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MADRAS FISHERIES
DEPARTMENT

ADMINISTRATION REPORT

FOR THE YEAR

1920-21

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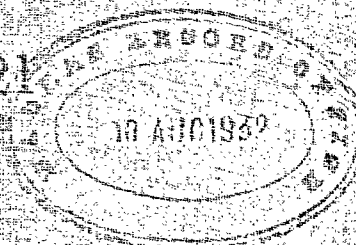
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BY

JAMES HORNEILL, F.L.S., F.R.S.L.,

Director of Fisheries, Madras.

Report No. 1 of 1922.

Madras Fisheries Bulletin, Vol. XV, pages 1 to 44.

MADRAS
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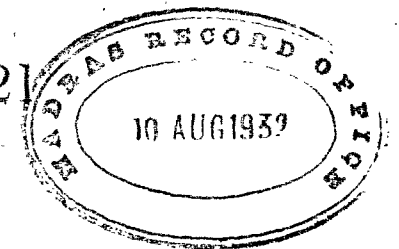
1922

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ADMINISTRATION REPORT OF THE DEPARTMENT OF
FISHERIES FOR THE YEAR ENDING 30TH JUNE 1921

BY

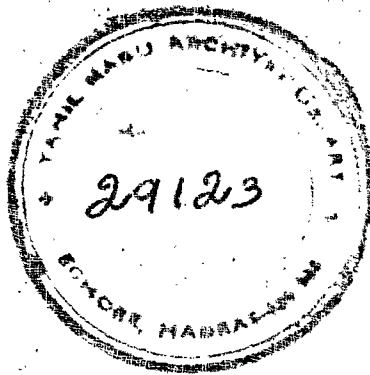
J. HORNELL, Esq., F.I.S., F.R.A.I.,
DIRECTOR OF FISHERIES.

ADMINISTRATION.

1. *Personnel.*—Mr. A. Y. G. Campbell, C.I.E., continued to act as Director till 15th November 1920, on which date I returned from leave and resumed charge of the Directorate. No change in the superior staff took place during the year. Rao Bahadur V. Govindan, as Assistant Director (Coast), continued in charge of the socio-economic section, together with the supervision of the Tanur Experimental Station, the fish-curing yards and the inshore experiments at Madras. Mr. H. L. Prager was responsible for the Experimental Cannery at Chaliyam, whilst Mr. J. A. Fernandez controlled the chank and beche-de-mer fisheries, in the absence on leave of Lieut. J. H. Allan, O.B.E., who returned only on June 7, 1921. Mr. R. H. Whitehouse carried on the duties of Marine Biologist, and Mr. B. Sundara Raj, Assistant Director (Inland), those pertaining to Inland Pisciculture. Mr. Karunakara Menon continued as Personal Assistant to the Director.

2. *Headquarters office and staff.*—As in 1919 I have again to deplore the inadequacy of the accommodation provided for my establishment and that of the Assistant Director (Inland). This consists of a small wing attached to the Director of Industries' offices. My own office is in a converted dressing room, so small and hot that it is difficult to work there in the heat of the day. The clerks are in worse condition, as they are crowded into two hot and ill-ventilated rooms. The Assistant Director's (Inland) staff is housed under equally unsuitable and unhygienic conditions. Unless better quarters are provided, the efficiency of work, now at a low level, is likely to deteriorate further. The need for additional staff is also sorely felt, and results in the utilization of the services, as clerks, of men whose duties are not of this description. Thus the Personal Assistant, specially appointed to relieve me of certain duties, in order that I might have time for greater general supervision and for research, is occupied to such an extent with accounts work that I do not get as much relief from his help as I should. Similarly my camp clerk can seldom accompany me on tour, and the Assistant

செப்பனருவர் பெயர் *K. Y. G.*
செப்பனருவதற்காக எடுத்திருக்கிற
கொள்கைப்பட்ட நாள். *1923*
செப்பனரு முடித்த நாள் *7-1-1923*
1923
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மு.பா.எ.
கையொப்பம். *சுபார்க்கும்*
கையொப்பம்.



Director (Inland), to make up for the lack of adequate clerical staff, has frequently to utilize the services of his Assistant Inspectors. The work of the department has increased very greatly during the past two years but the additional staff asked for long ago has not yet been sanctioned. The work of the Assistant Director (Coast) similarly suffers, and like my own is always more or less in arrears in consequence.

GENERAL.

3. *Expansion of work.*—This has continued in certain directions, such as the more vigorous preparation of scientific and technical reports for publication, increase in the number of schools and fish-curing yards under the charge of the department, and in a large extension of the operations of the piscicultural section. One hundred and thirty-five tanks were taken over under the authority of G.O. No. 217, Revenue (Special), dated 3rd February 1920, from the District Boards of Chingleput and Nellore. To meet the needs of this section for subordinates trained on the technical side, I arranged for the utilization of the Ennore bungalow as a modest but efficient training institute for this purpose; the results have been gratifying and it may be possible to develop this temporary arrangement into a permanent and economical training scheme that will obviate the need for a costly Fishery College as proposed in more prosperous times.

4. *Finance.*—Expenditure on non-industrial sections of the work, especially education, socio-economics, supervision and research, continues to increase; as a consequence the excellent financial result in the piscicultural section and the fairly good one from the chank fishery are masked. The total revenue from all sources amounted to Rs. 2,29,420, the expenditure to Rs. 2,93,027, a loss of Rupees 63,607 as compared with Rs. 19,087 in 1919-20. The increase in the deficit by Rs. 44,520 is due in the main to increases in supervision and research (Rs. 5,400 to the Marine Biologist alone), in temporary additions to the pay of the establishment (Rs. 14,900), in travelling allowances due chiefly to the increased rates given (Rupees 5,000), and Rs. 3,000 upon education and socio-economic work. With Rs. 15,948 spent upon tin-plate, still in stock, these items account for the whole of the increase in the deficit. The possibility of making the department self-supporting depends on the arrest of the declining revenue obtained from the chank fisheries, and upon the early completion of the tank acquisition schemes, the two great sources of income. Reorganization of the cannery, which may involve its removal to a more suitable site, and more enterprise in the conduct of the Tanur Experimental Curing Station are also urgent and should contribute a substantial quota to profits when effected.

The profits derived from the various semi-commercial sections of our work are as follows:—

	Expenditure.	Receipts.	Profit.
	RS.	RS.	RS.
Chank and beche-de-mer fisheries	42,392	79,928	35,536
Tank stocking operations	57,762	90,484	32,722
Marine aquarium	4,993	10,133	5,140
Pulicat Oyster farm	1,807	2,290	483
Zoological supply	2,975	3,131	156
Marine Fish farm	646	805	159
Total ..	1,11,615	1,86,772	75,257

	RS.
Losses were sustained from—	
Inshore fishing experiments	563
Tanur Experimental Station	136
Experimental Cannery	1,879
Total ..	2,578

In the case of the cannery no real loss has probably taken place, the deficit being due to the large stock of unsold goods being estimated at only two-thirds their selling value. The loss on the Tanur yard is due to the same unavoidable cause as militated against success so adversely in the case of the cannery, namely, the extraordinary scarcity of sardines during the 1920-21 season.

5. *The Director's work apart from administration.*—This has been less than usual owing to my having been on leave for the first 4½ months of the year and to the increase of work due to the reduced assistance I receive from the Personal Assistant whose time is too much occupied with account work. While on leave I was deputed to study fishery conditions in Norway and Denmark and spent over two months on this investigation. The results are embodied in a lengthy report now in the press. Perhaps the most important conclusion arising from this work was the impression gained of the suitability of the Danish seine for introduction to Indian waters. More powerful engines for fish-catching are urgently required and as it appears that steam-trawling on the Madras coasts is too expensive a method under present conditions and too much hampered by other disabilities, the value of a powerful fishing method free from the disadvantages attendant on steam-trawling cannot well be overestimated.

Besides this, I wrote a comprehensive guide to the common shell-fish of South India, to serve as a companion hand-book to the collections of shells intended for supply to secondary schools. The Director of Public Instruction made the writing of this guide a

condition precedent to the placing of an order for a large number of these collections. This book should also prove of considerable value to those who take an interest in the common objects of the sea-shore, for till now, no attempt has been made to provide a popular guide to the shells of South India.

I have also been able to publish, thanks to the generosity of Government, a report upon the *Outrigger Fishing-Canoes of Indonesia*; this appeared as Report No. 2 of Fisheries Bulletin XII. At the science congress held in February 1921 at Calcutta, I also read a paper on *Catamarans and Reed Rafts* as evidence of former race continuity from the Mediterranean eastwards to South America. A summary was published in *Man in India* for June 1921.

Extensive tours have been made, chiefly in the interests of the piscicultural section, to investigate several schemes shortly to be submitted to Government. Special visits were also made to Tanur and Calicut to enquire into the protests made by curers against the imposition of certain of the new rules in force in the fish-curing yards at these places. I was fortunate enough to arrive at a *modus vivendi*, and that good relations, especially at Tanur, have been re-established is evident by the fact that the staff there has not been interfered with by the rioters in the recent disturbances.

My advice has been in frequent unofficial requisition by officers administering fisheries in other Governments. Among these may be mentioned inquiries upon canning procedure from Baroda and Travancore, upon general fishery development in the Seychelles, and upon freshwater pisciculture in Behar and Orissa and the Fiji Islands.

INDUSTRIAL SECTION.

THE EXPERIMENTAL CANNERY, CHALIYAM.

6. *General.*—The year under review was one of those unfortunate lean years experienced occasionally in practically every sardine-canning locality. The catches of sardines were a complete failure, not only in the neighbourhood of Chaliyam but everywhere else on the Malabar coast. Mackerel on the other hand were abundant and the bulk of the goods canned were of this fish. Unfortunately the demand for mackerel is small compared with sardines, and as their keeping qualities are inferior it is not advisable to can beyond a certain limit.

Prawns were also scarce at Chaliyam, and although large quantities were caught at Tanur, the condition of those taken to the Chaliyam cannery was usually such as to preclude their use in canning. This resulted, I believe, from the exceptionally torrid weather which characterized the past season, causing fish and

prawns to taint appreciably more quickly than during normal seasons. To add to the difficulties attending cannery operations during 1920-21, the price of tin-plate rose to an extravagant height and as a large purchase had to be effected at this time owing to depletion of our stock, the heavy cost of this plate has proved a serious handicap and one of the serious causes of the small deficit on the year's working. The quality and packing condition, both of this tin-plate and of a consignment of small tins, were thoroughly unsatisfactory and reflect the unsettled conditions of industrial life in England. So serious were the defects in these consignments that unless conditions improve, repeat orders may have to be placed elsewhere; labour that will not give proper care to the work in hand, cannot expect continued employment; orders are bound to drift to other countries where labour gives proper value for the wages received.

From various inquiries made it is evident that the operations of this department in pioneering a canning industry are impressing other authorities with the commercial potentialities of similar work in their territories. The departments dealing with fisheries under the Governments of Travancore and Baroda have both requested advice in regard to establishing experimental canneries, and besides giving all information possible, it has been arranged to supply can bodies and covers for their preliminary operations.

Sir Frederick A. Nicholson's most useful report on canning practice as applied to fishes has now been issued as Report No. 2 of Volume XIII of our Bulletin. It should prove invaluable as a working hand-book both to our own officers and to all others who contemplate canning enterprises in tropical countries.

