



*Otto Sverdrup shortly after his return from the Canadian Arctic Archipelago in 1902.
This year, 1974, marks the one hundred and twentieth anniversary of his birth.*

Otto Sverdrup to the Rescue of the Russian Imperial Navy

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Otto Sverdrup, one of Norway's greatest explorers, is usually remembered for his participation, as captain of *Fram*, in Nansen's memorable drift of 1893-96, and for his remarkably successful exploratory expedition in 1898-1902, again in *Fram*, to what are now the Queen Elizabeth Islands. Such obviously Scandinavian names as Axel Heiberg Island, Grise Fiord, and Slidre Fiord, bestowed by Sverdrup, testify to his achievements in that area.

But several later arctic exploits of Otto Sverdrup's, although in some ways ranking equally as high as the better known expeditions, have achieved relatively little renown. One of these was his leadership of the search-and-rescue expedition aboard *Eklips* in the Kara Sea in 1914-15, described in detail by L. M. Starokodskiy (1959) on whose account this article is largely based. Although one can not state categorically that Sverdrup's presence and experience saved human life, it is fair to say that had it not been for Sverdrup, and had ice conditions in the summer of 1915 been more severe, the Russian Imperial Navy might have experienced a major disaster.

The initial objectives of Sverdrup's expedition were two missing expeditions: those of G. L. Brusilov aboard *Sv. Anna*, and of V. A. Rusanov aboard *Gerkules*. Lieutenant Brusilov had mounted a private expedition to traverse the Northern Sea Route from west to east. With a 23-man crew he sailed aboard the *Sv. Anna*, an auxiliary schooner of 231 tons displacement, with a feeble 41 h.p. engine. Although the ship was outfitted with provisions for a year and a half, and carried an adequate supply of winter clothing, there were serious deficiencies in the preparations (Pinkhenson 1962 p. 592). The vessel was last seen as she fought her way into the ice-choked waters of the Karskoe More from Yugorskiy Shar (the strait between Ostrov Vaygach and the mainland) on 16 September 1912 (Vize 1948 p. 152).

The second expedition, that of V. A. Rusanov, appears to have been even less well planned. V. A. Rusanov, an experienced arctic geologist, had been appointed to command a government expedition to Svalbard to investigate the coal potential (Pinkhenson 1962 p. 489). The personnel consisted of thirteen men and one woman, and they sailed from Aleksandrovsk-na-Murmane (now Polyarnyy, near Murmansk) aboard the diminutive *Gerkules* on 26 June 1912.

At the end of a very successful summer's field work, three members of the expedition returned to Russia *via* Norway (Pinkhenson 1962 p. 492), but the

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remaining ten, without consultation with the authorities in St. Petersburg, set off with Rusanov in an incredibly rash attempt at reaching the Pacific *via* the Northern Sea Route.

The last to be heard of that expedition was a telegram left at Matochkin Shar on Novaya Zemlya, which reached St. Petersburg on 27 September 1912. In it, Rusanov indicated that he intended rounding the northern tip of Novaya Zemlya, and heading east across the Karskoe More; but nothing was heard from *Gerkules* thereafter.

As early as 1913, some public anxiety began to be expressed in Russia about the whereabouts of the expeditions of Brusilov and Rusanov as well as that of Sedov aboard *Sv. Foka*, which had left Arkhangelsk the previous year in an attempt to reach the Pole. Soon after, five sick men had been sent back from Krestovaya Guba on Novaya Zemlya, but nothing more had been heard of her since. An initial appeal to the Soviet of Ministers to mount a rescue operation was turned down and it was not until January 1914 that the Soviet of Ministers yielded to growing pressure and ordered the Naval Ministry, with the collaboration of the Ministry for Internal Affairs, to set a rescue operation in motion, aimed at the Sedov expedition. In February, due to pressure from the Russian Geographical Society and the Ministry for Internal Affairs, the government also agreed to send another vessel in search of the Brusilov and Rusanov expeditions. The government's reluctance to get involved is understandable considering that the leaders of these three expeditions had demonstrated an incredible degree of irresponsibility, and in view of the complete lack of clues as to where the search should be concentrated. In the special journal of the Soviet of Ministers, the entry for 20 February 1914 stressed that henceforth it was essential "to protect the Treasury from the expenses of arctic rescue expeditions of assorted kinds".

