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The *Helgoland* Expedition to Svalbard: Die Deutsche Expedition in das Nördliche Eismeer, 1898

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ABSTRACT. In the summer of 1898 the trawler *Helgoland* sailed north from Germany, bound for Svalbard. On board was a scientific expedition, the Deutsche Expedition in das Nördliche Eismeer, led by Fritz Römer and Fritz Schaudinn, and also a party of sportsmen led by Theodor Lerner. The main foci of the scientific effort were marine biology and ornithology. Pushing the ship to its limit, often in quite heavy ice and foul weather, the expedition pursued a complicated course around the archipelago. In terms of marine biology her scientists occupied 51 dredging stations and 82 plankton stations and collected an extremely rich assemblage of marine organisms. Perhaps the most exciting were a group of stations occupied on the continental slope to the north of Svalbard. *Helgoland*'s captain, Kapitän Rüdiger, made a number of corrections and additions to the map of Svalbard; his most significant contribution was the first accurate map of Kong Karls Land. *Helgoland* was also the first vessel to circumnavigate Nordaustlandet in a counterclockwise direction.

After the expedition's return to Germany, Römer and Schaudinn used the expedition's data as the focal point for an impressive collection of papers on arctic fauna. The series, entitled *Fauna Arctica*, runs to six volumes and represents a key contribution to arctic zoology.

Key words: *Helgoland* expedition, Svalbard, Kong Karls Land, marine biology, ornithology

RÉSUMÉ. Au cours de l'été 1898, le chalutier *Helgoland* partit d'Allemagne et mit le cap vers le Svalbard, en direction du nord. À bord se trouvaient une expédition scientifique, la Deutsche Expedition in das Nordliche Eismeer, dirigée par Fritz Romer et Fritz Schaudinn, ainsi qu'un groupe d'amateurs de chasse et de pêche, à la tête duquel se trouvait Theodor Lerner. L'effort scientifique devait se concentrer sur la biologie marine et l'ornithologie. En poussant le bateau jusqu'aux limites de ses possibilités, souvent alors que la mer était encombrée de glace et que le temps était très mauvais, l'expédition poursuivit sa route sinueuse dans l'archipel. En ce qui touche à la biologie marine, les savants visitèrent 51 postes de dragage et 82 postes de prélèvement de plancton et ils recueillirent une très riche variété d'organismes marins. La visite la plus intéressante fut peut-être celle des postes regroupés sur le plateau continental au nord du Svalbard. Le capitaine de l'*Helgoland*, Kapitän Rüdiger, apporta un certain nombre de corrections et d'additions à la carte du Svalbard; sa contribution la plus importante fut de dresser la première carte précise de Kong Karls Land. L'*Helgoland* fut aussi le premier bâtiment à faire le tour du Nordaustlandet dans le sens contraire à celui des aiguilles d'une montre.

Après le retour de l'expédition en Allemagne, Romer et Schaudinn, à partir des données de l'expédition, écrivirent une série impressionnante d'articles sur la faune arctique. Cette collection intitulée *Fauna Arctica* ne comprend pas moins de six volumes et constitue une contribution majeure à la zoologie arctique.

Mots clés: expédition de l'*Helgoland*, Svalbard, Kong Karls Land, biologie marine, ornithologie

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INTRODUCTION

In 1898 the German businessman Herr Theodor Lerner, who had already visited Svalbard as a tourist several times, conceived the idea of chartering a steamer and of mounting a private expedition to the archipelago (Römer and Schaudinn, 1900) that would combine elements of tourism, hunting and marine biological research. Undoubtedly Lerner's choice of the latter area of scientific endeavour as a major thrust of his expedition was influenced by his awareness (or by advice from others) as to its being one of the major gaps in the scientific knowledge of the archipelago.

Although a great deal of information on the archipelago and the surrounding waters had been accumulated by the whalers, particularly from the Netherlands, during the 17th century, the history of truly scientific investigation in Svalbard may be said to have begun with a number of expeditions aimed at reaching the North Pole from this direction. The first of these was the Russian Navy's expedition of 1764-66, conceived, planned and promoted by M.V. Lomonosov and commanded by Vasiliy Yakovlevich Chichagov (Belov, 1956) aboard the pink *Lapomnik* and two other vessels. The expedition resulted in the first reasonably accurate map of the west coast of Svalbard and a great deal of information on soundings, currents and ice in the Greenland Sea. Further information of the same type was gathered by the British Admiralty's expedition, commanded by Captain John Phipps, aboard *Racehorse* and *Carcass* in 1773 (Phipps, 1774) and by Captain William Edward Parry's expedition aboard *Hecla* in 1827 (Parry, 1828). These latter two expeditions added greatly to the knowledge of the northern coasts of the archipelago.

The first wholly scientific expedition to visit the archipelago was that of a French group, the Commission Scientifique du Nord, aboard the corvette *Recherche* in 1838 and 1839 (Marmier, 1844-47). It visited various of the fiords of Spitsbergen, especially Bellsund and Magdalenefjorden, and carried out a range of scientific observations. The next significant scientific expedition was the first of a long series of Swedish expeditions, namely Otto Torell's of 1858 aboard *Fridtjof* (Duner and Nordenskiöld, 1865), which visited a range of harbours from Hornsund north to Amsterdamøya. Three years later Torell led a further expedition (Chydenius, 1865; Leslie, 1879), in which A.E. Nordenskiöld and J.K.E. Chydenius also participated, aboard *Aeolus* and *Magdalena*; this expedition added greatly to the knowledge of the north coast of Spitsbergen as far east as Sorgfjorden.

Torell and Nordenskiöld led further expeditions to Svalbard in 1864 and 1868 (Torell and Nordenskiöld, 1869). The aim of the latter of these expeditions was to penetrate as far north as possible; in this it was not particularly successful, but the expedition contributed greatly to the geology and ornithology of the archipelago.

The summer of 1869 saw the first German foray into these waters: *Germania*, the vessel of the First German North Pole Expedition, cruised north around Spitsbergen and penetrated south through Hinlopenstretet as far as Wilhelmøya, which owes

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its name to this expedition (Koldewey, 1871). A few years later Nordenskiöld was back in Svalbard waters, leading a Swedish expedition in 1872-73 (Kjellman, 1875); this was the first scientific expedition to winter, at Mosselbukta at the entrance to Wijdefjorden. As part of this expedition Nordenskiöld and A.A.L. Palander made an impressive sledge trip east to the northeast tip of Nordaustlandet, then back westward across that island, thus achieving one of the earliest major sledge trips across any of the arctic ice caps, namely across Austfonna.

The year 1882 saw the mounting of one of the most intensive scientific operations ever to focus on Svalbard. This was the Swedish contribution to the First International Polar Year, led by Nils Ekholm (Ekholm, 1887; Barr, 1985). It established itself in winter quarters at Kapp Thordsen on Isfjorden to carry out an intensive program of meteorological, geomagnetic and other observations.

Kong Karls Land had first been sighted in 1872, and various Norwegian captains, especially Kaptein Hemming Andreassen, had repeatedly visited the island group during hunting trips (Pettersen, 1889). The first visit by a scientific expedition occurred in 1889; an expedition organized by the Bremen Geographical Society, aboard the yacht *Berentine*, and led by W. Kükenthal (Kükenthal, 1890), made several attempts to reach the island group and produced the first map of some of the islands.

