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HISTORY OF ARCTIC SHIPPING UP UNTIL 1945

Northwest Passage

The history of the search for a navigable Northwest Passage by ships of European nations is an extremely long one, starting as early as 1497. Initially the aim of the British and Dutch was to find a route to the Orient to grab their share of the lucrative trade with India, Southeast Asia and China, till then monopolized by Spain and Portugal which controlled the route via the Cape of Good Hope. In 1497 John Cabot (Giovanni Caboto), sponsored by King Henry VII of England, sailed from Bristol in *Mathew*; he made a landfall variously identified as on the coast of Newfoundland or of Cape Breton, but came no closer to finding the Passage (Williamson 1962). Over the following decade or so, he was followed (unsuccessfully) by the Portuguese seafarers Gaspar Corte Real and his brother Miguel, and also by John Cabot's brother Sebastian, who some theorize, penetrated Hudson Strait (Hoffman 1961).

The first expeditions in search of the Northwest Passage that are definitely known to have reached the Arctic were those of the English captain, Martin Frobisher in 1576, 1577 and 1578 (Collinson 1867; Stefansson 1938). In 1576 he reached Resolution Island

and entered Frobisher Bay, which he, however, believed to be a strait --- the entrance to the Northwest Passage. He became side-tracked when a rock he picked up on shore was declared to be gold-bearing. This led to his further expeditions to Frobisher Bay, with 3 ships in 1577 and 15 ships in 1578, but with gold-mining rather than the Northwest Passage as their goal.

Less than a decade later the English navigator John Davis made three attempts (in 1585, 1586 and 1587) to find the Passage (Markham, A.H. 1880). While in 1585 he explored part of the southwest coast of Greenland and crossed the strait named after him to explore the southern part of the east coast of Baffin Island (including Cumberland Sound) , during his following two expeditions he effectively repeated the same route twice. But on sailing south past the mouth of Frobisher Bay and Resolution Island he reported the mouth of another “great inlet” with spectacularly turbulent tide-races – the mouth of Hudson Strait – but did not explore it.

That honour went to an English expedition under Henry Hudson in 1610. Sailing through the strait he explored the eastern shore of Hudson Bay, then wintered in James Bay (Powys 19127). In the following summer his crew mutinied and Hudson, his son and seven others were set adrift in a boat, but the mutineers brought the ship safely back to England. Following Hudson’s lead, another English expedition, led by Thomas Button, sailed for Hudson Bay in 1612, hoping to find the Passage (Christy 1894). Button wintered at Port Nelson at the mouth of the Nelson River, and in the summer of 1613 explored the west coast of the Bay northwards to 65° in Roes Welcome Sound, before heading for home.

Two years later (in 1615) Robert Bylot (who had been one of the mutineers on Hudson's voyage), with William Baffin as pilot, again headed into Hudson Strait (Markham, C.R. 1881). They explored the north side of the strait and the east coast of Southampton Island as far as Frozen Strait, before turning back. In 1616 Bylot and Baffin tried another approach – via Davis Strait. Pushing north through the sea later named after Baffin, they discovered in turn the entrances to Smith Sound, Jones Sound and Lancaster Sound, but all were ice-choked; they therefore headed for home, convinced that there was no Northwest Passage by way of Davis Strait.

Despite the negative reports of Button, Bylot and Baffin, the focus now returned to Hudson Bay. In 1619-20 a Danish expedition under Jens Munk entered the Bay and wintered at the mouth of the Churchill River (Hansen 1970); all but Jens Munk and two companions died of scurvy, but they managed to sail the smaller of their vessels back to Denmark. A decade later (in 1631) two English expeditions headed for the Bay, those of Luke Foxe from London and Thomas James from Bristol (Christy 1894). Foxe sailed anti-clockwise around the Bay, then pushed well north through Frozen Channel, into Foxe Basin, along the west coast of Baffin Island. James also sailed anti-clockwise around the Bay (encountering Foxe near Cape Henrietta Maria), then deliberately wintered on Charlton Island. In 1632 he also penetrated some distance north through Frozen Channel.

Almost a century now elapsed before there were any further attempts at finding the Northwest Passage but then, strangely, in view of the earlier unsuccessful expeditions, the focus was again on Hudson Bay. In 1719 James Knight of the Hudson's Bay Company, sailed into Hudson Bay with two ships and then, with all his men,

disappeared (Williams 1962; Beattie and Geiger 1992). It was later found that they had wintered on Marble island off Rankin Island and had all died. Twenty years later, in 1741, driven by the persistence of Irish politician, Arthur Dobbs, the Royal Navy dispatched Captain Christopher Middleton to the Bay. After wintering at Churchill he coasted north up the west shore of the Bay and established that neither Wager Bay nor Repulse Bay led to the Northwest Passage (Barr and Williams 1994). Surprisingly, a further expedition sponsored by Dobbs sailed into the Bay in 1746; the two ships, commanded by William Moore and Francis Smith wintered near York Factory then coasted north along the west shore of the Bay (Barr and Williams 1995). They entered Chesterfield Inlet and confirmed that Wager Bay was not the entrance to the Passage.

After all these disappointments in Hudson Bay, there now came a long hiatus in the search for the Passage, and the focus thereafter moved elsewhere. In 1778 James Cook made the first serious attempt at locating the Northwest Passage from the west. Passing through Bering Strait with two ships, he was brought to a halt by impenetrable ice off Icy Cape Alaska and was forced to retreat (Beaglehole 1967). After Cook's death in Hawaii in February 1779, his second-in-command Charles Clerke, again pushed north into the Chukchi Sea in 1779 but was again repulsed by heavy pack ice.

After a further hiatus of some 40 years the search for the Northwest Passage by the Royal Navy was renewed, largely on the initiative of Sir John Barrow, Second Secretary at the Admiralty, who saw this, in part, as usefully employing the large number of men and half-pay officers who found themselves "on the beach" at the end of the Napoleonic Wars. Barrow was also driven, in part, by the fear that Russia might achieve the prize of the Northwest Passage. Nor was this fear unfounded. Two Russian

expeditions combined circumnavigations with a search for the Passage. Thus in 1816 O.E. Kotzebue passed Bering Strait in *Ryurik*, northward bound (Kotzebue 1821). He discovered and explored the sound now named after him, but ice prevented him from pushing further north. Then in 1820 and 1821 M.N. Vasil'yev and G.S. Shishmarev, in *Otkrytiye* and *Blagonamerenny* respectively, passed north through Bering Strait and in both years Vasil'yev penetrated a few tens of kilometers beyond Cook's farthest at Icy Cape (Ivashintsov 1980).

The last of these Russian attempts was an expedition by personnel of the Russian American Company, rather than by the Russian Navy. Commanded by the Aleut/Russian half-breed A.F. Kashevarov, it penetrated north through Bering Strait in 1838 (VanStone 1977). From Cape Lisburne Kashevarov continued in a large boat and five kayaks. Continuing with just the kayaks beyond Icy Cape, he reached Point Barrow and continued east to Dease Inlet. Outnumbered by increasingly hostile Inupiat, he turned back at this point.

At Barrow's instigation a long series of expeditions penetrated and explored substantial parts of the labyrinth of islands and channels that is now the Canadian arctic archipelago. In sequence they may be listed as follows: John Ross's expedition in *Isabella* and *Alexander* in 1818, that did little more than confirm what Baffin and Bylot had reported about Baffin Bay (Ross, J. 1819); William Edward Parry's expedition in *Hecla* and *Griper* in 1819-1820 that penetrated almost right through Parry Channel and wintered at Winter Harbour, Melville Island (Parry 1821); that of Parry, again, in *Fury* and *Hecla* (1821-23) that pushed north through Foxe Basin and wintered at Igloodik, but found Fury and Hecla Strait choked with ice (Parry 1824); that of Parry, yet again, in

Fury and *Hecla* in 1824-25, that sailed south from Lancaster Sound into Prince Regent Inlet, but was blocked by ice and lost one ship (*Fury*) (Parry 1826); that of John Ross again, this time in *Victory* in 1829-33, this being a private expedition (Ross, J 1835). It penetrated Prince Regent Inlet and the Gulf of Boothia to the east end of the Isthmus of Boothia, from where his nephew James Clark Ross sledged west to Point Victory at the northwest corner of King William Island, and also located the North Magnetic Pole near Cape Adelaide Regina on the west coast of Boothia Peninsula on 1 June 1831. The final expedition dispatched by the Royal Navy to try to find the Northwest Passage was that of Sir John Franklin in *Erebus* and *Terror* in 1845. Franklin's ships sailed north into Baffin Bay and disappeared (Cyriax 1939).

