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MADRAS FISHERIES DEPARTMENT

THE AIMS AND ACHIEVEMENTS OF
THE MADRAS DEPARTMENT
OF FISHERIES

BY

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MADRAS

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Fifteen years having elapsed since the active work of fishery development in its varied branches was commenced in Madras, it is appropriate that an opportunity be now taken to review concisely the work attempted and the successes achieved.

The aims of the department have grown considerably since its inception by the acceptance by Government in 1907 of the first proposals made by Sir F. A. Nicholson, K.C.I.E., the outcome of two years' inquiries in India, Japan, Europe and the United States. Before summarizing the results of our endeavours, a list of the principal aims which we now conceive should be covered by the activities of the department must be given; they are—

(1) To increase the food-supply of the people by developing both the marine and the fresh-water fisheries of the country to their utmost capacity.

(2) To improve the material and moral conditions of the fisher community by introducing better methods and improved gear, by demonstration to them of the value of thrift, co-operation, education and temperance, and by gradual enlightenment to lead them by degrees to become happier men and better citizens.

(3) To introduce new fishery industries and to develop old ones.

(4) To fight mosquito-borne diseases by the breeding and supply of larvicidal fishes into waters in malarial localities.

(5) To popularize interest in our operations and incidentally in marine and fresh-water biology by means of Public Aquaria, and the publication of popular zoological literature; also to

facilitate the study of zoology throughout India by the provision of zoological specimens suitable for teaching purposes.

(6) To carry on such scientific study of the bionomics of the food-fishes of the Presidency and of the animals on which they feed as our limited means will permit, bearing in mind that our resources must be utilized in the first instance for strictly practical and economic ends.

The practical working out of the above falls under one or other of the following main heads:—Fishery Development, Industries, Technical and Scientific Investigation, Education and Socio-economics.

I.—FISHERY DEVELOPMENT.

The two chief items under this head represent two of the outstanding successes of the department. They are the reorganization of the historic chank fisheries of the East Coast and the stocking schemes whereby our tanks and rivers are made to yield more abundantly. Both are highly profitable directly and these profits in good seasons usually enable a large proportion of the expenses of the department to be met without trenching on public funds. In other words "Fisheries" to a great extent has been a self-supporting department, able to pay its way. With the large and non-productive educational work now initiated, this favourable balance is not likely to be maintained.

The Chank Fisheries are peculiarly profitable. They are old and historic prerogatives of the Crown, worked directly by the Fisheries Department by means of volunteer labour, paid piece-work. The department provides many valuable facilities to the divers free of cost, including towage to the fishing grounds, buoying of the beds, and provision of camping quarters, assistance which considerably increases their earnings and gives them comfort undreamed of in former days. In spite of higher prices paid to the fishermen, the work of the department has resulted in largely increased catches and profits—

	RS.
In 1917-18 these fisheries gave a net profit of ...	39,278
In 1918-19 this rose to	67,580
In 1919-20 to	46,029
A total for these three years of ...	<u>1,52,887</u>

Since the 1919-20 season, owing to unfavourable markets and weather and to transient labour shortage, the profits have been less, viz.—

	RS.
1920-21	36,536
1921-22	8,266

A drastic scheme of retrenchment and reorganization is now being put into operation and already has been successful in overcoming the exceptional difficulties that beset this work during the past two years.

The chank fisheries of Madras are worked off the coasts of the six southern maritime districts on the east coast. The most important are those of Tinnevely and Rāmnād. The former yields from 1½ to 2 lakhs of shells per annum, the latter, leased for fifteen years for the sum of Rs. 60,000 from the Raja of Rāmnād, usually gives from 2 to 2½ lakhs. The smaller fisheries of Tanjore, South Arcot, Chingleput and Nellore are leased by Government to contractors, who make their own arrangements with the fishermen, subject to certain rules. The two fisheries carried on departmentally are now as fully organized as present conditions permit. Their produce is sold in advance by tender on terms generally extending over three seasons. Fisheries Bulletin No. 7 is devoted to a monograph of the chank. A detailed account of the methods adopted to fish the shells is given; the exceedingly ancient and wonderfully interesting industry of chank bangle manufacture is also described and illustrated very fully, while the ethnological importance of the wealth of curious folklore centring round this sacred shell receives adequate attention.

