

THE "MICHAEL SARS" IN THE ATLANTIC.<sup>1</sup>

THE cruise of the *Michael Sars* in the North Atlantic in 1910 has shown what a great deal of excellent work in investigating the deep waters of the ocean can be done by a comparatively small vessel, when the best possible equipment is provided, and men of exceptional competence and experience are in charge. Sir John Murray's judgment was sound when, instead of fitting out *de novo* a larger vessel for the investigations he wished to carry out in the Atlantic, he arranged with the Norwegian Government for the use of its fishery research steamer, a vessel only 125 feet long and of 226 gross tonnage, together with her scientific staff and crew. The immense advantage of proved men, accustomed to work together, and each thoroughly competent in his own particular line, for the successful execution of investigations of the very difficult kind which were undertaken by this expedition cannot be overestimated.

The work of the expedition was not only well done, but the results are being well presented both to the scientific and to the lay public. The detailed scientific reports are to be published in a series of volumes issued by the Bergen Museum, and will without doubt constitute a valuable and permanent addition to our knowledge of the physical and biological conditions of the Atlantic. The book now under review is designed to appeal to a wider public, and from the interesting way in which the facts are presented and the large number of excellent illustrations which it contains, it can scarcely fail to achieve its purpose. Although the book is chiefly devoted to an account of one particular expedition, Sir John Murray and Dr. Hjort have taken the opportunity, as the sub-title indicates, of placing before the public "a general account of the modern science of oceanography." The success with which the authors, and those who have collaborated with them, have carried out their task makes "The Depths of the Ocean" by far the best English book from which the general reader can gain a trustworthy knowledge of the aims and progress of the modern science of the sea.

Within the limits of a single article it would

<sup>1</sup> "The Depths of the Ocean." A General Account of the Modern Science of Oceanography based largely on the Scientific Researches of the Norwegian Steamer *Michael Sars* in the North Atlantic. By Sir John Murray, K.C.B., F.R.S., and Dr. Johan Hjort. Pp. xx+821. (London: Macmillan and Co., Ltd., 1912.) Price 28s net.

be quite impossible to give any adequate account of the wealth of interesting matter which this large volume contains. It will only be possible, therefore, whilst noting the general contents of the several chapters, to direct special attention to some of the questions upon which the results of the *Michael Sars* expedition have thrown new light.

The first chapter, on the history of oceanographical research, is written by Sir John Murray. It condenses and brings up to date the well-known historical account of the subject which Sir John wrote for the "Summary" volume of the *Challenger* reports. If a word of criticism may be allowed, it seems a pity that the more recent work around the coasts of north Europe, more particularly that done in connection with the international investigations, receives such slight reference. We should have been glad to see some more detailed notice of the brilliant achievements

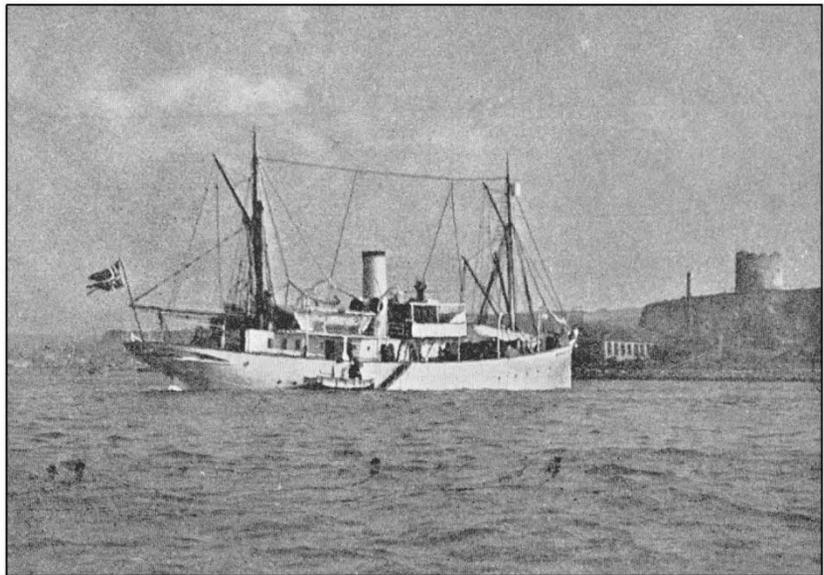


FIG. 1.—S.S. *Michael Sars* in Plymouth Harbour. From "The Depths of the Ocean."

