SURVEYING CRUISES OF H.M.S. "CHALLENGER" OFF THE COAST OF LABRADOR in 1932 and 1933.

Extract from an article by COMMANDER A.G.N. WYATT, R.N.
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FIRST CRUISE, 1932.

In June 1932 H.M.S. *Challenger* was ordered to proceed to Labrador and commence a survey of the coast between Indian Harbour and Cape Chidley on a scale of 1/75,000. On June 24 she sailed from Portsmouth and arrived at St. John's, Newfoundland, on July 5, having carried out a series of oceanographical observations on the passage.

The ship weighed from St. John's on July 7 and proceeded for Hopedale, in Labrador.

Off White Bear Islands several bergs were seen to be aground on the 2-fathom shoal between Bulldog Island and the Main. We passed inside this shoal, and the deep-sea echo-sounding graph showed a most irregular bottom all the way from off Gannet Islands. All the coast looked very barren, with no trees but some low vegetation of sorts and patches of snow lying in places; there was very marked mirage and all the hills and icebergs looked table-topped. We brought up in Webeck harbour, just past Cape Harrison, for the night, two icebergs being aground in the entrance but with plenty of room between them. Our course lay between the Sisters, a double islet, and the south end of the Ragged Islands, having good water all the time, thence 1 ½ miles north-eastward of Anauiat, thence north-eastward of Mortimer Shoal and Green Island, when the wind shifted to north-eastward and fog came in to the land, and we were just able to make an anchorage in a bight in the south end of East Ironbound Island. We passed between the Ironbound Islands and thence across and between Mokkovik Island and Uigoklialuit Island, then stood over to Cape Mokkovik, after which we followed the charted track between the Turnaviks, south of Striped Island and round Tikkerasuk light and across to Kayaksuatilik, where the passage between the islands and rocks is exceedingly narrow though quite deep; here the charted detail became inaccurate and was at one point quite unrecognizable, whereas hitherto it had been accurate so far as it went and sparsity of soundings was the point on which the existing survey failed most.

Before arriving at Hopedale pack-ice was sighted outside in the neighbourhood of Gull Island.

Hopedale, situated on a small bay in the mainland, is a Moravian Mission Station and Hudson's Bay Company trading post, and consists of the church and mission house, the Hudson's Bay Company's houses and store, and a collection of huts in which the settlement of something over a hundred Eskimos live. There is also a wireless station which is manned during the summer months by the Newfoundland Government.

On July 11 we sailed at noon for Nain. Close pack between Kikkertaksoak Islands and the coast islands prevented us taking the outer route to Cape Harrigan, so we passed through the inner sounds to Windy Tickle and out to Cape Harrigan. After rounding the cape however our course across to Wrecked Boat Island was entirely blocked, and we had to push our way through a loose pack, the ship butting the smaller pans end on, rising a little, and then breaking them with her weight.

The *Challenger* is not built to deal with ice of any weight and is not strengthened in any way except for double plating for 30 feet each side of the bow; it was therefore very necessary to take any unavoidable ice exactly end on, as a hard sharp pan might easily puncture our thin side plating if given a glancing blow.

I decided to try the inner route between Tunungayualuk and the Main; we found no difficulty until the channel bifurcated. We got out the boats, fine on each bow, with submarine sentries set at 10 fathoms and red flags to show when they found the ground. We proceeded awhile, and it took nearly all the afternoon to find a passage with 6 fathoms of water. We weighed about 5 p. m. and had good water until the narrows between Tuktuinak and Tunungayualuk, when the sentries tripped again, and we anchored until the boats found a passage with 7 fathoms; thence we passed between

Tuktuinak and Tunungayaksoak Islands without difficulty and across to Achpitok. The chart is just true enough to follow with great care but has no pretensions to accuracy.

I had some difficulty in picking the right channel between Nochalik and Kikkertavak owing to the chart being wrongly oriented.

I landed to reconnoitre a possible site for base measurement on Paul Island. We found a stretch which might do if we were prevented from reaching Port Manvers soon, the point which existing information seemed to indicate was the most suitable for the commencement of our survey. We arrived and anchored off Nain at 9.30 p.m. one week from St. John's.