The Pearl Fishery off the Tinnevely coast, which is intimately associated with the chank fishery, bulked largely in importance in ancient days. From causes still obscure but probably connected with changes in the contour line of the coast, the pearl banks have been seldom productive in recent years. In common with the Ceylon Pearl Fisheries, no fishery has taken place since 1908, except a small one at Tondi in Palk Bay in 1914. Historical evidence shows that there have been similar long barren intervals in the past, punctuated by an occasional fishery, hence we inspect the banks periodically in order that when the pearl oysters do re-appear, they may be properly watched and fished at the right time. The result of the long continued observations of the

writer shows that there is little or nothing to be done to obviate the recurrence of barren years. Science in this has been proved helpless in the face of the annually recurring monsoon.

The Fresh-water Fisheries administered by the department rank second only to the chank fisheries in regard to the handsome profit they return to Government. They show continuous yearly increase in the revenue obtained and there is every prospect that this satisfactory feature will continue concurrently with the extension of operations. These fisheries consist largely of waters in which the fishing revenues were assigned to district authorities years ago for local needs. The new owners did nothing to effect improvements, the fishery rents being sold for what they would fetch. The Fisheries Department has now initiated a scheme whereby irrigation tanks and other inland waters are surveyed district by district, and those found suitable are arranged in groups round centres where fish-breeding and rearing are carried on, and whence each year fry are removed in large numbers to reinforce the natural stock in the linked tanks. The fishing rights and revenues in these are being re-acquired gradually by Government, compensation being given on the average revenue of the preceding five years to the local authorities, who now have neither trouble nor risk in collecting this money. The profit made by Fisheries is the difference between the compensation thus paid and the revenue obtained from the fish sales after the working expenses of the annual restocking are deducted. The net profits on these inland fisheries during the last three years have been Rs. 20,573, Rs. 21,331 and Rs. 22,613, respectively. Within a short time from now the operations of this section will be enormously increased, for Government have agreed to the whole of the suitable tanks in the Presidency coming under the department's care eventually. In 1920 they approved of a detailed scheme for the organization of the most important tanks in the Nellore and Chingleput districts, whereby 135 tanks have come directly under the control of the department. The tanks of the Ganjām district have recently been surveyed and before long the whole Presidency will be covered and their inland fisheries set upon a suitable basis.

To render successful this fish-stocking of inland waters much patient research and experiment have been necessary; results have suffered from the lack of any estuarine and fresh-water research

station. In spite of this, notable success has been achieved, particularly with the seththakendai (*Etroplus suratensis*) of the Madras neighbourhood, with the large indigenous carp, *Catla catla*, and with certain of the mullets. The life history of the first of these has been worked out in detail, and it is now being bred regularly and in large numbers in all three of our existing fish farms at Perambur, Sunkesula and Ippur. The value of scientific research is well demonstrated in respect of *Etroplus*; consistent success only resulted when the breeding habits had been ascertained; the secret of success lies in the provision of suitable stone-built breeding refuges where the eggs may be deposited safely in the manner peculiar to this species. This fish is found naturally in estuaries and tanks near the sea-coast. By the efforts of the department it has been acclimatized successfully to waters far inland; Sunkesula is 130 miles from the sea. Similarly with the catla carp. It is numerous in the Kistna, the Godāvāri and the rivers further north, but till some 50 years ago the Kistna formed the southern limit of the distribution. Since the opening of the Cuddapah-Kurnool canal and the stocking of its reaches by this department with fry of this species, the catla has found its way into the river Pennar and is now very common in the Pennar-fed tanks in the Nellore district. Two years ago it was introduced into the great Madurantakam tank in the Chingleput district and this year large numbers were liberated in the Cauvery thereby extending its range still further south. Further extension will be made when the Chingleput Fort fish-farm is in operation.