The Royal Navy then mounted a massive search for Franklin's ships and their crews (totaling 129 men) over the following decade. Between 1847 and 1859 (when Sir Leopold McClintock in *Fox*, on a private expedition mounted by Franklin's widow, Jane Franklin, discovered the only rather cryptic message left by members of Franklin's expedition that provided some indication as to their fate, as well as abandoned traces and skeletons on King William Island (McClintock 1859)), man-hauling sledge parties from a total of 17 shipboard expeditions scoured the Arctic (Berton 1988); these involved a total of 26 ships, many making several voyages. There were also 8 supply voyages in support of the search vessels and one relief expedition. A total of 6 ships were abandoned in the Arctic. As a result of this huge expenditure of effort, practically the entire archipelago, including the "southern tier" of the Queen Elizabeth Islands, was explored. And while Sir Robert McClure and his men were awarded the Admiralty's prize of £10,000 for "discovering" the Northwest Passage, they had "discovered" it partly

on foot. After abandoning HMS *Investigator* at Mercy Bay on northern Banks Island in the spring of 1853, M'Clure and his men hiked across the ice to Dealy Island, where they took refuge on Captain Henry Kellett's ships "*Resolute*" and *Pioneer* (Osborn 1856). Then, after these ships became beset in the ice off Cape Cockburn off the southwest corner of Bathurst Island, later that same season, and after they in turn were abandoned in the spring of 1854, along with their entire crews McClure and his men hiked east to the depot ship *North Star*, at Beechey Island. They "completed" the Northwest Passage on board that vessel and the relief/supply ships *Talbot* and *Phoenix* later in the summer of 1854.

Thereafter no further interest was shown in the Northwest Passage until 1875. In that year Sir Allen Young mounted a private expedition in his yacht, *Pandora* from the west (Young 1876;1879). His aim was twofold: to relocate the north Magnetic Pole and to attempt the Northwest Passage. Ice conditions were particularly bad in that season, however, and having struggled south through Peel Sound he was totally blocked by ice in Franklin Strait, and was forced to retreat.

The next attempt at the Northwest Passage, that of the Norwegian, Roald Amundsen, could scarcely have represented a more striking contrast to that of Franklin. While the latter had involved two ships of 340 and 370 tonnes and a total complement of 129 men, Amundsen set sail from Norway in the spring of 1903 in the former herring-boat *Gjøa*, of only 47 tonnes and with only six companions (Amundsen 1908). A proficient skier, as a youth Amundsen had made two extended ski trips across the wilderness of Hardangervidda between Christiania (Oslo) and Bergen. He had served his

“polar apprenticeship” as second mate on Adrien de Gerlache de Gomery’s Antarctic expedition in *Belgica* in 1897-99, which barely survived a wintering in the pack ice of the Bellingshausen Sea, the first Antarctic wintering of any expedition vessel (Cook 1900).

It had long been Amundsen’s ambition to attempt the Northwest Passage. Well aware that to attain a degree of legitimacy for his expedition, and in order to attract funding, he would have to include a scientific component, he opted to combine his attempt at the Passage with a study of terrestrial magnetism and specifically, with a study of the movement of the North Magnetic Pole since its discovery by James Clark Ross in 1831. With this in mind he engaged in a six-week crash-course in terrestrial magnetism observations and calculations at the Deutsche Seewarte .

Over the period April-September 1901 Amundsen made a practice cruise in *Gjøa*, hunting seals in the Barents Sea. Despite foul weather and difficult ice conditions *Gjøa* performed well. Amundsen then had her ice-sheathing renewed and a kerosene engine installed.

Having garnered the advice and support of Otto Sverdrup, Sir Clements Markham, Admiral Sir Leopold McClintock , Sir Allen Young, and Fridtjof Nansen, and a financial contribution of 10,000 kroner from King Oscar II of Sweden and Norway, Amundsen finally put to sea at midnight on 16 June 1903 in overcast, rainy weather. Second-in-command was Danish naval lieutenant Godfred Hansen. First engineer was Peder Ristvedt; second engineer Gustav Wiik; the cook was Adolf Lindstrom, and finally, Amundsen had recruited two expert sealers from North Norway, Anton Lund and Helmer Hanssen.

Gjøa called at Godhaven in West Greenland on 25 July; here Amundsen bought dogs, sledges and kayaks, Pushing north into Melville Bay, at Dalrymple Rock Amundsen took aboard a cache of provisions that he had arranged to be left there by Scottish whalers. Heading west into Lancaster Sound, on 22 August *Gjøa* reached Beechey Island, where Franklin had wintered in 1845-46; on shore the graves of three men from that expedition and of a fourth man from a searching expedition, must have given Amundsen and his men food for thought.. Pushing south via Peel Sound and Franklin Strait, Amundsen passed *Pandora*'s furthest south, then headed southeast through James Ross Strait. Despite fog and heavy seas *Gjøa* made good progress. But there were other problems – she ran aground off the Beaufort Islands in James Ross Strait but was soon refloated. Next day, 31 August, a fire broke out in the engine room but was brought under control before it could do much damage. Then off Matty Island *Gjøa* ran aground on a reef during a gale; great sections of the keel were floating to the surface as the crew pitched cases of dog food and provisions overboard to lighten the vessel. Finally, pounding over the reef, *Gjøa* slid into deep water and was able to resume her voyage.

On September 9 as he cruised along the southeast coast of King William Island, Amundsen spotted an attractive, land-locked harbour, sheltered by the surrounding hills and with a good supply of fresh water; he decided it would make a suitable wintering harbour and quickly dropped anchor, naming it Gjøahaven – now Gjoa Haven. By 3 October *Gjøa* was solidly frozen-in and by then a small village had sprung up on shore: the two buildings of a magnetic observatory, an astronomical observatory, a store hut, and a hut in which two of the men lived. The rest lived on board. Soon afterwards caribou

were spotted on shore, on their fall migration, and over the next few weeks hunting became a primary activity. Soon there were enough frozen carcasses piled on *Gjøa*'s deck to last men and dogs for the winter.

Towards the end of October five Inuit appeared on shore; these were Netsilingmiut. Amundsen and his men quickly established friendly relations with them and shortly afterwards a village of snow-houses sprang up near the ship, housing some 80 people. Amundsen fully realized his good fortune. He took every opportunity to learn all he could from the Inuit: how to build a snow-house and to arrange its interior; how to drive dogs most effectively; how to wear skin-clothing (sewn by the Inuit women) and how to perfect the icing of sledge runners. Meanwhile a regular schedule of magnetic and meteorological observations was being maintained, while Ristvedt forged iron arrow-heads and knife blades to trade with the Inuit for clothing, dogs etc.

On 6 April 1904 Amundsen and Ristvedt set off northwards with two dog teams, aiming to locate the North Magnetic Pole. They stopped at Cape Hardy on Matty Island for several days to make magnetic observations, then crossed James Ross Strait to Cape Christian Frederick, then followed the west coast of Boothia Peninsula northwards. Passing Cape Adelaide Regina, near which James Ross had located the Magnetic Pole in 1831, their readings revealed that it had now migrated northwards. They turned back near the Tasmania Islands on 7 May by which point their readings indicated that they had probably overshot the pole. Amundsen calculated that it lay at $70^{\circ} 30'N$; $95^{\circ} 30'W$, i.e. that it had migrated north about 25 nautical miles since Ross's determination in 1831. Amundsen and Ristvedt were back at *Gjøa* by 27 May.

