THE VOYAGE OF THE R.R.S. "DISCOVERY II", SURVEYS AND SOUNDINGS.

(Extract from a paper read before the Royal Geographical Society, 14th December, 1931 by STANLEY KEMP, Sc. D., F. R. S.)

In our first ship, the R. R. S. *Discovery*, originally built for Captain SCOTT, we found ourselves very fully occupied with routine scientific work, and though our navigating officer, Lieut.-Comdr. J. M. CHAPLIN, R. N., eagerly seized every opportunity that presented itself, very little survey work was in fact accomplished.

At a later date Lieut.-Comdr. CHAPLIN was detached for special surveys in South Georgia, and during the past few years, with a motor boat, an assistant and four men, he has charted a considerable part of the island and surveyed all its more important harbours in detail. The newly published charts of the island are based largely upon his work.

Our new ship, the R. R. S. *Discovery II*, built in 1929, was specially designed for the Committee's work, and has proved an unqualified success. Her comparatively high speed and very large bunker capacity have allowed us to use our time to better advantage, and we have been able to put through scientific programmes far more expeditiously than before. It has thus happened that in our first commission we have been able to make some additions to our knowledge of certain little-known islands in the Atlantic sector of the Antarctic, and it is this work which is summarized in the present paper.

The surveys we have made have all been by running survey. The method is too well known to call for description, and though it is one of the least accurate, in the hands of a skilled navigator it can yield excellent results. I am myself convinced that in the sort of places we have been visiting running survey is the only practicable method. With us, as with any vessel operating in these distant waters, time is a factor of the greatest importance, and any other method would demand more than we could give. The weather is most precarious and harbours are few and far between. Landings are nearly always difficult, sometimes almost impossible, and to effect them many days would often be spent in awaiting suitable sea conditions. There is moreover so much work to be done that fully detailed surveys would take a vast number of years to accomplish even if the means were available.

Our surveys have been made primarily from the navigational point of view: to fix the land by positions obtained astronomically, to plot its coast-line and outlying dangers, to explore possible anchorages and harbours, and to determine the heights of the more conspicuous peaks. The value of the work has been increased by the large number of soundings we have been able to take with our echo-sounding machines. Working inshore they have seldom been taken less frequently than one per minute, and when there is necessity this speed can be doubled or trebled. At the same time we have made notes on the topography and fauna, and the land has been photographed and sketched from various points of view.

The South Sandwich Islands were first found by Captain COOK in 1775. After his rediscovery of South Georgia, where he landed and took formal possession, COOK sailed south in his attempt to prove or disprove the existence of an Antarctic continent. He turned East in about 60° S., and on the morning of 31st January he sighted three rocky islets with elevated snowclad land behind them. He called the outermost rock Freezeland Peak, and the land beyond it Cape Bristol. To the South he found other land which he named Southern Thule "because it is the most southern land that has ever yet been discovered", and to the North he found Cape Montagu. COOK thought he could see land to the eastward connecting these three, and he says: "I was sorry I could not determine this with greater certainty; but prudence would not permit me to venture near a coast, subject to thick fogs, on which there was no anchorage; where every port was blocked or filled up with ice; and the whole country, from the summits of the mountains down to the very brink of the cliffs which terminate the coast, covered many fathoms thick with everlasting snow. The cliffs alone was all which was to be seen like land." Still further to the North more land was sighted, which, "under the supposition

of its being an island," received the name of Saunders Isle, and beyond it a group of two islands, called Candlemas Islands after the day on which they were found. COOK then turned East and thus missed finding the three northernmost members of the group. In his Journal on 6th February COOK wrote: "I concluded that what we had seen, which I named Sandwich Land, was either a group of islands, or else a point of a continent. For I firmly believe that there is a track of land near the pole which is the source of most of the ice that is spread over this vast Southern Ocean."

Forty-five years later, in 1820, COOK's discoveries were completed and extended by the remarkable voyage of Captain F. G. VON BELLINGHAUSEN of the Imperial Russian Navy. He found the three northern islands, Zavodovski, Leskov and Visokoi, and by circumnavigating all the others he proved conclusively that they were islands and not parts of an Antarctic continent. He pushed far to the South, through much pack-ic , and reported that in 65° 25' S., with a range of 45 miles from the look-out, no continuation of the group towards the South was to be seen. He stated that both the Candlemas group and Southern Thule consisted of three islands, and the Atlas which accompanies his report contains sketches and plans of various members of the group (1).

Up till now the charts of these little-known islands have been based solely on the work done by COOK and BELLINGHAUSEN, for though they have been visited on various occasions (more often no doubt than published records indicate) no survey work of any importance has been attempted. The only exceptions to this statement are certain sketch-plans made of some of the islands by C. A. LARSEN, the whaling pioneer, and a plan of Zavodovski made by the *Quest* after the death of Sir Ernest SHACKLETON, under the command of Comdr. Frank WILD (2).

