



## With the yachts “Blencathra” and “Princesse Alice” to the Barents and Greenland seas

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# THE SCOTTISH GEOGRAPHICAL MAGAZINE.

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WITH THE YACHTS "BLENCATHRA" AND "PRINCESSE  
ALICE" TO THE BARENTS AND GREENLAND SEAS.

By WILLIAM S. BRUCE.

(*Read before the Society in Edinburgh on January 18th.*)

It is through the kindness of His Serene Highness the Prince of Monaco, and of Mr. Andrew Coats, that I am here to address you this evening.

On their respective yachts I had the good fortune last year to cruise over a great portion of the Barents and Greenland seas, and to make a number of scientific observations. It is a general outline of this work which I am about to give you.

I shall divide my paper into three parts. The first will be an account of the first voyage with Mr. Coats, in his yacht *Blencathra*, to the island of Kolguev and the coast of Novaya Zemlya. The second will be an account of Mr. Coats' second voyage to Bear Island, Hope Island, across the Barents Sea almost to the north end of Novaya Zemlya, and to the Wiche Islands. The third will be an account of my experiences on board the Prince of Monaco's yacht the *Princesse Alice*, in which we visited Bear Island, Hope Island, several parts of Spitzbergen, and the Greenland Sea.

On the 1st of May 1898 Mr. Coats set sail from Row, Gareloch, on his first Arctic cruise. As the deep-sea sounding machine had not arrived, I did not sail with the yacht, but waited for a week, taking the mail steamer from Newcastle to Bergen, and after a slow, but enjoyable, trip through the Norwegian fiords, where we called at over sixty places, I met the *Blencathra* on 19th May at Tromsø. There were on board Messrs. Andrew Coats, James Glen, Andrew Arthur, Hugh Parry, Dr. Cockburn, and myself. Two days before I arrived, the Tromsø neighbourhood was white with a fresh fall of snow. On the 21st we left Tromsø

for the north, calling at Hammerfest and Haaningsvaag, from which latter place—according to Dr. Sneider, of Tromsø Museum—I have been the first to collect a number of coleoptera. Aker fiord was next visited, in order to see a typical example of the wonderful bird-bergs of Norway, so vividly described by Brehm, Faber, and others. Kittiwake gulls, herring gulls, puffins, common guillemots, and razor-bills were there to be seen in thousands, reminding me of the still more remarkable cliff at Cape Flora, Franz Josef Land, where myriads of kittiwakes, Bruenich's guillemots, little auks, and dovebies resided during the summer months. Thereafter we steered for Novaya Zemlya, and on 30th May, at 8 P.M., we saw the ice blink. At eleven o'clock we sighted the first ice, and in half an hour the vessel came up to it. At midnight we were steaming through loose "brash" ice. The temperature of the air was 29·1° F., that of the surface of the sea 31·1°. There was a slight breeze from the eastward, and the typically overcast sky of the Barents Sea. Our course was E.  $\frac{1}{2}$  N. during that night, and we continued to work through a considerable amount of ice. At 10 A.M. on 31st May we sounded in 100 fathoms: no bottom.

Up to this date, and for some days after, I was busy getting everything in order for observations of various kinds. On previous voyages I found the type of book used for taking observations, which is supplied by the British Meteorological Office, cumbersome and not well fitted for ship work. I therefore resolved to try a form of slips modelled after those which are used by the Scottish Meteorological Society at Ben Nevis Observatory, with alterations necessary for observations taken on board ship instead of on *terra firma*. These I found to be entirely satisfactory. Throughout the voyage I took four-hourly meteorological and general observations, the first mate usually assisting me with those at 4 and 8 A.M. The same day also I took my first surface tow-netting. I dragged the net from 6.30 till 7.30 P.M., and procured a green, slimy mass composed of diatoms and nauplii, besides other material. So as to be able to use the tow-net at all times without fear of collecting material thrown overboard, Mr. Coats had a boom rigged out for me from the fore-rigging, from the end of which the net dragged about midships, away from the ship's side.

Among other birds we saw ivory gulls.<sup>1</sup> Surely these interesting birds must have some breeding-place nearer than Cape Mary Harmsworth or Wiche Islands. I shall not be surprised if they are found to breed in Novaya Zemlya or Kolguev, or both. Besides the ivory gulls other birds were noted, and some seals. At midnight I threw over the first of a series of floats to indicate the direction and rate of currents. During 1896 and 1897 I also threw over a number of floats in the Barents Sea; none of these has yet been recovered. Soon after noon, on the 1st of June, the captain reported seeing the coast of Novaya Zemlya from the masthead, viz., Razor Cape, 45 miles E.  $\frac{1}{2}$  N. But the

<sup>1</sup> This was in latitude 70° N. Captain Rüdiger says they are hardly ever met with south of latitude 75° N. Vide *Verhandlungen der Gesellschaft für Eräkunde zu Berlin*, Band xxv., 1898, No. 8 u. 9, p. 441.

ice was very tightly packed between us and the land. We had therefore to turn the ship's head southward along the edge of this tight ice, working our way in a zig-zag course among outer, looser pieces. At 11 P.M. we passed a walrus sloop which, like ourselves, was trying its best to get in to the land. A gale sprang up in the night, which helped to break up the ice, and next morning we had a visit from the captain of the walrus sloop. He told us he had been out twelve days from Tromsø, that he had reached latitude 77° N. (which must have been much farther to the westward), and had on board six bears, six seals, and a walrus. At 10 A.M. next day we were 35 miles off the land, and at 6 P.M. 42 miles off in the vicinity of North Goose Cape. Many birds were passing in flocks going in a north-easterly direction.