During the following summer (1890) yet another Swedish expedition visited Svalbard, that led by G.E.A. Nordenskiöld, which concentrated on the geology, paleontology and zoology of parts of Spitsbergen; overland trips included a ski trip from Hornsund to Recherchefjorden (Nordenskiöld, 1890). Two years later, in 1892, the French Navy's research vessel *La Manche*, under the command of Capitaine A.P.L. Bienaimé, carried out surveying, sounding and scientific work in Bellsund, Isfjorden and around Prins Karls Forland (Voyage de La Manche, 1894). Four years later Isfjorden was the focus of yet another Swedish expedition, led by geologist Baron G.J. de Geer (de Geer, 1896). Finally, this selective overview of the scientific exploration of Svalbard prior to 1898 would not be complete without reference to Conway's ski trips across Spitsbergen in 1896 and 1897 (Conway, 1897, 1898). Conway's accounts include a great deal of valuable information on the geology and glaciology of the archipelago.

While some observations were made by various of these earlier expeditions in the area of marine biology, it was a field of science that had largely been neglected. Hence Fritz Schaudinn (Fig. 1), Privat-Dozent (lecturer) at the Zoologischer Institut der Universität Berlin, and Fritz Römer (Fig. 2), Assistent (assistant) at the same establishment, were invited by Lerner to organize a comprehensive program of marine biological research during a cruise around the archipelago. A third scientist invited to participate in the expedition was Herr Dr. Bruhl, Assistent at the Königlicher Physiologische Institut zu Berlin, who would combine the duties of expedition doctor with collecting and research in the areas of animal physiology and bacteriology.

The two hunters invited to participate (apart from Theodor Lerner himself) were the Königliche Forst-Assessoren Bruning and von Krosigk and the Grossherzöglich-Mecklenburgische Jagdjunker Herr von Stralendorf. The final two members of the party were the famous animal painter Richard Friese and the writer Reinhold Cronheim, each of whom was to interpret the arctic landscape in his own medium.

In command of the expedition vessel was Korvettenkapitän a. D. Herman Rüdiger. Under his command were two mates, three engineers, one stoker, four seamen, one specimen preparer, one Norwegian ice pilot and one Norwegian harpooner (Rüdiger, 1898).

FIG. 1. Dr. Fritz Schaudinn.

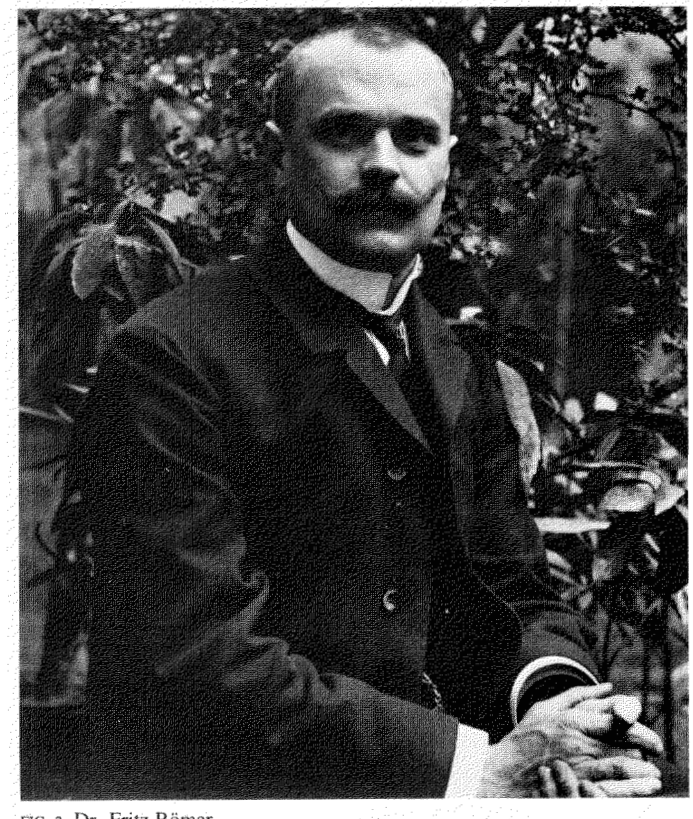

FIG. 2. Dr. Fritz Römer.

The vessel chartered for the expedition was a small steel fishing trawler, *Helgoland*, owned by the Oldenburgische Hochseefischerei Gesellschaft of Geestemunde. She was selected over a wooden whaling vessel of the type that had become

almost standard for polar expeditions, in that first of all there were no plans for wintering in the Arctic; secondly it was not anticipated that the vessel would be working in heavy arctic ice, although she was designed to tackle light ice, since this was a normal aspect of navigating the Elbe and Weser estuaries in winter. And thirdly, with her relatively small dimensions (a length of only 34 m and a draft of less than 5 m [Rüdiger, 1898]), *Helgoland* was extremely maneuverable, a distinct advantage for the marine biological work that was to be such a major focus of the expedition, and for working in tricky, uncharted coastal waters and among ice.

The design of the trawler also offered several real advantages for marine biological work in that the techniques of this area of science and of deep-sea trawling are very similar. Her low freeboard made the handling of dredges, trawls and plankton nets relatively easy. And of course she already possessed a powerful steam winch. The only additional item that had to be acquired was a hemp-cored steel cable, 2500 m in length, for deep-sea trawling. The net locker in the ship's bows was converted to a laboratory and equipped with tables, drawers and shelves (Römer and Schaudinn, 1900).

Helgoland sailed from Geestemunde in late May 1898. A severe North Sea gale submitted the stowage of equipment and cargo to a severe test and necessitated a stop of several days in Bergen while minor repairs were effected (Römer and Schaudinn, 1900). Next port of call was Tromsø, where ice pilot Soren Johannesen and harpooner Claus Thue came aboard. Here too the crow's nest was hoisted to the foremast, the whaleboats were stowed on deck and the bunkers were filled to capacity; a deckload of sacks of coal was also stowed.

Final preparations having been made, the expedition put to sea from Tromsø on 8 June in magnificent sunshine. Before leaving Norway's coastal waters, *Helgoland* made a stop at the whaling station on Rolfsøya in Troldfjorden. The scientists were present on the flensing plan as a 22 m female fin whale was processed and made an extensive collection of specimens for later analysis. The stomach contents were also subjected to careful scrutiny and were found to consist almost exclusively of red decapods, about 2-3 cm long. Whale steaks were served aboard *Helgoland* that night and were found to be quite appetizing; however many expedition members lost their meal later the same night in the rough waters of the Barents Sea.

The seas were so rough that the trawler could steam only at half speed to prevent the deck cargo of coal from being swept overboard. Despite the rough conditions, however, regular plankton hauls were made. This task and the preserving of the plankton samples took great willpower and effort on the part of the seasick scientists.