During the summer of 1904 Hanssen and Hansen made a boat-trip westwards through Simpson Strait as far as Cape Crozier; they discovered skeletal remains of some of Franklin's men at Point Hall. As the small group settled down for a second comfortable winter they were again joined by the same group of Inuit as in the previous winter – to the mutual benefit of both parties.

In the spring of 1905, on 2 April Hansen and Ristvedt set off westwards to map the unexplored northeastern coast of Victoria island. Crossing Victoria Strait to the vicinity of Cape Adelaide, they headed north across Edward Albert Bay and Collinson Peninsula, to Collinson's furthest north, near Pelly Point. From there they explored the coast northwards to near Cape Nansen, at about 72 °N. By 25 June they were back at Gjøahaven.

Once the ice in Gjøahaven had broken up, on 13 August 1905 *Gjøa* got under way again, heading west through Simpson Strait. With its treacherous shoals, drifting ice and strong currents this strait posed a serious challenge. Running west across Queen Maud Gulf, on 17 August 1905 she dropped anchor in Cambridge Bay, the furthest east point reached by Collinson's *Enterprise*, and where she had wintered in 1852-3.

Pushing on westwards through Dease Strait, Coronation Gulf, Dolphin and Union Strait with the assistance of Collinson's charts, Amundsen emerged into the open waters of Amundsen Gulf. On the morning of 26 August another ship was sighted ahead: she was the American whaling schooner *Charles Hansson*, Captain James McKenna, out of San Francisco. Amundsen must have felt that the Northwest Passage was now within his grasp. But it was not to be. As *Gjøa* pushed westwards across the Beaufort Sea she

began to encounter progressively heavier ice, and was finally brought to a halt on 9 September at King Point, just east of Herschel Island.

Anxious that news of his successful transit of the Northwest Passage reach Norway as soon as possible on 24 October Amundsen set off south overland, heading for the nearest telegraph station at Eagle City, Alaska, on the Yukon River. He was accompanied by two Inuit and by Captain William Mogg, whose ship had been wrecked at King Point. They reached Eagle City on 5 December and Amundsen sent a telegram of 1000 words to Fridtjof Nansen, announcing his success.

Amundsen started back north for King Point on 3 February 1906, arriving there on 12 March, having ski'ed a total of over 1600 kilometres. He was met with the sad news that Gustav Wiik was seriously ill, probably suffering from pleurisy; he died a few days later and was buried on the cliff-top at King Point.

On 10 August *Gjøa* got under way again. She passed Point Barrow on 30 August and emerged through Bering Strait a few days later, thus completing the first transit of the Northwest Passage. *Gjøa* reached San Francisco on 19 October, and there Amundsen left her. She was allocated a permanent "berth" near the west end of Golden Gate Park, where she remained until 1972 when she was repatriated to Norway. She is now on display next to Nansen's *Fram* in Oslo.

Two years after Amundsen completed his transit of the Passage Captain Joseph-Elzéar Bernier was dispatched north by the Canadian government in DGS *Arctic* to proclaim and reinforce Canadian sovereignty over the Arctic Archipelago (Bernier 1910). In August 1908 he found himself off Cape Hay, Melville Island with McClure Strait to the west clear of ice as far as the eye could see. He was convinced that he could have

completed a transit of the Northwest Passage, but since this was not part of his mandate, he turned back east and wintered at Winter Harbour.

Subsequently, on two occasions, there were transfers of freight through the Northwest Passage by ships of the Hudson's Bay Company, although each of the ships involved completed only part of the Passage. Thus in 1930 the schooner *Fort McPherson*, coming from the west, made rendez-vous with the *Fort St. James* which had come from the east via Prince Regent Inlet and Bellot Strait, at Gjoa Haven. Furs and freight were exchanged and then the two vessels returned from whence they had come.

Then in 1937, a similar operation occurred. On 1 September the Hudson's Bay Company's steamer *Nascopie* (Captain Thomas Smellie) reached the eastern end of Bellot Strait via Lancaster Sound and Prince Regent Inlet with a view to establishing a new trading post at that location, to be named Fort Ross (Finnie, 1937). On 2 September the Company's schooner *Aklavik* commanded by E.J. (Scottie) Gall, arrived from Tuktoyaktuk and Cambridge Bay via Gjoa Haven and Bellot Strait. While the new post was being erected some furs were transhipped from *Aklavik* to *Nascopie*, and some supplies and trade goods from *Nascopie* to *Aklavik*. On 8 September *Nascopie* got under way on her return voyage to Montreal while *Aklavik* started back west.

The next complete transit of the Northwest Passage was initially a response to Germany's invasion of Denmark in 1939. At that time practically the sole source of cryolite, essential for making aluminum, was the mine at Ivigtut in West Greenland. Alcan, Canada's leading manufacturer of aluminum, requested that the Canadian government make efforts to ensure that Greenland (and with it the Ivigtut mine) was not seized by Germany, as being a colony of Denmark. It was decided that the RCMP arctic

patrol vessel, *St. Roch*, should be dispatched from her home port of Vancouver, through the Northwest Passage, to protect the Ivigtut mine. Even before she sailed, however, the United States military, no doubt amazed at this Canadian audacity, had assumed responsibility for the defence of Greenland; nonetheless the plan for a transit of the Passage were not cancelled, the operation now being seen in Ottawa as a demonstration of Canadian arctic sovereignty.

St. Roch was a wooden schooner with a length of 104' 3"; beam of 24' 9"; depth of hold 11'; and a draft of 12' 6". A diesel engine of 150 hp gave her a speed of eight knots. Under the command of Corporal Henry Larsen *St. Roch* sailed from Vancouver on 23 June 1940, but got only as far as Cambridge Bay before being forced by heavy ice to turn back (Clarke 1959; Larsen 1967; Delgado 2003). After wintering at Walker Bay on southwestern Victoria Island, she attempted the Passage again in 1941. After calling at Gjoa Haven the vessel was again blocked by ice and forced to winter, this time at Pasley Bay on the west coast of Boothia Peninsula.

St. Roch got under way again in early August 1942 and, despite difficult ice conditions and the notorious whirlpools and tide races of Bellot Strait, managed to reach Prince Regent Inlet. She reached Halifax on 1 October, 1942, only the second vessel to make the transit of the Northwest Passage, and the first to do so from west to east.

In 1944 Larsen was instructed to take his ship back to Vancouver by the Northwest Passage, but by a different, more northerly variant (Thompson 1974). With a new deck-house and a more powerful diesel engine (of 300 hp) *St. Roch* sailed from Halifax on 22 July 1944. From Baffin Bay Larsen headed west for the full length of Parry Channel, then ran south through Prince of Wales Strait. He reached Bering Strait

on 27 September and Vancouver on 16 October, having made the entire trip from Halifax in only 86 days. *St. Roch* was thus the first ship to make a one-season transit of the Passage, and the first to make a double transit (Larsen, 1967; Delgado, 2003).

The Northeast Passage

The most striking feature of the history of shipping along the Northeast Passage (or Northern Sea Route), or at least of parts thereof, as compared to that of the Northwest Passage, is that it spans over five centuries. As early as 1478 the armies of Tsar Ivan III conquered Novgorod; thereby the territory of Muscovy (the forerunner of Russia) expanded to the White and Barents seas, giving that country its first access to any sea coast. By the end of the century the standard route for Muscovite merchants and diplomats bound for Western Europe was coastwise from the Whit Sea. The protracted wars between Russia and Sweden denied Russians the possibility of using the Baltic as a transit route and by the mid-16th century the White Sea route was well established.

By mid-century Russian vessels were operating at least as far east as Yugorskiy Shar (the most southerly of the straits leading to the Kara Sea). In June 1556 when Stephen Burrough of the English Muscovy Company called at Kol'skiy Zaliv, he found 20 Russian vessels about to sail to the waters east of the Pechora River, to fish and to hunt walrus. On reaching Ostrov Vaygach Burrough heard from the local Nentsy and from the Russians, of the existence of the Ob' River further east (Belov 1956; Neatby 1973). And in 1594 when the Dutch seafarer Willem Barents sailed north along the west coast of Novaya Zemlya to Mys Zhelaniya, he noted the wreckage of ships and grave

crosses at many points, indicating that the Russians had been there before him (Belov 1956).