Nain is quite a picturesque little settlement. There are about three hundred inhabitants. The principal buildings are the church, two missionaries' houses, and the Hudson's Bay Company's house and stores and the hospital which is now no longer used as such owing to lack of funds.

On July 16 we proceeded towards Port Manvers via Port Manvers Run, the pack-ice being solid right in to the coast. To our disappointment we saw that Port Manvers was blocked from shore to shore with the pack. There was nothing for it but to turn round, and return through the narrows into Port Manvers Run; and we anchored in the first cove where the shore offered possibilities for base measurement and extension; there is good anchorage near the head in 12 fathoms, and I named it "Challenger Cove".

The equipment supplied to surveying ships for base measurement is steel tapes 100 feet long for use along the ground, so that a reasonably even surface is required to avoid lengthy preparation: this sort of country is very rare in Labrador, where if the ground is not rough and rocky it is covered with woods or swamp.

On the 18th we dropped down on the tide through the first rattle and anchored off a sandy beach at the northern end of Satosoakuluk Island about 8 miles from Nain. I landed to reconnoitre and found a suitable site for a base on Satosoakuluk, just over a mile long, not too difficult to level and with good possibilities for extension to a first main polygon with sides from 10 to 12 miles long which would form the commencement of a chain up and down the coast, the marginal points of which would provide, on the one side, stations from which to carry out surveys of the outer islands and offing and, on the other, points from which to extend the triangulation up the bays and fjords when the opportunity should arise for these to be surveyed. It was quite evident, from what I had seen, that a detailed survey of the entire coast with all the countless islands, rocks, and shoals would be a work of many years; it therefore appeared to be the first necessity to provide a well-surveyed track either up the coast outside all the islands with channels leading in to each port of call, or a track inside most of the islands touching at each port and with tracks to seaward at intervals. I favoured the latter route because (*a*) it provided a route which avoided the constant stream of icebergs in the offing; (*b*) it is usually open to navigation earlier; (*c*) it is less subject to fog, which seems to hang over the cold Labrador current outside more often than it comes in to the land; (*d*) it provided anchorage in the event of fog or nightfall; (*e*) it is largely in sheltered water. This policy was approved by the Admiralty on receipt of my report.

During the next week a party continued the preparation and measurement of the base, azimuths were observed, another party camped to obtain astronomical observations with the prismatic astrolabe for position on Satosoakuluk, but were driven from their camp by mosquitoes and had to shift to a small stony islet, where they were able to complete their observations in comparative peace; I was engaged making a reconnaissance triangulation on the plane-table and marking and beaconing main stations; tidal stream observations were commenced on board the ship. All parties suffered severely; the mosquitoes have to be seen to be believed, for at times large areas of one's body could scarcely be seen for the numbers that settled; head-nets and gloves are essential for any work at rest.

A conversation with Mr. E. P. WHEELER, an American geologist who has spent a winter in the country, confirmed me in the opinion I had formed that much useful work could be done in charting the coast-line and topography from sledges travelling on the sea-ice during the months of March, April, May and June, after the stormy weather was over, if a party were left to winter on the coast; I had also been told that rocks and shoals with 2 fathoms or less over them would then be shown up by the ice piling up on them owing to tidal action, which would greatly facilitate locating them. This scheme was later approved by the Admiralty for the winter of 1933-34.

I took the ship round to Nain for the week-end and took the opportunity of establishing a tidal and meteorological observation camp.

It is interesting to note that our self-recording thermometer, a mercury-in-steel bulb situated in the ship's side 7 feet below water, showed a regular fluctuation of about 4°F. on the change of the tidal stream, which agreed almost exactly with our tidal stream observations, cold water from the ocean entering on the north-westerly stream and warm water from the various inlets leaving on the reverse flow. This range was reduced to 2°F. when the ice left the coast. Our base measurement over a length of 7622 feet was completed on July 29. On the 30th a fresh westerly wind blew the pack-ice off the coast and we saw no more of it.

