 to F. 892	107
Aluvapar	9	F. 884 F. 886 F. 889 F. 898 to F. 900 F. 902 F. 908 F. 918 F. 920 F. 923 F. 928 to F. 930	14
Kilavan par	8½	F. 931 to F. 983	53
		Total	432

During the year, 38 marked chanks were refished against 63 marked chanks during the previous year. Thirty-six of these refished chanks were returned to the sea for further growth. The two remaining chanks could not be returned to the sea as the flesh from them had been inadvertently extracted by the fishermen. The total number of chanks marked and liberated from the commencement of the experiments in 1931-32 is 4,132 of which 209 have so far been refished.

160. Information in regard to the migration and rate of growth of the 38 refished chanks is given in Appendix I. It will be seen therefrom that the chanks marked D. 712 and E. 949 showed the maximum rate of growth in length, viz., .82 mm. per month, and chank No. F. 342 showed the maximum rate of growth in diameter, viz., .64 mm. per month. Chank No. F. 551 had travelled the longest distance, namely, six miles in 9 months and 29 days. The marked chanks were refished from the bed on which they were liberated.

161. (iii) DIVING EXPERIMENTS.—No experiments were conducted during the year under review.

B. Administration.

162. (i) ROUTINE INSPECTION OF PEARL BANKS.—The banks lying in the extreme south off the coast from Tuticorin to Cape Comorin were inspected. In all, 49 banks were inspected and there was no spat fall in any of the banks examined. Since the cycle of barren years still continues, the prospects of a pearl fishery appear to be remote. Only eleven pearl oysters were fished on the Tholayiram par south end, central section and north end. There was no change in the faunistic condition of the banks. The

inspection was conducted for 19 days in all, i.e., from 19th to 29th March and from 3rd to 9th April 1941. The "Lady Nicholson" was in commission throughout the above periods. A few pearl banks left uninspected were also examined on the 21st and 22nd April 1941 with the aid of the "Sea Scout."

163. (ii) TINNEVELLY CHANK FISHERY.—During the 1940-41 season 436,625 chanks, including 682 from Idinthakarai and Uvari, were fished as against 539,662 during the previous season.

164. *Recruitment of divers.*—Three dhonies from Kilakarai with 58 divers took part in the fishery. Divers from Periapatnam, Vedalai and Pamban hired canoes at Tuticorin for the fishery. The number of boats which participated in the fishery was 30 (three dhonies and 27 canoes) against 24 boats (two dhonies and 22 canoes) in the previous fishery. One hundred and ninety-four divers enlisted themselves as against 167 during the previous year, and of these 58 were from Kilakarai, 30 from Periapatnam and 12 from other places in Ramnad and the rest were local divers of whom 51 were Bharathars, 16 Valayans, 15 Pallas, six Muhammadans, five Arabs and one Malayalee.

165. *Advance to divers.*—The amount outstanding with the divers at the beginning of the year was Rs. 96-9-0. During the season a sum of Rs. 300 was advanced to the divers making a total advance recoverable Rs. 396-9-0. A sum of Rs. 268-2-0 was recovered from them during the year. A sum of Rs. 2 was written off during the year as it was found to be irrecoverable. Thus, the balance outstanding at the close of the year was Rs. 126-7-0.

166. *Boat loan to divers.*—The amount outstanding with the sammatties at the beginning of the season was Rs. 106. No fresh loan was issued to sammatties during the year. A sum of Rs. 27 was recovered from them during the year. The amount still outstanding with the sammatties at the close of the year was Rs. 79.

167. *Quarters for divers.*—The divers brought from outside were accommodated in the old Police lines and the Armoury building as usual.

168. *Rate per chank.*—There was no change in the rate paid for chanks which continued to be one anna per chank.

169. *Fishery operations.*—The fishery commenced on 30th October 1940 and closed on 23rd May 1941. On 134 days the boats went out to sea as during the previous year. Adverse weather conditions prevented fishing on 44 days and Sundays and holidays accounted for 28 days. The largest catch made by an individual diver on any one day was 290 against 248 in the previous season. The average earning per head for the total number of working days and for the whole period of the fishery was Rs. 1-9-8 and Re. 1-0-8 as against Rs. 2-5-6 and Rs. 1-10-7, respectively during the previous season.

170. *Accident at sea.*—On the 14th December 1940 when divers were fishing chanks in the Siluvaikarai par in nine and a half fathoms depth, diver Sinthathurai Fernando of Tuticorin did not come up. When a search was made, he was found lying dead at the bottom of the sea.

171. *Inspection of chank beds.*—Twenty chank beds were buoyed during the year for fishing. Their names and the number of chanks fished from each of them are given in Appendix II.

172. In the previous season, Vadakalpathu, Melonbathu-Janathu and Athonbathu pars yielded the maximum number of chanks, whereas the beds at Melonbathu, Vadaithundan, Melakilathi, Janathu and Siluvai yielded the maximum number during the year under report.

173. *Immature shells.*—Out of 34,465 undersized shells brought ashore inadvertently by the divers, 20,965 were returned alive to the sea. The corresponding numbers for the previous year were 26,132 and 18,179 shells respectively.

174. *Idinthakarai and Uvari chanks.*—Six hundred and six chanks from Idinthakarai and 76 from Uvari were collected from fishing nets as against 178 during the previous year.

175. *Catches.*—Statistics of catches made during the three years ending with the year under report are given below:—

	1938-39.	1939-40.	1940-41.
Full-sized	363,980	539,662	436,625
Under-sized	6,457	7,987	13,509
Wormed	36,578	58,224	47,882

176. *Temperance.*—As usual, tea, coffee and rice kanji were sold to divers within the premises of the chank godown with a view to preventing them from resorting to toddy shops.

177. *Sale of chanks.*—Chanks of the season 1938-39 were taken complete delivery of by the purchasers. Tenders were invited for the disposal of the 1939-40 season chanks. The offer of Messrs. K. T. M. T. M. Abdul Kayoom Sahib Hussain Sahib of Kilakarai was accepted and they have remitted the third instalment and taken delivery of 100,000 full-sized, 1,475 under-sized and 10,800 wormed shells so far. The Government have permitted them to complete payment of the balance due and to take delivery of the shells on or before 31st December 1941 without interest and godown rent. Tenders have been invited for the chanks of the 1940-41 season.

178. (iii) **RAMNAD CHANK FISHERY.**—In G.O. Ms. No. 1188 (16-S), Development, dated 30th June 1941, the Government decided to take the lease of the chank fisheries off the coast of Ramnad belonging to the Ramnad Estate for a period of five years commencing on and from the 1st July 1941. Arrangements were immediately made to work the fishery departmentally.

179. (iv) OTHER CHANK FISHERIES.—Tenders were invited for the lease of the chank fisheries in the Tanjore, South Arcot, Chingleput and Nellore districts, for three years from 1st July 1941. The lease was granted to Janab M. K. Shumsudeen Maricair of Pondicherry.