The trawler approached Bjørnøya through dense fog, the proximity of land being indicated by the successive appearance of fulmars, glaucous gulls, kittiwakes, razorbills, guillemots and little auks. On the morning of 12 June the fog cleared to reveal Bjørnøya, bathed in sunshine. With a boat ahead sounding, *Helgoland* eased in to within 800 m of shore and dropped anchor in the little southern harbour. A party rowed ashore and for a while amused themselves by firing shots, simply to watch the waves of seabirds taking to the air from the vast nesting colonies on the cliffs of Fuglefjellet (Römer and Schaudinn, 1900). The commonest species observed were black guillemots (*Cepphus grylle*), razorbills (*Alca torda*), Brunnich's guillemots (*Uria lomvia*), little auks (*Plautus alle*), puffins (*Fratercula arctica*), kittiwakes (*Rissa tridactyla*), glaucous gulls (*Larus hyperboreus*) and fulmars (*Fulmarus glacialis*). Although the expedition members did not report it, it should be noted that the Bear Island guillemot (*Uria aalge hyperborea*) is also very numerous on the cliffs of Bjørnøya (Løvenskiold, 1963). Most of the first day was spent by zoologists in collecting eggs, embryos, downy young and adults of the various bird species from their preferred nesting habitats on the cliffs or on the adjacent gravel- or talus-covered slopes.

On the second day the scientists managed to find a landing spot at the mouth of a small stream valley that provided a route up to the interior. The zoologists investigated five of the numerous freshwater ponds in the interior. Apart from sounding and surveying, they also studied the fauna; they found it to be quite impoverished, the larger organisms being restricted to copepods, daphnids and mosquito larvae. The microscopic fauna bore a strong resemblance to that of ponds on mainland Europe, probably having been brought here by migrating waterfowl. Large flocks of gulls, mainly kittiwakes, were loafing and resting on the ponds. Purple sandpipers (*Calidris maritima*) were quite numerous but appeared to be feeding on the pond algae rather than on their normal insect diet. Some pairs of red-throated loons (*Gavia stellata*) were spotted on the ponds but were extremely wary. Several pairs of parasitic jaegers (*Stercorarius parasiticus*) were seen in courtship displays near the ponds.

On Fuglefjellet the zoologists found the den of an arctic fox and killed the female for their collection. Analysis of its stomach contents revealed that it had been feeding mainly on birds. Three other foxes were sighted and the tracks and fresh droppings of a polar bear were found. The scientists found the vegetation on Bjørnøya to be extremely meagre: the island consisted mainly of barren talus slopes and rock faces, with only isolated pockets of flowering plants, mosses and grasses attaining a relative degree of luxuriance only near the ponds.

After two days of hiking around the island, the scientists spent the third day in preserving and organizing the specimens they had collected and in investigating the fauna of the littoral zone. Rather strangely, Römer and Schaudinn (1900) make only an oblique reference to another scientific expedition visiting Bjørnøya at exactly the same time: *Antarctica*, the vessel of the Swedish Arctic Expedition led by Professor A.G. Nathorst, was lying in the southern harbour alongside *Helgoland* from 13 to 20 June (Nathorst, 1899). Nathorst makes no mention of the German expedition.

Helgoland put to sea again on 15 June and headed north. Abeam of the north cape of Bjørnøya the biologists dredged for benthic organisms for the first time, and a vast haul kept them busy until late into the night. Next day Sørkapp (Fig. 3) hove into view on the port beam, and as *Helgoland* headed into Storfjorden the first small ice floes drifted past the ship (Rüdiger, 1898).

Over the next week the trawler steamed to and fro through the continuous, but relatively light, ice of Storfjorden. On the 16th several bearded seals (*Erignathus barbatus*) and two polar bears were killed, and the scientists examined and measured them, taking innumerable samples. Several choice cuts of meat, destined for the galley, were hung in the shrouds. *Helgoland*'s farthest north during this week was the mouth of the Ginevrabotnen, but this strait, like Freemansundet, the other strait leading through to Olgastretet, was blocked by solid ice, which *Helgoland* was incapable of tackling.

Fortunately the weather during this week was magnificent, with bright sunshine and steady but light northerly winds, which kept the ice reasonably loose yet did not raise a heavy sea. The scientists were able to occupy five dredging stations and six

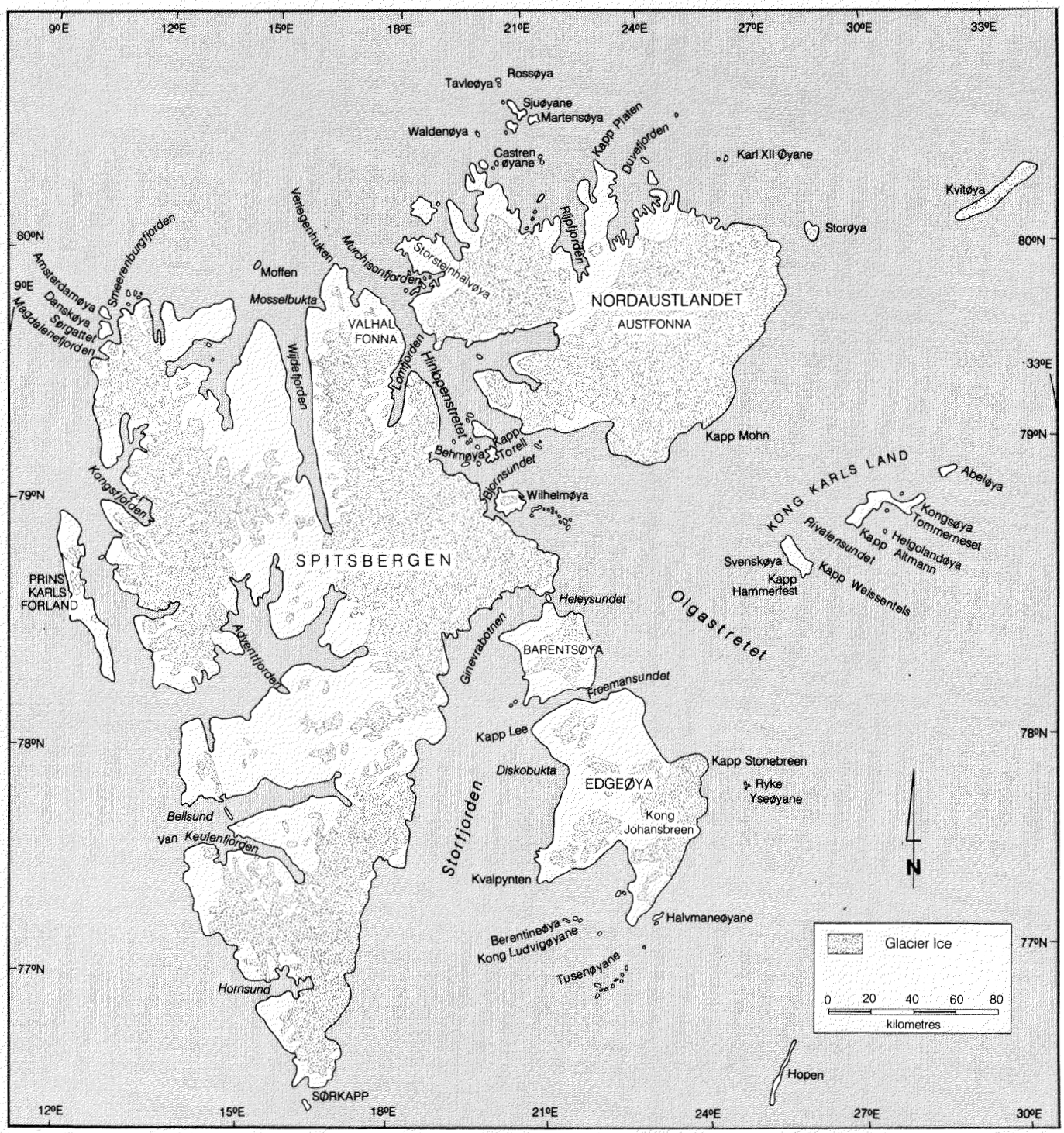

FIG. 3. Map of Svalbard, showing *Helgoland*'s areas of operations.

plankton stations, all of which produced abundant specimens. The coasts of Spitsbergen to the west and of Edgeøya and Barentsøya to the east were constantly in sight. The scientists were struck by the sharp contrast between the rugged, jagged, glacier-hung peaks of Spitsbergen and the horizontal, tabular plateaux of the islands to the east. This contrast was all the more striking in that the mountains of Spitsbergen were still largely snow covered, whereas only a few lingering snowbanks persisted in the gullies of Barentsøya and Edgeøya.