By about this date a commercial route had been established via the Barents and Kara seas to the booming fur-trade centre of Mangazeya on the Taz River. From Arkhangel'sk the route ran coastwise through Yugorskiy Shar into the Kara Sea and across to the west coast of Poluostrov Yamal. To avoid the difficult ice conditions usually prevailing even in summer around the northern tip of that peninsula, the shallow-drafted vessels ascended the Mutnaya (now Seyakha) River, were portaged across the low height-of-land, then descended the Zelenaya to Obskaya Guba; running south they then headed up Tazovskaya Guba to reach the Taz (Belov 1956). This route fell into disuse after prohibition of its use by Tsar Mikhail Fedorovich in 1616 and 1619, as a means of greater control of the fur trade; the overland route further south could be more easily controlled (and taxed).

This same period witnessed the phenomenal Russian overland surge eastward from the Urals to the Pacific. The Cossack leader Yermak crossed the Urals and conquered the Tatar kingdom of Kuchun in 1582 (Lantzeff and Pierce 1973). And in the summer of 1641 a detachment of Cossacks led by Ivan Yur'yev Moskvitin descended the Okhota River to the sea of Okhotsk, i.e. to the Pacific Ocean. The driving force behind this phenomenal eastward surge was the desire for furs, extracted as *yasak* or tribute from the indigenous peoples. The routes used were mainly river routes – by boat in summer and by sleigh in winter. However, at the same time attempts were being made to utilize parts of the Northern Sea Route, including the section around Poluostrov Taymyr.

On 14 September 1940 a survey party led by N.I. Linnik from the hydrographic survey vessel, *Nord*, landed on the northernmost of the Ostrova Faddeya, off the northeast coast of Polustrov Taymyr. Then (and on a further visit on the 26th they discovered a wide range of artifacts, some half-buried among the rocks and gravel, about 5-10 m from the shore. They included copper kettles and pans, silver coins, rings, crosses, an axe, scissors and a rusted arquebus (Kosoy 1944). In March 1941 while scouring the coast for driftwood for fuel, Linnik and two companions discovered the remains of a log hut on the shores of nearby Zaliv Simsa, some 100 km southeast of Mys Chelyuskina. Once the snow had cleared, on 30 May 1941 a party led by Linnik examined the site in detail and discovered a similar range of artifacts as on the Ostrova Faddeya, along with human bones (Dolgikh, 1948; Okladnikov 1951; Barr 1974; Kosoy 1944).

In 1945 both sites were excavated by an expedition led by A.P. Okladnikov. He recovered a remarkable collection of artifacts including parts of a boat, firearms, bows and arrows, substantial numbers of cloth fragments, leather garments and footwear and 3,482 Russian coins. Both sites revealed abundant remains of furs: over half were of arctic fox and most of the rest sable.

Okladnikov interpreted these artifacts as evidence that a ship-borne expedition coasting along the arctic coast had become stranded either by becoming beset in the ice or wrecked; the log hut was assumed to have been the expedition's winter quarters. It was clearly a Russian expedition, and on the basis of the date of the latest coin being 1619 Okladnikov (1951) argued that the expedition had occurred soon after that. Since, by that date Russians had not penetrated east of Taymyr he also argued that the

expedition had been eastward-bound and had already rounded Mys Chelyuskina. This meant that this nameless Russian expedition had passed this crucial point on the Northern Sea Route some 260 years before Nordenskiöld's expedition in *Vega*.

In 1971 and 1972 V.A. Troitskiy (1973) carried out further excavations at both sites. On the basis of his finds he refuted the idea that the expedition was eastward-bound. Most importantly he questioned why a trading expedition heading east would have been transporting such a large quantity of furs. He argued that the expedition occurred around 1640, by which time Russians were well established in the Lena basin. In his view the expedition had been westward-bound from the Lena to European Russia. Irrespective of the direction in which the expedition was heading, the archeological record thus indicates that in the early seventeenth century Russian seafarers were attempting to round Poluostrov Taymyr. While one expedition came to grief, others may have been more successful.

By the mid-17th century substantial use was already being made of the Lena-Kolyma section of the Northern Sea Route farther east. In 1633, the year in which Yakutsk was founded, a group of Cossacks led by Il'ya Perfirev descended the Lena to its delta (Belov 1956; Armstrong 1965). Here the party split into two groups: one sailed west to the mouth of the Olenek, the other east to the mouth of the Yana. By 1643 the entire coast from the mouth of the Olenek to the mouth of the Kolyma had been explored. By 1645 the first trading vessels were plying between Zhigansk on the middle Lena, and the Kolyma, and over the next few decades there was a regular movement of shipping along this central section of the Northern Sea Route. By the end of the 17th century, however, these coastwise voyages had ceased. This was due in part to a shift in emphasis of the fur

trade from the northern river basins to more southerly ones such as the Penzhina, Gizhiga and Okhota and to Kamchatka (Belov 1956). These areas were better served by the more southerly river routes and hence use of the northern coastwise route lapsed.

. Further east an extremely important voyage occurred in 1648, when seven vessels under the command of the Cossack Semen Dezhnev, started down the Kolyma from Nizhnekolymsk, bound for the Anadyr' basin which was rumoured to be rich in fur (Fisher 1981). When a storm blew up east of Chaunskaya Guba, four vessels were driven ashore and wrecked, and most of the survivors killed by the Chukchi. Around 1 September the three remaining vessels reached "Bol'shoy Kamenniy Nos", i.e. Mys Dezhnev the easternmost point of Eurasia. One of the three ships was wrecked on the cape. Coasting south in the Bering Sea the remaining two ships became separated in foul weather. Dezhnev's vessel finally made a landfall at Mys Olyutorskiy, south of Anadyrskiy Zaliv. Thus in 1648 Russian vessels were the first to pass through Bering Strait.

As early as the mid-17th century, therefore, a very considerable portion of the Northern Sea Route had already been explored by Russians seafarers; attempts had even been made to travel the central section of the route from the Lena to the Yenisey around Poluostrov Taymyr.

Although the importance of Dezhnev's achievement was recognized in Moscow at the time, later knowledge of it appears to have been lost, and it was only much later that it resurfaced on the basis of some of his reports languishing in the archives at Yakutsk or Irkutsk. This was the background against which Tsar Peter the Great mounted the First Kamchatka Expedition of 1725-1730, whose main objective was to determine

the geography of the Bering Strait area. Leader of this expedition was Vitus Bering, a Dane in the Russian Navy (Frost 2003). By July 1728, after three years of preparations and overland travel across the length of Siberia, Bering and his crew were ready to put to sea from Nizhnekamchatsk in the ship *Sv Gavriil*. Coasting north Bering discovered St. Lawrence Island and pushed further north past Mys Dezhnev. At 67° 18'N; 167°W, well north of Bering Strait and only some 130 km south of Point Hope Alaska, Bering decided to turn back. Neither on the outward or homeward passage did he sight the Alaskan coast, although he did sight and name the Diomede Islands. Thus the existence of Bering Strait still remained contestable; the two continents might conceivably be joined at a latitude further north than that reached by *Sv. Gavriil*, and Bering could not have known positively that he was in the Arctic Ocean.

The next chapter in the history of Russian arctic seafaring was an undertaking, mounted by the Russian Navy, unparalleled in the history of world exploration: the Great Northern Expedition of 1733-1743. Vitus Bering was again in overall command, but this was on a vastly greater scale than his first expedition. It consisted of seven separate detachments, totaling some 975 men, not counting scientific and support teams. Its objectives were to investigate the feasibility of the Northern Sea Route, to explore the American (Alaskan) coast and to reconnoiter a sea route from Kamchatka to Japan (Belov 1956).

