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youth. He will, I am sure, have the warm sympathy and best wishes of the Fellows of this Society. His project is one which deserves encouragement, for the scheme for succouring the missing explorers will be incomplete unless the search of Cape Chelyuskin, and its vicinity, is provided for.

The American people may be assured that not only do English geographers feel the deepest sympathy for the gallant explorers on board the *Jeannette*, but that we shall gladly and actively do what lies in our power to make the search complete; and to give any aid that may, after due consideration, appear likely to be useful. The debt of gratitude that we owe to the nation which sent forth the *Rescue* and *Advance* to search for Franklin can never be forgotten by England.

The Dutch Arctic Voyages (1878, 1879, 1880, 1881) and the probable position of Mr. Leigh Smith. By Commodore JANSEN (Royal Dutch Navy), Hon. Corr. Mem. R.G.S. (Councillor of State).

(Read at the Evening Meeting, December 12th, 1881.)

THE first account received this year, by telegram from Vardö in Norway, from Captain H. Van Broekhuizen, commander of the Dutch exploring schooner *Willem Barents*, on the position of the ice in the Spitzbergen Sea during the months of May and June 1881, showed plainly that this has been a most extraordinary south-ice year, in which ice is met with in much lower latitudes than in common years. Such south-ice years are unusual, but a year like 1881, in which the ice (not to call it pack) reached nearly to the North Cape in April, is unknown, even in the old records of the Dutch whalers. Great interest was consequently felt in the investigations of the *Willem Barents* during so unusual a season; and it was a relief when the telegram from Hammerfest, on September 23rd, brought the welcome news of her safe arrival there. She had succeeded in reaching the Orange Islands off the north point of Novaya Zemlya, and in ascertaining the position of the ice-limit in September, from 65° to 33° E. longitude. At that time the explorers were surprised to find the ice in the same latitude as in a common year, and there were no traces of that south-ice which had given the *Willem Barents* so much trouble during the first months of her cruise.

The intention of this paper, written under the impression of great anxiety with regard to the position of the *Eira*, is to submit a few facts, based on the observations of the *Willem Barents* during the last four years, for the consideration of the Royal Geographical Society, and of those who will have to decide upon the steps to be taken for the relief of Mr. Leigh Smith.

The object of the voyages of the *Willem Barents* has been a systematic investigation of the Barents Sea during a course of years so as to be in

a position, after mature consideration of all the probabilities, to select a new base for future polar exploration. All that has been done, and will be done by the *Willem Barents*, is preliminary work, and it must be continued for several years before the desired knowledge can be obtained.

Previous to the year 1872 very little was known of the Barents Sea. Spitzbergen had been circumnavigated, and land had been seen in 1707, at an unknown distance to the eastward of it, by the Dutch whaling Captain Gillis. In later years land had been seen in a lower latitude and closer to Spitzbergen, to the eastward, which was supposed to be the re-discovered Wyche's Land of Purchas. But beyond that, to the eastward, no land was known north of 76° . The large area of the Barents Sea, north of that parallel, was supposed to be covered by impenetrable pack ice which had its southern limit, with slight fluctuations, in about 76° N. Here it was found by the old Dutch whalers, and here it was again found, in 1872, by Weyprecht and Payer in the *Isbjörn*.

But in 1873 the discovery was unexpectedly made by Norwegian fishermen, that all the ice south of Wyche's Land had disappeared, and that they could sail up to, and round that land in August. Exactly at the same time the steamer *Tegethoff* got beset in the ice near Cape Nassau, on the coast of Novaya Zemlya; when she commenced her famous drift which brought her, a year later, to Franz-Josef Land.

The discovery of this land gave an eastern boundary to the Barents Sea on the meridian of the Orange Islands, reached and named by old Barents. The discovery of open water round Wyche's Land showed that the southern ice-limit in the Barents Sea is not fixed, but variable. Consequently the deduction was drawn that by studying the changes in the ice, rules might be learnt for reaching Franz-Josef Land.

The circumstance that open water was found towards and around Wyche's Land, at the very same time when no water could be seen from the mast-head of the *Tegethoff* off Cape Nassau, made it probable that north-westerly gales had blown the ice from Wyche's Land towards Novaya Zemlya, and blocked up the channel between this land and Franz-Josef Land, at the eastern limit of the Barents Sea. If, on the contrary, north or north-easterly gales prevail, it is probable that the ice would be blown away from Franz-Josef Land towards the Barents and Spitzbergen seas, clearing its southern coast from ice.