7. *Output.*—In spite of all disadvantages, the output was an average one, amounting to 67,524 tins of all kinds. This is a satisfactory advance upon the preceding year, when only 59,586 tins were put up. The bulk consisted of mackerel, with sardines occupying the second position. Prawns were less extensively treated owing to small supplies. Of the larger fish, *narimin* (*Lates calcarifer*) was the only one obtained and canned in any appreciable quantity.

8. *Sales.*—Due to a variety of causes, sales amounted to 35,092 tins only, as against 40,729 last year, leaving a comparatively large balance of 82,152 tins on hand at the end of the year. Although disappointing, the fall in sales is not surprising in view of the chaotic state of the market for canned goods during the year under review; in this connexion it is worthy of note that many canneries in Portugal and the United States have suspended operations owing to the heavy losses sustained during the post-war slump.

in trade. So far as India is concerned these adverse conditions may be enumerated as under, namely—

(a) a glut of imported goods bought during the months when business was booming and thrown on the markets last year at particularly low prices—often even below cost—in order to obtain ready money to meet business exigencies caused by the financial stringency of recent days;

(b) the disposal of large quantities of surplus stores of tinned fish by the Munitions Department at similarly low prices;

(c) the sweeping reduction in the number of English troops stationed in India; and

(d) the withdrawal by the South Indian Railway Company of the concession enjoyed during previous years of sending canned fish at half parcels rates, coupled with the recent large enhancement of rates plus a surcharge.

In some respects the last of these causes has been the most detrimental, for freight now bears a wholly disproportionate relation to the factory value of the goods, amounting to from 30 to nearly 50 per cent of such value. As a consequence many old customers have ceased to order and others complain of the heavy freight charges.

Efforts have been made to bring the products of the cannery more prominently to the notice of the public and to give an impetus to sales by sending representative samples to local exhibitions, by advertising and by wide circulation of a new price-list got up in attractive booklet form. New and distinctive labels have also been designed and are now in the press. Beyond a temporary fillip, the advertisements have not effected much, apparently due to the heavy railway rates that handicap a direct parcel trade with the populous cities in the north of India. It is evident that a reorganization of selling methods is required; I consider that a Government department should not carry on its sale operations by direct retail trade, but should entrust sales to a restricted number of wholesale agents who already have the machinery required for distribution. But this alternative has its own particular difficulties, for the production of the cannery is after all that of a plant designed primarily for experiment and demonstration; the output is greater than can be disposed of within the Presidency by personal recommendation and at the same time is far too small to be worth the consideration of a wholesale house with business relations throughout India. Such a firm has no use for the limited produce of our experimental plant, which averages only some 700 cases of miscellaneous goods per annum, whereof only some 300 cases are of sardines (the ordinary case of one-fourth size tinned sardines contains 100 tins). Such a production is too paltry for a wholesale firm to consider when it becomes a question of extensive advertisement to push a new and unknown

brand. Even the fact that our goods are of Indian origin is a handicap with those who are not acquainted with them, the general idea, needless to say quite erroneous, being that the high standard of care and cleanliness necessary to ensure a wholesome product is not likely to be maintained under tropical conditions.

At exhibitions held at Mangalore, Tellicherry, Bangalore and Pudukkottai, highest awards were obtained for the exhibits staged by the cannery.

9. *Finance.*—The total expenditure for the year amounted to Rs. 31,896-4-1 made up of Rs. 1,999-3-8 on capital account and Rs. 29,897 for running charges. Of the latter more than half went on a large purchase of tin-plate bought unfortunately when the market was exceptionally high; the greater part remains in stock. Against this expenditure, receipts paid into the treasury amounted to Rs. 16,707-1-3, the outstandings Rs. 2,024-15-1 and the value of goods on hand, at two-thirds the sale rates, Rs. 26,160-10-8, leaving an apparent loss of Rs. 1,878-14-11 on the year's working. In actuality there is every probability of the year's operations eventually resulting in a substantial profit, for there is no reason to believe that the goods in stock will be sold at other than their full value, instead of the two-thirds proportion for which credit is now taken. To achieve better results, it appears clear that it will be necessary to remove the cannery to a locality where sardines are either more naturally abundant or the fishermen more numerous and energetic; supplies at Chaliyam are neither large nor regular, and the consequence is that the staff is intermittently employed even during the four months that constitute the height of the sardine season. Concurrently reliable agencies must be established for the speedy disposal of the goods manufactured. (Sardines in oil always excepted, for these are not fully matured till 9 months or a year after canning and are said by some French manufacturers to improve even up to a limit of five years from canning.)

Pending the decision of Government on this question no further improvements and additions are being made to the buildings, and no steps have been taken to provide the quarters urgently needed for the Manager, who has in consequence to live at Feroke, two miles up river from the cannery. On several occasions he has been unable to proceed to his work on account of floods in the river, and the hardship of having to go up and down the river twice daily in a lugout canoe in rainy weather is more than should be expected from any man, however willing.

Messrs. Charlton and Cockburn, representatives of the well-known firm of Messrs. Price Waterhouse & Co., Chartered Accountants, London, who are advising the Government of India in respect

to the form of accounts to be maintained by industrial concerns under the Ministry of Development, paid two visits to the cannery to note the system now in use. They also discussed generally the account-keeping of the department with the Director at a meeting at Ootacamund.

10. *Experiments*.—Various experiments were carried on as usual, the chief being directed to the canning of soles, mackerel in oil, and mackerel put up *à la* tamarind fish. In consequence of the unsatisfactory quality of all the curry powders on the market, various trials were made to get one suitable to our special needs and the Manager deserves credit for the excellent result he has now attained. The curried sardines prepared at the cannery and already very greatly appreciated, will certainly be still more in favour in future.

11. *Staff*.—During the year under review Government were pleased to improve considerably the pay of the permanent staff from the Sub-Assistant downwards. The needs of the temporary staff were also duly considered and substantial increases were given to meet the increased cost of living. A bonus on profits, amounting in the aggregate to Rs. 1,014 was sanctioned by Government upon work done during the period 1917-19 and duly distributed to the staff, much to their satisfaction. It is hoped that this concession will bear good fruit in earnest and conscientious work during the coming season.

TANUR EXPERIMENTAL STATION.

12. 1920-21 proved even a worse year than its predecessor for the experimental operations carried on at this station in the curing of fish and the production of fish-oil and guano. Both sardines and the larger kinds of fish were extremely scarce, and had it not been for mackerel, of which fairly heavy catches were made, operations would have been trivial. As it was, 97,724 lb. fish, chiefly mackerel, were purchased for curing, the cost being Rs. 3,242 and the sale-proceeds Rs. 5,802. The market for the cured fish has been extended and local fish dealers are at the beginning to purchase our improved cures of fish for sale at the weekly shandys in the interior: this development is gratifying as is one that has long been sought; obviously it is of little use to prepare an improved quality of cure if the mass of the people do not touch it, preferring the badly cured and often partially put quality to which their vitiated taste has accustomed them. Demand for smoked fish and semi-dried prawns has also increased. Experiments in the moist-curing of mackerel were continued but were hampered by the difficulty of obtaining suitable containers at a reasonable price. The preparation of fish meal for poultry continued and the demand for it is slowly increasing.

13. *Oil and guano operations*—were restricted owing to the dearth of sardines. Only 27.4 tons were purchased as against 260 tons in the previous year. The quantity treated yielded 337 gallons of oil and 4.8 tons of guano. The operations though very small were highly remunerative; the cost of the material was Rs. 406 while sales and stock in hand amount to Rs. 603. The highest rate for guano was Rs. 120 per ton f.o.r. Tanur. The few sardines fished in the past season were extremely rich in their oil content, amounting to as much as 6.3 per cent in December 1920 as against 1.3 per cent in 1919. I had a sample of superfine sardine oil analysed by the Chemical Examiner to Government. Its constitution and characteristics were as follows:—

Specific gravity	...	...	...	...	0.927
Iodine value	...	...	...	...	161
Saponification value	...	...	...	...	196
Free fatty acid (as oleic acid)	...	...	...	...	0.5 per cent
Colour	...	...	...	...	Yellow (pale).

The percentage of acidity is considerably lower than is allowed by the British Pharmacopœia for codliver oil, hence it is probable that this oil has equal therapeutic value and may prove an effective substitute for the former; large samples have been sent to the Tuberculosis Hospital for actual trial. The cannery has also successfully employed this quality of oil in the canning of certain descriptions of sardines. It is certain that if oil producers will pay adequate attention to the separation of superfine and No. 1 oils, their enterprise will be richly rewarded. Unfortunately carelessness is prevalent and the factories seldom turn out any but low grades of oil of dark colour and high acidity, and therefore of low industrial value.

The trading accounts of the station show a gross profit of Rs. 425-8-4; after allowance for depreciation and overhead charges, this sum is converted into a small loss of Rs. 135-15-8. The poor result is due entirely to the dearth of sardines which yielded a return of Rs. 603 only as against Rs. 5,171 in the previous year.

14. *Improvement of the oil and guano industry*.—With a view to minimise the nuisance caused to the public by the insanitary working of the oil and guano factories, a set of rules for the guidance of factory owners was approved in G.O. Mis. No. 1381, Revenue (Special), dated 28th July 1920, and the local boards were empowered to enforce them. The taluk boards concerned have accordingly issued licences and appointed Sanitary Inspectors to regulate the working of the factories. As the development of the industry on the right lines is the business of the Fisheries Department, the Government also sanctioned the appointment of an Inspector of Oil and Guano Factories and a fitter to instruct the

factory owners in the right method of manufacture, and to advise them of the importance of placing products of a superior quality on the market, as well as of the danger to the industry caused by adulteration. A thorough inspection of all factories was made and as most of them were found to be very defective, advice as to how these defects could be remedied was given to their owners. Demonstrations of correct processes of manufacture were also given but owing to the scarcity of sardines it was not possible to do this on an extensive scale. There were 646 factories on the coast, of which 387 were licensed, but only 290 factories conducted operations and even these were limited to a couple of weeks' work during the year, on account of the great scarcity of sardines. The total output of guano was estimated roughly at about 1,500 tons, compared with the enormous quantity 24,000 tons manufactured in the previous season. On account of the adulteration of the guano with sand in previous years, there was very little demand for it, and hence, though the output was small, the price offered was very low. In some cases buyers actually preferred beach-dried sardine manure and paid for it even higher prices than for guano. The demand for oil was also very small. Inquiries show that Malabar fish-oil has recently earned, on account of its present low quality and adulteration, a bad reputation in the Calcutta market, where it used to be greatly in demand for batching jute fibre. This department is trying to bring the manufacturers to a sense of the injury they cause to the entire industry by their lack of commercial morality.

15. *Public fish-curing yards.*—The yards under the management of this department were increased by one during the past year, the total now being eight. The quantity of fish brought in for curing was 422,811 maunds; the cured weight was 239,504 maunds, an increase of over 35,000 maunds over the preceding year. 72,065 maunds of duty-free salt were supplied as against 60,061 maunds in 1919-20. The increase in the operations was due mainly to the phenomenally large quantities of mackerel caught at Malpe. The maximum was reached on 16th November 1920, when 7,942 maunds of fish were brought in.