Five of the detachments were mandated to explore separate sections of the Northern Sea Route: from the White Sea to the Ob'; from the Ob' to the Yenisey; from the Lena to the Yenisey; from the Lena to the Kolyma, and from the Kolyma to Bering Strait. The adventures and achievements of the naval parties under such leaders as

Stepan Malygin, Dmitry Leon'tevich Ovtsyn, Fedor Minin, Vasilii Pronchishchev, Khariton Prokop'yevich Laptev, Dmitriy Yakovlevich Laptev, Semen Chelyuskin and Petr Lasinius compare well with those of any of the better known explorers of the Northwest Passage. What clearly emerges from the reports of the Great Northern Expedition is that ice conditions in the Russian Arctic over the decade 1733-1743 were vastly worse in terms of navigation than at present and significantly worse than a century earlier. The various vessels were repeatedly blocked by ice and were forced to winter in the Arctic or to return to their starting points and to try again the following year. Thus it took one detachment three years to sail from the White Sea to the Ob'; and three years for another vessel to sail from the Ob' to the Yenisey. One detachment, despite eight years of effort, was unable to round (or even reach) Mys Chelyuskina by sea, while trying to sail from the Lena to the Yenisey. Here the crucial gap along the coast of Poluostrov Taymyr was filled by a party led by Semen Chelyuskin travelling in winter by dog sledge. Chelyuskin reached the cape now named after him, the northernmost point of Eurasia, on 9 May 1742. The detachment charged with sailing from the Lena to the Kolyma took 5 years to achieve this task, while two attempts at pushing east to Bering Strait were foiled by ice at Mys Bol'shoy Baranov.,

Almost all the parties endured extreme hardship and there were numerous deaths, mainly from scurvy. At least two detachment leaders, Lieutenants Vasilii Pronchishchev and Petr Lasinius, died of scurvy, as did Pronchishchev's wife, Mariya Pronchishcheva. During the winter of 1735-36 37 men of Lasinius' crew of 52 died of scurvy while wintering at the mouth of the Khara Ublakh, just east of Tiksi.

The Great Northern Expedition represented a remarkable accomplishment in terms of organization, perseverance and courage. It resulted in an outstanding compilation of knowledge. The entire arctic coast was surveyed and charted from Arkhangel'sk to Mys Bol'shoy Baranov, quite apart from the better-known achievements of the Pacific detachment, led by Bering himself and Chirikov, in charting the Aleutian Islands and parts of the mainland coast of Alaska.

In tangible terms the expedition resulted in 62 maps and charts of the arctic coast and Kamchatka, generally of a remarkably high standard, although it should be noted that these remained classified for a considerable time. It is interesting to contrast the general chart of the Russian Arctic resulting from the Great Northern Expedition, produced in 1746 and reproduced by Belov (1956, following p. 336) with what was known of the arctic coast of North America at that same date. By then William Baffin's voyage round Baffin Bay had been largely forgotten or discredited, and the only part of the arctic coast reliably known and charted was that of Hudson Bay and Strait; the most northerly point plotted with any precision was Repulse Bay, reached by Christopher Middleton in 1742; Everything north and west from there to Bering Strait was a gaping void.

The charts, soundings and sailing directions compiled during the expedition proved invaluable to later navigators. On the other hand the endless problems encountered by all the detachments due to ice, and their failure, despite repeated attempts at sailing around Poluoostrov Taymyr or along the arctic coast of Chukotka, led to the conclusion by the Russian Admiralty, that navigating the northern Sea Route was totally impracticable.

Not surprisingly there followed a period of inactivity in Russian exploration of the Arctic. But in the 1760's M.V. Lomonosov, a strong proponent of the concept of an "open polar sea," persuaded the Russian government to dispatch an expedition to sail north from Svalbard across the Pole (Belov 1956). Expedition commander was Vasiliy Yakovlevich Chichagov, In 1764 six vessels established an advanced base at Bellsund, Svalbard, and a year later three expedition ships sailed north, They were blocked by ice at 80° 26'N before being forced to retreat. Eight years later (in 1773) the British Admiralty mounted an almost identical attempt at sailing across the Pole from Svalbard (Phipps 1774; Savours 1984). Two ships, *Racehorse* and *Carcass* (Captain Constantine John Phipps and Captain Skeffington Lutwidge respectively) headed north from the Sjuøyane (north of Nodaustlandet), but reached only 80° 48'N before being blocked by ice, i.e. only marginally beating Chichagov.

The closing decades of the 18th century and early years of the 19th century brought no further attempts at exploring the Northern Sea Route *per se* but a number of important undertakings were mounted, by both the Russian Admiralty and by private individuals, aimed at exploring various offshore islands or at investigating rumours of offshore land masses (Belov 1956). Thus in 1763-64 Stepan Andreyev traveled north across the ice from the mouth of the Kolyma in search of a rumoured landmass, and discovered the Medvezh'i Ostrova; over the period 1769-71 Lieutenant I. Leont'yev produced a reliable survey of those islands; in 1768-69 Lieutenant Fedor Rozmyslov surveyed Matochkin Shar, the strait bisecting Novaya Zemlya; over the period 1770-1774 trader Ivan Lyakhov discovered and explored the islands now named after him in the Novosibirskiye Ostrova; in 1805-06 Yakov Sannikov discovered Ostrov Faddeyevskiy and Novaya Sibir' in the

Novosibirskiye Ostrova; and finally M.M. Gedenshtrom mounted a major expedition to survey all aspects of the Novosibirskiye Ostrova over the period 1808-12.

Serious attempts were also being made at closing the troubling gap in the map of the arctic coast of Chukotka. In 1762 the trader Nikita Shalaurov tried sailing east from the mouth of the Kolyma but was foiled by ice at Chaunskaya Guba. In 1765 he tried again in his ship, *Vera, Nadezhda, Lyubov'*, and disappeared (Belov 1956). The Chukchi later found his wintering site, littered with skeletons.

During his foray into the Chukchi Sea in *Resolute* and *Discovery* in 1778 Captain James Cook penetrated as far west from Bering Strait as Mys Shmidta (Beaglehole 1967); this encouraged Catherine the Great to mount an expedition to complete the exploration of Chukotka. Command of the expedition was given to Joseph Billings, who had been with Cook as Assistant Astronomer. His first attempt at sailing east from the Kolyma was blocked by ice at Mys Bol'shoy Baranov in 1787 (Sauer 1802; Sarychev 1806). Then in 1791-92 Billings traveled overland across Chukotka from Bukhta Lavrentiya to Nizhnekolymsk, while an independent party under Gilev, travelled along the coast with reindeer sledges, from Mys Dezhneva to Chaunskaya Guba, thus closing this gap in the map of the arctic littoral with some degree of accuracy.

The nineteenth century is remarkable for the almost total lack of Russian interest in attempting the Northern Sea Route. By contrast the century was marked by determined efforts at locating rumoured landmasses lying in the Arctic Ocean, or in exploring arctic islands. Thus in the early 1820's the Russian Admiralty mounted two expeditions which, traveling by dog sledge, between them surveyed most of the coast from the Lena to Bering Strait. Over the period 1820-23 Lieutenant P.F. Anzhu and

companions thoroughly surveyed the Novosibirskiye Ostrova and made at least three attempts at locating “Zemla Sannikova” a landmass alleged to lie north of that archipelago (Vrangel’ 1844). Lieutenant F.P. Vrangel’s mandate was to survey the coast from the Kolyma east to Kolyuchinskaya Guba and to try to locate a landmass alleged to lie north of Chukotka. In pursuit of these aims he honed the technique of exploration by dog sledge to a fine art. When he set off from Nizhnekolymsk in February 1823 his expedition consisted of 23 dog sledges, most of these being support sledges. That spring, in search of the alleged land to the north (Ostrov Vrangelya) he was stopped by open water only 25 km from that island, although poor visibility prevented him from seeing it. He did, however, continue his survey of the mainland coast as far as Kolyuchinskaya Guba, thus completing the map of the arctic littoral of Eurasia (Vrangel’ 1840).