By the 3rd of June the Lucas deep-sea sounding machine was rigged up with its 2500 fathoms of wire, and at 8 P.M. we took our first sounding with it in 75 fathoms. Afterwards we had the trawl over for the first time. It was a small double-headed trawl, modelled after that used by the United States ship *Blake*. The catch was rich, including coelenterates, echinoderms, crustacea, molluscs, fishes. No chance offering itself to get in to the land during the next few days, we then steered for Kolguev, and sighted it at 9.30 A.M. On June 7th we lay-to six miles off the land, which was stretching between SSE. and WSW.; the lead touched bottom in 20 fathoms on sand; there was a heavy swell running from the westward. There was no tight ice here, only a few loose pieces, with a great number of very fine walrus lying upon them. There were none of the "endless fields of pack-ice" which Colonel Feilden<sup>1</sup> described for 1897, as late as on 5th of July, extending from Kolguev to Novaya Zemlya, nor was there any ice "resting on the north end of Kolguev." The whole coast of Kolguev was free of ice except these few loose pieces on the north coast which I have already described. Here the sportsmen obtained a few walrus, and I was able to make a number of biological and physical observations. All day long we saw plenty of ivory gulls, and this may be regarded as the first record of ivory gull for Kolguev; indeed I have little doubt that they will be found breeding there. On the 8th, 9th and 10th we had bad weather, and lay-to before a strong gale from the NNW.; the ship rolled very heavily, and I was in great distress, for, in spite of carefully stowing all my gear, it had got adrift in the forecabin, and spirit, formalin, and all kinds of precious things were all mixed up together. This gale drove us far to the SSE, and it was not till noon on the 10th that we sighted the land. At midnight on the 10th we anchored in five fathoms, about three miles off the land, near the river Baroskikka, in the south-east of the island. The gale had now blown what little ice there was away altogether, only leaving a few stranded pieces. I lowered away my traps here as on several previous occasions, but caught nothing. This was undoubtedly due to their framework being made of iron instead of wood.<sup>2</sup> On June the 12th we

<sup>1</sup> *Geographical Journal*, vol. xi. pp. 335 and 336.

<sup>2</sup> In Franz Josef Land, in 1896 and 1897, I made some traps with wooden frames, and met with success. The Prince of Monaco has since told me that he has had similar failure with metal-framed traps.

landed, but in rather an unfortunate place. Before us lay a long stretch of four or five miles of wet sand and lanes of water, with great masses of stranded pack-ice. We could not have got across this and back again in anything like reasonable time, and we were not prepared to wait here, it might be, for several days. So we wandered about the wet sand and over the stranded ice for some hours. Several birds were shot, and Mr. Parry found a glaucous gull's nest with two eggs. There were several other glaucous gulls' nests on the sand, where it was raised slightly above the rest. I remained mostly at the sea edge, and obtained a number of entomostraca, molluscs, and other things of zoological interest. Mr. Coats now resolved to land on the north or west coast of the island, but again the wind freshened after we got round, and prevented us effecting another landing. Eventually landing had to be abandoned, and having circumnavigated the island, we steered a course for Novaya Zemlya.

We passed through some drift-ice in the early morning of the 16th, but at 3.30 P.M. the coast of Novaya Zemlya was sighted, with no ice in view. We steamed north-westward along the coast, never seeing a piece of ice, and at midnight had a fine haul with the trawl. How different from the fields of ice which blocked our way just ten days ago! We went a little to the north of South Goose Cape, and then the ice stopped us once more; it was stretching right across our bows in a solid mass in an east and west direction, so we turned and anchored at the south end of Kostin Shar, off Kostin Point, in ten fathoms. On June the 19th we landed at Kostin Point. Here there are two Russian crosses, about 10 or 12 feet high. Perhaps what was of greatest interest was obtaining the grey phalarope (*Phalaropus fulicarius*), Mr. Reid and I each shooting one. This is a new record in the avifauna of Novaya Zemlya. Among other birds little stints (*Tringa minuta*), which Mr. Pearson and Colonel Feilden first found the eggs of in 1897, were numerous, and we saw many of their nests,<sup>1</sup> but it was too early for their eggs. A solid floe was stretching across the Shar to the mainland. On June the 20th there was a fresh breeze blowing, and a heavy fall of snow lay upon the decks. Next day, Midsummer day, however, it was fine, calm, sunny weather, and everybody went ashore at Cape Cherni, on the mainland, and good collections of plants, animals, and fossils were made. Here we met two Russians from the Pechora district; they had been wintering, and looked wretched specimens of humanity. More coal, fresh water, and provisions were now required, so we steered for Vardö. The breeze freshened, and on the morning of June 25th we ran into Vardö harbour before a strong gale of wind from the north.

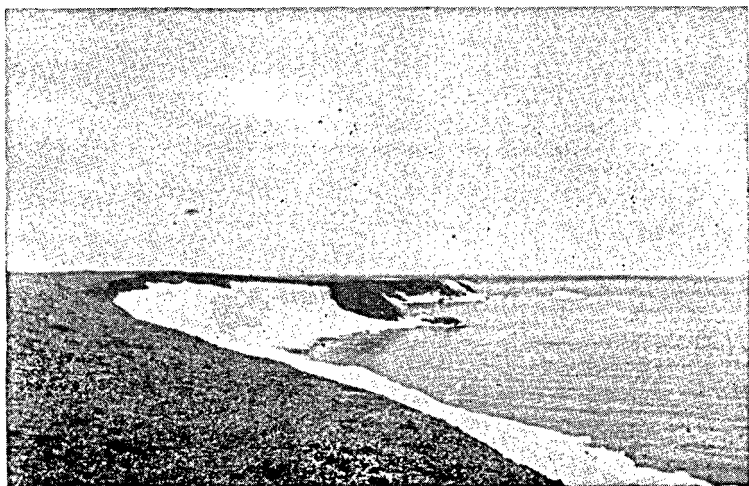
We remained in Vardö for a week, and during this time visited the mainland, as well as the neighbouring islands of Hornö and Renö, which are noted as breeding-places of the eider-duck. These birds nest there in thousands, and one almost steps on the birds before they will reveal themselves by flying away. In addition to eider-ducks, there are a great number of glaucous and black-backed gulls, besides hosts of

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<sup>1</sup> Vide *The Ibis* (Seventh Series), vol. iv. No. 14.—“Notes on Birds observed on Waigats, Novaya Zemlya, and Dolgoi Island in 1897. By Henry J. Pearson.”



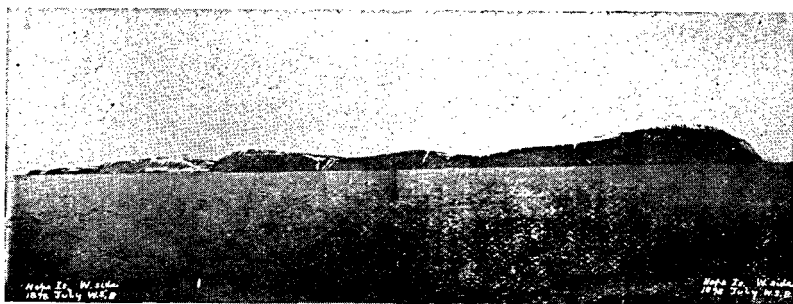
THE YACHT "BLENCATHRA" IN THE ICE OF BARENTS SEA.



