The Zoological Survey of India *

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IN the year 1784 the Asiatic Society of Bengal or, as it was then called, the Asiatic Society, was founded by Sir William Jones. The formation of a Museum was not definitely stated to be one of the objects of the Society, but specimens were frequently sent to the Society, either for examination and report or for safe custody, and in 1796 a definite proposal for the erection of a suitable building, to house the collections that had thus accrued, was first mooted. It was, however, not until 1808 that the Society came to possess its own building, which it still occupies to-day, but from then on definite efforts were made to establish a Museum and this was finally achieved in 1814.

Although Sir William Jones, the founder, was opposed to the collection of zoological objects, on the ground that it entailed the destruction of life, there was, nevertheless, from the very inception of the Museum a quite definite biological bias. At the outset the Museum was subdivided into two parts, (a) comprising archaeology, ethnology, and technical exhibits, and (b) including geology and zoology. The former section was placed under the care of the Society's librarian, and the latter under a special curator, the first to be appointed being Dr. Nathaniel Wallich, who presented to the Museum duplicate specimens from his own collection in order to form a nucleus.

Up to 1836 the Museum was supported entirely from the funds of the Society, but in that year, owing to financial troubles and losses, consequent on one of the Calcutta banks closing its doors, the Society was compelled to petition the East India Company for assistance in maintaining the Museum and the necessary staff, and in 1839 the Company sanctioned a grant of Rs. 300 per mensem for this purpose. The first curator to be appointed under the changed conditions was Dr. J. T. Pearson of the Bengal Medical Service, thus commencing the close association between the Museum and the Government medical services that has continued to the present time. The continual growth of the collections in due time again caused a strain on the Society's resources, and in 1856 the Government of India was petitioned to found an Imperial Museum for India; the outbreak of the Indian Mutiny caused matters to be postponed for a few years, but in 1862 the Government announced its intention of founding such a Museum in Calcutta, and by the Indian Museum Act of 1866 definitely provided for its establishment and created a Board of Trustees for its management. The actual construction of the building naturally took some time, and it was not until 1875 that the Museum was ready for occupation, and the first two galleries, namely, those of archaeology and the mammalia, were thrown open to the public in 1878.

A study of the records of the Society shows that during these early years a number of distinguished zoologists had contributed to the collections, and

among these one may perhaps mention Dr. J. Anderson, who had made two collecting expeditions into Yunnan and China, in 1868 and 1875, and later became the first curator of the Indian Museum. Various other collections came from regions so far apart as Abyssinia, Persia, Tibet, different parts of India, Assam, and Burma; and in addition the Society received very valuable collections that had been made during the Persian Boundary Commission (1870-72), the second Yarkand Mission (1873-74), and the Daffa Expedition (1874-75). All these collections were handed over by the Asiatic Society to the Indian Museum to form the nucleus of the zoological collections.

The next stage in the evolution of the Zoological Survey of India may be said to have begun in 1875 with the opening of the Indian Museum as a State museum, and the appointment of a permanent staff, entirely maintained by funds provided by the Government of India. During the preceding few years the Asiatic Society had been taking a very keen interest in the schemes that were being put forward in other parts of the world for the investigation of the deep-sea fauna, and it felt that India should also play its part in these investigations; the Government was at this time considering the formation of a Marine Survey of India, and in consequence of the representations made by the Society it determined to appoint to this survey a special officer, the surgeon-naturalist, whose duty it would be to carry on investigations on the Indian deep-sea fauna, at the same time ruling that the collections thus made should be the property of the Asiatic Society of Bengal and, after identification, should be incorporated in the collections of the Indian Museum. The first appointment to the post of surgeon-naturalist to the Marine Survey of India was made in 1875, and in 1881 the Royal Indian Marine Survey ship *Investigator* was launched.

At its inception the Indian Museum included sections dealing with zoology, geology, and archaeology, and it was not until twelve years later, in 1887, that the section of art and economics was added. From the very commencement the importance of the zoological section was clearly recognised, and this is shown by the fact that the first three appointments to the staff were given to zoologists, namely: curator of the Indian Museum, Dr. J. Anderson; assistant curator, Mr. J. Wood-Mason; and first assistant to the curator, Mr. G. Nevill. A few years later the surgeon-naturalist was given an unofficial status in the Museum by being appointed an honorary assistant. Thus, very soon after its inception, the Museum staff consisted of four zoologists.