A proposal that an icebreaker should be used on the search-and-rescue mission had been turned down but in February 1914 a plan was drawn up to use vessels of a conventional design and was presented to the State Duma: the estimated expenditure was 575 thousand roubles; in fact 480 thousand roubles were spent in 1914 alone. Two vessels, *Eklips* and *Gerta* were purchased, and two others were chartered.

The almost impossible task of searching for Brusilov and Rusanov was entrusted to Otto Sverdrup, in *Eklips*. The whereabouts of the *Sv. Anna* were totally unknown; however, he was to search the coasts of the Kara Sea from the north island of Novaya Zemlya to the mouth of the Yenisei, and on to Mys Chelyuskina, and also Ostrov Uyedineniya (see Fig. 1).

Eklips was a good vessel for the job. She was a Dundee whaler built of oak with ice-sheathing of greenheart, and had numerous voyages to Baffin Bay to her credit. She had a displacement of 440 tons, length 45 m., beam 8.8 m., draught 4.8 m., and an engine of 360 h.p. For the first time radio was to play an important role in an arctic rescue mission: she carried a 4 kilowatt radio transmitter with an effective range of 800 km. The quantity of provisions put aboard was calculated not only on the possibility of wintering (16 months) but also on being prepared to supply the members of the lost expeditions. Warm clothing was provided on a similar basis. Some of the stores were bought from Roald Amundsen, who had

