

## THE STUDY OF MARINE ZOOLOGY IN INDIA

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IT is unfortunate that our Indian seas, possessing such a rich potential wealth of animal and plant life, should remain a neglected field in Natural History, and that our knowledge of them at the present moment should be poor. No doubt, the study of animals in our seas is extremely interesting and important, but so far very little attention has been paid to them.

Our knowledge of the life in the Indian seas, which is of a diverse character, is very meagre indeed: we know practically nothing about the life-histories, spawning habits, food, rate of growth, migrations, distribution and seasonal variations about some of the most important marine animals, especially those of great economic importance, *viz.*, the fishes. The welfare and prosperity of a fish mainly depends upon its food, and this food, in many cases, consists of the marine planktons, *viz.*, both phytoplanktons and zooplanktons. Plankton-life is one of the most important biological, ecological and economic factors in the sea. As for instance, certain very important food-fishes (*viz.*, the Mackerel—*Rostrelliger* sp. or *Scomber*) feed chiefly on planktons, *i.e.*, mostly on Copepods, which again subsist on the diatoms; and thus it is evident that there is a very close relation between the planktons and many other important organisms in the sea.

Within the plankton-life itself there is so much of seasonal variation, diversity of form and occurrence, vertical migration, etc.; and the density and specific range of planktons are also very variable indeed,—depending

upon several factors, among which the primary ones are the quantitative variation of the essential elements such as the silicic acid in the sea-water, which helps in the formation of the silicious skeletons of the diatoms; hydrogen-ion concentration; variations of temperature; sunlight; and salinity. All these factors are of very great importance to the life of planktons. In this connection reference may be made to the important works of Raben (1910), Murray, Moore (1915), Hornell (1923), Gray (1928), Atkins (1932), and others. It is true that in colder seas specific density of particular planktons is greater than that in the warmer seas, yet there is a vast field for work in this very fascinating branch of zoological study in India; and, it is also known that, so far as the number and variety of species are concerned, tropical waters are certainly always richer than the temperate and the arctic seas. In short, the economic aspects of planktons can hardly be overestimated, and it is for this reason and also because of the interrelation of life of other animals in the sea, very extensive investigations are now being done on them, both in the European as well as in American waters. In this connection particular mention may be made of the German Marine Biological Station at Kiel, where lately they have concentrated most of their attention on the intensive and extensive study of the planktons round about their seas.

However, our knowledge of the life-histories of the Indian Planktons is all

due to the earnest labours of Lt.-Col. R. B. Seymour Sewell (1912, 1913, 1926, 1929, 1932, etc.), but there is yet a vast virgin field to be explored. In addition to purely biological investigations of our seas, we must also direct our attention to certain other equally important factors which govern the conditions of life in the seas, viz., the physico-chemical aspects of the water. This has been badly neglected in India, both so far as fresh-water as well as marine animals are concerned, without which our knowledge of the life in the sea would be most imperfect, and at the same time any satisfactory solution as to the life-histories of many of our sea-animals can hardly be achieved. In short, both hydrobiological and hydrographical work is absolutely necessary in order to understand the natural history of the fauna of our seas correctly. All the important factors should be most carefully and scientifically investigated and studied in order to get a correct idea of the rich wealth of animal life in our seas, which is waiting exploitation, and which will ultimately confer inestimable benefit on the vast population of India.

Animal-life in our seas, especially those at the sea-shore, sea-bottom, and also the swimming animals, drifting life (or planktons), the boring animals, coral reefs, etc., presents a most fascinating aspect for a systematic study. While there is such a diversified fauna of marine life found within the limits of the Indian shores, our knowledge of them is still imperfect to a degree due to sheer neglect and lack of interest.

It is of utmost importance that, if we really wish to develop and enrich our knowledge of Indian Zoology, we should know all about the structure and the natural

history, bionomics, and physiology, of a vast assemblage of life that is present in our own seas, from the lowest to the highest. We should develop, encourage and create an interest in the study of marine zoology of our own country, which has been grievously neglected for such a long time. It is universally admitted that actual study of living marine animals is something far superior to, and more useful than, merely mechanically dissecting and drawing dead marine specimens in the class-room. Apart from the value of mere class-room study of morphology, marine animals are really very important from the point of view of the industries provided by the marine fisheries as well as the various products of very great value from the sea, which will greatly contribute towards the prosperity of our country. As a matter of fact, the whole success and prosperity of the marine fisheries entirely depend upon a complete knowledge of the life-histories of fishes, and it is here that the study of marine zoology can offer us the greatest assistance.

In order to create a real interest in the study of marine animals it is very necessary that the student of Zoology should go to the sea himself, and should actually observe, handle and examine the great variety of the most beautiful animals assembled together and found at the sea-coast; he must study their habits, ecology or bionomics, form and structure, behaviour and physiology on the spot and make his own notes from personal observations, and naturally he would thereby acquire a first-hand knowledge and information, which is the most important part of any scientific study. Such a kind of study is a vital necessity for the development and progress of marine zoology. As

a part of the work of any University curriculum our primary aim should be, first of all, to study thoroughly as many Indian marine types as possible, and then to examine the foreign types for the sake of critical comparison. In order to achieve this end specialists should take up the task voluntarily and engage themselves in working out the typical marine representatives from each class of animals, and a series of monographs should be prepared and published on the same line as the L.M.B.C. Memoirs. Of course, some admirable work has already been done in this direction in the Zoological Research Laboratory at Madras under the able guidance of Prof. R. Gopala Aiyar and also in the form of a series of valuable publications in the *Indian Zoological Memoirs* under the efficient editorship of Professor Karm Narain Bahl of the Lucknow University.