Other useful acclimatization centres in the distribution of the fry of certain species of mullet from estuaries to inland waters. This is the most recent of our efforts in this direction. The results are very gratifying for fry ranging in length from 2 to $5\frac{1}{2}$ inches have been found to increase in inland tanks to 9 and 11 inches within a period of 10 months.

The successful stocking of the Nilgiri streams with rainbow trout from New Zealand is another demonstration of what is possible when these operations are skilfully conceived. When these streams were first administered by this department, they were, with the exception of some carp and small minnows, devoid of fish life; now they teem with trout bred at the hatchery at Avalanche.

Sea Fisheries.—The development of our sea fisheries by introducing improved boats and appliances has presented greater

difficulty, largely due to the conservatism of the fisherfolk and the difficulty of getting satisfactory teachers and demonstrators. The introduction of methods proved excellent in one locality, into another where those that are indigenous are weaker in catching power, has been tried in Malabar, Tuticorin, Madras and Negapatam. At none was there decided success, but recently both at Calicut and at Negapatam local men have come forward with proposals to take over the boats and gear we have used for the demonstrations. Supervision of actual operations on the fishing grounds has been hitherto in the hands of intelligent but otherwise uneducated men as no educated Indian fishermen at present are available; the material being faulty and lacking in initiative, it is no wonder the results have been unsatisfactory in the main. Neither have these men been able to report intelligibly upon the conditions of the new waters they have worked in. With the recent placing of an order for an experimental sea-going launch to be devoted to the purpose of introducing and testing new methods, this vitally important problem will be attacked in a fresh direction with greater resources than in the past, and with greater concentration of effort. This fishing launch will be manned by an Indian crew who will be taught under the working direction of an experienced European master-fisherman able to report results and to vary the methods according to circumstances.

II.—INDUSTRIES.

Fish curing is an age-old industry in India, but the methods in use are generally primitive and susceptible of great improvement in regard to the flavour, appearance, cleanliness and keeping quality of the products. The chief indigenous method is to salt the fish, usually for one night, followed by sun-drying. Long and patient endeavour to ascertain improvements in methods that are yet inexpensive to adopt has been made by the department, particularly at its Experimental Station at Tanur in Malabar. Here numerous and varied experiments have been conducted with generally gratifying results. To enable the methods thus elaborated to be introduced to the notice of curers and to improve general conditions, particularly in regard to cleanliness and sanitation, six Government fish-curing yards were transferred temporarily from the Salt Department to "Fisheries" over two years ago. Progress in improvement has been slow owing both to the innate and ignorant conservatism of the curers and to factious opposition.

With patience, these obstacles are being overcome; even now there is a notable improvement in the cleanliness of the products of these yards.

Canning.—Experimental work was begun at Calicut in 1911, and transferred later to Chaliyam, 7 miles to the south. Complete success has been attained on the operative side, the quality of the goods packed being, in the opinion of experts, equal to similar European products. Notably is this the case in regard to the canning of sardines, mackerel and prawns; these constitute the bulk of the goods produced. The Indian oil sardine (*Sardinella longiceps*) at its best, is, in my opinion, fully equal to the true French sardine, which is in reality the young of the pilchard. Its oil content is greater than the latter, and this, I hold, is the chief criterion by which to estimate the value of the sardine for canning purposes.

Oil and guano factories.—Prior to the experimental work of the Fisheries Department in 1908, the amount of sardine oil produced on the West Coast was inconsiderable and of the worst possible quality. The usual method was to obtain the oil by the putrefaction of a mass of sardines contained in a worn out and filthy dug-out canoe. It was also a wasteful process, for the proteid and other residue were thrown into the sea. Similarly when fertilizer was made from sardines, the ancient and accepted procedure was to spread the sardines on the sand of the open beach, and so dry them in the sun. This had two drawbacks—large quantities of valuable oil, of no manurial value, were wasted, and the product became so highly impregnated with sand that analysis not infrequently showed the resultant mass to contain as much as 40 per cent of this useless adulterant.