V. BIOLOGICAL SPECIMEN SUPPLY.

180. The Zoological Supply Station, Ennur, continued to meet the constant demand for the supply of ordinary specimens for the study of Natural Science and for special zoological specimens of scientific interest from almost all the leading educational institutions throughout India. Mounted exhibits in glass museum jars were supplied to a number of educational institutions for developing school museums. The total value of specimens supplied amounted to Rs. 2,609-8-0 as against Rs. 2,474-4-0 in the previous year.

181. The station continued to be self-supporting, in the year under report and in fact the operations yielded a profit of Rs. 47-4-11 the expenditure during the year amounting to Rs. 2,774-9-1 and the receipts to Rs. 2,821-14-0.

182. *Oyster shell-grit*.—This by-product industry at the station continued to be popular with the owners of poultry farms throughout India, orders being received from such distant places as Calcutta and Jubbulpore. About 3,408 lb. of grit were sold during the year and a sum of Rs. 184-6-0 was realized as against 6,000 lb. sold and Rs. 302-8-0 realized during the previous year.

183. The products of the station were exhibited at public exhibitions including those held in Tinnevely and Trichur. A gold medal was awarded by the Trichur Exhibition authorities for the exhibits of the station. Some interesting and instructive exhibits prepared at the station were assigned as permanent exhibits of this department to the Malabar District Museum, Calicut, and to the Mettur Fishery Station.

184. The experiment on the breeding of gold fish was successful and by the sale of young ones a sum of Rs. 28 was realized.

VI. ANTI-MALARIAL WORK.

185. The fort-moats at Vellore and Chingleput were as usual stocked heavily with larvicidal fish in order to prevent the mosquito nuisance. At the request of the District Forest Officer and Collector of Salem, some of the water areas of the Kollimalai and Pachamalai were inspected by the Assistant Director of Fisheries (Inland) with a view to stocking them with larvicides suitable for culture in high altitudes and detailed technical advice was given indicating where such fish were available for stocking, etc.

186. In G.O. Ms. No. 2053, Development, dated 30th August 1940, the Government sanctioned the proposal of the Chief Conservator of Forests to depute two forest guards for training in fish

farming at the Sunkesula fish farm, Kurnool district. The two forest guards reported themselves for training on the 15th October 1940 to the Assistant Inspector of Fisheries in charge of the farm who gave them the necessary training.

187. An enquiry was received from the municipality of Gaya asking for advice in regard to the introduction of anti-larvæ fishes in the municipal tanks of Gaya and this was supplied. Subsequently the Construction Engineer of the municipality asked for the supply of 500 larvicidal fish as an experimental measure. But he was informed that on account of the very long distance the fish would have to travel from Madras to Gaya, it would be better for him to arrange for a supply from Calcutta. It was also suggested that the two sacred tanks mentioned by him might be stocked with Catla or Labeo, both of which could be procured from Calcutta or Rajbari.

188. In reply to an enquiry, the Commissioner of the Cocanada Municipality was informed that as larvicidal fish are surface feeders they are not likely to cause any serious disturbances to the gelatinous filtering layer of filter beds.

189. Larvicidal fish for stocking purposes were supplied to the President of the Kedur Panchayat Board (South Arcot district) and to Mrs. Chambers, Chromepet.

VII. SOCIO-ECONOMIC WORK.

A. Education.

190. (i) WEST COAST—(a) *Village schools*.—There were 43 schools at the beginning of the year. Two new schools were opened during the period under review, one at Udayawar West and the other at Ajanur in South Kanara district. Thus at the close of the year, there were 45 fisheries schools.

191. In G.O. Ms. No. 583, Development, dated 22nd March 1941, the Government sanctioned the proposal to take over the management of the school at Yerumal (South Kanara district) with effect from 1st June 1941. But, the District Educational Officer was of the opinion that a separate school for fisher children in the locality was not necessary although the proposal was based on the recommendation of the officers of the Education Department; the school could not be opened and the matter is under the consideration of Government. A deputation of the representatives of the fishermen community of the West Coast waited on the Second Adviser to His Excellency the Governor on the 18th November 1940 and represented, among other things, that fisheries schools should be opened in certain places in Malabar and South Kanara. The need for schools in these centres is under investigation. Standard VII was opened in the school at Vellayil. The opening of the VI Standard in the school at Palapatty was sanctioned and the new standard was opened on 9th July 1941. Standard IV was also opened in the school at Ajanur.

192. *Strength*.—The number of pupils undergoing instruction in the schools was 5,894 (3,655 boys and 2,239 girls) at the beginning and 6,099 (3,718 boys and 2,381 girls) at the end of the year showing an increase of 205 pupils. Had it not been for the disastrous cyclone in South Malabar and the consequent distress among the fisherfolk, which reduced the strength of the schools in the area, the total number of pupils under instruction in the schools would have been greater. The schools at Ajanur, Kumbala and Hejmadikodi in South Kanara, and Kavvayi, Quilandy and Parappanangadi in Malabar showed marked improvement in strength. The number of teachers employed in the schools was 182 at the beginning and 183 at the end of the year.

193. *Conductresses*.—Conductresses continued to be employed in the schools at Vekkode, Kaipamangalam, Mannalamkunnu, Palapatty, Veliangode, Puduponnani, Puthenkadapuram, Naduvattam and Kannankadavu schools. In the Kundazhiyur and Kadavanad schools, conductresses were appointed during the year. The employment of conductresses has been beneficial to the schools, as they not only use their influence to persuade the parents to send their children to school regularly, but also take the children to school.

194. *Scheme of studies*.—The Director of Public Instruction has issued instructions that the teaching of English should begin only in Standard IV and that teachers with qualifications lower than those of a secondary grade trained teacher's certificate should not be permitted to teach the subject. Under rule 12 (3) of the Rules for Recognition issued in G.O. No. 1903, Education, dated the 21st August 1939, every headmaster appointed after 1st October 1939 to any school with standard V as the highest and with four or five teachers should hold a trained teacher's certificate of the secondary grade. It was, therefore, suggested that the teaching of English in Fisheries schools might be continued in complete lower elementary schools with not less than 10 pupils in standard V, which have higher elementary schools in the neighbourhood. The Government in G.O. Ms. No. 1167, Development, dated 28th June 1941, approved the suggestion, and sanctioned the conversion of seven posts of higher elementary grade teachers into an equal number of posts of secondary grade teachers for teaching English and for employment as headmasters.

