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Madras Fisheries Department

ADMINISTRATION REPORT

FOR THE YEAR 1932-33

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BY

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

Director of Fisheries

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FISHERIES DEPARTMENT.

Subject.

Fisheries—Administration Report—1932-33—Submission of.

Ref. No. 1921 G/33.

STATION, MADRAS.

Dated the 31st October 1933.

From

DR. B. SUNDARA RAJ, M.A., PH.D.,
DIRECTOR OF FISHERIES,
MADRAS,

To

THE SECRETARY TO GOVERNMENT,
DEVELOPMENT DEPARTMENT.

SIR,

I have the honour to submit the Administration Report of the Fisheries Department for the year ending 30th June 1933.

INTRODUCTION.

2. The economic depression notwithstanding, it is a matter for satisfaction that the year under report marks steady advance in the several activities of the department besides entirely new developments in other directions. Research in particular, which is essential for the progress of a technical department, received special attention and the report which follows records distinct progress along several lines of investigation, biological and technological.

3. The scheme for propaganda in favour of rural pisciculture, shortlived though it was, not only revealed the enormous possibilities of pond and well culture as a by-industry in rural areas, but brought home to the department the need for a more thorough knowledge of fish and of the conditions that govern their growth and fattening in the restricted water-areas of village wells and ponds. As the entire scheme originated with the suggestion made by the Royal Commission on Agriculture, when the finances of the Madras Government failed for the continuance of the propaganda, the Imperial Council of Agricultural Research was



approached for financial support towards the research side of the scheme. The long needed fresh-water Biological station and Central Fish-farm for research will, it is hoped, materialize before long.

4. An equally important development relates to advanced biochemical research in the technology of fish-manures, fish-oil and fish-meal at the Tanur station. The early experiments of Sir F. A. Nicholson two decades ago brought about a revolutionary change in the fish manure industry of the West Coast of this Presidency and no fewer than 647 private factories on the model of Tanur sprang up along the sea-board of the Malabar and South Kanara districts and raised the output from insignificant amounts of oil and beach-dried manure to 32,000 tons of guano and 12,000 tons of oil in a favourable sardine season. The quality of the production however is admittedly poor. The products, if improved in the light of modern technological research, would fetch several times their present market value. Tanur, as at present equipped and staffed, cannot undertake the necessary research. At the instance of the Imperial Council of Agricultural Research, a scheme involving the employment of a qualified Bio-Chemist and the establishment of a technological laboratory has been formulated and is now under the consideration of the Council.

5. The educational activities of the department have been confined so far to the West Coast. This year for the first time an important community of fishermen on the East Coast (the Bharathas of Ramnad and Tinnevely) realizing the advantages of the special system of education formulated by the department for the fisher-class, have memorialized Government for the extension of the scheme to the East Coast and have generously offered Rs. 10,000 towards the erection of the building. As elementary schools for their children already exist, the relative cost to Government will be quite small as it will be limited to the equipment, staff and running charges of the institute.

6. In the chank marking experiments during the year no fewer than 485 chanks have been marked and liberated on the banks, which when refished will throw considerable light on the rate of growth, mortality and migrations of the chank in its natural haunts, about which nothing is at present known, while the studies on chank and chank egg-capsules under confinement, which have been commenced at Krusadai Island this year, have already added to our knowledge facts regarding the fecundity, development and early stages of this economically important mollusc.

7. A definite beginning in the establishment of a pearl oyster park in the vicinity of Krusadai Island became possible during the year, through the fortunate discovery of a small bed of oysters

during the inspection of the pearl banks. Five hundred and fifty-eight oysterlings were successfully transported from the bank to the island and have now been placed in specially designed oyster-cages, and are under observation.

8. The usual methods of cultching to encourage the deposition of spat (young of the oyster) having failed to yield satisfactory results in the attempt made to repopulate the depleted edible oyster beds of the Pulicat Oyster Farm, a search for the most up-to-date methods in use in Europe, America, Japan and Singapore was made and experiments with the most promising of these have been set up at Pulicat. The results so far obtained indicate that the comparatively simple method of pegging bamboo mats on mud flats with the dead oyster-shells spread on them successfully adopted in Singapore will prove the most suitable.

9. The Milk-fish (Chanos) common in the sea and back-waters throughout the Presidency is intensively cultivated in the Philippines and the East Indies, the investment in the industry in Manila Bay alone being estimated at Rs. 13,50,00,000. An important beginning was made during the year with the investigation for the culture of this valuable food fish at the Krusadai Biological station with the help of the Philippine Bureau of Fisheries.

10. Lastly, the observation on the nests and eggs of Gourami and the experiments in the best methods of cultivating the fish made for the first time in the Præma fish farm introduced a new departure in the normal work of the inland fish farms. The meagrely educated and poorly paid Assistant Inspectors in charge of the farms were incapable of making scientific observations hitherto but constant persuasion and instruction, it is gratifying to note, have yielded some results in the new facts that have been discovered concerning the eggs and nests of Gourami.

11. In the field of technological research, the most important achievement perhaps is the almost complete success obtained from the experiments with the Japanese diving apparatus. The compressed steel cylinders in place of the cast iron ones in the original Japanese apparatus, and the newly devised pressure reducing valve to deliver air to the diver at a uniform pressure proved successful far beyond expectation and enabled the submersion of the diver for 18 minutes instead of the maximum of 7 minutes with the old apparatus. As the cylinders were pumped to only a third of their tested pressure, the maximum under-water period of the diver with the new apparatus still remains to be ascertained.

12. Finally, the perfection of the drier and its demonstration to the public, the arrangements to introduce on the East Coast the fish-meal industry evolved in Tanur and the experiments in

the storing of cured prawns in CO₂ with a view to improve marketing and induce curers to adopt the superior method of preparing prawns developed at Tanur, are the most salient features of the work of the Tanur station. Another important line of investigation undertaken relates to the preservation of boats and nets. The entire capital investment in the fishing industry of this Presidency is represented by the cost of craft and tackle. Efforts to lengthen the useful life of catamarans and nets will confer enormous pecuniary benefits on the industry. Systematic experiments towards this end have been devised and will form an important part of the technological research at the Tanur station in the coming years.

PART I.

ACTIVITIES OF THE DEPARTMENT.

I. MARINE FISHERIES.

A. RESEARCH.

(a) Scientific Research.

13. (i) TRAWLER.—Further progress was made in the preparation of the third and final report on the Systematic Survey of deep sea-fishing grounds by S.T. "Lady Goshen." Appendices I, II and III of the report containing particulars of trawling cruises and hauls and statements of the weights and kinds of fish caught, statistical accounts of other marine fauna found in the catches, and the charts concerned have been prepared.

14. The following specimens of sponges collected during the survey have been identified through the courtesy of Mr. Burton of the British Museum of Natural History:—

- (1) *Clathria frondifera* (Bow).
- (2) *Axinella donnani*, Carter.
- (3) *Axinella bubarinoides*, Dendy.
- (4) *Rhabderemia indica*, Dendy.
- (5) *Aulospongos tubulatus* (Bow).
- (6) *Spirastrella purpurea* (Lam).
- (7) *Auleta lyrata* (Esper).
- (8) *Geodia areolata*, Carter.
- (9) *Acanthella cavernosa*, Dendy.
- (10) *Megalopastas pulvillus*, Dendy.
- (11) *Petrosia testudinaria* (Lam).
- (12) *Auleta elongata*, Dendy.
- (13) *Protostylissa foetida* (Dendy).
- (14) *Dendrilla membranosa* (Pallas).

Twenty specimens are still with him.

15. (ii) WEST HILL BIOLOGICAL STATION, CALICUT—*Plankton investigation*.—Plankton was collected tri-weekly excluding the

monsoon months on 59 days during the year. As in the previous year special attention was paid to the collection and sorting of fish eggs and larvæ in the plankton for further study.

16. The Flagellate, *Phaeocystis*, which occurred in swarms in October and early part of November last year made its appearance in equal abundance this year also but with the difference that its appearance was later in the season, i.e., in December. This fact is very significant seeing that the occurrence of *Phaeocystis* synchronizes with the practical disappearance of the sardine shoals for the season. The* presence of swarms of *Phaeocystis* has been considered the cause of the poor herring fishery in the spring of 1926 at Lowestoft and herrings belong to the same family as the Malabar oil-sardine.

17. The simple quantitative study of plankton by sedimentation and the calculation of the cubic contents of the sediment was continued. The quantity of plankton available in September is neither equalled nor even approached by that of any other month in the year, the proportion being 42.5 cubic centimetres to 8.5 cubic centimetres and is due to swarms of *Diatoms*, *Noctiluca* and *Ctenophores*. Plankton was least abundant after the first week of March until the second week of April after which data are not available due to rough weather, and for a short period in November, December and January. In February, plankton occurred in moderate quantities on account of the predominance of *copepods* and the diatom *Rhizosolenia*.

18. Among the Phyto-plankton, diatoms were abundant during October and November while dino-flagellates were scarce. The following table shows the dominant groups of diatoms and the period of their occurrence.

Genus.	Occurrence.
(1) <i>Rhizosolenia</i> ...	Throughout the year but abundant from September to March.
(2) <i>Fragillaria</i> ...	Common from September to November and in June.
(3) <i>Coscinodiscus</i> ...	Almost throughout the year, abundant from October to December.
(4) <i>Chaetoceras</i> ...	Common in November, January and June.
(5) <i>Nitzschia</i> ...	Abundant in September and November.
(6) <i>Navicula</i> ...	Plentiful in January.

* (1) Savage, R.E. 1930—"The influence of *Phaeocystis* on the Migrations of the Herring" Min. of Agr. and Fisheries, Fishery Investigations, Series II, Volume XII, No. 2.

(2) Savage, R.E. 1930—"The relation between the Feeding of the Herring off the East Coast of England and the Plankton of the Surrounding Waters." Fishery Investigations, Series II, Volume XII, No. 3, 1931.

Trichodesmium, a favourite food of Mackerel, occurred in small quantities in January. This tallies with the fact that the year was poor for Mackerel.

19. The year was characterized by the absence of oil-bearing dino-flagellates, a favourite food of sardine and the meagre appearance of *Ceratium*, the only dino-flagellate represented in October, November, February and March. This possibly accounts for the poor sardine fishery of the year.

20. Among the animal organisms in the plankton the most dominant forms with their seasonal abundance are shown in the statement below :—

Organisms.			Occurrence.
(1) Copepods	...	...	Throughout the year, abundant in February and early March.
(2) Lucifer	...	...	Abundant throughout the year.
(3) Evadne	...	...	Common from October to December.
(4) Penelia	...	...	Common in September and October.
(5) Decapod larvæ	...	...	Common in September, October, January, February and March.
(6) Noctiluca	...	...	Abundant in September, October, January and February.
(7) Ctenophores	...	...	Abundant from September to December.
(8) Diphyes	...	...	Common in November.
(9) Molluscan larvæ	...	...	Abundant from October to December and February.
(10) Sagitta	...	...	Common throughout the year.
(11) Worm larvæ	...	...	Throughout the year in small numbers
(12) Fish eggs and larvæ	...	...	

21. The maximum catch of the sardine for the year occurred in October when *Noctiluca* was swarming and the minimum catch of Sardine in December when *Noctiluca* was absent.

22. Fish eggs were most frequent in November and larvæ in September and January.

23. *Sardine investigation*.—The year 1932-33 was a poor year for sardine. Samples of oil-sardine (*Sardinella longiceps*) were collected and studied whenever available. One thousand two hundred and twenty-seven fish selected from in-shore catches were thus examined. Sardines made their appearance this season on 10th September and rapidly increased in numbers so that by the middle of the month the maximum catch for the year was reached. After the fishery declined and the fish disappeared altogether by the middle of January. On the first day of the fishery specimens ranged in size between 15 to 17 cms., the majority size being 16 cms. On subsequent days until 17th November the size ranged from 9 cms. to 14 cms. From the second week of November the catches were very poor but the sardines were bigger in size. In December and January the fish measured 16 to 20 cms. These fish belonged to

a different age group apparently representing the generation sampled on 4th October. Judged by the samples the sardine fishery this year comprised two age groups, one starting with the majority size of 10 cms. and the other with that of 16 cms. in the first week of October. The former attained the majority size of 13 cms. by the third week of November, the latter 19 cms. by the fourth week of December 1932.

24. The above observations confirm the conclusions arrived at in 1921-22 when two similar generations were evident. (Vide Madras Fisheries Bulletin, Volume XVII, Report No. 5, pages 163 to 166.)

25. The stomach contents of 900 out of 1,227 specimens (caught in October and November) were examined. The stomach of 400 of these were empty. The following plankton organisms were found in the stomach of the rest :—

Copepods, Larval bivalves, Peridinians, Ostracods, *Coscinodiscus*, *Biddulphia*, *Dinophysis* and *Ceratium*.

Though *Phæocystis*, *Noctiluca*, *Lucifer*, *Ctenophores*, *Chaetoceras* and *Rhizosolenia* were equally abundant in the plankton during October to December they were not found in the stomach of sardines.

As observed by Savage* in the case of the European Herring, there is probably here also a case of selective feeding.

26. There was hardly any fat in the fish this season. As in 1921-22 there was a preponderance of males over females and individual fish with half-spent gonads were noticed in the catches which were composed of only the older generation at the commencement of the fishery in October. (Vide pages 175-176 of Madras Fisheries Bulletin, Volume XVII, No. 5, 1923.)

27. *Other fisheries investigations*.—The daily collection and identification of the important food fishes were continued and the data recorded in the fish register maintained for the purpose. A detailed study of the economically important shoaling fishes was made. Over 1,300 fishes were so examined.

28. The investigation of growth rate in the common food fish by biometrical studies on regular samples obtained from catches on the lines formulated by Mr. Whitehouse in 1923 was recommenced and the results recorded in a special register, Fish Register, No. II.

29. *Hydrographical investigations*.—To the usual daily record of temperature and density of surface sea water and the collection

* Savage, R.E.: "The relation between the Feeding of the Herring off the East Coast of England and the plankton of the surrounding waters." Min. of Agr. and Fisheries, Fishery Investigation, Series II, Volume XII, No. 3, 1931, pages 50, 51 and 53.

of water sample for subsequent analysis for chlorine and salinity the determination of hydrogen ion concentration (pH) by the colorimetric method was added.

30. *Miscellaneous*.—The Research Assistant continued to teach Elementary Zoology to the students of the Fisheries Training Institute and examined the final year students in the subject.

31. (iii) KRUSADAI BIOLOGICAL STATION—*Plankton investigation*.—As usual the daily collection and preliminary analysis of plankton was continued; the net, the time of day, duration of haul, the locality and courses of the plankton cruise being the same from day to day. As regards volume two distinct maxima were noticeable in the year; in August 76 c.c. per haul and December 34 c.c. per haul. The former is due to the extraordinary abundance of hydromedusæ and the latter to the preponderance of copepods and hydromedusæ. Plankton was most scanty in September and April during the intervals between the monsoons. In the five months October to February, the quantity of plankton was more or less constant. Of these months October and November are predominantly *diatomaceous* and December and January characteristically *zoo-planktonic*. In February, diatoms and animal plankton were equally abundant. In April, though the volume of plankton was at a minimum yet diatoms predominated and several genera, e.g., *Rhizosolenia*, *Coscinodiscus*, *Asterionella*, *Biddulphia*, etc., were present with *Trichodesmium*, another plant organism.

32. Among the phyto-plankton, diatoms are fairly well represented. The dominant diatoms are *Rhizosolenia*, *Coscinodiscus*, *Chaetoceras* and *Thalassiothrix* as shown in the statement below :—

Organisms.	Occurrence.
(1) <i>Rhizosolenia</i>	Almost throughout the year, abundant in October.
(2) <i>Coscinodiscus</i>	Almost throughout the year, abundant in February.
(3) <i>Chaetoceras</i>	Abundant in July, August, October and November.
(4) <i>Thalassiothrix</i>	Abundant in August, October and November.

They were most abundant in April and October corresponding to the double (Spring and Autumn) maxima of European waters and those of Madras.* *Biddulphia* said to be abundant off the Madras Coast was comparatively rare.

* "A preliminary account of the Madras Plankton." By Mr. K. Sankara Menon. Records of the Indian Museum, Vol. XXXIII, Part IV, 1931, vide pages 493-494.

33. *Trichodesmium* was often seen in dense swarms along the west and northern margins of Kundugal point during the month of July and in the Galaxea Lagoon during November but never in swarms in the area traversed by the tow net. They, however, occurred in fair abundance almost throughout the year.

34. *Peridinium*s were conspicuous by their absence in these waters being found only occasionally and that very sparingly. This probably was due to the coarse nature of the plankton net used at the station.

35. The following table gives the more important *animal* plankton and their seasonal abundance.

Organisms.	Occurrence.
(1) Copepods and Crustacean larvæ.	Throughout the year. Most abundant in September and from November to March.
(2) Larval peneids ...	Common during the middle of January and February.
(3) Other Crustaceans, Mysis, Lucifer, Amphipods and Megalopa larvæ.	Throughout the year in small numbers.
(4) Larval Gastropods ...	Abundant in February.
(5) Larval bivalves ...	Common from March to June and in November.
(6) Larval worms ...	Throughout the year in small quantities.
(7) Sagitta	Throughout the year, but abundant in December, January, March and June.
(8) Noctiluca	Common in November.
(9) Radiolarians (Acanthometron).	Common in March.
(10) Hydromedusæ ...	Throughout the year, abundant from July to October, December, February and March.

36. *Research on East Coast Sardines*.—An intensive study of the species composing the sardine shoals at Pamban commenced last year is continuing.

37. Data are being collected for the preparation of a preliminary report on other fisheries concerned with silver-bellies (*Leiognathus* spp. and *Gazza minuta*) and 'Kuthippu' (*Lactarius lactarius*).

38. The daily collection, identification and study of the food fish of the Pamban area were continued. Ninety-six more specimens of fish were collected and identified and recorded in Fish Register No. I. As at West Hill, a Fish Register No. II was opened this year to record data relating to important shoaling fishes of the Pamban area. Eight hundred samples of 'Choodah'

(*Sardinella gibbosa*, and *S. brachysoma*); 'Thondan' (*Dussumieria hasseltii*); 'Karnal' (*Equula edentula*, *E. insidiatrix* *E. splendens*, *E. daura*, *Gazza minula*); and 'Kothippu' (*Laclarius laclarius*) were so examined.

39. *Hydrographical and Meteorological Data.*—The daily record, just before sunrise, of the sea surface temperature by the standard thermometer from a true sample taken in the wooden bucket provided for the purpose and the collection of samples of surface sea water for chlorine and other determinations were continued. As at West Hill the determination of hydrogen ion concentration (pH) by the colorimetric method has been added to the daily routine. The new set of standard areometers ordered for the station last year was brought into use for recording the density of sea water during the current year. A Stevenson's Screen with thermometers for noting the maximum and minimum temperature of the air was set up during the year.

40. *Aquarium studies.*—Owing to the dismantling of the salt water-supply system to the aquaria for the construction of the ferro-concrete roof to the main laboratory, the aquarium studies could not be continued.

41. *Pearl Oyster experiments.*—A fresh attempt was made this year to transport from the pearl banks to the Krusadai Island all live-oysters found in the course of the annual inspection of the pearl banks.