The experiments made by the department had unexampled and swift success. It was found that a simple and quite inexpensive plant could be devised to separate the oil and fertilizer effectively and profitably. The high quality of the oil and fertilizer ("fish guano" as it is now known technically) reacted favourably upon prices, and has rendered this new industry so profitable that literally hundreds of small factories have come into existence. In this case the demonstrations we were able to give were so conclusive financially, that the small capitalists of the West Coast rushed to share in the big profits that were being made by those first in the field. At the close of the 1919-20 fishery year the

difficulty, largely due to the conservatism of the fisherfolk and the difficulty of getting satisfactory teachers and demonstrators. The introduction of methods proved excellent in one locality, into another where those that are indigenous are weaker in catching power, has been tried in Malabar, Tuticorin, Madras and Negapatam. At none was there decided success, but recently both at Calicut and at Negapatam local men have come forward with proposals to take over the boats and gear we have used for the demonstrations. Supervision of actual operations on the fishing grounds has been hitherto in the hands of intelligent but otherwise uneducated men as no educated Indian fishermen at present are available; the material being faulty and lacking in initiative, it is no wonder the results have been unsatisfactory in the main. Neither have these men been able to report intelligibly upon the conditions of the new waters they have worked in. With the recent placing of an order for an experimental sea-going launch to be devoted to the purpose of introducing and testing new methods, this vitally important problem will be attacked in a fresh direction with greater resources than in the past, and with greater concentration of effort. This fishing launch will be manned by an Indian crew who will be taught under the working direction of an experienced European master-fisherman able to report results and to vary the methods according to circumstances.

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number had reached the amazing total of 563. The estimate of their production for the same season was 24,000 tons of fish-guano valued at Rs. 100 per ton, the value of the oil manufactured being about Rs. 3,75,000—the two together amounting to 27¾ lakhs—a wonderful result, which apart from any other success achieved by the department, would alone justify its existence. A further advance has again been made during the past two years whereby it appears likely that much of the material now used as fertilizer will eventually be utilized more profitably as a feeding stuff for domestic animals. Success has already been obtained in producing high class fish-meals from all the common fishes found plentiful on the West Coast, particularly mackerel and sardines. Those who have tried these meals for cattle, pigs, dogs, and poultry speak highly of them when employed in proper proportions with a greater bulk of starchy foods. It now remains to produce them in larger quantities and to introduce them widely to the notice the Indian public. In Europe and America the high nutritive value of these meals is recognized and the fish-meal trade there is assuming large and important proportions.

Soap making.—This industry has now passed from the control of this department but the credit for its successful inception belongs to "Fisheries." The story is worth repeating. In 1913 an oil expert, Mr. A. K. Menon, trained in England under a Government scholarship, was appointed to this department to investigate under the direction of Sir F. A. Nicholson, the character and uses of sardine oil and fish stearine. His work at the Tanur Experimental Station resulted in the production of a fish-oil soap that is now in great demand by tea, coffee and mango planters as a cheap and efficient insecticide. This success naturally led to the manufacture of other soaps from vegetable oils and other fats. When the industry was thoroughly established, the latter branch of the work so overshadowed the former, that it became an anomaly to carry on the work under the Fisheries Department and so it was transferred to the Department of Industries.

Bêche-de-mer.—This minor industry, which consists of the curing of the thick body wall of a species of sea-cucumber (*Holothurian*), had virtually died out some years ago when this department's attention was drawn to its decay. An investigation was made and experiments carried out as detailed in Report No. 4 of Fisheries Bulletin, Volume XI. It now constitutes an integral section

of the department's operations in Palk Bay and affords a welcome addition to the income of the chank divers of that locality. In 1919-20, the total dried production was 6,245 lb. The whole of this eventually finds its way to Singapore and thence to China.

III.—TECHNICAL AND SCIENTIFIC INVESTIGATION.

Apart from researches directly connected with the industrial branch, investigations covering a wide field, and continuous since the beginning of operations, upon zoological and oceanographic subjects have been carried on to considerable extent. The varied nature of these enquiries will be understood from the list of publications given below:—

By Sir F. A. Nicholson—

1. Note on Fisheries in Japan (Bulletin II), Madras, 1907.
2. The Preservation and Curing of Fish (Bulletin III), Madras, 1909.
3. Carp Growing in Germany (Bulletin XI), Madras, 1917.
4. Remarks on Canning (Bulletin XIII), Madras, 1921.
5. Manufacture of Fish Oil and Guano (Bulletin XIII), Madras, 1921.