On August 1 parties were away marking the coast-line for survey, and observation of the base extension triangulation was commenced which was completed, computed, and plotted by the 6th, and on the 5th our astronomical observation camp was struck, the sights having been satisfactorily obtained. The following week sounding and coast-line were commenced. The air-survey plane party had successfully accomplished their photographic survey between Okkak and last season's work, about 150 miles, which did not ake them long, as they only left us twelve days ago.

One dangerous rock was discovered by the boats this day well out in the channel off the western end of Rhodes Island. There are no charts whatever northward of Nain except a general chart of the coast on a very small scale on which none of the detail

of the coast is correct, and there are no soundings shown, so that it is useless for coasting. On the 10th the ship and boats were sounding and a secondary triangulation was commenced for a plan of Nain anchorage.

Before sounding in the ship I went up with our navigator, and photographer, in the seaplane which had very kindly been instructed by Dr. FORBES to help us in any way she could. We flew over the route followed on our passage between Davis Inlet and Nain and got a very fine view of the ground and located one dangerous rock close to our track between Nukasusutok and Kikkertavak and made a rough sketch of its position. No dangers with a greater depth over them than about 2 fathoms appeared to be visible from aloft, and these only when nearly vertically under the plane; this is probably because the bottom is covered with mud except where it reaches the above height, at which point it is probably fouled by the ice and so kept bright; the underwater contour at this depth was most clearly defined by an almost prefectly smooth line.

Later in the day the plane made a flight on our behalf to photograph the islands lying between here and Cape Harrigan, and a map made from these at the War Office proved very helpful later for planning triangulation. On their return the plane sailed for Hopedale homeward bound to the States. Sounding and charting of the coast-line and topography was continued during the next three days.

On August 15 we sailed from Nain to carry out oceanographical observations in the offing, and then proceed to Halifax, Nova Scotia, to replenish with oil fuel. A party under the first lieutenant, Lieut.-Commander E.H.B. BAKER, was left behind in camp to make a plan of Nain anchorage.

We made the first oceanographical station northward of the Hen and Chickens Islets; here the sea was dotted with numerous icebergs, and I counted over sixty in sight which were dangerous to navigation and many small growlers; the larger ones all appeared to be aground. The bottom was very uneven, varying rapidly between 20 and 70 fathoms, and the following year we discovered several dangerous rocks in this locality. After our second station, about 12 miles seaward of the outer islands and just within the 100-fathom line, the bergs ceased and there were no more sighted. The Davis Strait current impinges hereabouts on the Labrador coast bringing its cargo of bergs which get hung up amongst the islands and shoals until they melt, only a comparatively small number of them escaping and continuing their voyage to the southward, some of them of a fantastic shape showing an advanced state of disintegration.

About 20 miles outside the islands, between our second and third stations, the surface temperature rose 3°F., and between the same stations the water deepened to over 200 fathoms, rising again to 59 fathoms at our third station. We did not again cross the 100-fathoms line for about another 30 miles. The surface temperature again dropped 4°F. about 35 miles outside the islands and just before our fourth station.

Our last station was made the next day in lat. 57°21'N., long. 56°32'W., in a depth of 1502 fathoms, mud, a vertical series extending down to 2000 metres; at none of our outer stations did the surface temperature fall below 10°C. and at no depth, down to 2000 metres, did it go below 3°C.; a marked difference from the inshore stations where minus temperatures were obtained at middle depths. We stood inshore again on completion of our observations and made our landfall about the Hen and Chickens about midday the following day, but found it exceedingly difficult to recognise landmarks owing to mirage which distorts everything and makes the sharpest peaks appear table-topped; this I imagine is the usual condition in the summer time and must always make coasting difficult for the stranger.

Off Cape Harrigan, in approximately 56°4'N., 59°58'W., we experienced large and varied fluctuations of the compass needle amounting to as much as 14 1/2° and a mean swing to 6° to the eastward; this would not have been very surprising in this part of the world, where the same sort of thing occurs frequently on shore, but in this case the depths varied between 37 and 130 fathoms with no bottom, except for one cast of 22 fathoms, and these depths are usually considered too great for local attraction to affect the compass needle; the Astronomer Royal, in remarking on my report to the Hydrographer of the Navy, considered it probable that there was some local disturbance; but that part of the swing shown by our compass might be due to a variation of the Earth's field associated with an aurora.