42. Three consignments of live-oysters were obtained this year. The first lot of 102 oysterlings ranging in size between 35 to 47 millimeters which were fished at a depth of 7 to 7½ fathoms from Thondan Par, Tuticorin, on the 27th March 1933, was transported by rail and received at the station the next day. These oysters were immediately placed in one of the specially designed wire-net cages, and anchored in Porites Bay in a depth of three fathoms. Another consignment of 100 oysterlings brought by 'Lady Nicholson' on 3rd April 1933 was placed in another similar cage which was anchored close to the first cage. These oysterlings ranged in size from 17 to 43 millimeters. A few coral stones for attachment were placed in the second cage as the oysters in No. 1 cage were found to avoid the wire-net of the cage. A third consignment of 356 oysterlings ranging in size from 16 to 52 millimeters, brought by 'Lady Nicholson' on 6th April 1933 was transferred to a third cage similarly anchored.

43. Great care was exercised in handling and transporting oysters and the heavy casualties which occurred last year were thus avoided. The total casualties in the three cages up to end of the year is 298. Of these as many as 192 oysters died in June. As

Porites Bay is on the landward side of the island and is sheltered from currents, an accumulation of mud and silt occurs which is apt to smother the oysters. The channels in the Galaxea Reef on the seaward side of the Island are subject to heavy tidal currents and the water even in rough weather is comparatively clear. With a view to ascertain the suitability of the latter for pearl oysters, half the consignment was shifted towards the end of the year to a channel in the Galaxea Reef.

44. To determine the rate of growth by direct observation on individual oysters in captivity, the two cages in the Galaxea Reef have been provided with pigeon holes for individual oysters. These oysters are examined every week and the sizes are recorded. These studies were commenced with a view to ascertain the possibilities of maintaining pearl oysters in captivity, to determine the optimum conditions for pearl oysters of salinity, temperature and pH of sea water, to study their life history, rate of growth and habits for the eventual establishment of an Oyster Park and to detect the causes and remedies for the irregular cyclic character of the pearl fisheries.

45. *Chank investigation.*—During the year under report, an intensive statistical and biometrical study of chanks was started at this station with a view to find out the age and duration of life, the productivity of the various banks, the size composition of chanks populating the banks, the vertical distribution of chanks of different ages and sizes according to depth, and the existence of local races, etc. Random samples of 100 shells taken once a week from the shells fished in the adjoining fishing centres, Rameswaram, Theedai and Thonithurai, are measured and studied with reference to the area fished and the position of the banks. The number of divers, the average earning per diver, the proportion of shells of various sizes and of wormed-shells in the catches, the occurrence of egg capsules, etc., are also recorded in a special register devised for the purpose.

46. The measurements obtained at Rameswaram this season show that the majority of the chanks measure 50 to 70 millimeters in diameter. As regards their distribution, 40 to 50 millimeter sizes seems to be dominant within three fathoms; 50 to 60 millimeter sizes between three and four fathoms (except on a single day when they were fished between five and seven fathoms); and 60 to 70 millimeter shells between four and six fathoms. Up to six fathoms limit the chanks are progressively larger with the increase in depth. An abundance of the comparatively smaller sized shells (50 to 60 millimeters in diameter) was noticed in deeper waters (five to seven fathoms) on the last day of the fishery. The undersized chanks seem to range up to five fathoms from the shore. The maximum size of the chanks fished

at Rameswaram this year is 106 millimeters but they were rare and comprised 0.1 per cent of the total catch.

47. Yet another set of investigations which has been started at this station during the year relates to the food, sexual maturity, spawning season, early stages, and life-history of the chank. So far only one chank could be dissected for the examination of its gonads and stomach contents; but four egg-capsules in different stages of development have been secured and kept under observation for the study of the embryology of the chank. The egg-capsule measures 7 to 10 inches and contains 30 to 33 chambers. The lower chambers about nine in number seem to be empty as the capsule is rooted to the ground at this end. The number of young chanks found in each chamber seems to vary widely from 2 to 10. It seems to take not less than ten days for the development of the 'Veliger' stage and another eight days for the appearance of the 'Protoconch' stage. The young chank then acquires more or less adult characters and escapes from the egg-capsule to lead a free-life. In the veliger stage the larva possesses a four to six whorled conical transparent shell 3.75 to 5.5 millimeters long, a pair of tentacles with eyes at their bases, two otocysts and one four-lobed ciliated velum. In the protoconch stage a totally different shell, hard, almost cylindrical and 9 to 10 millimeters long with three to five whorls having six to seven irregular longitudinal brick-red streaks on the last whorl is developed. There are two tentacles with eyes at their bases and an opercle attached to the foot but the ciliated 'velum' is absent. The development of the 'veliger' stage and its metamorphosis into the 'protoconch' take place within the capsule.

48. The total number of young found in a single egg-capsule seems to range from about 70 to 240. Whether the chank lays one egg-capsule or several requires further investigation. Cannibalism seems to prevail among the young protoconches found in the chambers.

49. The spawning season of the chank has been recorded as the trimester (January to March) by previous observers. It has now been found to spawn in April and even in July. Only dead capsules washed up by the waves were found this year, in June.

50. *Miscellaneous*.—Specimens of sponges kindly identified by Mr. Burton of the British Museum were added to the Museum collection in the station.

51. *Visitors*.—The following parties of students and college staff visited the station :—

(1) A party of 15 students of the American College, Madura, with their Professor C. P. Gnanamuthu, M.A., F.Z.S., in the third week of August.

(2) A party of 15 students of the Central College, Bangalore, with Professor A. Narayana Rao, B.Sc., Mr. B. R. Seshachari, M.Sc., and Mr. L. S. Ramaswami, B.Sc., in the first week of October.

(3) Lecturers A. V. Narayanaswami, M.A., and T. K. Gopalachari, B.A. (Hons.), of the P.R. College, in the first week of January.

52. (iv) VIZAGAPATAM STATION.—Biological Research at Vizagapatam station is still handicapped by the location of the office in an unsuitable building. In view of the non-availability of any of the Government buildings or of suitable private ones for rent, it is proposed to put up buildings for the future biological station and aquarium. Plans and estimates are under preparation.

53. The authorities of Mrs. A.V.N. College, Vizagapatam, are interested in the scheme for the establishment of a Biological Station and Aquarium at Vizagapatam and recently the Andhra University Commission have emphasized the need for it, in the following words :—"To the extent that biology is a regional study, the development of this science must depend upon the investigation of the local flora and fauna and this University being on the coast can provide exceptional facilities for the study of marine plants and animals. The creation of a small marine biological station at Vizagapatam with a museum and aquarium attached to it will do much towards this end and will also stimulate popular interest in a subject which is rapidly growing in importance." The lecturer in zoology of Mrs. A.V.N. College, Vizagapatam, is carrying on studies in *Meretrix* in the Vizagapatam harbour area and plankton investigations in and out of the harbour in collaboration with this department.

54. The collection of specimens and detailed notes on the fish and fisheries of the Northern Circars was continued.

55. (v) MARINE AQUARIUM LABORATORY.—As usual analysis of samples of sea water was carried on in the Marine Aquarium Laboratory, Madras. About 190 samples of sea water were analyzed. Sodium hypochlorite solution was prepared from time to time and sent to the Tanur Experimental Station for fish preservation experiments. Some experiments on the colour preservation of dead fish for exhibition were also carried out.

56. (vi) FISH STATISTICS.—The Government sanctioned in G.O. No. 464, dated 24th April 1933, the permanent appointment of the statistical clerk. The statistical work which was in arrears since the abolition of the post has been restarted. With the appointment of the statistical clerk, it is proposed to issue a statistical report for the East Coast on the lines of that published for the West Coast.

(b) Technological Research.

57. (i) **FISHING METHODS**—*The Yorkshire Coble*.—In accordance with the instructions contained in paragraph 3 of G.O. No. 1664, Development, dated 21st December 1932, in the course of the diving experiments at Sethubavachathram the opportunity was taken to try the possibilities of the coble as a fishing boat. One of the enquirers for the demonstration with the coble is now at Topputturai, close to Sethubavachathram. An opportunity will be taken to interest him as well as other fishermen, in the use of the coble.

58. (ii) **EXPERIMENTS TO IMPROVE EAST COAST CURING METHODS**.—The year 1932-33 saw the introduction of improvements in the fish-curing yards of the East Coast. In the wake of the reforms introduced at the Idinthakarai yard the ticket-holders in two other adjoining yards at Ovari and Sippikulam have commenced the construction of improved curing sheds, and cement vats of approved design. The proposal to carry on departmental curing on improved lines in selected yards as on the West Coast could not be given effect to owing to the poor fishing season and consequent irregular catches.

59. (iii) **TANUR EXPERIMENTAL STATION**—*Advanced research in fish-manure, etc.*—Though the simple process of boiling the fish in open vats and expressing the oil by hand presses devised at the Tanur station in 1912 has been extensively copied, the resultant products are admittedly crude and are susceptible of vast improvements which will greatly enhance the quality of the products and the margin of profits to the West Coast industry. A detailed scheme for advanced research on fish-manure, fish-oil and fish-meal arising out of a report which the Imperial Council of Agriculture Research had asked from me in 1931 was sent to the Council by the Madras Government (vide G.O. No. 107, Development, dated 25th January 1933). The proposal is to establish a Fisheries Bio-Chemical Laboratory at Tanur and to engage the services of a competent and experienced Fisheries Chemist for the first three years and to train an understudy to the Chemist for subsequent work, to investigate the various problems connected with the processes of manufacture and devise the best methods on up-to-date scientific lines to ensure both cheapness of production and excellence of quality. The capital cost of the scheme was estimated at Rs. 50,620 and the running cost at Rs. 80,987. The contribution of the Madras Government towards the scheme is the cost of the site and buildings, estimated at Rs. 39,120 and included in the capital cost of Rs. 50,620. The scheme came up for consideration before the Advisory Committee of the Imperial Council which met

at Delhi in February 1933. I attended the meeting and explained the scheme which has been referred for report to a sub-committee.

60. *Drift net experiments*.—This year also no fishing experiments with drift nets were feasible as the fishing season continued poor and it was not possible to secure the services of fishermen, who are mostly under contract on account of their indebtedness to boat owners. The canoe belonging to the station having become unserviceable was condemned and sold. The question of purchasing another canoe will be considered when the fishing season improves.

61. *Artificial drier*.—The effect of controls for the admission of air and its escape which regulate circulation inside the chamber mentioned in paragraph 59 of last year's report was studied jointly and severally in the experiments done this year.

62. Further experiments were conducted during the year with shelled and unshelled, salted and fresh, boiled and unboiled prawns, employing firewood and coconut-husk as fuel. The mode of firing and the effect of regulating dryage by adjusting the cold and hot air vents and by means of an adjustable asbestos screen, were investigated. The regulation of temperature by means of hot and cold air valves and careful firing has been fully achieved. In several experiments the top and bottom temperatures registered were identical. No more research on the regulation of temperature seems necessary. The dryage of trays is also fairly uniform, compared with what it used to be. One or two bottom trays, being the nearest to the fire chamber and getting the first supply of dry air from the air inlets, however, dry first and have to be removed from the drier in about 1½ hours. Though this is not a great inconvenience, the possibility of eliminating this defect will continue to form the subject-matter of future investigations.

63. As the drier has now reached a satisfactory working stage, efforts were made to demonstrate its working and its advantages to three leading prawn-curiers from South Kanara and Malabar. The demonstration was held on 25th June 1933, and proved satisfactory to all the three and helped to allay their suspicions that (1) artificial drying was unremuneratively expensive, (2) that the drier was complicated and could not be manipulated by ordinary curiers, (3) that fish and prawns are apt to get scorched, (4) that fresh unshelled prawns which are extensively beach dried could not be dried in the drier and (5) that the artificially dried prawns would be poor in appearance. It was proved at this demonstration that at no greater cost than about 2 pies per pound prawns could be dried during the monsoon, with no more expert labour than

ordinary coolies, even women, and that prawns shelled or unshelled, boiled or unboiled could be dried without distinction. The resultant product was admitted by the fishermen to be superior to the sun-dried prawns in appearance and quality. The results of the last four years' experiments on the artificial drier has, therefore, reached a satisfactory stage and the drier is about to be copied by the interested public.

64. *Experiments with sodium hypochlorite.*—Further experiments with sodium hypochlorite (NaClO) were conducted with prawns and various kinds of fish. One per cent solution was found not strong enough to prevent taint in prawns in $18\frac{1}{2}$ hours. Some experiments with 1 per cent solution and salt were, therefore, tried. The prawns so preserved were found difficult to shell. The percentage of salt was reduced in certain experiments. Even then the prawns were difficult to shell and the shelled prawns were poor in appearance. Experiments with a change of solution after 9 hours were encouraging. In the case of small miscellaneous fish .75 and .50 per cent solutions were found inadequate to preserve them for 12 hours, but 1 per cent was strong enough and the fish so preserved when dried were equal to freshly-cured fish. One per cent solution was found sufficient to preserve small gutted shark for 18 hours whereas ungutted small seer became tainted.

65. These experiments have shown that a stronger solution of sodium hypochlorite will be required if this re-agent is to be employed by ordinary curers or fishermen. Otherwise the bulk of the solution to be carried in fishing canoes will be inconveniently large. Enquiries will be made for obtaining solution of higher concentration from other institutions or for ordering a more powerful electrolyser.

66. *Experiments with carbon dioxide.*—In 1929 samples of semi-dried Tanur prawns were sent to the Indian Trade Commissioner, London, for exhibition purposes. As a result of their exhibition, the Trade Commissioner received enquiries for samples of Indian dried prawns preferably larger sized prawns if they can be obtained on a commercial scale. A further sample was sent to him in August 1931 for display at the International Grocers' Exhibition, London. Subsequently in December 1932, the Trade Commissioner wrote to me that three firms in London were interested in our prawns and that they would like to have fresh samples in sufficient quantities to make a proper test together with particulars regarding prices and packing. In reply I pointed out that the Tanur station does not manufacture prawns in bulk and that I would try and interest private curers in the business and let him know what qualities and quantities could be exported by them. In 1911-12, Sir F. Nicholson devised improved methods of

curing prawns at the Tanur station. The process has been sufficiently demonstrated and advertised, but has not been adopted by any private curer so far, as the demand is small and the market standards are low. When the enquiry from the Trade Commissioner was communicated to some of the larger prawn-curers, they were of opinion that they will be glad to adopt the improved methods provided the semi-dried prawns will find a market in England. The semi-dried prawns at Tanur under existing conditions of storage do not keep for more than six to eight weeks. Even within this period their fresh pink colour gradually fades, the flesh dries to a harder consistency through evaporation and the appearance becomes marred by salt excrescence on the surface. As the transport to England will take at least a month it was necessary to devise some improved method of packing which would prevent the gradual deterioration of prawns in storage. An airtight container filled with carbon dioxide was considered the best method of packing and storing and experiments in this method of storing are now in progress at Tanur.

67. *Fish-meal experiments.*—The present method of roasting the meal causes discoloration if the operation is delayed even by the fraction of a minute. This could be remedied if a water-jacketed frying pan is devised. As the stuff cannot be treated above the boiling point in such a pan, a longer treatment may be required. Also the keeping quality of meal prepared by this method of roasting has to be experimentally determined.

68. The introduction of the fish-meal industry developed at Tanur as a cottage industry on the East Coast received attention during the year as the ribbon-fish fisheries of the Tinnevely district proved unusually abundant and the curers complained of unremunerative prices for cured fish. It would seem that some of the East Coast fish which appear in immense shoals at particular seasons, such as, Whitebait, Ribbon-fish and Silver-bellies if converted into fish-meal will yield a larger margin of profit than when cured into 'Karuvad.' Besides, fish-meal can be stored for a much longer period than salted and sun-dried fish and Tanur can always find a market for the meal. Attempts are being made at important centres to demonstrate methods of mealing fish and to interest curers in this new industry.

69. *Net preservations.*—The cost of craft and tackle represents practically the entire capital investment in the case of the fishing industry in India. The relative cost of craft and nets is roughly calculated as 1 : 4. Any economy in these investments is bound to reflect favourably on the industry. The proper preservation of fishing nets has, therefore, engaged the attention of the Tanur station for some years past. The principal factors that conduce to

the proper preservation and to the lengthening of the useful life of fishing nets in the order of their importance are—

- (1) Thorough cleaning of the net after use daily and sun drying.
- (2) Proper storage of net by hanging in an airy place in the shades.
- (3) Application of chemical preservatives.

70. Some experiments with copper oleate as a preservative for fishing nets have been tried at Tanur. After extensive and continuous experiments the Bureau of Fisheries*, United States of America, advocates the following as the most useful and suitable dip for light gear, i.e., nets of all kinds that are in general use in the East and the West Coasts of this Presidency—the treatment of the net at 180° to 220° F for three minutes in a mixture of the following ingredients :—

1 Copper Oleate	..	..	9½ parts by weight.
2 „ resinate	..	..	19 „ „
3 Chicla	..	..	7 „ „
4 Kerosene	..	..	64½ „ „

As 'Chicla,' a gum from a Central and South American tree is not available in India a more powerful preservative, viz., cashew-oil will be substituted for this and experiments will be tried at Tanur.

71. Since the useful life of nets primarily depends on careful handling such as thorough cleaning, drying and storage, a net owner who is habitually careful and can be trusted to handle the nets with care will be selected. A drift net which consists of several uniform sections which are knitted together when the net is plied will be chosen for the experiment. One of the sections will be treated with the consent of the owner in the manner described above and given to the fishermen for use along with other sections, barked and tanned in the customary fashion. The condition of the sections specially treated as compared with the ordinary section of the same net will be watched with a view to ascertain the advantages of the method over indigenous tanning. As the wear and tear of the net varies largely according to the locality, the experiments will be conducted in as many centres in the Presidency as possible.

72. Experiments to economise investment on craft remain to be devised at Tanur.

73. *Purchase and manufacture.*—Five thousand eight hundred and fifteen pounds of fresh fish for Rs. 187-8-3 for curing (at an average rate of 6.2 pies per pound) and 15,515 lb. of fresh fish for Rs. 321-15-6 for manufacture of fish-meal (at an average rate of

* Mem. S.-330, Department of Commerce, Bureau of Fisheries, Washington—Net Preservation, Research—1932, with recommendation by W. T. Com.

5.9 pies per pound) were purchased during the year as against 5,283 lb. of fresh fish for Rs. 118-12-4 for curing (at an average rate of 4.3 pies per pound) and 28,240 lb. of fresh fish for Rs. 225-15-0 for preparing fish-meal (at an average rate of 1.5 pies per pound) in the previous year. The total output for the year was 890½ lb. cured fish, 2,332 lb. of fish-meal and five bottles of second-class oil, valued at Rs. 799-12-5, as against 969 lb. of cured fish, 5,196 lb. of fish-meal and eight gallons of third-class oil valued at Rs. 849-11-10 in the previous year.

74. *Sales.*—Five hundred and ninety-four and three-fourths pounds of cured fish, 2,909 lb. of fish-meal, 96 gallons 5½ bottles of fish-oil, and miscellaneous articles to the value of Rs. 2,104-6-6 were sold during the year, as against 918 lb. of cured-fish, 4,381 lb. of fish-meal, 46½ gallons of fish-oil and miscellaneous articles valued at Rs. 1,959-7-0 in the previous year. There was demand for fish-meal especially for cheap second-grade quality but for want of stock, due to the scarcity of cheap fish, regular supplies could not be made and several customers chiefly of Northern India ordering large quantities for their poultry-farms, dairies, cattle-farms, etc., had to be disappointed. For producing second-grade fish-meal, cheap fish appearing in shoals and caught in bulk are required. Such commercial fish were scarce during the year and therefore very dear.

75. *Stock.*—The year closed with a stock of 358½ lb. semi-dried prawns, 5 lb. of fish-meal, first class, 8½ lb. fish-meal, second class, 78½ lb. pink meal, 13½ lb. fish bones, 31 lb. of fish-meal cake, 65 lb. tallow, 2 bottles 13 oz. fish-oil, first class, and 13 gallons 1 bottle 4 oz. fish-oil, third class.