The employment of old brine, filtered for re-use in curing fish, is being gradually introduced, and 28,994 gallons were used for curing 4,442 maunds of fish. Not only does this result in a reduction in the curing expenses; it results in an actual saving to Government of the difference between the cost price and the issue price of the equivalent amount of salt that would be used if this brine were not utilized; last year in spite of the conservatism of curers, who are slow in appreciating the advantage of this procedure, a saving to the curers of Rs. 462 was effected. When this method is systematically

employed throughout all the yards, the resultant saving will be of very considerable importance.

In the Malpe, Mangalore and Thanirbhavi yards, the majority of the curers have put up permanent curing yards, with cemented floors and curing vats, on the models designed by the department. Loans have been sanctioned for the construction of similar ones in the Calicut and Thalayi yards. In the others, pending construction of such permanent structures, the curers were instructed to improve their cadjan sheds in certain inexpensive ways, such as cleansing the floor, providing ventilation and disinfecting the tubs, etc. This caused a strike extending to 2½ months at Tanur. During this period they cured their fish outside the yard with duty-paid salt and undoubtedly spent several times the amount in duty that compliance with the instructions would have cost. Various deputations waited upon me, and only after two visits to Tanur, could I persuade the men of the utility and reasonableness of the innovations. Political influences appear to have been at work, and I believe the majority had no real desire to refuse obedience to the new rules. Similarly a partial strike occurred at Cannanore where ten Mappilla curers stopped work rather than improve their methods, and since then have been curing fish with *duty-paid bazaar salt*.

Now the chief objects in establishing public fish-curing yards are (a) 'to prevent the loss entailed on the fishing classes by the purchase of duty-paid salt for curing fish', and (b) 'to prevent the injurious effects of the supply of badly-cured fish.' The attitude of the Mappilla curers of Cannanore and Tanur, who are capitalist middlemen, shows that they can make a profit even by using duty-paid salt. Therefore it is evident that they could put up satisfactory sheds and introduce the simple improvements which we advocate, without the least hardship. It is evident that their refusal to do this is due to their desire to make a maximum of profit regardless of the quality of the product. The fact that the department controls only a small number of the total of yards is a handicap to the rapid introduction of improvements, as curers undoubtedly hope to tire out our officers and discredit our work by delaying to carry out improvements—the object being to have the yards reverted to the Salt Department.

Two Assistant Inspectors were transferred to the department, while four temporary yard officers were entertained. All subordinate officers underwent a course of training at the Tanur Experimental Station in improved methods of curing, in the filtration and re-use of old brine and in the estimation of the correct proportions of salt required for different classes of fish. They were specially taught sanitation as applicable to fish-curing yards.

INSHORE FISHING EXPERIMENTS AT MADRAS.

16. These experiments have now been carried on continuously through a period of three years. In spite of the demonstration that better catches can usually be made by the employment of certain forms of Malabar nets, used in conjunction with large dugout canoes, no Madras capitalist or fisherman has yet been sufficiently impressed to induce him to adopt these methods commercially; all negotiations proved abortive as prospective buyers always saddled their offer with the condition of being permitted to fish inside the harbour. This condition is unacceptable as it would facilitate smuggling.

During the past year of 307 working days, the total quantity of fish caught amounted to 84,786 lb. compared with 114,850 lb. in the previous year. This great falling off is attributed by the fishermen to the abnormally high temperature experienced during the fishing season, a connexion that appears obscure; fish scarcity however was certainly prevalent along the East Coast during the first half of 1921; one consequence of this is seen in the increased number of fishermen from Cochin and other fishing centres in the north, who went to Burma in search of employment.

The fish caught by our canoes off Madras was sold for Rs. 5,809 as against Rs. 6,404 in the previous year. Expenditure amounted to Rs. 6,295 including an item of Rs. 264 debitable to capital. The loss on the year's working was therefore Rs. 222 exclusive of capital expenditure. The experiment is to be carried on for another six months, in the hope that the canoes and nets may be purchased by local fishermen in the interval.

An extremely useful analysis of the results obtained during the first season's work by sub-assistant M.R. Ry. M. Ramaswami Nayudu, B.A., was published during the year as Report No. 3 of Bulletin No. XII. In it the seasonal variations in the catches of each species of fish are recorded in detail, together with statistics of their relative abundance and other information. For the first time we now begin to have distinct knowledge of the constitution of the food-fish fauna of Madras, and of the relative fishing value of the various nets employed in their capture. This work will be continued. In addition, at the instance of the Hon'ble the Minister for Development, statistics of the fish supplies coming into the city of Madras will be compiled during the coming year. No information on this subject is on record and it is obvious, for many reasons, that exact information should be collected; this information will be particularly useful to any persons or companies who may contemplate the introduction of deep-sea fishing boats. The first requirement of business men in such a case is to have fairly exact knowledge of the extent of existing sources of supply.

PULICAT OYSTER FARM.

17. The past year's operations have been the most satisfactory on record. The 1920 season lasted unusually late, not closing till 24th October; the present year's season opened on 19th March 1921, as against 15th March last year. The condition of the oysters has been satisfactory and demand has increased considerably, 167,000 being sold as against 133,450, the figure for last year. Owing to the increase in railway freight, enhanced prices had to be charged in view of the fact that freight has to be prepaid. Considering the fact that oysters are supplied at the farm at only Rs. 1-3-0 per hundred, the higher freight rates now in force have had fortunately no adverse effect upon demand; as shown above, the farm is now on a financially sound footing. I propose during next season to introduce such changes in the method of distribution as will diminish largely the disabilities at present attendant upon regular and satisfactory supply due to the comparative inaccessibility of Pulicat, whence the oysters have to be brought 16 miles by canal to Ennur Railway Station for despatch to the consignees.

Experiments made during the past season indicate that healthy layings of oysters may be made in special enclosures close to the bar at Ennur. This line of operations will be pursued extensively next year, but no oysters will be put upon the market from this locality until bacteriological examination has proved them to be free from harmful bacterial infection.

The following table shows the details of the past year's operations as compared with those of 1919-20, viz.:-

	1919-20			1920-21		
	RS.	A.	P.	RS.	A.	P.
Receipts ...	1,715	9	6	2,290	6	0
Expenditure ...	1,860	0	6	1,807	6	3
Loss ...	144	7	0	Profit	482	15 9

A small plot of land has been acquired at Pulicat, on which permanent store sheds will be built, in order to obviate the present inconvenience of renting buildings not entirely suitable for the purpose. With methods of procedure now simplified and adapted to local conditions, and with improved transport arrangements, I look forward to a largely increased output in future years; no food product of the sea can compare with clean-grown oysters for palatability and digestibility, combined with tonic and appetite-stimulating qualities; for this reason they are particularly suitable for invalids and those with jaded appetites. Unfortunately these facts are not sufficiently known and appreciated, hence I propose an active publicity campaign when next season opens; special

emphasis will have to be laid on how they should be prepared for the table—the best of oysters are utterly ruined if the shells be opened roughly and the flesh served up in an unattractive way, as happens so frequently with the ordinary Madras cook who loves to open oysters with a hammer.

THE DEPARTMENTAL MARINE FISHERIES.

18. Of these the only important one at present is the chank fishery, for alike with Ceylon, the pearl fishery has been unproductive for many years whilst that for beche-de-mer is merely an adjunct to the chank fishery, carried on mainly to bring the wages of the Tirupalakudi chank divers to a remunerative level. During the year under notice the decline in the chank fishery noted in 1919-20 continued, and the results both financially and in output were particularly disappointing. The total catch of shells fell to 283,869 compared with 339,835 in the preceding year, and 435,262 in 1918-19. The beche-de-mer fishery was an entire failure.

19. *Financial results.*—The details of the revenue and expenditure for the various chank fisheries for the year are shown below, annas and pies being omitted :—

	Revenue.	Expenditure.	Profit.
	RS.	RS.	RS.
Tinnevelly chank fishery.	35,883	11,158	24,725
Ramnad chank and beche-de-mer fishery ...	30,605	22,528	8,077
Sivaganga chank fishery...	269	264	5
Tanjore chank fishery ...	4,467	...	4,467
South Arcot chank fishery.	1,546	...	1,546
Nellore and Chingleput chank fishery ..	1,250	...	1,250
Miscellaneous receipts ...	5,909	1,128	4,781
Total ...	79,929	35,078	44,851
Deduct supervision charges ...	...	...	8,314
Net profit ...	...	...	36,537

This profit is the smallest for the past seven years and coincides with a marked decline in the number of chanks fished as shown by the following tabulation :—

	Net profits.	Number of shells fished.
	RS.	
1916-17 ...	53,938	418,314
1917-18 ...	57,122	391,187
1918-19 ...	82,611	435,262
1919-20 ...	46,029	339,835
1920-21 ...	36,537	283,869

An investigation of the causes that have led to this great reduction will be undertaken personally by the Director, who has special and long-standing experience of this industry, having reorganized both the Tinnevelly and Ramnad fisheries when those were under his direct control; in the 6 years after the leasing of the Ramnad fishery and ending with 1918-19 a total *net* profit of Rs. 2,75,648 was obtained from these fisheries, while the net profit for the 3 last years of this period when organization was perfected, amounted to the handsome *annual* average of Rs. 64,557. Any considerable fall from this figure entails anxiety, particularly when associated with a great diminution in the number of shells fished. Were it not that we are now receiving the highest price on record for the Tuticorin chanks (Rs. 325 per 1,000, compared with Rs. 99-9-7 when first I took over charge in 1909), the net profit would be still more disappointing.

20. *Tinnevelly chank fishery.*—The year's catch of shells was 109,434 as against 158,941 in the preceding year. In addition, the large number of 23,177 undersized were brought in, a number greater than usual. Special attention must be given next season to prevent these being brought ashore; they are of trivial value to Government and connote an equivalent reduction of the number of valuable fullsized shells available for fishing next season. The fishery commenced on 30th October 1920 and ended on 9th May 1921, the number of non-working days during this period being 59. The maximum number of divers employed was 43 as against 53 last season, and of these only 25 were local men. It is increasingly evident that diving as an occupation is becoming yearly more unpopular in Tuticorin, where less strenuous and more regular employment is open to the sons of divers and fishermen owing to the development of the town as a great shipping and industrial centre. As a consequence, if more divers are to be employed, the system of recruitment from the Ramnad coast must be developed, and to do this, a further increase in the rate paid for shells seems inevitable. Apart from this, the weather conditions were adverse both at the beginning and towards the end of the fishery. Seven hundred and seventy-five shells were collected at Idinthakarai as against 480 last year.

21. *Ramnad chank fishery.*—The total catch for the year amounted to 171,774 as compared with 177,858 shells in the previous season, the details being as follows :—

	1919-20.	1920-21.
Rameswaram ...	122,880	101,028
South Vedalsai and Kilakarai...	10,188	13,879
Pillaimadam ...	29,055	21,228
Tirupalakudi ...	15,735	35,641
	<u>177,858</u>	<u>171,774</u>

Unsettled weather and the early onset of monsoon conditions interfered somewhat with the fishery, but the principal reason for the poor catches lay in the lack of success in recruiting an adequate labour force for the Rameswaram section of the fishery. The maximum number of canoes engaged there was 22 as against 32 in the preceding season, which again was less by 11 than the number employed in 1918-19. The decrease therefore has been in progress for two years past. One of the divers was stabbed in the chest by the tail spine of a ray-fish; the alarm at this entailed a few days' cessation of work. Of the 12,375 undersized shells brought ashore, 10,923 were returned alive to the sea, a very satisfactory proportion. For the Vedalai fishery a number of Kilakarai divers were recruited to make good the deficiency caused by a decrease in the number of local men taking part in the fishery. This policy is to be developed further during the coming season, as the offshore beds here are capable of yielding considerably larger quantities of shells than last year's catch. The Tirupalakudi fishery was the only successful one in this section, the catch amounting to 36,641; that for 1919-20 was only 15,735. The men of this place have no other occupation beyond fishing and diving; therefore when chanks are plentiful and promise better returns than ordinary fishing, the chank diving force automatically increases.