Twenty-one icebergs were in sight off Cape Harrison at daylight, but only three in sight off Round Island at nightfall. During this passage a continuous line of soundings was run along the coast, also on each subsequent passage when conditions allowed of fixing.

The ship arrived at Halifax on the 22nd and sailed again on August 27. On the 30th we lay to off a particularly fine iceberg and lowered a boat to obtain photographs of the ship in company with it (*). The following day we were back on our ground and commenced running a line of soundings.

After rounding Cape Harrison we shaped to pass northward of Double Island and inside the Dog Islands by the track followed by the *Gulnare* in the seventies; the charted detail and soundings were quite fairly accurate, but we got 7 fathoms where 12 fathoms are shown south-westward of the Dog Islands. We endeavoured to find Adlavik Harbour as described in the sailing directions, but these did not tally with the chart.

Adlavik Harbour, which was not shown on the chart, opened up after we passed the previous night's anchorage, an entire island of some size having been omitted; we made a compass-sketch survey as we passed and continued thence close round Pomiadluk Point, Capes Strawberry, Mokkovik, and Aillik, correcting the chart as we went. Just before passing between the Turnaviks we narrowly escaped grounding on a rock, the bottom being clearly visible from the bridge on both sides; we were over it before we could get a reliable sounding, but it could not have been much over our draught of 15 feet; after fixing its position we proceeded. The chart after rounding Tikkerasuk is totally unreliable so that little could be found to base corrections upon, but some improvement in the sailing directions was made; we anchored off Hopedale at 5.45. Sailing at 6.30 the next morning we proceeded by the inner track to Windy Tickle and thence round Cape Harrigan, left Wrecked Boat Island to starboard, Katauyak to port, and then inside Ayagatot to Spracklings Island and Kikkertaksoak, and arrived and anchored in Ford Harbour at 7.30. The islands from Ayagatot were nearly all incorrectly charted and many omitted, and the light shown on Spracklings Island is actually on an uncharted island about 3 miles to the westward; so we made a running gyro-compass sketch survey and ran a line of soundings throughout to correct and complete the chart as far as possible based on existing detail which appeared relatively correct.

On September 5 a party was landed to build a trig. beacon, the ship then went round to Nain and found our camp all well and the plan finished. We left Port Manvers and anchored at the southern end of the narrows. The boat was sent through to look at things as we did not complete the passage last time, and she reported least water 5 fathoms in the fairway and a very strong tide (6 knots) running to the northward. I waited till the tide turned, when we weighed and went through without difficulty.

We weighed from our anchorage on the morning of the 8th and stood out of Port Manvers, the entrance to which is much encumbered with rocks and a very uneven bottom, then worked our way to the southward and anchored under the Black Islands, where I landed in a small harbour with a party to erect a mark on the highest hill close eastward of Amerak.

On September 13 the ship proceeded to Port Manvers. I landed and ascended Mount Thorsby. We erected our signal and obtained main angles, using the GALTON sun signal for the longer rays. The summit was sprinkled with snow and there was enough wind to make it bitterly cold observing.

The ship left Port Manvers next morning and worked southward along the Aulatsivik shore to try and find a passage to Iviksuak, but got hung up in 3 fathoms and had to anchor while the boat was got out to look for better water among the maze of islands, which she succeeded in doing by the afternoon when the ship followed her to Iviksuak.

I was away early the next morning to erect a mark on Semikutak, a steep rocky island some 8 or 9 miles seaward of Iviksuak, only accessible in calm weather and with no anchorage for a boat. I obtained a satisfactory view of other points from the summit, also of the coast; there was only one iceberg in sight by the Hen and Chickens, where a month previously I counted sixty visible from the bridge.

