



MADRAS FISHERIES DEPARTMENT

ADMINISTRATION REPORT

FOR THE YEAR

1938-39

BY

DIWAN BAHADUR

DR. B. SUNDARA RAJ, M.A., PH.D.

Director of Fisheries

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FISHERIES DEPARTMENT.

Subject.

Fisheries—Administration Report—1938-39—Submission of.

Ref. No. 2015-G/39.

Station, MADRAS.

Dated the 31st October 1939.

From

DIWAN BAHADUR DR. B. SUNDARA RAJ, M.A., PH.D.,
Director of Fisheries,
Madras,

To

THE SECRETARY TO THE GOVERNMENT OF MADRAS,
DEVELOPMENT DEPARTMENT.

SIR,

I have the honour to submit the Administration Report of the Fisheries Department for the year ending 30th June 1939.

INTRODUCTION.

2. The decision of Government on the long pending question of retrenchment and reorganization referred to in paragraph 2 of report for 1935-36, paragraph 3 of report for 1936-37 and paragraph 2 of report for 1937-38, was received in January this year (G.O. No. 51, Development, dated 6th January 1939). The Government have again come to the conclusion that the Department should be continued as a separate entity as at present under the Director of Fisheries. They were however of the view that it is possible to effect certain economies without seriously curtailing the Department's activities. The most important of the retrenchments ordered were—

- (i) substitution of a non-gazetted Sub-Assistant Director of Fisheries in place of the Assistant Director of Fisheries (Coast), Calicut;
- (ii) abolition of the post of Research Assistant in charge of the Ennur Biological Station;
- (iii) reduction of the staff of the Assistant Director of Fisheries (Inland) by a clerk and a typist;
- (iv) dispensing with the services of the Inspector of the Salt Transport section at Tuticorin;

- (v) reduction in the staff of the Mopad fish farm; and
- (vi) transfer of the Praema Anti-malarial Farm to the control of the Forest Department.

All these have been given effect to. Some minor measures are still under consideration.

3. While anxious to curtail expenditure to the utmost extent possible, Government have not been unmindful of the need to expand the activities of the Department and revive proposals which have been kept in abeyance for years.

The most important of the schemes revived are—

- (i) proposals for the continuance of the deep-sea fishing experiments;
- (ii) revival of the propaganda for pisciculture in rural areas;
- (iii) proposal for continuing the research on Hilsa by marking experiments deferred in G.O. No. 1463, Development, dated 7th October 1931; and
- (iv) transfer of deep-water fishing experiments from Mopad to Mettur Reservoir.

Considerable progress has been made in all these directions and detailed schemes for the first two have been submitted to Government.

4. Other steps to develop the activities of the Department taken during the year relate to—

- (i) establishment of a Fisheries Technological Institute at Tuticorin;
- (ii) proposals to inaugurate a fish-freezing industry in the Presidency; and
- (iii) transfer of the conservancy operations in the Moyar river from the Forest to the Fisheries Department.

The munificent offer of the Bharata community of Tuticorin, who have come forward to meet Government half-way by providing buildings and fifteen scholarships, was accepted by Government during the year, and the opening of a technological institute which will not only train teachers in fisheries technics but will also provide instruction in all branches of fisheries to apprentices has been deferred till 1940-41.

In G.O. Ms. No. 1550, Development, dated 3rd September 1924, Government deferred my proposals for initiating fish refrigeration. In 1927 the commendable interest and initiative shown by Mr. Soma

Marakala, a leading fisherman of Malpe, led to the establishment under my guidance of a private fish-freezing factory, the first of its kind in India. The high railway freight and the provincial motor taxes introduced in 1928, however, led to the closure of the factory after two years of successful working. At the instance of the Provincial Marketing Officer, the Government have now called for a modest scheme for initiating the fish-freezing industry in the Province.

Government, having received representations regarding heavy poaching in the Moyar river, decided to appoint a staff of watchers and place them under the control of the Fisheries Department.

Further, the chronic state of debt amounting almost to serfdom in which the majority of the fishermen of the Presidency live has been one of the most potent causes of their low economic condition and the primitive state of the industry. A proposal to remedy the situation by legislation is receiving the attention of Government, as has been done already in the case of agriculturists.

5. The fishing season on both the coasts has been even poorer than last year, hampering research on the economically important sardine and mackerel fisheries. The discovery of an even larger bed of pearl oyster-lings than in the previous year enabled the expansion of the pearl farm at Krusadai Island from a laboratory scale with a few hundred oysters to a small experimental farm on the Japanese model. This large addition will enable the department to investigate the possibilities of pearl farming and the production of cultural pearls.

6. An unusually severe drought proved disastrous to inland fisheries in many districts. Pisciculture on the usual scale was not possible and a serious fall in the revenue occurred. The closure of the fishing experiments at Mopad occasioned a review of the experiments from 1921 to 1938 and the results of the piscicultural experiments conducted for the first time on so gigantic a scale have provided valuable data for the development of inland fisheries in the Presidency.

The Mettur Dam completed in 1934 has had a disastrous effect on the fisheries of the Cauvery below. High floods have disappeared and the Hilsa in their usual numbers are no longer able to ascend the river for breeding purposes. The deep pools wherein breeding fish of all kinds took shelter are becoming silted up. Thanks to the development of the fisheries of the Stanley Reservoir by scientific control and culture, the disastrous effect on the fisheries of the Cauvery below has been partially checked. Stocking with new and

improved varieties of edible fish and the conservation of the fisheries for the last five years have contributed to a marked improvement in the fisheries of the reservoir and are paving the way for the resuscitation of the fisheries of the Cauvery. As the lake now holds a large stock of fish, the fisheries were formally thrown open to the public for fishing since the close of the year.

By carefully planned experiments at the Catla stocking centre at Nidadavolu the heavy mortality attending the capture and transport of this valuable fish have been considerably reduced.

7. The most important result of the technological research is the discovery of a South Indian fish which yields an oil with more than 35 times the vitamin potency of commercial cod liver oil and nearly three-fourths that of the best Halibut liver oil on the market. The Government have sanctioned a scheme for initiating the manufacture of medicinal fish oil as a cottage industry.

8. In the administration of fish-curing yards a popular move has been made in relaxing the stringent rules insisting on deposits and bonds from fishermen for opening new yards or reviving old ones. In pursuance of the new policy four yards closed as a measure of retrenchment in 1930 were reopened and applications for four new yards have been received.

9. On the important question of the agency for the administration of schools for fisher children which has been under consideration since the closure of the Fisheries Training Institute, Government concluded that the schools should continue under the Fisheries Department and a more liberal policy of improving existing schools and opening new schools has since been adopted.

PART I.

ACTIVITIES OF THE DEPARTMENT.

I. MARINE FISHERIES.

A. RESEARCH.

(a) Scientific Research.

10. (i) WEST HILL BIOLOGICAL STATION, CALICUT—*Plankton investigation*.—Surface plankton was collected on 143 days during the year as against 138 days last year, as follows :—

109 hauls in 4 to 6 fathoms off West Hill.

15 hauls in 9 to 14 fathoms off Quilandi.

10 hauls in 6 to 15 fathoms off Chaliyam.

9 hauls in 12 to 18 fathoms off Tanur.

The plankton was studied with special reference to fish eggs and larvæ which were isolated for detailed study. These were common in the plankton from September to November but were rare in other months of the year. Only a few oil-sardine eggs were obtained from the plankton collected off Quilandi on 30th August 1938.

The quantitative study of plankton was continued on the usual lines. The plankton was at its maximum in November and at its minimum in September. Last year the maximum was in September and the minimum in January. As usual Copepods occurred throughout the year and were predominant in the hauls of plankton.

11. *Phyto-plankton*.—The diatoms which were most abundant in the plankton of the year were *Coscinodiscus* and *Fragilaria*, the former being represented by the species *Coscinodiscus jonesianus*, *C. gigas var. dioramma*, *C. oculusiridis*, *C. radiatus* and *C. joneschii*. The same diatoms were dominant last year also.

12. The table below gives the groups of diatoms and their seasonal occurrence :—

Genus.	Occurrence.
<i>Coscinodiscus</i>	.. Present throughout the year ; abundant from August to October, December, January, April and May. In fewer numbers during the rest of the year.
<i>Fragilaria</i>	.. Present throughout the year ; abundant from August to November and in fewer numbers during the rest of the year.
<i>Chaetoceras</i>	.. Present throughout the year ; abundant in August, November, October and in smaller numbers during the rest of the year.
<i>Rhizosolenia</i>	.. Fairly common in December and March and in fewer numbers in the other months of the year excepting September and October when they were absent.
<i>Biddulphia</i>	.. Absent in March and May and rare in other months.
<i>Pleurosigma</i>	.. In small numbers from November to January ; absent during the rest of the year.
<i>Thalassiothrix</i>	.. Fairly common in August, and in small numbers during September, January, February and May and absent during rest of the year.
<i>Nitzschia</i>	.. Abundant in November and in fewer numbers in December and absent during the rest of the year.
<i>Streptotheca</i>	.. Rare during August and September, from November to February and during April and May ; absent in the other months of the year.

Genus.	Occurrence.
<i>Ceratulina</i>	.. Absent in October and occasionally found during the rest of the year.
<i>Asterionella japonica</i> .	Rare in August, January, April and May ; absent in other months.
<i>Coscinosira</i>	.. Rare in September, October and March ; absent in other months.
<i>Lauderia</i>	.. Rare in August, September and May ; absent in other months.
<i>Ditylum</i>	.. Rare in April and May ; absent in other months.

13. Zoo-plankton.—As usual zoo-plankton was more abundant than phyto-plankton. Among Copepods the more abundant species were *Acartia erythrae*, *A. centrura*, *A. spinicauda*, *Paracalanus spp.*, *Euterpina sp.*, *Temora turbinata*, *Oithona plumifera*, *Oithona sp.*, *Pseudodiaptomus sp.* and *Centropagus sp.*

14. The dominant animal organisms and their seasonal occurrence were as follows :—

Genus.	Occurrence.
<i>Copepods</i>	.. Present in large numbers throughout the year except in August.
<i>Noctiluca</i>	.. Abundant in August, September, October and November and in small numbers in February and May ; absent in other months.
<i>Evadne</i>	.. Present throughout the year. Abundant in October and November ; less so in August, September and April and in small numbers during the other months of the year.
<i>Larval bivalves.</i>	Present throughout the year, abundant in August less so in September, October, November, February and March and in small numbers during the other months of the year.
<i>Daphnids</i>	.. In small numbers throughout the year except September and May when they were absent.
<i>Sagitta</i>	.. Present throughout the year, abundant in November and May, less so in January and February and in small numbers during the other months of the year.
<i>Leucifer</i>	.. Fairly common throughout the year.
<i>Nauplius larvae.</i>	Present in small numbers throughout the year.
<i>Ctenophores</i>	.. Rare throughout the year ; absent in August and December.
<i>Medusoids</i>	.. Rare during October and November, from January to March and in May ; absent in other months.
<i>Appendicularia.</i>	Rare throughout the year, absent in October and April.
<i>Radiolarians (Acanthometron sp.)</i>	Common in November and rare in October and May and absent in the other months of the year.

15. *Sardine investigation*.—Oil-sardine were scarce this year also. Random samples were procured and studied whenever available locally and from neighbouring places, such as Quilandi, Beypore, Tanur, etc. The fish appeared for the first time this year on 1st August 1938. The shoal consisted of immature sardine ranging from 11-13 cms. in length over all. From the last week of August oil-sardine with fairly well developed gonads began to appear, and continued to be caught regularly till the end of the month. As the sea off Quilandi is a breeding ground for the oil-sardine, samples from the catches there were periodically examined. In a sample obtained on 25th August there were two females with fully mature transparent ova. Further observations were therefore carried out at Quilandi. There was a single female with fully ripe ovaries in a sample examined the next day. An attempt was made to fertilize the ova artificially and hatch them out with the aid of an aerator, but unfortunately it was possible to keep the fertilized eggs alive only from 10-15 a.m. to 12 noon. It was not possible to repeat the experiment for want of similar spawning individuals. A few eggs of the oil-sardine were obtained from the off shore plankton collected off Quilandy on 30th August 1938. Mature oil-sardine were available for study only on two days in September (9th and 11th); but did not include any females with transparent ova. Recovering spents alone were obtained later in November and December. Thus this year sardine off Calicut bred in the months of August to October. A sample of preserved oil-sardines taken from a catch made off Cannanore on 15th October 1938 was procured and examined on 17th October 1938. Their gonads were in an advanced stage of development and none of them had spawned. This shows that there are a few late spawners also—vide paragraph 14 of last year's report. From the observation made in the season of 1934 and in that of 1938, it seems worth investigating whether there is a lunar periodicity in the spawning of the oil-sardine. In 1934, 9th September was a New Moon day. Spawning females were found in the catches from 6th September to 14th September, that is to say, three days before the New Moon day and five days after it. In 1938 the 25th August was a New Moon day and spawning females were found in the catches made on that day and the following day. There were eggs of the oil-sardine in the night off-shore plankton collected on 29th August. In these two instances, the observations made indicate that the spawning of the oil-sardine bears some relation to the waxing and waning of the Moon. The spawning instinct of avoiding bright moon-lit days may also be a wise provision of nature, for spawning individuals will derive protection in the darkness from their enemies including man.

16. The breeding grounds of the oil-sardine off Quilandi are swept by strong currents. The fishermen are prevented at times from fishing on account of these though oil-sardine shoals may be sighted. The choice of a spot subject to strong currents by the spawning shoals may be purposive. No sooner are the eggs laid than they are likely to be carried away by the swift currents and dispersed. This perhaps accounts for the absence of eggs in fairly advanced stages of development and for the total absence of any stages of the egg of the oil-sardine in the day plankton collected till now at Quilandi. That the drifting of the oil-sardine eggs may be shorewards at times is seen by the fact that their eggs were obtained in a haul of in-shore plankton collected off West Hill on 28th September 1937—vide paragraph 15 of last year's report.

17. The specially designed departmental seine-net (Kolli-valai) for collecting sardine of all sizes could not be used this year also, owing to the scarcity of the oil-sardine.

18. The size, sex, stomach-contents, condition of gonads and fat of 1,582 specimens of oil-sardine were recorded from the catches sampled during the year. The size frequency of the samples measured was as follows :—

Length overall.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Total.
8 cm.	19	..	..	..	..	..	..	..	..	..	19
9 cm.	158	..	..	..	..	..	..	..	..	..	158
10 cm.	23	..	..	..	1	..	..	..	..	..	27
11 cm.	20	..	..	..	..	36	..	..	..	..	..	59
12 cm.	69	1	..	..	..	57	..	..	..	..	..	127
13 cm.	1	..	..	3	..	7	..	..	..	..	..	11
14 cm.	40	28	19	10	..	..	..	..	108
15 cm.	34	86	59	33	..	..	..	..	218
16 cm.	1	..	..	47	82	53	41	..	..	..	..	229
17 cm.	9	..	..	51	64	48	32	..	..	..	..	212
18 cm.	94	21	9	16	15	60	2	..	..	..	..	229
19 cm.	40	26	9	6	30	49	3	..	..	..	..	221
20 cm.	4	4	..	..	10	9	..	..	..	..	..	160
21 cm.	3	..	..	..	..	..	31
Total	238	251	18	206	316	401	124	..	5	24	..	1,582

The size of the fish this year ranged from 8 to 21 cm. in length overall. Sixteen cm. was the size best represented in the catches.

19. *Food of the oil-sardine.*—An analysis of the stomach contents shows that the following organisms formed the food of the oil-sardine during the last season :—

Copepods (*Paracalanus* sp., *Acartia* sp., *Oithona* sp., and *Euterpina* sp.)

Cosinodiscus (*C. oculusiridis*, *C. jonesianus*, *C. gigas* var. *diaromma*).

Peridinians (*P. depressum*, *P. ovatum* and *P. oceanicum*).

Fragilaria.

Ceratium (*C. tripos*, *C. massiliense*, *C. fusus* and *C. furca*).

- Larval bivalves.*
- Biddulphia.*
- Dinophsis (D. homunculus, D. miles).*
- Evadne.*
- Nitzschia.*
- Pleurosigma.*
- Chaetoceras lorenzianum.*
- Planktoniella.*
- Tintinnus.*

20. *Scale readings.*—Arrangements are being made to send samples of oil-sardines scales to Dr. Einar Lea, Norway, a well-known authority on scales, for his opinion.

21. *Races of the oil-sardine.*—A sample of oil-sardine received from Aden was examined in detail for the study of racial characters.

22. *Mackerel investigation.*—Mackerel were not so scarce this year as they were last year. During the year 71 samples, consisting of 1,447 specimens were collected and studied as against 192 last year. They ranged from 10 to 26 cm. in length overall—vide table below. As in the last two years 22 cm. long fish were most dominant in the catches.

Length overall.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Total.
10 cm.	4	..	..	..	..	..	..	..	..	..	..	..	4
11 cm.	10	..	..	..	..	..	..	..	..	..	..	..	18
12 cm.	24	..	..	..	..	..	..	..	..	..	..	..	30
13 cm.	8	6	..	..	..	..	..	..	..	..	..	..	16
14 cm.	20	8	..	..	..	..	..	..	..	..	..	..	29
15 cm.	16	27	..	..	..	..	..	..	..	..	..	..	48
16 cm.	4	97	..	..	..	..	..	..	..	..	..	..	111
17 cm.	..	107	4	..	..	..	..	..	..	..	..	..	182
18 cm.	..	79	37	..	..	..	..	..	..	..	..	..	137
19 cm.	..	19	116	1	..	..	..	..	..	..	..	..	156
20 cm.	..	5	94	17	10	1	1	1	..	..	..	..	131
21 cm.	..	4	12	96	52	21	11	5	..	..	..	..	205
22 cm.	..	2	2	78	25	33	32	22	..	4	12	8	218
23 cm.	..	4	1	6	..	2	15	4	..	7	21	50	110
24 cm.	..	4	5	3	..	..	1	..	..	1	2	26	42
25 cm.	..	1	1	2	..	..	..	..	..	..	..	2	9
26 cm.	..	..	1	..	..	..	..	..	..	..	..	..	1
Total	86	443	278	205	87	57	60	32	..	12	55	137	1,447

23. Mackerel appeared for the first time this year on the 16th of July. These fish ranged from 11–13 cm. in length overall and were all immature. Such specimens were caught occasionally till the first week of August. Full-grown mackerel were caught for the first time on 8th August. They ranged from 17 to 22 cm. in length overall, and their gonads were undeveloped showing they were not breeding. This class of fish continued to be caught throughout August and from September to February occasionally. After the second week of February they appeared again only in the

last week of May, when their gonads were fairly well developed. After that they disappeared altogether from the catches.

24. An older generation of mackerel measuring from 23 to 25 cm. in length overall was also met with in the catches of the year. They appeared for the first time with fairly well developed gonads on 30th August 1938. These appeared again only on 23rd September 1938, the sample examined on that day consisting of ripe, partly spent and spent fish. They were found again on 8th October 1938 as partly spent and spent fish.

25. The above observations more or less confirm the inference made last year that the spawning of mackerel begins sometime about June and continues to about the end of September—vide paragraph 22 of last year's report. There is also now sufficient evidence that at least three generations of mackerel are found in the catches made on the coast. Whether the very young mackerel only a few millimeters in length seen in occasional years is a fourth generation can be settled only by further research.

26. It was not possible this year also to secure spawning fish and carry out artificial hatching of the ova to study the early development. A few mackerel eggs and larvæ were obtained from the off-shore plankton collected off Chaliyam on 3rd June 1939.

27. *Food of mackerel.*—The stomach contents of the mackerel were examined in detail and the following organisms were found during the last season :—

Copepods (*Paracalanus* sp., *Euterpina* sp., *Acartia* sp. and *Oithona* sp.).

Coscinodiscus (*C. jonesianus*, *C. oculusiridis*, *C. gigas* var. *diaromma* and *C. joneschii*).

Peridinians (*P. depressum* and *P. ovatum*).

Larval bivalves.

Evadne.

Fragilaria.

Ceratium (*C. tripos* and *C. massiliense*).

Thalassiothrix nitzschioides.

Nitzschia.

Asterionella japonica.

Rhizosolenia.

Pleurosigma.

Dinophysis homunculus.

Biddulphia granulata.

Larval prawns.

Tintinnus.

Planktoniella.

Ceratulina.

Fish eggs.
Daphnids.
Larval worms.

28. The occurrence of fish-eggs in the stomach contents of the mackerel was observed for the first time last year—vide paragraph 25 of the Administration Report (1937-38). It was considered then that their inclusion might have been accidental. But during the year under report fish-eggs have been noticed in the stomach contents of mackerel on several days as shown in the statement below :—

Date.	Size of mackerel.
	cms.
(1) 8th October 1938 at Calicut ..	.. 23-25
(2) 14th October 1938 ..	.. 20-22
(3) 17th October 1938 ..	.. 20-22
(4) 31st October 1938 ..	.. 20-22
(5) 5th November 1938 ..	.. 20-22
(6) 22nd September 1938 at Quilandi ..	.. 19-21
(7) 20th April 1939 at Quilandi ..	.. 20-22

Fish-eggs are evidently a normal item of food. Both clupeoid and non-clupeoid eggs were found. It was not possible to record their characters, as they were partly digested. If on further investigation, the mackerel is found to feed on the eggs of the oil-sardine or vice versa, it may prove to be one of the causes for the natural fluctuation of these fisheries.

29. In consultation with firms in America and with Dr. Einar Lea of Norway suitable tags for the Indian mackerel and oil-sardine have been selected and a scheme for conducting marking experiments has been submitted to Government since the close of the year.