76. *Advertisement.*—Advertisement regarding fish-meal, cured fish, etc., in the Villagers' Calendar of the Agricultural Department, and the book on Poultry Farming published by the Viswa-barathi Poultry Section, Bengal, continued during the year.

77. *Receipts and expenditure.*—The receipts for the year amounted to Rs. 2,181-13-5 as against Rs. 2,352-13-10 in the previous year. The expenditure excluding establishment charges of Rs. 2,094-2-3 amounted to Rs. 2,042-6-9 as against Rupees 3,784-0-5 in the previous year.

78. *Training of apprentices.*—One fish trader, V. Damodaran of Calicut, who owns an Oil and Guano Factory applied and was admitted to the station to learn the methods of manufacturing fish-meal and semi-dried prawns.

79. Mr. Mohanappa Thingalaya of Mangalore was similarly permitted to visit the station and acquire practical knowledge of

preparing fishery products according to improved methods. He did not however avail himself of the permission during the year on account of slackness of operations at the station.

80. S. Raja Fernando, Sub-Inspector, Tuticorin, in charge of fish-curing yards, was deputed by the Assistant Director, Pearl and Chank Fisheries, to the station in February 1933 for training in the manufacture of fish-oil, guano, fish-meal and curing of fish. Mr. A. Somayaji, Inspector of Fisheries, Tuticorin, when at Calicut in connexion with the navigation classes at the Fisheries Training Institute, also visited the station to study the methods of manufacture of various Tanur products.

B. ADMINISTRATION.

(a) Public Fish-curing Yards.

81. At the beginning of the year there were 104 fish-curing yards in the Presidency. The number of yards at the close of the year remained the same. Of these 25 are in charge of Sub-Inspectors, 38 in charge of Petty-yard Officers and 41 in charge of peons.

82. With a view to balance revenue and expenditure the Retrenchment Committee recommended in 1931 the levy of varying rates of issue price of salt in fish-curing yards according to the loss on the working of the respective yards on the analogy of cess levied in Salt Factories under section 431 (B) of the Madras Salt Manual. This recommendation of the Committee was found impracticable for the following reasons :—

(1) While there is no limit to the sale price of salt manufactured in salt factories, the issue price in fish-curing yards should not even approximate the bazaar price of salt and any increase in the issue price is subject to this important limitation.

(2) The policy and aim of the department has been to encourage fishermen to cure their catches themselves in the yards. It is the smaller yards that cater chiefly to the needs of the fishermen. The transactions in these yards are not large as the capitalist curers secure most of the catch and these yards generally work at a loss in a poor season. Consequently varying the rate of issue price to cover loss will involve as a rule higher price of salt in these small yards, than in the larger ones resorted to by capitalist curers. The scheme will therefore directly tend to reduce or even extinguish the profits of the poor fishermen curers while the middlemen and merchants will thrive at the expense of the fishermen.

(3) The scheme does not provide for any means of distributing the profits which almost invariably accrue in the case of the larger yards. The intention of Government in running fish-curing yards being the advancement of the fish-curing industry,

any scheme which proposes to recover losses from the curers should also provide ways of reimbursing the curers to the extent of profits earned.

83. In G.O. Ms. No. 483, Development, dated 5th April 1932, Government decided that it is not possible to accept the recommendations of the Retrenchment Committee.

84. They however considered that the cost of the administration of the fish-curing yards appeared susceptible of reduction and asked for the overhead and contingent charges to be examined. In 1925, all possible lines of economy in expenditure in fish-curing yards were considered and reported to Government. Since 1925, some of these suggestions for economy had been adopted. I therefore reviewed the whole situation in the light of experience gained during the last eight years and have submitted a detailed report on the economies still possible.

85. *Inspection of yards by Salt officers.*—With a view to economy the Central Board of Revenue, in consultation with the local Government, discontinued the inspection of fish-curing yards by the Officers of the Salt Department. The Inspecting Officers of the Fisheries Department have undertaken to look after the interests of the Salt Department at their periodical inspection of the yards.

86. (i) **EAST COAST (NORTHERN SECTION).**—The number of fish-curing yards (30) in this section remained the same during the year. Further progress was made with the proposal to reopen the yard at Srirangapuram (Vizagapatam). The fishermen have selected a suitable site and have taken it on lease and are awaiting the municipal sanction to build on it. The site selected for the proposed yard at Bunderpetta near Calingapatam was not available as the Revenue Department considered it necessary to retain the land for the future needs of the village as a grazing ground. Another suitable site in consultation with the Revenue Department has been selected since the close of the year. The proposals for a new yard at Dokulapadu near Pundi and at Sonapur did not materialize.

87. *Transactions.*—The total quantity of fresh fish brought to the yards was 124,988 maunds 20 seers and the quantity of salt issued was 17,023 maunds 39 seers against 95,924 maunds 2 seers of fish and 13,831 maunds 39 seers of salt in the previous year. The operations in 23 out of the 30 yards were better than in the previous year. The decrease in transactions in the remaining 7 yards was generally attributed to (1) increase in fresh fish trade, (2) poor fishing season at Prayagi, (3) failure of sardine and jew-fish fisheries at Mukkam and (4) scarcity of sardine and ribbon-fish at Konapapeta, Mulapeta and Uppada.

88. *Supply of salt.*—Monopoly and excise salt were supplied to the yards. The total quantity of salt supplied to all the 30 yards was 17,216 maunds of which 2,300 maunds was monopoly and 14,916 maunds excise against 3,952 maunds and 10,238 maunds, respectively, in the previous year. The cost of monopoly salt varied from 3 annas 6 pies to 6 annas per maund and that of excise salt from 3 annas to 10 annas 6 pies per maund.

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

90. *Balance stock of salt.*—The stock of salt in the 30 yards at the beginning of the year was 1,748 maunds 7 seers and at the close of the year 2,096 maunds 8 seers.

91. *Reforms in yards.*—The extensions to the model-shed at Uppada were completed. As a result of the demonstration with wire net drying racks for drying fish conducted by the department, a ticket-holder of the Uppada yard has been persuaded to use the method.

92. *Miscellaneous*—(1) *Yard fence.*—The destruction of the prickly-pear fence in the yards is almost complete and suitable substitutes, e.g., screw-pine, aloes and columnar cactus are being planted. Palmyra nuts are also being planted in some yards.

93. (2) *Petty construction and repairs.*—The system of departmental construction and repairs was extended to this section in the latter part of the year and resulted in appreciable reduction of expenditure under petty construction and repairs.

94. (ii) *EAST COAST (CENTRAL SECTION).*—The number of fish-curing yards (9) in this section remained the same during the year.

95. *Transactions.*—The total quantity of fresh fish brought to the yards during the year was 69,812 maunds 16 seers and the quantity of salt issued was 10,183 maunds 12 seers against 61,495 maunds 23 seers of fish and 8,886 maunds 21 seers of salt in the previous year. As in the Northern Circars there was an increase in transactions in all the yards except Sattankuppam and Kottapatnam. The decrease in Sattankuppam was due to fresh fish trade with Madras while at Kottapatnam it is attributed to an unfavourable fishing season.

96. *Supply of salt.*—Monopoly and excise salt were supplied to the yards. The total quantity of salt supplied to all the 9 yards was 8,470 maunds of which 4,650 maunds was monopoly and 3,820 maunds excise as against 4,560 and 3,821 maunds, respectively, in the previous year. The cost of monopoly salt varied from As. 4-7 to As. 5-7 per maund and that of excise salt from As. 2-8 to As. 4-8 per maund.

97. *Wastage of salt.*—There was a wastage of 31 seers of salt due to the wetting of bags on account of sudden rain during transit from Sunnambukolam boat basin to Medicalkuppam yard.

98. *Balance stock of salt.*—The stock of salt in the 9 yards at the beginning of the year was 626 maunds 9 seers and at the close of the year 562 maunds 6 seers.

99. *Miscellaneous*—(1) *Yard fence.*—Since the destruction of the prickly-pear the question of putting up some other fence in its stead has been under consideration. Last year screw-pine and aloe were planted in all the yards. They throve well till February when their growth received a check due to the hot droughty summer. Further efforts to grow a live fence are being made.

100. (iii) *EAST COAST (SOUTHERN SECTION).*—The number of yards (14) in this section remained the same during the year. The reopening of a yard at Kuttanguli is still under consideration. A fall in transactions at Tranquebar fish-curing yard is attributed to its bad location. It is therefore proposed to transfer the yard to another site which is more centrally situated. Transactions in the fish-curing yard at Point Calimere continued to be on the increase and in view of this gradual increase the question of closing or converting it as a 'peons' yard has been deferred for the present. During the year the fishermen of Killai and Cuddalore in the South Arcot district petitioned for the opening of yards in these places. The matter has been investigated and proposals will be submitted to Government as part II schemes for 1934-35.

101. *Transactions.*—The total quantity of fresh fish brought to the yards was 63,062 maunds 35 seers and the quantity of salt issued was 12,188 maunds 31 seers against 73,484 maunds 13 seers of fish and 15,697 maunds 39 seers of salt in the previous year. The decrease in transactions which was noticed in 10 out of the 14 yards was due to (1) the absence of the usual shoaling fishes, (2) the use of swamp salt by the fishermen of Arcot Thurai for curing and (3) the absence of regular fishing on account of a strong faction in the village of Mukkur. The yards at Adirampatnam, Nambuthalai and Pinnakayal continued to show improvement in operations due to good catches of cat-fish (Manthan keluru) at Adirampatnam, sharks, rays, plough-fish and horse mackerel at Nambuthalai and ribbon-fish at Pinnakayal. Point Calimere yard improved in operations as the fishermen did not use swamp salt for curing fish. Vanagiri, Tranquebar, Muthupet, Sippikulam, Ovari and Idinthakarai showed low operations owing to the absence of shoaling fish. The consumption of salt at Sethubavachatram yard has been poor. This is accounted for by the absence of Sengani (*Psammoperca*) and hilsa. The fall in transaction in Attankarai was due to the fact that the fishermen of

Vaippar, Sippikulam, Devipatnam and Thondi did not camp here as usual during the season.

102. *Supply of salt*.—The total quantity of salt supplied to all the 14 fish-curing yards was 12,208 maunds of salt against 13,530 maunds in the previous year. To Idinthakarai, Ovari, Sippikulam and Mukkur yards which could be served by sea from Tuticorin, 5,400 maunds bought at 1 anna per maund were transported by boats. The cost of salt supplied to the remaining 10 yards from the nearest salt factories varied from 2 annas 3 pies to 6 annas per maund.

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

104. *Balance stock of salt*.—The stock of salt in the 14 yards at the beginning of the year was 3,984 maunds 33 seers and at the close of the year 4,004 maunds 2 seers.

105. *Reforms in yards*.—A well with clay-rings is under construction in the Nambuthalai yard. During the year, night curing of fish up to 9 p.m. was permitted in Idinthakarai yard and a special concession for removing fish within twelve hours from the yard premises was granted to the curers of this yard to suit the requirements of the weekly market.

106. *Miscellaneous*—(1) *Yard fence*.—The prickly-pear fence has been completely destroyed by cochineal. Palmyra nuts have been planted along the fence in all the yards. Arrangements are being made to plant the Madras thorn (*Ingaduleis*) in all yards as this is found to form an effective fence. Arcot Thurai and Point Calimere were provided with barbed wire fences. Vanagiri, Tranquebar and Arcot Thurai yards were provided with square wire net enclosures on the drying ground to counteract the destruction caused by dogs at night.

107. (2) *Pit manure and kitchen gardens*.—The scheme of converting the fish refuse resulting from curing operations which is wasted by fishermen into pit manure was introduced in the yards this year by the yard staff as a demonstration. In addition to Ovari, Attankarai and Nambuthalai yards, small kitchen gardens have been raised in Adirampatnam and Vanagiri yards.

108. (iv) *WEST COAST*.—The number of fish-curing yards (51) in this section remained the same during the year. Since the close of the year, the Government have issued orders to close the yard at Vekkode and Agathi. The shifting of the Ponnani yard to a new and more suitable site has been sanctioned and the work is in progress.

109. The temporary yards at Baikampadi, Hosabettu and Nattika have been retained as the curers have offered security to bear any loss that may be sustained in running these yards. There

was a loss in the working of the Nattika yard for the year ending 30th November 1932 amounting to Rs. 29-4-11. The loss in the working of the fish-curing yard at Baikampadi for the year ending 31st March 1933 was Rs. 43-14-2. These amounts were recovered from the curers. There was no loss in working the Hosabettu yard. The gain in working this yard estimated at Rs. 10-12-1 has been credited to Government. In respect of the closed yard at Vekkode, the loss to be recovered from the curers amounts to Rs. 189-9-1.

110. *Transactions*.—The total quantity of fresh fish brought to the yards was 727,441 maunds 31 seers and the quantity of salt issued was 119,003 maunds 13 seers against 842,832 maunds 1 seer of fish and 140,924 maunds 22 seers of salt in the previous year. The decrease in transactions is attributed to the fall in operations chiefly at Malpe and in yards south of Badagara. Malpe is the biggest yard in South Kanara but its consumption was only 15,400 maunds 10 seers against 22,522 maunds 34 seers of salt in the previous year. There was an appreciable decrease in the salt used for Ratnagiri and Colombo systems of curing. This is due to the fact that there was not much demand for fish cured by these methods. The smaller varieties of fish were rare and mackerel and sardine were practically absent in the yards south of Badagara. The heavy rains that started as early as April did not permit of extensive fishing in these places as the sea was very rough periodically. The Hosdrug yard records this year the highest consumption of salt since the yard was opened. Operations in the Ullal yard were low. Madai showed a marked increase in consumption due to the increased catches of small varieties of fish. There was however a marked decrease in the catches of big varieties, which is reported to be due to an understanding among fishermen to restrict long-line operations in certain seasons. This is said to have contributed towards the increased catches of small kinds of fish.

111. There was an increase in consumption of salt in the yards at Kirimanjeshwar, Hosabettu, Bockapatnam, Kumbla, Adakath-bail, Kasaragod, Thaikadapuram, Mattool, Azhicode, Cannanore, Etakad, Tellicherry, Thalayi, Madakara and Badagara. The increase in the South Kanara yards is attributed to the desire of the curers to prevent the closure of the yards. The remarkable increase at Kirimanjeshwar yard however from 1,158 maunds 25 seers to 2,433 maunds 19 seers is stated to be due to the increase in popularity of the fish-curing yard which was established only a few years ago. At the Cannanore yard, the improved catches of silver-bellies, ribbon-fish and small miscellaneous kinds of fish are responsible for the increase. The increased transactions in the

new yard at Etakad is encouraging especially as last year's operations were disappointing. At Tellicherry the increase is due to heavy catches of cat-fish and ribbon-fish. Thalayi yard has done well this year, as the curers are reported to have stopped the sale of fresh fish. At Madakara the consumption was nearly double that of last year and was due to heavy catches of shark, cat-fish and skate. The Madapalli yard has seen its worst this year. The slight increase in the Badagara yard is not appreciable but this is not surprising since a considerable amount of private curing is done with bazaar salt and the catches of fish from this point southwards have also been remarkably poor. Transactions in the Quilandy yard declined and the yards south of it showed very poor operations.

112. *Supply of salt.*—All the fish-curing yards possessed a good supply of salt at the beginning of the season. Altogether 120,600 maunds of salt purchased at a uniform rate of 1 anna 8 pies per maund obtained on competitive tenders were transported during the year from Tuticorin to the West Coast. Of this 99,700 maunds were sent by sea and the rest by rail.

113. *Wastage of salt.*—A wastage of 992 maunds 7 seers occurred during the year against 1,626 maunds 22 seers in 1931-32. Of this 165 maunds 17 seers were due to damage caused by the cyclone of May 1932 and 720 maunds 12 seers to long storage. Issue price and single duty on 5 maunds 2 seers have been recovered from the local transport contractors as the wastage was found to be due to their negligence.

114. *Balance stock of salt.*—The stock of salt in the yards and gollahs at the beginning of the year was 159,925 maunds 9 seers and at the close of the year 159,625 maunds 29 seers.

115. *Demonstration of curing methods.*—At the Malpe I fish-curing yard, 25,000 mackerels were cured in the departmental demonstration shed, the expenditure being Rs. 130-5-6 and the receipts Rs. 148-12-0. The demonstration shed at the Calicut North yard stands in the name of the Headmaster, Fisheries Training Institute. Operations were conducted on three occasions and only 5 seers of salt were issued. The fish cured was caught by the students and a total expenditure of Re. 0-14-6 were incurred including the issue-price of salt. The cured-product was sold for Rs. 3-2-0.

116. *Standard curing-sheds.*—Eighteen permanent sheds of approved design were constructed in South Kanara district yards and six in the Malabar district yards. The tickets of two curers who owned permanent sheds in South Kanara were cancelled during the year. The curers realize the advantages of the standard type of curing-shed but their poverty stands in their way.

117. *Damage to yards.*—The north-eastern portion of the Bockapatnam yard site is being steadily eroded by currents. The Mattool yard has again been affected by the sea. The fence was destroyed and one of the curing-sheds collapsed. Proposals for shifting the yard to a better site have been submitted to Government. Another yard which is usually a source of anxiety is Tellicherry but fortunately it has not been affected this year. At Etakad tidal waves invaded the premises of the yard and caused slight damage to the fence. The proposal to shift the Vadanapalli yard was ordered by Government to be revived as a Part II scheme for 1934-35 unless the progress of erosion makes it essential to shift the yard earlier.

118. *Miscellaneous.*—There was a theft of cash amounting to Rs. 200-15-0 from the Paravanna fish-curing yard. Investigation showed that a coolie working in the yard got into the temporary office and store-shed by making a breach in the bamboo walls, broke open the record box and took away the cash. He was prosecuted and convicted. The question of supplying all fish-curing yards with strong cash chests is now under consideration.

119. At the commencement of the season, during the Civil Disobedience Movement, Congress volunteers raided the Mangalore and Bockapatnam yards on 24th October 1932 and 3rd November 1932, respectively. At the Bockapatnam yard the raid was unsuccessful but at the Mangalore yard the raiders broke open the store shed and destroyed 1 maund 10 seers of salt. The volunteers responsible for the raid were prosecuted and convicted.

(b) Private Oil and Guano Factories.

120. Though 25 factories took out licences in the South Kanara district, for want of sardines only one factory at Gangoli worked during the year. In the previous year 31 factories were licensed of which 20 worked. The total output of guano in the South Kanara district was 20 tons, of fish-oil 200 gallons, of fish-manure 18 tons and of beach dried manure 62 tons. The price obtained for fish-oil was Rs. 1-8-0 per gallon or Rs. 375 per ton, and for guano Rs. 120 per ton. Fish-manure was sold at Rs. 100 per ton and the price of beach dried manure varied between Rs. 60 and Rs. 80 per ton. In the Malabar district there were 71 factories that took out licences but none worked during the year for want of sardines.

II. MINOR MARINE AND ESTUARINE FISHERIES.

A. Prawns.

121. The investigation relating to the migration of the sea-prawn (*Peneopsis monoceros*) into the Collair lake where it contributes to valuable fishery was continued. Tow-net collections

of young fry, and sampling of adult prawns from stake-nets and their analysis into sizes and sexes during the prawn season and after, yielded results which seemed to indicate that the migration was for the purpose of breeding. Confirmation of certain facts like the presence of *Peneopsis* fry at the commencement of the season and its total absence at the end, combined with the absence of small-sized prawns in the catches and the gross disproportion of the sexes towards the close of the season, is necessary before definite conclusions can be drawn.