Friday, September 23, confirmed the beliefs of the superstitious. Weighing at daylight to land a party on Semikutak while the weather was fine, we were steaming along a track twice previously followed without any indication of danger and, as usual, sounding every twenty seconds with the echo gear and getting water between 30 and 50 fathoms, when a sounding of 21 fathoms was called, and before another could be obtained the ship struck a pinnacle rock invisible from the masthead at a ship's length.

(*) *See* Hydrographic Review, *Vol. X, No. 1, May* 1933, *facing page* 12.

On sounding round the ship, 5 fathoms were found under the bows, 3 under the stern, with 30 fathoms two ship's lengths away, while the ship was balanced on a 9-foot patch under the bridge with both ends clear of the ground; had we been less than a ship's length to either side we should have gone clear. I now decided to try and haul her off astern when the tide made. As we had gone ashore about low water neaps and expected about a 2-foot rise it would be necessary to lighten the vessel somewhat, but not until the last minute, so as to prevent pounding as much as possible; for this purpose we laid out the bower anchors astern and brought the hawsers to the trawl winch while a kedge was laid out on the starboard bow to keep her head steady to the swell. Having four of our officers and most of the seamen away in camp, all hands, including cooks, stewards and civilians, had to assist in this work, which they did admirably and without mishap except for one man, who was surprised by the lurch given by the boat when an anchor was dropped and took a beautiful header into the icy water, but was pulled out none the worse. Before trying to haul off I got a round of angles to fix the position of the rock. All was ready just before high water, when the bower cables were veered on to the bottom, every one was sent aft, 14 tons of water were pumped from the starboard boiler, and 15 tons of oil from the port forward outer tank to keep an even keel; this lightened the ship about 5 inches on her mean draft, and at high water the stern hawsers were hove upon, the engines were put full speed astern, and at about 12.30 the ship came off gently, which was very lucky, as with only a slight increase of sea I fear we should have lost her.

After refloating and recovering anchors the ship returned to Ford Harbour to examine the damage with divers while the boats were sent away to recover the camping parties. Diving continued all next day, and the divers had a severe time of it in water only one degree above freezing; missing rivets were plugged with wood or lead plugs and an attempt was made to caulk the worst of the leaky seams; this so far reduced the entry of water that the pumps were able to control the leaks. We now found that we had only 40 tons of fuel free from water, which would not be enough to carry the ship to St. John's if we got any bad weather; our fresh water was also spoiled and the salved provisions would just about carry us to civilization. We were of course in communication with Halifax by W/T, and learned that H.M.S. *Heliotrope* had been ordered to our assistance. We sailed at daylight on the 26th, with a boat sweeping ahead and keeping inside all the islands to get sheltered water till we found how our repairs were holding, and reached Davis Inlet that night. Next day we stood out to sea past Cape Harrigan, and thence down the coast, and at sunset on the 28th fell in with the *Heliotrope* off Spotted Island. The ships sailed in company on the morning of the 30th, and after being again stormbound for two days in the Bay of Islands we reached Halifax safely on the morning of the 5th with enough oil for half a day's steaming in hand. Repairs were carried out at Halifax before the ship's return to England.

SECOND CRUISE, 1933.

The ship arrived on the coast, after working in the West Indies, on 22nd July 1933, and found the usual procession of icebergs, which seemed rather more numerous than last year. During that night we passed a number of bergs close to and had to alter course; it was never really dark, and they could be seen as a dark mass against the light of the northern sky at perhaps a mile, but showed up white as they drew abaft the beam and were visible much farther. On a really dark night however they cannot be seen more than a quarter of a mile, if that, and it is only safe to just keep steerage way unless a searchlight is available, growlers being visible even less far. We arrived off Gull Island next morning and made a running survey of the passage into Hopedale to correct the published chart.

Weighing from Hopedale the next morning we took the outside passage, through the "Cluster of Rocks" to Windy Tickle, carrying out a running survey on the way and with the boat ahead. Fog came down off Cape Harrigan and we had to feel our way past with an occasional glimpse of the cliffs. Thence we took our old route inside Massacre Island to Davis Inlet, where we brought up off the Hudson's Bay post. While the boat sounded out the anchorage I landed to inquire of the Hudson's Bay Company trader as to supplies for a Winter Survey Party.

