

Progress of the Discovery Investigations.¹

By Dr. STANLEY KEMP.

SINCE the R.R.S. *Discovery* returned to England at the end of 1927, the oceanographic and whaling investigations which the Discovery Committee is conducting in the South Atlantic have been continued with the R.S.S. *William Scoresby* and at the Marine Biological Station in South Georgia.

R.S.S. WILLIAM SCORESBY.

The *William Scoresby* sailed from Cowes in the last week of 1927 with Mr. D. Dilwyn John in charge of the scientific work. The commencement of the voyage was marked by a tragedy, for two days after leaving port, in a heavy gale in the Bay of Biscay, leading seaman Sydney Cook was washed overboard and lost. During the previous commission he had proved himself a cheerful and willing member of the small ship's company, and his practical experience of trawling had been a valuable asset. Shortly before reaching the Falkland Islands the vessel met a number of fin whales and experiments were made in whale-marking. Eight hits were recorded, and it is believed that at least five whales were marked.

On Feb. 7 the *Scoresby* left for South Georgia, taking on the passage a line of seven stations, mostly in deep water, at which observations were made on plankton and hydrology. As in the previous season, icebergs were unusually numerous, and one of the stations was taken under the lee of a berg estimated to have a length of 50 miles. At South Georgia the vessel was engaged until Mar. 13 in repeating the survey of the planktonic and hydrological conditions on the whaling grounds. This survey was hindered by fog and the presence of ice, but 48 stations were taken, 21 consisting mainly of plankton observations and 27 with full hydrological observations in addition. With the view of testing the uniformity of the plankton distribution in the area, series of continuous hauls with plankton nets were made during the course of the survey. One series of hauls with surface nets was made, and two with oblique nets worked from 100 metres to the surface. The rather difficult technique involved in the latter operations owes much to the ingenuity of Mr. F. E. C. Davies, now acting chief officer of the vessel.

At the conclusion of the survey the *Scoresby* unfortunately touched a rock in the approaches to Stromness Harbour. This caused damage to the stern frame, and delayed resumption of work until April 14, when the whaling season was concluding. The whaling factories reported that pack-ice was closing in on the South Shetlands, and some of them had already left on the return voyage to Europe.

In these conditions it was not possible to complete the full programme. The *Scoresby* sailed from South Georgia on a south-westerly course and,

after six deep-water stations had been taken, met pack-ice about 40 miles north of Clarence Island, the seventh station being worked in an open lane in the ice. The sea on this occasion was ominously calm and it became apparent that the vessel was sheltered by an extension of the pack lying to the north. During the night a south-west gale arose and the vessel succeeded with some difficulty in getting clear, with her decks and superstructure heavily coated with ice. So far as could be ascertained, the pack-ice formed an impenetrable barrier to further progress in a southerly direction, and a course was therefore set for the Falkland Islands. Seven further stations were taken, including three on the Burdwood Bank, and Port Stanley was reached on May 1. One night, when in the pack-ice, a number of fin whales came close up to the ship, apparently attracted by the lights on board; marking guns were brought into operation, and it is believed that six of the whales were marked. This passage was the most difficult that has been made during the investigations. Weather of exceptional severity was encountered throughout, and for eight days out of a total of seventeen the vessel was hove to.

During the winter season of 1928 the *William Scoresby* continued the trawling survey which had begun in 1926 of the plateau round the Falkland Islands. About 38 trawling stations were taken over an area some 400 miles in length by 300 miles in breadth. During this work particular attention was paid to the edge of the continental slope, where it was thought that hake (the fish of greatest economic importance in the region) might occur plentifully. The results of this trawling survey cannot yet be definitely assessed. That they are not unpromising may be judged from the fact that in several areas hake were found in marketable quantities, though the season in which the operations have hitherto been conducted may be expected (on analogy with northern fisheries) to be the least productive.