Over the period 1819-39 a whole series of expeditions, mounted by the Russian Admiralty or the Academy of Sciences, sailed along various sections of the coasts of Novaya Zemlya. Their leaders included Lieutenant A.P. Lazarev, Lieutenant F.P. Litke, P.K. Pakhtusov, K.M. Baer and A.K. Tsvol’ka. All encountered difficult ice conditions and while Pakhtusov circumnavigated the south island in 1833, none managed to sail around the north island. These surveys were achieved at great cost in terms of death and hardship: thus Tsvol’ka and eight of his men died of scurvy during their wintering at Krestovaya Guba in the winter of 1838-39 (Belov 1956).

Soon thereafter a foreign expedition made an important contribution to the map of the Russian eastern Arctic. In 1849, while searching for the missing Franklin expedition in HMS *Herald*, Captain Henry Kellett discovered and landed on Ostrov Geralda and sighted Ostrov Vrangelya (Seemann 1853).

In June 1878, sponsored by King Oscar II of Sweden and Norway and by the Swedish merchant Oscar Dickson and the Siberian entrepreneur Aleksandr Sibiryakov, Baron Adolf Erik Nordenskiöld sailed from Karlskrona to attempt a voyage through the Northeast Passage to the Pacific in the auxiliary steamer *Vega* (Nordenskiöld 1881). She was joined at Tromsø by the steamer *Lena*, bound for the eponymous river, and at Yugorskiy Shar on 31 July by the steamer *Fraser* and the sailing vessel *Express*, bound for the Yenisey. The small convoy reached Ostrov Dikson at the mouth of the Yenisey on 6 August; from here *Fraser* and *Express* headed south, up the Yenisey, while *Vega* and *Lena* continued eastward. They rounded Mys Chelyuskina, the first ships definitely known to have done so, on 19 August. On the 28th the two ships parted company, *Lena* heading south up the Lena to Yakutsk, while *Vega* continued eastward through Proliv Lapteva. Beyond Mys Shelagskiy she began to encounter ice and on 28 September was brought to a halt and forced to winter near the Chukchi settlement of Pitlekay, at the eastern entrance to Kolyuchniskaya Guba, only some 200 km short of Bering Strait. Lieutenant Oscar Nordquist, a Swedish Finn in the Russian Army, had been seconded to the expedition as Russian interpreter; an excellent linguist he quickly acquired a working knowledge of the Chukchi language, and was a major contributor to the excellent relations established with the local Chukchi over the winter.

Vega got under way again on 18 July 1879 and passed through Bering Strait on the 20th. After visiting Port Clarence, Alaska, St. Lawrence Island and the Komandorskiye Ostrova, Nordenskiöld headed south to Yokohama, where he was given a very warm welcome by the Japanese. *Vega* then headed for home via Hong Kong, Canton, Singapore, Ceylon and the Suez Canal. She reached Stockholm to a rapturous welcome,

on 24 April 1880, the first known vessel to achieve a transit of the Northeast Passage, and the first vessel to circumnavigate Eurasia.

The voyages of *Fraser* and *Express* to the Yenisey (from which they returned to Western Europe with cargoes of grain loaded at Dudinka) were far from the only such voyages using the Kara Sea route to Western Siberia at this period. A pivotal figure in these developments was the rather unlikely person of Captain Joseph Wiggins, the Board of Trade's examiner for Navigation and Seamanship in the Port of Sunderland in the North of England (Johnson, 1907; Armstrong 1952; Stone 1994). Wiggins was convinced of the potential of a sea-route via the Kara Sea for transporting cargoes to and from Western Siberia. With the encouragement of German geographer, August Petermann and of Siberian merchant and mine-owner M.K. Sidorov, in 1874 Wiggins sailed from Dundee in the steamer *Diana*. Despite problems with ice, he reached the west coast of Poluoostrov Yamal and rounded Ostrov Belyy into Obskaya Guba but ice conditions then forced him to retreat. He tried again in the following year, this time in the diminutive sailing vessel, *Whim*, but encountered persistent gales and reached only Ostrov Kolguyev before being forced to turn back

In 1876 Wiggins tried again, in the screw steamer *Thames* (120 tons), financed by Siberian mine-owner Aleksandr Sibiryakov and Englishman Charles Gardiner. *Thames* was hauling a cargo of assorted British goods and the plan was for her to haul a return cargo of graphite from the mines at Kureyka on the Yenisey. Wiggins reached the Yenisey safely but missed the schooner that hauled the graphite cargo downriver from Kureyka. Wiggins therefore headed upriver in *Thames*, the first foreign vessel to enter

the river from the sea. *Thames* wintered at Kureyka, while Wiggins returned to England overland.

In 1877 Wiggins returned from England to Kureyka, and started down the Yenisey in *Thames* with a cargo of graphite. She ran aground on the lower river and had to be abandoned; Wiggins returned upriver to Yeniseysk and sold the hulk where she lay. Undaunted, in 1878 he chartered the steamer *Warkworth* (650 tons) and sailed in her, with a mixed cargo bound for Obskaya Guba. He successfully reached Nadymkaya at the southern end of Obskaya Guba; here he unloaded his cargo and loaded a return cargo of wheat that had been shipped down the Ob'. By 2 October *Warkworth* had returned to Liverpool with the first cargo to reach England via the Kara Sea, in the impressive time of two months and one day for the round trip.

After a hiatus of 9 years, in 1887 Wiggins took the steamer *Phoenix* to the Kara Sea with a cargo of salt and ascended the Yenisey to Yeniseysk. The steamer remained on the Yenisey. Then in 1889 Wiggins again reached the Yenisey in *Labrador*. And in 1893 he received a practical demonstration of support from the Russian government; he was asked to deliver a cargo of rails for the Trans-Siberian Railway (then under construction) to Krasnoyarsk. He chartered the steamer *Orestes* (2500 tons), which was accompanied by three river vessels that would haul the rails up the Yenisey and then remain on the river. The small fleet reached Gol'chikha safely and the rails were successfully transshipped; *Orestes* returned to England while the river vessels (with Wiggins on board) travelled upriver. In recognition of his achievement, on orders of the Tsar Wiggins received a solid silver punch-bowl, salver, ladle and 25 mugs.

Wiggins' efforts at developing the Kara Sea Route continued intermittently for a further 12 years. In 1905, when the Trans-Siberian Railway was choked with freight and men heading east to the Russo-Japanese War, and when there was a serious outbreak of famine in Central Siberia, Wiggins was asked by the Russian government to mount a major relief effort to alleviate the situation. He organized a fleet of seven steamers and tugs and 9 lighters, loaded with relief supplies. They delivered 12,000 tonnes of cargo to the Yenisey. But Wiggins did not accompany the convoy. Even after being taken seriously ill he had continue to plan the operation, fully intending to take part, but he died at his home in Harrogate, Yorkshire, on 13 September 1905, while the convoy was still at sea.

The voyages of *Fraser* and *Express*, that accompanied *Vega* as far as the Yenisey in 1878 were far from being Nordenskiöld's first attempts at developing the Kara Sea route to the Yenisey. In 1875 he had mounted a major scientific expedition, under the sponsorship of Göteborg entrepreneur Oscar Dickson (Nordenskiöld 1876). In the steamer *Pröven* he and a group of scientists reached Ostrov Dikson, which he recognized as providing a superb harbour. *Pröven* then returned to Sweden while Nordenskiöld and the other scientists ascended the Yenisey by motor-launch and river steamer to Yeniseysk.

In 1876, again sponsored by Dickson and also by Sibiryakov, Nordenskiöld returned to the Yenisey, this time on board the steamer *Ymer* with a cargo of assorted Swedish goods. *Ymer* ascended the river to Korepovskoye where her cargo was placed in depot on shore and *Ymer* returned safely to Sweden (Nordenskiöld *et al.* 1877).

As we have seen, in 1878, for the first leg of Nordenskiöld's attempt at the transit of the Northern Sea Route, *Vega* was accompanied by the steamer *Fraser* and the sailing vessel *Express*. Apart from hauling coal and provisions for *Vega*, they also carried salt and other goods bound for the Yenisey. From Dikson *Fraser* and *Express* headed upriver to Dudinka, exchanged their cargoes for cargoes of grain then returned to Norway via Matchkin Shar. They reached Hammerfest safely on 26 September 1878.