CAPE CHERNI, NOVAYA ZEMLYA, LAT.  $70^{\circ} 50' N.$ , LONG.  $53^{\circ} 26' E.$



SW. COAST OF KOLGUEV, NEAR RIVER BAROSKIKKA.



THE WHOLE WEST COAST OF HOPE ISLAND, LENGTH ABOUT 13 MILES,  
HEIGHT OVER 1000 FEET.

kittiwakes on the more precipitous rocks. There are puffins, razor-bills, cormorants, and black and common guillemots as well. The herbage is remarkably rich, *Cornus suecica*, a pink lychnis, scurvy grass, and ferns being the most conspicuous.

At length, on the 1st of July, we set sail once more for the ice. Our course lay in a more or less north-westerly direction towards Bear Island. Nordkyn, some fifty miles from Vardö, was abreast of us at six o'clock next morning, and at five o'clock on the afternoon of the 3rd we sighted Mount Misery, the highest hill in Bear Island, bearing W. by N. from the *Blencathra*. We steamed round the north side of the island, and just before midnight dropped anchor in 14 fathoms on the west side. We lay there for the night, Mr. Coats intending to land the following day; Captain M'Kay, however, not finding the anchorage very suitable, moved round to the south, but as he found nothing in the way of a harbour, and feared a breeze, landing had to be abandoned; so after circumnavigating the island, we turned our course to the more interesting and less known Hope Island. On the homeward voyage of the *Windward* with the Jackson-Harmsworth expedition, we intended to land at Bear Island, and failed on account of the head winds: thus for the second time I was disappointed within twelve months. We had now gone 47 miles to the north-eastward, when we were signalled to by a very small Norwegian steamer. Mr. Coats told the captain to head towards her. She wanted to know her position; for more than a week she had been continually in fog—a not unknown feature of the Barents Sea—and had quite lost her reckoning. We were soon able to give her the information she required, and each vessel went on its course, she to the southward, and we towards Hope Island. While yet as far as 44 miles from Hope Island we sighted the land. Ice was now reported from the mast-head, but it turned out to be a false alarm. At 4.30 P.M. we took a sounding in only 38 fathoms, with a bottom of small stones, on the bank that stretches the whole way between Bear Island and Hope Island, and which in some places is only 20 fathoms below the surface. Gradually we approached the island, and both Mr. Coats and myself had the good fortune to get very fair photographs of the south end. As the Admiralty chart only gives a dotted outline for its coast, and does not indicate its elevation, I shall later on spend a minute or two in describing it. Suffice it to say just now that we steered round to the west side, where I got other two photographs of its entire west coast. Captain M'Kay dropped anchor six miles off in 15 fathoms. By eleven o'clock Mr. Coats ordered the steam launch to be lowered, and with the small Norwegian seal-hunting boat we steamed for the shore. There was a heavy swell running at the time, but the boat was let go from the launch, and Mr. Reid, myself, and two Norwegian sailors pulled fairly close in, when our keel bumped on the bottom, but next minute we could not touch bottom with the oar. After spending nearly an hour we had to abandon the attempt, as landing meant certain immersion in the ice-cold water and probable upsetting of the boat, with guns, ammunition, etc., and as well as the probability of having to stay on shore for some days without provisions



or dry clothing. There was nothing else to be done but to turn back again once more to the ship. Next day, before steering to the north-eastward, we had another haul of the trawl in 27 fathoms. Unfortunately the tail of the net fouled over the mouth of the trawl, and we got very little, although, from the amount and variety that did come up, I could see that the bottom was very rich in animal life. This was proved later on by one of the richest hauls the Prince of Monaco obtained close by.

We then headed NE. by E., and for the first time saw Spitzbergen, viz., Edge Land, and, at the same time, Hope Island on the other side. We were steering a course towards the Wiche<sup>1</sup> Islands, and as no soundings had been taken here, I suggested to Mr. Coats that we should sound every two hours. Mr. Coats quite fell in with the idea, and I took soundings till 4 A.M., when we were finally stopped by impenetrable ice. The deepest of these soundings was 98 fathoms in clayey mud at 2 A.M. These and other soundings which I took, when they are in localities where no soundings have hitherto been made, are to be found in the table.<sup>2</sup>

To reach Wiche Islands just then, even with a much stronger ship than the *Blencathra*, was impossible, so Mr. Coats cruised away to the eastward along the tight pack-edge, in among the looser navigable outside ice, going into all the bights that seemed like openings towards Franz Josef Land and the north, and did the extremely useful piece of work of mapping out the line of the pack-edge for July 1898 from Spitzbergen almost to Novaya Zemlya. This line runs in a more or less WNW. and ESE. direction from 77° 37' N., 28° 48' E., to 75° 46' N., 50° 32' E., and has a deep bight, attaining latitude 77° 36' N. in 40° 15' E. We were enveloped for the whole time in the very thickest fog or mist, and had to make our course by dead reckoning, but the course, as I charted it, is very approximately correct, and may be taken as the line of ice for July 1898. During this cruise right across the Barents Sea the trawl, dredge, tangle, and tow-net were continually at work, and some valuable additions were made to our knowledge of the fauna of the Barents Sea. We also took several soundings, and I was able to take a few deep-sea temperatures and salinities when the vessel was absolutely at rest. The deepest water here was 110 fathoms, which is an average depth for the whole of the Barents Sea. On July 15th we were back again to the southward of the Wiche Islands, and this time sighted the Swedish Foreland at noon, bearing NE.  $\frac{3}{4}$  N. to N.  $\frac{1}{4}$  E. That day we fell in with two bears, a male and a female, and naturally there was a good deal of interest for those who were to have their first shot at this large North Polar mammal. Both bears were dropped. During the second hunt Dr. Cockburn and myself were in the crow's-nest. The hunt was on a large floe. The bear, which first charged towards the boat, was wounded, after which it took to its heels, as they nearly always do, and rapidly gained on its pursuers, now in full chase after it on the ice-floe. But a long shot

<sup>1</sup> I call these islands by the name given to them by their discoverer, the British voyager Edge, in 1617, and not by that given them after the voyage of von Heuglin and Graf Zeil in 1870, viz., King Charles Islands, in honour of the King of Württemberg.