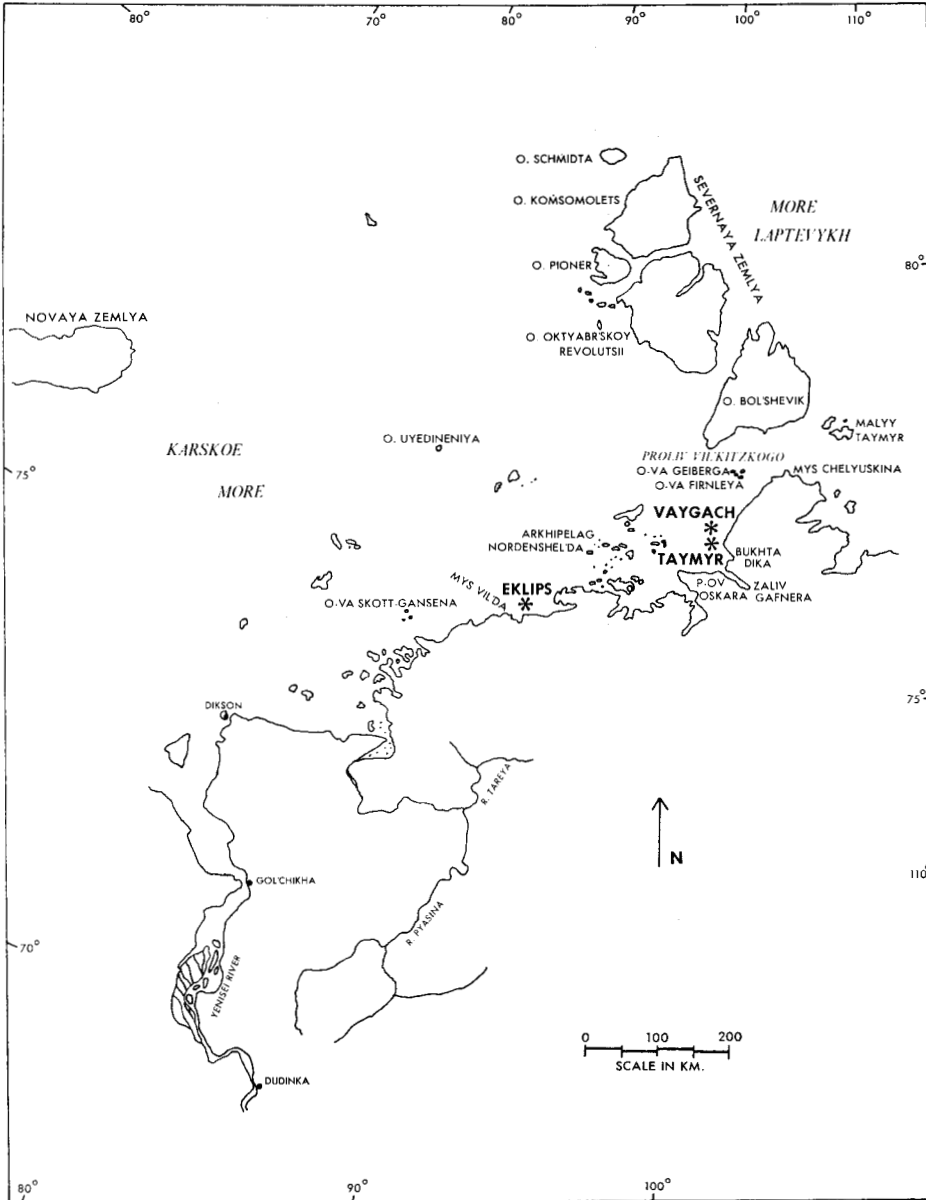


FIG. 1. Eastern part of the Kara Sea showing wintering places of *Taymyr*, *Vaygach*, and *Eklips*.

prepared them for an unrealized expedition aboard *Fram*. For search parties, *Eklips* was equipped with sledges and 31 sledge dogs.

Her crew consisted of 21 men: 18 Norwegians, 1 Finn, and 2 Russians: one, the doctor, I. I. Trzhemesskiy, who was the official representative of the Russian Naval Ministry, the other the radio operator D. I. Ivanov (Vize 1948 p. 154).

She sailed from Christiania (Oslo) on 13 July 1914, and reached Aleksandrovsk-na-Murmane on 1 August, and by 13 August was heading east into the Karskoe More. By the 16th, she was already beset and drifting with the ice; this drift, alternating with occasional spells of independent progress under either sail or steam, continued until 20 August, when *Eklips* encountered unbroken ice, and for several weeks further progress was blocked.

It was here, between the Ostrova Tillo and Markgama, that around noon on 9 September, one of her radio transmissions was answered by a completely unexpected call:

Taymyr and *Vaygach* located at the Ostrova Firnleya. Tell us who you are and where you are.

At 0100 hours, Sverdrup replied:

Eklips expedition searching for Brusilov and Rusanov; located between Ostrova Tillo and Markgama.

This, as it turned out, was to be an extremely fortunate encounter for *Taymyr* and *Vaygach*, the two Russian Imperial Navy icebreakers of the Arctic Ocean Hydrographic Expedition which since 1910 had been engaged in making the first accurate survey of the arctic coasts of Siberia as an essential preliminary to establishing a practicable Northern Sea Route. Their achievements had been substantial, quite apart from their important, but relatively mundane survey work. In 1911 they had made the first Russian landing on Ostrov Vrangelya in the Chukchi Sea, as well as the first accurate survey and circumnavigation of that island. And in 1913 they had made the major discovery of Severnaya Zemlya, or Zemlya Nikolaya II, as it was first named. They had plotted the east coast of the archipelago, but ice had prevented any detailed exploration, or any determination of its westerly extent.

On their departure from Vladivostok on 7 June 1914, the expedition had been instructed that its main task was now the through-passage to the Barentsevo More (Barents Sea): hydrographic work should be undertaken only within such limits as would not hinder the expedition from traversing the entire Northern Sea Route.

At first sight, the vessels were quite well equipped for this task, certainly as well as any others at that time. They were identical, launched in the fall of 1909 from the Navy shipyards on the Neva at St. Petersburg. They were steel-hulled with plates varying in thickness from 8 to 22 mm. Stem and sternpost were cast to a special design, which theoretically allowed them to break ice going either ahead or astern. The ships' hulls were rounded, along the lines of *Fram* and for the same reason. Frames were spaced at 50-cm. intervals. A double bottom, and longitudinal and transverse watertight bulkheads dividing the hull into 35 compartments theoretically made each vessel almost unsinkable.

They were relatively small vessels, although much larger than *Eklips*; they were 54 m. in length, beam at the waterline 11 m., draught on an even keel 4.4 m., displacement about 1,200 tons. Triple-expansion steam engines of 1,220 rated horsepower theoretically allowed them to break ice up to 1 m. thick, but this

calculated figure was over-optimistic. The coal bunkers could hold 500 tons. At an economical 6-knot speed, with a daily consumption of 6 tons, this was sufficient for more than two and a half months of continuous steaming, i.e. for about 16,000 km. The provision holds could store enough food for 50 men for a year and a half (Transehe 1925 p. 371).