The scientists went ashore several times. At Diskobukta on Edgeøya they found the wide coastal plain covered with a dense vegetation. Arctic poppies (*Papaver radicatum*), various saxifrages and Ranunculaceae were already in flower. There were numerous herds of reindeer grazing on the lowland, and the hunters soon found that they were totally unafraid. Several dozen animals were shot during two excursions ashore, the meat being hung in the "pantry" in the shrouds.

Having swung around the south coast of Edgeøya, on the evening of the 23rd *Helgoland* dropped anchor off Berentineøya, one of the Kong Ludvigøyane. The main reason for visiting this

island was to inspect the cairn on its summit, erected by Professor Wilhelm Kükenthal in 1889. While engaged in a very similar expedition to that aboard *Helgoland*, Kükenthal's ship *Berentine* ran aground and was crushed by ice on this island on 11 June 1889 (Kükenthal, 1890). Fortunately he and his companions were rescued by the Tromsø sealing vessel *Cecilie Maline* only four days later. Kükenthal was able to come to an arrangement with the captain of the latter vessel allowing him to continue his scientific investigations in Svalbard waters for the remainder of the season.

During the next few days *Helgoland*'s scientists investigated the abundant bird life of the Tusenøyane, an archipelago of low-lying marshy islands off the south coast of Edgeøya. They supported enormous breeding populations of king and common eiders (*Somateria spectabilis* and *S. mollissima*), brent geese (*Branta bernicla*), sandpipers (*Calidris maritima*), arctic terns (*Sterna paradisea*) and grey phalaropes (*Phalaropus fulicarius*). The scientists were intrigued to watch a polar bear raiding eider nests on Berentineøya; its stomach was later found to contain a vast quantity of eggs. The scientists also took careful notes on the phalaropes, determining that only the males incubated the eggs while the females loafed in flocks on the ice floes or on freshwater ponds. Numerous eggs and embryos of all the nesting species were collected.

From here the plan was to proceed northeast to investigate Kong Karls Land, but the trawler encountered heavy ice off Halvmåneøya; the skipper of a walrus-hunting vessel, *Anna*, with whom the Germans spoke here, reported that he had been dodging off this ice edge for three weeks in the hope of getting farther north and east (Römer and Schaudinn, 1900). Kapitän Rüdiger now took his vessel southeast in the hope of getting around the barrier on the south, but to no avail; the ice margin stretched persistently southeast toward Hopen. The scientists now decided to postpone their visit to Kong Karls Land and to head instead for the west coast of Spitsbergen. Hence *Helgoland* now headed west across the mouth of Storfjorden, although masses of ice forced her to swing quite far south. The voyage around Sørkapp and north up the coast to Bellsund was plagued by storms and fog; Kapitän Rüdiger was very grateful for the presence of numerous stranded bergs and floes off the tip of Sørkapp, in that they acted as very useful beacons marking shoals that could have been extremely hazardous given the poor visibility (Rüdiger, 1898).

On 27 June *Helgoland* ran before a gale into the shelter of Van Keulenfjorden, off Bellsund. Here again the ornithologists made a fruitful trip ashore; they found their first pink-footed geese (*Anser brachyrhynchus*) nesting on boggy, grassy meadows, while the coastal cliffs swarmed with gulls, guillemots and puffins. The marine biologists had barely finished hauling a dredge in a depth of 150 m in the entrance to Bellsund when a fierce southwest gale struck. Seas continually swept the deck and even filled the crow's nest on the foremast with water. Boxes, bottles, jars and instruments broke loose in the laboratory and were hurled to and fro, producing utter chaos. Everyone was extremely relieved when, having swung around the northern tip of Prins Karls Forland, *Helgoland* again ran for shelter, this time in Kongsfjorden.

This involuntary stop was a welcome one for the marine biologists, giving them a chance to repair their nets and trawls, which had suffered some damage on the rocky bottoms. Once the rain had stopped a party also made a trip by boat to the head of the fiord. This entailed an exciting journey through a steady stream of rolling, tossing bergy-bits calved from the glacier snouts around the fiord; these latter also caused some anxiety to the ship's officers, concerned for the safety of the anchored vessel (Rüdiger, 1898). At the head of the fiord the boat party visited some small bird islands, where they discovered the same range of nesting species as on Tusenøyane.

Since the storm had abated by next morning (30 June), *Helgoland* put to sea again. In the entrance to Kongsfjorden the zoologists were keen to investigate a "hole" marked on the chart as having a depth of 250 fathoms. After a prolonged search a round, narrow, steep-sided hole 395 m deep was found, whereas the general depth in the mouth of the fiord was 60-80 m. Very few organisms were found, mainly just dead worm tubes and the occasional echinoderm. Particularly striking was the stench of sulphuretted hydrogen given off by the mud. This is an interesting early reference to anoxic bottom water, which occurs relatively commonly in the fiords of Norway and the Canadian Arctic.

Passing the mouth of Magdalenefjorden, *Helgoland* next ran through Sørgattet into Smeerenburgfjorden. At its southwest end, just off a glacier that was calving continuously and spectacularly, a rich haul of benthic and planktonic organisms was collected. The dredge brought up a very colourful selection of brown and red algae (Römer and Schaudinn, 1900). That evening (30 June) several hours were devoted to a visit to the station at Virgohamna on Danskøya, from where Andrée began his ill-fated balloon trip to the Pole in 1897 (Svenska Sallskäpet för Antropologi och Geografi, 1930). The skeleton of Andrée's balloon house lay in a tangle of debris on the beach.

Heading east along the north coast of Spitsbergen in completely ice-free seas, *Helgoland* next called at the low atoll-like island of Moffen. A boat party went ashore, running into the central lagoon via the entrance on the northwest side. There were large numbers of eider nests, but most had recently been robbed of their eggs by Norwegian hunters; the ducks were loafing in large numbers on the beach. Large quantities of driftwood and several Norwegian glass net floats were assumed to have been carried here from the Norwegian coast by the North Atlantic Drift.

Continuing northeastward, still in open water, *Helgoland* ran into heavy ice and dense fog almost simultaneously as she was approaching the high, rocky tower of Rossøya and the lower Tavleøya. While the trawler lay off the edge of the looser ice, a boat worked its way through the ice to a landing site on Rossøya. A study of the avifauna revealed that the following species were nesting: *Plectrophenax nivalis, Cepphus grylle, Uria lomvia, Plautus alle, Larus hyperboreus, Rissa tridactyla, Pagophila eburnea, Fulmarus glacialis, Somateria mollissima, Branta bernicla* and *Clangula hyemalis*. The landing party was forced to beat a hasty retreat when it was seen that the ice conditions were steadily deteriorating; the dense fog plus the fact that Kapitän Rüdiger had to retreat some distance westward due to the ice made the return boat trip an exciting one.