<sup>2</sup> Vide pp. 125-6.

dropped it, and in double quick time the doctor and the naturalist were seen slipping down the fore-rigging to get at their cameras, tape measures, and dissecting knives. After having taken all the measurements, and having photographed the victim a dozen times, the Norwegian walrus-hunters were shown how to make cuts for removing the skin, and Dr. Cockburn and myself roughly studied its anatomy. Both skins were of a fair size and in good condition.

We were again in the neighbourhood of the Wiche Islands, and I must spend a little time describing these interesting and little-known islands.

In 1897 the Admiralty chart marked five islands from east to west, viz., Swedish Foreland, Jena Island, Abel Island, adding the two very large Johannesen Islands. On the homeward voyage of the *Windward* we passed within three miles to the south-eastward of the easternmost of these two Johannesen islands, and from the masthead in clear weather saw no sign of them. Last year also the Scottish whaler *Balena*, on her return from Franz Josef Land, where she had been walrus-hunting, sailed over their assigned position, and Mr. Pike, in his yacht, the *Victoria*, saw no signs of them whilst cruising in their vicinity. The Admiralty, therefore, last year left them out.<sup>1</sup> The first island we saw was Swedish Foreland, and I was fortunate enough to get a photograph of it, showing Cape Hammerfest. To the east of this we saw Jena Island, Cape Altman standing out prominently: this land tailed away into low glaciated land to the eastward. Beyond this, bearing N.E.  $\frac{1}{2}$  E., was what appeared to be a third island, towards which we steamed, and as the land opened up we could see more of Jena Island. At the back of the glacier stood a very prominent bell-like crag, which is faintly indicated in a photograph I have taken, and quite clearly shown in the sketch I made on the spot. Perhaps this is what Captain Rüdiger afterwards saw and named Enemy mountain. We then got to the ESE. of what appeared to be a third island, but which I find, on comparing my sketches with that of Mr. Arnold Pike,<sup>2</sup> must be the east end of Jena Island, the low land forming the curve of Victoria Bay not being seen by us. To Dr. Kükenthal in 1889 Jena Island appeared as two islands, and Captain Rüdiger, of the German ship *Helgoland*, who visited these islands after we did last year, says that the low-lying land may easily be mistaken for a channel. In front, and extending beyond the bluff cliff and talus of Cape Altman, stretched a low spit of land, clearly indicated in the sketch: this was probably the low islands which are in Victoria Bay.

Mr. Pike<sup>3</sup> thinks that the mapping of the two Johannesen Islands probably arose from the shape of Jena Island. He says, "I feel con-

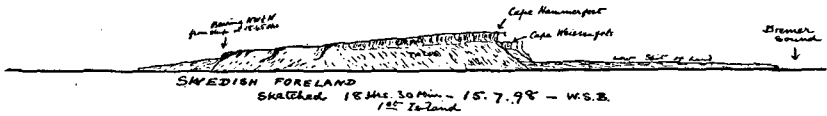
<sup>1</sup> Vide *Geog. Journal*, vol. xi. No. 4 (Routes of the *Victoria*, *Balena*, and *Windward*). The *Blencathra* also sailed over the West Johannesen Island last year. It was therefore scarcely the *Helgoland* that "completely established their non-existence." Vide *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, Band xxv., 1898, No. 8 u. 9.

<sup>2</sup> Vide *Geog. Journal*, vol. xi. No. 4, p. 369. Captain Rüdiger also gives this as his opinion. Vide *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, Band xxv., 1898, No. 8 u. 9, p. 442.

<sup>3</sup> *Geog. Journal*, vol. xi. No. 4, p. 366.

vinced that the mistake arose through the shape of Kong Karl's Land (Jena Island) itself, which, when viewed from a short distance, appears as two, or from some points of view as three, islands." Beyond this last named, Captain M'Kay, Dr. Cockburn and myself, who were all at the masthead, saw lying away to the north-eastward a very low flat island which could not be photographed, and which could not be seen from the

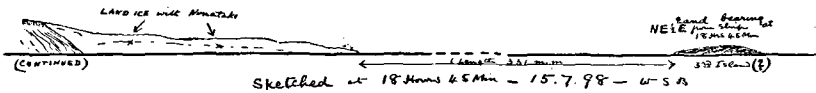
(1)



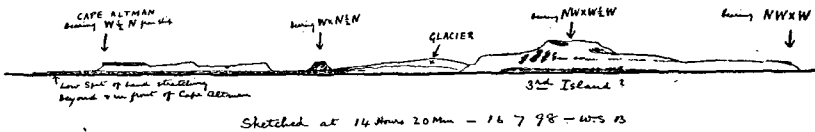
(2)



(3)



(4)



#### SKETCHES OF WICHE ISLANDS, JULY 1898, by WILLIAM S. BRUCE.

Note.—(1), (2), and (3) must be looked upon as continuous; (1) being the west end of the land, and (3) being the east end of the land as seen between 18 hrs. 30 min. and 18 hrs. 45 min., on July 15th, 1898. The whole is drawn to scale; thus, the length from end to end of the land in (2) Jena Island is 242 units, and the length indicated thus  $\longleftrightarrow$  in (3) should be 331 units, being contracted only to get the apparent third island into the same sketch.

No. (4) is an enlarged view of the apparent third island, with a view of Cape Altman and the rest of Jena Island farther away and to the westward (i.e. left half of the sketch). I sketched this on July 16th, 1898, at 14 hrs. 20 min., when the ship was in a more easterly position, Cape Altman lying almost due west of us. Thus the summit of the apparent third island bore NW. by W.  $\frac{1}{2}$  W., instead of NE.  $\frac{1}{2}$  E. as on the previous day. The result of this change of position is a modification of the appearance of the east end of Cape Altman; a view of the bell-shaped rock bearing W. by N.  $\frac{1}{2}$  N. which was not seen on 15th July; and an enlarged view of the land which looked like a third island.