By investigating the whole area of the Barents Sea it was thought possible that traces might be found and followed, of a warm counter-current forming a lead towards higher latitudes along some coast with a western aspect, as is the case on the west coasts of Spitzbergen and of Greenland.

These considerations led to the voyages of the *Willem Barents*. After our lamented friend Koolemans Beynen had received some training in ice navigation on board the *Pandora* in 1875 and 1876, under so excellent a master as Sir Allen Young, he aroused public spirit in Holland so

successfully as to obtain sufficient funds for an expedition into the Barents Sea.

Several reasons influenced the decision to select a sailing schooner for this service. She had to enter upon a new field of research in an ice-bound sea which is open to the northward, of which the movements were unknown. Its circumstances are quite distinct from those of the intricate channels of the archipelago west of Greenland, where so much experience and so much renown have been gained by British Arctic heroes. The experience in ice navigation there acquired, either with or without steam, is of no avail in the Barents Sea, because the circumstances are entirely different.

No ice pilot or Norwegian fisherman was taken on board in this unexplored sea. Captain and officers of the *Willem Barents* have had to find their own way in this new field of research; and the same officers could not be kept longer than two years, after which they have had to return to the regular service in men-of-war. So that there is the disadvantage of the experience not accumulating in the same person. In spite of these drawbacks good work has been done amidst the continuous fogs of the Barents Sea, surrounded by dangers, and without a hope of assistance in the event of disaster.

As yet our study of the ice in the Barents Sea is incomplete, and it is only the anxiety respecting the position of Mr. Leigh Smith that induces me, in the present imperfect stage of our investigations, to submit a few facts for consideration.

The winter of 1877-78 had been a very mild one in Europe, and the following spring was most beautiful. Early in May 1878 the *Willem Barents* left Ymuiden, the new seaport of Amsterdam, for the first time, to take a general view of the ice west and north of Spitzbergen, to pay a visit to Bear Island, and then to call at Vardö before proceeding to the Barents Sea. She had strict orders, during this first voyage, not to go into the Kara Sea, nor east of Cape Nassau, but to confine her observations to the Barents Sea. She was specially to determine the position of its southern ice-limit in August and September.

The year 1878 was uncommonly favourable. It was ascertained, through information gathered from different sources, that ice had not been met with south of the parallel of 76° N., either in the Barents Sea or more to the eastward. The three straits giving access to the Kara Sea were open, so that fishermen sailed in and beyond it, and discovered Einsamkeit Island, to the east of the north point of Novaya Zemlya.

It was Nordenskiöld's great good fortune that this year, the one in which he undertook to round Cape Chelyuskin, and make the North-East Passage, was so favourable. It appeared as if the Ice King had an interest in the success of this great experiment, which was planned with so much knowledge, foresight, and practical skill.

What a contrast was there between this year and 1873! Then the

Tegethoff had to make her way through ice to Cape Nassau, where she was beset and drifted away in a north-easterly direction without seeing any open water from her mast-head during the whole of September. In the same month of 1878, on the same route, there was open water, and no ice was to be seen.

The great differences in the conditions of the Barents and adjacent seas, in different years, pointed to a general cause variable in its action, rather than to a cause of which the operation produces constant and equal results. Such differences were a great inducement to continue the investigations, and they were, at the same time, a warning not to arrive at hasty conclusions from a single year's experience.

Traces of a warm counter-current in the Barents Sea were detected by serial temperature observations; but not as a definite strong current making a lane of open water towards more northern latitudes. It had more the appearance of a general northerly and easterly drift *in the water*, the ice drifting with it when it was calm, and at other times propelled by the wind in every direction. In 1878 the ice in the Barents Sea was found in more or less rotten streams, in 76° N.; and on the 45th meridian (E.) it could be penetrated to a little north of 78° ; but more to the westward the ice was more compressed, and had all the appearance of being pack ice, or small floe-bergs. In September no opening was found in the ice, which stretched in a W.S.W. and E.N.E. direction, in about the parallel of 76° N. from 55° to 40° E. longitude.