Pushing northward into the ice, *Helgoland* reached a latitude of 80°48'N, but the ice then forced her to turn back. Trawling in a depth of 85 m produced a rich haul of echinoderms. Despite the abundance of ice, the water temperature was still above 0°C and the air temperature between 3° and 4°C.

That evening, having extricated herself from the fog and the ice, *Helgoland* headed south (Rüdiger, 1898) and dropped anchor for a few hours off Waldenøya. Next Kapitän Rüdiger took his ship southeast to the mouth of Rijpfjorden, where he moored to the ice edge. It was a magnificent, sunny day (Sunday, 3 July),

and at noon the temperature in the shade climbed to 11.5°C, one of the highest recorded on the entire trip. The scientists made a productive plankton haul and also amused themselves with a boat trip during which they gazed down through the calm, transparent water, watching the life on the seabed. In the interim members of the crew tried frying bacon out on the ice to attract bears; the strategy was successful and a mother bear and her two cubs were shot close alongside the ship. Some of the scientists also went seal hunting, and the results of their hunt provided the artist, Friese, with a subject for a painting.

Getting under way again, *Helgoland* rounded Kapp Platen but ran into heavy ice a little farther east. Duvefjorden and the Karl XII Øyane were quite inaccessible. A dredge was hauled and then the ship headed back west. Off the Castrenøyane hunting vessels had reported that Hinlopenstretet was completely ice free. It was decided to take advantage of this and run through the strait to the south side of the archipelago to resume explorations there.

Steaming at full speed around Storsteinhalvøya and past the mouth of Murchisonfjorden, *Helgoland* ran south through Hinlopenstret, finding it indeed free of ice. Off Kapp Torell, however, a barrier of close ice blocked the southern exit from the strait, a white expanse of ice extending right to the horizon. While the trawler lay at anchor in the lee of Behmøya the scientists made boat trips along the edge of the ice, collecting plankton. Some walrus were sighted and also a school of over 100 beluga. Quite heavy masses of ice, including both floes and icebergs, were drifting to and fro in the strait, endangering the ship where she lay off Behmøya; hence it was prudently decided to retreat north through Hinlopenstretet. A strong northerly gale, funnelling down the strait, was raising a lively sea, and all on board were quite relieved when Kapitän Rüdiger decided to seek shelter in the lee of Foottøya in Lomfjorden. A dredge haul here produced rather discouraging results; the zoologists concluded that the impoverished nature of the fauna was due to the constant rain of silt and sand from glaciers and icebergs.

Putting to sea again, *Helgoland* ran north past the spectacular ice cliffs of Valhalfonna. To everyone's surprise, since the British chart showed only 22 fathoms, a sounding here produced a depth of 450 m; the depths increased even more toward the north, reaching 480 m off Verlegenhuken. Two dredge hauls from this deep trench produced an abundant fauna, with echinoderms predominating. The plankton hauls indicated a flow of cold, arctic water at depth, moving south through Hinlopenstretet (identified on the basis of its abundant diatoms), while the upper layers consisted of the warm waters of the North Atlantic Drift (Römer and Schaudinn, 1900).

A brief stop was made in Wijdefjorden, where the larder was replenished by a successful reindeer hunt, and another at Mosselbukta, where a party visited the house where A.E. Nordenskiöld and his party had wintered during their attempt at the Pole in 1872-73 (Leslie, 1879; Kjellman, 1875).

Helgoland was now bound for Adventfjorden and a rendezvous with the steamer *Auguste-Viktoria* of the Hamburg-Amerika Paketfahrt-Aktiengesellschaft. Running through Smeerenburgfjorden and Sørgattet once again, she was delayed for a whole day off Amsterdamoya by a severe westerly gale and hence did not reach Adventfjorden until the evening of 10 July. The members of the *Helgoland* expedition were amazed at the amount of activity at Adventfjorden. Apart from *Auguste-Viktoria*, from which, by pre-arrangement, *Helgoland* received both coal and provisions, SMS *Olga*, carrying an expedition dispatched by the Deutscher Seefisch-Verein (German Sea Fisheries Union), was also lying at anchor, along with an English yacht and several small Norwegian hunting and tourist vessels. On shore there was a hotel, operated by a Norwegian company and complete with a post office and a newspaper office, which produced a trilingual newspaper, the most northerly in the world. Scientists, officers and crew members enjoyed the chance to interact with strangers for a change, while the zoologists cooperated with Dr. Hartlaub, zoologist with the fisheries expedition, in doing some collecting (Römer and Schaudinn, 1900).

On 15 July *Helgoland* weighed anchor and headed south, bound for Kong Karls Land. But first a southeasterly gale forced her to run for shelter into Hornsund. Even here, however, she was menaced by icebergs driving before the violent squalls blowing down from the mountains. This three-day sojourn in Hornsund allowed extensive plankton collections to be made; the zoologists also found that the North Atlantic Drift had carried a large variety of pelagic organisms into this cul-de-sac, especially medusae.

The continuation of the voyage around Sørkapp and across the entrance of Storfjorden was made in heavy seas, while off the Tusenøyane the situation was complicated by dense fog. Fortunately, however, there was no sign of any ice. Coasting north along the east coast of Edgeøya, the scientists only fleetingly glimpsed the impressive ice cliffs of Kong Johansbreen through the fog. Dropping the Ryke Yseøyane astern, Kapitän Rüdiger next set a course for Kapp Hammerfest, the southern tip of Svenskøya.

Finally on the morning of 23 July a small island was spotted, with a much larger land mass lying beyond it to the north. A party went ashore on the islet (named Helgoland Insel) to clarify the situation. Confusion arose from the fact that *Helgoland* had sailed right over the southern part of Svenskøya as it had been plotted on the map by Kükenthal on the basis of his visit to the area in 1889 (Kükenthal, 1890). The latter had been close to the southeast coast of Svenskøya on four occasions between 24 June and 12 August 1889, sometimes within 3-4 km of land, but nonetheless had made a serious mistake in plotting its position and size. As it appears on his map, it is almost four times larger and twice as long as it is in reality.

The *Helgoland* scientists quickly realized that the island on which they had landed lay in a large bay on the south side of a much larger island (which they named Jena Insel), now known as Kongsøya. Leaving Helgolandøya, the trawler now headed north for the south coast of Kongsøya but was severely hampered by drift ice, packed together by a strong east wind. From the ship it was clear that Kongsøya consisted of high eastern and western sections joined by a central lowland, which might easily be mistaken for a strait at a distance (Rüdiger, 1898).

In the early hours of 24 July a landing party went ashore to investigate this lowland; the scientists were met by a female bear with two cubs. The mother and one cub were shot and the other cub captured. Hiking north across the lowland, which they found to be very boggy and strewn with lakes and ponds, the scientists found sandpiper nests with fully fledged young. Swinging west, they climbed to the top of the western basaltic plateau, from which they got a fine view of the rest of the island. They also spotted some more bears near the coast and shot three more on the way back to the boat; the dead animals were towed out to the ship. One of the scientists received a very bad scare when, having wounded a female bear, he broke through the ice and lost his rifle. When the bear charged he had only a knife with which to protect himself and received a solid cuff before he managed to escape.

Helgoland lay at anchor due to dense fog for the next few days; scientists and hunters took advantage of the opportunity to make trips ashore. The bear population was truly amazing: in one bay, Viktoriabukta, 14 bears were seen at one time.