After BELLINGHAUSEN certain of the islands were visited in 1830 by Captain BROWN in the schooner *Pacific* and by BISCOE in the brig *Thula*. MORRELL relates that he examined all the islands in 1823, but his statements have often been proved untrustworthy, and his account, though extremely brief, contains several inaccuracies. Since 1830, so far as I have been able to ascertain, there is no record for seventy-five years of any visit to the islands, though it is practically certain that sealers must have gone there. In 1908 C. A. LARSEN examined the group, seeking harbours and a site for a whaling station. In this he was unsuccessful, but he made rather considerable additions to our knowledge of the islands, though he missed one of them in a fog and by reason of pack-ice was unable to reach Southern Thule. He performed a remarkable feat — one which I think will not be repeated for many a long day — in landing on five islands. In going ashore on Zavodovski he was twice upset into ice-cold water, and on land was overcome by fumes, for the island still exhibits volcanic activity. As a result of this adventure he was seriously ill for some months. He collected geological specimens and trawled and dredged at a number of points.

In this summary of the history of the islands it is not possible to give a detailed account of more recent visits (3). FILCHNER, on the Second German South Polar Expedition in 1911, examined the northern islands in very bad weather, and he gives some sketches of them in his book: *Zum Sechsten Erdteil.* In the same year some enterprising Norwegian whalers lost one of their vessels in heavy ice near Southern Thule. SHACKLETON sighted two islands from the *Endurance* in 1914, the *Quest* worked round Zavodovski in 1922, and the whale-catcher *Busen VII*, under Captain H. HANSEN, visited the islands from Saunders northwards in 1927. In 1927/8 Mr. J. E. HAMILTON, of the *Discovery* Committee's staff, accompanied the factory ship *Anglo-Norse* on a whaling expedition to the South Sandwich group, and he appears to have been the first to confirm BELLINGHAUSEN'S statement that Southern Thule consists of three islands.

The South Sandwich Islands form a chain nearly 300 miles in length, and the positions which we assign to them bear testimony to the great accuracy of COOK and BELLINGHAUSEN. With modern instruments and wireless time signals little alteration has been made. The greatest discrepancy is in Visokoi, which BELLINGHAUSEN unaccountably placed some 8 miles north of its true position.

---

(1) *We were particularly fortunate in having on board a folio of Notes on the South Sandwich Islands, compiled in the Hydrographic Office of the Admiralty, which contained translations of he relevant parts of* BELLINGHAUSEN'S *narrative and reproductions of his sketches.*

(2) LARSEN'S *plans are unpublished. That made by the* Quest *is shown in* Rep. Geol. Collections made during the Voyage of the Quest... in 1921-2, *p.* 65 (*British Museum*, 1930).

(3) *A fuller account will be found in* KEMP *and* NELSON, The South Sandwich Islands, Discovery Reports, *Vol. III, pp.* 133-198 (1931).

Southern Thule, as BELLINGHAUSEN stated, consists of three islands. Two of these, Cook and Thule, are buried deep in glacier, while the third, to which the name Bellinghausen Island has recently been given, still shows signs of volcanic activity.

Between Cook and Thule we discovered with our echo-sounding machines the existence of a very deep basin. The maximum sounding was 409 fathoms, and there is a comparatively large area with depths of over 300 fathoms. To the north and south the water is very shallow, with not more than 20 fathoms. We think it evident that this basin represents the original crater from which both Cook and Thule originated, and it is possible that the two were once joined together, forming one very large island. Here, as in Saunders Island and the Candlemas group, the centre of activity has shifted to a fresh site, and it appears likely that Bellinghausen Island is a more recent formation.

At the time of our visit to the islands our shallow-water echo-sounding machine was working admirably, and inshore soundings, which from a navigational view are of great importance, were taken in large numbers. But the deep-water machine was not efficient over the whole of its range, and we were thus unable to sound out the bank on which the islands stand with any degree of thoroughness. Fortunately we were able to get expert assistance when we underwent a refit in South Africa, and in the following season, 1930/31, we were able to gather some interesting data bearing upon the topography of the sea-bottom in this part of the Southern Ocean.

It was NORDENSKIÖLD who first showed that the volcanic rocks of Graham Land are identical with those of the Andes, and SUESS put forward the theory that there was a protrusion of these Andean types far into the Atlantic, and that a former land connection existed through Cape Horn, the Burdwood Bank, South Georgia, the South Sandwich Islands, the South Orkneys and the South Shetlands. This is known as the theory of the South Antillean Arc (1), and though it has been contested on geological grounds, opinion nowadays is mostly in its favour. It is strongly supported by the conclusions which Professor TYRRELL has drawn from our specimens from Thule Island. Soundings throughout the area are very scanty, but a few of them seemed to show that ridges connecting the islands might be found. This material has been seized upon by supporters of SUESS's theory for the construction of contoured charts; but these, since they are based on inadequate data, are in reality little more than an expression of the personal views of the author.

During the past season, with our deep-water echo-sounding apparatus working well, we have taken every opportunity to obtain soundings between the island groups. Sounding continuously, day and night, whenever we were at sea, we have in one season taken more soundings than previously existed in the whole area, and we have been able to show that some of the links in the chain that SUESS postulated were very well defined.