122. In connexion with the export of dried prawns attempts were made to get the Akividu merchants in touch with markets overseas and to devise better methods of packing. Packing in mats and gunnies is the method adopted for sending the stuff to Rangoon but it is not satisfactory. Another problem facing the prawn-curers is the inclement weather which interferes with drying and to solve this difficulty the cheap drier evolved at Tanur has been suggested.

B. Edible Oysters.

123. (i) OYSTER RESEARCH.—With a view to augment the stock of the depleted oyster beds of the Pulicat Oyster Farm and to study the rate of growth in the different beds and the vertical distribution of the spat in the park experiments in oyster culture on up-to-date lines in vogue in America, Japan and Singapore were initiated during the year. The following types of spat collectors were tried:—

- (1) Simple wires, 18" and 24" long, suspended from a horizontal wire.
- (2) Shells of *Meretrix casta* threaded on the above wires to serve as cultch.
- (3) Plain and tarred pieces of coconut rope 18" and 24" long, $\frac{1}{2}$ " thick suspended from a horizontal wire.
- (4) Dead oyster shells spread on bamboo mats pegged to the muddy bed of the Park in about 2 to 3 feet depth of water.

124. The experiments were conducted in Pulicat, Lighthouse and Chinnaparaval beds of the oyster farm. No spat was noticed attached to the simple wires or plain or tarred ropes. Comparatively few spat were found on *Meretrix* shells. The maximum amount of spat was noticed on the oyster shells spread on the bamboo mats. The experiments have also yielded many valuable data regarding the relative merits of the different oyster beds in Pulicat lake regarding spat fall and growth of oysters. The experiments commenced only in November 1932 and complete data are

not therefore available. The experiments however have proved that the oysters can be grown at Pulicat to a maximum size of 47 millimeters in about six months.

125. The ecological studies of the oysters in the natural beds at Gokulapalli were also continued and the following further data have been obtained during the year.

126. Extensive measurements in sample areas selected at random showed that the sizes of oysters in zone A, at the top of the oyster bed ranged from 15 × 11 mms. to 89 × 53 mms. in zone B 23 × 19 to 120 × 70 mms. and in zone C from 21 × 17 to 145 × 51 mms. Among those in the top zone A, and the next zone B the larger oysters were found towards the bottom. The three zones differ also in the proportion of the dead to the live-oysters, the mortality being highest, viz., 119 per cent in the top zone A, the lowest 30 per cent in the intermediate zone B, and 55 per cent in the bottom zone C. The majority of the casualties in zone C are among very young oysters indicating thereby that conditions in that zone are not favourable for spat though most suitable for older oysters. The following weeds collected from the oyster beds have been identified with the kind assistance of Professor Parthasarathi Ayyangar:—

- | | |
|------------------------------------|-----------------------------|
| (1) <i>Halophila ovalis</i> . | (5) <i>Chaetomorpha</i> sp. |
| (2) <i>Halophila</i> sp. | (6) <i>Polysiphonia</i> sp. |
| (3) <i>Cymodocea isoctefolia</i> . | (7) <i>Lyngbia</i> sp. |
| (4) <i>Hypnea misciformis</i> . | |

127. A common crab (*Thalamita*) has been found to cause heavy destruction among oysters collected and stored in shallow water pending supply to customers. Though small it is formidable enough to break the shell and feed on the soft flesh of the mollusc. The crab has been noticed to select the weakest part of the shell (i.e., where it has been detached from stones or other substratum) and by means of its powerful claws to crush the shell at this spot making a circular hole through which it extracts the soft flesh of the oyster. To stop the depredation of the crab a wire net fence of sufficiently small mesh was erected round the storage platform and has proved a cheap and effective safeguard. In the natural beds where the oysters still adhere to the rock or other substratum the destruction of the crab is limited to young oysters which it is able to pierce through.

128. (ii) SONAPUR BEDS.—The extensive oyster beds at Sonapur continued to be watched and attempts were made to secure the bed from destruction by shell contractors.

129. (iii) OYSTER SUPPLY.—The season commenced on 18th February 1933 and the supply still continues. All the oysters were supplied from Gokulapalli beds as in the previous year. Local labour being cheaper was utilized for the work as in the previous year and the Pulicat staff were not deputed to Gokulapalli. During the year 93,825 oysters were sold for Rs. 1,899-12-0 against 96,300 oysters sold for Rs. 1,936-10-0 in the previous year. The actual expenditure amounted to Rs. 1,810-12-0 against Rs. 1,678-11-0 in the previous year; the total receipts from the oyster farm however was Rs. 2,571-12-0 against Rs. 1,936-10-0 and the net receipts Rs. 761 against Rs. 257-15-0 in 1931-32.

130. The dead shell-heaps collected during the last few years from the Pulicat oyster farm were sold for Rs. 155. The right of collecting similar dead (meretrix) shells on the shores of the oyster farm in the Pulicat lake between mile 24/0 to 27/1 of the Buckingham canal excluding the Karimanal area was leased for Rs. 517 for one year from 1st June 1933 to one Mr. Kandaswami Nayakar. Express conditions that he should not collect oysters or other shells from the oyster beds have been entered in the agreement.

131. On a representation made by the Khazi of Madras, Government ordered the exclusion of the Pudupet oyster bed situated in the Coromandal village—vide Development Memorandum No. 1698-II/33-1, dated 16th June 1933.

III. INLAND FISHERIES.

A. Research.

132. (i) RESEARCH ON RURAL PISCICULTURE.—With reference to the recommendation of the Royal Commission on Agriculture in paragraph 415 of their report, Government sanctioned in 1930 an Assistant Director and staff for propaganda in favour of rural pisciculture, but owing to financial stringency, the staff had to be disbanded in 1931 after about a year. The year's work was so successful that it has awakened considerable interest in pisciculture on the part of private individuals and public bodies. Applications from different parts of the Presidency are constantly received for advice and help in growing fish in village wells, ponds and tanks. But the department is not in a position to render assistance not merely for want of staff but for want of the necessary information regarding the kinds and availability of fish suitable for small wells and tanks in the different districts, and the factors that govern their growth and fattening in small wells and ponds. The experience gained during the year had served to disclose the possibility

of using some local fish in Madras for well and pond culture. The only fish successfully used during the propaganda was 'Catla'—a North Indian carp—the fry of which are available only in the Kistna and Godavari rivers in this Presidency in July and August. Not only is it expensive to transport the fry to South India but stocking operations have to be limited to the hot weather months of July and August when most ponds and wells in South India are dry. It will be a great advantage, therefore, if catla can be bred locally at the required time, or fish that breed at other times and are locally abundant can be used for stocking, but at present we have little or no information concerning these matters. Recently, when the Director of Agriculture and his staff in Coimbatore, Tinnevely and the Northern Circars kindly offered to help the department to carry on the propaganda in favour of rural pisciculture, provided fish for stocking, advice and help in growing them were given by the Fisheries Department, I had to confess my inability to supply fish or necessary instructions concerning them as practically nothing is known regarding the local varieties of fish.

133. For assisting the ryots in the different districts in growing fish in their wells and ponds, the following information is essential :—

- (1) which of the several kinds of fresh-water food fish available in this Presidency are suitable for stocking wells and ponds;
- (2) what is the breeding season of the selected kinds and where the young fish for stocking wells and ponds can be obtained plentifully and cheaply by the ryots;
- (3) whether suitable fish for pisciculture are available locally; if not, the nearest source where they can be had and the cheapest mode of transport;
- (4) what is the favourite food of these fish and how is such food natural or artificial to be obtained by the villager abundantly and cheaply;
- (5) what weeds, snail, and other vegetable and animal organisms are associated with the occurrence and abundance of these fish and how could they be cultivated in ponds and wells;
- (6) what are the favourable physical and chemical characters of water in which the different fish thrive best and how unfavourable conditions present in certain wells and ponds can be remedied;

(7) what are the enemies of the fish to be reared and how they can be eradicated in ponds and wells for successful results; and

(8) what are the diseases of fish in captivity and how they are to be controlled.

134. For the above investigation and research (i) a properly equipped research station (fish-farm) and (ii) qualified staff are necessary.

135. In pursuance of the recommendations in section IV, chapter III of the report of the Committee on Fisheries in Madras, for the consolidation of research on inland pisciculture, the Madras Government had sanctioned a fully equipped fresh-water biological station and fish-farm. A valuable site measuring 13 acres in the old brickfield at Chetput and the Superintendent's quarters which could be used by the resident officer, have been assigned to the department for the establishment of the station. Government have also approved of the excavation of the first set of seven fish-ponds at an estimated cost of Rs. 21,060 as well as plans and estimates for the proposed laboratory, offices, and store-shed at an estimated cost of Rs. 13,000.

136. As the research on pond and well culture to assist the ryots is the direct outcome of the recommendations made by the Royal Commission on Agriculture, and is an addition to the regular work contemplated at the biological station, I proposed that the Agricultural Research Council should be approached for funds for the special investigations detailed above for a period of five years.

137. The fresh-water biological station with additional staff and equipment for research on rural pisciculture was estimated to cost Rs. 40,060 for capital expenditure, and Rs. 62,222 for running charges. Out of this, Rs. 34,060 capital expenditure and Rs. 4,590 running expenditure will be provided by the Madras Government besides the valuable site of 13 acres in extent in the City of Madras and staff quarters valued at Rs. 1,581. The contribution by the Imperial Council of Agricultural Research will be Rs. 6,000 for capital expenditure and Rs. 57,632 for running charges.

138. The proposal relating to research on rural pisciculture was discussed and unanimously approved by the Provincial Research Committee and has been forwarded to the Imperial Council of Agricultural Research by the Madras Government (vide G.O. Ms. No. 90, Development, dated 23rd January 1933).

139. (ii) DEEP-WATER TANK FISHING EXPERIMENTS.—Owing to the complete failure of rain in Mopad last year, the reservoir received a very scanty supply and by the end of January, water sank below the sill level of the sluice. The fishing experiments

were therefore confined to the old Manneru bed. The following statement gives statistics of the fishing experiments at Mopad for the year ending June 1933 :—

Month.	Total number of fish caught.	Total weight in lb.	Amount realized in rupees.			Name of implement used and weight of fish in lb. captured by each					Catla.	
						Drift net.	Cast net.	Ennore net.	Night line.	Patthu net.	Number.	Weight in lb.
1932.			RS.	A.	P.							
July ..	377	673½	60	1	9	..	668½	..	5	..	285	548½
August ..	558	940	82	4	0	..	940	..	..	..	503	787½
September ..	421	723	67	12	6	..	705	..	13	..	411	669
October ..	462	759	70	0	6	47	610	..	82½	19½	356	616
November ..	485	710½	65	6	9	248½	359	..	97	6	159	262
December ..	523	706½	65	4	9	261½	261½	..	170	13½	46	107
1933.												
January ..	862	1,095	101	11	2	121	106	775	93	..	338	611½
February ..	1,456	1,844	125	0	0	..	..	1,344	..	..	448	771½
March ..	1,774	1,841	152	6	8	..	..	1,841	..	..	526	1,021
April ..	1,766	1,765	142	1	4	..	..	1,765	..	..	680	1,018½
May ..	1,592	1,715	135	4	8	..	..	1,715	..	..	666	1,139½
June ..	1,699	1,561	130	1	4	..	..	1,561	..	..	691	1,071
	11,965	13,833½	1,197	7	5	678	8,650	9,001	465½	39	5,054	8,622½

* This includes 32 Gourami weighing 42 lb. sold at 8 annas per viss.

It will be seen from the above statement that the Ennore and cast nets were responsible for the major portion of the total catch. This was expected as the reservoir was low. Catla, the newly introduced carp, figured prominently in the catches, five thousand and fifty-four fish weighing 8,622½ lb. having been caught against 1,101 catla weighing 1,911½ lb. in 1931-32; and 290 catla weighing 674 lb. in 1903-31. Catla measuring 15 inches to 18 inches were put on the market as they are best esteemed at that size. All bigger fish—some 30 inches long—were returned alive to the reservoir to serve as breeders. The catch this year is the record. The price obtained however is comparatively low on account of the heavy fall in the price of food-stuffs. Greater catches were possible but on account of the difficulty in quick transport and low market price, the catches were restricted.

140. (iii) FISH BREEDING—*Avalanche Hatchery for Trout*.—The hatchery was operated as usual during the cold weather. The two streams, the Arokiam puzha and the Bhavani puzha opened to fishing last year were resorted to occasionally. With a view to exterminate the Malabar carp (*B. malabaricus*) introduced into the Pykara river some years ago and very abundant there and to stock the river with trout the Nilgiri Association have permitted extensive netting of the river for carp. Bhavani as usual attracted some mahseer fishermen during December and January. The biggest mahseer caught is reported to have weighed 26 lb.

141. *Hilsa Hatchery*.—The bore hole at Bezwada was completed but the fishing season was a failure and hatching experiments were therefore not possible. Experience during the last seven years has shown that the Hilsa fisheries at Bezwada are

unreliable and a sufficient supply of ripe hilsa is not regularly available for the hatchery at Bezwada. A quest for a more suitable site for the location of the hilsa hatchery in the Godavari where much larger fisheries exist resulted in the selection of Bobbarlanka on the Dowlaiswaram anicut. With the permission of the Public Works Department a site close to the head sluice was secured at Bobbarlanka for trial operations. A well and a temporary shed are under construction. The approaching hilsa season will show if Bobbarlanka offers better facilities than Bezwada.

142. *Gourami*.—Observations on the breeding habits of Gourami and experiments in intensive pond-culture on lines adopted by breeders in Java were commenced during the year. The Gourami breeds best in the Sunkesula and Prama farms of the Kurnool district. The difficulty in pursuing research of this nature has all along been the absence of qualified staff on the spot. Special efforts were made during the year to instruct the local Assistant Inspectors to observe the nest-building habits of the fish and to make periodical collections and reports. For the first time two nests with eggs *in situ*, one in Sunkesula and the other in Prama, were secured on 17th February 1933 and 6th June 1933 respectively. The first however was lost through bad preservation and ignorant handling. Better results attended the collection and preservation of the second nest. The eggs collected numbered 709 and measured 2.2 to 2.3 m.m. in diameter. They are smooth and non-adhesive, with an exceptionally large oil globule. Due to improper fixing and preservation, further details of structure could not be traced. The discovery of the eggs by the Sub-Assistant Inspector, however, marks a great step in advance and it is to be hoped that with experience and increased vigilance in observation it will be possible for him to make further and fuller observations on the nest-building and breeding habits of this important food-fish. The materials employed by the fish for constructing its nest and its exact position in the pond with reference to water-level, vegetation, etc., have also been investigated. The following plants are used by the fish for nest-building :—

<i>Nymphaea lotus</i> .	<i>Ottelia atsinodes</i> .
<i>Nymphaea alpa</i> .	<i>Pistia stratiodea</i> .
<i>Lagarosiphona roxpurghii</i> .	<i>Hydrilla verticellata</i> .
<i>Limnophylla</i> .	<i>Ipomæa aquatica</i> .
<i>Myriophyllum</i> .	<i>Chara sp.</i>
<i>Vallisneria spiralis</i> .	

The nests measure 6 inches in diameter and 7 inches in height and they are circular, hollow cupshaped structures of dry weed and grass more or less closely resembling birds' nests. They are set with the opening facing horizontally in thick clumps of bul-rush growing along the margin of ponds at a depth of 6 to 9 inches from

the water-surface and 10 to 14 inches above the bottom of the pond. Pisciculturists in Java suspend tufts of fibres of the palm, *Arenga saccharifera*, in the breeding ponds during the nest-building season. The nests built in these tufts are then easily removed to nursery ponds where the eggs hatch. This facilitates the easy separation of the young from adults and their segregation for growth in nursery ponds. Experiments along these lines are in progress.

143. The two experimental ponds for determining the causes that adversely affect the breeding of Gourami at Ippur were completed. Though they adjoin each other it was reported that one contained water of a milky colour and the other crystal clear water. The reason for the difference could not be traced by the Inland staff. On a personal examination I found that the milky coloured water was found to be fresh while the clear water was brackish. The weeds growing in the ponds also indicated the difference in the nature of the water in the two ponds. A trial pit close to the ponds proved that the sub-soil water was clear but very brackish like the water in one of the ponds. When this was baled out and the trial pit was filled quickly with fresh water from the supply channel the water turned milky in colour but continued fresh for days. This helped to trace the cause of the difference between the two experimental ponds. The one with fresh-water was apparently filled up with fresh-water from the channel before the sub-soil water had accumulated in it and in the other pond the sub-soil water had been allowed by the contractor to accumulate before the channel water was let in. The question of draining the ponds and filling them quickly with a good supply of fresh-water from the channel to prevent undue brackishness and to equalize conditions in the two ponds remains to be tried. The water from the two ponds was analyzed with the following results.

144. Sample A contains a large quantity of silica in fine suspension in addition to chlorides, sulphates and carbonates in small amounts.

145. Sample B though clear and colourless gives a high figure for common salt, and sulphates and carbonates are also present.

Colour and transparency.	Sample A. Muddy and Opaque.	Sample B. Colourless and clear.
Total solids, parts per 100,000	97.0	344.0
Temporary hardness, 100,000	2.5	5.5
Permanent hardness do.	0.5	1.5
Total hardness do.	3.0	7.0
Chlorides (as chlorine)	7.1	124.3
Sulphates	Present.	Present.
Nitrates	Nil.	Nil.
Phosphates	Nil.	Nil.
pH,	7.4	8.4
Reaction of Phenolphthalein	..	Alkaline.

The bottom soil of the two ponds has been sent to the Soil Analyst at Coimbatore Agricultural College for report. In view of the marked difference in the water noticed in the two ponds, the contemplated experiments on Gourami under controlled conditions could not be commenced. An important advance however has been made with reference to the Gourami problem at Ippur. One of the adverse causes affecting the breeding of Gourami was believed by Mr. Hornell to be the unusually large size of the Ippur Gourami pond, 4.59 acres in extent (vide paragraph 80 of my annual report for 1924-25). As prolific breeding of Gourami has occurred in the section of the Vellore Fort Moat about 6.96 acres in extent it has helped to prove once for all that the size of the pond in Ippur cannot be the deterrent factor. The discovery that the sub-soil water is highly brackish leads to the suspicion that the problem is connected with the salinity of the water-supply at Ippur.

146. The investigation into the reasons why Gourami do not breed at Mopad could not be conducted owing to the failure of water-supply in the reservoir.

147. In 1928, 200 Gourami fingerlings measuring 4 to 5 inches were supplied to Mr. House of the Anamalais. He has reported that though the fish grew splendidly they did not breed. One fish taken is reported to have weighed 6½ lb. In the fish-farms they do not attain this size. At Sunkesula the biggest fish never weighed more than 4 lb.

148. *Mullet*.—As usual fry from estuaries were utilized for stocking a large number of provincialized tanks in the Kandukur and the Kavali taluks.

149. *Catla*.—In the Madurantakam tank Catla measuring 27 inches to 30 inches were caught during departmental fishing. The Zamindar of Chunampet, who saw the fish, ordered 200 fish for stocking a tank in his estate. In the Willingdon Reservoir, Catla measuring 36 inches are reported to have been caught. Here the fish is called 'Ponali Kendai,' a new name coined by the fishermen.

150. *Mahseer*.—Experiments to introduce this species into the Mopad reservoir are in progress.

