

## Recent Antarctic Research

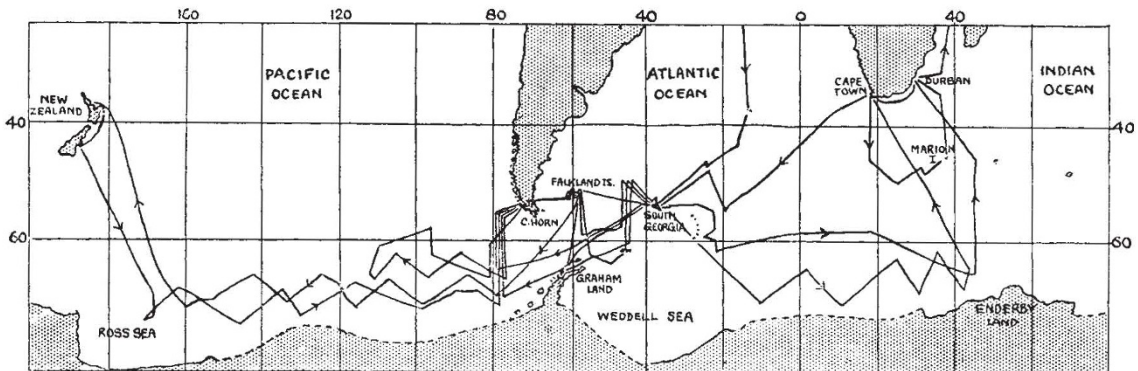
undertaken by the Discovery Committee

THE R.R.S. *Discovery II*, 1933-35

By Dr. N. A. Mackintosh

THE R.R.S. *Discovery II* returned to England at the end of her third commission in June this year. During the twenty months she was away, her work included an examination of the whale population and its environment in the vicinity of the Atlantic and Pacific ice edge; repeated observations on a particular meridian for the study of seasonal variations; some repetition and consolidation of observations taken in previous commissions; a survey of the South Shetland

The section of the work which may be said to have yielded the quickest results was that in which a line of stations on the meridian of 80° W. was repeated in December, March, September, October and November. Each line included from seven to ten stations at intervals of about 90 miles, and in each case the southernmost station was at the edge of the pack ice. The routine at each station included a series of six vertical hauls with closing 70-cm. plankton nets from various depths between 1,000 metres and the surface. A preliminary examination of the samples from these nets reveals a large-scale migration of the

Fig. 1. Voyages of the R.R.S. *Discovery II*, 1933-35.

Islands and, on the homeward voyage, a new line of stations running parallel to the East African coast from Marion Island in 47° S. to the Gulf of Aden. Throughout the commission, routine soundings were taken with the echo-sounding machines. The route taken by the ship on her various cruises is indicated in Fig. 1.

Several years will, of course, be required for a proper examination of the material and data collected, but certain interesting points have already arisen and may be briefly described here.

During several long cruises, in which a zigzag course was followed to the north of the pack ice, direct and continuous observations on whales were combined with routine observations on plankton and hydrology. These observations provide material for comparing the abundance of whales in the Pacific and Atlantic sectors of the Antarctic, and an important correlation has been observed between the distribution of whales and the surface temperature of the water. It is anticipated that the most important results of the commission's work will in due course be derived from these cruises off the ice edge.

plankton which is likely to be of far-reaching importance.

It is known that in the Antarctic zone there is a thin layer of cold Antarctic surface water which moves with a northerly component away from the ice. Below this is the so-called warm deep water flowing south, and below this again the cold Antarctic bottom water which moves northwards. Fig. 2 shows six vertical sections of the line in 80° W. The first shows diagrammatically the circulation of the surface water and the warm deep water. The other five show the newly ascertained distribution of the copepod *Rhincalanus gigas* in the various months in which the line was repeated. They are drawn quite roughly and may need adjustment when the material is examined in more detail. In December (summer) the species is mainly concentrated near the surface. In March it tends to sink to the north of the Antarctic convergence. In September (winter) it is practically confined to the warm deep water, and in October and November (spring) it has largely regained the Antarctic surface water. Similar seasonal changes in level have been

observed in several other species which, together with *R. gigas*, make up the bulk of the Antarctic macroplankton, but these do not appear to include the Crustacean, *Euphausia superba*, which constitutes the food of the Blue and Fin whales. To those who have studied the plankton of the Southern Ocean, it has for long been a problem to understand how organisms drifting in the surface water are not all carried northward into warmer latitudes where they could not be expected to survive. The stations worked by the *Discovery II* in 80° W. have provided material