30. *Other fishery investigations.*—In addition to the detailed research on oil-sardine and mackerel, ecological studies on other shoaling fishes of the coast such as *Sardinella brachysoma*, *Leiognathus bindus*, *Stolephorus commersonii*, *Kowala thoracata* and *Selar crumenophthalmus* were continued as usual. In all 2,940 specimens were studied.

31. *Kowala thoracata*, a small clupeoid shoaling fish, yields an important seasonal fishery on the West Coast. Observations on its food, size, spawning season and egg have been made from time to time since 1930. Its food consists of planktonic organisms. The following were found in its stomach contents :—

Zooplankton—

- (1) Copepods consisting chiefly of *Paracalanus sp.*, *Acartia sp.* and *Euterpina sp.*
- (2) *Evadne sp.*

- (3) Crab-zoea.
- (4) Larval bivalves.
- (5) Fish-eggs.

Phyto-plankton—

- (1) The following species of *Coscinodiscus* :—
 - C. jonesianus*.
 - C. gigas* var. *diaromma*.
 - C. oculusiridis*.
- (2) *Fragilaria* sp.
- (3) *Chaetoceras lorenzianum*.
- (4) *Thalassiothrix nitzschioides*.
- (5) *Ceratium massiliense*.
- (6) *Peridinium depressum* and *P. ovatum*.
- (7) *Tintinnus* sp.
- (8) *Dinophysis homunculus*.
- (9) *Biddulphia* sp.

On 3rd September 1938, the stomach contents of fifty specimens of *Kowala thoracata* were examined at Quilandi and they contained fish-eggs, thus confirming previous observations—vide paragraph 24 of Administration Report of 1934–35. This sardine appears to be destructive to fish-eggs and in one instance its food was found to consist mostly of eggs of mackerel. It is very likely that this fish follows spawning shoals of fish in order to feed on their eggs. This may be one of the factors influencing the natural fluctuations in the mackerel fishery.

32. *Size, maturity and spawning season of K. thoracata.*—Specimens ranging from 60 mm. to 120 mm. in length have been collected. Weber and Beaufort give the length as about 90 mm. Young specimens less than 60 mm. have not been found in commercial catches. Fish measuring 100–110 mm. formed the bulk of the specimens sampled and examined. Sexual maturity is attained when the fish reach a length of about 90 mm. The left ovary and the left testis only are functional; the right ovary and the right testis are vestigial. Sections of the latter showed neither oogonia or spermatogonia. One would expect systematists to include this among the generic characters of the genus *Kowala*; but the fact that they have not done so indicates that this has not been noticed.

33. Specimens partly or fully spent were seen in February 1936. In December 1938, female specimens with fully mature transparent ova were obtained. One may, therefore, infer that roughly the spawning season of this sardine ranges between the months of November and February.

34. The artificial fertilization attempted on 1st December 1938 resulted in the formation of the vitelline membrane indicating fertilization. The fertilized egg is a typical clupeoid egg with vacuolated yolk and a large perivitelline space. More than one yellow oil-globule are found in each egg, the number varying from four to eight. The entire egg including the perivitelline space measures about 0·8 mm. in diameter. The number of eggs on an average in a ripe female is about 8,000, a comparatively small figure for a clupeoid. Even making allowance for the atrophy of the right ovary, the fecundity of this sardine is low when compared with that of the herring (*Clupea harengus*) and the pilchard (*Clupea pilchardus*) which lay about 30,000 and 60,000 eggs, respectively. Now that we know the appearance and size of fertilized eggs of *Kowala thoracata*, it should be possible to identify the eggs in the plankton which will help to locate the spawning grounds of the fish and to fix its spawning season more precisely. Dr. D. W. Devanesan, the Assistant Director of Fisheries (Biology), and Mr. V. John, Research Assistant, West Hill, are reading a paper on the subject at the ensuing session of the Indian Science Congress in January 1940. The usual collection and identification of the important food fishes of the coast was continued.

35. *Hydrographical and weather observations.*—The usual daily records of surface temperature, specific gravity, salinity, and hydrogen-ion concentration (pH) of sea-water, maximum and minimum temperatures and humidity of air, the condition of the sea and weather were made. The surface temperature of the sea reached its maximum of 31° 1 C. on the 29th April 1939 and its minimum of 23° 4 C. on 6th July 1938. The salinity of sea-water was highest on the 6th May 1939 when it was 41·55 and lowest, namely, 13·21 on 5th July 1938. The pH values ranged from 7·9 to 8·3, and specific gravity from 1·014 to 1·0325.

36. *Museum.*—The following mounted specimens have been added to the museum during the year :—

- (1) *Carcharias laticaudus*.
- (2) *Sphyrna blochii*.
- (3) *Rhynchobatus djeddensis*.
- (4) *Sardinella longiceps*—fully developed male and female dissected and mounted to show gonads.
- (5) *Alectes niger*.
- (6) *Rastrelliger kanagurta*—fully developed male and female specimens dissected and mounted to show gonads.
- (7) *Scomberomorus commersonii*.

37. *Visitors*.—(1) Professor A. Ramanatham, Additional Professor of Zoology, Presidency College, Madras, with a party of Honours and B.Sc. pass students worked at the station from 4th October 1938 to 6th October 1938.

(2) Moulvi Bedar Bakht, an officer deputed by the Registrar of Co-operative Societies, Bengal, underwent training at this station from 30th December 1938 to 9th January 1939.

(3) Mr. G. N. Mitra, M.Sc., deputed by the Government of Orissa for training worked here from the 16th of June 1939 to 10th September 1939.

38. (ii) KRUSADAI BIOLOGICAL STATION.—*Plankton investigation*.—Inshore plankton was collected from Kundugal channel on 61 days and from the open sea on four days (one collection north of Rameswaram Island in the Palk Bay; and three south of Krusadai Island in the Gulf of Mannar).

39. *Phyto-plankton*.—In the channel plankton, diatoms were common in July, August, October, November and March. The relative abundance of the dominant groups of diatoms in the different months of the year is shown below :—

Genus.	Occurrence.
<i>Trichodesmium</i> ..	Abundant in October, November and March and rare in August, April and June.
<i>Chaetocerus</i> ..	Abundant in July, October and November and rare in other months.
<i>Rhizosolenia</i> ..	Abundant in July and August and rare in December and March.
<i>Coscinodiscus</i> ..	Abundant in July and October and rare in December and March.
<i>Thalassiothrix</i> ..	Abundant in July and October and rare in November, February and March.
<i>Biddulphia</i> ..	Common in February and March.

The following diatoms were also found but were rare :—

Nitzschia, *Navicula*, *Bacteriastrum*, *Bacillaria*, *Pleurosigma*, *Hemidiscus* and *Ditylum*.

40. *Zoo-plankton*.—The seasonal occurrence of the various forms is noted below :—

Genus.	Occurrence.
<i>Radiolarians</i> ..	Rare in July, August and March.
<i>Copepods and crustacean larvæ</i> .	Abundant in July, August, September and March and less so in other months.
<i>Otenophores</i> ..	Few in July, November, January and rare in March, May and June.
<i>Echinopluteus larvæ</i> ..	Rare in November, December, January, March, April and June.

Genus.	Occurrence.
<i>Leucifer hansenii</i>	Abundant in July, August and May and rare in October, November and December.
<i>Creseis acicula</i> ..	Common in February and March and rare in July, August and September.
<i>Ceratium</i> ..	In small numbers from July to November.
<i>Sagitta</i> ..	Common in November, less common in October, rare in July, August, December and January.
<i>Larval bivalves and gastropods</i>	Common in August, less common in September, rare in other months.
<i>Noctiluca</i> ..	Common in November and December.
<i>Appendicularia</i>	In small numbers in September, October and November.
<i>Fish eggs and larvæ</i> ..	In small numbers in July, August, October and November.
<i>Tornaria larvæ of Balanoglossus.</i>	On February 3rd, 4th, 13th and 16th, 1939.

41. The occurrence of *Tornaria* larvæ in the Krusadai plankton was noticed for the first time this year. Three genera and four species of Balanoglossids are known to live on the shores of Krusadai Island: (1) *Chlamydothorax* (= *Ptychodera*) *krusadiensis*, species novum, to be described by Prof. C. R. Narayana Rao, (2) *Chlamydothorax* (= *Ptychodera*) *ceylonensis* Spengel, (3) *Ptychodera minuta* Spengel and (4) *Glandiceps hacksii* Spengel.

42. One and two occur in the vicinity of Bushy Point on the Ceylon side of the Island while (3) and (4) were collected from Porites Bay and Watchman's Bay on the northern shore of the island facing Mandapam. Though adults were abundant, no *Tornaria* larvæ could be seen in the plankton collections of the biological station. Special interest in this larvæ was aroused when a request for *Tornaria* material from Dr. G. Stiasny of the Rijkmuseum van Natuurlijke Historie, Leiden, Holland, was received in October 1934. The Assistant Director and the Research Assistant, Krusadai, made a special search and have found the larvæ in the plankton. They have submitted a paper on this subject to the ensuing session of the Indian Science Congress in January 1940.

43. *Research on East Coast food fishes.*—The identification and study of the local food fishes was continued as usual. Special studies of the following fisheries were made:—

(a) *Lactarius lactarius.*—Seven hundred and twenty-nine specimens of *Lactarius* were examined. The ovaries begin to fill in and grow from July onwards, becoming fully mature about October. Special collections of off-shore and in-shore plankton were made in the month of October off Than-gachimadam at the spot where the fish shoaled heavily and

the fish-eggs found have been examined. As fish with mature transparent eggs were not found, artificial fertilization was not possible and the identity of the egg has not yet been determined with certainty. It is a carnivorous fish feeding mostly on other fishes.

(b) *Dussumieria hasseltii*.—One hundred and fifty-four specimens were examined. The females and males were found mature in September. It is purely a plankton feeder.

44. *Hydrographical and meteorological observations*.—These were recorded as usual. In the Kundugal channel the highest surface temperature of sea-water was 30.6° C. on 26th April 1939 as against 31.2° C. on 27th April 1938, and the lowest temperature was 24.2° C. on 10th January 1939 as against 23.2° C. on 29th November 1937. The highest salinity was on 22nd August 1938 (36.89) and the lowest salinity (24.68) on 9th December 1938, 14th December 1938 and 3rd January 1939. The pH value ranged from 8.3 to 8.7 and the specific gravity from 1.0183 to 1.0257.

45. *The Pearl Farm*.—The year opened with 260 oysters in special cages including those in the spat-cage containing 49 oysterlings collected in May 1938. All the adult oysters were measured and weighed at regular intervals as usual. There has been a heavy mortality in the farm and only 7 of the adult oysters out of 260 and 27 oysterlings out of 49 in the spat-cage have survived.

46. During the year, 364 pearl oysterlings collected during the inspection of Pearl banks were added to the farm. The oysterlings were placed in six wooden cages and are under observation and study which will help to check the data on rate of growth, age and mortality gathered so far.

47. *Extension of the farm*.—In the beginning of the year, there were 214 Mussal Island oysters collected in March 1938. Sixty-seven thousand one hundred and thirteen live oysters of more or less the same kind with long auricles and poor colour markings collected from the spat-fall off Pudupatnam in shallow water (2½ fathoms) were placed in wire cages suspended from casuarina rafts and were added to the farm in September-December 1938. Unusual weather conditions and want of experience with the new type of cages and rafts caused serious damage and loss of oysters on more than one occasion when unusual stormy weather prevailed. Besides loss, casualties among oysters which remained in the undamaged cages increased. To reduce the heavy mortality, various experiments were tried. From January, bamboo-rafts with long bags of wire gauze were tried as these were less expensive but casualties increased greatly and it was decided to revert to the iron cages and

casuarina rafts. In April, profiting by the experience gained, the iron cages were reinforced with corner rivets and stout wire-netting was substituted for cheap wire-gauze. These cages are lasting better and are expected to prove satisfactory in the long run.

48. *Estimation of pearls in Pudupatnam oysters.*—One thousand Sethubavachatram oysters were potted and allowed to rot as usual. When washed, only one small pearl and one slightly bigger but poorly coloured pearl were obtained. About 150 oysters were used for culture pearl experiments conducted in January and March 1939; all died. One operated oyster however lived for 37 days. The experiments will be continued with the experience gained so far.

49. Seventeen spat collected from the cages of shallow water oysters of Vedalai and Pudupatnam were put into a separate wooden cage with cubicles for intensive study especially to see whether the long posterior auricle is of specific value and whether the shallow water oysters of Vedalai and Pudupatnam are different from the Tuticorin oysters.

50. At the close of the year there were only 10,821 Pudupatnam oysters and 99 Mussal Island oysters in the farm.

51. *Research on chank fisheries.*—The measurement and examination of chanks fished at Rameswaram and Irumani by the Ramnad lessee was continued.

52. *Museum.*—The museum was provided with painted name boards. The following additions were made this year:—

<i>Zoantharia</i>	..	<i>Peachia</i> sp.
<i>Alcyonaria</i>	..	<i>Pteroides</i> sp.
<i>Chaetopoda</i>	..	<i>Armandia leptocirris</i> Grube. * <i>Dasychone cingulata</i> Grube. * <i>Sthenelais</i> sp.
<i>Gephyrea</i>	..	<i>Physcosoma nigrescens</i> Keferstein.
<i>Echinodermata</i>	..	<i>Pentaceros hedemanni</i> (Lutken). <i>Palmipes sarasini</i> , de Loriol. <i>Ophiactis savignyi</i> (Muller and Trochel). <i>Ophiophragma relictus</i> (Koehler). <i>Ophiothrix hirsuta</i> , Muller and Trochel. <i>Holothuria monocaria</i> (Lesson). <i>Stichopus chloronotus</i> Brandt. <i>Synapta striata</i> Semper. <i>Phyllophorus</i> sp. † <i>Tropiometra encrinus</i> (found teeming on the pearl oyster cages).

* Note.—These were kindly identified by Professor Gopala Ayyar, University of Madras.

† Note.—A new record for this area.

<i>Mollusca</i>	..	<i>Solen corneus.</i> <i>Arca (Trisidos) tortuosa</i> L var. <i>torta</i> (Morch).
<i>Crustacea</i>	..	<i>Balanus tintinnabulum.</i>
<i>Pisces</i>	..	Two specimens of Mirror carp (<i>Cyprinus carpio</i>) from Nuwara Eliya, Ceylon.
Sea weeds—		
Woods that are destroyed by rain— Vide paragraph 44 of last year's report.	}	1. <i>Cymodocea isoetifolia</i> Aschers.
		2. <i>Cymodocea serrulata</i> Aschers and Magn.
<i>Microdictyon.</i>		
<i>Hormophysa triquetra.</i>		
<i>Hydroclathrus clathratus.</i>		

53. *Discovery of Coeloplana sp.*—The preliminary note by Dr. D. W. Devanesan and Sri S. Varadarajan, Research Assistant, Krusadai, on *Coeloplana sp.* discovered by Prof. Tattersall was read at the Science Congress, Lahore. Later the paper was published in "Current Science," Volume 8, No. 4, April 1930.

54. The Research Assistant has since discovered another new species of *Coeloplana* occurring as a commensal on the star-fish *Pentaceros hedemanni*. The Assistant Director confirmed the identification and the Research Assistant has sent a short note on the occurrence of the new species to "Current Science" for publication.

55. *Coconut tope and casuarina plantation.*—Before the auction sale the tope was managed departmentally for four months when the coconuts and dried leaves were sold for Rs. 99-3-9. The lease of the tope was auctioned and Janab Abdul Kader of Pamban being the highest bidder who offered Rs. 140 per annum took the lease on 1st October 1938. One hundred and twenty-five bent casuarina trees were sold at 6 annas each to Janab Abdul Kader of Pamban and a sum of Rs. 46-14-0 was realized.

In consultation with Sri M. O. Parthasarathi Ayyangar, Professor of Botany, University of Madras, the lease for grazing sheep on the island was discontinued from December 1938. The sheep constituted an intruding factor in the study and observation of the succession of plant-life. If sheep were absent, the seasonal climax of the island flora would be natural and better facilitated. Dispersal of seeds and fruits on the island from the main land through the agency of birds, wind and oceanic currents which lead to the formation of a strand vegetation would also not be unduly interfered with. In the absence of sheep grazing, grass also will form one of the competing plants for dominance on the island and the biotic relationship of grass to the rest of the flora can be studied without interference. The discontinuance of sheep grazing did not materially affect the total average amount realized by leasing the usufructs of the island. Foregoing a small sum of Rs. 20 or Rs. 30

in the interests of the normal floral development of the island does not appear serious while the contribution the island will make to the knowledge of botany will be valuable.

56. *Miscellaneous*.—Two green turtles (*Chelonia mydas*) were supplied to the Madras Club. Zoological specimens were collected and sent to Ennur as usual for supply work. Specimens of complete bivalve shells were sent to the Director of Industries, Central Provinces, Nagpur. One hundred larvicides (*Gambusia affinis*) were supplied on 26th May 1939 to the Willis W. Pierce Memorial Hospital, Madura.

57. The wind mill and parts purchased for the station have been transferred to the island and will be shortly installed.

58. *Visitors*.—The following professors and parties of students visited the station :—

- (1) Sri R. V. Seshaiya, M.A., Lecturer in Zoology, Annamalai University, with 20 B.Sc. students from 12th to 13th August.
- (2) Prof. R. Gopala Ayyar, M.A., M.Sc., Director, University Zoology Laboratory, Madras, with 3 post-graduate students from 10th to 18th September 1938.
- (3) Sri D. B. Krishna Rao, B.Sc. (Hons.), University Research Scholar, Botany Laboratory of Madras, from 13th to 23rd September 1938.
- (4) Sri M. Ekambaranatha Ayyar, M.A., L.T., Assistant Professor of Zoology, Presidency College, Madras, with four students from 12th to 15th October 1938.
- (5) Mr. C. John, M.A., Professor of Zoology; and Mr. K. J. Joseph, M.A., Assistant Professor of Zoology, St. Berchman's College, Chenganachery, with eight B.Sc. students from 6th to 7th January 1939.
- (6) Dr. C. P. Gnanamuthu, M.A., D.Sc., F.Z.S., Professor of Zoology, American College, Madura, with 13 women undergraduates accompanied by Mrs. E. L. Nolting from 13th to 15th January 1939.

The Professor again visited the station from 20th to 23rd March 1939.

59. The following also visited the station during the year under report :—

- (1) The Hon'ble the Minister for Agriculture and Rural Development visited the station from 19th to 20th April 1939; and
- (2) Sri S. V. Ramamurthi, M.A., I.C.S., Labour Commissioner, on 24th November 1938.

60. (iii) VIZAGAPATAM LABORATORY.—Specimens of common edible fishes are being collected for identification and exhibition

in the museum. Samples of cured fish manufactured in the area are also collected for exhibition at the museum.

61. (iv) MARINE AQUARIUM LABORATORY.—Fifty samples of sea water collected at the following places were titrated at the laboratory for the estimation of their chlorine contents :—

28 samples from Adyar backwaters, 7 from Ennur, 7 from Gokulapalli and 4 from Pulicat, for oyster culture experiments,

1 from Pudupatnam and 1 from Sethubavachatram for pearl oyster culture experiments,

1 from Adyar backwater in connexion with the studies on the growth of mullets, and

1 from Ennur for Mr. G. N. Mitra, the Orissa Research Scholar, for oyster culture experiments conducted by him.

62. Sri C. Bhaskara Nayar of the Zoological Research Laboratory of the Madras University worked at the laboratory on *Squilla rephedi* and Miss Mary Samuel on the sex of *Serranus*. Sri G. N. Mitra, M.Sc., of Orissa, worked in the laboratory for a week, and Sri N. K. Srinivasan of Trivandrum worked as an apprentice from 14th July 1938 to 15th January 1939.

63. Specimens of aquarium and other fishes were supplied to the Director of the Paris Museum through Dr. Joseph, to Mr. Gazendra Singh of the St. Thomas' Mount Cantonment office for transmission to Poona, and to the Director of Industries, Bombay. Zoological specimens such as fishes, snakes, and star-fishes were also sent to the Ennur Biological Supply section.

64. Prof. B. K. Das and Lecturer Rahimulla of the Osmania University and Professor Gopala Ayyar, Director of Zoological Laboratory of the Madras University, conducted certain researches on marine fishes at the aquarium.

(b) Technological Research.

65. (i) FISHING METHODS—*Deep-sea fishing experiments*.—Exhaustive enquiries were made in India and abroad for chartering a fishing boat for continuing experiments in deep-sea fishing by all the well known methods of fishing, viz., trawling, drift, seine, ring and purse-netting and long-lining. As it is proposed to charter only a sea-going Deisel engine fishing boat of sufficient size to stand the monsoon the offers of full-sized steam trawlers which are capable of fishing only for bottom fish by trawling had to be rejected. The details of the four definite offers of Deisel engine boats received are as below :—

- (1) Messrs. Nippon Suisan, Japan—£7,000 per year, or Rs. 8,621-9-0 per month including cost of ice for a 100-ton boat from Japan.

- (2) Messrs. Kitubishi Shoji Kaisha, Limited, Tokyo, Japan—£10,435 per year or Rs. 11,594 per month for a 100-ton boat from Japan.
- (3) Messrs. Mitsubishi Shoji Kaisha, Limited, Tokyo, Japan—Rs. 3,977 per mensem for a 10-ton boat from Singapore. (All the three insist on an expert being entertained three months in advance to make a preliminary survey, before actually chartering the boat.)
- (4) Messrs. Gopal & Co., Triplicane, Madras—£5,500 per year or Rs. 7,144 per mensem for a 94-ton Deisel engine boat from Denmark including cost of ice, fuel and lubricating oil.

Messrs. Gopal & Co. further state that the master of the boat is a fishing expert himself and has worked in the Near East waters and has actual experience of Indian seas, and the boat is equipped with trawl and seine nets, etc. Since this offer is the most satisfactory, Government sanction has been sought for negotiating the charter of the boat.