151. *Chanos culture*.—Chanos is by far the most important fish in the Manilla market and is cultivated intensively in the Philippines where the capital invested in the industry is estimated at 45,000,000 pesos (Rs. 13,50,00,000) around Manilla Bay alone.* Further progress was made with the chanos investigations at Krusadai Island commenced last year. Through the courtesy of

* "Bangos Culture in the Philippine Islands" by Albert W. Herre. The Philippine Journal of Science, Vol. 38, No. 4, 1929.

the Philippine Bureau of Science samples of the natural food of chanos fry called 'Lab Lab' in the Philippines was obtained and compared with the diatoms and algæ found in the Krusadai swamp. The following is the comparative list:—

Manilla fish farms.		Krusadai swamp.
1. Filamentous algæ—		1. Filamentous algæ.—
Oscillatoria sp.		Oscillatoria spp.
Spirulina major.		Macrocoleus sociatus.
		Lyngbia spp.
2. Diatoms—		2. Diatoms.—
Nitzschia closterium (Ehr.)	..	Navicula spp.
" longissima (Breb.)	..	Nitzschia spp.
Navicula spp.	..	N. closterium.
Pleurosigma spp.	..	Pleurosigma sp.
Surirella striatula, Turpin	..	
" ovalis, Breb.	..	

152. The common algæ and diatoms in both seem almost the same. The samples of both will however be referred to specialists on the subject for further analysis and specific identification.

153. The possibility of constructing an experimental pond for the culture of chanos on the Island is now receiving attention. The chief difficulty is the absence of clay or other sand binding material for forming the water-tight bunds. At the request of one Mr. A. K. S. Aboobucker Maracayar, Mandapam, 500 chanos fry from the swamp were transferred to a large natural pond at Thonithurai close to Mandapam.

154. The conversion of the channels belonging to the Chanda-navada estate between Bahuda river and Yegasinghi into a fish-farm desired by the Karji of Sonapur did not materialize, as he anticipated trouble with the local fishermen. Therefore M.R.Ry. P. Narayanaswami Nayudu Garu, a wealthy landowner, has now come forward to open the chanos farm there. M.R.Ry. V. Kameswara Rao Nayudu Garu, of Pundi, intends to open another chanos farm at Pundi. Necessary advice was given to both on fish-farming.

B. Administration.

155. (i) FISH FARMS—*Sunkesula*.—The question of constructing additional ponds to relieve congestion is under consideration. During the year 190 Gourami fingerlings were collected and sent out and 204 big Gourami measuring 14 inches and above weighing 440 lb. were sold to the public for Rs. 124-6-9. There is yet a large head of small and big fish for sale. Since the destruction of the prickly-pear fence round the farm by cochineal the ponds are without protection. Last year a crocodile entered the farm from the river. To prevent destruction of fish by crocodiles a rough loose stone wall 4 feet high was constructed along the south-eastern

boundary of the farm. *Etroplus* continue to breed well and the resultant fry were as usual distributed to the provincialized tanks and channels of the Ceded districts.

156. *Præma fish-farms*.—The water-supply dispute with the villagers of Kadamalakalva was firstly investigated by the Collector and a tentative settlement was reached on 8th May 1933 by which half the spring water during the non-cultivation season and three-quarter of the supply during the cultivation season was arranged to be given to the villagers pending final disposal of the question.

157. The normal work of the farm continued satisfactorily.

158. *Ippur fish-farm*.—The normal work of the farm continued on the usual lines. There was an adequate supply of water in the Surveypalle reservoir and the farm did not suffer from drought this year.

159. *Powder factory fish-farm*.—The Assistant Director reported in February that the Gourami pond in the Powder factory fish-farm was poisoned by some one and that as a result five Gourami fingerlings were found dead. The pond was immediately netted and the fish caught were kept in conditioning boxes and left in the pond opposite to Hydari Garden bungalow. After a thorough cleaning and filling with fresh-water the fish were returned to the pond. A sample of the fouled water was sent to the King Institute, Guindy, for chemical examination, and the water was reported to have been fouled only by decaying vegetable matter. The dead fish specimens were dissected and their stomach contents were found to contain globular seed-like bodies, which were sent to the Botanical Assistant, Government Museum, for identification.

160. *Vellore Fort Moat fish-farm*.—The proceeds from the sale of fish, lotus, etc., amounted to Rs. 1,000. The routine work of the farm including the maintenance of a good stock of larvicides as an antimalarial measure was continued on the usual lines.

161. *Mopad fish-farm*.—Unprecedented drought seriously hampered the work of the Mopad fish-farm during the year. Even as early as January the water-supply from the reservoir to the ponds failed. The fish from the breeding ponds had therefore to be transferred to Ippur for safe custody, while the fry was distributed to the provincialized tanks in the Kandukur and Kanigiri taluks. All the ponds of the farm are now dry.

162. *Chingleput Fort-moat fish-farm*.—After the rectification of defects the Public Works Department finally handed over the Fort-moat farm to this department towards the close of the year.

163. (ii) GANJAM TANK STOCKING SCHEME.—Proposals for the acquisition and development of inland fisheries in the Ganjam district were revived in November 1932 as a part II scheme for

1933-34 and Government were informed that the department was maintaining the buildings taken over for working the scheme. Government in their order No. R. 278, Development, dated 6th December 1932, directed that the scheme should be postponed and that the same may be renewed when financial conditions improve.

164. (iii) PISCICULTURAL SURVEY—*Perennial springs in the Chingleput and the Chittoor districts*.—The suitability for fish-farming of two springs in the Chingleput district, one at the foot of the Kambakkam Hills and the other near Satyavedu, were further investigated. The Kambakkam spring in the Kambakkam reserve forest has a good perennial supply and no irrigation interests are involved. It will therefore prove an excellent site for a fish-farm. The spring at Satyavedu is the type of tank I have been wanting for trying the experiments in breeding catla in confined waters.

165. (iv) STOCKING OPERATIONS AND RESULTS.—Several tanks in the Nellore district suffered for want of rains during the year and were not stocked owing to very meagre supply.

166. *Gourami*.—Mr. Bell, Superintendent, Blind School, Poonamallee, was supplied with 50 gourami fingerlings.

167. *Etroplus*.—Wherever introduced this fish thrives and breeds. For improving inland fisheries this fish was extensively employed as in previous years.

168. The Superintendent, Agricultural Research Station, Koilpatti, was supplied with 255 fingerlings.

169. The Superintendent, Palur Agricultural Station near Nellikuppam, was supplied with 100 *etroplus*.

170. *Catla stocking*.—The following waters were stocked with catla at a cost of Rs. 1,382.

1 Vellore Fort Moat fish farm	..	..	590
2 Veeranam tank	..	..	600
3 Willingdon Reservoir	..	..	598
4 Chingleput Fort Moat farm	..	..	500
5 Dusimamandur tank	..	..	600
6 Cauvery above Mettur dam	..	..	2,083
7 Attigunta tank, Nellore	..	..	140
8 Victory Memorial Blind school, pond, Poonamallee	..	..	100
9 Mopad fish farm	..	..	1,000
Total ..			6,211

The Cauvery above the Mettur Dam was stocked with 2,083 catla.

171. Dusimamandur tank, one of the big tanks of the Presidency, was stocked for the first time with catla this year. The results will be watched.

172. The following gentlemen were supplied with catla during the year :—

- (1) Mr. Bell, Superintendent, Blind School, Poonamallee, with 100 catla.
- (2) The Zamindar of Chunampet, with 200 catla.
- (3) Dr. Venkataswami Chetti, with 100 catla.
- (4) Dr. Sitaramayya of Cocanada, with 100 catla.
- (5) Mr. Rutherford, I.C.S., Collector of Chingleput, with 100 catla.

173. Two ponds, one at Gangavaram, and the other at Athakur near Ampapuram, were inspected by the Inspector of Fisheries, Vizagapatam, at the request of the Co-operative Society there and advice for stocking them given. At the request of the President of the Panchayat Board, the tank at Gudlavelluru was inspected by the Inspector of Fisheries, Vizagapatam, as the water was reported to be bad. The water was however found to be fit for use and the President was asked to inform the Inspector when the water next turns bad.

174. (v) DISPOSAL OF FISHERIES BY PRIVATE TENDERS.—To combat local combination Government sanctioned the disposal of the following tank fisheries by accepting private tenders :—

Name of tank.	Highest bid in auction or offer by tender.			Amount obtained by private tender (annual rental).			Annual compensation.		
(1)	(2)			(3)			(4)		
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
Nellore district—									
Kanigiri Reservoir and Duvvuru tank	13,100	0	0	3,700	0	0	2,125	0	0
	for three years.								
Kavali tank				26	0	0	24	0	0
Bhogavolu tank				45	0	0	82	0	0
Mungamuru tank and supply channel				40	0	0	25	0	0
Juttur or Tallapalem				64	0	0	54	0	0
Chinnakraka				25	0	0	8	0	0
Papireddi cheruvu				98	0	0	122	0	0
Pokkuru tank	No bid.			* 15	0	0	7	0	0
Rapur big tank	37	5	4	† 66	10	8	12	8	0
Idukurpeta tank	71	0	0	† 31	0	0	4	0	0
Anantavaram tank	101	0	0	† 190	0	0	186	0	0
Narikalapalle	5	4	0	† 20	0	0	7	11	0
Chagollu				135	0	0			
Chingleput district—									
Neidavoyal tank	21	0	0	† 70	0	0	30	0	0
Uttiramerur tank	550	0	0	† 950	0	0	903	0	0
Neman tank				700	0	0	228	0	0

* Per year for five years. † Per year for three years.

175. Owing to the determined combination of the villagers there was no bid for the Madurantakam tank fishery and Chinnambedu and Vadamadurai tanks fetched Rs. 17 and Rs. 80 respectively in

public auction. The tanks therefore were fished departmentally. The fishing of the Madurantakam tank proved very difficult owing to obstruction caused by the local people and unseasonal rains. The operation therefore was protracted. Only half of the fish was caught and the rest abandoned on account of heavy rains which brought in two months supply of water to the tank. A sum of Rs. 792 was realized.

176. (vi) DISPOSAL OF FISHERIES BY PUBLIC TENDERS.—For the first time the fisheries of the delta tank of the Nellore district were disposed of by inviting tenders. The result was very satisfactory and saved a lot of correspondence.

177. (vii) FISHERY SALES.—Owing to acute economic depression which prevailed during the year and failure of rains in parts of the Nellore and Chingleput districts and unseasonal rains in some parts of the latter district, the realization of adequate rentals became an acute problem. In the taluks of Kavali, Kandukur, Atmakur and Udayagiri of the Nellore district poor rentals were realized for want of water in the tanks. In the Chingleput district also while many tanks did not receive a full supply, heavy rains in March, prevented tanks like the Madurantakam tank from being fished. The total income during the year was Rs. 1,00,797-7-2 which was Rs. 9,695-12-0 less than in the previous year. Unless the financial conditions improve and the prices of agricultural produce rise, better rentals cannot be expected.

IV. CROWN MONOPOLIES (PEARL AND CHANK FISHERIES).

A. Research.

178. (i) CHANK-MARKING EXPERIMENTS.—Four hundred and eighty-five under-sized chanks were marked and liberated during the year. The beds selected were those off Tuticorin where fishing is done regularly each year and the following are the details of the shells liberated on each bank :—

Name of bed.	Depth.	Tag numbers.	Number of chanks marked.
I Vada Oli Pathu Par	9½ fms.	B. 16—51 C. 1—125 C. 151—180 C. 281—366	277
II Aluwa Par	9½ fms.	C. 126—150 C. 382—449	93
III Tholayiram Par (South section)	9½ fms.	C. 251—280	70
IV Janathu Par	10 fms.	C. 251—280	30
V Kadayam Par	9½ fms.	C. 367—381	15
			485

Only three marked chanks were refished during the season and the details are given below :—

		Shell marked A-74.	Shell marked A-91.	Shell marked A-92.
Date of liberation	.. ..	4th April 1932.	5th May 1932.	5th May 1932.
Date of recapture	.. ..	1st December 1932.	30th January 1933.	10th February 1933.
Interval	.. ..	7 months and 26 days.	8 months and 26 days.	9 months and 5 days.
Where liberated	.. ..	Melaompathu par. W. Section.	Melaompathu par. W. Section.	Melaompathu par. W. Section.
Where refished	.. ..	Vada oli pathu.	Kilavan par.	East of Melaompathu par.
Distance travelled	.. ..	$\frac{1}{2}$ mile.	$1\frac{1}{2}$ miles.	$\frac{1}{2}$ mile.
Course	.. ..	South west.	South west. by	Due east.
Length of shell when liberated.	.. ..	108 m.m.	99.5 m.m.	84.5 m.m.
Length when re-fished	.. ..	112 m.m.	118 m.m.	103 m.m.
Growth	.. ..	4 m.m.	18.5 m.m.	18.5 m.m.
Diameter when liberated	.. ..	56 m.m.	49 m.m.	47 m.m.
Diameter when re-fished	.. ..	59 m.m.	53 m.m.	53 m.m.
Growth	.. ..	3 m.m.	4 m.m.	6 m.m.

Since only 3 out of 485 shells liberated were refished it is too early to arrive at any conclusions. Of these three shells refished shell marked A-92 shows a growth of 18.5 m.m. in length and 6 m.m. in diameter, within a period of 9 months and 5 days. The instruction issued to the divers that they should not kill marked chanks when refished has not been observed and they extracted the flesh from two out of the three chanks taken. A severe warning will be issued to them again this season. The labels designed stand the action of the sea-water satisfactorily and they do not interfere in any way with the growth or the migration of the chanks.

179. (ii) CHANK DREDGE.—The new type of 6-foot dredge ordered from Messrs. A. R. Pawle and Co., Brightlingsea, Essex, was received towards the close of the year too late for trials during the year.

180. (iii) DIVING EXPERIMENTS.—The three chromium-plated steel cylinders (bottles) and the pressure-reducing valve ordered through Messrs. Volkart Bros., Madras, were received in April 1933. When tested by the Industrial Engineer, the three bottles with the connexions were found to weigh more than the required weight but as the number of bottles, could always be reduced to two, he was of opinion that this did not present an unsurmountable difficulty. The pressure reducing valve however proved a perfect piece of mechanism satisfying all requirements.

181. Experiments with the new set of three bottles fitted with the pressure-reducing valve were conducted by the Industrial Engineer and myself at Sethubavachatram, from 18th to 25th May

1933. The experiment was done in three stages. To accustom the diver to the manipulation of the valve and the new apparatus generally, the initial test was conducted on land. The single stage air compressor employed was able to charge the bottles only up to a pressure of about 600 lb. Subsequently the test was repeated in the sea in shallow water of about 5 feet depth. The apparatus worked satisfactorily and the diver was able to remain under water without discomfort for the surprisingly long period of 23½ minutes, a result that was not anticipated. The final stage of the experiment was conducted in 2½ fathoms of water about three miles out to sea from a specially constructed platform. In this test the diver was made to move about freely on the bottom of the sea as if in search of chanks. It was found by repeated tests that he was able to work under water for a maximum period of 18 minutes, i.e., over 2½ times the period for which he was under water during the last set of experiments in 1931 with the Japanese air bottles. It must be admitted that the results of the improvements made have surpassed expectation, considering the fact that the bottles were charged only to a third of their working capacity and a sixth of their tested capacity.

182. Speaking generally, the apparatus proved suitable and satisfactory. The primary object of prolonging the under-water time of the diver with the type of simple apparatus with which we are concerned, has now been more than satisfactorily achieved. Only a few minor defects which have come to notice in the present set of experiments remain to be attended to. The face mask is a size smaller than is required by the diver employed and the rubber of which it is made appears to have perished. It hurts the diver when kept on for a quarter of an hour or more. The single stage compressor now in use cannot charge the bottles to a pressure higher than 600 lb. A two stage compressor is therefore needed for further experiments to increase the pressure and thereby increase the underwater time. From the observations made and reports of the diver, it appears that the weight of three bottles hampers to a certain extent the free movements of the diver under water. It is desirable to remedy this by a reduction in the number of bottles from three to two and by an increase in the pressure of air in the two bottles. The present set of experiments has definitely advanced our efforts to devise a suitable simple diving apparatus for the chank diver. It only remains to secure a face mask of suitable size and a two stage compressor to enhance the pressure in the bottles to their full working capacity and to reduce the weight of the apparatus as a whole to ensure a maximum of comfort and efficiency. It is towards these ends our next efforts should be directed.

B. Administration.

183. (i) INSPECTION OF PEARL BANKS.—Twenty-eight banks belonging to the Central division lying between Tuticorin and Pamban and last inspected in 1929-30 were inspected this year. They were—

I. Pamban Group.

- (1) Pamban Karai Par. (3) Pamban Peria Par.
(2) Pamban Velangu Par and
Pamban Puthu Par.

II. Musal Tivu Group.

- (4) Musal Tivu Par. (5) Musal Tivu Choleva Karai
Par.

III. Kilakarai Group.

- (6) Kilakarai Vellamalai Ve- (7) Kilakarai Vellamalai Karai
langu Par. Par.
(8) Anna Par.

IV. Tanni Tivu Group.

- (9) Valinukam Par. (11) Nallatanni Tivu Par.
(10) Valinukam Thundu Par. (12) Upputanni Tivu Par.

V. Vembar Group.

- (13) Kumulam Par. (15) Vembar Peria Par.
(14) Vembar Karai Par.

VI. Oyster Vaippar Group.

- (16) Vaippar Peria Par.

VII. Inner Vaippar Group.

- (17) Vaippar Karai Par. (20) Paduthamarican Par.
(18) Devi Par. (21) Paduthamarican Thundu
(19) Pernandu Par. Par.
(22) Katti Thirukkai Par.

VIII. Cruzian Group.

- (23) Cruzian Par. (26) Tuticorin Kunda Par.
(24) Cruzian Thundu Par. (27) Karai Par.
(25) Van Tivu Arupagam Par. (28) Pudhu Par.

None of the banks had any deposit of oysters excepting a small uncharted bank off Tuticorin in 7 to 7½ fathoms known as Thundu Par. The oysters were judged to be six months to one year old. The area of distribution of these oysters was only about one-sixteenth of a square mile and their estimated number is about 4 lakhs. It is doubtful whether these oysters will survive as they are surrounded by a large deposit of "suram" and avicula shells, well-known enemies of the pearl oyster. Even if they survive they

are not sufficiently large in number to justify a fishery, even on a small scale. Their occurrence however indicates that conditions are not altogether unfavourable for a spat fall. This view is further strengthened by the great change in the faunistic life of some of the banks since 1930 shown in the table below:—

	1930 inspection.	1933 inspection.
Vaippar Peria Par ..	No "suram" or other shells.	"Suram" and avicula shells and few scattered oysters.
Vaippar Karai Par ..	Do.	"Suram" and avicula shells.
Devi Par ..	Do.	Plenty of "suram" and avicula shells.
Pernandu Par ..	Do.	"Suram" specially plentiful; avicula shells in fair number.
Paduthamarican Par ..	Do.	"Suram" in plenty; avicula shells and few scattered oysters.
Paduthamarican Thundu Par.	Do.	Do.
Siluvai Par ..	Do.	"Suram" and few scattered oysters.
Katti Thirukkai Par ..	Do.	"Suram".
Cruzian Par ..	Do.	"Suram" in plenty and few scattered oysters.
Cruzian Thundu Par ..	Do.	Large deposit of "suram."
Van Tivu Arupagam Par.	Do.	Large deposit of "suram" and avicula shells.
Tuticorin Kuda Par ..	Do.	Plenty of "suram" and few scattered oysters.
Karai Par and Pudu Par.	Do.	Do.

The presence of large numbers of "suram," a moderate proportion of avicula shells and a small number of pearl oysters lead to the conclusion that factors responsible for the resuscitation of shell beds of suram (*Modiola*) and Kannikai (*avicula*) are not very different from and possibly the same as those that occasion spat fall of pearl oysters. The rotation of fisheries noted in paragraph 206 of last year's report seems to indicate that rainfall exercises a definite influence on shell beds as a whole. The exceptional floods and rainfall in the Tinnevely district in the cold weather of 1931 would therefore seem to have had a share in the change noted.