The winter of 1878-79 had not been very severe in Europe, but the spring of 1879 was very cold. The *Willem Barents* sailed on her second voyage in the beginning of June, first to determine the position of the ice to the north of North Cape, then to call at Vardö before commencing her observations in the Barents Sea. But this time she had liberty to go into the Kara Sea, and beyond Cape Nassau.

In the same season the *Isbjörn* went out, hired by Sir Henry Gore Booth, who was accompanied by the best man that could be found for co-operation and investigation, Captain A. H. Markham, R.N. This second vessel secured the great advantage of simultaneous observations at different points, which is so valuable in Arctic research.

The three straits into the Kara Sea were closed until August; and even then, towards the end of the month, only the Jugor Strait was open, enabling a steamer to pass with some difficulty. She found a broad lane along the Russian coast, and an ice-field from 20 to 30 miles broad, on the east coast of Novaya Zemlya. This prevented steamers from entering the Kara Sea by way of Waygat or the Matyushin Shar.

East of the boundary line of the Barents Sea, between the Orange Islands and Franz-Josef Land, ice was encountered with an ice-blink above it, and the *Isbjörn* was not able to reach Barents Ice-haven, after rounding the Orange Islands.

The Barents Sea was nearly in the same condition as the year before,

only there were more streams of rotten ice, and nowhere such compressed ice as was found south of Wyche's Land. Attention had been directed to the meridian of 55° E. in 76° N. for more careful inspection, and shaping her course to that point, in the first days of September, the *Willem Barents* went north, in open water, until she sighted Franz-Josef Land. At the very same time the *Isbjörn* could not get much beyond 78° N., a little more to the eastward, in about 45° E.

Captain de Bruyne was satisfied with the great discovery that Franz-Josef Land could be reached in open water. It was of no use to go closer in shore, in a small sailing craft, so late in the season, where he would have run the risk of being beset. He very properly returned home with the news of his success.

Although it was considered that this discovery was of the greatest importance, it did not constitute a sufficiently conclusive body of evidence. More certainty was required that Franz-Josef Land could be reached in two consecutive years, before that land could be selected as a base for future polar research. Consequently the *Willem Barents* was once more sent out, in June 1880; but now in command of Captain H. Van Broekhuizen, who had made the second voyage in her.

After calling at Vardö, Captain Broekhuizen continued the examination of the Barents Sea, visited the Russian station of Karmakuli in Mossel Bay, and went thence to the Matyushin Shar, which he found closed with ice, as in the previous year. But there was open water in the Barents Sea west of Novaya Zemlya. Here and there streams of ice were seen, which it is difficult, in a fog, to recognise as such. Unfortunately the *Willem Barents* struck on a reef extending from Cross Island, and was nearly lost. She was got off, after great exertions, and not without serious injury. Still the captain persisted in an attempt to round the Orange Islands, but near the Ice Cape he found the ice along the eastern boundary of the Barents Sea, in the same position as it was before. He therefore decided to return home.

Steamers had not been able, during 1880, to pass through the straits into the Kara Sea. They had tried to go round the Orange Islands, but only one succeeded, after having been beset for several days. At last she got into the land-water on the east coast, and escaped by way of Matyushin Shar. It was only late in September that M. Sibiriakoff went through the Jugor Strait with two steamers, which arrived at, but did not return from the Yenisei. They found the same conditions in the Kara Sea as in the previous year, only the straits were a little worse.

Mr. Leigh Smith, in his steamer *Eira*, was more fortunate. To his active and energetic initiative we are indebted for information about the southern ice-limit in the Barents Sea in 1880, which we should otherwise have lost owing to the accident which happened to the *Willem Barents*. Mr. Grant, the eminent amateur artist, was this year on board the *Eira*. He had made two previous voyages in the *Willem*

Barents, on board of which vessel we are always glad to have him, as he is looked upon as the good genius of the ship. He thus had the remarkable fortune to reach Franz-Josef Land twice in open water, and this time he was enabled to land at several points.

The *Eira* had been in the Greenland ice and on the north-west coast of Spitzbergen before she proceeded to the Barents Sea. Mr. Leigh Smith first tried to work through the ice in about 45° E.; but the *Eira* could not force her way. She got beset, drifted towards 79° N., and was only extricated by quick determination and great practical skill. Otherwise she would have shared the fate of the *Tegethoff*. This is the great danger in the Barents Sea. The ice carries a ship that is beset in calm weather more and more into, and not out of it.