deck. But from the masthead it was seen perfectly clearly. This was on the night of the 16th in clear weather and bright sunshine. On the 17th at noon I took a sextant observation, but there was so much refraction that the horizon was not reliable in spite of very clear weather. Unfortunately the wind now increased from the eastward, and the ice was coming in, packing against the east of Spitzbergen. We had therefore to retreat, and as it was had considerable difficulty in extri-

cating the *Blencathra* from the ice. Afterwards the weather became very bad with wind and fog, and it was necessary for Mr. Coats to return home. A week later the German ship *Helgoland*, under the command of Captain Rüdiger, who had failed to get anywhere near these islands earlier in the season on account of the ice, now found little ice where we were hemmed in and had difficulty to extricate the yacht *Blencathra*. What a difference may take place in a few days! Mr. Pearson and Colonel Feilden had a similar experience at Novaya Zemlya the year before. He says, "Rounding the north end of Kolguev Island we found that a marvellous change had taken place during the past ten days. The endless fields of pack-ice which before extended from Kolguev to Novaya Zemlya had entirely disappeared. Now and again we passed a sodden, dirty fragment of ice rapidly melting; the fog had gone, and in bright sunlight and with a favouring wind we made the northern entrance of the Kostin Shar on the evening of July 17th."<sup>1</sup> I have already narrated the similar experience Mr. Coats' yacht had off Novaya Zemlya earlier in the season last year. Captain Rüdiger coming later had the good fortune to get right into the land and effect a landing on the low unnamed island which we had previously seen from the mast-head, and which Mr. Arnold Pike discovered and described in 1897.<sup>2</sup> Captain Rüdiger alters the position of south and Swedish Foreland and Jena Island, placing them farther north, and making the islands much smaller. But Mr. Pike sailed in and out and all round these islands, and his observations taken on shore with sextant and artificial horizon, both on Cape Weissenfels and near Tømmernæs, agreed very nearly with his position on the Admiralty Chart. Mr. Pike was also on Cape Hammerfest, and "climbed about 500 feet up the hill at the east end of König Karl" (Jena Island). On the low unnamed island Captain Rüdiger discovered ivory gulls breeding, and claims that he has discovered the first known breeding-place of the ivory gull. He appears to have overlooked the fact that Mr. Pike found them breeding on Cape Weissenfels in 1897, and that we, with the Jackson-Harmsworth Polar Expedition, discovered tens of thousands breeding at Cape Mary Harmsworth, and brought home eggs and birds. Mr. Leigh Smith in Franz Josef Land and others have also found ivory gulls breeding.<sup>3</sup> After this an attempt to go up Stor fiord had to be abandoned on account of bad weather, and the second voyage of the *Blencathra* ended on the 25th of July by dropping anchor in Tromsø.

I have given an account of Mr. Coats' voyage to this Society rather from a purely geographical point of view than otherwise, but the chief scientific work done was zoology. We trawled, dredged, trapped, in order to capture animals from the bottom, and tow-netted to capture the floating plankton, and thus obtained a goodly number of animals, which I am at present working at with the help of specialists at home

<sup>1</sup> *Geog. Journal*, vol. xi. No. 4, p. 338.

<sup>2</sup> *Ibid.* p. 336.

<sup>3</sup> *Ibis* (Seventeenth Series), vol. iv. No. 14, pp. 264-267.—"On the avifauna of Franz Josef Land, by Wm. Eagle Clarke, F.L.S. With notes by Wm. S. Bruce, of the Jackson-Harmsworth Expedition."

Richardson and M'Clintock first found ivory gulls breeding during the Franklin Search Expeditions; Malmgren found them in 1861 in Spitzbergen; Feilden in Smith's Sound in 1875.

and abroad. These, along with the animals I captured in and near Franz Josef, and on my voyages out there in 1896 and back again in 1897, will, I venture to predict, form a very considerable addition to our knowledge of the fauna of the Barents Sea, of which we have only scanty records. In addition to zoological work we took a number of soundings, ascertained the temperature and salinity of the water at different depths, threw out floats to ascertain the direction and rate of currents, and took continuous meteorological observations. Whenever a landing was effected, not only animals, but also plants, rocks, fossils, and anything else of interest, were collected. The following is the record of observations and collections made at 249 stations:—

34 Hawls with the dredge, trawl, tangle, and trap.

60 Gatherings of surface plankton.

88 Soundings, 57 being in new localities.

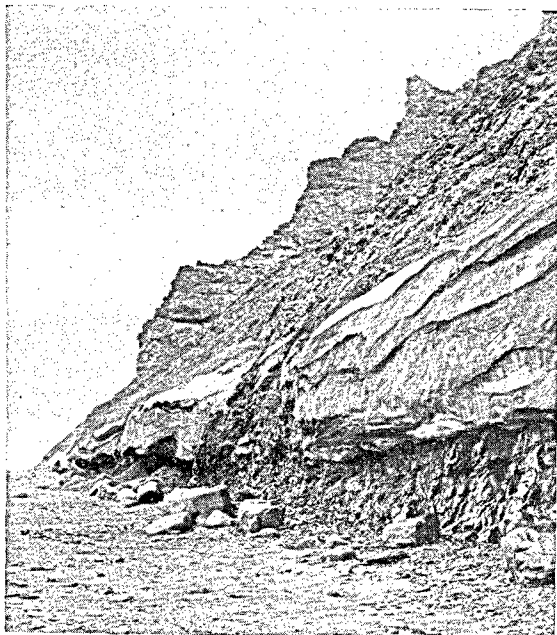
30 Salinity observations.

147 Floats thrown out at thirty-seven stations.

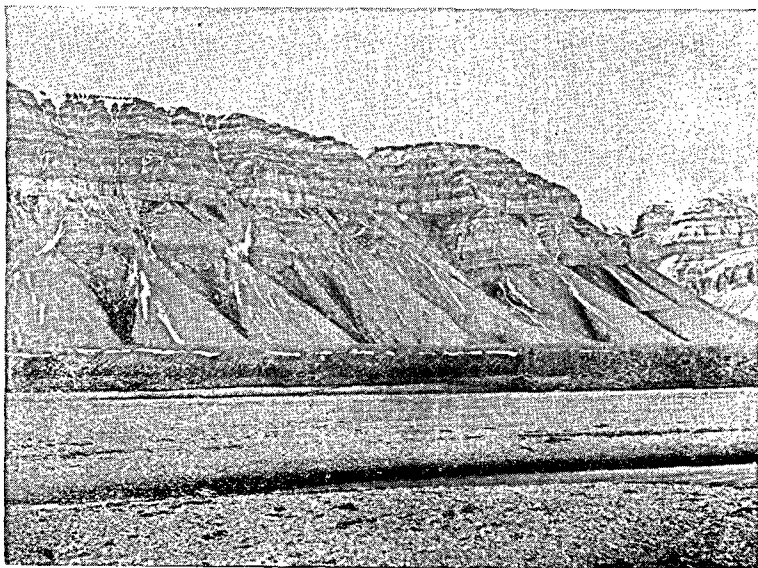
But the arrival of the *Blencathra* in Tromsø did not after all terminate my voyages to the Arctic last year. The Prince of Monaco's new yacht, *Princesse Alice*, had arrived there only just before we did, from the south. He was about to prosecute his oceanic researches in a different direction this season, viz., in the Arctic seas round about Spitzbergen; instead, as in past years, in the Atlantic and Mediterranean. It was a pleasant surprise to me to be asked by His Highness whether I would not return with him to Spitzbergen now that the cruises of the *Blencathra* were over. I could not refuse so tempting an offer, and on the 29th of July I was voyaging once more to the north. It is not my purpose to give you a detailed account of the "Voyage of the *Princesse Alice*." The Prince will do so personally before the Academy of Sciences in Paris and elsewhere, and it would be impertinent on my part to anticipate him. I may, however, perhaps be permitted to give a few personal reminiscences of a most pleasant and profitable voyage.