Another ship's captain who played a major role in developing the Kara sea route, and whose activities overlapped with those of Wiggins and Nordenskiöld was the German captain, Eduard Dallmann (Barr, Krause and Pawlik 2004). Until 1875 he had made a name for himself as a whaling captain, and had even made a trial whaling voyage to the Antarctic in 1873-74. But then in 1877 he was invited by Sibiryakov to take a cargo to the mouth of the Yenisey. Dallmann chartered the steamer *Fraser* (used later by Nordenskiöld) and sailed from Bremerhaven with a cargo of Russian tobacco, sugar and a steam-pump. Passing through Karskiye Vorota, he took advantage of a shore-lead to sneak past Ostrov Belyy, and to reach the mouth of the Yenisey. Unable to locate the lighters that were to have met him to exchange cargoes, he placed his cargo in store at Korepovskoye and started back downriver. He returned to Hammerfest by way of Matochkin Shar and was back in Göteborg by 26 September. In the following year (1878), at the request of Russian cotton-magnate Baron Ludwig von Knoop, Dallmann purchased the side-paddle steamer *Sachsen*; having renamed her *Moskva*, and with Louis Wieting Jr. as mate, he sailed from Hamburg on 6 July 1878, with the steamer *Louise* (Captain B.E. Burmeister) in company. The two steamers were towing three steel lighters. But *Louise* ran aground off the Norwegian coast and was badly damaged.

Transferring *Louise*'s salvaged cargo to the steamer *Tsaritsa* Dallmann continued his voyage to the Kara Sea. He reached the Yenisey safely but *Tsaritsa* ran aground on one of the innumerable sandbars on the lower river; her cargo was transferred to *Moskva* which continued upriver with one lighter. On 16 September *Moskva* reached Yeniseysk, the first vessel to reach that city from the Atlantic. Dallmann found a suitable wintering site for the paddle-steamer near Strelka, about 75 km above Yeniseysk. Leaving Wieting in charge of the steamer, and of the small settlement that was built on shore, Dallmann continued south on the start of his long overland trip via Moscow and St. Petersburg to Bremen.

In 1879 Dallmann put to sea from Bremerhaven in *Louise* (now fully repaired), bound for the Yenisey again. Along with several other steamers trying to reach the Kara Sea, Dallmann found the various straits blocked by ice, but he persisted and ultimately entered the Kara Sea via Yugorskiy Shar. Reaching the Yenisey, he steamed upriver to Karaulnoye where he made rendez-vous with Wieting who was waiting in *Moskva* with a full cargo of grain. Once they had exchanged cargoes *Louise* started for home, and despite severe problems with ice, and at the cost of losing a propeller blade and parts of two others, she emerged from Yugorskiy Shar and returned safely to Bremerhaven. *Moskva* meanwhile steamed upriver and Wieting again put her into winter quarters at Strelka.

In 1880 Dallmann headed for the Yenisey yet again, this time in the new paddle-steamer *Dallmann*, accompanied by *Louise*, again commanded by Burmeister. This time Dallmann decided to reach the Kara Sea by rounding Novaya Zemlya on the north. But beyond Mys Zhelaniya the two ships ran into heavy ice and for a while were beset and

drifting. While they fought free of the ice *Louise* had lost parts of three propeller blades and had lost several rivets, and Burmeister refused to continue across the Kara Sea. Since *Louise* was carrying the freight for the Yenisey, and since *Dallmann* was extremely vulnerable in ice, Dallmann was forced to abandon the voyage.

In 1881 Dallmann tried again with the paddle-steamer *Dallmann*, and again accompanied by *Louise*, Captain Burmeister. The two vessels reached Baron Knoop's establishment at Karaulnoye safely to find Wieting waiting with three barges loaded with grain. Having exchanged cargoes *Louise* started back to Germany while *Dallmann* headed upriver towing the three barges. Once the cargoes had been discharged at Yeniseysk Wieting and Dallmann put *Dallmann* into the usual winter quarters at Strelka and settled down for yet another winter.

In the following year (1882) Burmeister put to sea from Bremerhaven and in Hammerfest made rendez-vous with *Varna*, on board which was the Dutch expedition of the First International Polar Year, bound for Dikson, where it was planned that it would winter. The two ships, along with the Danish steamer *Dijmphna* carrying Lieutenant A. Hovgaard's expedition, bound for Mys Chelyuskina, encountered heavy ice in Karskiye Vorota, but managed to reach the Kara Sea where they were all beset. *Louise* managed to fight her way free but Burmeister decided to abandon his voyage and to head back to Germany. Meanwhile Dallmann and Wieting were waiting at Karaulnoye with *Dallmann* and a string of lighters loaded with grain, and having waited until 18 September, started back south.

In January 1883 a serious fire destroyed some of the buildings at Strelka, and in the light of this and of Burmeister's failure to reach the Yenisey in *Louise*, Baron Knoop

decided to cut his losses. 1883 would be the last year in which he would try to send a ship to the Yenisey. With Dallmann in command *Louise* sailed from Bremerhaven on 27 June 1883. She ran through Yugorskiy Shar safely but soon ran into heavy ice. Becoming beset she drifted back through the strait with the ice; when she was able to get under way again, the propeller came into contact with a tough ice tongue and the propeller shaft sheared. Captain Hans Johannesen of the steamer *A.E. Nordensiöld* was persuaded to tow her back to Hammerfest. Affairs at Strelka were wound up, the paddle-steamers *Dallmann* and *Moskva*, barges and lighters were sold and Wieting and his men traveled home overland, having spent five years on the Yenisey. Over the previous seven seasons Dallmann's attempts at reaching the Yenisey and exchanging cargoes with lighters towed down the river had been successful only four times, either due to ice conditions or failure to coordinate the sea and river components of the operation.

The last attempt by foreign interests to develop the Kara Sea route prior to the Russian Revolution came from the initiative of an enterprising Norwegian, Jonas Lied (Lied 1960). His interest in the Kara Sea route was sparked by his reading of Johnson's biography of Joseph Wiggins, early in 1910. That summer he travelled to Krasnoyarsk and descended the Yenisey to Gol'chikha with a view to assessing the commercial potential of the river's hinterland. Impressed by what he saw, in 1912 he and a number of business associates formed the Siberian Steamship, Manufacturing and Trading Company in Christiania (Oslo). They chartered the steamer *Tulla*, which sailed from Tromsø, but on encountering ice her captain decided not to enter the Kara Sea; meanwhile Lied had descended the Yenisey with a paddle-steamer and two barges loaded with a cargo of hemp, timber and graphite — only to wait in vain for *Tulla* to arrive.

Despite this disappointment, the Siberian Company tried again in 1913. Lied chartered the steamer *Correct* and obtained a contract to transport 1000 tonnes of cement for the Altay Railway. Fridtjof Nansen also traveled on board *Correct* as a guest. *Correct* reached the Yenisey without incident and at Nosonovskiyy at the south end of Yeniseyskiy Zaliv met the river craft that had brought exchange cargoes downriver. Here, too, Nansen transferred to the motor vessel *Omul* for the trip upriver.

Lied and the Siberian Company enjoyed two further successful seasons (1914 and 1915). In 1914 the ships involved were *Ragna* and *Skule* and in 1915, *Haugastoel* and *Eden*, the former going to the Ob' and the latter to the Yenisey. The outgoing cargo in 1914 consisted of timber, butter, graphite, flax, hemp, hides and bristles, and in 1915 30,000 casks of butter which despite the lack of refrigeration, reached England in good condition.

In 1916 Lied took the major step of buying an entire river fleet (10 powered vessels and 30 barges) on the Yenisey, and a half share of a river fleet on the Ob' (49 powered vessels and 140 barges). That summer he dispatched the steamer *Edam* to the Yenisey; a major part of its cargo was a complete sawmill for a site on the upper river where Lied had bought a large area of standing timber. *Edam* reached the Yenisey safely and started back west with a cargo of flax but was torpedoed off Bergen.