In order to obtain some knowledge of the winter conditions on the whaling grounds, the *Scoresby* left Port Stanley for South Georgia on Aug. 19, repeating *en route* the series of stations taken earlier in the year. After arrival, though much interrupted by gales, fog, and snow, four lines of stations were completed and a further series of continuous surface nets was hauled.

Since the Discovery investigations began, the methods of operation of the whaling factories in the Dependencies have undergone a marked change. Four years ago these factory ships lay at anchor at Deception Island, or in other harbours in the South Shetlands, while their whale catchers worked in the neighbouring area. Recently, however, the factory ships have been taken along the edge of the pack, where the only shelter is that which the ice may afford; and since whales have been found in abundance, this more dangerous method of

¹ For previous accounts of the investigations see NATURE, Oct. 30, 1926, and May 19, 1928.

operation has become general. The area worked in this way extends across the mouth of the Weddell Sea from Elephant Island and the South Orkneys so far east as the South Sandwich Islands.

In September 1928 the *Scoresby* left South Georgia to observe conditions along the ice edge, but the first attempt, when pack-ice was found 120 miles east of the island, was rendered abortive

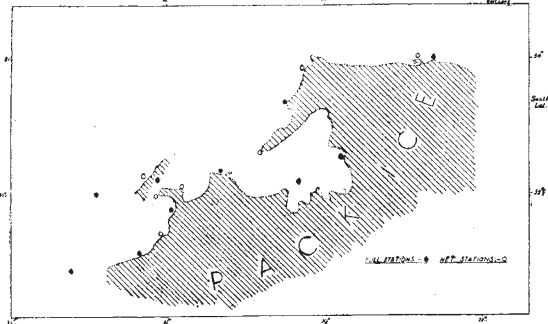


FIG. 1.—Chart illustrating the work carried out by the R.S.S. *William Scoresby* along the edge of the pack-ice to the east of South Georgia in September and October 1928.

by the onset of heavy weather. In the early days of October a line of stations was taken south-eastwards from Cooper Island, and continuing on an easterly course the pack was found in Lat. $55^{\circ} 27' S.$, Long. $32^{\circ} 21' W.$ With a westerly breeze the edge of the pack was often very sharply defined and frequently it was possible to make observations at its actual margin. The ice edge was followed in an easterly direction for several days, and as shown in Fig. 1, 13 stations were taken along a length of 300 miles. Mr. M. C. Lester, chief officer of the *Scoresby*, made some useful observations on ice conditions. The plankton was found to be characterised by a number of forms which are not found on the South Georgia grounds, among them *Euphausia crystallophias*. This species was found in considerable abundance and may prove to be the chief food of whales frequenting the ice edge.

Returning to South Georgia the *Scoresby* was docked, and with minor repairs and boiler cleaning was not ready for sea until the end of November. She then made a passage to Port Stanley, again taking a line of stations, and on returning to South Georgia she began an extended survey of the whaling grounds. This survey, which is illustrated in Fig. 2, is the most thorough which has yet been made. The lines of stations extend seawards far beyond those previously taken. Of the total number of 53 stations, 44 include full hydrological observations in addition to the plankton work. In spite of very severe weather during the first half of the period, the entire survey was completed in one month (Dec. 16–Jan. 15), during which the two members of the

scientific staff (Messrs. D. D. John and J. W. S. Marr) worked almost unceasingly. Great credit is due to them and also to Capt. R. L. V. Shannon and his crew, for a very remarkable performance. At the conclusion of the survey a series of continuous oblique nets was hauled over a distance of 30 miles.

The cruise to the South Shetlands, which (as already explained) was frustrated by pack-ice in the previous season, began on Feb. 5, and the entire programme as shown in Fig. 3 was put through without the necessity of returning to South Georgia for fuel. Between South Georgia and the South Shetlands eight stations were taken, and in the Bransfield Strait, where peculiar hydrological conditions exist, three lines of stations were made. The return passage to the Falkland Islands was made via Drake Strait and Cape Horn. Here the weather lived up to its evil reputation, and the seven stations on this line were accomplished with some difficulty in heavy swells. Three further stations were taken between the Straits of Lemaire and the Falkland Islands, and seven plankton stations on the return to South Georgia. The season's work concluded with two lines of stations on the south-west side of the island.