There were on board besides the Prince, Captain Carr, Professor Brandt of Kiel, Mr. J. Y. Buchanan, Dr. Jules Richard, chief of the Prince's scientific staff, four others, and myself. From Tromsø we steered for Bear Island, and arrived there on the morning of July 30th, anchoring in 10 fathoms off the south-east of the island, at the foot of Mount Misery. This time a landing was successfully accomplished.

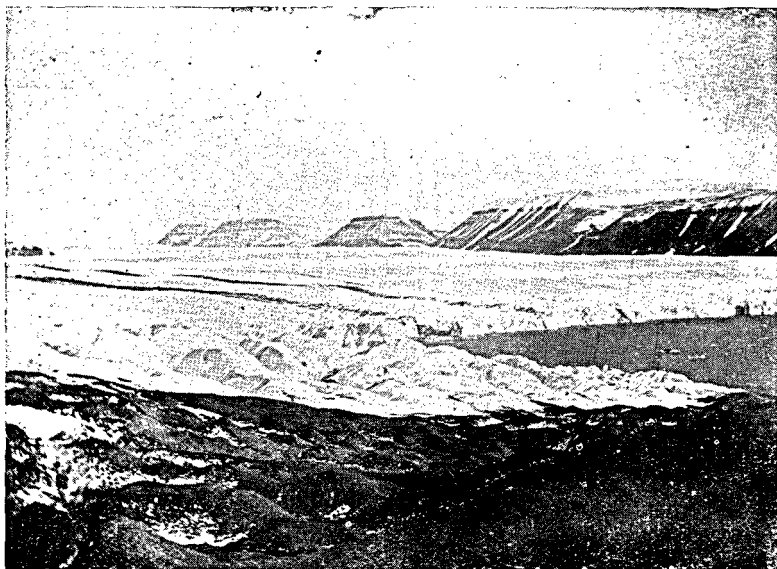
Once ashore we all went in different directions, and came home by the end of the day pretty heavily laden. I climbed up Mount Misery to a height of 600 feet, and did not go farther because of a thick cloud which enveloped the other 600 feet, in which I should have been able to see nothing. At this height, however, I came across a "bird-berg" swarming with kittiwake gulls, fulmar petrels, puffins, and guillemots. Most of the eggs were hatched, and some of the young birds were beginning to fly. I got a number of fossils also *in situ* at this point. Bear Island is a desolate, wind-swept island, but in the interior are a number of fresh-water ponds which would, no doubt, be interesting to the zoologist. In the evening we left for Hope Island, which we came upon in a thick fog; but such a good course had been steered that we



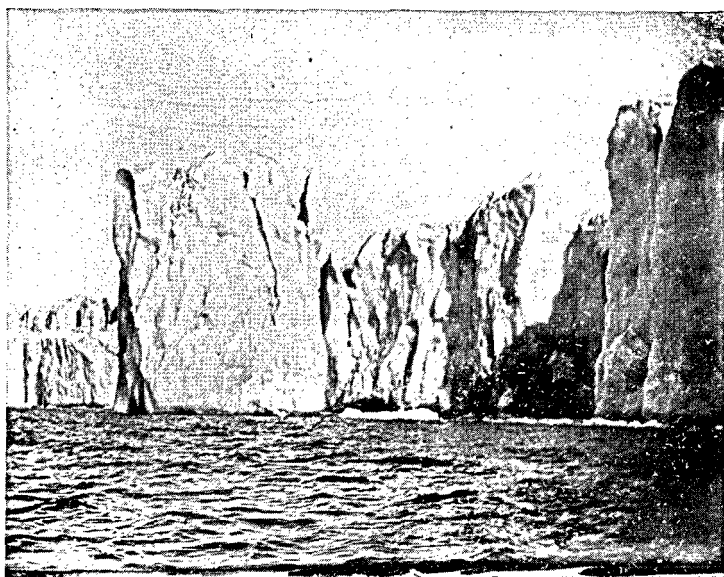
NORTH SHORE OF CHANGING POINT, BARENTS ISLAND,  
GINEVRA BAY.



MOUNT TEMPLE, SASSEN BAY, SPITZBERGEN.  
(RAISED BEACHES IN FOREGROUND.)



GRAND (OR POST) GLACIER, SASSEN BAY, SPITZBERGEN.



FACE OF GRAND (OR POST) GLACIER, SASSEN BAY.

headed straight for the south end, and anchored half a mile or less from it, under the precipitous cliff of about 1000 feet. Next morning the *Princesse Alice* went round to the east side, anchoring about a mile from the shore, and we landed exactly opposite the place where we had attempted to land with Mr. Coats; this time it was quite calm, and there was no swell. Hope Island is described in the Admiralty chart as "quite barren." But even without landing it was obvious that this was not correct, for from the *Blencathra* boat I could see plants growing, and it was quite obvious that Richardson's skua was breeding there, and that it was a resort for other birds. We recorded on the *Blencathra* Richardson's skua (probably breeding), glaucous gulls, rotges, looms (probably common and certainly Bruennich), dovebies, great numbers of kittiwakes, and puffins. The whole party dividing up, I, attended by a seaman, climbed to the summit in order to ascertain the height and structure of the island as far as it was possible. With some difficulty we managed to climb to the top, which, ending in a rotten, shaley cliff of about 20 or 30 feet, crumbled away as we tried to climb up it. We were now at an elevation of 870 feet. The island is table-topped and cut up with gullies. At 730 feet I deposited a record in a cairn which we built. The highest part that I reached was 920 feet, farther westward. I should say that the south end is slightly higher, having an altitude of about 1000 feet, that being the highest part of the island. On my way up I found a certain number of fossils; these bear some resemblance to those of the Carboniferous period, but as they have not yet been examined by specialists, it is hazardous to express an opinion. On my trip I saw rotges breeding, and almost certainly the pomatorhine skua. I fired at one, but only knocked some feathers out of his wing and did not get another shot at him. I also saw Arctic skuas, many ducklings, mollies, and kitties, and shot a black guillemot. On the summit I found flies, snow fleas, a worm, green algæ, and other plants, and lower down more plants, which my friend, Mr. Robert Turnbull, has examined. It was a great satisfaction to get these animals and plants, and the Admiralty must now erase "quite barren" from their charts. There were many whale's bones, and much driftwood on the shore; one trunk I measured was 60 feet long. There are raised beaches to at least 80 or 100 feet, and miniature glaciers in the higher gullies.