66. The Coble at Mettur has been detailed for patrol duty in the Stanley Reservoir pending the construction of a suitable motor boat for the purpose.

67. (ii) TANUR EXPERIMENTAL STATION—*Advanced research on fish-manure, etc.*—The Imperial Council of Agricultural Research have not yet allotted funds for the scheme approved and sanctioned by them.

68. *Future of the station.*—In G.O. No. 51, Development, dated 6th January 1939, Government directed that the Tanur station should be transferred to West Hill and the Research Assistant, Tanur, should work under the supervision of the Assistant Director (Biology). Consequently the contemplated repairs to the old night school shed to house the new chemical laboratory had to be suspended, and the chemicals and apparatus, etc., already ordered and received were stored temporarily in the Tanur office.

69. Estimates for the transfer of plants and erection of necessary buildings at West Hill have been received from the Executive Engineer, West Coast division, and amount to Rs. 30,000. These have been submitted to Government.

70. *Experiments with sodium hypo-chlorite.*—The electric regulator at the Aquarium was examined by the Electrical Engineer to Government, Madras, and found unserviceable. Quotations have, therefore, been called for from Messrs. Mather and Platts, Limited, Bombay, for one ammeter to read up to $7\frac{1}{2}$ amps., and one regulating resistance to carry 5 amp. continuously and to absorb 200 volts not required by the cells.

71. *Experiments with carbon-dioxide.*—Carbon-dioxide having proved the best medium for storing semi-dried prawns the station cured large quantities during the prawn fishing season and supplied customers regularly throughout the year.

72. *Experiments with prawn pickling.*—The prawns pickled in bottles on 23rd November 1937 still continue under observation. On 23rd November 1938, one year after pickling, one bottle was opened and the pH of the filtered pickle was tested. Owing to the total absence of vinegar (acetic acid) in the pickle used, the pH at the commencement was between 6·7 and 6·9. The pH of the solution in the bottle after one year when tested was found to be 6·7. The station staff tasted the prawns and pronounced the quality excellent.

73. On 6th October 1938 large prawns were available and five more bottles were packed to ascertain the effect of the period of processing on the colour of the prawns. Two bottles with weak brine and two with strong brine were processed for 2 and 15 minutes, respectively. It is suspected that the intensity of the red colour is dependent on the duration of processing; first increasing with the time of boiling, but decreasing with further boiling, evidently due to destruction of the pigment. Several experiments reducing the period of blanching to tone down the harsh red colour showed that the red colour develops in processing and insufficiently blanched prawns do not peel readily and cause unsightly deposits of a white powdery matter in the bottles.

74. An experiment was conducted on 16th May 1939 with white prawns (*Penaeus indicus*). When blanched for the usual period and bottled, the prawns did not develop the harsh red colour. It was therefore established that the intensity of the red colouration is characteristic of certain species of prawns.

75. *Experiments in pilchardising fish for long storage.*—Continuing the experiments reported in paragraph 66 of last year's report, one more fish of economic importance was treated during the year. Eighty pounds of Korakutti, which gave 65 lb. of gutted and cleaned fish, was pilchardized on 16th May 1939 in a wooden cask with 3 : 1 of salt. On 18th May 1939 a further quantity of 26 lb. (20 lb. when gutted and cleaned) was similarly treated and added to the barrel to make good the shrinkage. The fish is under observation.

76. The 80 lb. of "Adavu" pilchardized on 18th October 1937 continued in an excellent condition for a year. The fish was sun-dried when the experiment was terminated and sold at Dowlaishwaram shandy on 24th September 1938 for Rs. 5-11-0, resulting in a profit of 8 annas at a time when mackerel were scarce in the market. The oil-sardine pilchardized last year, however, did not look well,

the oil had also imparted a rancid smell. It was sold at Dowlaish-waram shandy on 14th December 1938 at a loss of 13 annas. The 100 cat-fish pilchardized last year on 18th May 1938 on the Canadian model when examined on 23rd November 1938, appeared to have not been properly preserved, the Research Assistant having ignored the instructions in the Canadian book. They were therefore sundried and sold immediately before putrefaction set in and brought in a profit of 13 annas.

77. *Dry ice experiments.*—In view of the numerous enquiries regarding the use of dry ice for the refrigeration of fresh fish, some experiments with the active co-operation of Messrs. Spencer & Company were arranged. Messrs. Spencer & Company have offered the dry ice packing cases ("Shippers") for the experiment and have agreed to supply dry ice when required. It is well known that the cost of freezing of fresh fish by dry ice is very high and uneconomical. The experiment planned was therefore to ascertain the advantages if any of transporting frozen fish with dry ice over long distances by rail. As dry ice is much colder and does not turn into water when it thaws it is said to be economical and convenient for the transport of frozen fish. The experiments planned are on a very small scale. It is proposed to freeze about 6 to 7 lb. of fish with an ordinary ice cream maker using powdered ice and salt, packing the fish so frozen with dry ice in the "Shippers" and despatching the "Shippers" by rail from Tanur to Madras and Vizagapatam. By such experiments the exact quantity of dry ice needed per unit weight of frozen fish and the duration of transport can be ascertained and the cost compared with similar transport done with the help of ordinary ice. Only three trial experiments have so far been conducted at Tanur, the Research Assistant being very ignorant of refrigeration processes. The time needed for freezing a lot of 6—7 lb. fish in an ice-cream freezer, and the ice required for freezing the fish have been determined but the dry ice has not yet been used.

78. *Experiments with the drier.*—The artificial drier at Tanur was used several times during the year for drying prawns in inclement weather. On 21st June 1939, the use of the drier was demonstrated to the Research Assistant, the Sub-Assistant Director and to Mr. G. N. Mitra, a Government scholar from Orissa and a fresh set of instructions for the proper use of the drier was issued. For obtaining the best results the following rules must be observed :—

- (i) Properly graded fish or prawns of more or less the same size should be dried at a time.
- (ii) They should be spread in a single layer on the trays.

- (iii) The air inlets should be closed and the drier should be heated till more or less uniform temperatures at the top and bottom of the drying chamber at both ends are registered, after which the air holes should be opened gradually.
- (iv) The working temperature of the drier should be between 65°C to 80°C (149°F to 176°F.).
- (v) The air outlets at the top of the closed chamber are to be opened when the temperature at the top is high and exceeds the bottom temperature. These are however rarely used.
- (vi) By keeping the shutters completely open, the temperature may be brought down quickly in any of the chambers inside the drier. This should be done whenever there is sudden rise of temperature due to careless firing and the fish or prawns are likely to be charred. With due care such a contingency will never arise.
- (vii) The temperature of any of the drying chambers can be adjusted by increasing or decreasing the fire in the appropriate fire place.

79. To facilitate reading the temperature from outside without opening the cabins every time the temperature in the chamber is to be noted, it is proposed to fit up a Cambridge Dial thermometer.

80. *Experiments with cemented vats and glazed pots.*—The jar mentioned in paragraph 67 of last year's report has successfully withstood the tests without showing any signs of cracking of the glaze or deterioration of other sorts. Quotations for the supply of 100 jars have been called for. On their receipt a scheme to introduce the glazed pots for curing in the East Coast yards, by outright sale or on credit, the cost being recovered by means of a cess, will be submitted to Government.

81. *Fumigation with carbon-bi-sulphide.*—The experiments in seven kilner jars were concluded on 21st June 1939 after a period of a year and 18 days. All the fish fumigated with half an ounce of carbon-bi-sulphide every two months, and those treated with one-sixteenth ounce every month were found to be in good saleable condition. Those treated with half an ounce every two months and those treated with one quarter of an ounce every month were the best. Those treated with one-sixteenth ounce every month, however, showed some salt excrescence. The experiments have proved that fumigation with half ounce every four months or one-eighth ounce every month is the minimum treatment required per pound of fish to enable cured fish to be preserved in good condition for long periods without defects and the cost works out to two pies worth of chemical per pound of fish every month or 1 anna per year which is rather high for salt fish. Further experiments

however are required to see whether fumigation with one-eighth ounce of carbon-bi-sulphide every month will preserve two or three pounds of fish in the same jar. Further series of experiments with 3 and 7 lb. jars have been started.

82. The experiments with cat-fish in mud pots as containers did not yield satisfactory results, as the fish putrified after two months in spite of regular fumigation. This shows that mud pots cannot be used for fumigation, as they are not airtight.

83. *Vitamin survey of fish oils.*—Oils from the following fishes were tested at the Coonor laboratory during the year :—

Name of fish.	Date of extraction.	Vitamin A contents.
(1) Velamin (<i>Pristis cuspidatus</i>)	.. 25th July 1938	.. 3,400 mg.
(2) Do.	.. 14th March 1939	.. 2,083 mg.
(3) Varipuliyana Sura (<i>Galeocerdo tigrinus</i>)	18th January 1939.	700 mg.
(4) Do.	26th February 1939.	6,000 mg.
(5) Komban sura (<i>Sphyrna blochii</i>)	.. 10th March 1939	.. 14,062 mg.
(6) Do.	.. 20th March 1939	.. 10,156.0 mg.
(7) Pal Sorrah (<i>Carcharias temminckii</i>)	25th June 1939	.. 2,000 mg.
(8) Keeripallan Sura	.. 10th September 1939	300 mg.
(9) Cat-fish (<i>Arius dussumieri</i>) (bodyoil)	18th May 1939	.. 44.0 mg.

Since the necessary apparatus (a colourimeter) has been installed at Tanur for roughly estimating the vitamin A content, the testing of oils was commenced at Tanur during the year. Difficulties, however, were experienced in obtaining a standard for comparison. Norwegian cod liver oil with known vitamin A potency was finally adopted on the advice of Dr. Aykroyd, Director of the Coonor Nutrition Research Laboratory, as the standard for further determination. The following comparative statement of determination at Tanur and Coonor show that the tests at Tanur are fairly accurate for ordinary purposes. More accurate readings cannot be obtained except with expensive apparatus such as the spectrophotometer.

Name of fish.	Tanur estimate.	Coonor estimate.
1. Varipuliyana Sura (<i>Galeocerdo tigrinus</i>)	900.4 mg.*	700 mg.
2. Kallan Sura (<i>Galeocerdo tigrinus</i>)	6,621.0 mg.†	6,000 mg.
3. Pal Sura (<i>Carcharias temminckii</i>)	2,574 mg.†	2,000 mg.
4. Velamin (<i>Pristis cuspidatus</i>)	1,911 mg.†	2,083 mg.

A Hilger vitameter A is a more accurate and modern instrument than the colourimeter and its purchase for Tanur has been suggested.

* With cod liver oil standard.

† With carotene standard.

84. Tests in recent years have given a value approximating to 20,000 mg. of vitamin A for Halibut liver oil, the most potent source of vitamin A known and even so some South Indian fish oils compare favourably with it. The oil from *Sphyrna blochii* has yielded an oil 35 times as potent in vitamin A as ordinary commercial cod liver oil and nearly three-fourth as potent as the best Halibut liver oil. This unexpected discovery shows that there is every prospect of establishing a medicinal fish oil industry in South India.

85. The scheme for initiating a medicinal oil industry submitted to Government—vide paragraph 74 of last year's report was sanctioned in G.O. No. 866, Development, dated 3rd April 1939, and necessary provision has been included in the Budget Estimate for 1939-40. The scheme is sanctioned in the first instance for a period of one year. The demonstration of the Tanur method for the benefit of the officers who are to supervise the manufacture of oil in the yards all along the coast will be conducted at Ponnani in September 1939 when the fishing season is expected to commence.

86. Many enquiries from India and abroad have already been received for supplies for medicinal fish oil, and pending the manufacture of this oil as a cottage industry all along the coast, no supplies could be guaranteed. Samples of Tanur oil of high potency have been distributed to various medical men and hospitals to test its therapeutic value.

87. *Anti-oxidant (Maleic acid)*.—For the long storage of edible oils this acid has been recommended by the Biological Board of Canada.* An experiment with strong fish liver oil with a vitamin value of 6,621 mg. manufactured at Tanur in November 1938, was started on 8th March 1939 by adding 0.01 per cent of Maleic acid. Two determinations of the acid value were made with satisfactory results. The effects of using different containers such as white glass bottles, brown glass bottles and white flint glass bottles for storing the oil during the experiment are being watched.

88. *Research on sea-weed manure*.—The two coconut trees under observation and three other trees in a dying condition in the same plot were manured on 25th July 1938 with a mixture of 12 lb. manure and 48 lb. ash each. On 18th July 1939 six more trees in a weak and unhealthy condition were selected and treated with manure in the proportions tried originally at Krusadai Island, viz., with 38 lb. green sea weed and 19 lb. sheep manure per tree.

89. *Research to lengthen the life of fishing craft and tackle*.—The logs treated with the "Ascu" process in a catamaran at Rayapuram are still in good serviceable condition and have withstood

* Bulletin No. XLVI of the Biological Board of Canada.

six years of constant use. The "Ascu" treated fence in the Tanur yard is still in good condition and is expected to remain so for another two years. Considering the imperfect treatment under low pressure, the results are gratifying.

90. A sample of light wood (Royyi) used for catamarams was treated in the Vizagapatam Port Ascu Plant by the Port Department Engineer with 70 per cent solution and is under observation. A sample of the treated wood was exhibited at the Madras "All-India Khadi & Swadeshi Exhibition," 1938-39.

91. *Tanur plant.*—St. Vincent's Industrials, Calicut, are repairing the engine and compressor. Immediately the plant is put into working order a series of experiments on the treatment of fencing materials will be conducted, and the question of the cost of treatment in relation to the length of life will be worked out.

92. *Preservation of nets.*—One hemp net ("Etta vala") in two pieces of netting from the Fisheries Training Institute, was treated with dip C on 25th September 1938. The net after treatment was handed over to Sri K. P. Balan of the Tanur North Yard on 23rd February 1939 for use. He was permitted to alter the net to suit local methods of fishing. Though he was not able to use the hemp net for want of cat-fish shoals, the two pieces of netting used with his paithuvala is reported to have stood heavy wear and tear satisfactorily. The experiment is continuing.

93. *Purchase and manufacture.*—A total quantity of 14,255 lb. of fish at a cost of Rs. 365-7-0 was purchased for curing during the year against 12,903 lb. of fish costing Rs. 330-6-0 in the previous year. Thirty thousand eight hundred and fifty-four pounds of fish at a cost of Rs. 526-1-0 were purchased and treated for fish meal against 9,826 lb. costing Rs. 174-8-6 last year. The total output for the year was 2,447 lb. cured fish, 8,006 lb. fish meal, 6,314 lb. fish cakes, 2,133 lb. pink meal, 1,775 lb. of fish bones and 24 gallons fish oil at a cost of Rs. 1,395-14-0. The output during 1937-38 was 2,060 lb. cured fish, 2,045 lb. fish meal, 2,056 lb. fish cakes, 430 lb. pink meal, 7 lb. fish-guano, 351 lb. fish bones and 14 gallons 1 bottle fish oil costing Rs. 743-15-2.

94. *Sales.*—During the year 2,143 lb. of cured fish, 6,331 lb. fish meal, 56 gallons fish oil and miscellaneous articles were sold for Rs. 2,679-6-9 whereas last year 2,006 lb. of cured fish, 2,218 lb. fish meal, 3,941 lb. fish bones, 3,447 lb. fish guano, 489 gallons 2 bottles fish oil and miscellaneous articles were sold for Rs. 2,575-10-0

95. *Stock.*—The year closed with a stock of 413 lb. small prawns, 1 $\frac{3}{4}$ lb. pomfrets, $\frac{3}{4}$ lb. mackerel, 22 lb. podimeen, 495 lb. fish meal, II class, 2,131 lb. fish bones, 113 gallons 4 bottles fish oil, 23

bottles fish liver oil as against 128 lb. small prawns, 100 cat-fish, 7 lb. fish meal, II class, 351 lb. fish bones, 145 gallons 4 bottles fish oil in 1937-38.

96. *Receipts and expenditure.*—The receipts of the station amounted during the year to Rs. 2,771-6-9 as against Rs. 2,709-12-0 last year and the expenditure, excluding the establishment charges of Rs. 2,188-1-0 to Rs. 5,342-11-11 as against Rs. 4,736-9-7 in the previous year.

97. *Advertisement.*—Besides the usual advertisement in the Villager's Calendar, the products of the station were exhibited at the Commercial Museums at Calicut and Mangalore. The station also participated in all the exhibitions held during the year in the Presidency.

98. *Training of apprentices.*—The following underwent training at the station during the year :—

- (1) Two candidates from the Orissa Government.
- (2) An officer of the Co-operative Societies, Bengal, for a period of eleven days.
- (3) The Inspector of Fisheries, Malvani, Bombay.
- (4) Mr. Pharmy Pohuemeal of Bombay.
- (5) Mr. Kunhiraman of Tanur.
- (6) Mr. G. N. Mitra, M.Sc., deputed by the Orissa Government.
- (7) Moulvi Bedar Bakht an officer deputed by the Registrar of Co-operative Societies, Bengal.

B. ADMINISTRATION.

(a) Public fish-curing yards.

99. There were 100 fish-curing yards at the beginning of the year, four yards closed as a measure of retrenchment in 1931 were reopened, and a new private yard was opened in the South Kanara district during the year, making the total number of fish-curing yards by the end of the year 105. Of these, 12 yards are in charge of Sub-Inspectors, 92 in charge of petty yard officers and 1 in charge of a peon.

100. *Change of policy of Government in opening new yards.*—In G.O. Ms. No. 1022, Development, dated 23rd July 1934, Government on account of financial stringency, ordered that no proposals either for continuance of temporary yards or for the reopening of yards temporarily closed, or for opening of new yards should be submitted to them, unless the curers concerned undertook to reimburse Government the loss, if any incurred in working the yards, to deposit in advance adequate security and to execute a bond making themselves jointly and severally liable to make good the loss—vide

paragraph 123 of the Administration Report for 1934-35. The restrictions on opening of new yards were imposed only for a period of one year (1935-36) and Government promised to issue further orders at the end of that year. In G.O. Ms. No. 1622, Development, dated 7th July 1938, Government sanctioned the reopening of four out of the five yards temporarily closed in 1931 on the West Coast, viz., Meladi, Elathur, Beypore (North) and Kaipamangalam yards without any of the conditions mentioned above. The opening of the fifth yard at Tanur (South) involved an initial expenditure of Rs. 2,700 on the reconstruction of shed and fence and was therefore postponed to 1939-40. Since no orders were received from Government as contemplated in G.O. No. 1022, dated 23rd July 1934, Government were asked if the conditions laid down in that Government Order were still in force. In G.O. Ms. No. 1270, Development, dated 13th May 1939, Government decided to waive the conditions laid down in the above Government Order in connexion with the opening of new yards if it were fairly certain that there would be no loss in their working. This has greatly relieved the anxiety of fishermen in several places who have been clamouring for new yards.

101. In G.O. No. 51, Development, dated 6th January 1939, the Government observed that fish-curing yards on the East Coast which have been working at a loss should be examined to decide which of them can be closed down without causing undue hardship to curers concerned. The question whether fish-curing yards which do not work at a profit should be closed is being carefully examined.

102. (i) EAST COAST (NORTHERN SECTION).—The number of yards in this section continued to be 26. All the yards were in charge of petty yard officers of whom 23 are Secondary School-Leaving Certificate holders.

103. The proposal for shifting the Calingapatam yard to the adjoining village is pending the detailed examination of the working of the yards ordered by Government in G.O. No. 51, Development, dated 6th January 1939. The proposal to open new yards at Nizampatam and Kothapalem is still under investigation.

104. *Review of the chief coastal fisheries.*—In the Circars the sardine fishery ranked as first in importance during the year. It commenced in October and lasted till the end of June. The sardine season was at its height from January to May. The catches were good in East Godavari and normal elsewhere. The ribbon fish fishery was second in importance, and was normal throughout the coast. The fish occurred throughout the year and the catches were good from July to December. The next fishery in importance was

“ White Bait,” which lasted from September to May. The catches were good in the north as far as Calingapatam but poor in the south. Silver-bellies and pomfrets came next and occurred throughout the year in fair numbers. The Jew-fish fishery was poor in all places, though the fish occurred throughout the year.

105. *Transactions.*—The total quantity of fresh fish brought to the yards in the Circars was 115,403 maunds 10 seers, the salt issued for curing was 14,735 maunds 21 seers and the quantity of cured fish let out from the yards was 63,781 maunds 12 seers against 120,356 maunds 11 seers of fresh fish, 15,100 maunds 10 seers of salt, and 68,542 maunds 32 seers of cured fish last year. The fishing season was normal during the year, and sixteen yards showed increased transactions over last year. Of the estimated quantity of fish landed in the villages served by these yards, viz., 381,816 maunds valued at Rs. 9,86,620 the fresh fish brought to the yards for curing formed about 30 per cent against 36 per cent last year. The number of ticket-holders in the yards decreased from 1,064 at the beginning of the year to 973 at the end of the year. Vigorous efforts with the co-operation of the Health department are being made to induce the fishermen who cure fish outside with swamp salt to resort to the yards with a view to supply the markets with well-cured fish.

106. *Supply of salt.*—The quantity of salt purchased and supplied to the yards was 2,872 maunds monopoly, and 11,986 maunds excise salt against 1,902 maunds and 13,352 maunds respectively last year. The rate paid for monopoly salt ranged from 4 annas to 6½ annas per maund and that for excise salt from 4 annas to 8½ annas per maund, against 6½ annas and 4 annas to Re. 1-4-0 respectively last year. The average cost of salt including conveyance to yards worked out to As. 8-5 per maund against As. 11-2 per maund last year.

107. *Wastage of salt.*—There was no wastage of salt during the year under report.

108. *Balance stock of salt.*—The stock of salt in the yards on 30th June 1939 was 1,534 maunds 38 seers against 1,412 maunds 19 seers on 30th June 1938.