195. (ii) EAST COAST—*Fisheries Technological Institute*.—The Bharatha Mahajana Sangham reported that the Sangham and the leaders of the Bharatha community having provided 15 scholarships in place of the Rs. 10,000 offered by them in 1933 for a building, they were not in a position to make any further financial contribution to the institute. Mr. J. L. P. Roche Victoria, M.L.A., offered to pay Rs. 1,500 immediately and another sum of Rs. 1,500 a year later towards the building. But, in G.O. Ms. No. 1971, Development, dated 21st August 1940, the Government stated that they

were not prepared to open the Institute until the Bharatha Mahajana Sangham provided a permanent building for housing the Institute free of cost to the Government. When I visited Tuticorin in September, Mr. Roche Victoria and the Secretary of the Bharatha Mahajana Sangham met and discussed with me the question, in the course of which, they suggested that, if, instead of starting the Institute in the island buildings, a building could be put up on a site in the mainland, the sum of Rs. 1,500 offered by Mr. Roche Victoria and which was immediately available could be utilised for this purpose. The suggestion to locate the institute on the mainland was accepted, but the site selected for the location of the institute was not available as the Police Department were unable to see their way to part with it. In consultation with the Collector of Tinnevely, an alternative site was selected and this was approved by Government, who have ordered its transfer to the Department of Industries and Commerce for use as the site of a school building for the Fisheries Technological Institute, Tuticorin. The Bharatha Mahajana Sangham has been asked to take up the construction of the building and complete it within a period of two months. Since the close of the year, the foundation stone of the building has been laid and the work is in progress.

196. (iii) MARINE AQUARIUM.—The Aquarium continued to be popular and attracted a total number of 118,383 visitors as compared with 106,289 in the previous year. The record attendance was, as usual, on the Kannu Pongal Day, when there were 3,079 visitors, as against 3,113 in the previous year. The number of visitors on the Vaikunta Ekadasi day, another important day for visitors, was only 884 against 1,333 last year. The daily average attendance was 324.33 which shows an increase of 11.4 per cent. As many as 102 batches of school children visited the Aquarium against 71 last year. Of these, 26 batches of 1,386 children were from the Corporation and aided schools within the City and were admitted free of charge and 76 batches of 3,188 children were admitted at the usual concession rates. The total number of children both boys and girls who visited the Aquarium during the year was 4,574 against 3,234 that of last year.

197. *Receipts*.—The gate collections rose from Rs. 8,058-10-0 to Rs. 9,072-14-0. The sale of books and picture post cards and miscellaneous receipts amounted to Rs. 212-7-0 as against Rs. 266-8-0 last year.

198. The land in Block No. 45, R.S. No. 3364 of Triplicane C. 0-2-1685 square feet on which the Aquarium restaurant stands and the adjoining land was handed over to the Revenue Department on 7th June 1941 in accordance with the orders issued in G.O. Ms. No. 1147, Revenue, dated 19th May 1941, and consequently the rentals from the lessee from this date will be collected by that department. Nevertheless the total receipts during the year amounted to Rs. 10,198-10-0 as against Rs. 9,666-2-0 in the previous year, whilst the total expenditure was Rs. 6,419-0-5

in the year under report as against Rs. 6,840-0-3 last year. There was thus an excess of receipts over expenditure of Rs. 3,779-9-7 as compared with Rs. 2,826-1-9 in the previous year.

199. *Items of interest.*—(i) Two edible turtles (*Chelonia mydas*) received from Krusadai Island were added to the Turtle pond.

(ii) Whirligig beetles (*Dinentes*) along with larvicidal fishes were exhibited.

(iii) The Monitor Lizard, *Varanus salvator*, which was obtained from Ceylon through the courtesy of the Ceylon Marine Biologist was exhibited from 7th June 1940 to 4th January 1941 when it died. The lizard was an attractive exhibit. It was fed on fish, frogs, fowl entrails, fowl eggs and rats. The dead specimen was presented to the Government Museum, Madras.

(iv) The receipt of the following gifts are hereby acknowledged with thanks :—

(i) Miss Amy Carmichael of Dohnavur, Tinnevely—	
<i>Panchax lineatus</i>	3
<i>Etrophus maculatus</i>	4
(ii) Sri V. Tiruvengada Mudaliar, Retired Auditor, Post and Telegraphs, Rangoon— <i>Mollienisia</i> (Black mollies)	3
(iii) Health Officer, Madras Corporation— <i>Gambusia</i> <i>affinis</i>	100

(v) Certain experiments were conducted with a model aerator for exhibiting live jelly fishes. One jelly fish lived for over four days. An apparatus to exhibit live jelly fishes in the hall is under contemplation.

(vi) Revival of gold-fish culture. When the Public Works Department repaired the roofing of the Aquarium they closed the openings which were made directly above the central gold-fish pond. The adverse effect of this on the gold fish was not then anticipated. As sun light and rain water were not available, the gold fish did not thrive. The openings have since been provided again and a pair of gold fish were released into the central pond on 24th June 1941.

200. *Some interesting observations made in the Aquarium.*—

(i) There were two cases of parturition in the Aquarium during the year. In December 1940 a gravid Electric Ray (*Astrape diptergia*) gave birth to eight young ones. But before 12-30 a.m. next day, all the young ones died because certain young squeaking Perches (*Therapon sp.*) kept in the same tank tore away the yolk-sacs of the young ones before they could be absorbed.

(ii) In February 1941, a nine inch Rock cod (*Epinephelus salmoides*) caught hold of a Puffer-fish (*Tetrodon fluviatilis*) and was trying to swallow it with its tail in and head out. The other fishes in the tank attacked the Rock cod which was not able to swallow

the Puffer-fish as it had expanded its stomach into a globe. In the meantime a Sucker-fish tried to snatch the Puffer-fish and succeeded in its attempt but it was also not able to swallow it. The other fishes in the tank attacked the Sucker-fish but it did not give in. The Laboratory Assistant fearing that he might lose two fishes instead of one had the *Tetrodon* removed, and it was found to be dead. This explains why the Puffer-fish enlarges its stomach as a means of escape when an enemy attempts to swallow it.

(iii) A gravid sea-snake (*Enhydrina valakadian*) was bought in May 1941 and it gave birth to seven babies. The young ones were found swimming head down and tails up and were of grey colour with dark bands. They were fed on very tiny bits of prawns and small bits of fishes but they hardly seemed to get a bite as there are several adult snakes in the tank. Between 28th June and 21st July 1941, five of the young ones died. Two are still alive.

(iv) A specimen of the shell-fish "Beggar's Bowl" (*Melo indica*) nearly 1½ feet in girth lived in one of the tanks for over a fortnight, from 16th June to 1st July 1941. Occasionally it crawled on to the glass sheet of the tank with its broad foot applied to the glass and this afforded great amusement to the visitors.

201. *Miscellaneous*.—G.O. Ms. No. 3166, Revenue, dated 20th December 1940, communicated to the Director of Industries and Commerce in Development Endorsement No. 481-D/41-C, dated 7th January 1941, has exempted the Aquarium from the Madras Entertainment Tax Act, 1939, under section 8 (2).

202. As a measure of economy the post of a peon was retrenched from 12th June 1941 in accordance with G.O. No. 1153, Development, dated 26th June 1941.

203. There were many distinguished visitors to the Aquarium during the year including His Excellency Lord Linlithgow, Viceroy of India, and His Excellency Sir Arthur Hope, Governor of Madras, and Lady Hope.

B. Co-operative Societies.

204. (i) WEST COAST.—(a) *South Kanara*.—The 19 societies that existed in the district at the close of the previous year continued to function throughout the year under report. No new society was started. The application of the Punjabi Fish Curers' Co-operative Society referred to in paragraph 226 of last year's report is still under consideration as the proposed fish-curing yard at the locality has not yet been sanctioned.