In this brief synopsis of the work done by the *William Scoresby* during some sixteen months, it

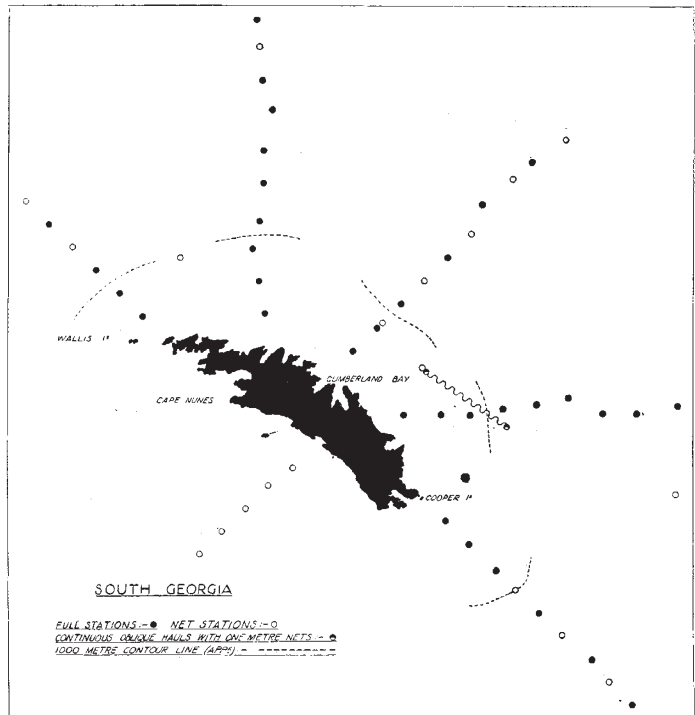


FIG. 2.—Chart illustrating the work carried out by the R.S.S. *William Scoresby* off South Georgia during December 1928 and January 1929.

has not been possible to make any statement regarding the results obtained. The small scientific staff, for most of the time only two in number, was very fully occupied in the collection of data and material and was without time even for a

preliminary inspection of what had been obtained. There are indications that results of great interest will follow, but at the moment all that can be said is that, thanks to the enthusiasm shown by the personnel, the work of maintaining continuity of observations during the past two seasons has been most successfully performed. On three different occasions surveys of the South Georgia whaling grounds have been carried out; connected lines of stations have been taken covering a wide area, and special observations have been made in Bransfield Strait. The trawling survey in the Falkland area has been continued and valuable work done on the edge of the pack-ice.

WHALE-MARKING.

The *William Scoresby* has been so fully occupied with observations on plankton and hydrology that, as was foreseen, she was not able to make any serious experiments in whale-marking. During the past season, however, the Discovery Committee was able to arrange with one of the whaling companies at South Georgia for the occasional use for this purpose of their spare whale catcher. Three cruises, each accompanied by one of the scientific staff, have been made in this vessel. On the first occasion a visit was paid to the ice edge east and south of South Georgia, where many whales had been sighted by the *Scoresby*, but owing to the very bad weather which was encountered only two whales were marked. The remaining two cruises, each completed in three days, were made on the South Georgia grounds and proved far more successful.

On the first occasion 72 certain hits and 13 doubtful were recorded, while on the second the figures are 25 certain and 2 doubtful. It is thought that at least 13 whales on the first occasion and 3 on the second were marked twice. The whale-marking operations were in charge of Mr. J. W. S. Marr and Mr. G. Rayner, Capt. Evensen, who was in command of the vessel, doing his utmost to ensure success.