On the 25th we sailed from Davis Inlet with the boat going ahead and took the passage westward of the Freestone Islands, thence between Spracklings Island and Lopsided Island, and the long straight stretch past Kikkertaksoak to Ford Harbour; a boat was lowered off Kikkertaksoak to re-flag the mark, and I was glad to see most of our

last season's marks still standing in spite of the winter gales. We carried out corrections to the chart on passage and found 5 fathoms near where we had 11 on our last trip this way. During the remainder of the month parties were busy marking and triangulating. A visit was made to Nain, where the same folk were found as last year and, in addition, Mr. WHEELER, the American geologist, whom we were able to assist with some data and by checking his chronometers. I was also able to make most of our arrangements for supplies, equipment, and dogs for the Winter Survey Party.

On August 1 the survey of a track from Nain out to the Hen and Chickens was commenced, and continued uninterruptedly until the ship left to refuel at the end of September, camps being established as necessary and stations made for tidal and tidal-stream observations at various points. During this period two trips to the southward were made by the ship while the boats continued the work from camp; each passage conveyed dangerous cases of septic mosquito bite to hospital. On the passage north from St. Anthony we had a lot of fog, which made the icebergs an anxiety, especially at night, as they could only be located by the sound of the sea breaking against them as the ship approached.

On September 15 snow appeared on all the mountain tops. Next day the weather moderated sufficiently to work in sheltered water, and I took the ship out to the Hen and Chickens, but the swell was too heavy to do any work and was breaking in 4 fathoms, which made things too risky in unsurveyed water. I was however able to locate and fix several new breakers shown up by the swell before returning to protected water to work. A camp was established at Kauk Harbour, about 3 miles south of Nain, with a party to carry on the survey of the channel southward from Nain whilst the ship proceeded to Halifax for fuel and stores on the 25th.

The ship returned with stores and equipment for a Winter Survey Party on October 12, making the Hen and Chickens in a snowstorm and just reaching Nain before fog and nightfall were added to the snow to blot everything out. During the next month the survey of the South Channel was continued, conditions steadily becoming less pleasant; daily the temperature fell lower, and as the sea-water is always cold it was not long before the spray started to freeze and the boats came back each day covered in ice; sailing boats had their sails frozen into a curve on each tack, the ice breaking off in a shower when they went about; the ship grew whiskers of ice all round the water-line, and ropes doubled their size with frozen spray or snow. By the 30th snow covered the country down to the landwash, and did not melt again. An unexpected difficulty arose owing to the tar in the boats' falls freezing, so that the ropes became stiff and brittle; on one occasion when hoisting one broke like a stick, after which it was necessary to keep them unrove and stowed down below until they were required for use.

On November 10 I discontinued work in the field as conditions became too rigorous and the ship proceeded to Nain and started to establish the Winter Party in their base at the Hudson's Bay Company's hospital building; stores and equipment of every variety were landed and the house was rigged up very comfortably. A half-grown black bear was brought on board destined for the zoological park at Whipsnade; he was a friendly little fellow and was christened "Jacky" by the sailors.

On the 16th the surface of the sea was "smoking" all over, which it does prior to freezing, so I decided to sail without waiting for our mail, which was on its way north, and after bidding farewell to the Winter Party we left at noon before a fresh gale from the west, and were clear of the land before night fell accompanied by snow.

The Winter Survey Party: Lieut-Commander E.H.B. BAKER, in command and in charge of survey; Leading Seaman T.O. HAMPSON, surveying recorder; Able Seaman A. J. MARLOW; Able Seaman F. MARSHALL; J.M.H. HOLGATE, Officer's Steward and Cook, were selected from volunteers from nearly the whole of the ship's company and officers, and their object is to endeavour to continue the charting of the coasts and islands and the topography within a radius of 60 miles from Nain and south of Port Manvers, using Nain as their main base from which to establish camps in snow houses or tents, as may be convenient for carrying out the work. They will use "komatiks" and dog-teams as long as conditions allow, after which local boats will be employed to continue the survey until the arrival of the ship about July 1934, when they will rejoin her and she will resume the survey where it was broken off last year.