109. *Transport of salt.*—On enquiry, it was ascertained that transport of white salt from Tuticorin to Northern Circars either by sea or by rail would cost more than the issue price of salt, viz., Re. 1-4-0. Further enquiries are being made in other places.

110. *Fence.*—Gates and gate posts were renewed in eight yards this year. Attempts to grow live fence still present difficulties due to village cattle. Proposals for putting up barbed-wire fencing to keep out village cattle are under consideration.

111. (ii) EAST COAST (CENTRAL SECTION).—There were nine yards in this section as last year. All the yards were in charge of petty yard officers of whom six were Secondary School-Leaving Certificate holders. Some of the fishermen who migrated from Irukkam (vide paragraph 106 of last year's report) have returned and the others are expected to return shortly. There is therefore no need to shift the yard from Irukkam to Monakuppam.

112. *Review of chief coastal fisheries.*—The fishing season was poorer even than last year. The chief shoaling fishes that appeared during the year were seer, pomfret, ribbon fish, mullet, sardine and prawn.

113. Seer was caught off Kadapakkam during August to May. Pomfrets shoaled off Kadapakkam in April and off Pulianjerikuppam in February and March. Ribbon fish was caught in large quantities in all the yards except Kothapatnam from September to November, and mullets at Kondurpalaiyam and Kadapakkam in August and at Pulianjerikuppam in October and February. Sardine were available only at Kadapakkam and Pulianjerikuppam in August and May respectively. Prawns were fished in Mangodu, Medicalkuppam, Irukkam and Sathankuppam yards around Pulicat in December and in April and May.

114. *Transactions.*—The total quantity of fresh fish brought to the yards was 46,216 maunds 32 seers, the quantity of salt issued 7,063 maunds 21 seers, and that of cured fish let out from the yards was 27,712 maunds 18 seers. The corresponding figures for the previous year was 78,876 maunds 8 seers, 11,976 maunds 17 seers, and 45,624 maunds 5 seers. The fall in transactions was partly due to the use of swamp salt by the curers, and partly to a poor fishing season. The two yards where the use of swamp salt is not possible, viz., Kadapakkam and Nelathurpalaiyam, showed improved transactions while all the others had poor transactions particularly Medicalkuppam, Irukkam, Kondurpalaiyam and Kothapatnam where the transactions were below those of last year by 45 to 65 per cent.

115. *Supply of salt.*—The total quantity of salt supplied to the yards was 7,260 maunds against 11,980 maunds last year. The entire quantity was excise salt, no monopoly salt being available. The rate paid per maund of salt ranged from 2 to 4 annas and the transport charges from As. 1-7 to As. 3-1 per maund.

116. *Wastage of salt.*—There was no wastage of salt during the year.

117. *Balance stock of salt.*—The stock of salt in the yards at the beginning of the year was 591 maunds 30 seers, and at the close of the year 788 maunds 9 seers.

118. *Transport of salt.*—Transport of salt to all the yards was done during the year. The question of purchasing a boat to replace the old one for transport at Krishnapatam is still under the consideration of Government.

119. *Fence.*—The question of providing wire fence to all the yards could not be pursued this year for want of funds.

120. *Improvements in yards.*—The model shed constructed in 1936–37 in the Mangodu yard has been very satisfactory and affords better accommodation to the staff and greater safety to duty-free salt. The question of constructing similar sheds in all the other yards will be taken up when finances improve.

121. (iii) EAST COAST (SOUTHERN SECTION).—There were fourteen yards in this section as last year, and all of them were in charge of petty yard officers of whom only one is a Secondary School-Leaving Certificate holder.

122. *Review of chief coastal fisheries.*—The fishing season this year was poorer than last year on the Tinnevely, Ramnad and Tanjore coasts. In the Tinnevely district “Thondan” (*Dussumieria*) “Chalai” (*Sardinella*) and “Tiruvenganai” (*Pellona*) fisheries were normal in the south and poor in the north. “Savalai” (*Trichiurus*) and “Kuthippu” (*Lactarius*) fisheries were poor.

123. In the Ramnad district there were good catches of “Kalar” (*Anodontosoma*), Seer (*Scomberomorus*) and “Savalai” (*Trichiurus*), at Attankarai; and “Cheppili” (*Lutjanus*) and “Para” (*Caranx*) at Nambuthalai; while the usual shoals of “Thiruvenganai” (*Pellona*) and “Thondan” (*Dussumieria*) were absent at Mukkur.

124. In the Tanjore district Seela (*Scomberomorus*) and Oollam (*Hilsa*) were abundant at Vanagiri. But the landing of miscellaneous small fish at Tranquebar, *Hilsa* at Arcot Thurai, Thread fin (*Polynemus*), Jew fish (*Sciaena*) and sharks at Point Calimere; Cat-fish (*Arius*) and mullet (*Mugil*) at Muthupet, sharks, skates and rays at Adirampatnam and *Hilsa* and Cat-fish (*Arius*) at Sethubavachathram were poor.

125. *Transactions.*—The total quantity of fresh fish brought to the yards during the year was 49,162 maunds 39 seers the salt issued 10,336 maunds and cured fish removed from the yards 34,671 maunds 37 seers against 60,500 maunds 3 seers of fresh fish, 13,031 maunds 29 seers of salt and 42,907 maunds 14 seers of cured fish last year. Excepting Pinnacoyal in the Tinnevely district, Nambuthalai and Attankarai in the Ramnad district and Vanagiri in the Tanjore district, transactions in the yards were poorer than last year, due to adverse weather conditions and the use of swamp salt for curing.

126. *Supply of salt.*—Nine thousand one hundred and four maunds of salt were supplied to the yards from Kulasekarapatnam, Keeranur, Morekolam, Vattanam, Adirampatnam, Vedaranniyam, Tranquebar and Neidavasal factories, against 18,000 maunds in the previous year. The transport from Kulasekarapatnam to Ovari and Idinthakarai was by boat, and it cost As. 4-5 per maund. Transport of salt to the other yards was by bullock-carts and the charges varied from 11 pies to As. 5-6 per maund.

127. *Wastage of salt.*—There was no wastage of salt during the year.

128. *Balance stock of salt.*—The stock of salt in all the yards on 30th June 1939 was 4,935 maunds 38 seers against 6,167 maunds 38 seers on 30th June 1938.

129. *Reforms in yards.*—An additional store with Mangalore tile roofing was constructed at the Ovari fish-curing yard during the year at a cost of Rs. 382-12-0. There was no sea erosion this season at the Point Calimere yard.

130. *Fence.*—The planting of live fence in place of prickly pear destroyed by cochineal has not yet proved a success in the Pinnakayal and Sippikulam yards due to marshy and sandy soil. In the other yards live fences of aloes, screw pines, etc., are thriving.

131. *Miscellaneous.*—The palmyra and coconut trees in the fish-curing yards were leased out for Rs. 19-6-0 against Rs. 22-4-0 last year.

132. (iv) *WEST COAST.*—There were 56 yards on the West Coast against 51 last year. Twelve of them were in charge of Sub-Inspectors, 43 in charge of petty yard officers and one in charge of a peon.

133. *Yards newly opened or closed.*—A private yard for Sri K. Sessa Marakala, which could not be opened last year, was opened on 13th October 1938. The operations in this yard were satisfactory and 869 maunds of salt were consumed. The consumption in the other two private yards at Malpe and Paduthonse was only 680 and 682 maunds of salt, respectively. Sri Annaya, who applied for a private yard at Malpe, died on 22nd May 1939. The closed yards at Meladi, Elathur, Kaipamangalam and Beypur North were re-opened during the year. Proposals for opening new yards at Edakashiyur, British Cochin, Punjavi and Tharpathi and a private yard for Aboobucker Sahib of Baidur are under consideration. The opening of a yard at Hejmadi-Kodi is delayed for want of a building, which is expected to be ready by October 1939. The fishermen of Kizhur have again pressed for the reopening of their yard, and

have applied for a loan to run the yard. Since the yard worked previously at a loss, the question whether the loan applied for could be granted is under consideration.

134. *Review of chief coastal fisheries.*—Oil-sardine appeared in the north of the South Kanara district from November to February, and in one or two yards in the south. In Malabar small shoals of oil-sardine appeared in the south for a short time, while in the central portion they shoaled from August to January. Mackerel appeared in the South Kanara district from September to April, though the catches in the north and south were poorer than last year. In Malabar mackerel appeared in small shoals throughout the year.

135. The other important shoaling fishes that appeared off the South Kanara district were cat-fish (*Arius*) in July and October, Chamban (*Selar crumenophthalmus*) in October, Sole (*Cynoglossus semifasciatus*) in August to October, Thalayan (*Trichiurus*) in July, Tholiyan-mathi (*Sardinella fimbriata*) from November to February and prawns in August and September. In the Malabar district, cat-fish (*Arius*) shoaled throughout the year, Chamban (*Selar crumenophthalmus*) in a few places from July to September and throughout the coast in October, Sole (*Cynoglossus semifasciatus*) from August to December, Mullan (*Leio-gnothus* and *Gazza*) in small quantities throughout the year, Thalayan (*Trichiurus*) in May and June and prawns all the year round except in October and November.

136. *Transactions.*—The total quantity of fresh fish brought to the yards was 805,682 maunds 10 seers salt issued 131,682 maunds 39 seers and cured fish removed 521,481 maunds 12 seers against 951,084 maunds 35 seers of fresh fish, 159,676 maunds 20 seers of salt and 608,696 maunds 23 seers of cured fish last year.

137. In the South Kanara district, operations improved in the Hungarcutta, Malpe I and II, Paduthonse and Udayavar yards due to better catches of mackerel, while there was a fall in operations in the other yards compared with last year. In Malabar, Azhicode, Edakad, Thalayi and Madapalli in the north showed improved transactions, due to better catches of Chamban, mackerel and sole, while Quilandi, Pudiappa, Calicut North, Beypore South and Parappanangadi yards showed a decline in operations compared with the previous year. In all the other yards there was a heavy fall in operations due to a disappointingly poor season.

138. *Systems of curing.*—Besides the local methods of cure, the Colombo and Ratnagiri methods were employed in Kirimanjeshwar, Gangoli, Hungarcutta, Malpe I and Udayavar yards. In the

Ullal yard the Colombo method of curing was not resorted to this year owing to the scarcity of mackerel. At Paduthonse and Kidiyur yards there was no curing by the Ratnagiri method. In general the curing operations under these two systems showed an increase over that of last year.

Year.	Colombo system.		Ratnagiri system.	
	MDS.	SEERS.	MDS.	SEERS.
1937-38 ..	11,763	33	4,397	38
1938-39 ..	21,333	24	6,845	1

139. *Demonstration curing sheds.*—In the demonstration curing shed at Malpe yard, 34 maunds of mackerel, 16 maunds 10 seers of Palatharam (miscellaneous small fish) and 1 maund 20 seers of skates were bought and cured in November and December at a cost of Rs. 99-14-0. The cured fish was sold for Rs. 109-10-0 resulting in a profit of Rs. 9-12-0. In the demonstration shed at the Calicut North yard 1 maund 32 seers of pomfret were cured and sold for a profit of 9 annas to Government.

140. *Standard curing sheds.*—In the yards on the West Coast there were 609 permanent type-design curing sheds at the beginning of the year. Twenty sheds were newly constructed during the year, the tickets of eight curers who owned type design sheds were cancelled, leaving the total number of such sheds at the end of the year at 621. Though ticket-holders appreciate the advantages of the type-design sheds, want of funds due to poor fishing seasons stands in their way.

141. *Damage to yards.*—There has been further sea-erosion in the Hungarcutta yard during the year; the combined guard and store shed is not likely to survive the current fishing season. The acquisition of new site has been sanctioned, but the site has not yet been handed over to the department. The Vadanapalli yard also is threatened by the sea, and during May 1939, the sea came as far as the gate, but receded shortly after. The question of shifting the yard to a safe site is receiving attention.

142. *Supply of salt.*—The total quantity of salt supplied from Tuticorin to the West Coast was 155,600 maunds against 156,386 maunds last year. There was no depletion of salt in any of the yards during the year. As the Kootayi yard was often threatened with depletion during heavy operations proposals for constructing an additional store at this yard are under consideration.

143. *Supply of salt to other institutions.*—The following quantities of salt were supplied to the institutions noted below :—

	MDS.
Sub-Jail, Mangalore	28
Central Jail, Cannanore	200
Sub-Jail, Calicut	30
Mental Hospital, Calicut	110
Tanur Experimental Station	20

144. *Wastage of salt.*—There was a wastage of 100 maunds 8 seers of salt during the year, against 67 maunds 35 seers last year. Of this a wastage of 38 maunds 4 seers was written off during the year, and the rest of the wastage is under investigation. The cost and single duty on the wastage of 1 maund 10 seers ascertained in three short weight bags delivered by 'Lord Inchcape' on 15th March 1939, and on a bag of salt dropped into the sea at Calicut from schooner "Hydros," with the cost of the gunny were recovered from the Tuticorin salt transport contractor and from the West Coast unloading contractor respectively.

145. *Balance stock of salt.*—The balance stock of salt remaining in the fish-curing yards on 30th June 1939 was 174,820 maunds 24 seers, against 151,390 maunds 11 seers at the beginning of the year.

146. *Improvements in yards.*—Two new store sheds were constructed at the Malpe 1 yard and two more at the Udayavar fish-curing yard at a cost of Rs. 2,494 and Rs. 2,600 respectively during the year. The question of providing additional store sheds at Kumbala, Thalayi, Badagara, Kotayi, Paravanna and Mannalam-kunnu yards is under consideration. A well was sunk in the Paravanna yard, and proposals for sinking wells at Kootayi, Blangad and Karimpuram yards are under consideration. The basements of weighing sheds in the Nattika, Ponnani and Pudiakadapuram yards were lowered during the year to facilitate easy access to the weighing sheds for head loads of fish.

147. *Miscellaneous—Pit manure.*—The manure collected at the Malpe I yard was sold for Rs. 120 against Rs. 53 last year.

148. *Fence.*—The experiments in growing a live fence with Korukapulli (Madras thorn) were successful at the Tanur North yard but have not been successful elsewhere. Further experiments are under contemplation.

149. *Departmental salt factory on the West Coast.*—The Government of India have agreed to this Department's proposal to experiment with manufacture of white salt on the West Coast for fish-curing. In G.O. No. 2336, Development, dated 18th October 1937, the Madras Government sanctioned the acquisition of 25 cents

of private land in Payyanur desam for the experiment. The cost of acquisition was fixed at Rs. 28-12-0. Acquisition proceedings was started during the year, and the Collector held the award enquiry on 5th July 1939. Immediately the land is handed over to the Department experiments will be commenced.

150. *Private curing.*—Private curing with locally manufactured salt was resorted to by some curers in Gangoli, Hungarcutta, Malpe and Udayavar yards and about 400 bags of such salt are reported to have been so used. At Madakara private curing with 50 bags of salt purchased in the local bazaar was reported.

151. *Visits.*—The Hon'ble the Minister for Public Works visited the Tanur North Yard in January 1939.

(b) Private Oil and Guano Factories.

152. About 36 factories between Gangoli to Udayavar worked during the year, and manufactured 30 tons of fish oil and 130 tons of guano in the South Kanara district and 1,270 tons of beach dried manure were also made and sold for prices varying from Rs. 45 to Rs. 80. The prices for fish oil ranged from Rs. 170 to Rs. 240 and guano from Rs. 37-8-0 to Rs. 52-8-0 per ton and for manure from Rs. 45 to Rs. 80 per ton.

153. In Malabar only 20 factories worked during the year. They manufactured $6\frac{1}{2}$ tons of oil and 142 tons of guano; 318 tons of beach dried manure were also made. The prices ranged from Rs. 150 to Rs. 250 per ton of oil, Rs. 50 to Rs. 63 per ton of guano and Rs. 30 to Rs. 35 per ton of beach dried manure. The poor output was due to failure of the sardine season.

II. MINOR MARINE AND ESTUARINE FISHERIES.

A. Prawns.

154. The prawn fishery in the Collair lake this year also was a failure and no investigations on prawns were therefore possible.

B. Edible Oysters.

155. (i) OYSTER SUPPLY.—The 1938 season which commenced on 12th March 1938, was not closed and the oyster supply was continued without a break till the close of the year and is continuing. Since the oysters from Gokkulapalli were not fat, the supply was made from Ennur from August 1938. Eighty-nine thousand four hundred and seventy-five oysters were supplied during the year ending 30th June 1939 against 63,800 last year. The sale proceeds amounted to Rs. 1,582-6-9 against Rs. 1,151-13-0 last year.

156. With effect from 1st March 1939 Messrs. Vernon & Co., 26, Second Line Beach, Madras, took up the sole agency for the distribution of the Department's oysters and the firm has guaranteed

to purchase and distribute 84,000 oysters at a flat rate of Rs. 8 per 500 oysters f.o.r. Madras during the season. They have so far purchased 32,165 valued at Rs. 511-0-9 till 30th June 1939.

157. (ii) SHELL LEASE.—The right to collect dead “matti” shells for lime burning from the Ennur oyster beds was leased out for one year from 1st July 1939 for Rs. 557 and from the Pulicat oyster farm for Rs. 225 for one year from 1st September 1938.

III. INLAND FISHERIES.

158. The year under review was an abnormally bad year for inland fisheries and revenues. Many permanent water tanks ran completely dry on account of the unusually severe drought. The level of water even in the Mettur reservoir was so low that there was no irrigable water in the river below for months. The famine conditions prevailing in several districts of the Presidency have also frustrated efforts at securing adequate rentals for tanks which had a supply of water.

A. Research.

159. (i) RESEARCH ON RURAL PISCICULTURE.—The scheme sanctioned by the Imperial Council of Agricultural Research for establishing a fresh water biological station at Chetput (Madras) still awaits funds from the Council, and the intensive research on problems connected with inland fisheries is therefore held up.

160. (ii) DEEP WATER FISHING EXPERIMENTS.—From 1st November 1938, the fisheries of the Mopad reservoir were leased, and thus have entered upon a new phase. From the construction of the reservoir in 1922 till last year, the department was solely responsible for stocking and fishing the lake, in order (1) to assess correctly the development of fisheries in this new reservoir, and its potentiality and (2) to ascertain the best method of fishing continuously a lake of considerable depth. This experiment in tank-culture conducted for the first time on so gigantic a scale under complete departmental control and on approved scientific lines, has furnished a wealth of data invaluable for the development of inland fisheries in South India. The results obtained in stocking the lake and fishing it for the last seventeen years have been published in the administration reports of the department for the years 1922-23 to 1937-38.

161. The fishing experiments in the reservoir commenced in 1922-23. The plying of cast nets from the shore or from rafts in shallow water was the only indigenious method of fishing when the experiments started. The first new net to be tried was the drift net with varying mesh. It proved its usefulness from the beginning but was particularly effective from 1927-28, when its proper use

was ascertained. The drift nets chiefly caught *Labeo fimbriata* and were plied at night. *Catla* was not generally caught by this net showing that it is more or less a bottom fish. In 1927-28 a "lifting" net in use in the Ennur backwater for Mullet was introduced and proved effective for the capture of *Catla*. In 1931-32 a large sized seine net (Agni vala) and in 1932-33, the "Paithu vala," a miniature seine net used by the West Coast sea-fishermen were tried, but without appreciable success, on account of the uneven bottom and boulders in the bed of the lake. The last net to be tried was the "Ooza vala" in 1938-39. This is a long sheet of cotton netting measuring 2,400 feet in length and 15 feet in breadth, with 2" square mesh, weights along the bottom and floats along the top. It is used in deep pools of stationary water in the Godavari river. The method is to pay out the net in a circle round a pool, and to beat the enclosed water from boats or canoes by long bamboo poles. This scares the fish which dash in different directions and are caught in the surrounding net. This proved very effective and both *Labeo* and *Catla* were caught in large numbers. Long lines have been successfully employed since 1935-36 for the capture of eels, "fresh water sharks," and in the early years (1922-1926) "Murrels." Basket traps extensively used in the weedy shallows of the Collair lake for the capture of young *Catla*, and the "Murrel noose" were tried in 1931-32. As weeds and "Murrels" disappeared from the lake within the first few years of its formation these methods of fishing did not prove successful.

162. The stocking of the Mopad reservoir was chiefly confined to the annual introduction of *Catla* fry, measuring 1 inch to 2½ inches from 1921 to 1935. *Catla* of marketable size began to figure in the catches from 1929 and accounted for no less than three-fourths of the total catch from the lake last year. The sizes and weights of the *Catla* caught in 1938-39 were as follows :—

Length.	Weight.	Percentage of the total catch.
18 inches to 22 inches	.. 4½ to 6 lb.	71
24 inches to 26 inches	.. 6½ to 10 lb.	4
30 inches to 35 inches	.. 18 to 24 lb.	½

This is by itself a satisfactory achievement but even more satisfactory is the positive proof which has been obtained of the breeding of this riverine fish in the confined waters of the lake. This is the first and only record of *Catla* breeding in confined waters.

163. Direct proof of *Catla* breeding in the Mopad lake has been rare. Once in 1936 the Assistant Inspector in charge observed males with flowing milt and one female with ripe but not oozing eggs,

both measuring 22 inches and above. Once, on 24th January 1938, four fingerlings of *Catla* measuring 4 inches to 5 inches were captured though no fry were introduced since 1935, leading to the conclusion that these four fingerlings must be the result of natural breeding in the lake. Apart from this there is the indisputable evidence of *Catla* having multiplied in the lake from the statistics that have been maintained of the fry stocked in the lake and fish caught out of it during the last seventeen years—vide statement below :—

Number of fry stocked from 1921 to 1935	..	7,927
Number of fish caught from 1928 to 1939	..	25,060
Number caught in excess of number stocked	..	17,133

There are still a large number of *Catla* in the lake which have not been captured.

