

CURRENT SCIENCE

Vol. VIII]

August 1939

[No. 8

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Shell-Fisheries in the Andamans

IN reviewing the activities of the Zoological Survey of India during the years 1932-35, and 1935-38, we have had occasion in our editorials of December 1935 and of April 1939, to refer briefly to the part played by this Department in the scientific investigation of problems of economic importance such as, for instance, amongst others, the shell-fisheries in the Andamans. The recent publication by this Department of a *Consolidated Report on the Shell-Fisheries in the Andaman and Nicobar Islands during the years, 1930-35* enables us to assess the value of the fishery research work which the Department had been called upon to undertake early in 1930, under conditions not comparable to those of enlightened Governments more prosperous and resourceful than the Government of India. Many departmental reports suffer the fate of being filed and forgotten in Government Secretariats,

but we are happy to note that the Director, Zoological Survey of India, has consolidated the reports of his scientific staff and published the results of six years' hard work in an intelligible form, so that they may be available to the general public interested in the scientific and economic progress of this country.

The Report is divided into three parts, the first of which deals with (1) the genesis and history of the shell-fishery in the Andaman Islands; (2) the fishing methods of the Japanese who discovered the valuable beds of Top and Turban shells (*Trochus niloticus* and *Turbo marmoratus*) around the islands of the Andaman and Nicobar groups; and (3) the scientific work of the officers of the Zoological Survey on these shell-fishes and their recommendations to preserve and perpetuate the shell-fishery. The second part consists of Tables of measurements of the

shell-fish and their eggs, of records of field-studies and of various other data on which the entire Report is based. The third part embodies the reports of individual officers deputed for fishery work which serve as a reference to the study of the first part. A grasp of the topography of the Andaman and Nicobar Islands and the adjacent islands of the Bay of Bengal and the Malay archipelago is greatly facilitated by the inclusion in the Report of two maps of these islands.

A sudden accession of wealth is no less embarrassing to Governments than to individuals. The knowledge that extensive and valuable mother-of-pearl shell-beds were discovered for them unintentionally by a band of intrepid Japanese in the territorial waters of the unguarded and uninhabited coasts of the two hundred and odd islands under their administrative charge seems to have put the Local Government at Port Blair in an unenviable position of embarrassment. The Andamans Government, however, lost no time in issuing licences to the Japanese of Singapore to collect mother-of-pearl shells on these coasts and in collecting royalty on the quantities of shells fished. They also realised at the same time that it was necessary to assess the extent of this new marine wealth and the possibilities of its further exploitation, and to take adequate steps to safeguard the fishery as a permanent source of income. The Local Government's timely decision to call in the aid of the Zoological Survey to solve the problems of exploitation and preservation of the fishery was praiseworthy for its wisdom and far-sightedness.

The preliminary investigation by the Zoological Survey early in 1930 not long after a fleet of Japanese fishing vessels had been apprehended in Port Blair was con-

cerned not only with the *Trochus* and *Turbo* shell-fishery but also with the exploitation of other sources of marine products including edible fish and Trepang or *Beche-de-mer*. This investigation showed that with proper management of the shell and other fisheries a net annual income of not less than Rs. 40,000 may be anticipated, an income that could meet the cost of a permanent staff of Zoologists at Port Blair to advise the Local Government on their fishery problems. The Government of India on the recommendations of the Director, Zoological Survey, based on the results of this investigation sanctioned a scheme of research for five years in the first instance, and appointed at Port Blair a marine Zoologist trained and recruited in England as the Research Officer to study the shell-fish and the fishery in detail and provide a scientific basis for the control of the fishery. Although the avalanche of the Government of India retrenchment schemes of 1931 descended on this officer when he had been in office for barely six months, the scheme of research was saved by the Zoological Survey stepping into the breach. At the end of the five-year period, however, the research work on the fishery which was by no means complete was abruptly terminated on grounds of financial stringency, when further facilities for essential research and for the safeguarding of the already depleted fishery were urgently needed.

Before dealing with the scientific aspects of the Report before us we wish to draw attention to the fact that the investigating officers of the Zoological Survey had from the commencement of the investigation early in 1930 realised that the shell-beds were bound to suffer serious depletion in the absence of an efficient inspecting staff to

control the licensed fishermen and to keep out poaching boats from fishing in territorial waters. That they had raised a warning finger is evident in their individual reports. The Director, Zoological Survey, in his preface to the present Report lays emphasis on this subject and, what was more serious from the point of view of the investigating officers, on the absence of a properly equipped laboratory fitted up with aquaria and running sea-water, and other requisites of sound biological work which, as he remarks, "made it impossible for the officer-in-charge to carry out detailed investigations on the bionomics, life-history, etc., of *Trochus niloticus*". It is difficult to understand why the Government of India agreed to initiate a scheme of research without a careful and adequate consideration of the immediate and future needs of their investigating officers. It is a pleasant surprise to us, however, that in spite of the handicaps of smallness of staff and meagreness of equipment the Zoological Survey was able to carry on its investigations in the Andamans for over five years and produce results which are of a no mean order.