By Mr. James Hornell—

Pearl Fisheries.

1. Report on the Indian Pearl Fisheries of the Gulf of Mannar (a long report of 109 pages), Madras, 1905.
2. Explanation of the Irregularly Cyclic Character of the Pearl Fisheries of the Gulf of Mannar (Bulletin VIII), 1916.
3. Report on the Pearl Fishery held at Tondi, 1914 (Bulletin VIII), 1916.
4. Prof. Huxley and the Ceylon Pearl Fishery, with a note on the Cultural Production of Free Spherical Pearls (Bulletin VIII), 1916.
- 4a. Pearl Formation in the Indian Pearl Oyster (*Jnl. and Proc., Asiatic Society of Bengal*, N.S., Volume XVIII, No. 2), 1922.
(Also numerous reports in the 5 volumes of Reports to the Government of Ceylon on the Pearl Fisheries of Ceylon, published by the Royal Society.)

Oyster Culture.

5. Report on the Suitability of Pulicat Lake for Oyster Culture (Bulletin IV), 1908.

6. Note on an attempt to ascertain the Principal Determining Factor in Oyster Spawning in Madras Backwaters (Bulletin IV), 1908.
7. The Practice of Oyster Culture at Arcachon and Its Lessons for India (Bulletin V), 1910.
8. The Present Depletion of the Oyster Beds of Sind; Its Causes and the Remedies (Report to the Government of Bombay), 1910.
9. A Note on the Edible Oyster (Bulletin VII), 1916.

Chanks and Chank Fishing.

10. The Sacred Chank of India (Bulletin VII), 181 pages, Madras, 1914.
11. The Indian Conch (*Turbinella*) and Its Relation to Hindu Life and Religion (In *Marine Zoology of Okhamandal*).
12. The Chank Bangle Industry (*Memoirs of the Asiatic Society of Bengal, Volume III, No. 7, pages 407—448*), Calcutta, 1913.
13. The Indian Varieties and Races of the Genus *Turbinella* (Chank) (*Memoirs of the Indian Museum, Volume VI*), Calcutta, 1916.

Other Mollusca.

14. The Utilization of Coral and Shells for Lime Burning in the Madras Presidency (Bulletin No. VIII), Madras, 1916.
15. The Edible Molluscs of the Madras Presidency (Bulletin XI), Madras, 1916.
- 15a. The Common Molluscs of South India (Bulletin XIV), Madras, 1921.
16. A Revision of the Indian Species of *Meretrix* (one of the clams) (*Records of the Indian Museum, Volume XIII, Part III*), Calcutta, 1917.
17. The Anatomy of the Window-Pane Oyster (*Placuna*) (*Marine Zoology of Okhamandal*), London, 1909.

Fishes and Fishing.

18. Report on the Feasibility of Operating Deep-sea Fishing Boats on the Coasts of the Madras Presidency (Bulletin IV), Madras, 1908.
19. The Results of a Fishery Cruise along the Malabar Coast and to the Laccadive Islands in 1908 (Bulletin IV), Madras, 1908.
20. Marine Fish-farming for India (Bulletin XI), Madras, 1911.
21. Note upon two Exploring Cruises in Search of Trawl Grounds off the Indian and Ceylon Coasts (Bulletin VIII), Madras, 1916.

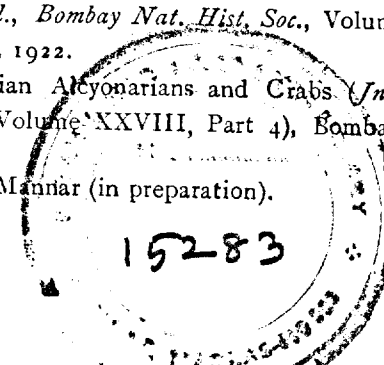
22. A New Protozoan Cause of Widespread Mortality among Marine Fishes (Bulletin XI), Madras, 1917.
23. A Statistical Analysis of the Fishing Industry of Tuticorin (Bulletin XI), Madras, 1917.
24. The Indian Bêche-de-mer Industry, Its History and Recent Revival (Bulletin XI), Madras, 1917.
25. Report to the Government of Baroda on the Marine Zoology of Okhamandal, 2 volumes, London, 1909—16.
- 25a. The Fisheries of Norway and Denmark (Bulletin XIV), Madras, 1921.
- 25b. The Flying-Fish fishery of the Coromandel Coast (Bulletin XV), 1922.