22. The unimportant *Sivaganga chank fishery* leased from the zamindari for administrative reasons, yielded 2,661 shells, mostly caught in nets. No regular beds are known off this part of the coast and this makes chank fishing as a separate occupation too unremunerative to pursue.

23. *Leased chank fisheries.*—The chank fisheries of the seaboard districts from Tanjore to Nellore inclusive are not susceptible of departmental fishery, primarily because of physical characteristics of the shore line coupled with the strong inshore currents and the frequent turbidity of the water over the chank-bearing bottom. It happens also that several of the nets most commonly used, particularly the thurivalai, sweep the bottom and bring up large numbers of chanks. The system has therefore been evolved of leasing the exclusive right to purchase these shells from the fishermen; the lessee appoints agents in the different villages to receive and pay for the shells. The sums received in respect of the various districts are noted above in paragraph 19. No expenditure is incurred by Government in respect of these fisheries, the whole rental being clear profit. The total amounted last year to Rs. 7,262-12-10. The Fisheries department may justly claim credit for the satisfactory development of this section of its work, for when I took charge of the chank fisheries in 1909, no revenue was derived from any district save Tanjore, where the paltry sum of Rs. 261 represented the total revenue obtained from this source.

24. *Economic condition of the divers.*—This heading will in future disappear, as under orders of Government (G.O. Mis. No. 301, Law, dated 6th May 1921), welfare work among the fishing communities of the East Coast is transferred to the Commissioner of Labour. At the same time every endeavour is and will be made to advance the well-being of these people in every way possible. Connected with this is the advance system under which from time immemorial the divers receive advances from their employers in times of seasonal unemployment and when bad weather interferes with fishing. They also expect and demand advances at the beginning of a fishery to meet the cost of the necessary preparations, including such items as the repair of their boats, the purchase of new gear and a sum to leave behind for their family's expenditure in cases where the fishing is at a distance from their home port. The system when worked sympathetically, as I can vouch it was during the years I had direct charge of the fisheries, is of the greatest value to men who are naturally improvident and whose vocation is an uncertain and seasonal one. Particularly is it of use to the men's wives, who otherwise would be dependent upon uncertain remittances from their husbands when the latter were away from home. It is a counsel of perfection and therefore not practicable in ordinary life, to say that the system should cease and the men be taught to rely upon themselves and to organize co-operative societies to advance monies to members during emergencies. If the men were educated and unprejudiced and thrifty, this desirable arrangement might be possible, but we have to take things as we find them; under present conditions I believe it will be better to increase the rate paid in certain localities as compensation for the rise in the cost of living and to wait till education has made further advance before hastily scrapping a system that has worked satisfactorily in the past and to which the men themselves have a well-marked preference. According to the instructions issued in 1920, special efforts were made during the past year to reduce drastically the sum outstanding as advances; the sum of Rs. 917-13-3 was also remitted under orders of Government. The advances outstanding at the beginning of the year were Rs. 3,618-0-7; with the sum remitted and special strictness in recovery, this amount was reduced at the end of the year to Rs. 1,881-6-4. How far this drastic application of the instruction to recover advances has affected fishery results adversely, it is difficult to assess; the fact remains that reduced catches coincide with unusual strictness in limiting and recovering these advances.

25. *The Beche-de-mer fishery* was a complete failure last season, only 163 lb. being cured. The scarcity has been attributed to heavy mortality due to an unusual influx of fresh water from the

river Vaigai during the last rainy season. The whole cure of the two seasons 1919-20 and 1920-21, was sold last year in Singapore at good rates, but in spite of this and of the sales being in Straits dollars standing at a premium as compared with the depreciated rupee, the transaction involved a loss of Rs. 417-7-5. This unfavourable result was due to deterioration and loss of weight through prolonged storage; it appears preferable in every way to despatch consignments as ready, without waiting for long periods for some problematic improvement in market rates.

26. *The Pearl Fishery* remains in abeyance owing to the almost complete absence of pearl oysters of any age upon the banks. Here and there, as usual, occasional individuals have been found during the partial inspections which are alone possible pending the re-commissioning of the *Lady Nicholson*. The cost of these and of the upkeep of this vessel amounted in the year under notice to Rs. 8,488-7-9. As Baron Von Imhoff once remarked in a review of the Ceylon administration, "There is more of glitter than of gold about the Pearl Fishery." According to a calculation of probabilities which I made some years ago, we cannot expect another pearl fishery for another 4 or 5 years.

27. *Fishery Vessels*.—During the past year an order was placed for two twin Gleniffer engines each of 60-75 B.H.P., for the re-engining of the *Lady Nicholson*. These have now arrived and will be installed shortly. Thanks are due to the Ministry of Agriculture and Fisheries in London for the kind assistance of their expert in arriving at a satisfactory choice of engine. The *Sutherland*, *Pearl* and *Leverett* have all done good service in the chank fisheries, particularly in the towage of chank divers' canoes to and from the beds: the *Leverett* was especially useful in this way and her services obviated the employment of a hired tug during the Rameswaram fishery, a saving of approximately Rs. 4,000. This however was possible only because of the small number of canoes engaged in the fishery. Had a normal number been employed, a more powerful towing launch would have been a necessity, and the extra profits made would have far exceeded such an expenditure. The *Leverett* is now undergoing alterations which should improve her sea-going qualities. All the above vessels are in good condition, but it is probable that the *Sutherland* will have to be replaced by another and more powerful launch within the next two years, as both her hull and engines begin to show the effects of old age.

The purchase of a sea-going launch capable of being used not only for towage but also in commercial fishing experiments aiming at the introduction of new methods, is under the consideration of Government.

One of the results of my deputation to Scandinavia already mentioned, was a strong recommendation to Government to arrange for exhaustive trials of the Danish seine to be carried out by the Assistant Director of Fisheries (Marine) in selected localities on the Madras coasts. I was particularly impressed with the great catching power of these nets and their apparent suitability for the conditions on certain parts of this coast. They are operated from large motor cutters, provided with motor winches for reeling in the net ropes and for automatically coiling them away. On my suggestion Lieut. Allan was deputed to investigate the details at Esbjerg in Denmark, where this method of fishing was developed. He has reported most favourably on the nets, but is of opinion that the cutters in use in Denmark are not suitable for use under tropical conditions. I hope that the next annual report will chronicle the successful introduction of this powerful net to Indian waters. I may add that recent fishery advices from England mention the success of Danish cutters using this form of seine in competing with the work of steam trawlers. The latter are much more expensive to operate in every way and the former have the advantage of landing their catches generally in better condition than the trawlers. As a consequence, these Danish vessels are able to sell their catches at considerably lower prices than the trawlers. Such boats or a modified type suitable for our somewhat peculiar conditions, seem to me likely to solve the difficulty of how to increase Indian fish supplies. A type of boat suitable for the purpose if built in India should not cost more than Rs. 20,000 fully equipped, a figure that compares most favourably with the Rs. 1,50,000 or more involved in the purchase and equipment of a modern steam-trawler.

MARINE BIOLOGIST'S SECTION.

28. The headquarters remained at Tuticorin as in the preceding year. Work also proceeded upon the same lines. On the research side, the Marine Biologist devoted himself mainly to a continuation of the enquiry into the species of mullets (*Mugilidae*) found at Tuticorin, to an investigation of the rate of growth among the fishes living in the Silavatturai backwater, to statistical work on the prawns found in the same area, and to the collection of plankton. Upon none of these subjects has a report been furnished, but that upon the mullets is promised for an early date. This should prove of considerable practical value, for at present several species are extremely difficult to differentiate at sight, and as a consequence, there is always some uncertainty in the stocking of fresh water tanks with mullet fry, for certain species readily adapt themselves to a life in fresh water, while others are unable to do so and die off

quickly. Hence the necessity to be able to distinguish readily the species that are tolerant of a fresh water habitat from those which are not. (See remarks on tank stocking with mullet in the Piscicultural section.)

During the year, the Marine Biologist paid visits to a number of coast centres, for the purpose of collecting information and material, while Sub-Assistant M.R. Ry. S. Ramaswami Ayyangar took advantage of the resumption of the annual Laccadive inspection, to accompany the party and thus to obtain further knowledge of the economic possibilities of the islands in respect of marine products. His report is awaited.

The supply of zoological specimens for teaching and exhibition purposes continued to expand, the total receipts amounting to the comparatively large sum of Rs. 3,131-4-0, compared with Rs. 1,608 in the preceding year 1919-20. Comparison is difficult however as last year's figures have been unduly swollen by reason of great increase in the cost of glassware. This, while giving a fictitious idea of rapid progress, restricts sales as the increased cost has to be charged to the buyers; it is hoped that more normal conditions will soon return in the glass trade, and so permit of more real progress being made. The estimated cost of the specimens sent out, including the salary of the Sub-Assistant in charge, amounted to Rs. 2,974-15-9, showing a margin of Rs. 156-4-3 on the credit side.

This work of zoological supply was begun in 1915 by the present Director, who was induced to make this departure by a consideration of the difficulties till then hampering the study of Zoology in Indian colleges. Until then students to a large extent relied upon a study of text-book figures and had little or no familiarity with the animals themselves. They could describe a sea-anemone or a holothurian with exactitude, but would fail to recognize either if they saw them alive in a rock pool on the sea-shore. In the rare instances where more thorough work was done, attention was concentrated either upon land and fresh-water types as more readily procurable, or limited supplies of material were obtained from European Biological stations. The fact that zoological study was hopelessly fettered for want of supplies that lay abundant to hand in our waters, so impressed me at an early date in my fisheries duties that I sought and obtained the permission of Government to begin the supply of zoological specimens to educational institutions throughout India, at rates calculated just to cover the cost of preparation. A clear idea of the utility of the work and of the estimation in which it is held by colleges and schools throughout the length and breadth of India is obtained by an examination of the

value of the specimens supplied during the six years since its inception, viz. :—

		RS.			RS.
1915-16	...	360	1918-19	...	1,258
1916-17	...	576	1919-20	...	1,608
1917-18	...	736	1920-21	...	3,131

The continuous rise in the annual value of the supplies bespeaks not only increasing appreciation by the educational world of India, but also a greatly widened and more solid foundation of the zoological training now current in our colleges.

The improvement of school museums throughout the Presidency is also one of the aims of this branch of our activities. In very few instances are existing school museums of any real educational value; especially is this true of natural history exhibits. If the school be in a coast town, a jumble of unnamed shells, with odds and ends of the flotsam and jetsam of the sea, offends the eye of the zoologist by reason of its utter uselessness. No possible educational value can attach to a collection of shells gathered haphazard and exhibited without order or explanation. To afford remedy in part for this unsatisfactory state of affairs in secondary schools, I arranged some years ago for the preparation of compact wall cases containing named selections of typical Madras shells. The Director of Public Instruction warmly approved of the scheme, and promised to order a large supply of these collections provided that a descriptive hand-book be prepared. It was difficult to find time in which to write such a description, for nothing of the kind has hitherto been attempted, but I have now completed the task and the report is in the hands of the printer. I hope shortly to complete a companion work on South Indian crustaceans to illustrate a typical collection of our common crabs.