On 28 July the trawler got under way again, heading east along the south coast, but off Tommerneset she was brought to a halt again by thick fog. Trawls and plankton nets were in regular operation, either from the trawler or from boats, with very satisfying results. The extremely rough, rocky nature of the seabed meant that the bottom trawls were almost invariably bent and damaged when they surfaced, and the engineers were kept busy making repairs.

When the weather cleared *Helgoland* headed northeast toward Zemlya Frantsa Iosifa with a double aim in view: in part to locate the ice margin and in part to check the reports of two islands seen in this area by Kaptein H. Johannessen and Kaptein Hemming Andreassen in the summer of 1884 (Kükenthal, 1890). On the basis of his own observations in the summer of 1889, Kükenthal had decided that these islands did not exist, and now *Helgoland*'s foray to the northeast confirmed this.

After leaving the area of Kong Karls Land, *Helgoland* ran across Andreassen in his ship *Rivalen* near Kapp Mohn, and Kapitän Rüdiger was able to question him about the islands he had reported (Rüdiger, 1898). On the basis of his answers and of his log for the period in question, Rüdiger was satisfied that Andreassen had been deceived by the low isthmus in the middle of Kongsøya as seen from the south into thinking that it was two islands (he had been unable to get close due to ice). But neither Andreassen, himself, nor Rüdiger could explain how the "islands" had been so grossly exaggerated in size or displaced so far north and east.

As *Helgoland* ran northeast from Kongsøya rapidly increasing depths indicated that a deep channel ran between Svalbard and Zemlya Frantsa Iosifa, although, since the ship was brought to a halt by ice some 65 km northeast of Kongsøya, this hunch could not be fully confirmed. In fact a major trough does extend between Kong Karls Land and Kvitøya.

Over the next few days *Helgoland* slowly made her way, with frequent stops, westward along the north coast of Kongsøya. Numerous trips were made ashore to study the flora, fauna and geology. Swinging south through Rivalensundet, the trawler stopped at Kapp Altmann, where a cairn was built and a message deposited to commemorate the first circumnavigation of Kongsøya. At the previous anchorage on the south side of Kongsøya the Germans had found two Norwegian hunting vessels at anchor. They had already killed 9 bears, which along with the 27 shot by *Helgoland*'s sportsmen, provide some indication of the abundance of bears around this archipelago. When a walrus surfaced nearby the Germans were treated to the interesting spectacle of the Norwegians hunting the animal from a boat with rifles, harpoon and lance.

On 2 August *Helgoland* sailed around Abeløya, the most easterly of the Kong Karls Land group, and a party went ashore (Römer and Schaudinn, 1900). They found it to be a generally barren, low heap of rock, the vegetation consisting only of mosses and lichens. But to the delight of the ornithologists, they found an extensive nesting colony of ivory gulls (*Pagophila eburnea*), the nests scattered on level ground amid those of terns and eiders. The only previous definitive reports of this species nesting on Svalbard were those of Johanessen, who had observed this gull similarly nesting on open, low-lying land on Storøya in 1887, of Malmgren (of the Swedish expedition of 1861), who had reported it nesting on cliffs in Murchisonfjorden along with other gulls such as kittiwakes and glaucous gulls (Bent, 1921), and of Pike, who had found it nesting on Svenskøya the previous year (Løvenskiold, 1963:268). A substantial number of eggs was collected, along with specimens of young gulls of varying ages.

The next objective was to explore Svenskøya. Steaming back west along the north coast of Kongsøya, *Helgoland* swung south through Rivalensundet and a party went ashore at Kapp Weissenfels on Kongsøya. In an area of sand dunes in a generally peaty lowland on the east side of the island they found a bleached, intact skeleton of a very large bear, almost completely buried in the drifting sand. Large numbers of waterfowl, including oldsquaws (*Clangula hyemalis*), red-throated loons (*Gavia stellata*), eiders (*Somateria mollissima*), brent geese (*Branta bernicla*) and pink-footed geese (*Anser brachyrhynchus*), were seen on or around the island's pools and lakes. Guillemots and gulls (including the occasional ivory gull) were nesting in the cracks and clefts of the columnar basalt cliffs where the plateau forming the spine of the island reached the sea in the north and south.

Once *Helgoland* had steamed around Svenskøya and had occupied a dredging station in the middle of Rivalensundet, her pioneer survey of Kong Karls Land was complete. Her marine biologists had collected a wide range of planktonic and benthic organisms; her ornithologists had made a comprehensive survey of the birds on all three major islands. Most importantly, Kapitän Rüdiger had compiled the first accurate map of the archipelago despite a great deal of foggy weather and gales during the 11 days *Helgoland* spent in the area (Rüdiger, 1898). The Swedish expedition under Nathorst also surveyed the archipelago that summer, but the resultant map compiled by C.J.O. Kjellström and A. Hamberg presents the coasts of Abeløya as a vague dotted line (Nathorst, 1899). Rüdiger's map is not only more accurate but also predates the Swedish map by a year. Both maps are certainly a vast improvement on Kükenthal's map of a decade earlier; most importantly, they both show Svenskøya in its true position and size, only about one-quarter the size shown on Kükenthal's map (1889).

On 5 August *Helgoland* finally left Kong Karls Land and Kapitän Rüdiger set a course for Kapp Mohn, the southeast corner of Nordaustlandet. As the trawler approached the cape, as mentioned earlier, she encountered the Norwegian hunting vessel *Rivalen*, and Rüdiger was able to glean a great deal of information about ice conditions from her captain, Andreassen. The plan now was to push north along the east coast of Nordaustlandet. For almost two days *Helgoland* steamed along the impressive front of the Austfonna, the most extensive continuous ice cliffs of the European Arctic, some 50-60 m high and completely unbroken by any rock outcrops or nunataks. Numerous icebergs were seen being calved and the abundance of drifting icebergs provoked some tense moments, especially since fog persisted for much of the time. At one point *Helgoland* came close to running at full speed into the ice cliff itself, the danger being averted only by a sharp turn as the cliff loomed out of the fog ahead.

On 7 August the trawler dropped anchor off the east side of Storøya, which Kapitän Rüdiger determined to be located some 37 km farther north than indicated on the British Admiralty chart. The southern, higher half of the island was entirely covered by an ice cap, but the northeastern half consisted of a low, desolate rock plain sprinkled with lakes and ponds. The ornithologists were surprised to find nests of almost all the low island nesting species they had found farther south. Red-throated loons (*Gavia stellata*) were numerous on the freshwater lakes

and pools, many of them accompanied by young. Vast crowds of arctic terns (*Sterna paradisaea*) were still nesting on the beach ridges. Most exciting of all was the sighting of numbers of Sabine's gulls (*Xema sabinei*) mingling with the terns. Römer and Schaudinn (1900:30) described it as "a small, elegant gull with a blue-grey back, black wingtips and black head, which had completely adopted the behaviour and manner of flying of the terns." The weather was very foggy and as a result the ornithologists were unable to locate any nests of the Sabine's gull, but two females that were shot had eggs in their oviducts. This was the first indication that the bird probably nested on Svalbard (Løvenskiold, 1963:256).