Fishing Boats.

26. The Origin and Ethnological Significance of Indian Boat Designs, 117 pages (*Memoirs of the Asiatic Society of Bengal, Volume VII, No. 3*), Calcutta, 1920.
27. The Outrigger Canoes of Indonesia, 71 pages (Bulletin XII), Madras, 1920.
28. The Affinities of East African Canoes (*Man*), London, 1919.
29. Les Pirogues à Balancier de Madagascar et de L'Afrique Orientale (*La Géographie, Volume XXXIV, No. 1*), Paris, 1920.
30. The Common Origin of the Outrigger Canoes of Madagascar and East Africa (*Man, Volume XX, No. 9*), London, 1920.
- 30a. Catamarans and Reed Rafts (*Man in India, Vol. I*), Ranchi, 1921.
- 30b. The Origin of the Chinese Junk and Sampan (*Man in India, Volume II*), Ranchi, 1922.

General.

31. Three New Indian Cestodes (*Reports of the Indian Museum, Volume VII, Part II, No. 18*), Calcutta, 1912.
32. Description of a New Species of *Pinnotheres* (By J. Hornell and T. Southwell) (*Marine Zoology of Okhamandal, Part II*), London, 1916.
33. A Guide to the Madras Marine Aquarium, Madras, 1919.
34. The Madras Aquarium (*Jnl., Bombay Nat. Hist. Soc., Volume XXVIII, Part 3*), Bombay, 1922.
35. Some Commensals of Indian Alcyonarians and Crabs (*Jnl., Bombay Nat. Hist. Soc., Volume XXVIII, Part 4*), Bombay, 1922.
36. The Currents of the Gulf of Mannar (in preparation).



by the late Mr. H. C. Wilson—

1. Note on the Treatment of Swamps, etc., for the Destruction of Mosquito Larvæ (Bulletin XI), Madras, 1917.
2. Reports on the Fisheries in the Rivers of the Nilgiri district (Bulletin XII), Madras, 1920.

by Rao Bahadur V. Govindan—

1. Fishery Statistics and Information, West and East Coasts, Madras Presidency (Bulletin IX), Madras, 1916.

By Mr. B. Sundara Raj—

1. Remarks on the Madras Species of Haplochromis, read before the Indian Science Congress, Madras, 1915.
2. Notes on the Fresh-water Fishes of Madras (Records of the Indian Museum, Volume XII, Part 6, No. 17), Calcutta, 1916.
3. On the Habits of Hilsa (Clupea ilisha) and Their Artificial Propagation in the Coleroon (Jnl. and Proc., Asiatic Society of Bengal, N.S., Vol. XIII, No. 2), Calcutta, 1917.
4. The Value of Fish as Natural Enemies of Mosquitoes in combating Malaria (Leaflet issued by the Madras Fisheries Department), Madras, 1918.
5. A new Genus of Lernaeid Fish Parasite from Madras, read before the Indian Science Congress, Nagpore, 1920.

By Mr. S. T. Moses—

1. The Fish Supply of Madras; a statistical study (in the Press).
2. The Anatomy of the Chank (ready for the Press).

By Mr. M. Ramaswami Nayudu—

1. A Statistical Analysis of an Inshore Fishing Experiment at Madras (Bulletin XII), 1919.
2. The Eggs and Larvæ of Flying-fishes (Bulletin XV), Madras, 1922.

By Mr. Ramaswami Ayyangar—

1. Notes on the Fauna and Fishing Industries of the Laccadive Islands (Bulletin XV), Madras, 1922.

IV.—EDUCATION.