of the Danish workers in the North Atlantic, and one would have expected a good Scotsman like Sir John Murray to have at least mentioned the important work done by the Scottish Fishery Board, even though he did not consider that carried out by England and by Ireland as worthy of a place.

In the second and third chapters Dr. Hjort gives a narrative of the cruise, with many details of the equipment of the ship and the methods of work. The feature of most interest to the working naturalist is perhaps the account of the number of different pieces of apparatus for capturing pelagic animals which it was found possible to work at one and the same time. As many as nine or ten nets, including two or three Petersen young-fish trawls and some very large tow-nets, were towed together at different depths, and appear to have worked well.

Sir John Murray's principal contribution, which is on the depths and deposits of the ocean, constitutes chapter iv. The chapter is mainly de-

amount of light penetrated sufficient to produce an effect on photographic plates, and the very close agreement which was found in the deep-water temperatures taken by the best modern instruments with those taken at the same stations by the *Challenger* expedition more than thirty years before.

Dr. Helland-Hansen is followed by Prof. Gran, with an account of the pelagic plant life, one of the most interesting chapters of the whole book. The general subject is treated in a masterly way, and the importance of these minute vegetable organisms, forming as they do the fundamental food supply of the ocean, cannot be overrated. The special contribution of the expedition to the advancement of this subject is the discovery, by means of a large centrifuge worked by the steam-winch of the vessel, of the extraordinary abundance of the most minute plankton forms, especially in the warmer seas. These forms are

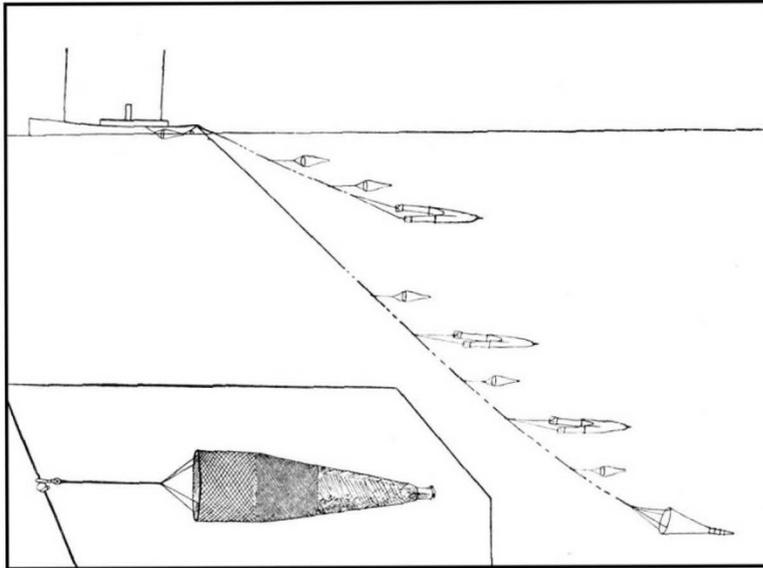


FIG. 2.—The *Michael Sars* towing ten nets and pelagic trawls (surface net not shown). From "The Depths of the Ocean."

voted to a general account of these subjects. Written as it is by the greatest living authority, in a style as interesting as it is scientifically accurate, it cannot fail to be welcome to all who wish to learn the present position of our knowledge of the configuration of the ocean basins and the nature of the deposits which lie upon their floors. The section dealing with the mineral collections obtained during the cruise of the *Michel Sars* is by Drs. Peach and Horne, who examined the specimens. The most interesting fact recorded by them is the discovery of glaciated stones, some of which are illustrated, at a depth of a little more than a mile, at a point 230 miles south-west of Mizen Head, Ireland.