205. *Members and paid-up share capital*.—During the year under report, 109 members were admitted and 64 members were removed. A sum of Rs. 2,919-15-0 was collected towards share capital and Rs. 1,715 was paid off as against Rs. 1,360-9-0 collected and Rs. 558-11-0 paid off during the previous year. Thus at the end of the year, there were 886 members with a paid-up share capital of Rs. 15,021.

206. *Deposits and borrowings—Deposits*—Fixed deposits amounting to Rs. 643 were received during the year under report in four societies and an amount of Rs. 270 was paid off. Thus at the end of the year the deposits of the four societies amounted to Rs. 996-11-0 as against Rs. 623-11-0 at the end of the previous year. Monthly deposits amounting to Rs. 37-8-0 were received and an amount of Rs. 50-12-0 was paid off in the Utchil Bovis' Co-operative Society leaving Rs. 66-15-0 with the society as against Rs. 89-4-0 at the end of the previous year. In the Coondapoor Kharvis' Thrift Co-operative Society anna fund deposits amounting to Re. 1-6-0 were received and an amount of Rs. 33-7-0 was paid off, leaving with the fund Rs. 140-2-0 as against Rs. 172-3-0 at the close of the previous year.

207. *Borrowings*.—Ten of the societies were indebted to the South Kanara Central Co-operative Bank to the extent of Rs. 9,119 at the beginning of the year. During the year, eight societies borrowed in all Rs. 9,759 and a sum of Rs. 7,123 was repaid. Hence, at the end of the year, 11 societies owed to the bank Rs. 11,750. Of this amount, Rs. 1,904 was overdue from two of the societies as against Rs. 3,453 overdue at the end of the previous year from four societies. As in the previous year no interest was overdue to the Central Bank at the end of the year under report.

208. *Loans to members*.—An amount of Rs. 17,182-9-0 was issued as loans to members and an amount of Rs. 13,179-4-0 was collected, as against Rs. 13,807-8-0 issued and Rs. 9,768-9-0 collected during the previous year. The purposes for which loans were granted during the year are noted below:—

	RS.	A.	P.
Prior debts	6,051	8	0
Boats and nets	3,693	6	0
Trade	1,488	0	0
Rice and other necessaries of life	4,947	2	0
Buildings, etc.	678	0	0
Others	324	9	0
Total ..	17,182	9	0

At the end of the year a sum of Rs. 40,639-7-0 was outstanding against members. Of this amount, Rs. 15,454-6-0 was overdue. Amounts outstanding and overdue at the end of the previous year were Rs. 36,636-2-0 and Rs. 15,214-3-0 respectively. There was an increase in the collections and a decrease in the percentage of overdues in spite of the poor catches. Overdues in three of the societies alone amounted to Rs. 9,534-2-0, which was due to amounts being locked up in the hands of leading and influential members, the apathy of the members and the poor fishing season.

209. *Investments*.—The reserve funds of 16 societies amounted at the end of the year to Rs. 9,701-14-0 of which Rs. 4,100 has been invested in the South Kanara Central Co-operative Bank,

Mangalore, the financing bank of the district. An amount of Rs. 191-4-0 was invested during the year as against Rs. 234-11-0 in the previous year. Five of the societies have invested their entire reserve fund. The uninvested reserve fund is made use of by the societies as working capital. Fifteen societies have affiliated themselves to the financing bank of the district, one affiliating during the year. In this way a sum of Rs. 490 has been invested in that bank. The amount of cash-balances of 12 societies invested in separate savings bank accounts was Rs. 840-11-0 at the end of the year. The Ajanur Fishermen Co-operative Society, the Uchil Bovis' Co-operative Society and the Coondapoor Kharvis' Thrift Society had at the end of the year Rs. 200, Rs. 45 and Rs. 100 respectively as fixed deposits in the South Kanara Central Co-operative Bank, Mangalore. The Nileshwar Fishermen Co-operative Society owed the Kanhangad Fishermen Co-operative Society, Rs. 427 on account of loans of certain members transferred to it from the latter society.

210. *Non-credit work.*—For the better working of the fishermen co-operative societies and for the social and economic improvements of the fisherfolk, it is necessary that the societies should establish themselves in the place of fish merchants and supply the industrial and domestic needs of the members and pool and sell the fish caught by them. If this is done profits that are being taken away by the middlemen would accrue to the fishermen themselves and enable them to improve their economic condition. Generally loans in societies should be disbursed only to those who are prepared to sell their catches through their societies. During the year under report, rice, paddy and yarn were purchased by the Kanhangad, Ajanur, Kasaragod and Kadangot Bovis' societies and distributed to their members. The total cost of the purchases, including conveyance charges, amounted to Rs. 2,418-5-0 and the approximate financial benefit derived by members to Rs. 111-6-0. Of a total of 421 muras of rice purchased, as much as 386 muras costing Rs. 2,161-3-0 were purchased from the Mangalore and Kasaragod branches of the South Kanara Agriculturists' Co-operative Wholesale Society, Puttur.

211. The Ajanur and Kanhangad Fishermen Societies collected 242,880 lb. fish and sold it for the sum of Rs. 1,411-1-0. Of this a sum of Rs. 1,162-2-0 was distributed to the supplier members after deducting charges and the supplier members benefited to the extent of Rs. 343. These transactions have not only benefited the members, but also facilitated collections of their dues to the societies thus enabling the societies in their turn to pay off their dues to the Central Bank. The Ajanur society supplied the members of the Keekan Tobacco Growers' Society with fish worth Rs. 94-8-0 for the cultivation of tobacco. Thus, these societies sold their produce to a society and purchased their requirement from a society and forged an admirable co-operative link, which, if maintained and strengthened may be expected to achieve good results. In the Nileshwar, Kanhangad and Ajanur societies, loans were issued

generally to such of the members as would sell their catches through their respective societies. The Registrar of Co-operative Societies with the President of the South Kanara Central Co-operative Bank, visited the Ajanur Fishermen Society on the 14th March and met several of the members. The Registrar was satisfied with the working of the society, and as suggested by him, a scheme for the better working of the fishermen co-operative societies has been drawn up. Some of the essential features of the scheme are (i) wholesale purchase of the domestic and industrial requirements of the members for distribution among them, (ii) pooling the catches of fish of members with a view to selling them, either fresh, cured or converted into manure, through the societies, (iii) opening depots in outside markets for marketing cured products and (iv) introduction of deep sea fishing with a view to the increased production of shark-liver oil.

212. *General.*—The petty yard officers of the Bekal and Adakathabail fish curing yards are the ex officio secretaries of the Bekal and Kasuragod Fishermen Co-operative Societies, respectively. The headmasters of the Hejmadikodi and Kizhur Fisheries Schools are the ex officio secretary and agent, respectively, of the Moolky Mogers' and Kizhur Fishermen Co-operative Societies. The latter society passed a resolution at the end of the year electing a board of directors in lieu of the agent and appointing the headmaster of the local fisheries school as its ex officio president. The fishing season was poor and prices of fish were low. Yet, there was a general improvement in the working of many societies, particularly the Ajanur Fishermen society of which mention has been made in an article published in the Madras Journal of Co-operation, Vol. XXXII, May 1941.