With the creation of a permanent staff, and as a result of a breadth of vision and a true appreciation of the value of zoological research that has ever characterised the Trustees of the Indian Museum, it became a recognised part of the function of the

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staff to go out into the field and make their own collections, so as to make a study of the living, just as much as of the preserved, animals; it was thus possible for a number of expeditions to be carried out in various parts of the Indian Empire and even beyond its frontiers, and among the latter regions that were visited, mention may be made of the expeditions by the late Dr. N. Annandale to the Lake of Tiberias in Palestine, to the Talé Sap in Siam, and to Lake Biwa in Japan. These activities naturally resulted in large accretions to the collections, and during this second period in the history of the Zoological Survey very considerable further additions were made by a succession of surgeon-naturalists on the R.I.M.S. *Investigator*, pre-eminent among whom stands Col. A. Alcock, I.M.S. During this period large additions of valuable collections of both the land and fresh-water fauna were obtained as the result of systematic collecting during certain political and military expeditions, notably during:

- (1) The Afghan Delimitation Commission, 1885;
- (2) The Afghan-Baluch Boundary Commission, 1896;
- (3) The Tibet Expedition, 1903-4;
- (4) The Seistan Arbitration Commission, 1903-6; and
- (5) The Abor Expedition, 1911-12.

Numerous additions were also presented to the Museum by friends of the department, such as officers of the Geological and Botanical Surveys of India, the Indian Forest Service, and the Indian Medical Service; by planters in various parts of India; and finally, but by no means the least, by the officers of the Hoogli Pilot Service, to whom the Museum owes a very valuable collection of the fauna of the estuarine region at the mouth of the Ganges. Special mention must also be made of the collections made by the officers of the Fishery Department of the Government of Bengal and by the research trawler *Golden Crown* during investigation into the fishery resources of the Bay of Bengal.

Several very valuable collections, such as the de Niceville collection of butterflies, the Dudgeon collection, etc., were also purchased by the Trustees.

The rapid increase in the size of the collections, and the consequent work of the Zoological and Anthropological Section of the Museum, resulted in a gradual increase in the staff, and in 1916 there were four zoologists on the permanent staff of the Museum, and, in addition, attached to the Museum were one unofficial, though paid, worker, the late Mr. E. Brunetti, and the surgeon-naturalist—the total staff thus being six.

It was in this year, 1916, that the Zoological and Anthropological Section of the Indian Museum was converted by the Government of India into the Zoological Survey of India. The reason of this conversion is not to be found in any change in the duties of the officers of the department, but in the recognition by the Government that the work of the section had been and then was, in all essential features, similar to the work that was being done by the already existing Geological and Botanical

Surveys, and the need of placing the head of the section on an equal footing with the directors of these other Surveys as a fellow-trustee of the Museum and not merely a paid servant of the Trustees.

The ever-increasing work of the Survey has from time to time necessitated the creation of additional appointments, and at the present day the full staff as sanctioned by the Secretary of State should consist of a director, two superintendents, and seven assistant-superintendents, the last addition to the staff being the naturalist to the Marine Survey, a post that was previously always held by an officer of the Indian Medical Service. Up to the present time, however, only seven officers have been appointed, and of these one is an anthropologist. In consequence of the policy of the Government of India to indianise the various services, as many Indians as possible have been selected to fill the various posts as they fell vacant or were sanctioned, and to-day the director is the only European in the Survey, the other six officers being Indian.

The conversion of the Zoological Section of the Museum to a Survey gave official recognition to the view that field-work was one of the most important duties of the department, and it thus became possible to formulate definite programmes of work that could be spread over a series of years. A commencement on definite survey lines had, however, been begun some years previously by investigations into the lake fauna of Asia, and this had culminated in the survey of the Chilka Lake, a special volume of the *Memoirs of the Indian Museum* being devoted to the results. The first definite survey of the newly created Zoological Survey was undertaken at the request of the medical authorities in India, who, as the War of 1914-18 drew to its close, became anxious lest the disease schistosomiasis, that was unknown in human beings in India, though present in other animals, might be introduced by troops returning from areas overseas in which this disease is rampant. Systematic investigations were, therefore, undertaken in order to discover whether any of the known mollusc hosts of the Schistosome might be present in India, or, alternatively, whether any of the more common fresh-water molluscs could act as such a host; and, in addition, to determine what species of Cercariæ were already living in the country. As a result of these inquiries, the Zoological Survey was able to inform the Government that, so far as it was possible to judge, there was no fear of an extension of this disease into India; a conclusion that was entirely justified by results, for although the troops from overseas were brought back to India without any precautions whatsoever being taken in the way of quarantine, there has been no spread of this disease in that country.