The living quarters were well insulated; the steel hull-plates and frames were covered with alternate layers of pulverized cork, kapok, rubberoid, together with an air space, making a total insulation layer of 25 cm. In case of wintering, when the fires would be drawn and the steam heating non-operative, 10 coal-burning stoves were installed in various parts of the ships. A supply of naphtha, with the necessary lamps, was carried for periods when the electricity would be shut off. In the galley, the oven was capable of producing 200 kg of bread in one batch. Each ship had a radio transmitter, but the effective range was only 240 km. This was to prove one of the greatest and potentially most dangerous deficiencies of the expedition.

In command of *Taymyr* and also of the expedition on the 1914-15 voyage was Captain B. A. Vil'kitskiy. Under him, were 49 officers and men, including medical officer L. M. Starokadomskiy. Captain P. A. Novopashenny was in command of *Vaygach* with 47 officers and men.

The ships were stocked with food for one and a half years, and with a large quantity of winter clothing, both woollen and fur. There were some skis and man-hauling sledges aboard, but no dogs.

The vessels had sailed from Vladivostok on 7 July, but various commitments delayed their getting to grips with the real task: bathymetric work in the Tuscarora Deep, the outbreak of World War I, and an attempt to rescue the shipwrecked crew of Stefansson's *Karluk* from Ostrov Vrangelya (Barr 1972).

In due course *Taymyr* and *Vaygach* made a rendez-vous at Mys Chelyuskina (Fig. 1), where an impenetrable ice-barrier had balked them the previous year. That year (1914), ice conditions in Proliv Vil'kitskogo were immeasurably better.

About midnight on 5 September, the vessels weighed anchor at the southwest tip of Severnaya Zemlya and headed slowly south through heavy ice. Fog caused long delays while the ships lay to ice anchors, but they made steady although tortuous progress south dictated by the leads and polynias. They passed the Ostrova Geiberga, but on 9 September, off the Ostrova Firnleya, *Taymyr* was caught between two large icefields, pivoting around each other, and was severely nipped. She received heavy damage on the port side beneath the waterline: 70 frames were broken; the bulkheads of the transverse and for'ard port coal bunkers were stove in; rivets in the ship's plates were sprung in the sick-bay and in the engineer's and doctor's cabins, and water poured into these compartments. The pressure fortunately ceased, the leaks were stopped and the water pumped out, but the ship had been seriously weakened; another similar nip might prove fatal.

Vaygach also suffered from ice pressures: she broke a propeller blade (one had already been damaged) and was taking water at a rate of 3 tons per hour.

With the chance of pressure being renewed at any minute, *Taymyr*'s crew spent the night in moving reserves of food, warm clothing, kerosene and naphtha from the hold to the upper deck, in preparation for abandoning ship. It was in the midst

of all this anxiety, tension and bustle that *Taymyr's* radio-operator had chanced to pick up *Eklips's* transmission and had successfully made contact.

This unexpected establishment of contact with another expedition must have been a source of great relief to the officers and men aboard *Taymyr* and *Vaygach*. An animated exchange began, with Sverdrup reporting all he knew of the progress of the war. Sverdrup thought that he might be able to reach the icebreakers, but fortunately the ice prevented him. From his wintering position at Mys Vil'da he was able to act as an essential radio relay-station between *Taymyr* and *Vaygach* and St. Petersburg. Had he moved any farther north, he would have lost contact with the mainland. At the same time, even at Mys Vil'da he was at the limit of *Taymyr's* radio range; had they been any farther apart they would not have been able to reach each other.

But *Taymyr's* and *Vaygach's* problems were not over by any means. On board *Taymyr* they worked to stop the leaks more effectively, and finished moving emergency stores on deck. Then over a period of several days, she edged her way out of the trap, moving from polynia to polynia as leads opened and closed, but with young ice forming on the open water, it was clear that a wintering was inevitable and imminent.