This supply work benefits the whole of India; indeed it is the colleges in the north of India that take chief advantage of the facilities provided. In these circumstances it would appear fitting that the Government of India should be asked for a contribution towards the development and extension of an educational service that has unanimous approval and support from practically every college in India where zoology is a subject of instruction.

His Excellency Lord Willingdon, Governor of Madras, accompanied by Her Excellency Lady Willingdon, honoured the Tuticorin Biological Laboratory with a visit on 31st October 1920; the various collections were shown to them and the scope and nature of the current investigations explained.

29. *Krusadai Island Biological station* progressed during the year. With the exception of the main building which still requires

roofing, all the others were completed; this station is ideally situated for biological investigation, as the island is margined by a fringing coral reef with a rich mud-bank fauna within a mile distance on the north side and deep water, characterized by profuse and diversified bottom life, adjacent to the south beach. The completion of the buildings will mark the realization of the hopes of all zoologists who have had the privilege of pursuing their studies on the coast of South India. They will also provide useful headquarters for the Department's Fishery Inspection vessel, as the anchorage in front of the station is the best and most sheltered of any along the south-east coast, with the added advantage of central position, being midway between our chank fisheries in the Gulf of Mannar and Palk Bay.

MADRAS MARINE AQUARIUM.

30. The aquarium on the Marina continues to maintain its claim to be among the foremost popular resorts in Madras; the extra expenditure authorized by Government for the purpose of adding to its amenities and attractiveness has again been justified by a maintenance of the phenomenal increase in attendance and gate money which occurred when it was transferred to 'Fisheries' as shown below:—

	1918-19.	1919-20.	1920-21.
Number of visitors ...	96,957	163,517	161,699
	RS.	RS.	RS.
Admission money ...	3,783	9,380	9,772
Expenditure ...	2,064	4,861	4,993
Profit ...	1,719	4,519	4,779

To this profit has to be added miscellaneous receipts amounting to Rs. 130 and the value of the guide-books and other publications sold, amounting to Rs. 231-10-0. The Pongal festival again gave the highest attendance, as many as 4,963 visitors having paid for admittance on Kannu Pongal day, as against 4,104 in the preceding year. Among the distinguished visitors during the year was His Royal Highness the Duke of Connaught, who was accompanied by His Excellency Lord Willingdon, on 12th January 1921. The Hon'ble the Minister for Development, who takes a great interest in the success of the aquarium, has also paid several visits of inspection.

Improvements effected comprised the construction of a small laboratory room for the use of the officer in charge, and of further additions to the electric lighting of the tanks and of an electric signboard at the commencement of the pathway to the building.

The tank lighting improvement consisted of the installation of two shaded lights in front of each tank, in order that the paintings and legends in the frames along the upper margin of the tank front should be visible during the evening illumination. The practical utility of the two latter improvements is shown by the fact that the evening attendance rose from 7,742 (receipts Rs. 1,938-6-0) in the year 1919-20 to 10,429 (receipts Rs. 2,584-13-0) in the past year.

The construction of a filter well at the margin of the sea to improve the quality of the water in circulation was commenced.

The sale of the second edition of the Aquarium guide, priced at 2 annas, continued slow, only 637 copies being sold till 16th December 1920. On a representation to Government of the advantages of stimulating the interest of the general public in the life of the common fishes of our seas, Government were pleased to authorize a reduction in price to the more popular one anna; immediately sales rose and during the next six months over 2,000 copies were sold, the total for the year being 2,913 copies. A third edition will shortly have to be issued. To cater for the non-English reading public, an edition in the vernacular (Tamil) has been prepared, and was placed on sale on 21st July 1921.

31. *Research.*—Mr. S. T. Moses, the Sub-Assistant in charge, took up fresh subjects for investigation during the year—the anatomy of the ocellated Sea-Hare (*Notarchus*) and the habits of the paddy-cutting crabs. The latter is a subject referred to Fisheries by the Agricultural Department, who seek a means to diminish the damage caused in certain places by this pest. Unfortunately the demands made upon his time by routine duties and by teaching work in connexion with the training of probationary fishery inspectors at the Ennur Institute have seriously restricted the time available for such researches.

32. *Museum specimens.*—The same Sub-Assistant undertakes the preparation of Museum exhibits of Madras crabs and other large crustacea. A considerable number of specimens were despatched to various colleges and museums; the profits on these have hitherto been credited to the Tuticorin Biological Laboratory, but should properly be shown under aquarium receipts.

INLAND PISCICULTURE.

33. This section progressed most satisfactorily during the past year and has given excellent results both on the research and development sides. The four Assistant Inspectors sanctioned by Government in April 1920 were duly appointed and they have undergone an extensive course of training in the theory and practice

of pisciculture during the past year. I placed the Ennur station at the Assistant Director's disposal for this purpose, and it bids fair to form the nucleus of that training institute so greatly needed for the instruction of the department's subordinates. The present students, besides pisciculture, have had instruction in elementary zoology, and in surveying, levelling, account keeping and office routine. Such trained men should enable the department to make more rapid and thorough progress on the piscicultural side than has been possible in the past.

34. *Tank acquisition and stocking.*—In accordance with my programme initiated two years ago, these operations are now being taken up systematically, district by district. During the past year possession was obtained of the 135 tanks acquired under Government sanction from the District Boards of Nellore and Chingleput. Stocking was duly carried out and it is satisfactory to find that in the case of the fishery sale of those tanks attended by the department's officer specially deputed to this work, the revenue obtained amounted to Rs. 2,849 against compensation payable of Rs. 1,066-8-0. Those sales which could not be attended, on the other hand, brought in a total of only Rs. 7,855-4-0 against compensation payable of Rs. 8,101, a fact that emphasizes the need for the department's officers to be present at all auctions, as they only have direct interest in ensuring that there be healthy competition among bidders, and in refusing bids which are obviously inadequate. The rentals of a number of tanks and channels in the Coimbatore district supplied from the Cauvery and Bhavani rivers were also provincialized during the year (G.O. Mis. No. 520, Development, dated 5th April 1921) as from 1922-23, and an annual compensation of Rs. 1,893 assigned to the District Board in consideration thereof.

The total revenue derived from the fishery sales of all inland waters under our control amounted during the past year to the handsome figure of Rs. 90,484-3-0 as against compensation payable to district boards of Rs. 55,959-14-0. These figures compare with rentals realized in 1919-20 of Rs. 75,956-3-6, and compensation payable of Rs. 44,946-14-0. The increase in revenue and in profit from this source is most gratifying and betokens the intrinsic value of the department's operations in this promising field of work.

The district of Ganjam has been surveyed during the past year, and a scheme for the acquisition of the fishing rights in its principal tanks and streams is under preparation.

35. *Fish farms.*—During the year the three established fish farms at Sunkesula (Kurnool), Ippur (Nellore) and Perambur continued their work satisfactorily. It is unnecessary to go into details as the work done there has now settled into routine, and to give particulars would merely be to recapitulate the paragraphs in last year's report.

The difficulties experienced at the *Sunkesula farm* increase, partly because of the restricted area of the ponds available now that our operations have increased beyond all original expectations, and partly because of the high cost entailed by the pumping operations necessary to keep the ponds properly supplied with fresh-water during the hot weather. It has become necessary to find a site where operations can be carried on both more extensively and more economically. Unfortunately the only possible site is one at Mahanandi, in proximity to the temple, and although the temple authorities originally agreed to the construction of the farm, they have lately demurred until the purpose of the farm is clearly defined and certain assurances given that under no circumstances will fish be killed at the farm. The matter is under negotiation.

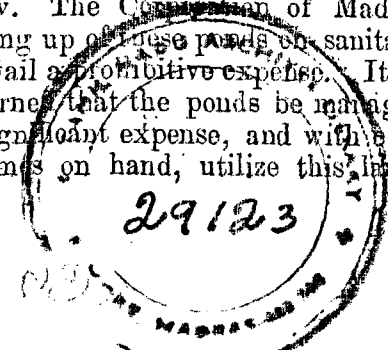
As in previous years the market at Kurnool was supplied with fish reared in the Edurur swamp: 595 lb. of Murrel and 774 lb. of Carp and other fish were thus distributed.

The stock of Gourami at Sunkesula continued to do well, and bred twice during the year. *Etroplus* also bred prolifically, and the fry were extensively distributed to various tanks.

36. At the *Ippur farm*, the few *Etroplus* introduced during the previous year multiplied exceedingly, a result due to the provision of special facilities for them to nest. Their fry have been distributed to the irrigation tanks under our control in the Nellore district. A large quantity of *Haplochilus* was also supplied from this farm for antimalarial stocking purposes, to the officer in charge of the Station Hospital at Secunderabad.

None of the Gourami bred at Ippur, and it appears certain that some conditions are adverse. I have suggested that perhaps the ponds are too large, as this fish breeds freely in quite small ponds at Perambur and Sunkesula. This modification will be tried next season.

37. The *Perambur farm*, where both Gourami and *Etroplus* breed freely, has now become too small for our operations. Another site was sought and has been found in the extensive borrow pits at the Government brick-fields at Chetpat, which hold permanent water and are otherwise eminently suitable for our requirements. The Chief Engineer to Government has kindly placed several of these ponds at our disposal, as the site is shortly to be abandoned owing to the exhaustion of the available clay. The Corporation of Madras appear to have pressed for the filling up of these ponds on sanitary grounds, a procedure that would entail a prohibitive expense. It is therefore in the interests of all concerned that the ponds be managed by 'Fisheries', as we can, at insignificant expense, and with considerable advantage to fishery schemes on hand, utilize this large



area for the culture and distribution of food fish, fry and larvicidal fishes. When the ponds are cleaned out and remodelled, it is proposed to transfer the Perambur fish-farm operations entirely to this centre, where supervision will be easier and the area of culture-water many times increased. Proposals will shortly be submitted.

38. *Prema larvicidal fish-farm*.—The two ponds at this centre continued to provide large supplies for stocking the Nallamalai waters. During the year under report all permanent waters in the Bairluti, Pecheruvu and Gundalakamma ranges and one spring in the Chelma range were stocked with larvicides. An extension of the ponds has become necessary to meet the increased volume of operations. Plans and estimates for these have been prepared.

39. *Acclimatization*.—This work proceeded as in the year preceding, but on a larger scale. *Etrophus suratensis* bred prolifically in all our three fish-farms, and its wide distribution to inland waters should soon make it well known in places where none existed a couple of years ago. This result emphasizes the value of biological research, for it was not till the life-history of this fish had been fully investigated, that we were able to provide the breeding fish with nesting places suitable for its peculiar requirements. The stock of Gourami is steadily increasing at Sunkesula and Perambur and it will soon be possible to utilize its fry in considerable numbers for stocking purposes.