164. A fact of considerable interest is that this fish which is accustomed to breed in the South-West monsoon is not for that reason exactly suitable for breeding in the southern waters of the Presidency where the rainy season is from October to December. Such a readjustment is not easily made. But the fact that *Catla* has bred in the Mopad reservoir gives the hope that the fish is capable of adjusting itself. There is however one factor that needs to be remembered. The rainy season in the Mopad area is really intermediate in character. Mopad gets an almost equal amount of rainfall from June to September and from October to December, and it is likely that *Catla* bred only in the years when the South-West monsoon caused floods in the Manneru. The five dominant sizes of *Catla* caught, viz., 18", 26", 30", 34" and 36" also support this view but as intermediate sizes also occur the chances of *Catla* having bred annually is not totally excluded—vide analysis of catches from 18" to 36" given below :—

Sizes ..	18"	19"	20"	21"	22"	23"	24"	25"	26"	30"	33"	34"	36"
Number caught.	2,300	2,419	1,985	1,694	34	47	48	289	121	18	25	2	19

This can be further elucidated only by continuing the observations in the lake and maintaining correct statistics of catches as well as fingerlings stocked. A satisfactory stage having been reached in the operations at Mopad, a departmental bulletin on the history of operations, methods of fishing and results is under preparation.

165. Since 1st November 1938 the fishery in the lake has been conducted by the lessee under departmental supervision. The catches made during the year were 12,602 fish against 3,145 last year of which the number of *Catla* caught was 9,507 against 406 last year. The lease was for a sum of Rs. 750 for one year—vide paragraph 160 of last year's report. Since the lessee has made

large profits, the question of starting a co-operative society for fishing the lake in future is under investigation.

166. (iii) FISH BREEDING—*Avalanche hatchery for trout*.—The hatchery was operated as usual by the Nilgiri Game Association and 30,000 trout fry were liberated into the trout streams between 22nd January 1939 to 12th April 1939.

167. *Introduction of mirror carp into the Nilgiri waters*.—Another important step taken towards the development of inland waters by the introduction of improved varieties of food fish was the introduction for the first time of "Mirror carp" on the Nilgiris. At the instance of the Hon'ble Minister for Agriculture and Fisheries, the question of improving and controlling the fisheries of the Ootacamund lake received attention. The lake already holds the Common carp (*Cyprinus carpio*) and Tench (*Tinca vulgaris*) introduced in 1874*. Both breed in the lake. Carp is more abundant than Tench but never attains more than eighteen inches in length or twenty ounces in weight. Fishing with rod and line is now free as the catches are meagre though the carp fetch a good price. After a more careful examination of the conditions prevailing in the lake it was decided to introduce the "Mirror carp."

168. This fish was first introduced into Ceylon from Prussia in 1914 by the Ceylon Fishing Club. They averaged about 6 inches in length when introduced and speedily grew in the Hatchery Ponds in Nuwara Eliya but though kept there for some years did not breed. To encourage them to breed they were removed to a lower elevation and kept in an open pond again with no success. Finally they were returned to Nuwara Eliya and turned into a large pond in the Park, where apparently due to the presence of a plentiful supply of water lilies which provide breeding facilities they bred and have continued to breed ever since. Mirror carp was also successfully introduced into the Hatton district at an elevation of 4,200 feet and have bred there. In Ceylon they have grown to a size from 30 to 40 pounds in the Uuwara Eliya lake. Owing to their large size, rapid growth and prolific reproduction, coupled with their resistance to drought and ability to sustain life in the most barren ponds, they are a highly suitable food fish for culture in South Indian hill waters.

169. Though the Hatchery Superintendent, Ceylon Fishing Club, Nuwara Eliya, doubted the possibility of safely transporting the fish through the plains a trained fieldman of the Department was sent to Ceylon and 45 Mirror carp fingerlings were successfully transported and planted in the crescentic pond near the band-stand in the

* "The Rod in India" by H. S. Thomas, 1881, page 193.

Government Botanical Gardens, Ootacamund, on 4th January 1939. In June 1939 the fish were found thriving. As the pond is shallow for such a rapid growing fish, the question of shifting the fish to a deeper tanks is receiving attention:

170. The Central Pond in Sim's Park, Coonoor, was inspected. This pond about 500 feet long is 10 feet 7 inches deep at the sluice. The weeds * growing in the pond are (1) *Paranassia wightiana* (2) *Moniera cuneifolia* and (3) *Spirogyra* sp. In extent, depth and vegetation this pond should prove a most satisfactory breeding pond for the Mirror carp. With the concurrence of the Director of Agriculture, the pond will be converted into a breeding pond with shutters for the sluice and surplus channel and an emergency overflow channel for sudden floods before the fish are transferred to Coonoor. The ultimate aim of the department is, as stated above, to stock the Ootacamund lake and other lakes with this valuable food fish and regulate their fisheries.

171. *Revival of the scheme for rural pisciculture.*—Gourami is the most esteemed fresh water food fish in the world with the possible exception of Trout. Though Gourami fingerlings are available for sale in large numbers in the fish farms, only well-to-do pond owners cultivate this slow growing fish. The chief demand is for the fast growing *Catla* which is the quickest growing fish available and in many ways adapted to local conditions. By rapid growth it quickly exceeds the predacious murrel in size and is not therefore susceptible to wholesale destruction by this enemy. As *Catla* feed on algae and molluscs they need no special food. By rapid growth they attain a marketable size in the course of 6 to 8 months for which alone the majority of ponds hold water. During the year at the instance of Government the scheme to popularize pond culture which was abandoned in 1931 for financial considerations was revived on a small scale to be worked under the supervision of the Assistant Director (Inland) and staff. Profiting by past experience it is proposed to take over for a year or so the control of selected ponds and tanks from individuals or local bodies interested in pisciculture and to demonstrate methods of culture by cleaning and stocking and to prove the profits to be earned by guarding the tank for a year or more and fishing and selling the fish. A modest scheme with the bare minimum of staff and expenditure required has been submitted to Government since the close of the year.

172. *Hilsa hatchery.*—The Hilsa hatchery experiments at Bobberlanka at the Godavari anicut were conducted from 16th October to 8th November 1938. Female fish with oozing eggs were

* I am indebted to Professor M. O. Parthasarathy Ayyangar of the Madras University for their identification.

obtained on three days, i.e., 19th, 21st and 24th October. On the 24th both male and female breeders were available alive and some millions of eggs were successfully hatched.

173. For greater efficiency and economy Government have sanctioned a power pump for the hatchery which will be installed in the current year.

174. *Revival of Hilsa marking experiments.*—Hilsa fisheries are among the most economically important inland fisheries in India and exist in all the larger rivers such as the Indus, the Cauvery, the Kistna, the Godavari, the Ganges and the Brahmaputra. Considerable research on their breeding and life history in the rivers has been done by the department. Once they leave the rivers and go back to the sea nothing is known regarding them. An experiment was made in Palk Bay to mark the fish with specially designed metal tags and liberate them alive in 1930–31. But Government deferred the proposals to carry out marking experiments in a systematic scale in G.O. No. 1463, Development, dated 7th October 1931. In passing orders on the reorganization of the department [paragraph 11 (2) of G.O. No. 51, Development, dated 6th January 1939] Government have asked for the revival of the Hilsa marking experiments.

175. *Gourami* continued to thrive and breed at Sunkesula and Vellore. After the loss of the Powder Factory pond at Perambur (sold by the Military department), they have not done well in the pond belonging to the Medical Stores, Egmore, where they were kept. While transferring the fish to a newly excavated pond at the Chetput brickfields nearly the whole stock was lost. In June the acting Assistant Director (Inland) undertook this without reference to me and seems to have mismanaged the operation.

176. On the closure of the Mopad fish farm the stock of *Gourami* were transferred to the church tank at Nellore. The *Gourami* in the experimental pond at the Ippur farm continue to build nests and for the first time a solitary young *Gourami* was noticed this year. Apparently the fish has begun to breed, after all these years of experimentation.

177. *Catla.*—Further evidence that *Catla* have established themselves in the Cauvery and are breeding was obtained during the year. During my visit to Hoginakal in September 1938, two adult fish with ripe gonads ready to spawn were caught. Young *Catla* of sizes ranging from 4 inches to 9 inches were found at Kumbakonam, Papanasam and Mannargudi taluks in the Tanjore district before the stocking with *Catla* fry for the year was commenced. *Catla* fingerlings were also caught at Nerinjapettai, Perupallam, etc., in the Cauvery near Mettur.

178. Stocking the Mettur reservoir with *Catla* has been stopped as at Mopad to obtain conclusive evidence that the fish is breeding in the reservoir.

179. The pond at Satyavedu taken over from the Revenue Department for experimenting with the artificial breeding of *Catla* has been remodelled and provided with a proper inlet and outlet. Twenty-four *Catla* breeders of both sexes were introduced from Mopad.

180. *Etroplus*.—This fish is a prolific breeder and continues to produce in all the fish farms an ample annual stock of fry for stocking.

181. *Mulletts*.—The Ippur fish farm is specially suited for experiments with brackish water food fish which have not been so far brought under cultural treatment though they are the objects of valuable fisheries all over the east in Egypt, Malaya, Java, the Phillipines and Japan. Mullet fry are abundant in the backwaters, but only a few species grow to a large size and survive in fresh water. The fry of these species must be distinguished before successful stocking can be undertaken. A search for large fresh water Mulletts from irrigation tanks close to the coast was undertaken by the Assistant Inspector of Fisheries, Ippur. On 19th June 1939 large Mulletts, 12 inches and above were collected from Thamarai-kunda pond in the Mallam village in the Venkatagiri estate. The water in this pond is fresh and has a depth of only three feet but is connected with Veppatheru, a salt water creek during the rains. Another specimen was collected on 13th June 1939 from a fresh water irrigation well near Krishnapatam. When these are identified a search for their fry will next be undertaken.

B. Administration.

182. (i) FISH FARMS—*Sunkesula*.—Some of the ponds were emptied, cleared of silt and refilled and the fish redistributed according to size. Two hundred and sixteen big Gourami were sold to the public for Rs. 74-1-9. The proposal to stock provincialized tanks in the Ceded districts with *catla* from this farm was carried out for the first time this year. *Catla* fingerlings from Edurur swamp were utilized for stocking operations and the following irrigation tanks in the Ceded districts were stocked, viz., (i) Daroji, (ii) Kamalapuram, (iii) Singanamala, (iv) Venkatapuram and (v) Markapur. This is expected to improve the fisheries and consequently enhance rentals.

183. In G.O. No. 51, Development, dated 6th January 1939, Government ordered that the staff employed in the *Sunkesula* fish farm should be reduced. This is under examination. The menial

staff of the farm have been reduced from nine to seven with effect from 1st May 1939.

184. *Praema fish farm*.—In the same Order, Government also ordered the transfer to the Forest Department of this farm which is primarily intended for the breeding of larvicides for the Nallamalai. A forest guard was trained and the farm was handed over to the Forest Department on 4th April 1939.

185. *Ippur fish farm*.—In paragraph 4 (iii) of the same Order, Government ordered the Ippur farm to be continued for a year and the question of its further retention examined and reported on at the end of that period. The work of the farm therefore received special attention. Several ponds in a silted up condition have been deepened and experiments with several classes of brackish-water food-fish have commenced. The most important of these is the resumption of the research on Mulletts discontinued since 1923—vide paragraph 181 supra.

186. The culture of *Etroplus* in Pond III, which used to be the *Etroplus* breeding pond was recommended. One hundred and four *Etroplus* breeders were introduced into it from 2nd December 1938 to 28th January 1939.

187. In spite of all efforts to eradicate murrel from the Gourami experimental pond, two murrels measuring 13 inches and 19 inches were caught on 31st May 1939. Nevertheless several nests and one young Gourami were found showing that Gourami have after all begun to breed.

188. *Mopad fish farm*.—When passing orders on the reorganization of the Department, Government ordered that the Mopad fish farm should be closed, and that necessary arrangements should be made to continue from a central place the stocking operations carried on there, utilizing the Assistant Inspector and a watchman for the purpose. Subsequently in G.O. Ms. No. 1229, Development, dated 10th May 1939, they have agreed to retain the Assistant Inspector, a watchman and a fisherman at Mopad to supervise the fishing operations of the reservoir and to collect fry and fingerlings for stocking the adjoining provincialized tanks. The departmental fishing was terminated and the fishery of the Mopad reservoir was leased from 1st November 1938—vide paragraph 160 supra.

189. *Vellore Fort Moat fish farm*.—The growing of food fish such as Gourami and *Catla* and anti-malarial operations were continued in the moat as usual.

190. The fishery of the moat was leased to one Abdul Rahman for Rs. 1,800 for the year ending 31st March 1940, but as he failed

to execute the necessary agreement the lease was cancelled and a resale was ordered at his risk. The resale fetched Rs. 1,440 and is pending confirmation.

191. At the instance of the Vellore Municipality, the Collector of North Arcot, in his letter, dated 15th September 1938, proposed the cancellation of the fishery lease, closure of the fish farm and the transfer of the moat to the control of the Public Works Department so that it might be maintained full for boating by the public of Vellore. After an exhaustive discussion with the Collector and the Executive Engineer, the impracticable nature of these proposals were explained to Government and the Government ordered the continuance of the existing arrangements for the control and maintenance of the moat. As regards the regulation of water in the moat, the Government directed that the Public Works Department should take necessary steps in the matter, without causing any interference to the fish farm (G.O. No. 1237, Development, dated 10th May 1939).

192. *Chingleput Fort Moat fish farm.*—The moat was stocked with 1,457 *Catla* in September 1938. As the moat was drying up on account of the severe drought this year, it was fished early and the fish sold for Rs. 67-12-0.

193. *Chetpat Brickfields fish farm.*—The two ponds constructed have not yet been completed and handed over to this department. The ponds were provided with a fence by the Public Works Department on the western and northern sides. The other sides will be fenced when funds permit.

194. *Mettur fish farm.*—In G.O. Ms. No. 1147, Public Works, dated 8th June 1938, funds were provided for remedying the leaky condition of the fish ponds and the Public Works Department were instructed to try the remedy suggested by them in one of the ponds. Accordingly one pond has been paved with clay, but still there seems to be appreciable leakage and this is being watched by the Public Works Department. The shade and fruit trees planted on the bunds are growing satisfactorily.

195. *Patrolling the reservoir.*—The Coble "Pinctada" continues on patrol work, pending the construction of the motor boat sanctioned for Mettur.

196. *Poaching.*—Four watchers have been guarding and patrolling the reservoir from the four important villages round the lake. In all twenty-four cases of poaching were detected, and seventeen cases ended in convictions. The punishments awarded were fines ranging from Rs. 3 to Rs. 30, or seven days to one and a half months' simple imprisonment. Six cases are still under trial.

197. *Prohibition of fishing at Mettur.*—The lease of the fishery in the Cauvery between the dam and the bridge and the Ellis surplus channel was suspended under the orders of Government—vide paragraph 193 of last year's report. In G.O. No. 1630, Development, dated 27th June 1939, the Government approved my proposal to extend further the prohibition from the bridge to the confluence of the river with the Ellis surplus, to stop the ruthless destruction of fish and fry which was noticed in this stretch. All fishing in this area has been prohibited, and a rigorous patrol of the river and channels has been instituted.

198. *Licensing of fishing in the reservoir.*—The local fishing population having been deprived of their living on account of the prohibition represented that something should be done to help them to obtain a livelihood. As the reservoir was found to be well stocked with fish as a result of conservancy and cultural operations for the past five years it was decided to throw open the reservoir for fishing. Detailed proposals for licensing fishing with coracle and nets and with rod and line were submitted to Government and were sanctioned. The Research Assistant, Mettur, has been authorized to issue licences. The following fees were fixed for the licences—vide G.O. Ms. No. 1630, Development, dated 27th June 1939 :—

Rupee one for a rod and line per day, and
Rupees three for a coracle, two men with their full complements of nets and lines per month.

On a further representation made by the fishermen and subsequent enquiry conducted by me, these rules and licences were found unworkable and comprehensive proposals for various kinds of licences have been submitted to Government and sanctioned by them since the close of the year (G.O. No. 2286, Development, dated 9th September 1939). The licences approved and fees fixed are—

- | | |
|---|-------------------------------------|
| (1) For a coracle | Rs. 1½ a month or Rs. 16
a year. |
| (2) For all nets and hooks used from a coracle by one fisherman. | Rs. 1½ a month or Rs. 16
a year. |
| (3) For shore nets used by a fisherman without a coracle. | Rs. 1 a month or Rs. 10
a year. |
| (4) For angling with not more than two country rods and lines by one man. | Rs. 4 a month or Rs. 2
a year. |
| (5) For fishing with miniature cast net (Madivalai) by one person. | Rs. 4 a month or Rs. 2
a year. |
| (6) For one rod and line per sportsman (with reels, flies, spoon or live bait). | Rs. 5 a month. |

Fishing in the reservoir was formally inaugurated by the Hon'ble Minister for Agriculture and Fisheries on 13th August 1939.

199. (ii) PERIYAR SCHEME.—In G.O. Ms. No. 1894, dated 2nd September 1938, Government ordered the sale of the Periyar lake fishery in auction by the Public Works Department. The auction fetched Rs. 325 per annum for three years from 1st January 1939, but the Peermade Game Association who could not compete with the highest bidder at the public auction petitioned for the grant of the lease to them as they desired to protect and develop the fishery. The conditions of the lease to the Game Association are under discussion.

200. In view of their decision to give up departmental fishing of the Periyar lake and to lease it to the Peermade Game Association, Government enquired on 21st February 1939 whether the estimates for the construction of a fish farm at Siruganur for stocking the rivers and tanks of the Periyar system submitted in 1937 required revision. They pointed out that the Collector of Madura has recommended an increase of the fixed fish rent (acreage rent) from 2 annas 9 pies by 1 anna per acre. The increase of an anna will bring in only about Rs. 3,040 over and above Rs. 8,354, the average annual rent now realized and which will have to be paid to the District Board as compensation. In reply Government were informed that though the lake fishery is to be leased for a period of three years, it is essential to conserve and develop the fishery in the lake to its maximum capacity through the medium of the proposed farm in order to improve the fisheries of the Periyar fed tanks and connected rivers. A revised estimate reducing the cost of running the farm from Rs. 4,448 to Rs. 3,263 which was within the rental expected from the tanks served and the reservoir was submitted to Government on 25th March 1939.

201. (iii) NILGIRI FISHERIES.—Licences for coarse fishing in the Moyar and Bhavani are issued by the Nilgiri Game Association, and the revenue is appropriated by them. Since these waters are under the control of this Department, a reference was sent at the instance of Government to the Collector of Nilgiris, to ascertain the revenue derived from this source, and to ask why the amount should not be credited to this Department, who have appointed watchers to guard the fisheries. The Collector reported that the revenue derived is only Rs. 25 on an average per annum, and since the Nilgiri Game Association are incurring expenditure for issue of licences, by way of printing and staff, the recovery of the receipts may be waived. This has been recommended to Government, with the proviso that the Nilgiri Game Association should report the receipts obtained every year from coarse fishing licences in these rivers, to enable this Department to keep watch over the receipts.

202. *Conservancy of Moyar fisheries.*—When the control of the Nilgiri fisheries was transferred to the Nilgiri Game Association, the District Forest Officer who is the Secretary of that Association offered to look after the conservancy of the Moyar river. Apparently no special staff for safeguarding the fisheries was appointed. Representation was made in June 1938 that the Mayor is heavily poached during March to May and the fish caught are taken to Mysore, and the Forest Department is unable to safeguard the fisheries for want of staff. It was suggested that the supervision of the river might be transferred to the Fisheries Department, with a staff or two watchers to safeguard the fisheries. The suggestion was approved both by me as well as by the Chief Conservator of Forests, who, however, suggested that the watchers should be appointed by his department for the three months in a year, when poaching is heavy. In G.O. No. 689, Development, dated 20th March 1939, Government, however, sanctioned the appointment of watchers throughout the year to work under the Fisheries Department, and the Forest Range Officer, Sigur, and the District Forest Officer, Nilgiris, were asked to inspect and help this Department whenever possible. The watchers were appointed with effect from 1st May 1939.

203. (iv) *GOVERNMENT HOUSE PONDS, GUINDY.*—The tanks stocked with *Catla* by the Department in the Guindy Park Reserve, when auctioned in May 1938 fetched Rs. 200 against an expenditure of Rs. 38-11-0 incurred on stocking. The fisheries of the five tanks of the Guindy Park were ordered to be transferred to this Department and the rentals realized by leasing it credited to the same department in G.O. No. 132, Development, dated 18th January 1939. The question of using one of the permanent water ponds for breeding Gourami is under consideration.

C. Stocking Operations and Results.

204. (i) *Stocking operations.*—*Catla* stocking operations were conducted as usual. The year was a particularly good year for *Catla* fry. The following waters were stocked with *Catla* fingerlings :—

			Number of fish.
(1) Cauvery above Mettur Dam .. ..	..	..	3,839
(2) Vellore Fort Moat Fish-farm .. ..	..	..	1,576
(3) Chingleput Fish-farm .. ..	..	..	1,457
(4) Veeranam tank .. ..	..	..	753
(5) Chembarambakkam tank .. ..	..	..	818
(6) Madurantakam tank .. ..	..	..	785
(7) Kaveripauk tank .. ..	..	..	606
(8) Duesimamandur tank .. ..	..	..	800
(9) Bhavani .. ..	..	..	1,200

The following gentlemen and institutions were also supplied with Gourami, *Catla* and *Etroplus* and larvicidal fish during the year :—

(1) Dr. S. B. Setna, Bombay	1,000 catla.
(2) Executive Officer, Madura Devasthanam, for stocking Mariamman Teppakulam, Madura	250 „
(3) Mr. Malpas, Colombo Museum	50 „
(4) The Secretary, Karunthattangudi Fisher- men Co-operative Society	500 „
(5) Rao Bahadur Ramappa	50 „
(6) Dr. Hamid Khan, Fisheries Research Officer, Lylapore, The Punjab	500 gourmai.
(7) The Principal, Karnatak College, Dharwar	12 „
(8) The Chief Secretary to Government, Madras, for stocking a pond	200 larvicides.
(9) Sri T. N. Sarabeswara Ayyar, Kumba- konam	9 catla and 200 larvicides.
(10) The Principal, Buckingham and Carnatic Mills School	1,200 larvicides.
(11) Agricultural Department, Villupuram, Chidambaram and Tanjore	75 <i>Etroplus</i> .
(12) The Yuvarani of Pithapuram	100 larvicidal fish.