184. The economically most important Indian Pearl Bank, Tholayiram Par, and the Nagarai Par were also examined. The conditions in these banks were just the same as in the banks of the Central division.

185. The inspection was commenced on 14th March 1933 and concluded on 22nd April 1933 with an interval of 12 days from 26th to 30th March and 12th to 18th April due to bad weather conditions.

186. The "Lady Nicholson" was employed for the whole of the inspection excepting the inspection of the banks off Tuticorin for which the launch "Sea Scout" was found sufficient.

187. (ii) *TINNEVELLY CHANK FISHERY.*—The catches for the year amounted to 309,226 against 309,943 in the previous year. The chanks of 1930-31 season were removed from the godowns by the purchaser in December 1932. Tenders for the sale of 1931-32 chanks were called for in January 1933 and the only tender received was from M.R.Ry. K. T. M. T. M. Abdul Kaiyoom Sahib Hus-sain Sahib for Rs. 171 per 1,000 full-sized chanks and Rs. 10 for 1,000 under-sized and wormed chanks. Agreeably to his request Government permitted him, as a special case, to pay for and take delivery of shells in instalments of 25,000 at a time, subject to the condition that the payment of the amount and removal of the chanks should be completed by 31st August 1933. He has taken delivery of 80,000 full-sized shells and 21,000 under-sized and wormed chanks so far. Since the close of the year, the Government on a representation made by the lessee extended the period for taking delivery of the shells up to 31st October 1933. Tenders for the sale of 1932-33 season chanks will be called for as soon as the 1931-32 season chanks are delivered to the purchaser. Pending the calling of tenders the value of chanks fished in 1932-33 season has been estimated at the production cost of Rs. 122-7-9 per 1,000 shells. The value thus estimated is Rs. 37,565-10-1 as compared with Rs. 38,256-1-9 similarly estimated last year.

188. *Advance to divers.*—At the beginning of the season no balance was outstanding with the divers. An advance of Rs. 100 was issued during the year and Rs. 89-2-0 recovered from the party and the balance outstanding on 1st July 1933 was Rupees 10-14-0.

189. *Boat loans to divers.*—The grant of a loan of Rs. 100 was sanctioned to diver Madasamy of Tuticorin by Government in G.O. Ms. No. 935, Development, dated 11th July 1932. A sum of Rs. 52 has been repaid by him with interest due during the season and the balance is Rs. 48.

190. *Recruitment of divers.*—As the Kilakarai, Periapatnam and Vedalai divers returned from Ceylon late this year, their services could not be procured till the last week of December 1932. One hundred and seventy-one divers (108 foreign and 63 local) with 9 dhonies and 15 canoes participated in the fishery as shown below :—

Foreign Muhammadan divers—			Local divers—		
(1) Kilakarai	..	58	(1) Muhammadan	..	6
(2) Periapatnam	..	42	(2) Arabs	..	3
(3) Vedalai	..	8	(3) Bharathas	..	34
(4) Pamban	..	1	(4) Pallas	..	11
(5) Malabar	..	1	(5) Hindu Valayas	..	4
			(6) Roman Catholics	..	3

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191. *Quarters for divers.*—No sheds were erected this season also for the foreign divers, as it was found possible to house them in the old Police lines at Tuticorin taken over by the Department.

192. *Fishing operations.*—The fishery commenced on 1st November 1932 and closed on 18th May 1933. There were 135 working days in all. No fishing was possible for 41 days on account of bad weather. Unfortunately for want of funds the fishery had to be stopped for seven days (10th to 16th March 1933) just when the divers were beginning to get good catches. Foreign divers got discouraged by this and most of them left the fishery. A few days after they left, Government sanctioned the continuance of the fishery and the fishery was carried on with local divers and those among the foreign divers who remained behind, till the end of the season. The maximum catch for a day was 7,431 chanks against 8,360 in the last season and 14,158 in the season before last. The maximum earning of a diver for a day was Rs. 4 against Rs. 5-7-1 last season and Rs. 9 in the season before, when the rate per chank was one anna six pies instead of one anna. The average earning per head was Rs. 1-14-11 against Rs. 1-11-9 in the previous year.

193. The following is an analysis of the catches made during the three years ending 1932-33 :—

	1932-33	1931-32	1930-31
Full-sized	309,226	309,943	467,628
Under-sized	27,438	17,016	18,813
Wormed	39,971	62,716	54,554

194. A careful survey of chank beds was made as opportunity offered to locate good chank grounds and the following banks were marked with buoys, so that the divers may not wander and waste a day in search of good fishing grounds.

1 Katti-Thirukkai par.	6 Melonpathu.
2 Vadai Thundam.	7 Kilavan par.
3 Janathu Par.	8 Vadakal Pathu.
4 Vada Olipathu.	9 Aluvai par.
5 Saithonpathu.	10 Seltan par.

195. *Immature shells.*—As usual the divers were warned against bringing ashore immature chanks. This year also guage boards of zinc sheet were distributed to the canoes and dhonies with instructions to divers to measure the chanks at sea and bring ashore only full-sized shells. Of 38,997 under-sized chanks brought ashore inadvertently 11,469 were returned alive to sea and the rest could not be put back into the sea as the flesh had been extracted by divers for food.

196. *Valampuri chanks*.—No Valampuri chank was obtained this year and the one got in 1929-30 season still remains unsold.

197. *Idinthakarai chanks*.—Eight hundred and fifty shells were collected in nets against 331 last season.

198. *Weather*.—At the beginning of the season the weather was rainy and cloudy. After 24th November 1932 it became favourable. The south-west monsoon commenced on 19th May 1933 and the chank fishery closed the previous day.

199. *Temperance*.—Arrangements made for the supply of coffee to the divers in the chank godown premises to mitigate the drink evil among them was continued.

200. (iii) TANJORE AND SOUTH ARCOT CHANK FISHERIES.—Only one tender was received for these chank fisheries from Janab K. T. M. T. M. Abdul Kaiyoom Sahib Hussain Sahib of Calcutta for Rs. 1,111 and Rs. 211 respectively, for a period of one year from 1st July 1932 which was accepted.

201. (iv) CHINGLEPUT AND NELLORE DISTRICTS CHANK FISHERIES.—This chank fishery was leased out to Janab M. K. Shumsudeen Marakkayar of Pondicherry for Rs. 1,251 for a period of three years from 1st July 1930. This is the third and the last year of the lease.

202. In connexion with the execution petition against M. K. P. Muhammad Ibrahim Sahib of Madras for the recovery of decree amount (Rs. 2,100-12-0) mentioned in paragraph 232 of last year's report the Government Solicitor obtained encumbrance certificate of the property owned by the debtor and found that there are two mortgages on the property amounting to Rs. 6,000 with interest thereon. The Collector of Madras who was consulted in the matter stated that it did not seem to be worthwhile taking proceedings against the properties of the debtor. The Government therefore decided to drop further proceedings against him.

V. BIOLOGICAL SPECIMEN SUPPLY.

203. Besides individuals 29 institutions including the Government Secondary and Training School for Women, Vellore, which ordered specimens this year for the first time, were served by the Ennore station. The value of specimens supplied during the year was Rs. 1,582-12-0 against Rs. 2,925-12-0 in the previous year. The decrease in sales during the year was due to economic depression on account of which museums and educational institutions reduced their purchases. The reduction in the price of the set of museum specimens for secondary schools does not appear to have had any appreciable effect on the number of orders received.

204. *Named collections*.—A fairly complete collection of seaweeds from the Pamban area and 4 Crustacea, 4 Echinoderms and 2 Celeonterates and 1 worm were newly identified and added to the named collections at Ennore.

205. *Miscellaneous*.—The permanent Research Assistant was on long medical leave and no tour was therefore undertaken for the collection of specimens. The Ennore station however received collections of starfishes from the Research Assistant, Krusadai Island Biological station, and Tunicates from the Assistant Director, Pearl and Chank Fisheries, Tuticorin, for supply to colleges for dissection.

206. *Oyster shell grit*.—One and one-third tons (2,960 lb.) of grit was manufactured and sold to poultry keepers by the station for Rs. 157-4-0.

VI. ANTI-MALARIAL WORK.

207. At the request of the Manager of the Criminal Settlement at Siddapuram, the Assistant Director (Inland) inspected the place and suggested measures for combating malaria which prevails there and for growing good class food fish in the reservoir. He was able to stock all the perennial water-holes in and around the settlement with suitable larvicidal fish and has made arrangements for stocking the big irrigation reservoir with catla during the stocking season. Though the reservoir rarely gets a good supply deep pools in the bed of the lake hold permanent water.

208. The annual anti-malarial operations in the Nallamalais (Kurnool district) were carried out as usual and 50 water-holes were stocked with 20,500 fish from the Præma farm at a cost of Rs. 120-15-0. The rains having failed this year several water-holes were dry.

209. The Chingleput and Vellore fort-moats were stocked with larvicidal fish as usual to keep down the mosquito nuisance and consequent malarial infection, at a cost of Rs. 21.

210. The Women's Christian College, Madras, the Collector of Chingleput and the Mission Medical School for Women at Vellore were supplied with 1,000 larvicides each and Mr. Cottilingam of Hyderabad with 800.

211. The District Health Officer, Chingleput, wanted a supply of some thousands of larvicidal fish for stocking some waters in and around Sunnambakulam. The ponds were inspected and the Health Officer was informed that the required number will be supplied.

212. The Chairman, Municipal Council, Chingleput, was supplied with 500 larvicides for Rs. 5.

213. The cost of the anti-malarial work done by this department during the year was Rs. 141-15-0.

214. At the instance of the Conservator of Forests, IV Circle, Salem, anti-malarial investigations in the notorious malarial area of the Kolli Hills were undertaken this year. The Conservator suggested the investigations and obtained the sanction of the Chief Conservator of Forests for such operations in co-operation with the Fisheries Department. The Kolli Hills are notoriously malarial and form a range which is isolated on the east below the 1,000 feet level from the Pachamalai (which are equally malarial), and on all other sides drops steeply to the plains which are quite free from malaria. The Conservator therefore considered that they are ideally situated for purposes of observation. There is a Medical Officer on the hills employed by a Mission Society who have a missionary permanently stationed there and careful records of the evidence of malaria have been kept for many years. The late Rev. J. M. Brand, who died recently after fifteen years residence on these hills, was very keen on the subject and the Conservator had therefore no doubt that his successor would willingly record the observations necessary.

215. Before suggesting the stocking of waters on the plateau and round the settlement with larvicidal fish, a preliminary examination was made by the Inspector of Fisheries, Ootacamund, but on the important question of whether there are indigenous larvicidal fish on these hills or not the Inspector of Fisheries' report and collections failed to furnish the necessary information. At the request of the District Forest Officer, South Salem, I had to undertake the inspection of the waters from the 17th to 20th of March 1933. All important streams, paddy fields and wells were searched for mosquito larvæ. No mosquito larvæ were found in paddy fields and running water. The larvæ were found in stationary and isolated pools in the beds of streams and close to village wells. Many of the waters had no fish. A few rivers particularly the Aiyar had some large carp and some wells and a tank near Vasalur contained species of *Rasbora*, which is not of value as a mosquito destroyer. The well-known larvicides of hill streams, *Barilius Bhachy odanio*, and *Panchax* were conspicuous by their total absence. It was clear therefore that the mosquito nuisance and the consequent malaria was largely due to the absence of larvicidal fish in the waters of the Kolli hills. I have suggested therefore that all pools and puddles too small to hold fish close to the village

should be drained. A square tank belonging to the Mission Settlement at Valavandi has been selected with the consent of the mission for the breeding of suitable larvicides which will be distributed to all the neighbouring waters. This department will supply the larvicidal fish free of cost and transport them to Salem if the Forest Department will undertake the alterations to the tank and arrange to transport fish from Salem to Valavandi. The Medical Officers of the Mission Settlement have agreed to watch the experiment and record observations. Towards the close of the year an estimate and plan for converting the tank into a fish-breeding pond was sent to the District Forest Officer, Salem.

216. *Gambusia affinis*.—The newly constructed Gambussia pond at the Krusadai Island Station was brought into use during the year. A dozen fish from the old pond were introduced into it on 6th February 1933. The fish in both the ponds are thriving well.

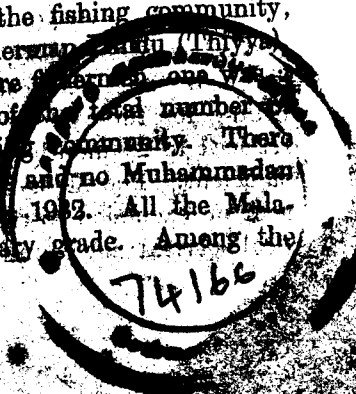
VII. SOCIO-ECONOMIC WORK.

A. Education.

217. (i) WEST COAST—(a) *Fisheries Training Institute*.—The institute reopened after the vacation on 1st August 1932 and was closed on 21st June 1933.

218. *Students*.—The total number of students on the rolls was 36. Of these 14 (13 men and 1 woman) were Kanarese students who had undergone the ordinary teachers' training at Mangalore with stipends paid by the Fisheries Department. The remaining 22 were Malayali students. Of these, 15 were students who had been in the first and second year classes in the previous year and who were promoted to the second and third year classes respectively at the beginning of the school year. New admissions during the year were restricted to women candidates who had already undergone the ordinary teachers' training. The number of such students admitted was seven. Thus the third-year class consisted of 32 students while there was no first-year class as such. The Kanarese students had to be taught separately from the Malayali students on account of the language difficulty. Some subjects had also to be taught separately to the women students. All the Malayali men-students belonged to the fishing community. Out of the 7 Malayali women-students, 5 belonged to the fishing community, one was a Christian and one was a non-fisherwoman (Thiyya). Twelve out of the 14 Kanarese students were fishermen, one was a Christian and one a Thiyya. Thus out of the total number of 36 on the rolls, 33 belonged to the fishing community. There were no Muhammadans among the students and no Muhammadan candidate qualified for admission applied in 1932. All the Malayali students were of the higher elementary grade. Among the

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Kanarese students 2 were of the secondary grade and 12 of the higher elementary grade. The 32 students of the third-year class and 1 old student who had failed in the previous year sat for the final examination. Of these 25 passed in full, 3 passed partially (failing in two subjects only) and 5 failed.

219. *Work at the Institute.*—The District Educational Officer inspected the institute on the 5th and 6th January 1933. He expressed satisfaction at the work turned out. In his report under "General Impression" he said, "The school is doing fairly good work in several directions, but the headmaster is handicapped in his work for want of a qualified drawing and drill instructor. During this year no attempt could be made to teach drawing and drill . . . The teaching work observed by me is quite fair. If the teaching of Natural Science can be entrusted to a trained teacher he can be expected to do better work than the untrained teacher who is handling the subject." Towards the close of the year the Government have sanctioned the post of a drawing and drill master for the Fisheries Training Institute (G.O. Ms. No. 911, Development, dated 28th July 1933). As regards a trained teacher for Zoology, the Educational Department was informed that simple Zoology is not taught but Zoology and Botany, Physics and Chemistry, as applied to Fisheries. No ordinary graduate in Zoology even if he is an L.T., can teach the subject and the Research Assistant of the West Hill Station is the most competent officer to handle the subject.

220. The carpentry work done at the institute was inspected by the Inspector of Industrial Schools on 16th June 1933. He was on the whole not satisfied with the way in which the subject had been handled. The present carpentry instructor was appointed in 1930. In 1930, 1931 and 1932 his work was inspected by Mr. Fyfe and was found to be fairly satisfactory. This year, the majority of the students examined in carpentry by the Inspector of Industrial Schools were students who attended the Fisheries Training Institute for the third year's course only and who therefore had only a year's training under the carpentry instructor of the Fisheries Training Institute which very likely accounts for the poor results.

221. The institute was inspected by the Assistant Director (Coast) in June 1933, and the accounts, equipment, etc., were checked. Last year each class in the institute was sent to sea for fishing for three months in the year. This year the period was reduced to 2½ months, which has been found by experience to be sufficient. The Malayali men-students of the third-year class were sent on excursion to the South Kanara Coast up to Malpe. Practical classes in canning, fish-smoking, manufacture of fish-oil

guano and fish-meal and semi-drying of prawns were conducted in the institute during the year. The students also cured fish on a few occasions in the Calicut North yard. The 'Sutherland' was used to teach the students not only seamanship but also line-fishing. Elements of navigation was taught to all the men-students by the Inspector of Fisheries, Tuticorin, who was deputed for the purpose. The school scout-troop continued to exist but was not very active. The literary and co-operative societies functioned as usual. The Literary Society celebrated its anniversary on 2nd April 1933 when the best student of the previous year was given a prize.

222. (b) *Village schools.*—The number of schools remained the same as at the beginning of the year, viz., 36 day-schools including the model school attached to the Fisheries Training Institute and the Vellayil night school.

223. *Strength.*—The total number of pupils attending the schools was 3,779 against 3,719 at the close of 1931-32. Of these 2,502 were boys and 1,277 were girls. The corresponding figures for 1931-32 were 2,460 and 1,259. There is a great disparity between the strength and attendance according to the progress reports received from schools. This appeared to be due to the disinclination of teachers to send away habitual absentees. Orders were therefore issued that children who were continuously absent for over a month should be removed from the rolls. In spite of this order reports are being received that in some schools absentees for over a month are continued to be shown in the registers. There is a remarkable decrease in attendance in Mappilla schools the average attendance being in many cases less than 50 per cent. The poverty of fishermen seems to be the main cause for the fall in strength in several schools. It is reported that they cannot afford even one meal a day and owing to their inability to clothe their children, these children are not sent to school. In most of the villages fishermen are reported to have cut down expenditure on marriages, funeral ceremonies and the like.

224. The Kavvayi school shows an increase in strength with the opening of the fourth standard and the appointment of an additional teacher was sanctioned. There was an agitation to admit Adi-Dravida boys in this school but owing to the peculiar circumstances under which the school is working, the Government have passed orders that this school need cater only to the educational needs of fishermen. The Padiappa school is growing and there is preponderance of girls over boys. The Madappali school seems to show a fall in strength. The Qunandy school also shows a fall which is attributed to the poverty of fishermen. The catches have been very poor for several years, and the fishermen of the place have no subsidiary occupation to depend upon.

225. The schools in the Ponnani taluk, except Mappilla schools, show steady progress. The fishermen of this locality evince greater interest in the education of their children than fishermen of other places.

226. The school children of the Sri Gnanodaya school and the Sandspit school sent up exhibits, viz., models of fishing nets and aquaria, for the last Industrial Exhibition at Mangalore. They were awarded certificates of merit by the Exhibition Committee. The Kaup and the Polippu schools took part in the Health Week Celebrations at Kaup and won prizes in games.

227. *Syllabus of studies.*—Consequent on the complete revision of the curriculum of studies in the Fisheries Training Institute in 1931, the syllabus of studies in the Fisheries Elementary schools was also revised and subsequently approved by the District Educational Council. From reports received and personal inspection it was found that the teachers could not handle the syllabus, as most of them were trained before the new syllabus was introduced in the Fisheries Training Institute and had no technical knowledge of fisheries. There are no text-books relating to fisheries and the elementary schools had not the requisite equipment to teach the curriculum prescribed. A minimum of apparatus with a view to economy was decided on and most of the schools were supplied during the year with the apparatus. Conference of teachers of the elementary schools in seven suitable centres were held during my tours on the West Coast to demonstrate the use of the apparatus as well as to clear doubts and difficulties of the teachers in handling the fisheries syllabus. Not only was the knowledge of the teachers with regard to fisheries subjects found to be extremely poor but their method of teaching the subject, was primitive and faulty. A complete change in the method of teaching as well as detailed notes on the various items in the curriculum were found necessary if the schools are to derive any benefit from the newly framed syllabus of studies. Accordingly practical lessons and detailed notes on most of the items have been drafted and sent to the Headmaster, Fisheries Training Institute, for adoption in the Fisheries Training Institute preliminary to their introduction in the elementary schools.