The author of the consolidated Report who carried on investigations in the Andamans from 1932 onwards seems to have accumulated a great wealth of statistical and observational data which, we are glad to find, have been incorporated in the present Report. For, they not only help to understand the conclusions of the author but justify the control measures which the author has recommended for the regulation of the fishery. The facilities for the collection of these data which the Local Government were able to provide the author must have been utterly inadequate when compared to those which the Japanese licensees were in a position to give, and the author wisely availed

of all the opportunities which the latter provided him of accompanying their fishing boats to the shell-beds around most of the islands of the Andaman and Nicobar groups in spite of the inevitable inconveniences of a small fishing craft. The data collected on these cruises with the Japanese were chiefly concerned with the rate of collection of shells by divers in various beds, the size, number and sex of shells collected in a day, the state of development of the eggs in various sizes of shells and the nature of the enemies affecting the life and commercial value of the shell-fish. The records of the size of eggs in *Trochus niloticus* of all available sizes from various localities show clearly that a fairly large percentage of shells 9 centimetres in maximum diameter is fully mature and bears a majority of full-sized eggs 0.20 to 0.25 millimetres in diameter, and justify the introduction of a 9.0 centimetre shell-gauge designed to prevent the fishing of young and immature shells. Unfortunately, *Trochus* shells 8.5 to 10.0 centimetres in maximum diameter seem to be of the highest market value because of the brilliant lustre of the mother-of-pearl layer on the inner surface of the shell and of the comparative freedom of the outer surface of the shell from animal or vegetable growths. The Japanese naturally regard these sizes of shells as constituting a first class commodity, and the graphs on pages 17 and 18 of the Report bear out the fact that the Japanese, during the years 1933-36, at any rate, preferred shells with maximum diameter of about 9-10 centimetres to those of other sizes, although in practice shells of less than 9 centimetres diameter with percentage frequency ranging from 5 to 20 had been fished in these years. The effect of the removal of young shells from the beds

farther away from Port Blair is not apparent because of the lack of facilities for collection of systematic data in those areas. But a picture of the systematic depletion of the large-sized shells in the shell-beds in the vicinity of Port Blair is provided by the graph on p. 16 of the Report which shows that in the four years 1931-32 to 1934-35 the percentage frequency of the small shells 3 centimetres in maximum diameter has gone up from as low a figure as 0.5 to about 45. The author was, however, able to show in 1934 (p. 20 of the Report) that the mean-size of shells in the Nicobar area collected in different months of a single fishing season showed a distinct tendency to fall as the months passed by as a result of intensive fishing in the same area, and we have no doubt that results similar to those gathered at Port Blair would have been obtained had it been possible to collect further data in the Nicobars.

The study of the rate of growth of *Trochus niloticus* was restricted to shells of certain bigger sizes only, as the experiments on the embryonic and the immediately higher stages of the shell-fish do not appear to have proved a success for lack of laboratory facilities of the right type. The experimental study of shells of 5 centimetres and above in maximum diameter has shown (1) that the rates of growth vary inversely with size of shell; (2) that growth in diameter is closely correlated with growth along the whorls of the shell; (3) that the female shell grows faster than the male shell; (4) that growth of shell is not influenced by seasonal variations; and (5) that the longevity of the species is approximately ten years. It is also clear from these studies that upto the end of the second year of their life the shell-fish have a size-range of 5.0 to 8.0 centi-

metres diameter when they are sexually unmaturing, and that the third year represented by the size-range 8.0 to 10.0 centimetres diameter is the most critical in their life as they then attain sexual maturity and begin to breed,—a stage at which the Japanese find it most profitable to market them. The reconciliation of the interests of the Japanese licensees and of those of the shell-fishery seems therefore, to have been a difficult matter when the Local Government had no means of enforcing the strict observance of their fishery regulations.

The ascertained facts in regard to the rate of growth at various ages or sizes of shells also show that if young shells in their second year of growth, that is, when they are 5.0 to 8.0 centimetres in maximum diameter, are allowed to grow for one fishing season more they will have reached maturity in their third year of life when they are 8.0 to 10.0 centimetres in maximum diameter, and have had at least one chance of leaving sufficient progeny to maintain the numerical strength of the beds depleted by fishing.

The introduction of a close season coinciding with the breeding period of the animal concerned is one of the well-known and recognised methods of regulating a fishery. The author of the Report has shown from a study (1) of the incidence of very young shells throughout the year; (2) of the percentage frequencies of various sizes of shells at any locality and in any part of the year; and (3) of the state of the reproductive products throughout the year, that *Trochus niloticus* breeds more or less continuously unlike many species of molluscs in temperate zones, which breed only in certain restricted seasons. The fixing of a close season for the Andamans cannot therefore be based on the breeding period of *Trochus*. The severity

of the monsoon from May to September when fishing is impossible along the Andaman and Nicobar coasts provides a natural though compulsory close-season.