213. (b) *Malabar.*—There were 35 societies at the beginning of the year. The affairs of the Puchiangadi Fishermen Society were finally closed during the year and no new society was registered. Hence, the number of societies at the end of the year was 34. A society was organized at Vengalam and the application is pending registration.

214. *Membership and share capital.*—At the beginning of the year there were 1,250 members with a paid-up share capital of Rs. 20,059-14-0. There were 61 new admissions, whilst the removals were 88. The receipts under share capital amounted to Rs. 960-1-0 and the withdrawals to Rs. 1,390-3-0. Thus, at the close of the year there were 1,223 members with a paid-up share capital of Rs. 19,629-12-0.

215. *Deposits.*—Except the Blangad Purchase and Sale Society which had a fixed deposit of Rs. 465 at the beginning of the year, none of the credit societies had any deposit. The Puthenkadapuram Arayajana society had members' recurring deposits of Rs. 20-5-0 and another society received a temporary loan accommodation of Rs. 25 from a member. Out of these amounts, a sum of Rs. 3-7-0 was withdrawn from the recurring deposit and the temporary loan

of Rs. 25 was also paid off. Thus, at the end of the year, there was an amount of Rs. 481-14-0 under deposits in the two societies.

216. *Borrowings*.—Eleven societies remained indebted to the Malabar District Co-operative Bank at the beginning of the year to the extent of Rs. 3,608-5-0 under principal of which a sum of Rs. 1,179-8-0 was overdue. Three societies borrowed loans amounting to Rs. 905 and repayments towards loans aggregated Rs. 1,258-5-0. At the end of the year the amount due under principal was Rs. 3,255. With one exception, all the societies paid their bank dues. The overdues from this society was Rs. 10 as against Rs. 1,179-8-0 at the end of the previous year. An amount of Rs. 261-7-0 was paid towards interest on bank loans leaving an overdue balance of Rs. 97. This amount was due from societies in the cyclone affected areas and from one society in the central section.

217. *Loans to members*.—The amount of outstandings against members at the beginning of the year was Rs. 43,942-5-0, of which Rs. 30,386-13-0 was overdue. Loans amounting to Rs. 11,869-6-0 were issued to members during the year for the following purposes:—

	RS.	A.	P.
Prior debts	8,329	8	0
Purchase of boat and net	928	0	0
Trade purposes	1,228	14	0
Domestic expenses	422	0	0
House building	826	0	0
Others	135	0	0
Total ..	11,869	6	0

A sum of Rs. 13,503-6-0 was collected. The balance on loans against members at the end of the year was Rs. 42,308-5-0, of which Rs. 25,345-10-0 was overdue. The fact that the repayments increased, whilst the overdues were reduced is very satisfactory, especially in view of the adverse conditions such as poor catches, low-prices and the severe cyclone which were encountered during the year.

218. *Investments*.—The total reserve fund of all the societies at the end of the year was Rs. 18,808-9-0, of which an amount of Rs. 4,509-15-0 has been separately invested in the financing bank leaving a balance of Rs. 14,360-5-0, including Rs. 61-11-0 invested in excess by a society, pending investment. The societies have been advised to invest the balance amounts in the District Co-operative Bank. The uninvested reserve fund is at present merged in the working capital of the societies.

219. *Shares in the Central Bank*.—The total amount invested in the shares of the Central Bank at the beginning of the year was Rs. 1,580. Owing to the final closing of the Puthiangadi Co-operative Society this amount was reduced by Rs. 10, so that at

the end of the year the amount was Rs. 1,570. The number of societies affiliated to the Central Bank was 26 at the end of the year. Twenty societies have public accounts in the Post Offices and Central Bank and the total amount to the credit of these accounts at the end of the year was Rs. 477-4-0. Three societies, namely, the Thalayi Fish Curers', Madapalli Fish Curers' and Velur Mogers', have buildings of their own valued at Rs. 1,105-10-0 in all. All the fish-curing sheds in the Thalayi fish-curing yard are owned by the Thalayi Fish Curers' Co-operative Society. The Blangad Purchase and Sale Society owned fishing boats and nets valued at Rs. 379-3-0.

220. *By-laws.*—Model by-laws were adopted in 13 societies.

221. *General.*—The Sub-Inspectors of Quilandy and Cannanore fish-curing yards continued to be the ex officio secretaries of the Quilandy Fishermen and the Cannanore Women Fish Curers' Co-operative Societies, respectively. The petty yard officers, of Meladi, Thalayi, Blangad and Pudiappa are the ex officio secretaries (and in the case of Pudiappa, President), of the societies situated in the respective places. The headmasters of the Kavvayi and Blangad Fisheries Schools are the ex officio office-bearers of the Kavvayi and Blangad Kadapuram Fishermen Co-operative Societies. The sanction of scriptory grants to certain societies was of great help to the societies in meeting the clerical charges. In spite of the poor fishing season and the low-prices prevailing during the year, some of the societies worked satisfactorily.

222. *Non-credit work.*—The three non-credit societies in the district, viz., (i) the Blangad Purchase and Sale Society, (ii) the Madapalli Fish Curers' Society and (iii) the Thalayi Fish Curers' Society, continued to function during the year. The total number of members and the amount of their paid-up share capital in these societies were 49 and Rs. 1,722, respectively, as against 50 and Rs. 1,709-4-0 in the previous year. The working of the Blangad Society was not satisfactory. The members were able to catch only 489 maunds of fish valued at Rs. 664-4-0 and the society's share therefrom was only Rs. 379-3-0 whilst the expenditure exceeded this amount. The value of boats and nets owned by the society was Rs. 379-3-0. No non-credit work was done in the Madapalli Society during the year. Loans outstanding against the members at the end of the year amounted to Rs. 290 and the store shed owned by the society was valued at Rs. 175-10-0. In the Thalayi Fish Curers' Society, the amount outstanding against members as loans at the end of the year was Rs. 262-1-0, of which, a sum of Rs. 76-10-0 was overdue. The society has invested Rs. 144-8-0 in the District Co-operative Bank as reserve fund and Rs. 500 in the shares of the bank. Twenty-one out of 22 members are ticket-holders in the Thalayi fish-curing yard. The curing sheds in the yard are owned by the society and are in the enjoyment of members free of rent. The store shed owned by the society fetches a rent of Rs. 45 per annum from some of the members who have

taken it on lease. There is a proposal to put up another store shed at a cost of about Rs. 1,000 for storing cured fish. During the year the society purchased 25,000 cured mackerel at a cost of Rs. 106-4-0 and disposed of them for Rs. 108-8-0 making a profit of Rs. 2-4-0 on the transaction. The members of the Madapalli and Thalayi Societies have facilities to sell their fish through their societies and so derive the maximum benefit. The Cannanore Women Fish Curers' Society, of which the president and the directors are women, had 36 members (all women) with a paid-up share capital of Rs. 673-8-0 at the end of the year. The reserve fund of the society was Rs. 331, of which Rs. 330-1-0 has been invested. The amount outstanding against members at the end of the year was Rs. 962-13-0 of which Rs. 403-13-0 was overdue. The West Coast Fisheries Subordinate Officers' Society worked satisfactorily during the year. The total number of members and the amount of their paid-up share capital at the end of the year were 199 and Rs. 8,581, respectively. Loans to the extent of Rs. 17,090 were issued and Rs. 13,323 were repaid during the year leaving a balance of Rs. 11,478 inclusive of the amount outstanding at the beginning of the year. There were no overdues from members who are all scattered on the coastal areas from Vekkode to Kirimanjeshwar. The total purchases made by the society for the benefit of the members amounted to Rs. 5,736-15-0 and a profit of Rs. 173 was made.