By shaping a course a little more to the eastward, near the meridian of 55° E., the *Eira* found open water and reached Franz-Josef Land; where Mr. Leigh Smith did admirable work during the two weeks in which he surveyed the coast, and made many important discoveries.

On the eastern side the sea was covered with ice, which he found extending south to 76° N., and this was also the case on the west side of the lane of open water through which he returned. From 76° N. he shaped his course along the ice towards Hope Island, to the north of which he found a great many grounded icebergs. He returned late in September to Hammerfest after a very successful and very interesting cruise.

The fact that Franz-Josef Land had been reached in two consecutive years made a strong argument against our continuing our investigations without a steamer. But against this could be placed the other fact that, in 1874 and 1875, no water could be seen from the mast-head of the *Tegethoff* near Wilczek Island, and that the crew had to drag their boats over ice through which no steamer could have cut, before they reached open water in 76° N. So the *Willem Barents* was repaired for her fourth voyage.

The winter of 1880-81 had been a very severe one in Europe, and the spring of 1881 was very cold, with incessant strong northerly winds in the North Sea. The *Willem Barents* sailed this year early in May, with orders to go along the west ice to the north of Spitzbergen, and to return from thence to Vardö. After leaving that place she was to attempt to get into the Kara Sea towards Dickson's Harbour, where Dr. Buys Ballot desired to establish a Dutch station, to co-operate with other international Polar stations. She was finally, in September, to determine the southern ice-limit in the Barents Sea.

South of Jan Mayen Island close ice was encountered in 69° N., and, in following its edge in an E.N.E. direction, no lane of water could be detected. The captain returned to Vardö to report and ask permission to try again, which was granted. This time he succeeded in working his sailing schooner through the ice, up to the south cape of Spitzbergen, but not without great difficulty. He was informed that Stor-Fjord was entirely free of ice. It appeared as if northerly or north-westerly gales

had blown all the ice against the drift of the warm current to the south and south-east, so as to cover it with masses of ice, which are usually confined to the polar ice-bearing currents.

Under these circumstances there was nothing to be gained by pushing further north, so the captain returned to Vardö to report, before proceeding to the eastward.

Captain Broekhuysen, in the beginning of August, found a great accumulation of ice still before the southern straits into the Kara Sea, in consequence of the same northerly gales. He was unable to get through it. Only one steamer succeeded in passing the Waygat in August. She found the condition of the Kara Sea to be the same as it was in 1879 and 1880. But she was unable to return by the Matyushin Shar. Coasting the broad ice-field which rested on the east coast of Novaya Zemlya, she came out through the Waygat on September 12th.

The *Willem Barents* proceeded from the southern straits to the Matyushin Shar, along the west coast in open water, without seeing ice. There was an ice barrier across Matyushin Shar; so she returned and went northwards towards the Orange Islands. But she was stopped by the ice at Cape Maurice, in the end of August. Being still unable to enter the Kara Sea, the *Willem Barents* went north along the eastern ice, on the meridian of 65° E., as far as 78° N., where the southern ice-limit was found. The edge was followed closely to 45° E., without finding any opening. In 33° E. the edge of the ice was met with in $76^{\circ} 30'$ N., in the same latitude as it had been left in 45° E., when a gale of wind from S.S.E. compelled them to leave the ice. From this point the *Willem Barents* returned to Hammerfest.

With these few facts before me, and assuming that Mr. Leigh Smith attempted to reach Franz-Josef Land, he probably expected that the same gales which blew the ice into the Spitzbergen Sea, would also have blown it away from the south coast of Franz-Josef Land. In this expectation he must have been disappointed, as up to the 8th of July he had not found an opening in the ice. After searching for such an opening during one month, he may have proceeded to the west ice, or have taken a look at the east coast of Spitzbergen. Probably, however, he went straight towards 55° E. long. and 76° N., the point where he succeeded last year, and it may be that he found open water, at the moment, and was afterwards closed in. In that case he may have selected good winter quarters, either in Eira Harbour or some other spot, or he may be beset in the ice, like the *Tegethoff*, and be drifted towards an unknown region.

The possibility that the explorers may be so situated, either in Franz-Josef Land or in the pack, is a sufficient reason for sending out an expedition for their relief.

[For the discussion on the two preceding papers, *vide* Report of the Evening Meeting, p. 49 *et seq.*]