There was further severe ice activity on the night of 20 September, and *Taymyr* was squeezed again. All hands were called, and Vil'kitskiy prepared to abandon ship. He radio'd to Sverdrup:

Have been nipped two miles from shore, latitude about $77^{\circ} 20'$. Ice is streaming past astern of us in a powerful flow towards Chelyuskin. Will attempt to avoid being moved away from shore. Route to shore is across icefields and through hummocks; we are surrounded by solidly packed thin ice . . . If we are unable to unload supplies and fuel, am relying on your help to reach either you or *Vaygach*. Ice flow along the coast, along with us, is being restrained by the islands.

Some time later, there was little alleviation of the situation:

Ice around ship is moving. Have not begun unloading yet; think that a change of wind might carry the ship away from the shore. Leak not increasing.

The tension continued, as the ice remained in motion for several more days. On the night of the 22nd, Vil'kitskiy again ordered preparations for abandoning the ship in favour of the ice. The crew was roused out about midnight and issued with woollen underwear and fur clothing. They prepared for an emergency unloading of a 20-day supply of provisions, sledges, skis, instruments, firearms, a first-aid kit, and personal belongings. The crew was then ordered to go back to bed fully dressed.

Next evening, *Taymyr* managed to force her way into a shore polynia, and steamed south along the edge of the land-fast ice. By the 24th, it was clear that she had reached her wintering spot, at Bukhta Dika; although the engines were run from time to time over the next few days, to be ready for any further movement; but she was not to move under her own steam again until spring breakup.

Vaygach too, was nipped by the ice several times, but although she was heeled over, received no serious damage. The final positions of the three vessels in their enforced wintering were as follows: *Taymyr* at 76° 40'N., 100° 30'E.; *Vaygach* 25 km. NNW of her; and *Eklips* at Mys Vil'da, 275 km. to the south.

All three vessels made normal preparations for wintering; dismantling of main engines; roofing-over of the upper deck with canvas, and banking the ships' sides with snow for added insulation. Strange as it may seem, although the Russian authorities had anticipated that a wintering might be inevitable, it almost seems as if they hoped it would not happen, and the icebreakers in some respects were really quite ill-prepared.

Firstly, the ships' quarters were unbearably cramped. The congestion had not been felt while the ships were at sea, since about one third of the crew was always on watch; but when the duty watch was reduced to one man on deck, the congestion in the crew's quarters became severe.

The diet, though adequate, was extremely monotonous. The basic menu was as follows:

Day	Dinner	Supper
Monday	Peas and salt beef	Salt salmon with peas and potatoes
Tuesday	Shchi with porridge, cranberry kissel	Macaroni with tomatoes and butter
Wednesday	Rice soup	Stew and potatoes
Thursday	Borshch, rice rissoles with mushrooms or treacle sauce	Wheat or millet porridge
Friday	Shchi with porridge, cranberry kissel	Salt salmon with cabbage and potatoes
Saturday	Peas and salt beef	Macaroni with tomatoes and meat
Sunday	Borshch, stewed fruit	Corned beef and potatoes

The officers' menu was varied somewhat by the addition of extra items, purchased by the officers out of their own pockets. It is interesting to note that the officers' mess on each vessel employed a civilian cook.

The steady diet of preserved meat soon became monotonous and the Russians had little success at hunting: *Taymyr* got only 4 bears during the voyage and *Vaygach* 8.

Owing largely to the efforts of Dr. Arngol'd and Dr. Starokadomskiy, no deaths on either ship can be attributed directly to scurvy. However, the diet was certainly a contributory cause to the death of Lieutenant Zhokhov aboard *Vaygach*. He found the preserved food totally inedible, and effectively from the beginning of January, he stopped eating. On 6 February he sent a humorous telegram to *Taymyr* challenging them to a football match (Kupetskiy 1964 p. 115) but by the middle of February he was unable to get out of bed. Dr. Arngol'd made an examination and found the sick man's kidneys seriously affected; on 1 March he died of uraemia.

Freedom from scurvy was largely attributable to a daily routine in which physical activity was stressed as far as possible. The routine aboard *Taymyr* was as follows:

- 0630 hours: Reveille.
- 0730 hours: Breakfast; then part of the crew sets off to get ice or snow to melt down for fresh water.
- 0900-1130 hours: Various ship's tasks in the open air.
- 1200 hours: Lunch
- 1330-1430 hours: Compulsory outing; if weather permits, skiing, skating on a specially constructed ice-rink, wrestling; and on bright days: football, target-shooting, etc.
- 1500 hours: Tea.
- 1600-1700 hours: Working at various jobs.
- 1800 hours: Supper.
- 1930-2300 hours: Resting, and working for those who wished.