Since the investigations began, more than a hundred whales have now been marked, most of them during the present year. So far, no marks have been returned and the possibility that some may have been overlooked during the process of flensing is disquieting. Recent experiments have resulted in the production of an improved mark, having an aluminium shaft which will not warp under sea-going conditions, a stream-line covering to the head, giving flatter trajectory and increased

range, and with a tag of brightly coloured material attached to facilitate recognition.

WHALING FACTORIES.

During the past two seasons opportunities have arisen for undertaking some scientific work on whaling vessels. In 1928, Mr. J. E. Hamilton accompanied the whaling factory *Anglo-Norse* on an expedition to the South Sandwich Islands, and in the following season Dr. E. H. Marshall visited the Ross Sea in the *C.A. Larsen*. On each of these voyages data were obtained on all whales captured, and as a result of facilities kindly given by the managers, serial observations on the hydrology and plankton were also made. The work accomplished will be of value in comparison with the more detailed investigations carried out on the research ships and at the biological station.

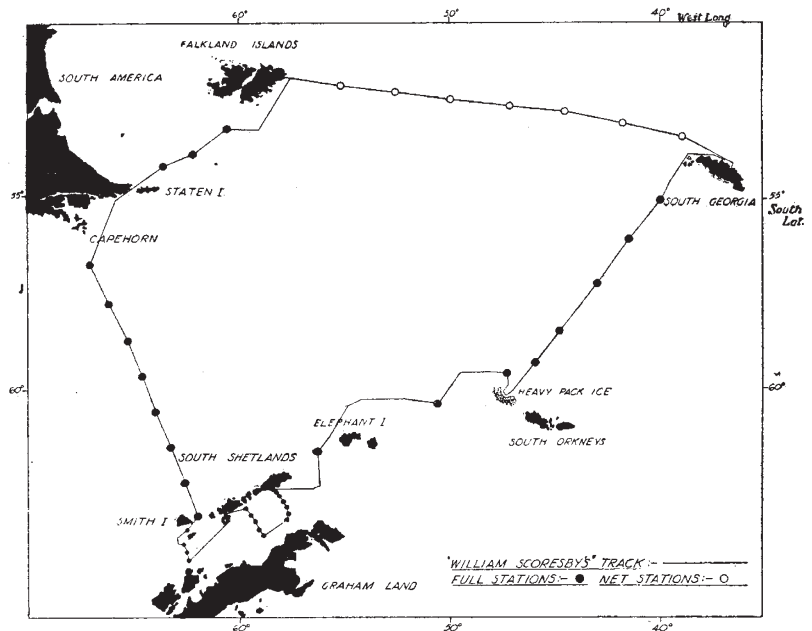


FIG. 3.—Chart illustrating series of observations between the Falkland Islands and their Dependencies made by the R.S.S. *William Scoresby* during February 1929.

THE MARINE BIOLOGICAL STATION, SOUTH GEORGIA.

The Marine Biological Station was reopened at the beginning of February 1928, with Mr. F. C. Fraser in charge, and from then until it was closed at the end of April 1929, 836 whales have been examined at the neighbouring whaling station. The staff also examined 29 whales at Deception Island, which was touched on the voyage to South Georgia, making a total of 2549 whales examined since the observations were commenced in 1925.

Most of the routine work of previous seasons has been continued. This includes observations on colour, external and internal parasites, stomach contents, condition of blubber, of external and internal genitalia and of mammary glands. All mature females have been examined for foetuses.

In previous seasons full series of measurements have been taken of every whale examined, but sufficient data of this kind had already been obtained for blue and fin whales, and in consequence full measurements were only taken of other species.

Altogether, whales of five different species have been examined. Blue and fin whales have been predominant, sei whales have occurred towards the end of both seasons, sperms have been taken more infrequently, and three humpbacks were examined during the few days allowed for their capture in December 1928.