A place for the study of marine zoology should be selected and located at such a situation in India as would be most suitable for the study of marine life with the best of all desired conditions and environment, and at such a place an All-India Marine Biological Station should be established with a proper well-trained research staff, and planned on a research basis in the same way as the one we find at Plymouth, Port Erin, Roscoff, Heligoland, Naples, Kiel and Woods Hole. For this purpose an ideal place will possibly be the Krusadi Island, with, of course, several smaller research sub-stations that should also be gradually established at Madras, Trivandrum, Bombay and Karachi. Undoubtedly most valuable researches could be done at such a station. The whole idea is that the present resources of the Fisheries

Department, under the Government of Madras at Krusadai, should be recognised as the nucleus for the future development and expansion of the All-India Marine Biological Station, and we should work together in full co-operation with the Fisheries Department. This would be most economical also, and in this way we shall be saving a lot of unnecessary initial outlay.

Every University in India which provides for training in Zoology should wholeheartedly co-operate with such a Marine Biological Station, and once a year both the staff as well as the senior students (say, the Honours and the Post-graduate) should visit the station, stay there for about 3 to 4 weeks, and study the marine animals in their natural home, and thus obtain a lot of most useful information about them. I should recommend that this should form a compulsory part of the University course for all B.Sc. Honours and the Post-graduate students. At such a place there should also be adequate arrangement for a vacation-refresher-course of lectures on marine animals, which would benefit the zoologists in general, such as we have at every coastal educational centre in Europe and America.

In view of the great diversity of form, structure and usefulness, marine animals are considered more important than the freshwater types, and hence a thorough study of them is absolutely essential in order to raise the general standard of zoological teaching in India. The only way to do it will be for the Universities as well as the Provincial and the State Governments to take a very keen interest and a more active part and a fuller advantage of all the resources existing in a central Marine Biological Station which should co-ordinate the activities of

other smaller sub-stations mentioned above. I would like to suggest that there should be at least one zoological table created and maintained by each University at such a place for research work to be conducted by any member of its staff, and that a generous

grant-in-aid should be given by each University as well as the Provincial and State Governments, in addition to a small fee paid by the individual worker himself, as is done in all Western countries for the maintenance of its establishment and upkeep.

## ORGANISATION OF INDUSTRIAL RESEARCH\*

IT is thought that the occasion of the annual meeting of the Court of the Indian Institute of Science, Bangalore, which brings together so many influential representatives of science, industry and the professions, might be profitably utilised for concerting measures to promote industrial research. This may be done with a view, not only to strengthen this class of research in the Indian Institute of Science, but also, if possible, to co-ordinate the work done in all parts of the country, and prepare a plan and programme for the coming year.

There are special reasons why stress should be laid on industrial research at the present time and why it would be appropriate for a body like the Court of this Institute to consider this subject. In recent months educationists and business men have been loudly calling for measures to promote industries. The War has cut off supply, or enhanced the prices of chemicals, machinery and other commodities usually imported hitherto, and Government are also hard put to it for obtaining transport, military and other stores.

The question of promoting industrial research has been under the consideration of the authorities of this Institute for over six years. In the latest quinquennial Review, the Irvine Committee have outlined a scheme "to make applied research the first and most responsible duty of the Institute".

The Science Institutes, Universities and

Colleges, have been spending considerable sums of money on research, but this is mostly on what is known as *pure research*. Since their activities are not regulated by any all-India Organisation which can speak with authority, there is no co-ordination or regulation of effort among research workers in the country just as there is, for instance, under Government auspices in Great Britain and the Dominions. This often results in duplication of work and waste of energy and money. There is no lack of scientific talent in the country to carry on industrial research or business ability to exploit such researches commercially but they are at present not systematically mobilised to serve the interests of industry.

The importance of application of scientific methods and knowledge to the practice of industries is now universally recognised. Several countries including the Dominions of the British Commonwealth have National Research Councils to organise and supervise work of this description, and recent indications are that the Government of India are also seriously thinking of a move in the same direction.

Until the Government of India find it possible to establish an institution like a National Research Council, it may be necessary to start a small *unofficial Committee* of representative scientists and business men to organise industrial research in War time.

A Committee of three members and three Honorary Secretaries is recommended. Each Secretary may be a leading Scientist or the head of a Science College or Institute.

The first duty of the proposed Committee would be to collect exact information of the kind and amount of research work that is now being done and the expenditure that is being incurred on it in the various educational and industrial centres in the country; then, by correspondence and discussion, to come to an understanding with the scientists and authorities of each centre as to the

\* This memorandum prepared by Sir M. Visvesvaraya, K.C.I.E., was forwarded to the members of the Court of the Indian Institute of Science, Bangalore, for discussion at the meeting held on 23rd instant. The note contains recommendations which furnish material for a fruitful public discussion which we invite. It seems opportune that Sir M. Visvesvaraya has initiated deliberations in the first instance at the meeting of the Court and we would ask our readers to contribute their views and suggestions which will be gladly considered for publication.—Ed.