With the approval of the scientists, and on the basis of Andreassen's report that open water extended from the west to just north of the Karl XII Øyane, Kapitän Rüdiger decided to attempt the circumnavigation of Nordaustlandet. It was quite a risky undertaking since if *Helgoland*, whose iron hull was not heavily ice strengthened, were subjected to any significant ice pressures she would inevitably be crushed. Having weighed the odds at 10 p.m. on 7 August, Rüdiger pointed the ship's bows north, steaming through broken ice. There was generally a fair number of leads and polynyas but at times *Helgoland* had to ram her way through ice barriers. The constant groaning, shrieking and creaking of the floes against the iron hull made sleep impossible, and most of the scientists spent the night on deck, enjoying a unique experience. Unfortunately dense fog greatly complicated Kapitän Rüdiger's task for most of the passage through this zone of pack ice. Suddenly at 9 a.m. a slight lifting of the fog revealed that a large stretch of water lay beyond a fairly massive ice barrier, while a swell on the water indicated that this was the start of the open sea (Rüdiger, 1898). *Helgoland* cautiously pushed her way through the ice barrier, and when two Tromsø hunting vessels loomed out of the fog shortly afterward they were able to confirm that there was no further ice to the west. Shortly afterward the fog dispersed completely, revealing the Karl XII Øyane to the southwest.

Helgoland had thus completed the first anticlockwise circumnavigation of Nordaustlandet. The feat had previously been achieved from west to east by Kaptein Carlsen in his brig *Jan Mayen* in 1863, but in following that route he was able to take full advantage of prevailing winds, currents and ice drift. And to give the Swedish expedition of 1898 its due, Dr. Nathorst's expedition ship *Antarctic* also completed a counterclockwise circumnavigation of Svalbard that summer and indeed called at the Karl XII Øyane on 20 August, less than two weeks after *Helgoland* steamed by them (Nathorst, 1899).

On the evening of the 8th *Helgoland* crossed the 81st parallel, and here to celebrate the occasion a dredging station was occupied in a depth of 195 m. The aim now was to push north to locate the great depths reported by Nansen during *Fram*'s drift across this area in 1896 — i.e., to penetrate beyond the edge of the continental shelf and into the deep waters of the Central Arctic Basin. But in this *Helgoland* was foiled by deteriorating weather; at 81°6′N she turned and, with a gale steadily increasing, ran back south and and took shelter in a small bay on the north side of Martensøya, one of the Sjuøyane. During the two days which the ship spent here a party went ashore and managed to shoot a reindeer, undoubtedly one of the most northerly of its species in the world (Römer and Schaudinn, 1900; Rüdiger, 1898).

By 10 August the storm had abated and *Helgoland* put to sea again, steering due north; she crossed the 81st parallel again, still in open water, and occupied a dredging station at 81°N, 21°E in a depth of 140 m. The bottom fauna was typical of all the other stations occupied thus far to the north of Svalbard. Thereafter, however, the depths steadily increased to 650 m and then 1000 m. The edge of the pack ice was reached at 81°32′N (Römer and Schaudinn, 1900; Rüdiger, 1898), but no bottom could be reached with 1130 m of sounding wire (which was all that remained as a result of repeated breakages). Clearly *Helgoland* was now over the continental slope, and this was reflected in the nature of the bottom fauna, most of the species being new to the German scientists. The type species of this deep-sea fauna were sponges, especially *Tetraxonier* and Hexactinellidae. The bottom was covered with a dense mat of sponge needles, colonized by giant foraminifera with thick, fine ooze filling the gaps in the mesh. There was a similar marked change in the plankton collected: high arctic diatoms and such high arctic species as the siphonophores *Diphyes arctica* and *Krohnia hamata* predominated here. By now there was no trace of North Atlantic Drift water; at the most northerly station (81°32′N, 20°53′E) on 11 August the surface water temperature was –0.8°C, the air temperature –1.2°C and the specific gravity of the water 1.0275.

Over a period of two days *Helgoland* cruised westward along the edge of the pack from 21°21′E to 18°50′E, during which time four dredge stations and four plankton stations were occupied, three of the four in each case being in depths of 1000 m or greater. To the north stretched an unbroken expanse of multi-year pack ice. By now, however, the trawler's coal reserves were dwindling rapidly, and on 12 August she was forced to turn south. The scientists still wanted to make further investigations in Olgastretet between Edgeøya and Kong Karls Land, and since Hinlopenstretet was ice free this was the route Kapitän Rüdiger selected.

For a little variety it was decided to run through Bjørnsundet between Wilhelmøya and the mainland of Spitsbergen, since, as far as was known, no vessel had done so previously (Römer and Schaudinn, 1900). As she ran through the strait *Helgoland* experienced in rapid succession some of the finest and some of the foulest weather of the entire cruise. The day started with superb warm sunshine and magnificent views of the mountains and glaciers on either side of the strait, but as the trawler emerged from the south end of Bjørnsundet a thick blizzard with an icy wind obscured all distant views. A dredging station was occupied in the strait and the scientists were coated with ice as they wrestled with the dredge and began organizing and classifying the abundant haul the dredge had brought up; indeed it was one of the largest and most varied hauls obtained anywhere in Svalbard waters. As a contribution to the charting of Hinlopenstretet, Kapitän Rüdiger was able to determine that Roonøya, marked on the earlier charts, did not exist (Rüdiger, 1898).

As the trawler emerged from Bjørnsundet through the tangle of islands and skerries and a liberal scattering of icebergs, conditions were far from pleasant; after the blizzard had blown itself out it was followed by a dense fog that reduced visibility almost to zero. With a northeast gale rising, Kapitän Rüdiger ran south to the entrance to Heleysundet (between Barentsøya and Spitsbergen) and took shelter in the lee of a small island at its eastern entrance, which he named Kükenthal Insel. The ornithologists made a survey of the bird species nesting on the basalt cliffs of the east end of the island. Intrigued by Heleysundet's reputation for fierce tidal currents, Römer, Schaudinn and two seamen rowed through the north arm of the strait in a small boat. The boat was thrown around in lively fashion by eddies and vortices, but they were certainly not as alarming as had been reported. A hunting party went ashore on the north shore (Spitsbergen) and killed a number of reindeer.

On the morning of 17 August *Helgoland* next ran into the eastern entrance of Freemansundet, where the marine biologists again wanted to sample the bottom fauna and the plankton. A dredge station was occupied off Kapp Lee in the middle of the strait in a depth of 38 m and then *Helgoland* headed back east, with the intention of running south past the Ryke Iseøyane. A belt of heavy pack ice north of that island group caused some concern and almost forced Kapitän Rüdiger to run through Freemansundet, but *Helgoland* managed to push her way through the ice; new ice was already starting to form between the floes. A landing was made on the Ryke Iseøyane, where an ornithological survey was carried out; then *Helgoland* pressed on south. At midnight on 19 August as the trawler passed Kapp Stonebreen, the sun just touched the northern horizon for a moment.

After running close past the east side of Hopen, the trawler's next stop was the Spitzbergen Bank, renowned for its good fishing. Dredging in a depth of 65 m, the marine biologists brought up a vast haul of sea cucumbers (*Cucumaria frondosa*), with a few large cod among them. Since the barometer was dropping alarmingly and bad weather was looming to the south, *Helgoland* quickly got under way again; dense fog soon enveloped the ship as the wind strengthened and the seas rose.

On the morning of 22 August the Norwegian coast came into sight, just east of Nordkapp. Wind and current had set the ship 120 km to the east; as a result she was 10 hours late in reaching Tromsø.