223. *War effort.*—Four fishermen co-operative societies in South Kanara and 11 societies in Malabar contributed between them a sum of Rs. 249 to the War Fund from their common good fund.

224. (ii) *EAST COAST.*—All the co-operative societies for inland fishermen continued to work throughout the year. Eight societies were granted leases of fishery rights in inland waters for varying terms during the year.

225. *Co-operation among sea fishermen.*—The Lawson's Bay Fishermen Co-operative Society continued to function during the year with the petty yard officer of the local fish curing yard as the ex-officio secretary. There were at the close of the year, 83 members with a paid-up share capital of Rs. 275-14-0. The loans outstanding at the beginning of the year amounted to Rs. 2,976-1-0; loans to the extent of Rs. 58-5-0 were distributed during the year and the outstandings at the close of the year were Rs. 2,116-6-0.

C. Other Socio-economic Work.

226. *Debt relief.*—As stated in paragraph 252 of the report for 1939-40, measures to afford relief to fishermen in regard to their indebtedness are pending investigation having been deferred until after the conclusion of the war.

227. (i) *WEST COAST.*—The various fishermen organizations referred to in the report of the previous year continued to do good work. The officers of the department continued to do all they could to improve the social and economic condition of the fisherfolk.

Teachers in Fisheries schools have been carrying on propaganda work in the sphere of education by frequently meeting the parents; explaining the benefits of literacy and inducing them to send their children to school. Applications are being received from fishermen for opening new schools and fish-curing yards. The cyclone and floods caused serious loss to the fisherfolk. About 3,000 houses were damaged rendering about 19,000 people homeless. One hundred and sixty boats and 340 nets belonging to the fishermen were destroyed. The officers of the department made immediate arrangements to collect statistics of the loss sustained by the fisherfolk and forwarded them to the Revenue authorities to enable the necessary help to be given to the people concerned.

228. *War efforts.*—A sum of Rs. 395-5-1 was subscribed towards the War Fund by the officers of the department working on the West Coast. One Sub-Inspector, two petty yard officers, two teachers and one peon have offered their services for the army.

229. (ii) EAST COAST.—The President of the Edupur Fishermen Co-operative Society desired that the Edupur swamp might be inspected with a view to locating a suitable place for fish farming in the Edupur thampara. The Inspector of Fisheries visited the locality and selected a place that should prove suitable for the purpose. The society is making arrangements to acquire the site.

230. (iii) PROVISION OF MARKETING FACILITIES.—The Government desired that some practical use should be made of the Assistant Marketing Officer in connection with fish and it was suggested to Government that the Assistant Marketing Officer might take up the following items of work: (i) collection of statistics of fresh fish sent in ice from various fishing centres on the West and East Coasts; (ii) methods of transport employed, charges incurred at present in packing and despatching fish in ice (including handling charges, cost of packages, and other charges); (iii) price realized in the interior markets; (iv) suggestions for increasing the volume of fresh fish trade; (v) market reports; (vi) fish by-products; (vii) shell-fish trade; and (viii) statistics of fish-supplies coming into the Madras markets. The Director of Agriculture who was consulted in the matter stated that the draft synopsis of the marketing survey of fish covered many of the items of work suggested above, that good progress had already been made regarding item (iv) and that it would be better to wait for the completion of the survey report before instituting further enquiries in the matter. This was agreed to. In connection with the fish marketing survey in progress the Provincial Marketing Officer was supplied with information on the following points: (i) total monthly and annual production (i.e.), raw fish caught in the whole Province variety-war for five years from 1935-36; (ii) total monthly and annual quantities cured (dry and wet salted) varietywar in the presidency for five years from 1935-36; (iii) important varieties of fish and their characteristics; (iv) types of nets and meshes; (v) fishing agreements, rules and laws; (vi) research institutions, etc.

231. The Assistant Marketing Officer, Government of India, visited the Uppada fish-curing yard on the 8th March and the Petty yard officer furnished him with the information required. He also visited the Dowleshwaram shandy and obtained a copy of the market return for the day.

VIII. PROPAGANDA.

A. Rural Pisciculture.

232. The Director of Agriculture, Mr. A. R. C. Westlake, I.C.S., transmitted a suggestion made to him by a gentleman from Kistna in regard to the possibilities of the tanks in the delta as fish-breeding grounds. The Inspector of Fisheries, Vizagapatam, who inspected one tank in the area with a view to ascertaining its suitability for breeding fish, reported that there are ample facilities for stocking most of the tanks with Catla, which are available extensively in the irrigation canals in the delta area. The Collector of Kistna has been addressed for information as to the ownership of the tanks, and other details as a preliminary to deciding whether the tanks could be utilized as fish-breeding grounds.

233. The tank belonging to Sri M. Shanmugasundaram, Avarani, Negapatam taluk, was inspected by the Assistant Director, Pearl and Chank Fisheries, Tuticorin, in order to ascertain whether it was suitable for fish culture. The owner was informed that he might try Catla and he purchased the fish from the department.

234. Specimens of fish life found in the fresh water storage tank of the Adyar Club, Madras, were, at the request of the Club identified as *Esteria* sp. popularly called "Fairy shrimps." The Adyar Club was informed that these are harmless creatures, are not known to carry any parasites and that they are erratic in their occurrence and appear in large numbers in certain years.

235. The Fisheries Research Officer, Punjab, was supplied with information in regard to the methods employed in this Province in the matter of transporting alive fry or adult fish with the object of stocking tanks, ponds, streams or rivers.

236. The Health Officer, Anti-malarial Scheme, Pattukkottai, reported a kind of disease noticed among the *Gambusia affinis* reared in his office nursery and which was seen to be prevalent among this particular fish found in wells and tanks where they were introduced by him. A few samples of the diseased fish were sent for examination and advice as to the nature of the disease. The Health Officer was informed in reply that the disease appeared to be what is known as 'Tail rot' due to an attack of a parasitic fungus, that the disease was highly infectious and that the affected fish should be immediately segregated for saline bath or turpentine treatment.

237. Dr. C. K. Ricardo Bertram (wife of Mr. G. C. L. Bertram, Chief Fisheries Officer, Fisheries Service, Government of Palestine), asked for advice about the possibilities of importing rapid growing

fish from India for experimental culturing in that country. She was supplied with the necessary information in regard to Gourami, Catla and Etroplus, and also Chanos.