It was early realized that no rapid progress in the general improvement of the conditions of our fisherfolk is possible till intelligence has been quickened and their comprehension of recommendations and methods facilitated by education on si-

but practical lines. A comprehensive scheme was therefore drawn out in March 1919. Government approved the proposals and up to the present time the department has opened 18 day and 9 night elementary schools. It is intended to open others as opportunity and funds allow. To provide teachers with qualifications especially adapted for these fisher schools, the department has established a Training Institute at Calicut; 36 stipendiary students are now undergoing training. These pupil teachers in addition to the curriculum followed in an ordinary training school receive specialized instruction in organizing and managing fishermen's co-operative societies, in sanitation, hygiene and first aid, and in the improved methods of fish-curing, manufacture of oil, guano, and meal, and other technical work elaborated at the Tanur Experimental Station. They are also given a practical insight into the chief methods of catching fish. The course extends through three years and by the end of that time it is hoped that the majority will be well on the way to become the Admirable Creightons of the fishing villages where they will be posted.

Education of a different nature is catered for by the existing aquarium at Madras, an institution established by Mr. Edgar Thurston in 1909, and transferred to this department in April 1919. It has been entirely reorganized; electric lighting has been installed and the exhibits enriched and rendered more attractive. An illustrated guide has been issued. The success of the reorganization may best be judged by the attendance, which leapt from 96,957 in the year we took charge, to 163,517 in the succeeding year. Similarly the takings increased from Rs. 3,783 to Rs. 9,772. In spite of a large increase of expenditure upon improvements, the profits are now Rs. 4,778 as against Rs. 1,719. The liberal expenditure on reorganization has therefore fully justified itself. Of the illustrated guide issued at a nominal price of 1 anna, 8,066 have been sold since its first publication in October 1919. This too in spite of the guide being published in English. A vernacular edition in Tamil has also been issued and has sold freely.

But our efforts to popularize the study of the animals of our seas are not limited to this one effort. A Zoological Supply Section was organized over four years ago at Tuticorin (since removed to Ennur) whence specimens of a great range of the inhabitants of our seas and coral reefs are despatched to any teaching institution or museum requiring them. Previous to the initiation of this supply

section, colleges throughout India were compelled to base their practical zoological teaching either upon text-book illustrations or to buy specimens at expensive rates from European Biological Stations. The Madras Fisheries Department has therefore become a Swadeshi organization in the true sense of the word; zoological study in India can in future be based upon locally obtained supplies. In this connexion I wish to draw attention to the fact that this useful work is not limited to the Madras Presidency; indeed the chief customers are colleges in the north of India, hence it is essentially an all-India service that we are rendering.

Our intention is eventually to supply all local school museums with typical sets of properly identified collections of common marine animals to replace the present useless jumble of unnamed specimens that serve no useful purpose, and are but a camouflage device to give school inspectors the idea that the boys take an interest in Natural History. These type collections are accompanied by printed explanatory notes, giving all important and interesting facts touching the specimens.

The value of the specimens sent out during the past three years shows clearly how appreciated by teaching institutions are the facilities thus provided. The figures are as follows:—

					RS.	A.	P.
1917-18	...	...	Receipts	...	755	11	0
1918-19	...	...	Do.	...	1,257	14	6
1919-20	...	...	Do.	...	1,607	12	0
1920-21	...	...	Do.	...	3,131	4	0

V.—SOCIO-ECONOMICS.

This section though always kept steadily in view from the first as ultimately one of the most important to which attention must be given, has been taken up comparatively recently in an extensive form. The staff detailed to its promotion is small and this of itself limits progress. The conservatism and suspicion of the fisherfolk already emphasized is another bar to rapid progress. Hence it is gratifying to record that this department, working in close touch with the Registrar of Co-operative Societies, has been so successful in preparing the ground and in carrying out preliminary arrangements, that the number of fishermen's co-operative societies had risen to 60 at the close of last year, with several further applications pending. The majority of these are thrift

organizations, engaged in loan operations. A notable variation is a wholesale co-operative oil and guano society at Mangalore, composed of factory owners who are combining to bulk their produce and sell it jointly.