205. (ii) SALE OF FISHERIES.—The Board of Revenue granted the lease of the New Coleroon Fishery to the Vallampadugai Fishermen Co-operative Society for Rs. 4,005 for 1938–39. The society paid a rental of only Rs. 1,501–4–0 and asked for a remission of the balance. The Government in their order Ms. No. 1251, Development, dated 11th May 1939, ordered the society to pay a further sum of Rs. 1,498–12–0 and stated that they would remit the balance of Rs. 1,005. The society however has not yet paid the amount.

206. (iii) DISPOSAL OF FISHERIES BY PRIVATE TENDERS.—The following fisheries were leased out to private tenderers :—

	RS.
Madarajagudur tank. Rs. 35. Compensation.	58
Perar Fisheries of Rs. 900 for one fasli Do.	1,295
Negapatam taluk. and Rs. 1,300 each for the next two faslis.	

207. (iv) FISHERY RENTALS.—The rentals obtained during the year were very poor. The total income from inland fisheries amounted to Rs. 71,294 against Rs. 82,782–15–5 last year. It is hoped that the fees collected by licensing fishing in the Mettur Reservoir will augment the revenue to some extent in the coming year. Most of the tanks in the Chingleput district were either dry or contained only a meagre supply of water on account of drought, and did not therefore fetch any rental. The amount realized from the fisheries of the Chingleput district was only Rs. 3,309 against Rs. 14,737 last

year, and the deficit in the total revenue during the year was *entirely due* to the very low rentals realized in the Chingleput district.

208. In paragraph 12 of G.O. No. 51, Development, dated 6th January 1939, Government have called for reports on the following :—

(i) Is the total income realized from the Mettur fisheries credited to the Fisheries Department?

(ii) Is it not advisable to retain only such of the tanks as yield good rentals and are likely to contain water for more than eight months in a year and hand back to the District Boards concerned the rest, technical advice being given by the Fisheries Department to enable the Boards to improve the fisheries and carry on fishing operations?

(iii) What are the possibilities of conducting deep-water fishing experiments at Mettur?

These are receiving attention and necessary reports will be submitted to Government.

IV. CROWN MONOPOLIES (PEARL AND CHANK FISHERIES).

A. Research.

209. (i) PEARL OYSTER—*Spat falls outside the regular banks.*—The inshore beds off Vedalai where oysters were fished for the first time last year were inspected. In one hundred dives only seven oysters overgrown with weeds and Alcyonarians were fished.

210. A spat fall of greater dimensions than the one off Vedalai was discovered in Palk Bay in August 1938 off Mallipatnam on the Tanjore coast in shallow water. The Assistant Director, Pearl and Chank Fisheries, received intimation that pearl oysters had been found in about two to two and a half fathoms of water opposite Mallipatnam and that the local fishermen were poaching oysters. Investigation showed that oysters in large numbers were being daily caught in fishing nets. On inspection the bed was found to be an extensive one, nearly two square miles in area situated in the regular fishing grounds off Mallipatnam and Adirampatnam in depths of two to two and a half fathoms on a sandy bottom. The oysters though full grown were estimated to be about eighteen months old. Growth rates ascertained in the Krusadai farm support this view. Also no oysters were fished by divers or gathered by fishing nets, the last fishing season (1937) apparently being very small. The oysters it was feared could not be expected to thrive long in shallow water and on sand. Being a regular fishing ground the patrolling charges would be high without any hope of the bed yielding a fishery after it had been so guarded. The presence of large number of skates and rays found feeding on the oysters indicated a speedy destruction of the bed. Collecting the oysters and transporting them to Krusadai for safe custody and to provide the nucleus of a pearl farm for experiments were therefore considered the best course. Fishermen

were therefore permitted to fish on the banks with their skate nets (a drift net sweeping the bottom) and collect the oysters alive which became entangled in the nets. The Fisheries patrol boat visited the banks daily and collected the catch, paying the fishermen a nominal fee of three pies per oyster. This method while cheap compared with diving proved most efficient and on favourable days as many as 2,521 oysters were collected by twelve boats each plying its fleet of nets. Seventy-four thousand five hundred and nineteen oysters in all were thus fished from 24th August 1938 to 21st November 1938 and transported to Krusadai farm alive in floating rafts of bamboo and wire net towed by boats. In the pearl farm the oysters were eventually placed in trays in specially designed wire net cages of Japanese model suspended from rafts of casuarina posts kept afloat by drums.

211. The collection of oysters had to be stopped with the advent of the north-east monsoon and unfavourable weather. Though the fishing season on this coast had also come to an end all fishing in the two square miles covered by oysters was prohibited by an ordinance issued in Government Notification No. 218, dated 8th March 1939, and the Sub-Inspector of the Pearl and Chank Fisheries, Tuticorin was temporarily stationed at Mallipatnam to guard the pearl bank.

212. Besides these, several pearl oysters attached to chanks were found from November to April when the chank fishing commenced off Tuticorin and 536 such oysters were brought by chank divers, indicating the prevalence of highly favourable conditions for a spat fall. Three hundred and four of these live oysterlings were sent to the Krusadai pearl farm. The annual inspection of the pearl banks, however, revealed the presence of only stray oysters widely scattered. Sixty oysters collected during the inspection were also sent to the pearl farm at Krusadai station.

213. (ii) CHANK-MARKING EXPERIMENTS.—The marking and releasing of young chanks were continued. Three hundred and eighty-seven chanks were marked and liberated alive during the year on the chank beds off Tuticorin in eight and a half fathoms to eleven fathoms, as noted below:—

Name of beds.	Depth in fathoms.	Numbers marked on chanks.	Total.
Passi Par.	8½	E. 681 to 730	50
Manchurichan	10	731 to 754	24
Vadaoilpathu	9½	755 to 800	46
Manchur chan	10	801 to 826	26
Athonbathu	9	827 to 856	30
Melamelthi	9	857 to 876	20
Siluvai par.	10	877 to 916	40
Jenathu par.	10	917 to 958	42
Athonbathu	10	959 to 1000	42
Melaonpathu	9	F. 1 to 25	25
Neelankelathu	11	26 to 67	42

Fifteen marked chanks were refished during the year. The flesh from seven was extracted inadvertently by divers, and hence could not be returned to the sea for further growth. The total number of chanks marked and liberated from the commencement of the experiment in 1931-32 is 3,216. Of these 108 have been so far refished.

214. A statement showing the migration and rate of growth of the 15 refished chanks is appended—vide Appendix I. It will be seen therefrom that chank numbered D. 708 showed the maximum rate of growth in length, viz., 1.54 mm. per month and chank numbered E. 491 showed the maximum rate of growth in diameter, viz., 1.2 mm. per month. Chank D. 643 had travelled the longest distance, viz., 9 miles in 33 months, the maximum distance travelled by any marked shell so far. Chank E. 491 has travelled about 36 yards in a day. Out of the fifteen marked chanks refished during the year, five were refished from the same bed on which they were liberated. This apparently shows that optimum environmental conditions were present in the bed such as abundance of food, absence of enemies and favourable hydrographical factors.

215. (iii) DIVING EXPERIMENTS.—The defects noticed in the compressor and diving apparatus were rectified by the suppliers. The water circulation has been set right, the number of air bottles has been reduced to two, and the bottles have been chromium plated again to safeguard against rust. The compressor set was worked on trial at the Volkart Bros. workshop and found satisfactory by the Industrial Engineer. An experienced mechanic from the Pearl and Chank Fisheries staff at Tuticorin was brought to Madras to study the working of the machine before taking charge. But actual under-water trials with a diver could not be made as Madras has been experiencing an exceptional drought and the swimming baths at the People's Park and elsewhere had to be closed down for want of water. It is not advisable to take the set to Sethubava-chattram for trials at sea without testing it at Madras.

B. Administration.

216. (i) ROUTINE INSPECTION OF PEARL BANKS.—The beds from Tuticorin to Cape Comorin having been inspected last year, the beds from Pamban to Vaipar, comprising the II section were inspected during the year. Excepting a few scattered oysters the beds were barren. 'Suram' (*Modiola sp.*) were abundant on the Tholayiram par, Kilathu par, Cruxian and Tuticorin thundu pars, and a sand wash over the southern half of the Tholayiram par was also noticed.

217. The inspection was conducted from 18th April 1939 to 29th April 1939 and from 15th May 1939 to 22nd May 1939 for eighteen days in all. The "Lady Nicholson" was on commission for twelve

days from 18th April 1939 to 29th April 1939 and the rest of the inspection was carried out on board "Leverett."

218. (ii) TINNEVELLY CHANK FISHERY.—During the 1938-39 season, 363,960 chanks including 237 from Idinthakarai and Ovari were fished against 309,257 chanks in the previous year.

219. *Recruitment of divers.*—No dhonies from Kilakarai and Periapatnam took part in the fishery though three such boats worked last year. But the divers from these localities hired canoes at Tuticorin for chank fishing. The number of canoes that participated in the fishery was eighteen against sixteen canoes and three boats last year. One hundred and twenty-nine divers against 137 last year enlisted. Of these 15 were from Kilakarai, fourteen from Periapatnam, four from other places in Ramnad and the rest were local divers, of whom six were Arabs, one Malayalee, seven Muhammadans, sixteen Valayans, fourteen Pallas and fifty-two Bharathars.

220. *Advance to divers.*—An advance of Rs. 87-5-0 was outstanding with the divers at the beginning of the season. Rs. 248 was issued as advance and a sum of Rs. 206-4-0 was recovered. A sum of Rs. 9 was written off as irrecoverable in G.O. No. 2286, Development, dated 14th September 1938. The balance outstanding with the divers at the end of the year was Rs. 120-1-0.

221. *Boat loan to divers.*—There was a balance of Rs. 232 due from sammatties at the beginning of the year. Of this Rs. 62 was recovered during the year. A fresh loan of Rs. 100 was issued for the purchase of a canoe to a sammati during the year. The total loan outstanding at the close of the year was Rs. 270.

222. *Quarters for divers.*—The foreign divers were accommodated in the old police lines as usual.

223. *Rate per chank.*—The same rate per chank as last year was paid, viz., one anna per chank.

224. *Fishing operations.*—The fishery commenced on 2nd November and closed on 23rd May. The number of days the boats went to sea was 141 against 135 last year. Unfavourable weather conditions prevented fishing on 25 days, and 24 days were Sundays and holidays. The largest catch made by an individual diver on any one day was 162, against 136 last year. The average earning per head per day for the total number of working days and for the whole period of the fishery was Rs. 1-12-0 and Rs. 1-4-10 against Rs. 1-11-0 and Re. 0-14-0, respectively, in the previous year.

225. *Inspection of chank beds.*—Twenty-six 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.

In the last season, Vadaithundom, Melakilathi and Athonpathu pars yielded the maximum number of chanks, while Siluvai, Melaonpathu and Aluvai pars yielded the maximum number this season.

226. *Immature shells.*—Out of 22,808 under-sized shells, brought ashore inadvertently by the divers 16,351 were returned alive to the sea. The corresponding numbers for the year previous being 31,678 and 18,422. The flesh having been extracted from the rest they could not be returned alive. The divers have as usual been warned not to extract flesh from undersized chanks.

227. *Idinthakarai and Ovari chanks.*—One hundred and ninety-seven chanks were collected at Idinthakarai and 40 at Ovari from fishing nets against 418 from Idinthakarai last year. The collection of chanks from fishing nets was extended to Ovari.

228. *Catches.*—The following is the comparative statistics of catches for the three years ending 1938-39.

		1936-37.	1937-38.	1938-39.
Full-sized	.. ..	398,792	309,257	363,960
Under-sized	.. ..	6,454	13,256	6,457
Wormed	.. ..	58,526	37,189	36,578

229. *Temperance.*—As usual, tea, coffee and rice-kanji were sold to divers within the chank godown premises to prevent them from going to toddy shops. For the first time the right to sell these was leased to one Veerabagu Chettiyar for a period of three years for Rs. 17 a year.

230. *Sale of chanks.*—The purchaser of the 1936-37 chanks completed taking delivery of that season chanks in full. Tenders were as usual invited for the disposal of the 1937-38 season chanks by wide advertisement in local and north Indian dailies and in Gazettes, as well as through the Fishery Expert of Bengal. Tenders for the entire catch as well as for lots of one lakh were invited with a view to give facilities for smaller merchants to bid. Only four tenders were received, viz.—

	Per 1,000 full-sized chanks.	Per 1,000 under-sized chanks.	Per 1,000 wormed chanks.
	RS.	RS. A.	RS. A.
1 K. T. M. Abdul Kasim, Kilakarai ..	207	17 8	14 8 *
2 Messrs. K. T. M. T. M. Abdul Kayoom Sahib Hussain Sahib, Kilakarai.	191	12 8	12 8 †
3 S. M. Sahul Hameed Marakkayar, Kila- karai.	165	18 0	13 0 *
4 Babu Gouranga Hari Dhar, representing the conch shell workers of Daoca.	150	30 0	30 0 *

The tenders received were unusually low and the plea that the chank market had deteriorated was found from enquiries in Bengal to be unsubstantial. By private negotiation the chanks of the

* For one lakh full-sized chanks and proportionate under-sized and wormed chanks.

† For the whole lot.

1937-38 season were finally sold to Babu Gouranga Hari Dhar, representing the conch shell workers of Dacca, at Rs. 212-8-0 per 1,000 full-sized chanks, and Rs. 30 per 1,000 under-sized and wormed chanks. The workers have since formed themselves into a limited company and have paid for and taken delivery of two-thirds of the chanks sold and they are expected to pay for and take delivery of the remaining one-third within the eight months allowed by the Government. Arrangements are in progress for the sale of 1938-39 chanks.

231. (iii) OTHER CHANK FISHERIES.—This is the second year of lease of the Tanjore, South Arcot, Chingleput and Nellore districts chank fisheries granted to Janab M. K. Shamsuddeen Marakkayar of Pondicherry for three years from 1st July 1938.

V. BIOLOGICAL SPECIMEN SUPPLY.

232. Five universities, eighteen colleges, one high school and ten other institutions and individuals were supplied with specimens from the Ennur station. Museum specimens for the study of animal life were supplied to two institutions in the Cochin State and one to Sri V. S. Swaminathan in the Madura district. The Osmania Training College, Hyderabad, was supplied with a collection of poisonous snakes mounted as museum specimens. As usual a large number of educational institutions were supplied with dissection specimens for class work. The value of specimens supplied amounted to Rs. 2,591-10-0 against Rs. 2,925 last year.

233. *Oyster shell grit*.—About two tons (4,217 lb.) of shell grit for poultry were manufactured and sold during the year for Rs. 228-11-0 against 5,910 lb. for Rs. 280 last year. Orders for grit were received as before from all over India. The two new machines installed for grinding the grit are working satisfactorily and have reduced the cost of manufacture from Rs. 70 per ton by hand pounding to Rs. 23-5-4 per ton, effecting a substantial economy of Rs. 46-10-8 per ton of grit.

234. The station participated in various exhibitions held all over the Presidency, and the products of the station were advertised in the Villagers' Calendar as usual.

VI. ANTI-MALARIAL WORK.

235. Anti-malarial stocking operations were conducted as usual on the Nallamalais and 164 water holes were stocked with 58,700 larvicides from the Praema farm at a cost of Rs. 158-2-3. The stocks of larvicides in the Chingleput and Vellore Fort Moats were as usual maintained to prevent mosquito nuisance. At the request of the Secretary of the Madras Race Club, the Guindy Lodge Pond was stocked with one hundred larvicidal fish (*Panchax blochii*).

236. A well belonging to Sri T. N. Sarabeshwara Ayyar, a retired postmaster, at Gopalapuram, Madras, was stocked with 100 *Panchax blochii*, and his tanks in the power-house at Kumbakonam with another 100 *Panchax blochii*.

237. The ornamental tank in the Willis F. Pierce Memorial Hospital, Madura, was stocked with 100 *Gambusia* from the Krusadai Biological Station.

238. The Joint Principal, Buckingham and Carnatic Mills School, was supplied with 12,000 larvicides to stock the tank in the mill premises.

239. At the request of the District Forest Officer, Cuddapah, four wells and a pond near Polathala in Ganganapalle Reserve Forest were stocked with 50 larvicidal fish.

240. Advice was given to the Public Health Department about the construction of breeding tanks for larvicidal fish for anti-malarial stocking operations in Wynaad (Malabar district). Advice was also given to the same department for the construction of a nursery to rear *Gambusia* for distribution as an anti-malarial measure in Pattukottai (Tanjore district).

241. The total cost of anti-malarial operations this year amounted to Rs. 213-1-0.

VII. SOCIO-ECONOMIC WORK.

A. Education.

242. (i) WEST COAST—(a) *Village schools*.—The policy of Government with reference to schools for fishermen was reaffirmed during the year. In G.O. No. 1288, Development, dated 10th September 1934, the schools under the control of the Fisheries department were excluded from the operation of the Champion scheme. Subsequently, the question was reopened by the Director of Public Instruction. Since the Champion scheme could not be enforced in all its details, and the intention of Government was neither to transfer the fisher schools to any other Government agency, nor to restrict the opening of fresh schools for fisher-children, in G.O. Ms. No. 2182, Development, dated 2nd September 1936, Government ordered that the Fisheries department should continue to be in charge of elementary education of fisher-children and the officers of the Education department should continue to inspect fisheries schools and advise the department whenever necessary. This was confirmed in the correspondence recorded in G.O. No. 1713, Development, dated 7th July 1939.

243. The number of schools run by the Fisheries department on the West Coast at the beginning of the year was 42. A new school was opened at Vekkode, raising the total number at the end of the year to 43. Proposals for opening a new school at Edakad were

dropped as the District Educational Officer, Malabar, did not recommend a school there. The question of taking over the aided school at Muttam near Madai is still under the consideration of Government. Government enquired whether the Manager of the latter school would place the school building at the disposal of Government free of rent for running the school, if taken over by the department, but the Manager has not agreed. Proposals for opening new schools at Pallipuram, Kadapuram and Ponnani are under consideration.

244. The Municipality of Cochin offered the school at St. John Pattom, Cochin, to Government to be run as a Fisheries school but Government suggested that the school might continue to remain under the control of the municipal council, but that a teacher capable of teaching fishery technics might be appointed and officers of the Fisheries department might inspect the school from time to time and advise the municipality (Government Memorandum No. 40-I/38-8, dated 5th April 1939). The municipality agreed to this suggestion, but wanted the expenditure involved to be met by this department. The expenditure is estimated to be about Rs. 700 a year. The matter has been referred to Government for their orders.

245. *Strength.*—The number of pupils in the schools at the beginning of the year was 5,162. Of these 3,322 were boys and 1,840 were girls. There were 3,704 boys and 2,153 girls studying in the schools at the end of the year, showing an increase of 695 pupils. The number of fisher-children attending the schools was 2,996 boys and 1,819 girls or a total of 4,815 against 4,220 last year.

246. In South Kanara the schools at Bekal, Adakathbail, Hejmade-Kodi, Kasaragode, Kaup, Kizhur and Kodi have increased in strength while in the school at Kumbbla there was a fall in attendance. There was a slight fall in the Malabar district in the attendance of Quilandy, Pudiappa, Kadalundi and Parappanangadi schools. The Madapalli school would have shown greater improvement had not a neighbouring private school attracted its pupils. The strength of Kavvayi school will improve if a boat is provided for the children to cross the river. On account of the preponderance of girls in the Kuriyadi school, it was converted into a girls' school.

247. Higher standards were opened in Kasaragode, Kaup, Hejmade-Kodi, Adakathbail and Puduponnani schools. All the schools in the Ponnani taluk except Kaduvanad and Blangad have increased in strength. Mannalamkunnun school which had declined needed special efforts to restore it to its normal strength. Puthenkadapuram school has also improved after Koran classes were arranged for in the school outside school hours. The Higher Elementary

schools at Nattikka and Kaipamangalam showed a marked increase in strength.

248. *Conductresses*.—Government have sanctioned the appointment of conductresses in Kannankadavu, Naduvattam, Kaipamangalam, Mannalamkundu, Palapatti, Veliangode, Puduponnani and Vekkode schools and proposals for the appointment of one for the Puthankadapuram school have been submitted to Government. In all the schools employing a conductress there has been appreciable improvement in strength and attendance.

249. (ii) *EAST COAST—Fisheries Technological Institute*.—The Government have deferred consideration of the proposals for opening a technological institute at Tuticorin to 1940–41.

250. (iii) *MARINE AQUARIUM*.—The Aquarium continued to be popular. The total number of visitors was 112,170 against 126,730 last year. The decrease was due to higher railway fares charged for the "zone" and "special" season tickets, and the failure of the monsoon and consequent poverty in some parts of the Presidency. The record attendance was as usual on "Kannu Pongal" day when 2,809 persons visited the aquarium against 3,234 last year. There were 977 visitors on the "Vaikunta Ekadasi" day against 896 last year. The daily average attendance was 307.32 against 347.24 last year. One hundred and twenty-seven batches of school children against 53 last year visited the Aquarium. Of these 35 batches consisted of 1,696 children from the Corporation and aided schools within the City who were admitted free of charge, and 91 batches consisting of 3,040 children who were admitted at the usual concession rates. The total number of school children visiting the Aquarium rose from 2,938 to 4,736 during the year.