The use of the fry of certain species of Mullet, begun in 1919-20, has been largely extended. Samples of the fry employed for this purpose, kept under observation in the Ippur fish farm, were found to have grown from sizes ranging between 2 and $5\frac{1}{2}$ inches in length, to 8 and 11 inches within a period of ten months, in June 1920. In the year now closed these same fish attained sizes ranging between 15 and 16 inches in length. Mullet that can be acclimatized to fresh water have many other advantages besides rapid growth. Their fry are extremely abundant in estuaries; they are easily captured and transported; they are chiefly vegetarian in diet and are esteemed highly as food, fetching better prices, weight for weight, than coarse tank fishes.

The valuable carp, *Catla catla*, is another fish that will repay effort to extend its area of distribution south of Madras where it does not naturally occur. Difficulty had been experienced in finding its breeding places and the haunts of its fry. Recent research has been successful in locating abundance of fingerlings in the Colair lake region and a proposal for establishing a fishery station in Colair lake is now under preparation.

40. *The Hilsa Hatchery* at the lower anicut could not be operated in 1920 owing to the lack of ripe fish. Attention was therefore concentrated upon a search for fry and young fish. Considerable success was achieved, young hilsa, between 57 mm. and 75 mm., being captured for the first time in channels above the anicut. Another set, ranging between 92 mm. and 130 mm., was secured from other channels. A study of the scales of hilsa has been commenced by Mr. Sundara Raj with a view to determine the age of breeders and the time the young spend in fresh water before going down to the sea. Considerable progress has been made and already several generally accepted preconceptions have been found erroneous.

41. *Incomplete schemes*.—The fish farm at Mopad is nearing completion. Stocking operations will probably commence within the next few months. The Kanigiri-Duvvur scheme was sanctioned for an experimental period of three years in May 1919, but so far the detailed plans and estimates have not been received from the Public Works Department.

The Chingleput and the Vellore moat schemes are two projects important both from the sanitary and the piscicultural standpoints. In each case, a considerable population lives within the fort and has suffered much from malaria in the past. In the case of Chingleput construction work was started during the past year, while at Vellore preliminary work was done in the clearing out of the masses of water hyacinth that choked the moat. The clearance of these weeds has, as at Chingleput, already yielded results mitigating largely the former mosquito plague, but no permanent good will result till the works be completed and the moat stocked with fish suitable for keeping down the growth of vegetation and for destroying mosquito larvae.

42. *Research*.—Owing to the restriction of practical work in several directions due to financial stringency, more time than usual was available for the investigation of the life-histories of food fishes. Considerable progress was made, as already mentioned, in the study of the early stages of hilsa; the nesting habits of the Gourami were further studied and also the breeding habits of two of the largest catfishes found in the Cauvery (*Macronis aor* and *M. seenghala*).

Encouragement has been given to others working on the same lines, and I am glad to record that Mr. N. P. Panikkar, F.L.S., Inspector of Fisheries, Travancore, and a former student of this department, has furnished a valuable and interesting account of the breeding habits of the two species of *Etrophus* found in Travancore. With the sanction of the Madras Government, this most useful paper has been published as a constituent report (No. 5) of Volume XII of our Fisheries Bulletin. It is indeed encouraging to find valuable

research work of high economic importance being done by men whose training has been received wholly in India. I refer especially to the investigations of Messrs. Sundara Raj, N. P. Panikkar, S. T. Moses and M. Ramaswami Nayudu.

SOCIO-ECONOMIC SECTION.

43. *Co-operation*.—(a) At the beginning of the year there were 47 fishermen's co-operative societies, including two productive societies, with a membership of 2,827. Of these forty-one were on the west coast and six on the east coast. Their number rose to sixty-nine at the end of the year and the membership to 3,541 (fifty-six being on the west coast, and thirteen on the east coast). The paid-up share capital of these societies also rose from Rs. 49,232 to Rs. 66,585 and the loans disbursed from Rs. 1,17,520 to Rs. 1,69,103. The two productive societies, viz., the Melady and Madapalli fish-curers' co-operative societies referred to in last year's report, were registered during the year but have not started work as the fish-curing yards in these two villages have not yet been opened. Four other societies which have been registered also remain to be started. The following table contains the more important figures relating to the working of these societies :—

	1918-19.	1919-20.	1920-21.
Number of members {males females	1,644 256	2,446 381	3,099 445
Total ..	1,900	2,827	3,544
Number of shares	2,438	3,832	4,875
Paid-up share capital	Rs. 25,388	Rs. 49,232	Rs. 63,585
Loans disbursed	40,511	1,17,520	1,69,102
" for payment of prior debts	8,735	17,866	26,318
" for industrial use	..	26,410	61,783
Loans due to the Central Banks and other depositors.	4,714	27,994	18,253

(b) The total borrowings of societies during the year 1920-21 amounted to only Rs. 7,410. At the end of the year the balance of loans due to Banks and others was Rs. 18,253. Of these Rs. 10,050 is the amount due by the Mangalore Guano Factory owners' co-operative society. This society did little or no business during the year and a commission of Rs. 99-4-4 collected was the only income it derived. The decrease of business is due to the failure of sardines during the year and also to want of experience and interest on the part of the office-bearers to carry on the business in a properly organized manner. The Co-operative and Fisheries Departments have jointly formulated a scheme for the better working of this society but it has not yet been accepted by it.

(c) The Thalayi Fish-Curers' co-operative society was not able to carry on joint sale for want of experienced men to manage its business, and as they could not utilize their paid-up share capital for this purpose, they have resolved to give this amount as loans to the members for their individual business till they gain some experience in the fish trade. It nevertheless collected a commission of Rs. 225-7-5, on the fish sold individually by the members and also refunded Rs. 512-11-9 towards the cost of the site acquired and of the building which Government put up for its use.

(d) The society of Uppalavadi has purchased a plot of land for Rs. 1,050 with the help of a loan from the Central Bank and secured a licence from the Cuddalore Municipal Council for opening a fish market thereon. This will not only enable them to get proper prices for their fish but also bring in a rent of about Rs. 40 per mensem. This is a noteworthy instance of a very humble, illiterate, and backward community who have improved their economic condition and status in a substantial manner by co-operation, though it is only two years since their society was started.

Another interesting society is the one organized for the stipendiary students of the Fisheries Training Institute.

On account of the slackness that prevailed in some of the societies, it was found necessary to consolidate them rather than to increase their number by starting others. There were also factions in a few of the villages which prevented the smooth working of their societies. Most of them have nevertheless worked satisfactorily making due allowance for the inexperience and illiteracy of the great majority of the members.

44. *Education.*—The Training Institute at Calicut continued to progress satisfactorily. Twenty-four pupil teachers were under training. Besides undergoing instruction in the syllabus subjects (except carpentry) they were given opportunity by means of frequent excursions to acquire practical knowledge of the principal methods of fishing and curing as practised on the west coast, including canning, smoking and the like.

Three canoes fully equipped with fishing gear were available for their use; they were regularly sent to sea in batches several times a week during the fair weather period to gain first-hand experience. The Headmaster is to be congratulated on the good progress made by his pupils.

45. *Village schools.*—The number of these schools rose from 20 to 28. Of these fifteen are day and thirteen night schools. The number of pupils rose from 929 (565 day and 364 night) to 1,385 (930 day and 455 night) and out of this total 285 were girls. The number of teachers employed by the department was 38 in the day

schools and 23 in the night schools. As in the previous year most of the new schools were started and worked by the villagers themselves for several months, and were taken over by the department only after being satisfied of the need for such schools in these localities. Similar applications were received from several other villages for the opening of schools, but on account of financial considerations no action was taken. Most of the schools are accommodated in temporary sheds or other unsuitable buildings and much inconvenience is felt for want of proper buildings. All the schools were inspected in the course of the year by officers of the Fisheries Department as well as by Sub-Assistant Inspectors and Supervisors of the Education Department.

46. *Temperance and other socio-economic work.*—Temperance work made further progress, especially in South Kanara where a large number of fishermen in the Udipi and Mangalore taluks have voluntarily abandoned toddy drinking. In some villages they have gone still further and have adopted objectionable coercive methods in their otherwise laudable desire to encourage thrift; in several instances caste panchayats have even passed resolutions prohibiting members from resorting to tea and coffee shops on the ground that much money is wasted in this way. It is hoped that the officers of the department will exercise their influence against such compulsory sumptuary rules and encourage the men to practise thrifty and temperate habits from conviction and not merely because of orders issued by the panchayat. Compulsory thrift and temperance invite a reaction sooner or later, and I consider that such artificial devices to uplift the working classes of the country should be discouraged. Let education, precept and example be the levers employed.

On the east coast the Assistant Director of Fisheries (Coast) visited several villages on propaganda work, but the results were unsatisfactory owing to the failure of the season and the existence of factions. In future, socio-economic work among the east coast fishermen will be carried on by the Labour Department.

As a result of representations made by this department from time to time, representatives of the fisher communities have been nominated as members upon most of the maritime taluk boards and municipal councils. A few have been appointed Honorary Magistrates and one has been nominated to a seat in the Madras Legislative Council.

General.

47. The conduct of the staff has been generally satisfactory and those at headquarters have my special sympathy owing to the unpleasant conditions under which they have to work. I am glad

to report that the Personal Assistant, Mr. U. Karunakara Menon, duly completed his term of training in co-operative work prescribed by the Registrar of Co-operative Societies, who states that the officers with whom he worked reported in very appreciative terms on his progress and of his keenness and capacity.

Mr. J. A. Fernandez, who acted for Lieut. Allan, Assistant Director of Fisheries (Marine), rose to the occasion and demonstrated the ability of a member of the sea-faring Parawar community for difficult administrative duties. I believe that Mr. Fernandez is the first member of his community to hold a post of such responsibility under Government, and it gives me much pleasure in bringing his services to the notice of Government.

48. The usual statements are appended.

JAMES HORNFIELD,
Director of Fisheries.

Statement I.—Summary of expenditure and receipts of the Fishery Department, 1920-21.

Particulars.	Expenditure.	Receipts.	Difference.
	RS. A. P.	RS. A. P.	RS. A. P.
I. Supervision and Research	1,13,820 14 6	3,645 0 7	— 1,10,175 13 11
II. Marine Fisheries	62,403 9 7	99,416 9 7	+ 37,013 0 0
III. Inland Fisheries	70,255 15 5	90,868 8 10	+ 22,612 9 5
IV. Factories	43,763 9 3	35,489 0 4	— 8,274 2 11
V. Capital expenditure	2,782 11 5	..	— 2,782 11 5
Total	2,93,026 12 2	2,29,419 9 4	— 63,607 2 10

Statement III.—Details of Receipts.

[illegible]

Statement IV.—Profit and Loss account of the Chank and Beche-de-mer fisheries for the season 1920-21.

Expenditure.	Amount.	Receipts.	Amount.
	RS. A. P.		RS. A. P.
Chank Fisheries—		Value of chanks fished—	
Tinnevely	11,158 5 10	Tinnevely	35,883 4 11
Ramnad	18,294 13 2	Ramnad	30,545 11 1
Sivaganga	264 1 0	Sivaganga	268 12 2
Beche-de-mer fishery ..	238 8 1	Beche-de-mer fished ..	58 14 6
Eighth year's proportion of the total consideration paid in 1913-14 for a 15 years' lease of the Ramnad fishery.	4,000 0 0		
Law suits expenses, Messrs. J. B. Dutt & Sons.	1,128 1 6	Chank rentals received—	
Supervision charges, viz:—	8,313 8 0	Tanjore district	4,466 10 4
pay and travelling allowances of Assistant Director (Marine), 50 per cent of pay, travelling allowance and contingencies of subordinate staff.		South Arcot district ..	1,546 2 6
The balance of profit is ..	36,536 2 10	Chingleput and Nellore districts.	1,250 0 0
		Godown rent and interest received from Messrs. J. B. Dutt & Sons.	5,909 0 11
	79,928 8 5		79,928 8 5

Statement V.—List of tanks and canals stocked by the Fisheries Department with the compensation paid and rentals realized for the year 1920-21.