Thereafter we steered about 40 miles to the north-eastward; but, meeting with ice, we could no longer proceed to the northward, the *Princesse Alice* being a steel vessel, so a course was steered for South Cape. Thence we went up Stor fiord to Ginevra Bay, where we made excursions by land and in the steam launch. Reaching as far as Helis Strait, we had an exciting incident in getting into a fully eight-knot current; but, thanks to the Prince's skilful handling of the launch, we were none of us the worse for it. After some days we went south again down Stor Fiord, and there is certainly no low flat island midway, as marked in the Admiralty chart of Spitzbergen. Thereafter we did some trawling to the westward of South Cape in deeper water than I had seen trawling or dredging. The catches were all of extreme interest, but I will not anticipate His Highness in giving you



details about them. We visited after this Sassen Bay, Advent Bay, Klaas Billen Bay, Smeerenberg Sound, Amsterdam and Dane's Island. On Dane's Island we saw Pike's house intact, and Andréé's balloon-house in ruins. Steering to the northward of Smeerenberg Sound, we reached latitude  $80^{\circ}34'$  N., and this was the Prince of Monaco's highest northern station. We could get no farther for ice, but I think it is just about a record high latitude for a steel vessel. The chief work of the voyage, of course, was deep-sea work. The deepest dredging was made on the 4th of September, in about 1800 fathoms, or more than two miles below the surface. Professor Brandt and Mr. J. Y. Buchanan left the yacht at Advent Bay, as it was getting late and they had to return. Thereafter the Prince intrusted me with making the observations for salinity, and with the working of the Hensen quantitative plankton net. I was very glad to have such an opportunity afforded me.

I wish to take this opportunity of expressing my gratitude to His Serene Highness the Prince of Monaco for the not only delightful, but also very profitable, time I had on board his magnificent yacht. Such an opportunity does not fall to the lot of every naturalist, and I feel quite unable to express adequately my sincere thanks.

Not less are my thanks due to Mr. Andrew Coats for his great kindness in enabling me to carry on further researches in the Arctic. When Mr. Coats asked me to join him he told me he was going for sport, that he wanted to shoot some bears and walruses, and that I must not regard the cruise as a scientific expedition. Mr. Coats has had excellent sport, but all will agree that he has also done excellent scientific work. It is to British yachtsmen such as these, whether they take a direct or indirect part in the work, that we owe much of our finest Arctic work, and I am sure you will all join with me in expressing the hope that Mr. Coats will spend more than one other season in the Arctic, and thus add to the lustre of Britain in the Polar Seas.

At the conclusion of the lecture Mr. R. Turnbull, B.Sc., made the following remarks on the

#### FLORA OF HOPE ISLAND.

The plants collected by Mr. W. S. Bruce were given me for identification, and the collection is the first recorded from that island, but, unfortunately, it is far from complete, because of the limited time Mr. Bruce spent on the island.

The vegetation of the part of the island passed over was scanty, and even the lichens—luxurious elsewhere in the Arctic—were very much dwarfed. From the *Princess Alice* at the SE. corner of the island, a portion of flat land appeared at a distance as green as a meadow, but there was no time to visit this comparatively rich area. A sample of soil and water from near the summit showed the Red-Snow Alga (*Sphaerella nivalis*), a species of *Merismopedia* (one of the Schizophyceæ), Desmids (*Cosmarium* and *Calocylindrus* types), several Diatoms, and a *Zygnema* (one of the *Conjugatæ*). From the rocks and soil generally were obtained four lichens, *Cetraria islandica*, L. (Icelandic moss); *Platysma nivalis*, L.; *Stereocaulon*

*paschale*, Ach.; and *Sphaerophoron coralloides*, Pers.; several mosses, but none in the capsule stage; and eight flowering plants, viz., a grass in flower (*Phippsia algida*, R.Br.), Iceland poppy in flower (*Papaver nudicaule*, L.), *Saxifraga oppositifolia*, L., in flower; *S. cernua*, L., in flower; *S. caespitosa*, L., in flower; *S. Hirculus*, L., not in flower; *S. hieracifolia*, Waldst. et Kit., in fruit; and *Stellaria humifusa*, Rottb., not in flower.

I am indebted to Colonel H. W. Feilden for help in naming the flowering plants from his large Arctic collection, and also for pointing out that *P. nudicaule* and *S. oppositifolia* are universally distributed throughout the Arctic, and that along with *Cerastium alpinum* and *Dryas octopetala* var. *integrifolia* they share the position of growing in the most northern land yet reached by man, having been obtained at Lockwood Island, 83° 24' N., by Lient. Lockwood, of the Greely Expedition.

TABLE I.—Soundings taken during the first cruise of steam-yacht *Blencathra*, in new localities, May and June 1898, in south-east of Barents Sea.