The outings on the ice were strictly compulsory for everybody. Their duration varied according to temperature, precipitation, and especially wind strength.

For drinking water, the Russians first used multi-year ice, but later snow water. After the boiler fires were drawn, the bath house aboard each vessel was heated only once a week, and one quarter of the crew would bathe in turn. Then, too, they would launder their clothes, which were hung out to dry on the upper deck. Thus, each man washed in the bath house once a month.

With the water closets shut down, alternative facilities had to be devised: *Taymyr's* crew erected a privy on the upper deck, projecting out over the port side. All garbage was dumped at one point over the ship's side.

Meteorological observations, bathymetric readings, upper air measurements, and ice growth measurements were carried out on a regular basis at each ship (Transehe 1925 p. 387).

In case of emergency, a shore depot was set up near *Taymyr* at the beginning of the winter. Two crates in which the floatplane had been transported were dragged ashore, and stocked with enough food for 50 men for 40 days.

In mid-October, both *Taymyr* and *Vaygach* experienced some further ice motion. Aboard both vessels frantic efforts were made to re-assemble the engines, in case they were needed. However, the ice soon settled down again, and *Taymyr* remained motionless for the rest of the winter. In early November, while Novopashenny and some of his men were visiting *Taymyr*, a blizzard started the ice around *Vaygach* moving again; the latter was heeled over very slightly, and pushed upwards a little, and there she stayed, some 12 km. from *Taymyr*.

The Russians now settled down to the rather hum-drum daily routine already outlined. Throughout the winter, classes were offered aboard both vessels in Russian, arithmetic, geometry, physics, geography and history, with German and French for those wishing to learn another language. Special classes were offered for specialists such as stokers, helmsmen, pursers, signalmen, etc., who wanted to up-grade their qualifications.

The arctic night lasted for 103 days; only for about 2 weeks, however, was it totally dark, even at noon. On three occasions, each of a week's duration, the moon shone daily for 9 to 10 hours.

The Russian vessels celebrated Christmas according to the Julian calendar, but nevertheless sent Christmas wishes to Sverdrup and his men on 25 December. Sverdrup returned the good wishes when the Russians were celebrating two weeks later.

Around 16 January, Vil'kitskiy warned *Eklips* and *Vaygach* of an enforced reduction in her radio traffic:

Will have to cancel the weekly radio schedule due to recently discovered damage to the apparatus from frequent freezing and thawing. We have no method of keeping the radio constantly warm. Will call you at this time on the last Saturday of each month. Will listen every Saturday from 1900-2200 hours, and instead of the nightly sched., every Wednesday also from 1900 to 2200 hours. In the event of storms or ice movement, will listen out at the former times (0100 to 0300 hours) every night and will have the radio ready for immediate action.

Hence *Taymyr's* radio contacts were largely reduced to listening to *Eklips's* information bulletins, gleaned from snatches of transmissions she managed to pick up.

Finally, on 20 January, *Eklips* made two-way radio contact with Yugorskiy Shar. Sverdrup sent a short telegram to St. Petersburg with the details of the location and condition of all three ships. In return, he received a telegram from the Chief Hydrographic Directorate dated 31 August, 1914 reporting the return of G. Y. Sedov's expedition, and of the rescue of the members of Brusilov's expedition.

It was a great relief to all members of the Russian expedition, to have made radio contact with the south, in that it obviated the need to send a party overland to report on the expedition's whereabouts and condition. Sverdrup now relayed two of Vil'kitskiy's messages, first dispatched on 21 October 1914, one to the Naval Ministry, the other to the Chief Hydrographic Directorate. The former, containing the crucial information reads as follows:

Having reached Chelyuskin, we encountered impassable ice. Both ships frozen in to the north of Poluostrov Korolya Oskara. *Taymyr's* latitude approximately $76^{\circ} 40'$; longitude $100^{\circ} 20'$. *Vaygach* 15 miles farther west. Hope to maintain contact through Sverdrup. In March will transfer part of the officers and men to *Eklips*. Request you send reindeer to Sverdrup for me, in order to facilitate the transfer of the men, and in summer send 400 tons of coal to Sverdrup. Expect to save enough coal for 2-3 weeks steaming. Would like to leave the reindeer near the ships until fall. Everybody in extremely good health.