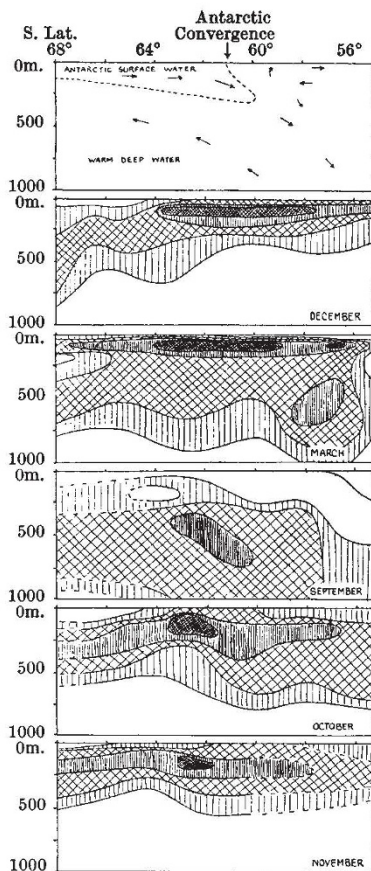


FIG. 2. Seasonal changes in the vertical distribution of the Copepod *Rhinocalanus gigas* on the meridian of 80° W.

from the consideration of which a very substantial contribution can be made towards the solution of this problem. It appears certain that at least a considerable number of the species are carried northwards in summer in the north-flowing surface water, and return south again in winter in the southgoing stream at depths of at least 400 m. It is believed that such a large-scale circulation of the plankton, extending over some hundreds of miles of latitude, has not hitherto been demonstrated in any part of the world.

Among the new devices which were successfully used during this commission mention may be made of the Harvey phytoplankton net and the

echo-sounding recorder. The former is an apparatus designed by Mr. F. W. Harvey of Plymouth<sup>1</sup>. Samples of phytoplankton are treated with acetone, and the amount of chlorophyll extracted is measured by comparison with a series of colour standards. This method is a great improvement on any hitherto used for estimating the relative abundance of phytoplankton in different localities. The apparatus was used at almost every station throughout the commission. With the echo-sounding recorder, the echo from the sea floor, produced by the ordinary deep-sea hammer, is picked up by a microphone and automatically marked on a moving scroll of paper. On this the contour of the bottom is traced out as a continuous line. It is most effective in shallow water and in places where rapid changes in depth occur, and it was in continual use during the surveying of the South Shetland Islands.

Among oceanic soundings, perhaps the most interesting observations were those made in the South Sandwich Deep. Soundings of 7,000–8,000 metres had previously been obtained to the east and north-east of the South Sandwich Islands. It has now been shown that the deep extends considerably farther south in the form of a curious narrow cleft in the sea floor exceeding 7,000 metres in depth, and running parallel with the chain of islands and the bend of the Scotia arc.

On the long line of stations taken up the East African coast, the fullest hydrological observations were made. The vertical section of this line is most instructive, and throws much light on the major current systems of the Indian Ocean. Large closing nets fished in deep water on the same line produced abundant material of biological interest.

During this commission the ship was under the executive command of Lieut. A. L. Nelson, R.N.R.

<sup>1</sup> *J. Mar. Biol. Assoc.*, 9, 2, 761; 1934.

### THE R.R.S. *William Scoresby*, 1934-35

By G. W. Rayner

The Discovery Committee's vessel, the R.R.S. *William Scoresby*, completed in May this year her fourth commission—a short one of seven months devoted entirely to the marking of whales on the whaling grounds in the Antarctic seas off Queen Mary Land, off Enderby Land and to the south of Bouvet Island. The ship sailed from London on October 16, 1934, and made a direct passage to Simonstown, where final preparations for the work in hand were completed. The ship's personnel, under the executive command of Lieut.-Comdr. C. R. U. Boothby, R.N.R., included an experienced Norwegian whale gunner, Capt. J. Endresen, who had charge of the manœuvring of the vessel whilst