251. *Visitors*.—The following were the distinguished visitors to the Aquarium :—

His Highness the Maharaja of Baroda.

His Highness the Maharaja of Bikanir with his family.

The Yuvaraja of Mysore and Party.

The African Delegates to the World Missionary Conference at Tambaram.

Sir Byramjee Jeejeebhoy, a Bombay millionaire.

Hon'ble Shamraj Rajwant, Minister for Public Works, Hyderabad State.

Hon'ble T. Khan, Minister for Public Health, Bengal.

Mr. T. Kagawa of Tokyo.

252. *Receipts*.—The gate collections amounted to Rs. 8,692-1-6 against Rs. 10,043-0-6 last year. The sale of books and picture post cards and miscellaneous receipts amounted to Rs. 187-15-0 against Rs. 153-5-0 last year. Rupees 2,015 was realized as rental

from the restaurant. Thus the total receipts amounted to Rupees 10,895-0-6 against Rs. 12,211-5-6 last year while the total expenditure was Rs. 6,437-1-3 against Rs. 7,571-9-3. There was thus an excess of receipts over expenditure of Rs. 4,457-15-3 against Rs. 4,639-1-3 last year.

253. *Improvements*.—One of the pumps for pumping water into the overhead tank was replaced. The pictures of coloured fish in frames over the tanks were renewed wherever needed. The Molluscan and Crustacean show cases were replaced by new ones. A few rare exhibits presented by Dr. Joseph of the Messageries Maritimes, viz., *Barbus sumatranus var. nigrofasciatus* and *Tetrodon cutcutia* were added to the exhibits. To afford wide publicity to the additions made to exhibits and enlighten the public on the habits and peculiarities of interesting fish in the Aquarium it was decided to publish short accounts periodically in the local dailies. Accordingly short notices about "Gold Sword tail" (*Xiphophorus helleri*) "Silver Sword tail" (*X. brevis*), "Guppy or Rainbow" fish (*Lebistes reticulatus*) and "Siamese fighting fish" (*Betta splendens*) were published in the "Hindu" and the "Mail."

254. *Aquarium buildings*.—In G.O. No. 3131, Development, dated 19th December 1938, Government accepted my proposals for constructing a new building for the Aquarium, but as funds were not available in 1939-40, ordered that the proposals might be renewed for consideration with the Budget Estimate for 1940-41. They have also ordered that tenders for leasing the present Aquarium buildings for use as a restaurant should be called for in advance and the best possible terms obtained.

255. *Miscellaneous*.—Permission was granted to Dr. A. J. Pandiyan to take photographs of the Aquarium fishes. As several demands for such permission were received, a fee of Rs. 50 per permit was fixed. The Manager of the Rajagopal Talkies was permitted to film the Aquarium fishes and a sum of Rs. 50 was collected from them.

B. Co-operative Societies.

256. (i) **WEST COAST**.—A scheme to improve the working of the Fishermen Co-operative Societies drafted and sent to the Registrar of Co-operative Societies is still under consideration. Meanwhile a comprehensive survey of the co-operative movement in the province has been undertaken by a committee under the chairmanship of Sir T. Vijayaraghavachariar, Kt.

257. (a) **SOUTH KANARA**.—There were 15 societies at the beginning of the year. Five new societies were organized during the year, of which three were registered. Thus there were 18 societies

at the end of the year. The two societies that are pending registration are for the benefit of ticket-holders of the proposed Kizhur and Punjavi fish-curing yards.

258. *Members and paid-up share capital.*—The number of members at the beginning of the year was 607 and the paid-up share capital Rs. 12,600-2-0. One hundred and two new members were admitted and 42 were removed. Rupees 811-8-0 was collected towards share capital and Rs. 364-2-0 was paid off. Hence at the end of the year there were 757 members and a paid-up share capital of Rs. 13,047-8-0.

259. *Deposits and borrowings.*—In the Uchil Bovis Co-operative Society monthly deposits of Rs. 54-12-0 were received as against Rs. 55 last year. Rupees 1-8-0 was paid off. A fixed deposit of Rs. 56-4-0 was also returned. Hence at the end of the year the society had Rs. 275-12-0 as deposits instead of Rs. 278-12-0 as at the end of last year. The Anna-fund deposit in the Coondapur Kharvis Thrift Co-operative Society increased from Rs. 101-4-0 at the beginning to Rs. 152 at the end of the year. Attempts to encourage small deposits like anna-funds and monthly deposits in the societies were continued.

260. At the beginning of the year seven societies were indebted to the South Kanara Central Co-operative Bank, Limited, Mangalore, to the extent of Rs. 6,175. During the year the Uchil Bovis Co-operative Society borrowed from the Central Bank Rs. 2,080. The indebted societies paid back in all Rs. 2,593 towards principal. This included one society which paid back its loan in full during the year. Hence at the end of the year only six societies were indebted to the Central Bank to the extent of Rs. 5,662 of which Rs. 4,476 was overdue as against Rs. 5,164 in the previous year. None of the societies was in arrears in respect of interest, whereas the interest overdue at the end of last year amounted to Rs. 34-5-0.

261. *Loans to members.*—Rupees 17,487-7-0 were collected from members, Rs. 17,220-15-0 was issued as loans. Thus the amount outstanding against members at the end of the year was Rs. 32,636-13-0. The purpose for which loans were issued were :—

			RS.	A.	P.
Liquidation of prior debts	..	..	13,543	15	0
Trade	..	..	1,035	0	0
Boats and nets	..	..	198	0	0
Other purposes	..	..	2,444	0	0
			<hr/>		
Total	..	..	17,220	15	0

The amount of the loans overdue at the end of the year was Rs. 15,476-14-0 against Rs. 22,362-10-0 at the end of 1937-38. Many of the time-barred loans were secured and the overdue loans

would have been further reduced but for the failure of the fishing season and the scarcity of shoals since the middle of November 1938. In all the societies the rate of interest on loans to members was $6\frac{1}{4}$ per cent per annum. Remissions of interest were given to members in many of the societies owing to their poor earnings and penal interest had to be abolished.

262. *Investments.*—The total amount of reserve fund accumulated by the fifteen societies was Rs. 9,181-5-0, of which Rs. 3,741-10-0 has been invested in the District Central Co-operative Bank, Mangalore, and the balance utilized for transactions of the societies. Rupees 247-1-0 was invested as reserve during the current year, against Rs. 155-14-0 last year. Five societies have however invested their entire reserve fund amounts into the financing bank and of these two have invested Rs. 60-2-0 in excess. The three societies that started work during the year have not paid anything towards the reserve fund as yet.

263. As a number of societies are working without borrowing from the Central Bank, they utilize their reserve funds without investing them in the financing bank. Three more societies were affiliated to the Central Bank during the year taking a share each. The total amount thus invested this year was Rs. 30 increasing the share capital in the Central Bank of affiliated societies from Rs. 390 at the beginning to Rs. 420 at the end of the year. Six more societies remain to be affiliated. At the end of the year eleven societies had Rs. 1,047-12-0 in the savings bank and current accounts as against Rs. 863-12-0 at the end of last year.

264. *By-laws.*—Model by-laws, referred to in paragraph 268 of the last year's report, have been introduced in 15 societies during the year. The Coondapur Kharvis Co-operative Thrift Society has also adopted the latest by-laws.

265. *Non-credit work.*—Due to the scarcity of fish during the year from November 1938 not much non-credit work could be done. Nevertheless, 19,200 cured mackerel were collected from the members of the Kasaragode Fishermen Co-operative Society and sold jointly for Rs. 62. Deducting the coolie charges of Rs. 1-8-0, Rs. 60-8-0 was credited towards the dues of the members of the society who supplied the fish.

266. *General.*—Government permitted petty yard officers of fish-curing yards at Adakathabail and Bekal and the headmasters of Hejmade-Kodi and Kishur Fishery schools to hold offices as secretaries and agents in the societies in their vicinity. Government have permitted the petty yard officer of the Adakkathabail fish-curing yard to collect one pie per seer of salt issued to the members of the Kasaragode fishermen society towards their dues to

the society. These permissions granted by Government resulted in an all-round improvement in the working of the societies. There has been a marked improvement in the working of the societies in the year, despite a poor fishing season. Many of the societies were resuscitated and put in working order.

267. During the year, the Uchil Bovis Co-operative Society, whose secretary is the headmaster of the local fishermen school, gave the school Rs. 25 out of its common good fund for the purchase of teaching materials and Rs. 3-12-0 towards the subscription for a Kanarese weekly.

268. A scheme for the supply of fish manure to the tobacco growers of Pallikere and its neighbourhood by the fishermen co-operative societies was drafted and forwarded to the Deputy Registrar of Co-operative Societies, Mangalore. The manure required per annum is estimated to be about 250 tons (1,000 candies) valued at about Rs. 11,250. If the scheme materializes financial benefit will accrue to the fishermen as well as to the tobacco growers.

269. (b) MALABAR.—There were 33 societies at the beginning of the year. Thayyil Fishermen Co-operative Society organized last year was registered and commenced work while the registration of Korapuzha Mogers' Co-operative Society was cancelled, leaving the total number of societies at the end of the year at 33.

270. A society for the fishermen of Madai organized during the year is pending registration.

271. *Membership and paid-up share capital.*—There were 1,310 members and a paid-up share capital of Rs. 21,433 at the beginning of the year in all the societies. Rupees 841-6-0 were collected towards share capital and Rs. 1,122-1-0 paid off as compared with Rs. 623-3-0 collected and Rs. 2,609-5-0 paid off during the previous year. At the end of the year there were 1,252 members with a paid-up share capital of Rs. 20,845-11-0. The decrease in the number of members and amount of paid-up share capital was due to cancellation of the registration of the Korapuzha Mogers' Co-operative Society referred to in paragraph 272 above, and the removal from the rolls of the names of deceased and recalcitrant members.

272. *Deposits and borrowings.*—The Blangad Purchase and Sale Co-operative Society received a fixed deposit of Rs. 90 during the year in addition to Rs. 375 that remained at the end of last year. No amount was paid off. Hence the total amount at the end of the year was Rs. 465. During the year only two societies borrowed Rs. 470 in all from the district bank. A sum of Rs. 452-12-0 was repaid to the Central Bank towards principal leaving a balance of Rs. 2,523-12-0 outstanding at the end of the year. Of this amount Rs. 2,238 was overdue. Interest overdue amounted to Rs. 351-5-0

against Rs. 321-5-0 last year. Of the amounts overdue, Rs. 1,944 against principal and the whole of the interest were from the societies situated in South Malabar. Strenuous efforts are being made to collect and pay the overdues to the bank.

273. *Loans to members.*—The total loans outstanding with the members at the beginning of the year were Rs. 43,789-4-0. A sum of Rs. 9,250-14-0 was issued as loans to members and Rs. 9,245-2-0 was collected, leaving Rs. 43,795 outstanding with members at the end of the year. Of this Rs. 30,802-15-0 was overdue against Rs. 29,521-9-0 last year. The increase was due to the failure of the fishing season and the consequent poor earnings of fishermen.

274. *Investments.*—The total reserve fund of the societies was Rs. 18,202-9-0, of which Rs. 4,167-12-0 has been separately invested in the Malabar District Co-operative Bank and the balance is pending investment. A sum of Rs. 4-12-0 was invested in excess by the Azhicode Fishermen Co-operative Society. As the societies are working mostly with their own share capital, they were not compelled to invest their entire reserve fund in the Central Banks.

275. *Shares in the Central Bank.*—Two societies invested Rs. 30 on shares in the District Bank raising the total invested to Rs. 1,460 from Rs. 1,430 last year. The number of affiliated societies remained 27 as last year, of which 20 societies had savings bank accounts to an extent of Rs. 625-12-0 at the end of the year, against Rs. 451-15-0 last year. The buildings owned by the Thalayi Fishermen Co-operative Society and the Madapalli Fishermen Co-operative Society were valued at Rs. 750 and Rs. 180 respectively at the end of the year.

276. *Model by-laws.*—The model by-laws approved by the Registrar of Co-operative Societies in 1936 were adopted in eight more societies.

277. *General.*—Due to scarcity of fish no non-credit work was possible in any of the societies. No collection and joint sale of fish was therefore made. In the Kollam Fishermen Co-operative Society however five bags of rice were purchased jointly during the year for Rs. 35 and distributed among four of the members, treating the cost price as loans to members, which effected a saving of 4 annas per bag or Rs. 3 on the total transaction.

278. *Slackness in collections and the dormant state of some of the societies* are due partly to the failure of the fishing season, and partly to the general indifference and lack of co-operation among the office-bearers, many of whom are ignorant of the principles of co-operation. Strong factions in the villages also contribute to the unsatisfactory state of the societies. Some of the leading fish merchants and non-fishermen capitalists are against co-operative

institutions for obvious reasons. In spite of these handicaps all possible help was rendered to the members. The Chintrapindi Arayajana Co-operative Society, Engandiyur Deeverajans Co-operative Society, the Quilandy Fishermen Co-operative Society, the Cannanore Women Fish-curers' Co-operative Society and the Azhicode Fishermen Co-operative Society are in good condition. Collection in hundi boxes are being encouraged at the Kuriyadi Fishermen Co-operative Society and at the Cannanore Women Fish-curers' Co-operative Society.

279. The Petty Yard Officers of the Meladi, Madapalli and Thalayi fish curing yards were permitted to become ex-officio secretaries of societies of their respective villages. The headmaster of the Kavayi Fisheries School is the ex-officio president of the Kavayi Fisheries Co-operative Society.

280. (c) **BLANGAD PURCHASE AND SALE SOCIETY—Membership and share capital.**—There were twelve members in this society at the beginning of the year. One member joined, and one left the society, leaving the total the same at the end of the year. Rupees 29 was collected towards share capital and Rs. 100 was paid off.

281. *Deposits and borrowings.*—There were no borrowings from the District Bank. A sum of Rs. 90 was received as fixed deposit, raising the total deposits with the society from Rs. 375 to Rs. 465.

282. *Loans.*—No loans were paid to the members during the year.

283. *Investments.*—The total reserve fund of the society was Rs. 363, of which Rs. 65-11-0 has been separately invested in the Malabar District Co-operative Bank. During the year a *Kalla Vala* was purchased for Rs. 90. The cost of boats and nets owned by the society at the end of the year was valued at Rs. 1,340 against Rs. 1,390 in the previous year.

284. *General.*—The quantity of fish caught by the society has gone down this year though the sale-proceeds increased. Eight hundred and nineteen and half maunds of fish were caught and sold for Rs. 943-14-0. Out of this Rs. 739-6-0 was paid to members forming the crew, Rs. 102-4-0 being the society's share distributable to members. The petty yard officer of the Blangad Fish-curing yard is maintaining the accounts of the society. Though the society is a useful one, it is unfortunately working at a loss year after year owing to the continued failure of successive fishing seasons.

285. (ii) **EAST COAST.**—All the Co-operative Societies for inland fishermen are working, though some of them continue to be in an unsatisfactory condition. As last year seven societies were granted lease of fishery rights in inland waters for varying terms during the year.

286. *Co-operation among sea fishermen.*—The Lawson's Bay Fishermen Co-operative Society is working satisfactorily. There were 12 members at the beginning of 1937-38 and the paid-up share capital was Rs. 119. At the end of that year the membership rose to 55 and the share capital to Rs. 202-6-0. The society till then was functioning only for the benefit of the two villages, Lawson's Bay and Mulapalem; its activity has been extended during the year to include the fishermen of Randugulapalem and Yandada villages as its members. This has increased the membership of the society at the close of the year (1938-39) to 123 and the paid-up share capital to Rs. 320.

287. The lease of the Atapaka-Jada fishery in the Collair lake (Kistna district) to the Fishermen Co-operative Society of Chintlapadu was objected to by the villagers of Atapaka who alleged that the fishermen obstructed them from taking water for their second-crop cultivation and that they prevented their cattle from drinking water in the jada. On enquiry the allegations were found to be baseless and the lease was granted to the co-operative society. Possibilities of organizing a co-operative society for the benefit of the Upputheru and Collair lake fishermen in the West Godavari and Kistna districts are under investigation.

C. Other Socio-Economic Work.

288. *Debt relief.*—At the Ponnani Political Conference held on 22nd May 1938, a resolution was passed requesting Government to appoint a commission to enquire into the pitiable condition of the labourers employed in the fishing industry of the taluk. The peculiar nature of the indebtedness of the fishermen labourers was explained to Government and in view of the special difficulties in assessing their financial condition without a proper enquiry, the appointment of a qualified officer with experience of debt relief work to conduct an enquiry was suggested. In their Memorandum No. 2316-I/38-3, dated 4th May 1939, the Government requested the Board of Revenue to report in consultation with this department and with the Collectors of important fishing districts of the Presidency on the measures to be taken to relieve the indebtedness of fishermen and whether their case could be covered by the proposed legislation for agricultural labourers. The suggestion already made by me for a comprehensive investigation of the problem by a competent officer before devising measures for relief for the fisher classes under the proposed enactment was again recommended. I have also suggested debt relief among fishermen as a subject for discussion at the periodical conference of heads of departments, and a note on the subject has been submitted to Government since the close of the year.

289. (i) **WEST COAST.**—The Hindu fishermen of South Kanara (Mogayers, Bovis and Mukkuvas) have several organizations, temperance associations and Mahajana Sabhas for their social amelioration and all of them are functioning satisfactorily. The "Atmavidya

Sangham " of Azhicode in Malabar has done considerable work for the physical and moral uplift of the Araya community of the place. The " Ghandi Sangham " at Badagara and the " Yuvajana Samajam " at Quilandy are also doing good social work. The library and reading room started for the Mappilla fishermen of Vellayil and the welfare centre in the village are showing good progress. Some of the prominent men of the Madapalli village having agreed to defray a third of the expenses involved, the construction of a bridge and an approach road to the Madapalli school under the rural reconstruction scheme is now under the consideration of the Collector of Malabar. Thanks to the efforts of the local Sub-Inspector of the yard in co-operation with the local municipal health week committee, sanitation among the Cannanore fishermen has greatly improved.

290. The officers of the department as hitherto are doing their best to ameliorate the condition of the fishermen community living in their jurisdiction. Though a general awakening exists throughout, the unfavourable fishing season this year has rendered efforts towards this end difficult and in certain places unfruitful.

291. (ii) EAST COAST.—The advice and persuasion of the Inspector of Fisheries, Vizagapatam, with the concurrence of the Deputy Tahsildar of Ichapur has had the desired effect. The faction that existed between the Edupur and Ichapuram fishermen over the lease of the fishery of the Edupur swamp has ended and the fisheries are now in the enjoyment of the Edupur fishermen. The question of starting a co-operative society for the benefit of the fishermen and the grant of the lease for a long term of years is under consideration.

292. The construction of a pipe line for irrigation water across the salt creek recommended by me was sanctioned by Government (G.O. Ms. No. 1647, Development, dated 4th July 1939), as the cross bund put up by the ryots seriously interfered with the immemorial fishing rights of Kandra fishermen in the swamp. This it is hoped will permanently settle the dispute without affecting either irrigation or fishery interests.

293. A representation praying for the intervention of this Department has been received from the fishermen of Vajjireddipalem in the Guntur district. The land on the sea coast on which the fishermen are living, it is alleged, has been assigned by the Revenue Department to Harijans for casurina plantation and the fishermen are being forcibly evicted. The matter is under enquiry.

294. (iii) *Provision of marketing facilities for curers.*—The Assistant Marketing Officer inspected the Uppada fish-curing yard and obtained information about the fish trade there. The departmental statistics were also furnished to him. The weekly ruling prices of various kinds of cured fish in the important weekly shandies

in the Presidency were collected for compilation into a bulletin at Tanur and distribution to the fish-curing yards for the information of curers and merchants to facilitate the disposal of their products in the best markets.

VIII. PROPAGANDA.

A. Rural Pisciculture.

295. *Enquiries received and advice given.*—Dr. J. C. Roy of Toungoo, Burmah, was furnished with information regarding culture of "Gourami" and "*Etrophus*."

Mr. James Campell Smith of East Indian Railway was given detailed instructions for rearing Gourami.

Mr. Sayyed Abdull Biyabani of Jalna (Deccan) was given advice for improving his tank fishery.

The Fishery Officer to the Bombay Government asked for advice regarding rearing of Catla in the Ulhas river but was told that no helpful suggestions could be given without a local inspection.

The Agricultural Demonstrator, Rayaldrug, was supplied with particulars of cost of Gourami for stocking and rearing for the use of an interested ryot.

The Manager of the Bee-keeping and Poultry Farming Centre, Kanchela (Kistna district) was furnished with pamphlets on *Catla*, *Etrophus* and Gourami and given advice as to the suitable fish for stocking his tank. The Scoutmaster, Government Middle School, Sandur, was also given similar information.

The District Health Officers of South Arcot and Nellore were advised regarding supplies of *Barbus dorsalis* for combating the spread of guinea worm.

The Deputy Director of Agriculture, Trichinopoly, was given information as to the best food fish that can be cultivated by ryots as a subsidiary occupation.

The Proprietor, Baba Taj Nursery, Saidapet, was informed of the unsuitability of his tank for fish culture, and the methods of remedying the defects found.

The tank in the premises of the Kumbakonam Electric Corporation was inspected and the Resident Engineer advised regarding stocking it with Gourami and *Catla*.

Mr. B. Gupta of Jaffirbund who desired to train his son in Pisciculture was given the information asked for.