But even this was not the end of the expedition. A second cruise in the Barents Sea and along the coasts of Novaya Zemlya had been planned from the start, but since the Svalbard cruise had been considerably extended in order to take advantage of the remarkably favourable ice conditions, it was now necessary for the second cruise to be considerably curtailed. *Helgoland* put to sea again from Tromsø on 2 September (Römer and Schaudinn, 1900). The weather was extremely stormy, with very heavy seas, and the scientists quickly realized that dredging and plankton sampling in the open waters of the Barents Sea would be out of the question. Instead the expedition members contented themselves with a coastwise cruise to Arkhangel'sk (Fig. 4) with stops at a number of points along the way.

The first of these was at Yeredika (Port Vladimir), a very sheltered little fishing harbour just west of the mouth of Kol'skiy Zaliv. The scientists dredged and made plankton hauls in sheltered bays and straits in the vicinity of an abandoned whaling station. They found an extremely varied nearshore bottom fauna but an almost total absence of plankton. This paucity of plankton was observed along the entire Murman coast and the scientists linked the non-appearance of the usual herring shoals to this lack of plankton.

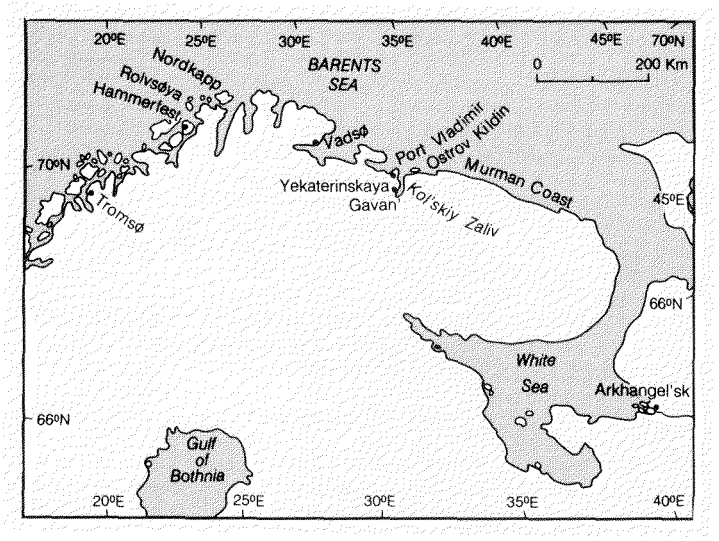

FIG. 4. Map of northern Scandinavia and the White Sea, showing area of operation of *Helgoland*'s second cruise in 1898.

The next stop was at the new Russian naval port of Yekaterinskaya Gavan' (now Polyarnoye) on a side inlet off Kol'skiy Zaliv. The decision to establish the port had been taken only the previous summer, and the German scientists were intrigued to observe the phenomenon of an "instant" town of prefabricated houses and buildings under construction. The bulk of the population had still not arrived and the erection of the houses had outstripped the progress of street construction. Of particular interest to the marine biologists was Professor N.M. Knipovich's newly established scientific station on which the *Murmanskaya nauchno-promyslovaya ekspeditsiya* (Murman scientific-commercial expedition) was based (Pinkhenson, 1962).

To their great delight, Römer and Schaudinn and their colleagues discovered that the deputy director of the new station was the zoologist Dr. L.L. Breitfuss, who had trained at the Berliner Zoologische Institut. He gave them a warm welcome and acted as their guide on their local collecting trips.

Accompanied by Breitfuss, the German scientists next made a two-day visit to the relict Mogil'noye Ozero on Ostrov Kildin. The lake has clearly been cut off from the sea due to glacio-isostatic uplift, and the German scientists wanted to investigate the ecology of the lake. Using one of *Helgoland*'s heavy whaleboats plus a boat borrowed from a local farmer/fisherman, the scientists surveyed the lake and carried out detailed measurements of salinity and temperature as well as biological investigations. Surface layers to a depth of 5 m were almost fresh but the salinity of the bottom layers was almost precisely that of sea water (c. 35‰). An abundant freshwater fauna was found in the surface layer but the saline bottom layer contained only an impoverished fauna.

Having taken Dr. Breitfuss back to Yekaterinskaya Gavan', *Helgoland* next ran back east to Arkhangel'sk. After encountering some of the roughest seas of the entire cruise in the shallow waters of the White Sea, the scientists were glad to spend a pleasant, relaxed stay at Arkhangel'sk, where they were the guests of the German pastor Herr. F. Bock. On her homeward voyage *Helgoland* stopped to make several dredge hauls in superb sunshine in the White Sea, then returned to Germany with brief stops at Vadsø, Hammerfest and Tromsø.

The achievements of this relatively short expedition are enormously impressive. Taking advantage of relatively good ice conditions, but at the same time hampered by persistent fogs and some severe storms, Kapitän Rüdiger had taken his little vessel on a comprehensive tour of the Svalbard archipelago. In so doing he had achieved the first counterclockwise circumnavigation of Nordaustlandet. In terms of true exploration he had produced the first accurate map of Kong Karls Land, correcting in particular the previous distorted representation of Svenskøya on earlier charts, and depicting Abeløya for the first time. Farther north, on the basis of his surveys the position of Storøya was moved north by some 37 km.

With regard to marine biology, the expedition scientists had occupied 51 dredging stations and 82 plankton stations in a dense network around the entire archipelago. The result was a vast range of specimens of arctic plankton and benthic fauna that

demonstrated the significance of the North Atlantic Drift in these waters. Particularly impressive were the stations occupied at 81°30′N in depths exceeding 1000 m, which thus provided the first examples of the benthic fauna from the continental slope of the Arctic Basin.

The ornithologists were equally successful, collecting large numbers of skins, embryos and eggs of arctic birds. Probably the most exciting discoveries were those of ivory gulls (*Pagophila eburnea*) nesting on the tundra of Abeløya and of Sabine's gulls (*Xema sabini*) mingling with arctic terns on Storøya. This was the first indication that Sabine's gull probably nested on Svalbard. The hunters were also remarkably successful. They shot 40 polar bears and brought 4 cubs back alive; they also killed about 48 seals of various species, over 50 reindeer and some arctic foxes (Rüdiger, 1898).

Perhaps the most impressive outcome of the expedition was the series of publications that emerged from it. To quote Römer and Schaudinn (1900:4):

> When we were able to gain an overview of the range and value of the material we had collected during the peaceful winter activity of unpacking and sorting, the decision slowly matured that we should place the analysis of the results of the cruise in a wider framework and, if possible, to make it the basis for the development of an overview, previously lacking, of the arctic fauna.

Hence Römer and Schaudinn made the following requests of the various experts who analyzed the specimens they had brought back from the Arctic: that they produce an inventory of all the previously known arctic species of the group they were handling; that they compare the forms from different arctic regions; and that they compare the arctic with the Antarctic forms.

The outcome was their extremely impressive six-volume compendium entitled *Fauna Arctica*, which represents a remarkably complete assemblage of the knowledge of the fauna of the arctic regions at the time (see Appendix for details of contents). Probably because it was published in German and, one suspects, in a relatively limited edition, this work is probably not as well known as it should be in the English-speaking world. At a more general level the same remarks also apply to the expedition that gave rise to this valuable compendium of zoological data. In the light of its contributions to the mapping of the Svalbard archipelago and to our knowledge of both the islands and the surrounding seas, the *Helgoland* expedition deserves a more prominent place in the history of arctic exploration and science.

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