	Fishery rental.	Compensation.
	RS. A. P.	RS. A. P.
1. Singanamalla tank	200 0 0	117 0 0
2. Ellanur tank	100 0 0	...
3. Kamalapuram tank	1,625 0 0	500 0 0
4. Daroji tank	216 10 8	155 0 0
5. Chembarambakkam tank ..	1,650 0 0	2,195 0 0
6. Madurantakam tank	550 0 0	
7. Kandakur Vyasasamudram tank...	90 0 0	200 0 0
8. Rangasamudram	11 0 0	
9. Tippasamudram	11 0 0	
10. Tsadam	8 0 0	95 0 0
11. Peddi Naidu tank...	11 8 0	
12. Markapur tank and supply channel	155 0 0	...
13. Kurnool-Cuddapah canal including three canals	3,811 2 0	2,553 14 0
14. Venkatapuram tank	95 0 0	...
15. Siddapuram tank	18 0 0	...
16. Belegal tank	...	16 0 0
17. Badakan tank	...	...
18. Kocheruvu tank	16 0 0	...
19. Kanigiri reservoir	1,750 0 0	1,755 0 0
20. Gudur tank	120 0 0	...
21. Karedu tank	24 8 0	117 0 0
22. Puduparti tank	...	5 0 0
23. Ippur Kamini tank	...	...
24. Kaveripakkam tank	4,176 10 8	3,789 0 0
25. Dusimamandur tank	2,335 0 0	100 0 0
26. Baruru tank	98 0 0	20 0 0
27. Three tanks under Barur ..	71 0 0	118 0 0
28. Penukondapuram tank	110 0 0	...
29. Panjampatti tank	16 0 0	...
30. River channels in Trichinopoly ..	289 6 0	...
31. Cauvery and Coleroon	62,221 5 8	34,924 0 0
32. Chingleput and Nellore tanks ..	10,704 0 0	9,300 0 0
Total	90,484 2 0	55,959 14 0

Statement VI.—Trading account of the Government Fisheries Cannery, Chaliyam, Malabar, for the year 1920-21.

	RS.	A.	P.	RS.	A.	P.
To stock of canned fish on 1st July 1920 ..	14,756	9	9	By sale of canned fish remitted to Treasury from 1st July 1920 to 30th June 1921.	16,033	3 9
To stock of guano, oil and empty tins, etc. ..	84	8	7	By sale of cured fish ..	86	7 8
To stock of empty tins manufactured at the cannery.	1,914	10	4	By sale of prawn shells ..	17	13 0
				By sale of tin scrap, empty tins, etc. ..	27	1 0
				By sale of tin scrap, empty tins, etc. ..	77	0 0
To cost of solder, tin-plate, empty cans (imported), tin and manufacturing sundries used.	13,174	10	7	By sale of fish oil ..	45	3 2
To cost of fuel ..	1,017	11	5	By sale of pit manure ..	49	4 1
To cost of fish used for canning and curing ..	2,405	6	8			
To cost of condiments and packing oil ..	1,379	13	9	To amount collected and remitted into Treasury against the previous year's sales.	1,784	13 2
To cost of sundry miscellaneous stores ..	184	4	1	To amount collected in advance and remitted into Treasury against future orders.	17	11 0
To cost of salt and preservatives ..	65	3	5			
To cost of packing materials ..	415	12	0	By value of canned fish, etc., sold but proceeds not remitted to Treasury on 30th June 1921.	15,404	9 1
To cost of labels and rubber rings ..	234	13	0	By value of manufactured goods on hand on 1st July 1921—	2,024	15 1
Wages of temporary staff and extra labour; 50 per cent only debited.	1,981	14	7	Canned fish ..	23,778	14 10
Railway freight ..	1,649	2	11	Guano ..	112	0 10
				Tin scrap and empty tins ..	1	8 0
Gross profit (transferred to Profit and Loss Account).				Fried oil ..	6	0 9
				Fish oil ..	18	0 0
				By value of empty cans manufactured at the Cannery on hand on 1st July 1921.	2,244	3 0
					26,160	10 3
					43,590	2 10

Statement VII.—Profit and Loss account of the Government Fisheries Cannery, Chaliyam, for the year ending 30th June 1921.

	RS.	A.	P.		RS.	A.	P.
To pay of permanent staff, viz., Manager, Sub-Assistant, Mechanic, Canning overseer, three clerks and one peon (50 per cent only debited).	4,816	9	6	By gross profit transferred from Trading Account.	4,374	9	9
To service stamps ..	505	12	0	Loss	1,878	14	11
To depreciation and interest at 10 per cent (13,680—1,368 + Rs. 2,000 at 10 per cent).	1,431	3	2				
	6,253	8	8		6,253	8	8

Statement VIII.—Trading account of the Tanur Experimental Station for the year ending 30th June 1921.

Particulars.	Amount. Rs. A. P.	Total. Rs. A. P.
To stock of cured fish on hand on 1st July 1920.	243 4 0	
To stock of fish guano on hand on 1st July 1920.	214 7 3	
To stock of fish oil and foots on hand on 1st July 1920.	442 5 2	
To stock of prawn shells on hand on 1st July 1920.	36 11 1	
To stock of pit manure ..	136 8 0	
To stock of expendible stores, e.g., salt, fuel, etc.	996 6 0	
	2,059 9 6	
To charges (1st July 1920 to 30th June 1921).		
Establishment (temporary) wages (only 50 per cent debited) Rs. 929-14-7.		
Wages for coolies on muster rolls and overtime bills Rs. 798-1-10.	1,728 0 5	
To cost of fish for curing ..	3,241 11 6	
To cost of fish for oil and guano operations.	408 4 0	
Fuel ..	166 6 5	
Saw dust ..	1 15 0	
Packing materials ..	346 10 8	
Railway freight on cured goods ..	596 12 6	
Petty cart and carriage ..	368 7 1	
Sturdy stores ..	184 6 6	
Salt and preservatives ..	61 10 4	
Miscellaneous ..	223 9 6	
	7,315 13 6	
Total ..	9,385 7 0	
To gross profit ..	425 8 4	
Total ..	9,810 15 4	
Particulars.	Amount. Rs. A. P.	Total. Rs. A. P.
By sale of cured fish remitted into Treasury from 1st July 1920 to 30th June 1921.	5,803 7 3	
By sale of fish oil and foots ..	386 15 2	
Do. fish guano ..	497 3 10	
Do. prawn shells ..	151 14 2	
Do. pit manure ..	146 8 0	
Do. fish meal ..	77 10 6	
Total book adjustments ..	1,541 1 5	
	8,403 12 4	
Deduct outstanding shown in 1919-20 accounts.	1,193 5 3	
	7,410 7 1	
By value of stock on hand on 1st July 1921—		
Cured fish ..	130 15 0	
Fish oil and foots ..	177 0 0	
Prawn shells and fish manure ..	9 9 0	
Fish guano ..	198 15 0	
Expendible stores, e.g., salt, fuel, packing materials, etc.	940 13 0	
	1,487 4 0	
By value of goods sold but not realized on 1st July 1921.	..	913 4 3
Total ..	..	9,810 15 4

Statement IX.—Profit and Loss account of the Experimental Station, Tanur, for the year ending 30th June 1921.

Expenditure.	Amount. Rs. A. P.	Receipts.	Amount. Rs. A. P.
To rent due for Bangalore stall ..	..	By collecting charges ..	..
Do. Cannanore yard ..	..	By rent for Cannanore yard due ..	..
To rent paid for ..	..	By miscellaneous receipts—	..
To postage charges ..	..	Sale of coconuts, etc., Rs. 384-12-11 ..	..
To coconut plantation maintenance charges ..	..	Other receipts Rs. 208-8-6 ..	..
To pay of permanent staff (50 per cent) ..	..		
To depreciation on value of plant and machinery ..	..		
Rs. 2,681-14-5 + 323-3-5 + 1,419-9-6 = 4,424-11-5 at 10 per cent.	..	By gross profit transferred from Trading account ..	..
			914 2 4
			425 8 4
		Net loss ..	1,339 10 8
		Total ..	1,475 10 4

N.B.—No supervision charges have been included in the statement as the Honorary Superintendent has relinquished his control of the station.

Order—No. 2142, Development, dated 17th November 1921.

The Government have read with interest the administration report of the Fisheries Department for the year 1920-21. The Government consider that the results of the year were perhaps not so encouraging as a perusal of the report might suggest. Certain schemes originally included in the departmental programme have proved under present financial conditions too costly to justify pursuing them further and this has been recognized in orders recently passed. In the case of certain other experiments, the principal of which is the cannery, the experience of the year has been the reverse of promising.

2. *Industrial section.—The experimental Cannery, Chaliyam.*—In paragraph 9 of the report the Director refers to the necessity of removing the cannery to a better site. The Government have decided that it is desirable to take this step after a suitable site has been found and as soon as the necessary funds can be allotted.

The cannery is reported to have worked at a small loss of Rs. 1,878-14-11. This figure is arrived at after crediting to the year's revenue two-thirds of the value of unsold products, and this, the Government believe, is a correct method of commercial accounting. They understand, however, that purchasers for these unusually large stocks of canned goods are not yet forthcoming, and that the unsold stock has since increased. Unless a market for this stock develops, it is clear that the actual loss on the year's working will be much greater than that appearing in the report. It also seems likely that these conditions will repeat themselves in the year 1921-22.

The question of this cannery has recently received much attention from the Government. The management appears to have been satisfactory enough so far as its efficiency in small scale production is concerned, but from the financial point of view it cannot be regarded as anything but discouraging. The Government are convinced that if pioneering efforts are to be followed by private enterprise, it is essential to demonstrate not only efficiency of manufacture but the possibility of regular profits. It is hoped that the reconstruction of the cannery on a more suitable site together with more attention to the selling part of the business may demonstrate this possibility. The cannery has been peculiarly affected by the fact that the local demand for its products was largely a war demand, and it was unprepared with any selling agency sufficient to meet changed conditions.

3. *The Tanur Experimental station* also showed a small loss during the year, but this is a minor matter. These experimental stations are not necessarily intended to show a profit.

4. *Public fish-curing yards*—Paragraph 15 of the report.—The question of the policy to be adopted in respect of the compulsory

introduction in Government yards of the hygienic methods of fish-curing originated by Sir Frederick Nicholson, has also recently received much attention from the Government. Political disturbances in Malabar are however likely to compel the postponement of the wider introduction of this policy at least for some months.

5. *Sea-fishing experiments*—(a) *With ordinary fishing boats and gear.*—The Government note from paragraph 16 of the report that the experiments known as the inshore fishing experiments in Madras have been of value for scientific purposes. Their main object, however, it is understood, was to demonstrate the possibility of using Malabar canoes and nets on the East Coast near Madras, and the possibility of obtaining larger catches by these methods than do local fishermen through the methods they employ. In this object the experiment has so far been completely unsuccessful. Local fishermen have in fact refused to experiment with these canoes and nets except on condition that they shall be permitted to fish within the Madras harbour, a concession not ordinarily allowed to fishermen. It appears moreover that successful fishing within the harbour would demonstrate nothing of value regarding the utility of the canoes and nets under ordinary conditions.