Between the Burdwood Bank and the Shag Rocks we have only one line, but it was taken on a zigzag course across the area where we hoped to find the ridge. The soundings are insufficient for contouring but none the less give good indications that such a ridge is to be found. To the North and to the South there is over 2000 fathoms, and on our course we have 41 soundings of under 1000 fathoms, 21 under 500 fathoms, and 4 under 250 fathoms. The lowest sounding is 201 fathoms situated about midway between the Burdwood Bank and the Shag Rocks. Between the Shag Rocks and South Georgia four lines of soundings show the existence of the ridge very clearly, and farther to the East a connection with less than 2000 fathoms has been shown to extend to the South Sandwich group.

North of the South Sandwich Islands the *Meteor* obtained a sounding of 4402 fathoms — at that time the deepest point in the whole of the South Atlantic. We ourselves recorded soundings of over 4000 fathoms near this position, and later, on a course running East-North-East between Saunders Island and the Candlemas group and thence in a North-West direction, we made two traverses of the deep, which is thus shown to exist far to the South of the point at which it was originally discovered. It has the form of a curved trough lying just to the East of the island chain, and its breadth abreast of the Candlemas group is only some 20 miles. The southern limits of the deep yet remain to be traced. The greatest sounding we obtained — 4421 fathoms (fully corrected) — is only slightly in excess of that recorded by the *Meteor*.

In October 1930, on our return to South Georgia from Cape Town, we paid a visit

---

(1) *The term "South Sandwich Arc" is perhaps to be preferred, since it does not suggest a misleading comparison.*

to Bouvet Island and, as several vessels before us have done, we made search once more for Thompson Island and the rocks called the Chimneys, which NORRIS in 1825 reported as lying 45 miles North-East of Bouvet. We had clear weather, but a big sea was running and echo-soundings were unusually difficult to obtain. We quartered the locality thoroughly, examining some 6000 square miles of sea, and no trace of the island was to be found. In this region there is an extensive area with less than 1000 fathoms of water; but it seems that we have traced out the approximate boundaries of this rise, and in the area examined it is certain that no island exists.

Of Bouvet Island itself running surveys had previously been made by the *Valdivia* and *Norvegia*, but on plotting positions we found a lack of agreement and we therefore made a fresh survey, taking two lines of echo-soundings round the island. We searched in vain for a pyramidal rock said to lie 5 1/2 miles off the coast.

That NORRIS did not take any soundings near Thompson Island is perhaps excusable; a hundred years ago a captain operating in these waters must have been very fully occupied in navigating his small vessel. There seems however to be less excuse for vessels which in recent years have reported dangers to navigation in the Southern Ocean. On this subject I write with some feeling, for in the aggregate we have spent whole days, often diverging widely from our proper course, in trying to rediscover these perils. Vessels light-heartedly report rocks, reefs or breakers in the open ocean, growing kelp is observed, people lean over the side and actually see the bottom — and we go there and find 2000 and 3000 fathoms of water. In a number of cases we have succeeded in producing sufficient evidence to persuade the Admiralty and the charts have been corrected; but for obvious reasons it is far easier to get a rock inserted on the charts than to get it expunged. If only those who make reports would remember the elementary use of the hand-line and lead, they would save much time and trouble to those who come after.

The charts of the South Shetlands are based largely on work done nearly one hundred yars ago, and they are known to be inaccurate in a number of particulars. We have found that several of the islands were widely out of position, reefs known to the whalers but not hitherto charted have been inserted and large corrections have been made in the vicinity of Snow and Livingston Islands. An intricate passage between these islands has been surveyed and it is believed that this will be of value to whalers from Deception Island. Many lines of echo-soundings have been taken in Bransfield Strait, and the bottom topography, with its two enclosed basins, is now known in general outline.

In the Palmer Archipelago, thanks to the work of the *Belgica* and of the French expeditions under CHARCOT, the charts are more accurate than in the South Shetlands; a few minor corrections were made as we passed through the islands and a series of soundings was taken in the channels.

The Hydrographer of the Royal British Navy heartily supported the lecturer's remarks regarding the reports of dangers received. He stated that reports were received at the Admiralty of breakers, shoals, fish jumping out of the water, birds flying over reefs, but no attempt was made to verify these reports by soundings. Such reports could not be discredited, but it is not desirable to plaster charts with what are called vigias, which must cause great anxiety to the sailor the next time that he passes near such a reported danger. It is to be hoped that with the arrival of echo-sounding — which is a much easier way of taking soundings — more authentic details may be obtained before such dangers are reported.

The Hydrographer referred to one result of the work of the *Discovery II* which the lecturer did not mention explicitly, with regard to the lost group of islands, Thompson's Island and the Chimneys. From old records they appear to have been lost ever since NORRIS sighted them, but from the survey of the *Discovery II*, coupled with all the old searches made for these rocks, it had been possible to expunge them from charts as being non-existent.