238. Enquiries received from the Commissioner of the Tiruvannamalai Municipality, President of the Zami-golvepalli Panchayat Board (Kistna district), and the Assistant Research Officer of the Department of Marine Biology and Fisheries of the University of Travancore, on the subject of fish culture, were attended to and suitable replies sent.

239. A consignment of two dozen Gourami fingerlings was sent in charge of an attendant to the Staff Surgeon, Hyderabad, Deccan. A consignment of fish (10 Gourami fingerlings and 200 Etroplus) was also sent in charge of an attendant to the Director of Fisheries, Baroda.

240. Four persons were supplied with information and necessary technical advice in regard to the suitability of stocking their private ponds. Fifteen persons were also supplied with live fish both for food and rearing purposes.

B Exhibitions.

241. The department participated in the following exhibitions :—

- (1) The Fourth Indian Industries Exhibition, Tuticorin (28th July to 10th August 1940).
- (2) The All-India Khadi and Swadeshi Exhibition, Calicut (1st to 15th December 1940).
- (3) The Park Fair Exhibition, Madras (24th December 1940 to 25th January 1941).
- (4) The Vizagapatam District Agricultural Exhibition, Parvatipur (26th to 28th January 1941).
- (5) The District Agricultural Exhibition, Nellore (12th to 18th March 1941).
- (6) The All-India Swadeshi Exhibition, Trichur (1st to 15th May 1941).

A gold medal certificate was awarded by the authorities of the Trichur Exhibition for the exhibits of the department.

C. Museums.

242. The Government sanctioned during the year an expenditure of Rs. 200 in connexion with the display of fishery products at the Industrial and Commercial Museum, Chittoor. The permanent transfer of the fishery exhibits given on loan to the Central Industrial Museum, Madras, in 1939 was sanctioned. It was ordered that the exhibits should be treated as the property of the Government and that arrangements should be made to verify from time to time that the exhibits are in the museum.

IX. FISHERY LEGISLATION.

243. (i) LICENCES FOR FIXED ENGINES.—Seventy-four free licences were issued to fishermen of the Ramnad coast for placing 330 submerged trees in Palk Strait for catching fish during the year.

244. (ii) STAKE-NET FISHING.—Ninety-five free licences were issued for stake net fishing in the Valarpatnam and Taliparamba rivers in the Malabar district. The system of licensing was introduced in the case of Korapuzha river (Malabar district) and 119 licences were issued on a fee of Rs. 4 per licence.

245. (iii) FISHING IN METTUR RESERVOIR.—The Government sanctioned during the year the issue of free permits for coracles plying in the reservoir for purposes other than fishing and directed that the coracles be classified under the following three heads, (i) ferry, (ii) public transport, and (iii) private use.

246. (iv) FISHING IN THE ADYAR RIVER.—As stated in paragraph 267 of last year's administration report, the fishermen of Narayanaswami Garden contended that certain kinds of nets not specified in the prohibitory notification but having meshes smaller than the $1\frac{1}{2}$ inches prohibited were being used by the Dommingkuppam fishermen. Several attempts were made by the Assistant Director of Fisheries (Inland) to effect a compromise between the two parties of fishermen, but they were not successful. The Hindu fishermen (Sembadavars) asked that the Dommingkuppam fishermen should not be allowed to use the Agni valai (Bodie valai) in the Adyar river. As it was not possible to prohibit altogether the use of Agni valai for which they seemed to have acquired a prescriptive right it was suggested that its use should be restricted to once a week, but this was not agreeable to the fishermen. The Narayanaswami Garden fishermen after several protracted discussions eventually agreed to permit the use of Bodie valai, even twice a week, provided the other sets of smaller nets were not used. The Dommingkuppam fishermen represented that the Bodie valai fishermen possessing these smaller nets would be agreeable to abstain from using the nets but that there were many others including the Harijan fishermen in Dommingkuppam who could not be prevented from using them. Attempts were made to induce the Harijan fishermen to agree to this, but they refused. In view of the difficulty of excluding the smaller nets, it was then suggested that the Bodie valai might be used twice a week, the period of operation of the net being restricted on each day to 12 hours from 4 a.m. to 4 p.m. instead of 24 hours and the fishing to be conducted on either side of the bridge alternately, i.e., first near the mouth of the river, where the catches are likely to be heavier and then away from it. After a great deal of persuasion, this was agreed to by the Dommingkuppam fishermen but the Sembadavars refused to agree to it. As the suggestion to prohibit the use of the Bodie valai altogether or at least to restrict its use to one day of 12 hours per week seemed hardly feasible in all the

circumstances, it was recommended to Government that G.O. Ms. No. 951, Development, dated 9th April 1940, prohibiting the use of nets below $1\frac{1}{2}$ inches mesh might be cancelled and the use of Bodie valai restricted, as by a restricted use of the Bodie valai there would be no appreciable depletion in the fisheries in the Adyar river as the majority of the catch is composed of fish entering the river from the sea and as the supply would be replenished frequently when the bar in the sea at the river mouth is open every year. If the fishery was leased out, it would constitute a hardship to the poor fishermen many of whom eke out their daily livelihood from individual small catches and it would also lead to a great amount of agitation. The Government approved the recommendation and issued the necessary rules permitting the use of the Bodie valai twice a week between 4 a.m. and 4 p.m. on days to be fixed by me, the fishing to be conducted alternately on either side of the bridge. The rules published in 1940 were also cancelled.

X. PUBLICATIONS.

247. *Fish statistics*.—The question of printing and publishing the statistics of landings on the West Coast for the years 1931–32 to 1935–36 is under the consideration of Government. The statistics of landings on the West Coast for the three years 1936–37 to 1938–39 are under compilation.

248. *Bulletin on marketable fishes*.—The work in connexion with the compilation of this bulletin was completed and the bulletin is under revision before final publication.

249. Service Bulletin No. 2 (Research) on 'Information relating to the Marine Biological Station, Krusadai Island, Gulf of Manaar, for the use and guidance of visitors' was issued and circulated to the Biological Stations of the world and to the educational institutions in India.

250. The following papers were published in "Current Science" during the year:—

- (i) "Occurrence of *Tornaria* larvæ at Krusadai Island," by Dr. D. W. Devanesen and Sri S. Varadarajan;
- (ii) "On two kinds of fish eggs hatched in the laboratory of the West Hill Biological Station, Calicut" by Dr. D. W. Devanesen and Sri K. Chidambaram, B.Sc. (Hons.).

PART II.

FINANCE.

251. *Summary of financial results*.—The total revenue for the year was Rs. 5,05,866 against Rs. 4,85,966 in the previous year. The increase was mainly under (i) pearl and chank fisheries due to the disposal of the 1939–40 shells at favourable rates and fairly good catches of chanks during the year under report and (ii) inland

fisheries as a result of better rentals realized for some of the fisheries. Though the fish-curing yards worked at a profit on the whole, the net surplus was only Rs. 9,549 against Rs. 46,267 in the previous year due to the poor fishing season on the West Coast and high prices demanded for salt in the Northern Circars owing to salt famine. The Oyster Farm and the Biological Specimen Supply Section at Ennur continued to be self-supporting, whilst the aquarium showed a surplus of Rs. 3,780 as compared with Rs. 2,826 last year.