No. of Station.	1898.		Position.		Depth in Fathoms.	Nature of Bottom.	Notes.
	Date.	Hour.	Latitude.	Longitude.			
1	May 30	15 h. 15 m.	73° 18' N.	43° 32' E.	100	No bottom.	Hand lead.
2	" 31	10 h. 0 m.	73° 03'	47° 45'	100	No bottom.	Hand lead.
3	June 2	1 h. 0 m.	72° 32'	50° 00'	50	No bottom.	Mill's deep-sea water bottle.
4	" 2	6 h. 30 m.	72° 24'	50° 02'	56	Sand and mud.	Ordinary reel with wire and Kelvin depth recorder.
6	" 3	7 h. 15 m.	71° 36'	49° 12'	65	Mud.	Do.
7	" 3	18 h. 0 m.	71° 21'	48° 40'	75		Lucas, deep-sea sounding machine.
9	" 6	16 h. 0 m.	70° 10'	49° 08'	34		Do.
10	" 6	20 h. 0 m.	70° 03'	49° 10'	25		Do.
11	" 7	9 h. 30 m.	69° 30'	49° 21'	20	Sand.	Do., Kolgnev bearing SSE. and WSW. six miles.
16	" 10	9 h. 0 m.	69° 10'	50° 26'	22	Green mud and sand.	Hand lead.
38	" 15	13 h. 0 m.	69° 05'	51° 45'	27	Grey clay.	Lucas machine.
39	" 15	14 h. 0 m.	69° 08'	51° 53'	28	Rock.	Do.
40	" 15	16 h. 0 m.	69° 15'	52° 16'	30	Rock and mud.	Do.
41	" 15	20 h. 0 m.	69° 28'	52° 57'	27		Do.
42	" 15	Midnight.	69° 44'	53° 40'	38	Rock.	Do.
43	" 16	2 h. 0 m.	69° 52'	54° 00'	40	Mud and shells.	Do.
44	" 16	4 h. 0 m.	69° 57'	54° 15'	41	Mud.	Do.
45	" 16	6 h. 0 m.	70° 05'	54° 40'	41	Mud.	Do.
46	" 16	8 h. 0 m.	70° 12'	55° 00'	38	Mud.	Do.
47	" 16	10 h. 0 m.	70° 18'	55° 21'	60	Rock.	Do.
48	" 16	Noon.	70° 23'	55° 33'	65	Rock.	Do., twelve miles SSE., off Chernoi Nos.
49	" 16	14 h. 0 m.	70° 28'	55° 08'	75	Rock.	Do., eight miles SW., off Chernoi Nos.
50	" 16	16 h. 0 m.	70° 34'	54° 38'	78	Mud and shells.	Lucas machine.
51	" 16	18 h. 0 m.	70° 39'	54° 09'	31	Green sandy clay.	Do.
52	" 16	20 h. 0 m.	70° 44'	53° 41'	27	Rock.	Do.
53	" 16	Midnight.	70° 51'	53° 00'	16	Rock.	Do., four miles S., off Kostin Point.

TABLE II.—Soundings taken during the second cruise of the steam-yacht *Blencathra*, in new localities, July 1898, in the west of the Barents Sea, and from west to east between latitudes 75° to 78° north.

No. of Station.	1898.		Position.		Depth in Fathoms.	Nature of Bottom.	Notes.
	Date.	Hour.	Latitude.	Longitude.			
56	July 2	17 h. 0 m.	72° 32' N.	24° 22' E.	150	.	Lucas. Wire carried away, lost sinker and thermometer.
57	" 3	13 h. 0 m.	74° 02'	21° 00'	75	No bottom.	Lucas.
58	" 3	17 h. 0 m.	74° 23'	20° 22'	40	Shell and coral.	Lucas. Mount Misery bearing W. by N.
59	" 3	19 h. 0 m.	74° 40'	18° 57'	25	Shell and coral.	Lucas. 2½ N. of Bear Island
60	" 3	23 h. 0 m.	74° 27'	18° 20'	14		Hand lead. West side of Bear Island. Let go anchor.
61	" 5	16 h. 30 m.	76° 17'	24° 23'	38	Small stones.	Lucas.
62	" 5	20 h. 0 m.	76° 43'	25° 17'	23	Stone w. coral.	Hand lead. Let go anchor 5 m. W. of Hope Island.
63	" 6	13 h. 0 m.	76° 57'	24° 59'	27	Mud.	Hand lead.
64	" 6	22 h. 0 m.	77° 17'	26° 40'	66	Mud.	Lucas.
65	" 6	Midnight.	77° 24'	27° 19'	74	Clay.	Do.
66	" 7	2 h. 0 m.	77° 32'	28° 03'	98	Muddy clay.	Do.
67	" 7	4 h. 0 m.	77° 37'	28° 46'	80	Stiff grey clay.	Do.
68	" 7	Midnight.	77° 03'	33° 00'	84	Mud.	Do.
69	" 8	23 h. 30 m.	77° 14'	38° 26'	76	Mud.	Do.
70	" 12	23 h. 0 m.	76° 01'	39° 04'	90	Mud.	Do.
71	" 12	Midnight.	76° 03'	38° 41'	80	Clay.	Do.
72	" 13	15 h. 0 m.	76° 24'	33° 43'	100	Mud.	Do.
73	" 14	8 h. 0 m.	76° 44'	30° 30'	100	Mud.	Do.
74	" 14	Noon.	76° 47'	29° 55'	100	Mud.	Do.
75	" 15	7 h. 0 m.	77° 53'	27° 48'	100	Mud.	Do.
76	" 19	10 h. 15 m.	77° 25'	25° 13'	35	Grey clay.	Do.
77	" 19	14 h. 30 m.	77° 20'	24° 53'	38	Grey clay.	Do.
78	" 20	10 h. 30 m.	76° 48'	21° 10'	Reef	Rock.	Sea breaking.
79	" 20	20 h. 0 m.	76° 22'	21° 33'	100	Mud.	Lucas.
80	" 20	22 h. 15 m.	76° 17'	21° 36'	60	Clay.	Do.
82	" 21	14 h. 15 m.	75° 55'	21° 18'	27	Stones.	Do.
84	" 21	16 h. 0 m.	76° 03'	20° 50'	27	Stones and sand	Do.
85	" 21	Midnight.	76° 29'	19° 08'	140	Rock.	Do.
86	" 22	8 h. 0 m.	76° 05'	19° 57'	72	Mud.	Do.
87	" 22	Noon.	75° 52'	20° 22'	52	Mud.	Do.
88	" 22	15 h. 30 m.	75° 34'	20° 31'	43	Sandy mud.	Do.

## NATURAL RESOURCES OF THE BARREN LANDS OF CANADA.

By J. B. TYRRELL, M.A., B.Sc., F.G.S.

(Read at the Meeting of the British Association, Toronto, 1897.)

CANADA, including the Arctic Islands, has an area of nearly 3,500,000 square miles. At present only 10 per cent. of this area is under cultivation of any kind, and probably not more than 35 per cent. is capable of cultivation. Possibly 25 per cent. of the land is more or less densely covered with forest, but most of this lies within the area that is capable