Congratulatory telegrams were soon received from both authorities. However, radio contact thereafter was far from continuous: for a whole week 23 to 30 January *Eklips* had no contact at all with the outside world.

On 11 February, the sun reappeared for the first time at *Taymyr*'s position, and a few days earlier at *Eklips*; the Russians welcomed it back with a suitably gay and crazy ceremony. Thereafter trips ashore became frequent, and aboard both Russian vessels, work was put in hand to repair some of the damage done by the ice in the fall. This even involved the ambitious project of replacing two of *Vaygach*'s broken propeller blades. By alternately cutting away part of the ice around her stern, and then allowing the ice to thicken again from beneath, the rudder and propeller were "frozen out", forming an ingenious ice dry-dock, allowing the engineers to work on the propeller. Each ship carried only one spare blade so one had to be sledged the 12 km. from *Taymyr*; each blade weighed half a ton, so this was no mean feat.

With lengthening of hours of sunlight, snowblindness became a serious problem among the Russians. A production line was set up to make sun goggles from canvas and fragments of lenses from red and green navigation lights. The improvement in light conditions also encouraged the *Taymyr* people to make a reconnaissance of Zaliv Gafnera, which Nansen had partially explored. A survey party set out for it on 1 June, accompanied by an aerosled made from the floatplane; pulling a second sledge, it reached speeds of 20 kph on firm, hard snow (40 kph according to Pinkhenson (1962 p. 620)).

Meanwhile, throughout the winter, the Russian captains and Otto Sverdrup had been wrestling with the possible eventuality that owing to the ice conditions and shortage of fuel, the icebreakers might have to face a second wintering. Vil'kitskiy proposed transporting coal to the icebreakers from the south. Sverdrup favoured transferring the icebreakers' crews to *Eklips* by sledge; the latter would then proceed to Dikson for coal then return to the icebreakers. The decision eventually reached was a compromise: since the reserves of food on board the icebreakers were sufficient to feed the entire crew for 8 months, or half for 16 months, it was decided to transfer only half the men to *Eklips* in the spring. If necessary, the remainder could spend a further winter in the ice without starving.

This plan was reported to St. Petersburg by Sverdrup. A reply from the Naval Ministry provided for the extreme situation:

If all efforts to reach open water in the current navigation season prove unavailing, abandon ships, and head overland to the mouth of the Yenisei with entire expedition personnel.

The Chief Hydrographic Directorate presented a less extreme plan, and it was the latter, with some modification which was adopted. First of all, Sverdrup was informed that the search for Rusanov and Brusilov had been called off and that *Eklips* was now assigned to helping *Taymyr* and *Vaygach* out of their potential predicament.

Sverdrup was not tardy in putting the first phase of the proposed plan into action: evacuation of half the icebreakers' crews to *Eklips*. First supply depots were laid between *Eklips* and *Taymyr*, and Sverdrup himself set off for *Taymyr* on 29 April, with 3 men and 3 dogteams. Meanwhile *Vaygach*'s complement of the evacuation party (13 men) hiked across to *Taymyr*. On 19 May, the evacuation party, 39 in all, set off to walk the 280 km. to *Eklips*, escorted by Sverdrup and his men.

They arrived at *Eklips* safely on 4 June. Next day the second phase of the operation meshed with the first phase. Nikifor Begichev, a man of vast northern experience, arrived at *Eklips* with 650 reindeer and the drivers, having trekked north across the tundra from the Turukhansk area. En route he had laid supply depots for the return trip. The caravan of sailors and reindeer set off on 15 July; they travelled south to the confluence of the Tareya with the Pyasina (350 km.), up the Pyasina by boat (150 km.), and from there to Gol'chikha (200 km.). Since the men were unladen, the reindeer carrying all the supplies, they made a good 20 km. per day and reached Gol'chikha by 19 August.

In the meantime the icebreakers and *Eklips* were facing the problems of breakup. Around all three ships, first ice movement had been on 21 July, with cracks opening and leads widening. All three crews re-assembled the engines, raised steam and tested everything.