From the economic point of view the shell-fishery in the Andamans proved to be a disappointment during the latter half of the period of the fishery. The steep decline in tonnage of shells in the second year of the fishery and the steady fall thereafter are clearly indicated in the graph on p. 24 of the Report. No one with knowledge of these shell-fisheries in other countries could have expected a better fate for the Andaman fishery which was at no stage under any sort of control by the authorities. Rules and regulations, if not rigorously enforced, do not carry conviction. The *Trochus* fishery in Mergui, Burma seems to have suffered a very similar fate. Making ample allowance for natural fluctuations in the breeding of *Trochus* and for variations in the period of fishing and in the number of divers employed for fishing shells, the decline of the fishery in the Andamans and in the Mergui archipelago is due, as the author of the Report points out, to the unrestricted and indiscriminate fishing of shells of all sizes by licensed as well as unlicensed Japanese fishermen, well organised and financially supported by the Japanese-owned fishery companies of Singapore. How efficient and thoroughly organised are the Japanese in the exploitation of the marine resources of the Indo-Pacific seas is vividly described by the author on pages 2 to 4 of the Report.

The fact that the Andamans and Nicobars and the Mergui archipelago are unguarded may have served as an invitation to the Japanese to explore the sheltered bays and winding creeks along these coasts, inaccessible to vessels larger than a small steam-

launch or motor boat. It is not surprising therefore that many instances of poaching have been frequently reported to the respective Governments during the last few years of shell-fishing. We have seen occasional newspaper reports of arrests and trials of the Japanese masters of the fishing boats, and of confiscations and heavy fines as a deterrent punishment. The fact that the Japanese still dare to visit these coasts show that poaching is enormously profitable, and that the Governments concerned are helpless to prevent poaching. Contrast the measures taken by the Queensland and New Caledonian Governments to protect their shell-fisheries which have been stabilised during the past quarter of a century with the introduction and enforcement of stringent regulations.

The concluding part of the Report shows that the *Trochus* shell fishery has suffered such severe depletion that its rehabilitation would be almost an impossibility unless the Government of India is prepared to prohibit fishing of shells throughout the Andaman and Nicobar area for a period of at least three years, and at the same time keep their coasts clear of poachers by constant and vigilant patrolling. It is too much to hope that the Indian Government will agree to spend large sums of money on the policing of these islands to save an industry, the highest anticipated revenue from which is not expected to meet the cost of maintaining a preventive and scientific staff. All the same we cannot help expressing our regret that an important new marine industry has been allowed to go to ruin, because of the inability of the Government of India to keep away foreign exploiters from these islands. Far from wishing for a worse turn in the present international situation the *Trochus*

beds have still a chance of complete revival in the event of a European War which will give them a prolonged rest. We may recall the fact that many depleted fisheries of the North Sea and the Atlantic revived completely after the last Great War, and we have every hope that an enforced rest to the shell-beds in the Andamans such as a world war alone can give will restore them to their former plenitude.

We are of the opinion that the economic exploitation of our land and marine resources for the benefit of our people is a paramount duty of the Government of the country and

no cost, however high, must be reckoned as an impediment to such exploitation. The National Planning Committee which recently met at Bombay seems to have decided that its immediate objective should be the establishment of new industries under the guidance and direction and with the material aid of the State, and the expansion of existing industries. It is also understood that the committee has appointed a separate sub-committee on fisheries. We earnestly hope that this sub-committee will fully consider the question of reviving the shell-fish industry of the Andamans.

The Liaison-Officer for India on the Staff of the Royal Botanic Gardens, Kew

THE appointment of Dr. K. N. Kaul of the Lucknow University, to serve as liaison-officer for India on the Staff of the Herbarium of the Royal Botanic Gardens, Kew, for a period of 2½ years, has recently been announced in the press. This appointment marks a new departure in filling this post, which is likely to promote very greatly the study of systematic botany in India, and enable India, in course of time, to have a number of systematic botanists trained at Kew and having first-hand knowledge of the Collections of Indian type material available at Kew and other European herbaria.

In order that Indian Scientists may realise the importance of the development, a brief history of the post may be given.

In 1883 there existed three main herbaria in India, those at Calcutta, Madras and Saharanpur, which could function properly only by maintaining close contact with Kew where all standard Indian collections were preserved. In order to meet the demands for information from these herbaria without

undue delay, the India office agreed to appoint an assistant for India who was to devote himself to the interests of the Indian botanical institutions and *pari passu* to the maintenance and elaboration of the Indian botanical collections at Kew.

The assistant for India at Kew has actively collaborated in the preparation of the monumental flora of British India and the several provincial floras based upon it. The type material on which these standard works are based being preserved in the Kew Herbarium, no identification of Indian material can be really authoritative without comparison of these types at Kew. The services of the assistant are continually required in comparing and verifying such material, and in conducting enquiries of considerable economic importance both in agriculture and forestry.

The post has upto now been mostly held by botanists with wide experience of India, after their retirement. The experience gained by these officers has thus been completely lost to India. As a matter of fact no Indian