Dr. Helland-Hansen's chapter on physical oceanography is certainly the best summary of the modern aspects of this subject which has yet appeared in English. Of the work of the expedition itself the striking features are the direct measurements of the currents entering and leaving the Mediterranean through the Straits of Gibraltar, the determination of the depths to which an

so small that they pass through the meshes of the finest silk nets, yet they occur in such vast quantities that they constitute in these waters

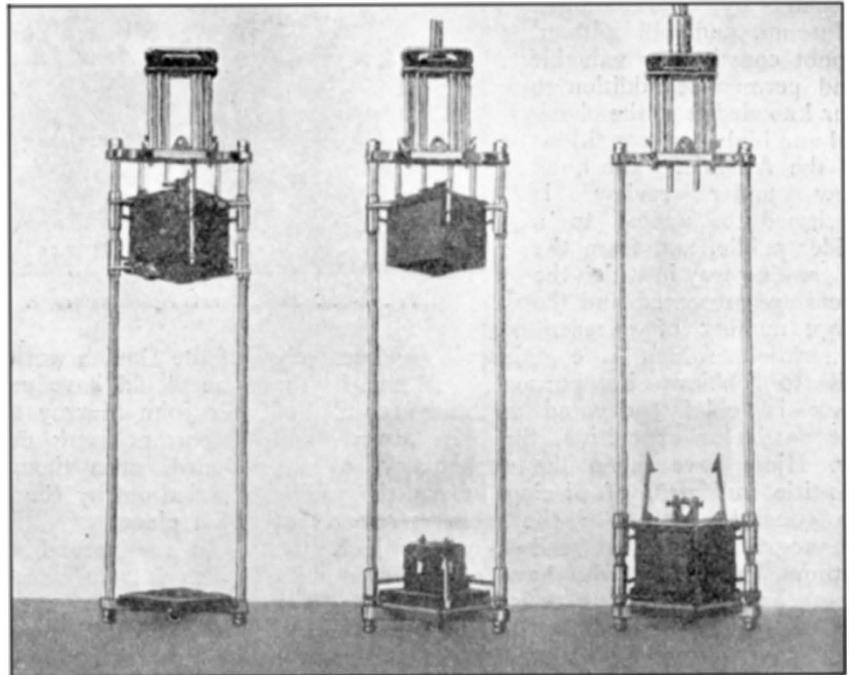


FIG. 3.—Helland-Hansen's photometer. On the left, as it is sent down; in the middle, open for exposure; on the right, closed and ready for hauling up. From "The Depths of the Ocean."

perhaps the most important part of the pelagic plant life.

Sections dealing with the bottom fauna are con-

tributed by Dr. Hjort and Dr. Appellöf in chapters vii. and viii., the former writing on the fishes, the latter on the invertebrates. It is a task of no little difficulty to treat such extensive subjects in a concise and yet comprehensive way. With the help of a large series of figures illustrating the numerous species mentioned, both authors have succeeded well, and it is to be hoped that their efforts may result in reviving popular as well as general scientific interest in these branches of marine biology, which, fascinating as they are, have rather tended to become of late years entirely relegated to specialists on particular groups.

Following these, chapter ix., on pelagic animal life, by Dr. Hjort, contains perhaps the largest proportion of original matter to be found in the book. This is due to the fact that the collecting gear chiefly used by the expedition consisted of townets and large pelagic nets of various patterns, all of them of very much greater fishing capacity than the nets which have previously

great variations in their size in different species, the factors which influence the floating of pelagic organisms, and the organs which are special adaptations for floating.