228. (ii) *EAST COAST—Fisheries Training Institute, Tuticorin.*—The most important event of the year was the realization of the value and need of technical education relating to the fishing industry, by the Bharathar community of the Tinnevely and Ramnad districts on the East Coast. They are the most influential and enlightened community of fishermen in the Presidency, and have already done much for the education of their children through the medium of the Catholic Church. During the visit of His

Excellency the Governor to Tuticorin early this year, the Chairman of the Municipal Council of Tuticorin, who is a leading member of the community, presented a memorial. The Government have sent the memorial to me for enquiry. Meantime the leaders of the community formed a committee for the exclusive purpose of organizing measures and urging on Government the establishment of a Fisheries Training Institute at Tuticorin on the model of the one at Calicut. The Committee have met on several occasions for the purpose of collecting funds, selecting a site, and deciding on the courses of instruction that are needed for their children. Sufficient money for the building required for the erection of the institute has already been subscribed and the Committee have sought the help of this department to staff, equip and run the institute. The proposals will be submitted to Government as a part II scheme for 1934-35.

229. (iii) *MARINE AQUARIUM.*—This institution continued to be a great popular attraction as in previous years. While the local residents came to see the aquarium in their usual numbers the number of foreign tourists and mufassal visitors was less than usual and consequently there was a fall in gate collections.

230. The number of visitors was 84,590 as against 85,413 in the previous year. The record attendance was on 'Kannu Pongal Day' when 3,597 people visited the place which is 297 more than last year. The daily average attendance for the year was 229 as against 232 of the previous year. Twenty-one batches of school children visited the Aquarium for demonstration. One hundred and fifteen Corporation school children were admitted free for Nature Study classes. The Aquarium was once reserved for a zenana party. Among the several distinguished visitors were, His Excellency General Sir Philip Chetwode, Commander-in-Chief in India, accompanied by Lady Chetwode, Mr. Mordy Jones of London, Maharani of Nabha and party, a zenana party from Bobbili, and His Highness the Maharaja of Bhavanagar, accompanied by Her Highness the Maharani.

231. The gate collections amounted to Rs. 6,408-1-3 against Rs. 6,564-10-6 last year. The sale of 423 English guides, 153 of Tamil, 225 packets of picture postcards and loose ones realized Rs. 19-8-0. The rent for the Aquarium Restaurant was Rs. 600. Thus the aggregate revenue for the year was Rs. 7,184-14-3 against Rs. 7,381-6-6, and the expenditure Rs. 6,589-8-5 against Rs. 7,328-10-4 in 1931-32.

232. The water-colour paintings of the exhibits in the Aquarium tanks are very old and have become unattractive largely

through water splashed on them by fish in the tanks during feeding operations. The pictures cost an appreciable amount of money and cannot be replaced at frequent intervals. An attempt is being made through the kind assistance of Mr. R. N. Selvam, Lecturer in Physics, Pachayappa's College, Madras, to take colour photographs of exhibits so as to replace the water-colours by colour transparencies which it is expected will not be subject to damage through wetting while they will be truer representations of nature.

B. Co-operative Societies.

233. (i) WEST COAST.—There were 14 fishermen societies in the South Kanara district. All these were thrift and credit institutions. Five are for Mukkuvas, one for Pudu Islams, two for Bovis and six for Mogers. The Pudu Islam and Mukkuva fishermen are highly indebted to the fish merchants. Their societies are also heavily indebted to the financing banks. These people, though badly hit by the scarcity of fish during the last six or seven years, do not resort to any other avocation but try to earn their livelihood by fishing. On the other hand the Bovis and Mogers, though not economically so bad, resort to other avocations during the off-season and also try to minimize debt as far as possible. Their societies, with the exception of the Utchil Bovis Society, are not indebted to the financing banks. The Utchil Bovis Society worked satisfactorily, both as a thrift and as a credit institution. It is not a defaulter to the Central Bank. It is the best society in the South Kanara district. In these 14 societies there were at the end of the year 682 members with a paid-up share capital of Rs. 14,698-4-0. During the year Rs. 254-8-0 were received towards share-capital and Rs. 696-7-0 were paid off. The Utchil Bovis Society has two fixed-deposits of Rs. 115. Seven of the societies are indebted to the financing bank. The total amount due was Rs. 11,287 on 1st July 1932. During the year Rs. 1,375 were borrowed (by the Utchil Bovis Society) and Rs. 1,986 paid off. So at the end of the year Rs. 10,676 were outstanding. Rupees 575-0-9 were overdue to the financing bank on account of interest. Interest amounting to Rs. 1,200-13-0 remained unpaid during the year. On 1st July 1932 Rs. 37,217-8-0 was outstanding as loans against members. Rupees 9,624-1-0 was issued as loans during the year and Rs. 9,386-8-0 were collected leaving Rupees 37,455-1-0 outstanding against members. Of this amount Rupees 9,475 was overdue. Many of the overdue loans were covered by decree and arbitration references. These heavy overdues are the result of the uncommon scarcity of fish. Rupees 3,41-6-5 was collected towards interest. The total reserve fund of the 14 societies is Rs. 6,832. Of this amount Rs. 2,411-3-0 has been

separately invested and Rs. 4,420-13-0 is awaiting investment. Nine societies have invested Rs. 390 as share capital in the financing banks, and six societies have invested Rs. 617-2-0 in the Savings Bank account.

234. In Malabar there were 39 societies at the beginning of the year. The Thayyil Arayajana and Meladi Fish Curers' Co-operative Societies were liquidated during the year, so that at the close of the year there were only 37 societies. Five of these societies are for Mogers, 23 for the Mukkuvas, 5 for Moonnillakars, 2 for Pudu Islams and 2 are the non-credit societies at Blangad and Palapatty.

235. In these 37 societies the number of members rose from 1,603 at the beginning of the year to 1,607. The total paid-up share capital at the beginning of the year was Rs. 31,454-12-0. Rupees 750-13-8 was received as share capital during the year and Rs. 935-10-0 paid-off. The share capital outstanding at the end of the year was Rs. 31,269-15-8. In the Korapuzha society alone a fixed deposit of Rs. 50 was received and repaid during the year. General deposits were not forthcoming in these societies. Fourteen societies had borrowed from the District Co-operative Bank. The outstanding amount of loan against these societies at the beginning of the year was Rs. 6,572. During the year none of the societies borrowed anything from the bank. A loan application for Rupees 1,600 submitted by the Kavvayi Arayajana Society was rejected by the bank. Nine societies paid in all Rs. 334-7-9 to the bank and there were outstanding against 14 societies a loan of Rupees 6,237-8-3 of which Rs. 5,916-4-2 is overdue. The interest paid to the bank during the year was Rs. 411-11-4. The amount of loans outstanding against the members at the beginning of the year was Rs. 58,286-10-0. Rupees 9,399-8-0 was issued as loan during the year and Rs. 8,424-9-2 is shown to have been collected so that the outstandings at the end of the year amounted to Rs. 59,261-8-10. Of this amount Rs. 38,579-14-0 is overdue. The interest collected during the year was Rs. 5,225-12-0. The total reserve fund standing to the credit of the societies is Rupees 20,039-8-0. Out of this Rs. 3,019-9-1 has been invested in the bank. Rupees 17,025-1-11 pending investment is mixed up with the working capital of the various societies. The paid-up share capital of the societies in the District Bank on 30th June 1933 was Rs. 1,430. Most of the societies have not paid up their shares fully.

236. The distribution of dividend to members was not allowed by the by-law dealing with the division of profits of the society in many of the societies in Malabar and South Kanara. The by-laws have now been so amended as to permit of distribution

of dividend to members, with the exception of eight societies in the South Kanara district. The Deputy Registrar of Co-operative Societies of that district is not in favour of these amendments though in Malabar the local Deputy Registrar has been readily registering the amendments. The members will have an incentive to work the societies when they get something in return for the share invested. Adjustments of dividends towards their loans will lessen their liabilities and will give them some relief.

237. During the monthly visits of the Special Co-operative Inspectors working under the Assistant Director (Coast) all attempts are being made to improve the condition of the societies. The scarcity of fish which the members have been experiencing consecutively for some years, has rendered their financial state deplorable. It is stated that a season so bad has not occurred during the last 40 years. The fishermen, especially the Mukkuvas and Pudu Islams, are in a very bad way. Sardines, the mainstay of the fisherfolk, did not appear at all and mackerel, which were appearing in considerable quantities during previous years, were also scarce. There were stray catches of cat-fish. These are stated to have been sold for low prices, in many cases the fish merchants adjusting the sale-proceeds towards their old dues. Being under the heavy burden of chronic indebtedness the fishermen could not do anything to improve the condition of their societies. With the advent of a good fishing season the societies may prosper and they may work properly for the benefit of their members. Till then these societies have to be kept going. No difficulty is anticipated in reviving the societies when the fishing season improves and the economic condition of the members becomes better.

238. With the appointment of the special Co-operative Inspectors to work in the Fisheries Department the Registrar of Co-operative Societies considered that there was no need to empower the Inspectors of Fisheries to inspect Fishermen Co-operative Societies. Accordingly on 5th January 1933, the Registrar of Co-operative Societies withdrew the powers previously conferred on Inspectors. The powers previously delegated to the Assistant Director (Coast) under the old Act of 1912 were again delegated to him under the new Act.

239. It was found necessary to wind up the Palapatty Boat and Net Society, which was working very unsatisfactorily, and the orders of Government were accordingly obtained. Necessary steps are being taken to sell the assets of the society for the recovery of arrears of the Government loan.

240. (ii) EAST COAST—*Co-operation among Inland Fishermen.*—The financial depression, referred to in the last year's report

(paragraph 283) continued to affect adversely the working of the co-operative societies in the Tanjore district. Almost all the societies in the Tanjore district ceased to function during the year. Another society in the South Arcot district, viz., Vallampadugai Fishermen Society suffered loss and became defunct. The Lalpet and Mannargudi societies are reported to be in a very bad state. The Trichinopoly Society (Hindu and Muhammadan) which became almost extinct was however revived during the year through the efforts of the Deputy Registrar of Co-operative Societies, Trichinopoly, and Government granted the lease of the fisheries of the Trichinopoly taluk to them. No new society was formed during the year.

241. *Co-operation among sea-fishermen.*—A co-operative society was started for the curers of the Lawson's Bay fish-curing yard on 15th May 1933 with the peon in charge as an ex-officio Secretary. The society has helped the fishermen of the locality with loans from the Central Bank for the renewal of their catamarans and nets, an important source of their indebtedness to money-lenders. The Co-operative Department could not see their way to organize societies for the fishermen of Gangavaram and Pentakota as the fishermen concerned were all illiterate and in the case of Pentakota there were factions in the village. The Vizagapatam Fishermen Association is now in a moribund state consequent on the transfer of the fisherman headmaster of the local municipal school.

C. Other Socio-economic Work.

242. (i) WEST COAST.—The prevailing trade depression and adverse fishing seasons have very much hampered the progress of socio-economic work but the various organizations started by fishermen to better their condition continued to do their work.

243. (ii) EAST COAST.—To the fisherfolk both at Vizagapatam and Lawson's Bay, a lantern lecture was given by the Inspector of Fisheries, Vizagapatam. Temperance propaganda was carried on by the Women's Christian Temperance Union of Vizagapatam. The action of the health authorities helped considerably the improvement of the slum conditions prevailing in fishing hamlets. Departmental attempts are being made to introduce a cheap house-building scheme among the fishermen.

VIII. PROPAGANDA.

A. Rural Pisciculture.

244. The department owes much to the enthusiasm and initiative of Mr. de Valois, Superintendent in charge of the American Arcot Mission Agricultural Station, near Katpadi, for continuing the propaganda for rural pisciculture in the North Arcot district. The *Etrophus* supplied to him are breeding freely in his well and have been distributed to several wells and ponds in the

surrounding villages, persuading villagers to adopt pisciculture as a subsidiary occupation. *Gourami* however have not bred. On inspection I found that proper breeding facilities were not available for the fish and have advised their transfer to a more suitable well with water weeds.

245. *Tiruvallur Rural Development Scheme*.—A most important move to improve rural areas was made during the year. Lt. Col. Webb, Director of Public Health, formulated a comprehensive scheme of co-operation between the several concerned departments of Government for a concentrated effort towards the improvement of conditions prevailing in the villages in a sample area in the Tiruvallur taluk of the Chingleput district, comprising some 90 square miles including 100 villages and hamlets with a population of about 69,000. So far as the Fisheries department was concerned it happened to be in the fortunate position of having initiated and worked a similar scheme for the development of rural pisciculture in the Saidapet and Chingleput taluks in 1930-31. As Government had suspended the scheme and abolished the staff, I had to confess my inability to co-operate with other departments in the Tiruvallur area.

B. Exhibitions.

246. The products of the Tanur station were exhibited in the Sociological Brotherhood Exhibition, Triplicane, Madras, and through Agricultural Exhibition Vans.

247. The products of the Tanur Experimental station, exhibits from the Inland section, sets of biological specimens mounted in museum jars, and show cases of dry invertebrates and grades of oyster grit for poultry feeding from the Ennur station, were on show at the Annual Madras Park Fair Exhibition held in the South Indian Athletic Association grounds in December 1932. A gold medal was awarded by the association for the exhibits of 1931.

248. The exhibits from the Tanur station along with mounted specimens in jars and samples of oyster shell-grit for poultry feeding from the Ennur station, were sent to the All-India Swadeshi Exhibitions held at Rajahmundry.

249. A similar number of museum jars and two bottles of oyster shell-grit for poultry feeding, were sent to the All-India Swadeshi Exhibition held at Rajahmundry during the great Godavari Pushkaram festival in July 1932.

C. Miscellaneous.

250. Mr. Ramanujachari, Traffic Canvasser, Bengal-Nagpore Railway, made enquiries regarding the suitability of Bimlipatam for fish supply. Statistical information regarding landings and value of fish for all the years available was supplied to him.

251. The cultural experiments at the Hosur Agricultural Farm was responsible for awakening the interest of Mr. K. Rama Reddi, a landlord of Hosur, in pisciculture. He was given advice about stocking some of his private waters. Advice regarding stocking of ponds and private wells was given to:—

- (1) Mr. S. M. Syed Azam Sahib, landlord and merchant, Tindivanam.
- (2) Mr. Dudley of Tirumangalam.
- (3) Mr. S. H. B. Thangal, landlord and merchant, Quilandy.
- (4) The President, Taluk Board, Periyakulam.
- (5) Mr. A. Ahmed, Panchgoan, P.O., Sylhet district.

There was an enquiry by the Superintendent, Rural Development Centre, Patancheru (Hyderabad-Deccan) about breeding different varieties of fish and he was furnished with all available information.

252. Mr. Hamid Khan, Fisheries Research Officer, of the Punjab Agricultural College, Lyallpur, sought advice about the cultivation of *Gourami* and *Etroplus* in the Punjab and he was furnished with full particulars.

IX. FISHERY LEGISLATION.

253. Government in G.O. Ms. No. 32, Development, dated 9th January 1933, cancelled the rules prohibiting fishing in the Adyar river with the large seine-net (*Agnivalai*)—vide paragraph 315 of the last year's report.

254. *Licences for fixed engines*.—During the year 68 free licences for fishing with submerged trees in the Palk Bay were issued under section 6 (3) of the Indian Fisheries Act.

255. In 1925, the Assistant Director (Coast) reported that the valams of Ramanthurithi Island were conducting prawn fishing operations on a large scale by planting stakes in the Palayangadi river in spite of the notification prohibiting fishing by the erection of fixed engines. As the prawn fishery was their only means of livelihood, the Assistant Director proposed legalizing stake-net fishing for prawns and suggested that instead of licences being issued to individual fishermen they should be persuaded to form co-operative societies, and licences issued to such societies, the licence fees forming the nucleus of the funds of the societies. To make sure whether the allegation that the prawn stake-nets in the Palayangadi river are destroying fish-fry was true, an investigation was undertaken at the Calicut Research station where samples of fortnightly nettings were obtained and analyzed. It was found that these nets hardly ever caught young prawns or fry of food-fish and the stake-nets therefore, cannot be said to cause injury to fisheries. The Collector of Malabar was therefore

requested to cancel the prohibition, which was done. Subsequently, however, the Collector withdrew his orders cancelling the prohibition as prohibition had been ordered by Government in their notification of 1915. In view of the fact that the stake-nets are found not to affect the fish-fry or immature prawns and that a large body of fishermen earn their livelihood by prawn-fishing operations, it was recommended to Government that prawn-fishing which is the sole means of livelihood for the valans fishermen might be permitted under a licence just as fishing with bushes and trees in the Gulf of Mannar and Palk Bay. The Government accordingly called for two draft notifications, one defining the rivers in which and the limits within which the fishing with stake-nets might be permitted, and another notification modifying the notification of 1915 prohibiting stake-nets. These notifications, have, since the close of the year, been submitted to Government.

256. *Fishing in anicuts.*—During the past few years river-fishery lessees in the Tanjore district were not permitted to fish up to the anicuts under G.O. No. 1 I., dated 3rd January 1927. This restriction never worked satisfactorily, and the order virtually remained a dead letter. In view of this the Chief Engineer for Irrigation recommended fishing up to the anicuts as before and keeping down shutters 6 inches below the water-surface during turn (morai) days. This was accepted by Government in G.O. No. 917 I., dated 24th April 1933. These are valuable concessions to the lessees and should result in improved rentals in the Tanjore district.

X. PUBLICATIONS.

257. *Fish statistics.*—In G.O. Ms. No. 242, Development, dated 25th February 1933, the Government directed that the fish statistics should not be printed as bulletins without the specific orders of Government. When printed the Government agreed they should be issued as bulletins of the Fisheries Department.

258. *Administration report.*—In G.O. Ms. No. 1659, Development, dated 21st December 1932, Government ordered that there was no need to have the Administration Reports bound as bulletins.

259. *Trawler's second report.*—The second report on a systematic survey of Deep Sea Fishing grounds by S. T. Lady Goschen for 1928-29 was published as Report No. 3 of the Madras Fisheries Bulletin No. 24 of 1932. The third and final report is under preparation.

260. *Bulletin on Marketable Fishes.*—The collection and identification of specimens from various localities were continued as and when opportunity offered. The Government were approached for

the appointment of a Research Assistant at headquarters to assist the Director in speeding up the work, but on account of financial stringency the proposal was deferred. Further progress was made in preparing drawings and paintings of fish to illustrate the bulletin. In connexion with the efforts to illustrate exhibits at the Marine Aquarium by colour photography, an attempt is being made to see if paintings cannot be replaced by photo prints of the colour photographs of fish for the Bulletin.

261. The paper on the "Food and Feeding Habits of *Sardinella gibbosa*" by Dr. D. W. Devanesan, the Assistant Biologist, was published in the Journal of the University of Madras.

PART II.

FINANCE.

262. *Summary of Financial Results.*—The total expenditure of the Department for the year was Rs. 5,47,341 as against Rs. 6,50,605 in the previous year. The decrease was due to the following reasons:—

- (1) Ten per cent emergency cut in the salary of the staff;
- (2) retrenchment in contingent expenditure all round as a measure of economy;
- (3) the leasing of the Tanjore Chank Fishery instead of working it departmentally;
- (4) the disposal of the trawler; and
- (5) the closing of some of the fish-curing yards on the west coast and the low rates at which salt was purchased and transported last year, resulting in the reduction in the prime cost of salt issued to curers during the year under report.