Our knowledge of the fauna of India is still very incomplete, and in every case in which an officer of the Zoological Survey of India has taken up the study of a group in the animal kingdom it has proved to be necessary that he should first pay careful attention to the taxonomic side, in order

to determine the various species that are present. As a result, considerable progress has been made on these lines, and during the sixteen years that the Survey has been in existence the number of new species that have been described and of 'types' that have been added to the collections of the Indian Museum has averaged some one hundred and twenty-five a year. Up to quite recent times the Survey has not attempted to deal with purely economic problems, unless specially requested to do so; it was rightly considered to be of more importance that their energies should be devoted to purely scientific research, for no zoological research can have any economic value unless it has a scientific basis, and the foundation of all such work is taxonomy. Nevertheless, the Survey has from time to time contributed towards the elucidation of problems of economic importance, and has been consulted by various local governments on such problems as the reorganisation of fishery departments, the institution of biological stations, the preservation of the fauna—as, for example, the Monitor lizards that were being exterminated for the supply of skins for the leather market—oyster fisheries, or the control of various species of animals that were directly or indirectly destroying crops. Within the last two years the Survey has by circumstances been compelled to take up one problem of economic importance, namely, the maintenance and preservation of the *Trochus* and *Turbo* fisheries in the Andaman Islands.

For many years past, each officer has been encouraged to take up two lines of study—one taxonomic and the other general; they are thus brought into touch with some of the wider problems of zoology and are in a better position to take advantage of their opportunities for study in the field, while the department as a whole is in a sound position to undertake team-work and thus to tackle the investigation of any of the more general problems, on the solution of which so much may depend in a country like India, in which agriculture and public health are the two subjects of greatest importance.

The Zoological Survey of India publishes the results of its research work in two serials that are devoted to zoology, namely, the *Records* and *Memoirs of the Indian Museum*, and within the

last year has commenced a third, entitled *Anthropological Bulletins from the Laboratory of the Zoological Survey of India*. These publications are very largely composed of original papers by the officers of the Survey, and by a system of exchanges with some three hundred other societies and institutions the Survey is able with comparatively little cost to maintain a very fairly complete and up-to-date library, that without any doubt is the finest zoological library for purposes of research in Asia. This library is at the service of every *bona fide* zoologist throughout the whole of India; a list is kept of all those who are engaged in research work, and every such worker is allowed to have from the library two volumes at a time for a period of a fortnight. In this way workers are able to keep in touch with and consult recent literature, without which it would be impossible for them to carry on their researches. Within the limits imposed on it by space, the Zoological Survey of India also provides accommodation for any research worker who wishes to come to the Museum in order to carry on his work either in the library or in the laboratory, and there is an ever-increasing demand for facilities of this nature, not only from zoologists in India but also from other countries.

It is no exaggeration to say that if the Zoological Survey is in the future to be curtailed, either in its personnel or its financial resources, to such an extent that the continuance of its publications is rendered impossible, such a blow will be dealt to the study of zoology in the whole of India that it will put the country back to where it was in 1875, when the Museum was first started, and will render almost impossible the satisfactory or trustworthy investigation of every problem in which zoology may be concerned. Finally, any drastic reduction of the staff must seriously endanger the collections. Such collections, especially in a tropical climate, require constant attention for their preservation and continuous study and research to maintain them in an up-to-date and scientific condition, so that each animal is correctly labelled and can at once be referred to for comparison and examination; and if in the future these collections are allowed to decay, the loss, not to India alone but to the whole world, will be one of the first magnitude.

Steel in Building Construction

IT is usual to criticise methods of engineering design by calling the engineer's 'factor of safety' a factor of ignorance. In one sense the accusation is true, since the factor is a cover for uncertainties; but, in effect, it is a concise expression of experience and, properly used, is as legitimate as the apparently more rigorous processes in calculation. It is an inheritance. The efforts of progressive engineers are bent towards its improvement. They attempt the reduction of its margins by enlargement of data, perfection of analysis, and advancement of materials. Sometimes a greater precision in things understood leads to a reduction of the factor, only to disclose

the increased importance of things less well understood; and thereby to compel a return. The subject of fatigue in materials and the history of the development of high speed machinery provide numerous examples.

It can scarcely be denied, however, that the factor of safety is subject to serious misuse at times. Weak design methods are frequently characterised by a meticulous arithmetical accuracy in inadequate calculation, covered by an arbitrary factor that may make the design quite safe but certainly renders the careful arithmetic ludicrous. Possibly this charge of imperfect calculation and arbitrary safety factors could be