Temperance and village betterment.—A propaganda in favour of temperance is another of the department's activities and this is meeting with a decided and gratifying measure of success in several important localities. This is the case particularly in South Kanara. Such work goes hand in hand with efforts to provide village meeting halls to be used for reading and other recreation. In several instances the fisherfolk have been so impressed with the advantage of possessing such halls, that they have subscribed substantial sums to construct the buildings; the Government provide the sites free of cost. Every opportunity is taken to show the fisherfolk the advantage of simple methods of sanitation and much is being accomplished in a quiet way.

VI.—ANTI-MALARIAL OPERATIONS.

These form a considerable and very valuable part of our work and consist of three separate phases, viz.—

(a) The breeding and distribution of mosquito-larvicidal fishes to municipalities and other bodies.

(b) The periodical stocking of pools in specially malarious localities with such larvicides.

(c) The conversion of mosquito-infested sheets of water into fish-breeding ponds which also serve the purpose of fry distribution centres for the stocking of irrigation tanks.

(a) The department is able to supply large numbers of larvicides at the nominal cost of Rs. 10 per thousand, but in spite of the earnest recommendation of Government, municipalities and other local authorities do not as yet avail themselves at all adequately of the facilities offered them to obtain a good strain of these useful little fishes. They appear either careless of the value of this cheap means of combating malaria, or else depend upon local supplies of what are too often species of inferior larvicidal quality.

The second form of operation is more directly in our power to organize, and an excellent beginning was made last year, when from our larvicidal fish farm at Praema in Kurnool district, 70,000 larvicidal fish were distributed to the streams and pools in the

intensely malarious Nandya and Chelama forest ranges on the Nallamalais. Operations will be extended to other ranges next season.

Our third line of attack upon malarious waters is perhaps even more important. Two instances where operations are in progress, are the conversion of the fort moats at Chingleput and Vellore into fish-farms. In both cases, until these operations were commenced, these moats formed stagnant pools, overgrown with dense pond vegetation, supremely suitable as harbourage to mosquito larvae. As a consequence, malaria was endemic within both forts, an extremely serious condition seeing that a large reformatory for boys is located within the Chingleput Fort, whilst a Police Training School is similarly located within that of Vellore. The cost of the two schemes is estimated at Rs. 11,450 and Rs. 16,000, respectively. When completed, the moats will cease to harbour mosquito larvae and will concurrently become ideal fish-breeding farms, whence large supplies of fry will be available for the stocking of the many large tanks now under the control of this department in Chingleput and Nellore districts.

VII.—STAFF AND COST OF THE DEPARTMENT.

This note, which is intended to take account only of the major operations, will not be complete without a few brief statistics. For the importance of its duties the staff is small. It consists of a Director, 2 Assistant Directors, a Superintendent of Pearl and Chank Fisheries, a Personal Assistant to the Director, 9 Sub-Assistants and a further subordinate staff of 44 exclusive of peons and temporary hands and the crews of the small fleet operated by the department.

As before mentioned the revenue of the department nearly balances expenditure. The figures for the past four years are as follows:—

	Revenue.			Expenditure.		
	RS.	A.	P.	RS.	A.	P.
1917-18	2,25,230	2	5	2,20,049	7	2
1918-19	2,77,145	0	11	2,35,118	12	11
1919-20	2,26,874	2	2	2,45,960	15	8
1920-21	2,29,419	9	4	2,93,026	12	2
	<u>9,59,668</u>	<u>14</u>	<u>10</u>	<u>9,94,155</u>	<u>15</u>	<u>11</u>

That the department after paying all expenses of supervision and a large non-productive outlay for educational purposes should show an adverse balance of not more than Rs. 34,487, over these four years is a record of which it is justifiably proud. The official publication of the department is its "Bulletin." The seventeenth volume is now under issue, the first two constituent reports being in the press. The aim of the department is to record its experiments and results as fully as possible, that those interested may be able to utilize the facts ascertained with as little delay as possible. As will be seen from the list given above the range of subject matter is varied and extensive and has not been confined to purely technical subjects.

MADRAS,
4th Nov. 1922.

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