Considerable variability was found to exist in the different species in the proportions of males to females. In blue and fin whales, males and females occurred in approximately equal numbers, by far the greater number of sei whales examined were female, and all the sperm whales were male. The stomachs of all whales were examined for food content, only 'krill' (Euphausians) being found in the whalebone whales. Special attention has been paid to the diagnosis of maturity, as indicated by an examination of the genitalia, and a considerable amount of data concerning foetuses has been collected. In all, 124 records of pregnancies have been obtained. Many of the smaller foetuses have been preserved, the smallest found measuring only 18 mm. in length. Towards the end of the 1927-28 season, a blue female was found to contain a foetus measuring 7.46 m. (more than 24 ft.) in length, the parent giving every indication of approaching parturition. As in previous seasons, the average size of the foetuses was found to increase as the season progressed, although the variation in size was considerable at any one period. Two instances of twins have been observed, and this season at one of the whaling stations at South Georgia, a whale having six foetuses was caught. Roughly, one-third of the immature fin females were found to possess the structure known as the vaginal band. It was also found in one immature sei female, and a doubtful instance of its presence occurred among the blue whales.

The mammary glands of all female whales have been examined and the presence of milk recorded. The stomachs of young whales have been examined for evidence of milk feeding. Although it is exceptional, two fin whales and one sei whale were found to be pregnant and lactating at the same time.

Observations on the colonies of elephant seal which inhabit South Georgia were made from time to time by Mr. G. Rayner, and Mr. G. E. R. Deacon, hydrologist, was fully occupied in the analysis of water samples obtained by the *William Scoresby*.

COASTAL SURVEY.

During the previous commission the survey officer, whose services had been lent to the Committee by the Admiralty, was chief officer of the R.R.S. *Discovery*. Facilities for survey were given whenever possible, and a considerable amount of

useful work was done, but the Committee felt that it would be an advantage in future operations to detach a survey party as a separate unit, thus allowing the officer-in-charge to devote his whole time to this work. In accordance with this plan, Lieut. Comdr. J. M. Chaplin left England by a whaling transport vessel in September 1928. He took with him an assistant, a motor mechanic, and three men, together with a specially designed motor launch. The party arrived in South Georgia in October, and work began at the end of the month.

The season was a bad one for survey operations; much fog prevailed, and sights could only be obtained on rare occasions. In Stromness Bay, Husvik, Leith, and Stromness harbours were surveyed in detail, with some soundings in the approaches, and surveys were also carried out at Maiiviken and Jason Harbour in East Cumberland Bay and at Godthull farther to the south-east. In February 1929 the survey officer accompanied the *William Scoresby* on her passage to the South Shetlands, Cape Horn, and the Falkland Islands, during which observations were made at Elephant Island and near Smith and Low Islands and a round of angles taken from the highest point of Deception Island. Observations for magnetic variation were made in the Falkland Islands.

While this work has been in progress in the south, those of the scientific staff who have remained in England have been occupied with the preparation of results. It is expected that the first volume of the Discovery Reports will be completed during the present year. A station list covering the period of the first commission has already been published and also a paper by S. Kemp, A. C. Hardy, and N. A. Mackintosh on the objects of the investigations and the equipment and methods which are employed. A lengthy whaling report by N. A. Mackintosh and J. F. G. Wheeler is in the press, together with papers on elephant seal and on the birds of South Georgia by L. H. Matthews, and on parasitic Nematoda and Acanthocephala by H. A. Baylis. Work on certain of the hydrological and plankton results is well advanced. The Admiralty has recently published charts embodying surveys carried out by Lieut.-Comdr. J. M. Chaplin, and these charts will also be issued with the Discovery Reports.

The *Discovery* has been chartered to the Commonwealth Government for an Antarctic expedition under Sir Douglas Mawson, with Captain J. K. Davis in command of the vessel. Mr. J. W. S. Marr, of the Discovery Committee's scientific staff, has been seconded to accompany the Australian expedition, on which he will take charge of the plankton investigations. For the continuance of the Committee's work in the Dependencies of the Falkland Islands, a new vessel, to be named the *Discovery II.*, is now under construction at Port Glasgow, and it is expected that she will be ready to sail for the south before the end of the present year.