One other subject in this final chapter must not be passed without notice—namely, the valuable contribution made by the *Michael Sars* expedition to the wonderful story of the life-history of the fresh-water eel. The expedition secured numerous eel larvæ of stages much younger than any previously found, and from the distribution of these larvæ the conclusion seems justified that the eel spawns south of the latitude of the Azores, and the larvæ are later carried into the northern North Atlantic and towards the coasts of northern Europe by the Gulf Stream.

Nothing could be more calculated than this book to awaken fresh interest in the importance of the thorough and complete investigation of the problems of the great oceans. A knowledge of the changes which take place from season to

season and from year to year in the Atlantic would be of incalculable value to every country in Europe, for there can now be scarcely a doubt that it is upon these changes that the variations in the yield of the harvests both of the land and of the sea are mainly dependent. These changes can never be ascertained by single cruises such as that of the *Michael Sars*, brilliantly though that cruise was carried out. What we now want is systematic and sustained researches extending over a period of years. Great Britain did

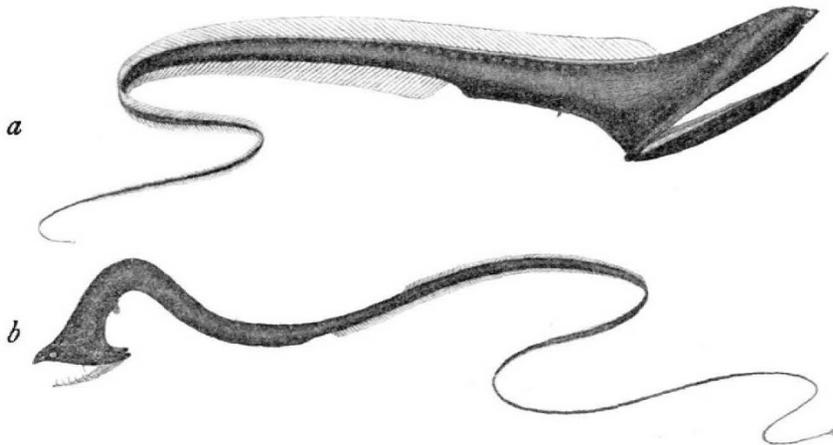


FIG. 4.—Two Gastrostomidæ. *a.* *Gastrostomus bairdii*, Gill and Ryder. Nat. size, 47 cm. *b.* New Genus. Nat. size, 20 cm. From "The Depths of the Ocean."

been used in ocean work. From the nature of the results already reached—and the material has as yet been only partially worked out—it seems clear, as Dr. Hjort maintains, that the qualitative results obtained by the use of these large nets towed for long periods give a more correct and comprehensive picture of the free-swimming life of the Atlantic than was obtained with the relatively small nets used by the German plankton expedition, the material from which Prof. Hensen and his helpers have attempted to work out quantitatively at the cost of such vast labour.

The final chapter, entitled "General Biology," is also written by Dr. Hjort. It deals with innumerable problems of scientific importance in a most suggestive and stimulating way, and maintains the high standard of the whole book to the end. Among the numerous questions dealt with are the colours of marine animals and their relation to the conditions in which these animals live, phosphorescence and luminous organs, the eyes of deep-sea fishes and the meaning of the

the pioneer work in connection with ocean research, and the time is fully ripe when a comprehensive scheme of investigation in the Atlantic should be organised in this country. The present notice can have no better conclusion than the expression of the hope that Sir John Murray will use his great experience and commanding position in trying to ensure that the British Government should make the necessary provision for such an investigation.

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#### THE SWISS SOCIETY OF NATURAL SCIENCES.

THE Société Helvétique des Sciences naturelles, which, in Switzerland, takes the place of a scientific academy, and is the centre of all concerted action in the scientific life of that country, held its annual reunion at Altdorf, in the canton of Uri, on September 8–10.

The first day was devoted to a general assembly, at which various matters were discussed, and some