Before she could break loose, *Taymyr* came dangerously close to being driven ashore by the moving ice. She slowly drifted shorewards over a period of several days, until there was less than half a metre of water beneath her keel. The piling up of the ice in great pressure ridges on the shoals saved her from being thrust aground.

Eklips managed to get under way first, and sailed for Dikson. On 8 August, an east-southeast wind dispersed the ice around *Taymyr*, and *Vaygach* too, and both icebreakers got under way. Their problems were not yet over, however: early on the morning of 11 August, *Taymyr* ran aground on a reef in the Arkhipelag Nordenshel'da. It was 24 hours later before she managed to get off at high tide, with *Vaygach's* assistance. Still in the Arkhipelag Nordenshel'da, the icebreakers were delayed by ice and fog until 20 August.

Meanwhile *Eklips* had reached Dikson. Sverdrup proposed loading with coal and coming to meet the icebreakers. Thereafter, he had another mission: the search for Rusanov had been renewed, and he was to investigate Ostrov Uyedineniya.

By 26 August, *Eklips* had loaded with coal, food, kerosene and mail, and was on her way east. The three vessels met off the Ostrova Skott-Gansena at 1500 hours three days later. Having transferred coal and mail, all three vessels got under way, *Eklips* for Ostrov Uyedineniya, and *Taymyr* and *Vaygach* for Dikson.

When the icebreakers reached their destination it was to find that Dr. Kushakov had amply fulfilled the third phase of the operation. Two houses, a bath house and a barn, all prefabricated in the South in Krasnoyarsk and shipped downstream, had been assembled on the previously uninhabited island. A 100-m. radio mast had been erected, and the Dikson radio station was to make its first official transmission on 5 September.

For several days the icebreakers' crews rested and read their mail. On 3 September, *Eklips* arrived, having searched Ostrov Uyedineniya in vain. Almost simultaneously, a party of Dolgans arrived from up-river with a note from the leader, Aleksandrov, reporting the safe arrival of the overland party at Gol'chikha, and of the fact that they were impatiently awaiting the mail steamer which was to transport them south to Krasnoyarsk.

This was no longer necessary: *Vaygach* steamed up-river and embarked the overland party. She was back at Dikson on 6 September, and the *Taymyr* mem-

bers of the overland party returned to their own ship. A complex precautionary rescue mission which had involved some 40 sailors in an overland hike of some 900 km. across the tundra was over, and life aboard the icebreakers settled back into its old routine.

Two days later the icebreakers left Dikson on the last leg of their traverse of the Northern Sea Route. They were preceded by *Eklips*, which was to undertake an ice reconnaissance. In fact this was unnecessary; no further ice was seen. Bad weather entailed a two-day stop at Yugorskiy Shar, and there were some further minor delays due to reports of mines in the entrance to the Beloe More, but by noon on 16 September 1915, *Eklips* was making fast alongside the city wharf at Arkhangelsk, with *Vaygach* and *Taymyr* right behind her. The city gave both the Russian crews and Sverdrup and his crew a hero's welcome.

Thus ended not only the through-passage of the Northern Sea Route by *Taymyr* and *Vaygach*, but also a complicated and well-mounted precautionary rescue operation, in which Otto Sverdrup played an eminent and worthy role.

Finally, it should be mentioned that Sverdrup was to head further Russian expeditions and was to come to the rescue of Russian sailors again, but in the service of the Soviet rather than the Tsarist regime. In 1920 he commanded the icebreaker *Svyatogor* (*Krasin*) when she rescued the passenger steamer *Solovey Budimirovich*, caught in the ice in the Karskoe More on a short coastal run from Arkhangelsk with 87 people aboard. One interesting development here was the transfer of several White Russians from *Solovey* to *Svyatogor*, temporarily under the Norwegian flag, despite Soviet protests.

Sverdrup's fourth and last voyage in Siberian waters was in 1921, when, from the bridge of the Soviet icebreaker *Lenin*, he commanded a convoy of five cargo ships on an experimental run through the Karskoe More to the mouths of the Ob' and Yenisei. The ships reached their destinations and returned safely, and this was considered an important step in the development of the Karskoe More sector of the Northern Sea Route (Fairley 1959 p. 272).

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