263. The total receipts for the year amounted to Rs. 3,86,410 as against Rs. 4,41,224 in the previous year. The chanks of the season just ended have been valued only at cost price as they have not yet been sold owing to the slump in the chank market. The river and tank fisheries brought in a revenue of Rs. 1,02,367 only as against Rs. 1,11,426 in the previous year. The fall under this item is due to economic depression which prevailed during the year, failure of rain in parts of Nellore and Chingleput districts resulting in poor rentals, and unseasonal rain which prevented some tanks from being fished. The receipts of the fish-curing yards were Rs. 2,02,836 as against Rs. 2,31,421 last year. Though the transactions in the year excluding indirect charges resulted in a profit of Rs. 7,155 as against a deficiency of Rs. 14,392 in the previous year, the fishing season on the west coast was very bad and in the Northern and Southern sections of the East Coast below normal.

264. The expenditure on schools for fishermen showed an increase from Rs. 60,859 to Rs. 67,852. Of this amount Rs. 6,330 represents the cost of new school buildings put up at Kumbala and Kaipamangalam.

265. A statement showing the total expenditure and revenue of the department is appended to the report. The rest of the statements are submitted in manuscript.

PART III.

STAFF AND EQUIPMENT.

I. BIOLOGICAL.

A. Assistant Biologist.

266. The Government were pleased to sanction in G.O. Ms. No. 544, Development, dated 8th May 1933, the continuance of the post of the Assistant Biologist and staff for another year from 1st April 1933.

267. Dr. D. W. Devanesan, Assistant Biologist, was granted leave on average pay for five months from 27th May 1933 on grounds of health and Dr. M. Ramaswami Nayudu was appointed to act.

B. Research Stations.

268. (i) WEST HILL STATION.—The temporary Inspector of Fisheries, Mr. S. Varadarajan, M.A., was in charge of the Station as Research Assistant till 13th May 1933 when Mr. V. John, B.A., took charge.

269. *Equipment.*—A new canoe was purchased for the station during the year.

270. (ii) KRUSADAI STATION.—Mr. E. K. Madhavan, B.A., continued to be the Research Assistant throughout the year except for four months and five days from 29th November 1932 to 3rd April 1933 when he was on sick leave and Mr. V. John, B.A., acted for him.

271. *Equipment.*—The Government sanctioned in G.O. Ms. No. 1291, Development, dated 30th September 1932, the replacement of the thatched roof of the Krusadai Biological Station with non-inflammable material at a cost of Rs. 2,500. A permanent ferro-concrete roof has therefore been substituted for the cadjan roof of the station during the year.

272. The experiment for the cultivation of the "Hariali" grass suggested by the Agricultural department was not successful, but the casuarina plantation started last year is thriving.

273. (iii) ENNUR STATION.—Mr. S. Ramaswami Ayyangar continued as Research Assistant till 14th September 1932, when he fell suddenly ill and was granted leave on medical certificate for a period of eight months. Mr. Jayaram Nayudu acted as Research Assistant, Ennur, during this period. Mr. S. Ramaswami Ayyangar rejoined duty on 14th May 1933.

274. *Equipment.*—The new zinc shed for storing trawler specimens was partitioned into two rooms, one for accommodating the jars, etc., of the Zoological Supply Section, and the other to keep the specimens belonging to the trawler collections. The work was carried out departmentally at a cost of Rs. 134.

C. Fish Statistics.

275. Government sanctioned a permanent clerk for the compilation of the statistical returns on Rs. 30 to Rs. 55 in G.O. Ms. No. 464, Development, dated 24th April 1933. With the approval of Government in G.O. Ms. No. 625, Development, dated 27th May 1933, the clerk was appointed at Madras.

II. TECHNOLOGICAL.

A. Tanur Experimental Station.

276. The acting Research Assistant, Mr. E. J. Verghese, was in charge of the station till 6th July 1932, when he was relieved by Mr. T. P. Baratan, Inspector of Fisheries, Calicut, and he continued to be in additional charge till 26th September 1932, the date when Mr. Ambady returned from leave. Mr. Ambady was again on sick leave from 5th to 20th November 1932, when the routine work of the station was managed by the clerk. Mr. T. P. Bhaskaran continued as clerk till the 28th July 1932, when he was replaced by A. Kanarakutty, a candidate selected by the Madras Services Commission.

277. *Equipment, Buildings and Sheds.*—Repairs to the fence, old walls, roofs and replastering of the floor of old buildings and some minor repairs to other buildings and the reconstruction of the watchmen's quarters which were damaged in the previous year's cyclone were done during the year at a cost aggregating Rs. 885.

278. *Travellers' Bungalow.*—The bungalow rent amounted to Rs. 59-14-0. The expenditure on improvements and repairs to the bungalow amounted to Rs. 204-13-0.

279. The Tanur Station was inspected by the Deputy Director of Agriculture, V Circle, Tellicherry, for the inspection of the coconut gardens manured under the supervision of the Ponnani Agricultural Demonstrator.

280. The Inspector of Factories visited the station twice in the year and the Inspector of Boilers in July 1932.

B. Chaliyam Cannery.

281. The Government Solicitor who was asked to draw up a draft lease deed (vide paragraph 340 of last year's report) inserted a clause under which the lessee will be bound to insure the factory for an agreed amount. Mr. Viswanath expressed his inability to comply with this condition. Government in Memorandum No. 1901-II/32-3, dated 4th January 1933, declined to lease the cannery to Mr. Viswanath and ordered that the cannery should be sold for what it would fetch, after due advertisement. The cannery was accordingly advertised for sale in February 1933 and the four offers received were submitted to Government for orders. Government have accepted the offer of the Western India Tin Manufacturing Company, Ernakulam, for Rs. 6,000 since the close of the year.

III. EDUCATIONAL.**A. Fisheries Training Institute, Calicut.**

282. As a result of the reorganization scheme sanctioned in G.O. No. 420, Development, dated 20th March 1932, the posts of Graduate Assistant, Boat Instructor, and Drill Instructor and clerk were abolished and the post of an assistant in the secondary grade and an operator mechanic created. The Government Order was given effect to during the course of the year. The Drill Instructor was granted leave for one year and 20 days and notice of discharge at the end of the leave. On a further representation made explaining the difficulties experienced for want of a Drill Instructor for the Institute, Government have since sanctioned the revival of the post and he is being recalled. The Graduate Assistant was reappointed as First Assistant in the secondary grade. A temporary Kanarese Interpreter was sanctioned by Government and one appointed from 10th August 1932 to 15th June 1933.

283. *Equipment.*—Books costing Rs. 36 were added to the library. The museum was enlarged by the addition of more exhibits. Four large museum cases were supplied at a cost of Rs. 1,166. The oil and guano press and accessories were erected in the guano shed. The canning room was provided with a chemical table and a weighing machine. For teaching piscicultural methods a set of two tanks was constructed in the Institute compound. Following the suggestions made by the District Educational Officer, 22 of the coconut trees in the compound were cut down for giving more space for the garden and playground.

B. Village Schools.

284. There were 143 teachers employed in the Fisheries schools at the close of the year against 139 in the beginning. Eleven of these teachers are of the secondary grade, out of whom 10 have

been trained at the Fisheries Training Institute. One hundred and fourteen are higher elementary trained teachers, 98 of whom were trained at the Fisheries Training Institute, 10 are lower elementary trained teachers of the Fisheries Training Institute and 3 ordinary trained lower elementary teachers. Five teachers are untrained of whom one is of the higher elementary grade.

285. Two additional teachers have been sanctioned for the South Kanara district, one for the Kirimanjeshwar school, and the other for the Tarapatti (Byndoor) school. Additional teachers have also been sanctioned for Kavvayi, Korapuzha, Kannankadavu, Pudiappa and Naduvattam schools. The number of teachers at Quilandy has been reduced by one, as Government considered that the strength of the classes did not justify the retention of the post. At Pudiappa and Kuriyadi additional teachers are found still necessary and proposals are under consideration. Kadavanad and Palapatti schools in the Ponnani taluk also require additional teachers for their efficient working. Application for additional teachers for the Nattika, Talikulam, and Kaipamangalam schools was made to Government but only one additional teacher for the Nattika school was sanctioned by Government. A second additional teacher was also sanctioned for the Nattika school for the VI standard which was opened towards the close of the year. There were six teachers at the Kottakadapuram school at the beginning of the year, but the Government considered that the strength did not justify the retention of the sixth teacher and consequently he was discharged towards the close of the year.

286. Eight women teachers, seven belonging to Malabar and one to South Kanara, were undergoing training for the third year at the Fisheries Training Institute during the year and on completion of their training have been posted to the following schools:—

South Kanara.

Sri Ganodaya School, Mangalore.

Malabar.

Korapuzha school.
Pudiappa school.
Quilandy school.

Kuriyadi school.
Kaipamangalam school.
Kottakadapuram school.

There were already women teachers employed in the Nattika, Kottakadapuram, Azhicode, Madapalli and Calicut model schools, and with the posting of the above eight teachers the total number of women teachers in the Fishery elementary schools has been raised now to 15.

287. *Accommodation.*—An additional permanent building has been put up for the Kumbala school at a cost of Rs. 1,600. An

estimate for the construction of a semi-permanent building for the Navunda school has been sanctioned and the work of construction will be taken on hand at the close of the monsoon. Accommodation is not sufficient at Pudiappa and Kadalundi and proposals are being submitted to acquire land and put up Government buildings. Proposals have been submitted for acquiring a plot of land and putting up a shed at Korapuzha as the present private building is becoming unsuitable to the growing needs of the school. There is no playground and the owner of the land does not provide the required facilities. At Kadalundi also the want of a suitable building is felt. Proposals have been submitted for acquiring the school site at Naduvattam. For the Quilandy school a plot of ground was acquired during the year as the playground was found insufficient. A urinal was also put up for the school. A urinal has been sanctioned for the Kuriyadi school and work will be taken on hand shortly. Proposals are being submitted for the construction of a permanent building for the Pudiappa school as the accommodation now provided is found to be insufficient and there is no playground attached to it. Accommodation was insufficient last year in Kaipamangalam, Talikulam, Puthenkadapuram and Kottakadapuram. The Talikulam school building has since been extended by its owner with the help of a loan of Rs. 500 from Government, recovery being made by withholding the enhanced rent for the extension. The building still requires some improvement and this subject is under correspondence. The Kaipamangalam school building was extended so as to provide double the accommodation it provided last year. A sum of Rs. 4,300 was spent on the extension and now there is ample accommodation for the present strength. The question of acquiring the site and building of the Kottakadapuram school is under the consideration of Government. To find accommodation to the increasing strength of the school a temporary semi-permanent shed was constructed by the owner of the building and an enhanced rent of Rs. 6 per mensem is being paid. The Puthenkadapuram school site and buildings have been acquired and an extension is under construction. The Kundazhiyur school which was housed in a rickety private shed was shifted to a permanent masonry building put up by Government on a site acquired for the purpose. The Government have already sanctioned the construction of a semi-permanent building for the Veliangode school on the Government site adjoining the fish-curing yard and the work is in progress. The Palapatti school, which was housed formerly in a rented dilapidated shed, was shifted to a new semi-permanent shed constructed by the owner of the original school shed. The site now selected seems more advantageous as it is situated in the midst of Mappilla fishermen.

IV. NAUTICAL.

A. "Lady Goschen."

288. The trawler which was finally disposed of to Mr. Muhammad Saifuddin S. Godhrawala of Bombay for Rs. 3,251 (vide paragraph 17 of last year's report) was delivered to the purchaser with stores on board on the 24th September 1932 by the Port Officer, Cochin, in whose charge the vessel was lying.

B. "Lady Nicholson."

289. The vessel was employed for the inspection of pearl banks from 14th March to 11th April 1933 and the full complement of the crew was engaged for a period of one month and twelve days. During the remaining period of the year, the crew were reduced to the minimum prescribed in G.O. No. 498, Development, dated 10th March 1930. The vessel was docked in October 1932 with the sanction of Government in G.O. Ms. No. 1228, dated 15th September 1932. The charges for her maintenance amounted to Rs. 7,212-7-2 against Rs. 6,296-4-6 in the previous year.

C. "Sea Scout."

290. The vessel was mostly used in the Tinnevely Chank Fishery and was engaged in the examination of pearl banks only for four days during the year. The full complement of the crew sanctioned from October to May was not entertained this year also, as a measure of retrenchment. Her maintenance charges were Rs. 2,617-10-5 against Rs. 2,732-1-4 in 1931-32.

D. "Leverett."

291. This vessel was used for the Tinnevely chank fishery for twenty-five days for the inspection of pearl banks, and the cost of her maintenance amounted to Rs. 3,443-15-4 against Rs. 3,323-3-0 in the previous year.

E. "Pearl."

292. The proposal to instal a new engine has not yet materialized. The cost of her upkeep was Rs. 474-13-4 against Rs. 495-13-6 last year.

V. ADMINISTRATIVE.

A. Director's Office.

293. *Director.*—There was no change.

294. *Personal Assistant.*—Dr. M. Ramaswami Nayudu continued as Personal Assistant till 30th May 1933 when he was appointed as acting Assistant Biologist. He was relieved by M. R. C. R. Natesa Pillai on 30th May 1933.

B. East Coast (North).

295. *Inspector*.—Mr. S. T. Moses continued as Inspector of Fisheries, Vizagapatam.

296. *Office staff*.—The senior clerk, N. Jagannatham, was on leave for three months from 3rd March 1933, and on the expiry of the leave was appointed as clerk in the Director's office at Madras. M. Chinmayya, a candidate exempted from the Madras Services Commission, was appointed as junior clerk and I. L. Narasimha Rao, promoted as senior clerk.

297. Difficulty is continued to be experienced in posting men for short leave vacancies, for want of reserves. The work of the section is on the increase, and the present staff of one sub-inspector and two clerks is not able to cope with the work.

C. East Coast (Central).

298. *Assistant Director*.—M.R.Ry. C. G. Chakrapani Ayyangar Avargal, B.A., continued as Assistant Director throughout the year.

299. *Staff*.—Mr. V. John, Inspector, was transferred to West Hill as Research Assistant and Mr. D. D. Peter Devadas appointed as Inspector of Fisheries, in his place from 14th May 1933.

D. East Coast (South).

300. *Assistant Director*.—M.R.Ry. Rao Bahadur J. A. Fernandez Avargal continued as Assistant Director throughout the year.

301. *Staff*.—Government sanctioned the retention of the temporary post of the Inspector of Fisheries for a further period of one year from 1st April 1932, and Mr. A. Somayaji continued in the post except for two months and fifteen days from 1st July 1932 when he took leave. Mr. D. D. Peter Devadas acted for him during this period. Government were also pleased to sanction the retention of the temporary clerk for another year from 1st April 1933.

E. West Coast.

302. *Assistant Director*.—M.R.Ry. U. Karunakara Menon Avargal, B.A., continued as Assistant Director during the year.

303. *Staff*.—There was no change in the personnel of the three Inspectors. The post of the Manager in the Assistant Director (Coast)'s office was made permanent and M.R.Ry. M. S. Venkateswara Ayyar was confirmed as such with effect from 13th April 1933. The staff is found very inadequate, but since proposals for additional staff have been repeatedly negatived they were not

revived this year. All the Inspectors are also complaining that the clerical work in their offices is too much for their section sub-inspectors to cope with, and the inspection work of the fish-curing yards suffers consequently.

304. *Equipment*.—The materials dismantled and stored in the Tanur North yard were advertised for sale during the year. The Government buildings in the closed yards at Meladi, Elathur, Beypore North, Kadalundi, Kodumbi and Kaipamangalam are being repaired and maintained pending the reopening of the yards. The total expenditure incurred on the closed yards was Rupees 1,497-8-2.

I have the honour to be,

Sir,

Your most obedient servant,

B. SUNDARA RAJ,
Director of Fisheries.

APPENDIX.

Expenditure and Revenue of the Fisheries Department for 1932-33.

Sections.	Expenditure.			Revenue.			Difference.					
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.			
A. Direction	35,809	6	4		4	3	0	—	35,805	3	4	
B. Pearl and Chank Fisheries	56,447	12	1	* 60,138	13	1			3,691	1	0	
C. Assistant Director (Marine)	2,724	5	0	3,323	14	0			599	9	0	
D. Assistant Director (Coast)	11,479	6	3	137	0	0		—	11,342	6	3	
E. Experimental stations—												
1. Tanur station ..	6,964	0	7	2,181	13	5		—	4,782	3	2	
2. Church Island Fish-curing Station		20	0	0	11	15	0		—	8	1	0
F. Training Institute ..	16,668	3	11	131	11	0		—	16,536	8	11	
G. Fisheries schools ..	67,851	9	6	65	12	10		—	67,785	12	8	
H. Assistant Director (Inland)—	1,02,249	5	2	1,02,367	7	2			118	2	0	
The Nilgiri Fisheries	8,389	3	3	2,928	0	0		—	5,461	3	3	
J. Oyster Farm	1,810	12	0	2,571	12	0			761	0	0	
K. 1. Marine Biological section—												
Zoological Supply Section, Ennur.	6,074	13	11	1,800	0	0		—	4,274	13	11	
Research Station, West Hill ..	13,313	5	2	..				—	13,313	5	2	
Research Station, Krusadai Island	6,394	10	6	497	9	0		—	5,897	1	6	
2. Aquarium	6,589	8	5	7,184	14	3			595	5	10	
L. Fish-curing yards—												
Voted	2,03,092	15	8	2,02,836	5	4		—	256	10	4	
Non-voted—Agathi Island	583	3	0	55	3	0		—	528	0	0	
Fisheries Cannery (for year ending 31st March 1933).	878	14	4	174	0	8		—	704	13	8	
Total ..	5,47,341	7	1	3,86,410	5	9		—	1,60,931	1	4	

* Includes Rs. 1,799 receipts from Salt Factory channels in the Ganjam district.

Government of Madras

DEVELOPMENT DEPARTMENT

G.O. No. 1444, 27th November 1933

Fisheries—Administration Report, 1932-33—Recorded with remarks.

READ—the following paper :—

From the Director of Fisheries, dated 31st October 1933,
No. 1921 G/33.

Expenditure and revenue both fell, as compared with last year; but the resultant loss on the administration of these yards has been considerably reduced from more than Rs. 22,500 in 1931-32 to about Rs. 250 in 1932-33.

5. The usual stocking operations have been continued in the Inland section and 'Catla' continues to give successful results. The scheme of Inland fishery research referred to in the last year's report has not yet been sanctioned. The revenue from Inland fisheries fell by nearly Rs. 10,000 in the year under review, the fall being attributable to the acute economic depression and to failure of rains in parts of Nellore and Chingleput districts.

6. There is a slight increase in the number of fishermen's children attending the fishery schools. A scheme has been formulated by the Director for the opening of a training centre on the East Coast.

7. The working of the co-operative societies continues to be unsatisfactory. There are heavy overdues in the societies on the West Coast, and some of the East Coast societies have ceased to function during the year.

8. The expenditure of the department has been reduced by nearly a lakh of rupees and the net cost of running the department has been Rs. 1,61,000 in the year under review, against rupees 2,09,000 in the previous year. The disposal of the trawler and the reduction of expenditure on fish-curing yards have contributed to this result.

(By order of the Government, Ministry of Education and Excise)

C. A. HENDERSON,
Secretary to Government.

To the Director of Fisheries.
" the Local Self-Government Department.
" all Collectors.
" the Board of Revenue (Land Revenue and Settlement).
" the Collector of Salt Revenue.
" the Law (Education) Department.
" the Commissioner of Labour.
" the Chief Engineer for Irrigation.
" the Public Works Department.