252. The total expenditure of the department was Rs. 5,78,526 against Rs. 5,86,655 in the previous year. The decrease was mainly under direction due to the abolition of the post of the Director of Fisheries.

253. The net cost of the Fisheries branch of the department was Rs. 72,659-9-11 as compared with Rs. 1,00,688-11-4 in the previous year.

254. Appendix III shows the total expenditure and revenue of the department. The rest of the statements are submitted in manuscript.

PART III.

STAFF AND EQUIPMENT.

I. BIOLOGICAL.

A. Assistant Director (Biology).

255. Rao Sahib Dr. D. W. Devanesan, M.A., PH.D., D.I.C., held the post of Assistant Director (Biology) throughout the year.

B. Research Stations.

256. Mr. P. I. Chacko, B.A., B.SC. (Hons.), was Research Assistant, West Hill Biological Station up to 9th September 1940, when he was transferred to the Krusadai Biological Station. Sri S. Varadarajan, M.A., F.Z.S., took charge of the West Hill Station on the 17th September 1940 and continued to be in charge of the station up to the close of the year. Sri S. Varadarajan was Research Assistant, Krusadai Biological Station, up to 10th September 1940 when he was relieved by Mr. P. I. Chacko who continued as Research Assistant till the close of the year.

II. TECHNOLOGICAL.

Tanur Experimental Station.

257. Sri Sunder Kini, B.SC. (Hons.), a candidate selected by the Madras Public Services Commission was in charge of the station from 22nd July to 31st August 1940. He was deputed to the Kerala Soap Institute, Calicut, for work on shark liver oil analysis

on 1st September 1940. From the 23rd September 1940, the Inspector of Fisheries, Central Section, Sri K. Ambady, was in charge of the Research Station with his headquarters at Tanur.

III. EDUCATIONAL.

258. (i) FISHERY ELEMENTARY SCHOOLS.—The number of teachers employed in the Fisheries schools rose from 182 at the beginning to 183 at the end of the year. Of these, one was a graduate and 22 secondary trained, of whom 18 (nine qualified and nine partially qualified) were trained at the Fisheries Training Institute, Calicut. One hundred and forty-six teachers were of the higher elementary grade, of whom 122 were Fisheries trained, 23 ordinary trained and one untrained. There were 14 lower elementary grade teachers of whom 10 were Fisheries trained, two ordinary trained and two untrained.

259. *Accommodation.*—Of the 45 schools, 26 are housed in buildings owned by Government, 17 are in rented buildings and the remaining two are in rent-free buildings provided by fishermen associations. Since the site and building of the Sri Gnanodaya School, one of the two schools accommodated in rent-free buildings, were found unsuitable, the Government have sanctioned the construction of a building on a Government site transferred to the department. The work remains to be carried out by the Public Works Department. As the present building of the Malpe school, the second school in rent-free building, was found insufficient, the Government have permitted the Mogaveera Samaj to construct a new building on an assurance of rent as fixed by the Public Works Department. An extension of the Kottakadapuram school building has been sanctioned by Government to be carried out in 1941-42. The acquisition of land for extending the Kaipamangalam school building has been effected. The Tallikulam school building collapsed during the cyclone and the school was housed in a temporary shed constructed in the compound of the adjacent yard staff-quarters.

260. (ii) CO-OPERATIVE SOCIETIES.—Sri U. Parameswara and Sri M. G. Nair, the two Special Co-operative Inspectors deputed for the supervision of fishermen co-operative societies, were in charge of the northern and southern sections respectively throughout the year.

IV. NAUTICAL.

261. (i) "*Lady Nicholson.*"—This vessel was employed on the inspection of pearl banks as in previous years when the full complement of the crew was engaged. The vessel was put in dock at Mandapam and overhauled and repairs were carried out to it in August 1940.

262. (ii) "*Sea Scout*," was employed on routine chank fishery operations throughout the season. She was engaged for a few days on the inspection of pearl banks also.

263. (iii) "*Leverett*" was employed on routine chank fishery operations and also for the inspection of pearl banks along with the '*Lady Nicholson*.'

264. (iv) "*Pearl*" continued to be stationed at Krusadai Island for use at the Biological Station.

265. (v) "*Pinctada*" was employed on patrol work in the Mettur reservoir. Her engine went out of order and spare parts could not be procured.

V. ADMINISTRATIVE.

A. Director's Office.

266. Sri Diwan Bahadur B. Sundara Raj, M.A., PH.D., held the post of Director of Fisheries, until the 22nd August 1940 when the post was abolished and the Department of Fisheries amalgamated with the Department of Industries and Commerce and placed under my charge.

267. Sri K. Chidambaram, B.Sc. (Hons.), was employed as temporary Research Assistant up to the 31st May 1941 to assist in the preparation of the bulletin on the Marketable Fishes of Madras.

268. The post of a lower division clerk kept unfilled in the Fisheries section from 24th June 1940, has, since the close of the year, been abolished.

269. *Inland fisheries*.—Sri M. Kelan, a Sub-Inspector of Fisheries on the West Coast, was Research Assistant, Mettur, until the 23rd September 1940, when he was succeeded by Sri W. S. Kallat, who continued as Research Assistant until the 27th November when he was relieved by Sri N. V. Choodamani, B.Sc. (Hons.) a candidate selected by the Madras Public Services Commission, for appointment as Research Assistant. Sri Choodamani continued to be in charge of the station until the close of the year.

270. The laboratory at Mettur was equipped with a further supply of apparatus. Pipe connections to the overhead tank and laboratory fittings to the hatchery were completed.

B. East Coast (Northern Division).

271. Sri A. Somayaji continued to be Inspector of Fisheries, Vizagapatam, throughout the year.

272. The office of the Inspector was removed from the old Collector's office building to the building occupied by the Queen Mary Secondary and Training School, which was shifted to the former building.

C. East Coast (Central Division).

273. Dr. M. Ramaswami Nayudu, B.A., PH.D., continued as Assistant Director (Inland) throughout the year.

274. Mr. V. John, B.A., was Research Assistant (Inland) until the 25th May 1941 when he was transferred to the West Coast and Sri K. Chidambaram relieved him.

D. East Coast (Southern Division).

275. Mr. D. D. Peter Devadas, B.A., continued as Assistant Director, Pearl and Chank Fisheries, throughout the year. Mr. V. D. Spurgeon, B.A., was Inspector of Fisheries throughout the year.

E. West Coast.

276. Sri M. Jayaram Nayudu, B.A., continued as Sub-Assistant Director from the beginning of the year up to the 27th May 1941 when he went on leave. Mr. V. John acted as Sub-Assistant Director from 28th May 1941 until the end of the year.

I have the honour to be,

Sir,

Your most obedient servant,

L. B. GREEN,

Director of Industries and Commerce.