Mr. Moulvi Bedar Bakhth, deputed by the Government of Bengal, was given a short course of training in Pisciculture.

B. Exhibition.

296. The department participated in the following exhibitions :—

- (1) The Indian Industrial Exhibition, Tuticorin (28th July to 10th August 1938).

- (2) The All-Indian Khadi and Swadeshi Exhibition, Salem (6th to 21st August 1938).
- (3) The District Agricultural Exhibition and Cattle Fair, Cuddapah (September–October 1938).
- (4) The Rural Industrial and Agricultural Exhibition, Koduvayur (22nd to 29th October 1938).
- (5) The All-Indian Swadeshi, Agricultural and Industrial Exhibition, Tiruvannamalai (27th November to 11th December 1938).
- (6) The All-Indian Swadeshi and Khadi Exhibition, Madras (18th December 1938 to 15th January 1939).
- (7) The Swadeshi Industrial and Agricultural Exhibition, Tinnevely (26th June 1939 to 9th July 1939).
- (8) The All-Indian Khadi and Swadeshi Exhibition, Chidambaram (24th December 1938 to 8th January 1939).
- (9) The Agricultural Exhibition, Peddakkalapalli, Kistna district (17th to 19th January 1939).
- (10) The Agricultural Exhibition, Vizagapatam (24th to 26th January 1939).
- (11) The Khadi and Village Industries Exhibition, Tirupathi (February 1939).
- (12) The National Health and Baby Week Celebration, Kurnool (6th to 12th February 1939).
- (13) The All-Indian Khadi and Swadeshi Exhibition, Calicut (4th to 18th December 1938).
- (14) The Industrial and Health Exhibition, Karaikudi (14th to 23rd April 1939).
- (15) The All-Indian Swadeshi Exhibition, Trichur (26th to 29th April 1939).
- (16) The All-Indian Khadi and Swadeshi Exhibition, Trichinopoly (in June 1939).

Some gold medal certificates were awarded for the exhibits of the department at the exhibitions. The authorities of the Trichur Exhibition also awarded a gold medal certificate to the clerk (Sri M. G. Wariar) who was in charge of the fisheries stall at that exhibition.

C. Museum.

297. Fisheries exhibits in a suitable show case were supplied to the Mangalore Commercial Museum. Government in G.O. Ms. No. 531, Development, dated 3rd March 1939, have ordered that no expenditure on exhibits for commercial museums should be incurred without their express sanction. All available exhibits were lent to the Central Industrial and Commercial Museum, Madras, and to the Commercial Museum, Calicut, pending orders of Government.

IX. FISHERY LEGISLATION.

298. (i) LICENCES FOR FIXED ENGINES.—Seventy-six free licences were issued to fishermen of the Ramnad coast for placing 297 submerged trees in the Palk Strait for catching fish during the year.

299. (ii) STAKE NET FISHING.—Fifty-six licences were issued for stake net fishing in the Valarpatnam and Taliparamba rivers in Malabar as last year. The extension of the system of licensing to the stake nets in the Korapuzha river prayed for by the fishermen of Thiruvangur amsam is under consideration.

300. (iii) Legislation for debt relief is under consideration—vide paragraph 292 supra.

301. (iv) FISHING IN METTUR RESERVOIR.—In G.O. Ms. No. 1630, Development, dated 27th June 1939, the Government sanctioned the scheme for licensing fishing in the Mettur Reservoir—vide paragraph 198 supra.

X. PUBLICATION.

302. *Fish statistics*.—The statistics of landings on the West Coast for the three years 1928–29 to 1930–31 were printed and published as Parts II, III and IV of Bulletin No. 27, since the close of the year. Statements relating to subsequent years are under scrutiny.

303. *Bulletin of fishing methods*.—The second part of Mr. Hornell's report on the fishing methods of the Madras Presidency dealing with the Malabar Coast was printed and published during the year as Part I of Bulletin No. 27.

304. *Bulletin of marketable fishes*.—The collection and identification of specimens from various parts of the Presidency and a compilation of statistics relating to each food fish are continuing.

PART II.

FINANCE.

305. *Summary of financial results*.—The total revenue for the year was Rs. 3,83,495 as against Rs. 4,48,318 last year. The decrease was mainly under (1) Pearl and Chank Fisheries due to the non-disposal of 1938–39 chanks the value of which has been taken into account at only their production cost, viz., Rs. 38,647 against Rs. 78,585 which may be realized even at the previous year's rate of Rs. 212–8–0 per 1,000; (2) Inland fisheries as several tanks went dry owing to an unusual drought and therefore did not fetch any rentals; (3) fish-curing yards where transactions have been poor due to an unfavourable fishing season on the West Coast and extensive private curing with swamp salt on the East Coast whereby the surplus of receipts over expenditure was reduced from Rs. 34,108 in 1937–38 to Rs. 2,636 in 1938–39; and (4) the Marine aquarium which attracted fewer visitors than in the previous year owing to

the higher railway fares charged for the zone and special season tickets and poverty of the people generally owing to famine conditions.

306. The total expenditure of the department was Rs. 5,73,792 against Rs. 5,76,197 in 1937-38. The decrease is primarily due to a reduction in the quantity of salt purchased and supplied to the yards on account of an unfavourable fishing season on the West Coast.

307. The statement showing the total expenditure and revenue of the department is appended to the report—vide Appendix III. The rest of the statements are submitted in manuscript.

PART III.

STAFF AND EQUIPMENT.

I. BIOLOGICAL.

A. Assistant Director (Biology).

308. Dr. D. W. Devanesan continued to be the Assistant Director (Biology).

B. Research Stations.

309. Mr. V. John was Research Assistant, West Hill station, and Sri S. Varadarajan, Research Assistant, Krusadai Island station, throughout the year.

310. *Buildings.*—The bathroom at the Krusadai Biological station has been provided with a ferro concrete roof. Thus the entire main building has been provided with a permanent non-inflammable roof. One of the *Gambusia* ponds was provided with a coral stone revetment all round.

311 At the instance of Government [paragraph 12 (v) of G.O. No. 51, Development, dated 6th January 1939] the Madras University has been addressed for a subsidy towards the maintenance of the Krusadai Biological station. If the University agrees to make the contribution; the fees now levied for the visits of the students will be abolished.

II. TECHNOLOGICAL.

Tanur Experimental Station.

312. Sri V. P. Ananthanarayanan continued as Research Assistant throughout the year, except for three weeks (11th March 1939 to 1st April 1939) during which time he was on leave.

313. *Travellers' bungalow.*—The live fence round the bungalow is growing well except in a few places.

III. EDUCATIONAL.

314. (i) **FISHERY ELEMENTARY SCHOOLS.**—The number of teachers employed in village schools at the beginning of the year was 166, and at the close of the year 180. Twenty-two of them were

secondary trained, of whom eighteen were trained at the Fisheries Training Institute at Calicut. One hundred and forty-two teachers were of the Higher Elementary grade of whom eighteen were ordinary trained, 123 fisheries trained, and one untrained; sixteen were Lower Elementary grade teachers, of whom three were ordinary trained, ten fisheries trained and the remaining three untrained.

315. *Accommodation.*—At Adakathbail and Hejmadi-Kodi in South Kanara, temporary extensions to the school buildings were made to accommodate increased numbers of pupils. Extensions to the school buildings at Bekal, Kizhur, Navunda and Tharapathi are necessary. The Sri Gnanodaya school is held in the buildings of the Sri Gnanodaya Samaj and the Samajam is not in a position to provide sanitary conveniences necessary for the school. Also the strength is increasing for which there is no accommodation and extension is not possible. The members of the Samajam misuse the furniture and fittings belonging to the school when meetings are held. Proposals therefore for shifting the Sri Gnanodaya school to a building to be constructed in the Marine Yard close by are under consideration.

316. In Malabar, the seven schools in Puduponnani, Palapatty, Kottakadapuram, South Nattika, Vekkode, Kavvayi and Madapalli are housed in rented buildings. A verandah for the Madapalli school has been constructed and its roof is under construction. The provision of a play-ground is under consideration. The extension of the Parapanangadi school building is awaiting the conclusion of acquisition proceedings. The remodelling of the Pudiappa school building has been sanctioned. The Vellayil school was provided with a reinforced concrete roof.

317. Accommodation is not sufficient in Palapatty, Kottakadapuram, South Nattika, Kaipamangalam and Vekkode schools. Government have sanctioned the acquisition of the present site and building and the construction of an additional block for the Palapatty school. Though acquisition of the site for the Kottakadapuram school has been sanctioned in G.O. No. 1009, Development, dated 1st May 1937, the site has not yet been acquired, as the price to be paid is still under dispute. Since the owner of the Nattika school has expressed inability to make any further extension to the school to meet the need of the school, the question of acquiring the plot of ground in front of the school for constructing a building is under consideration. Proposals for acquiring a plot adjacent to the Kaipamangalam school for its extension have been sanctioned by Government since the close of the year. The question of acquiring a more suitable site adjacent to the present one for constructing a semi-permanent building for the Vekkode school is also under consideration. The land and building in which the Blangad school is located were acquired and taken possession of on 27th October 1938.

318. (ii) CO-OPERATIVE SOCIETIES.—U. Parameswara, an Inspector of the Co-operative Department, was in charge of the societies in North Malabar and South Kanara throughout the year, except from 5th August 1938 to 11th August 1938 when P. Kannan Nayar was in charge. P. Sankara Menon who was in charge of societies in South Malabar was relieved by P. Sukumaran on 2nd November 1938 who continued in charge till the end of the year.

IV. NAUTICAL.

319. (i) "*Lady Nicholson*."—This vessel was employed for the inspection of pearl banks as in previous years when the full complement of the crew was employed.

320. (ii) "*Sea Scout*."—This boat was employed in routine chank fishery operations.

321. (iii) "*Leverett*."—This was used in pearl and chank fishery work as usual.

322. (iv) "*Pearl*" was in use at the Biological Station, Kru-sadai. She was employed in Pearl Bank Inspection off Sethubava-chatram in September. On account of engine trouble, off-shore plankton could not be collected from October. In April she sprang a leak, and she was sent to Tuticorin for overhaul.

323. (v) "*Pinctada*."—The coble is on patrol duty at Mettur pending the purchase of a power boat for the reservoir.

324. Government in paragraph 12 (iv) of G.O. No. 51, Development, dated 6th January 1939, have called for a comparative statement of cost of maintaining both the departmental launches ("*Leverett*" and "*Sea Scout*") and of keeping only one of them and hiring a launch when necessary. The proposal is under examination.

V. ADMINISTRATION.

325. A. DIRECTOR'S OFFICE.—I continued to be the Director throughout the year. The designation of the Personal Assistant to the Director of Fisheries was changed to that of Manager in G.O. Ms. No. 1790, Development, dated 17th July 1939, as the present incumbent is not technically qualified in Fisheries Science.

326. *Inland fisheries*.—Government ordered in paragraph 3 of G.O. No. 51, Development, dated 6th January 1939, that the Inspector of Fisheries, Nilgiris, stationed at Ootacamund should be called Research Assistant and his headquarters changed to Mettur to be in charge of the new Mettur fisheries in addition to the supervision of the Nilgiri Fisheries. There were several changes in the personnel of this post as shown below :—

Sri E. K. Madhavan as Inspector of Fisheries, Ootacamund, 1st July 1938 to 14th August 1938.

Sri M. Jayaram Nayudu as Inspector of Fisheries, Ootacamund, 15th August 1938 to 9th November 1938.

Sri K. Chidambaram as Inspector of Fisheries, Ootacamund, 10th November 1938 to 11th January 1939.

Sri T. P. Baratan as Inspector of Fisheries, Ootacamund, 12th January 1939 to 5th March 1939.

Sri K. U. Nayar as Research Assistant, Mettur, 6th March 1939 to end of the year.

The designation of the post of Inspector of Fisheries (Inland) at Madras was also changed to that of Research Assistant.

327. B. EAST COAST (NORTHERN SECTION).—Sri T. S. Ramalinga Mudaliyar was reverted to his permanent post as Head Clerk, Assistant Director (Inland)'s office, Madras, on 11th October 1938. Sri M. Jayaram Nayudu was Inspector from 19th November 1938 to 11th April 1939 when he was relieved by his Sub-Inspector K. I. Mathew and was appointed Sub-Assistant Director (West Coast), Sri A. Somayaji, who was appointed as Inspector of Fisheries, Vizagapatam, joined on 12th May 1939.

328. C. EAST COAST (CENTRAL).—Dr. D. D. Dasan continued as Assistant Director (Inland) (on probation) throughout the year. The posts of a clerk and a typist were abolished in the office of the Assistant Director (Inland)—(paragraph 3 of G.O. No. 51, Development, dated 6th January 1939).

329. D. EAST COAST (SOUTHERN SECTION).—Mr. Peter Devadas was Assistant Director, Pearl and Chank Fisheries, till the forenoon of 28th April 1939 when Dr. M. Ramaswami Nayudu took charge.

330. Sri K. U. Nayar officiated as Inspector of Fisheries, Pearl and Chank Fisheries till 5th July 1938, Sri K. Chidambaram acted as Inspector from 27th August 1938 to 31st October, Sri A. Somayaji, from 1st November 1938 to 30th April 1939, and Mr. D. D. Peter Devadas from 1st May 1939. Government were pleased to sanction the permanent retention of the post of Inspector and clerk with effect from 1st April 1939. The work of the Salt Transport section was transferred to the control of the Assistant Director, Pearl and Chank Fisheries, with effect from 1938-39—(paragraph 7 of G.O. No. 51, Development, dated 6th January 1939).

331. E. WEST COAST.—Sri U. Karunakara Menon held the post of Assistant Director (Coast) till 17th April 1939, when the post was abolished and the post of Sub-Assistant Director was created instead—(paragraph 5 of G.O. No. 51, Development, dated 6th January 1939). Sri M. Jayaram Nayudu was appointed Sub-Assistant Director from 18th April 1939.

I have the honour to be,

Sir,

Your most obedient servant,

B. SUNDARA RAJ,

Director of Fisheries.

APPENDIX I.

Chank Marking Experiments.

Particulars of marked chanks refished during the year.

Serial number.	Number of shells recovered.	Date of liberation and recovery.			In which the shells were liberated.	From which recovered.	Distance travelled.	Length when liberated.		Length when re-covered.	Diameter liberated.	Diameter recovered.	Rate of growth per month.	
		Date of liberation.	Date of recovery.	Interval.				mm.	mm.				Length.	Diameter.
1	D. 643	15th March 1936	.. 28th December 1933	Y. K. D. .. 2 9 15	Vadaithundam	.. Pudu Par	.. 9	100	123	45	61	0.69	0.48	
2	D. 708	19th March 1936	.. Do.	.. 2 9 9	Melakeethi	.. Janathu Par	.. 3	100	151	54	67	1.54	0.39	
3	D. 713	Do.	.. Do.	.. 2 9 9	Do.	.. Do.	.. 3	108	122	55	62	0.42	0.21	
4	D. 731	21st March 1936	.. 29th March 1939	.. 3 0 8	Pudu Par	.. Pudu Par	.. Same bed.	109	150	52	75	1.14	0.64	
5	D. 794	25th March 1936	.. 7th January 1939	.. 2 9 12	Melonbathu 9 fathoms.	Melonbathu fathoms.	9	106	124	52	63	0.54	0.33	
6	D. 795	Do.	.. Do.	.. 2 9 12	Do.	.. Do.	.. 1	106	133	51	69	0.81	0.54	
7	D. 800	Do.	.. 2nd February 1939	.. 2 8 7	Melonbathu	.. Vadaonbathu	.. 5	104	120	54	70	0.05	0.05	
8	D. 908	7th May 1936	.. 10th November 1938	.. 2 6 3	Erri Ettu 8 fathoms.	Erri Ettu fathoms.	8½	104	115	52	59	0.36	0.23	
9	D. 913	Do.	.. 31st March 1938	.. 2 10 24	Erri Ettu	.. Nanjurichen	.. 3	105	145	52	74	1.14	0.63	
10	D. 917	Do.	.. 10th November 1938	.. 2 6 3	Erri Ettu 8 fathoms.	Erru Ettu fathoms.	8½	102	120	51	60	0.60	0.30	
11	E. 12	2nd March 1937	.. 6th February 1939	.. 1 11 4	Vadaonbathu	.. Kilavan Par	.. 3	95	109	56	59	0.60	0.13	
12	E. 74	8th March 1937	.. 18th March 1939	.. 2 0 10	Nilankalpathu	.. Aluvapur	.. 3	110	135	54	67	1.05	0.55	
13	E. 113	10th March 1937	.. 12th January 1939	.. 1 10 2	Pullpundu	.. Athonbathu	.. 5	105	111	55	58	0.27	0.13	
14	E. 378	8rd March 1938	.. 24th March 1939	.. 1 0 21	Pudu Par ½ fathoms.	Pudu Par fathoms.	10½	98	108	52	59	0.61	0.54	
15	E. 491	10th March 1938	.. 2nd January 1939	.. 0 9 22	Seltan Par	.. Pudu Par	.. 6	100	113	51	63	1.03	1.02	

N.B.—Chanks Nos. D. 643, D. 713, 794, 795, D. 913, 917, E.113, were not returned to sea for further growth as flesh had been removed from them by the divers inadvertently.

APPENDIX II.

Statement of chanks fished.

Name of chunk bed.	Number of chanks fished.	Name of chunk bed.	Number of chanks fished.
Karai and Nagari Par ..	82	Kilavan Par	12,229
Kattithirukkai Par ..	12,284	Kodamutnu Par	2,148
Eriettu Par	9,684	Vadaol pathu Par	2,201
Meenbathu Par	40,809	Seltan Par	7,932
Mel. kilathi Par	12,747	K. ol. ekunji Thanu Par ..	1,684
Saithonbathu Par	4,912	Nonjurtchan Par	23,755
Athonbathu Par	15,972	Kadayan Par South Par ..	8,297
Siluvai Par	61,039	Pannara Par	38
Vadaai hundam Par	2,429	Tnolayiram Par	52
Vadaonbathu Par	4,595	Saithukilathi Par	2,954
Kadayan Par North Par ..	13,701	Idinthakarai Chanks ..	197
Pulinundu Par	2,713	Vari Par	40
Pudu Par	47,472		
Aluva Par	38,423	Total ..	363,960
Janathu Par	16,188		
Nilankalpathu Par	21,386		

APPENDIX III.

Expenditure and Revenue of the Fisheries Department for the Fisheries year 1938-39.

Sections-	Expenditure.			Revenue.			Difference.			
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	
A. Direction	38,327	8	11	12	10	0	—	38,314	14	11
B. Pearl and Chunk Fisheries.	70,468	1	9	70,022	10	8	—	445	7	1
C. Assistant Director (Coast).	14,158	8	3	144	5	9	—	14,014	2	6
D. Tanur station ..	8,939	3	3	2,771	6	9	—	6,167	12	6
E. Training Institute ..	153	10	0	..	..	..	—	153	10	0
F. Fisheries School ..	80,477	12	3	781	5	9	—	79,696	6	6
G. Assistant Director (Inland).	1,07,539	13	5	75,540	6	9	—	31,999	6	8
The Nilgiri Fisheries ..	11,185	14	6	6,394	8	6	—	4,791	6	0
Palni Hills Fisheries ..	195	0	0	230	0	0	—	35	0	0
H. Oyster Farm	1,413	9	9	2,364	6	9	—	950	13	0
J-1. Marine Biological Section—										
Zoological Supply Section, Ennur.	3,835	8	7	3,562	9	6	—	272	15	1
Research Station, West Hill.	12,839	0	2	118	12	0	—	12,720	4	2
Research Station, Krusadai Island.	11,151	13	11	1,351	15	6	—	9,799	14	5
J-2. Aquarium	6,437	1	3	10,895	0	6	—	4,457	15	3
K. Fish curing yards ..	2,06,669	0	10	2,09,305	3	0	—	2,636	2	2
Total ..	5,73,791	10	10	3,83,495	5	5	—	1,90,266	5	5

Government of Madras

DEVELOPMENT DEPARTMENT

G.O. No. 1019, 3rd May 1940

Administration report—Fisheries department—1938-39—
Recorded with remarks.

READ—the following papers :—

From the Director of Fisheries, Madras, dated 31st October
1939, No. 2015-G/39.

Official Memorandum to the Superintendent, Government Press,
No. 32866-VI/39-2, dated 19th December 1939.

Order—No. 1019, Development, dated 3rd May 1940.

Recorded.

2. The unfavourable character of the fishing season during the year affected progress in all directions—research, inland fisheries and fish-curing yards. It also adversely affected the finances of the department; the net cost of the department was about Rs. 1.90 lakhs against Rs. 1.28 lakhs in the previous year, the increase being due mainly to the fall in revenue under inland fisheries and fish-curing yards. The working of the department has otherwise been satisfactory.

3. The Government note with interest the progress reported in the experiments on the manufacture of fish-oil. Apart from its manufacture as a cottage industry initiated by G.O. No. 866,

No. 1019, DEVELOPMENT, 3RD MAY 1940

Development, dated 3rd April 1939, the Government consider it very important at the present time that proposals for its manufacture on a commercial scale should be expedited.

(By order of His Excellency the Governor)

C. P. KARUNAKARA MENON,
Secretary to Government.

To the Director of Fisheries.
,, the Local Administration Department.
,, the Board of Revenue
,, the Collector of Salt Revenue.
,, the Commissioner of Labour.
,, the Chief Engineer for Irrigation.
,, the Registrar of Co-operative Societies.
,, the Director of Agriculture.
,, the Director of Industries.
,, the Accountant-General.
,, the Education and Public Health Department.
,, the Public Department.
,, the Finance Department.
,, all Collectors of districts.
,, the Statistical Officer.
,, the Secretary, Madras Legislature.
,, the Director-General of Commercial Intelligence and Statistics (with C.L.).
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