A similar history has attended the experiment with the Ratnagiri boats known as Machwas on the Malabar coast. This experiment was temporarily discontinued during the year under report, and it has since been decided to give it one year's further trial. The results of these experiments must be deemed to be rather unsatisfactory in that they have not yet succeeded in persuading fishermen on any part of the coast to adopt any change in fishing methods: nor has the department itself been able to demonstrate the fact that larger catches can be secured by any methods that they advocate.

(b) *Larger scale experiments.*—To the same general branch of experiment, that of improved methods of sea-fishing, but to a separate section of it, belong projected experiments in what may be termed 'capitalistic' conduct of fishing, i.e., experiments in vessels of such a size that they would be beyond the means of any ordinary fisherman, though in some cases quite possibly within the means of the master-fisherman or a group of master-fishermen. The question has long been debated whether the Madras Government should experiment in this connexion with a steam trawler. It has now definitely been decided not to embark on this experiment, the cost of which would now be very great. The Bombay Government, it is understood, is making such an experiment, the results of which will doubtless shortly be available.

In paragraph 27 of his report the Director refers to a proposed experiment with a motor-driven launch using a Danish seine. The Government have now decided to accept this recommendation and to experiment on these lines.

6. *Pulicat Oyster farm.*—The Government note with satisfaction the improved results from the farm during the season.

7. *Chank fishery.*—The Government are aware that they must expect a much reduced profit on the chank fishery during the current and some succeeding seasons owing to the reduction in the price of chanks which is due to economic causes beyond the Department's control. This particular cause did not apparently operate during the year 1920-21 in which the sale price of chanks to contractors was based on a contract entered into three years previously. The large reduction in profits in the year under report is due to a different reason, viz., the much smaller number of shells fished, caused it is believed by

(a) comparative exhaustion of the chank beds and failure to find others equally good, and

(b) constant difficulty about obtaining a sufficient number of divers.

The Government have on the recommendation of the Director endeavoured to meet the latter difficulty by raising the remuneration of divers employed on the Tinnevely coast, which is based on the number of chanks fished. The Director has also promised an investigation into the causes of the fall.

8. *Marine Biologist's section.*—There has been much discussion during the year on the subject of the scale on which this work should be performed, its scientific utility and the probability of co-ordinating it in the near future with any work likely to increase the catches of edible fish or, in other words, likely to result in commercial advantage to the public or to Government. Its scientific utility is not questioned, but the Government have decided after full consideration that the probability of obtaining any commercial results is remote, and for financial reasons they are unable to continue the work on its purely biological side, a matter which belongs more properly to the Zoological Department of the Government of India. The Government have therefore since dispensed with the services of the Marine Biologist on the termination of his two years' agreement, and are continuing only such branches of the department's biological activities as can be performed by a small staff of subordinates under the scientific control of the Director. One of these activities is the supply of zoological specimens for educational purposes to colleges and schools. This work was originated by the present Director when occupying the post of Marine Biologist, and continues to be successfully performed.

9. *Madras Marine Aquarium.*—This institution continues to be popular and profitable. The question of constructing a marine aquarium for purposes of research and education on a much more ambitious scale has long been under the consideration of Government. They have now decided not to proceed with the scheme for the present. Indeed the necessity for such an aquarium is closely

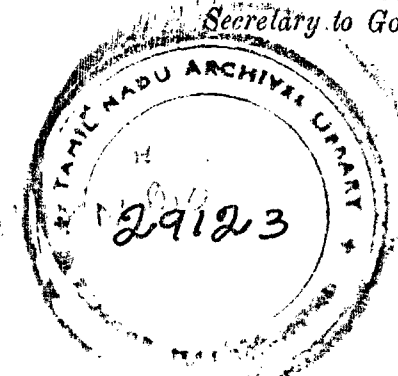
related to the development of biological research discussed in the previous paragraph.

10. *Inland pisciculture.*—The Government agree with the Director that this portion of the department's activities is satisfactory and that it is perhaps the one in which the greatest immediate advance is to be expected. The improvement of breed and quantity of fish in small inland waters presents a problem much easier of solution than the increase of sea catches, and in its nature far less likely to be complicated by the conservatism of the fishing class. It is in fact a question of improving the fish supply while leaving the methods of fishing unaltered, while the problem of sea-fishing is exactly the reverse. The weak point so far in these inland fishing experiments appears to be the difficulty of obtaining an adequate return to the Government for the increased fish supplies made available to the villagers. It is not of course suggested that the whole or the major part of the value of this increased fish supply should return to the Government, but a reasonable percentage of it certainly should do so. Indeed any very large extension of the inland fishing activities is likely to be dependent on the Government income derived from this source. So far, it is believed, villagers or contractors concerned have shown a reluctance to bid for the fishing privileges a much greater sum than they had been accustomed to offer before the tanks were stocked. Some advance is however already apparent in this respect and it is hoped that attendance at sales of the departmental officers recently trained at Ennore will produce a further improvement.

11. *Socio-economic section.*—The Government note that there is a considerable rise in the paid-up share capital of the co-operative societies among fishermen and in the number of fishery village schools controlled by the department. The Training Institute at Calicut continues to do satisfactory work.

(By order of the Government, Ministry of Development)

J. M. TURING,
Secretary to Government.



LIST OF MADRAS FISHERIES BULLETINS ISSUED UP TO DATE WITH THEIR CONTENTS AND PRICES.

BULL. NO.	PAGES
1. PAPERS FROM 1899 RELATING CHIEFLY TO THE DEVELOPMENT OF THE MADRAS FISHERIES BUREAU. BY SIR F. A. NICHOLSON, 1915. Re. 1-14-0. (Pages 237.)	
2. NOTE ON FISHERIES IN JAPAN. BY SIR F. A. NICHOLSON, 1907. (Out of print.)	
3. THE PRESERVATION AND CURING OF FISH. BY SIR F. A. NICHOLSON, 1919. (Exhausted; revised edition under preparation.)	
4. MADRAS FISHERY INVESTIGATIONS, 1908. BY JAMES HORNELL, F.L.S. (Out of print.)	
5. THE PRACTICE OF OYSTER-CULTURE AT ARCACHON AND ITS LESSONS FOR INDIA. BY JAMES HORNELL, F.L.S., 1910, Re. 1-6-0—	
I. Introduction	1-4
II. The physical conditions characterizing Arcachon basin	4-7
III. The origin and development of oyster-culture at Arcachon	7-19
IV. Present methods and conditions	19-74
V. Principal characteristics of other European systems of cultiva- tion	75-79
VI. Applicability of French methods to oyster-culture in India	79-90
6. MARINE FISH-FARMING FOR INDIA. BY JAMES HORNELL, F.L.S., 1915, Re. 1-4-0—	
I. Introductory	1-3
II. French fish-farming at Arcachon	4-20
III. The communal fish-farms of Comacchio	21-52
IV. The scope for marine fish-farming in India	63-83
7. THE CHANK CHANK OF INDIA. BY JAMES HORNELL, F.L.S., 1914, Re. 2—	
Introductory	1-2
I. The chank fisheries of India and Ceylon	3-40
II. The chank bangle industry	41-116
III. The role played by the chank in Indian religion and life	117-172
IV. Appendix	173-181
8. MARINE FISHERY INVESTIGATIONS IN MADRAS, 1914-15. BY JAMES HORNELL, F.L.S., 1916, Re. 1-12-0—	
I. A note on the edible oyster	1-10
II. An explanation of the irregularly cyclic character of the pearl fisheries of the Gulf of Manhar	11-22
III. Notes upon two exploring cruises in search of trawl grounds of the Indian and Ceylon coasts	23-41
IV. Report on the pearl fishery held at Pondi, 1914	43-92
V. Professor Huxley and the Ceylon pearl fishery, with a note on the forced or artificial production of free spherical pearls	93-104
VI. The utilization of conch and shells for lime-burning in the Madras Presidency	105-126

9. FISHERY STATISTICS AND INFORMATION, WEST AND EAST COASTS, MADRAS PRESIDENCY. COMPILED BY V. GOVINDAN, B.A., WITH INTRODUCTION BY SIR F. A. NICHOLSON, 1916, RS. 1-12-0—	
Gives a summary of the numbers of fish-curing yards and fishing boats, the methods of curing fish and a sketch of the economic conditions now existing, etc. (Pages 140.)	
10. ANNUAL REPORTS OF THE FISHERIES DEPARTMENT FOR EACH YEAR FROM 1908-09 TO 1916-17. BY SIR F. A. NICHOLSON, RS. 1-10-0. (Pages 179.)	
11. MADRAS FISHERY INVESTIGATIONS, 1917, Rs. 1-4-0—	
I. The edible molluscs of the Madras Presidency. By JAMES HORNELL, F.L.S.	1-51
II. A new protozoan cause of widespread mortality among marine fishes. By JAMES HORNELL, F.L.S.	53-66
III. A statistical analysis of the fishing industry of Cutchipora (South India). By JAMES HORNELL, F.L.S.	67-117
IV. The Indian oecche-de-mer industry: its history and recent revival. By JAMES HORNELL, F.L.S.	119-150
V. Carp-growing in Germany. By SIR F. A. NICHOLSON	151-160
VI. Note on treatment of swamps, stream beds, ponds, wells, pools, and other mosquito-infested areas for the destruction of their larvae. By H. C. WILSON	161-172
12. MADRAS FISHERY INVESTIGATIONS, 1920, Rs. 4—	
I. Madras Fisheries Administration Report, 1918-19. By JAMES HORNELL, F.L.S., M.S.A.I., As. 5	1-11
II. The Outrigger Canoes of Indonesia. By JAMES HORNELL, F.L.S., M.S.A.I. Illustrated with 35 text figures and 16 plates. Rs. 2-14-0	43-114
III. A Statistical Analysis of an Inshore Fishing Experiment at Madras, 1919. By M. RAMASWAMI NARAYAN, B.A., As. 4	115-133
IV. Reports on the methods of capture and supply of fish in the rivers of the Nilgiri district. By THE LATE H. C. WILSON, As. 4	135-150
V. Notes on the Cichlid Fishes of Malabar, <i>Etiopius surinensis</i> , and <i>H. maculatus</i> . By N. P. PINKHEAR, B.A., F.L.S., As. 4	157-166
13. MADRAS FISHERY INVESTIGATIONS, 1921—	
I. Madras Fisheries Administration Report, 1919-20. By THE HON. MR. AL. V. G. CAMPBELL, C.I.E., C.M.B., I.C.S., As. 4	1-56
II. Remarks on Canning. By SIR F. A. NICHOLSON, K.C.M.B., As. 12	57-126
III. Manufacture of Fish Oil and Chano. By SIR F. A. NICHOLSON, K.C.M.B., Rs. 1-4-0	127-136
14. MADRAS FISHERY INVESTIGATIONS, 1921—(continued)—	
IV. The Fisheries of Norway and Denmark. By JAMES HORNELL, F.L.S., As. 8	1-50
V. The Madras Marine Aquarium. By JAMES HORNELL, F.L.S., As. 6	57-66
VI. The Common Molluscs of South India. By JAMES HORNELL, F.L.S. (In the press)	67-165