In 1917 the steamer *Obi* sailed from the United States for the Yenisey, but strikes and the confused political situation in Russia scuppered Lied's plans. *Obi* was diverted to Arkhangel'sk where she unloaded; with a return cargo of potatoes she started back west but was torpedoed off the Murman coast. All of Lied's assets were seized by the Bol'sheviki, and this ended all private initiatives at developing the Kara Sea route.

During this period of attempts at developing the Kara Sea route, two expeditions achieved transits of a substantial part of the Northern Sea Route. The first of these was Fridtjof Nansen's expedition on board *Fram* (Nansen 1897). With the intention of proving his hypothesis of the existence of the Transarctic Drift, i.e. a permanent drift of the pack ice from the vicinity of the Novosibirskiye Ostrova across the Pole, he had a specially designed ship, *Fram*, built by Colin Archer. With Otto Sverdrup in command, *Fram* sailed from Christiania on 24 June 1893 and reached Khabarovo on Yugorskiy Shar on 29 July. Continuing eastwards, Nansen discovered Ostrov Sverdrupa and on 10 September rounded Mys Chelyuskina. Following the coast of Poluostrov Taymyr southwards into the Laptev Sea, Nansen next headed for the Novosibirskiye Ostrova. Deliberately heading north into the pack ice he allowed *Fram* to become beset at about 78° 50'N, just northwest of Ostrov Kotel'nyy. Subsequently *Fram* drifted north and northwest with the Transarctic Drift, reaching her most northerly point at 85° 55' 06"N; 66° 31'E, i.e. still well south of the Pole, on 15 November 1895. She emerged from the ice northwest of Spitsbergen and reached Tromsø on 28 August 1896.

The other partial transit of the Northern Sea Route was that of Baron Eduard Toll's expedition on board *Zarya* in 1900-03, whose aim was to check the reports of "Zemlya Sannikova" a landmass alleged to lie north of the Novosibirskiye Ostrova (Barr 1981; Toll 1909). Sponsored by the Russian Academy of Sciences, *Zarya* sailed from St. Petersburg on 8 June 1900; rounding Scandinavia she entered the Kara Sea via Yugorskiy Shar and reached Dikson on 30 July. Continuing east *Zarya* became entangled in the labyrinth of islands off the west coast of Poluostrov Taymyr and was trapped by ice for

about three weeks in Zaliv Middendorfa. She was finally forced to winter in Bukhta Kolin Archera. She got under way again on 11 August 1901 and rounded Mys Chelyuskina on the 19th, only the fourth ship to do so (after *Vega*, *Lena* and *Fram*). Heading east across the Laptev Sea, Toll sighted Ostrov Bennetta and spent some time searching for “Zemlya Sannikova.” On 2 September Toll aborted this search and ran south to Ostrov Kotel’nyy and found winter quarters in Bukhta Nerpalakh, a very sheltered anchorage on the west coast of Ostrov Kotel’nyy.

In June 1902 Toll and three companions set off by sledge and kayak , heading for Ostrov Bennetta, planning to search further for “Zemlya Sannikova”; *Zarya* was to pick them up later in the season. Under Captain F. Matisen *Zarya* put to sea again on 12 August, but was unable to reach Ostrov Bennetta due to ice. His coal almost exhausted, Matisen ran back south and abandoned his ship in Bukhta Tiksi, just east of the Lena delta. A search expedition led by Leytenant A.V. Kolchak reached Ostrov Bennetta on 4 August 1903 and found a note from Toll to say that he was leaving the island, southward bound, on 26 October 1902. The fate of Toll and his three companions is unknown.

A side effect of the Russian defeat in the Russo-Japanese War, and especially that of the Russian Navy at the Battle of Tsushima was a determined effort by the Navy to survey the whole length of the Northern Sea Route. It was argued that if the Baltic squadron could have been sent to the Far East by way of the Arctic it might have reached Vladivostok without being intercepted by the Japanese. The outcome was the Arctic Ocean Hydrographic Expedition, mounted in 1910-1915 (Starokadomskiy 1976). Two small icebreaking steamers, *Taymyr* and *Vaygach*, were built at St. Petersburg expressly for the expedition. Overall command of the expedition from 1910 until early in 1913 lay

with .S. Sergeyev. Thereafter for the remaining life of the expedition B.A. Vil'kitskiy was in overall command. Captains of *Taymyr* were B.V. Davydov (1910-1912) and B.A. Vil'kitskiy (1913-1915); and of *Vaygach* A.V. Kolchak (1910), K.V. Loman 1911-1912) and P.A. Novopasheny (1913-1915).

After proceeding to the Far East via the Suez Canal and Singapore, in the fall of 1910 the two steamers made a brief reconnaissance foray into the Chukchi Sea. Thereafter they surveyed progressively farther west from Bering Strait each season, returning to Vladivostok each winter. Thus in 1911 they surveyed the coast as far west as the Kolyma, along with Ostrov Vrangelya; in 1912 they continued their surveys to the east coast of Poluostrov Taymyr; and in 1913 they reached Mys Cheluskina and discovered Severnaya Zemlya, although they were able to survey only its east and south coasts and were unable to determine whether it was a single landmass or an archipelago. In 1914 their orders were to attempt the through-passage to Arkhangel'sk, but they became beset in the ice off the west coast of Poluostrov Taymyr and were forced to winter. They got under way again in 1915 and reached Arkhangel'sk safely on 3 September. They were thus only the third and fourth vessels to complete the transit of the Northern Sea Route.

One further expedition completed a transit of the Northern Sea Route prior to the establishment of Soviet authority throughout Russia and Siberia. This was the Norwegian expedition of Roald Amundsen in *Maud* (Amundsen 1921). Amundsen's aim was to replicate Nansen's drift in *Fram*, but by starting his drift further east he hoped that the Transarctic Drift would carry his ship right over the Pole.

Maud sailed from Christiania (Oslo) on 24 June 1918. Delayed at Yugorskiy Shar for some time by ice, she reached Dikson on 31 August. She rounded Mys Chelyuskina on 8 September but was blocked by ice immediately thereafter and was forced to winter only a few kilometers east of that cape. For Amundsen personally it was a tough winter: first he broke an arm, then he was attacked by a bear, and finally, in December 1918 he suffered CO poisoning from fumes from a kerosene lamp in a poorly ventilated magnetic observatory.

Maud got under way again on 12 September 1919. By 27 September she was passing abeam of the mouth of the Kolyma but, encountering heavy ice was forced to start a second wintering near Ostrov Ayon in Chaunskaya Guba. Apart from the meteorological and other observations made on board ship, chief scientist Harald Sverdrup spent four months with Chukchi reindeer herders in the interior and gathered a rich collection of ethnographic material.

Maud continued her voyage on 14 July 1920, but before starting the polar ice-drift Amundsen was forced to head through Bering Strait to Nome, for repairs to his ship, arriving there on 27 July 1920. *Maud* was thus the fourth ship to complete a transit of the Northern Sea Route. Thereby, too, Amundsen had achieved the distinction of being the first person to circumnavigate the Arctic Ocean, since he had now linked up with the track of his voyage in *Gjøa*.

Amundsen put to sea again on 6 August, bound back north through Bering Strait, still with the intention of starting his ice-drift. But *Maud* became beset near Mys Serdtse-Kamen' and was forced to winter near shore for a third time. It was not until 1 July 1921 that she broke free of the ice again. But her propeller had been damaged and she needed

other repairs. Amundsen therefore took her south to Seattle where she arrived on 31 August. At this point Amundsen left the ship, turning her over to Oscar Wisting as captain, and Harald Svedrup as chief scientist and expedition leader.

Taking *Maud* back north through Bering Strait in the summer of 1922, Svedrup finally managed to fulfil the original plan by inserting his ship in the pack ice near Ostrov Gerd on 8 August 1922 (Svedrup 1926). For two years she drifted with the ice west and northwest, but not as far north as Amundsen had hoped; indeed she generally replicated the drift of De Long's *Jeannette*, and emerged from the ice north of the Novosibirskiye Ostrova. Heading back east through Proliv Lapteva *Maud* was forced to winter in the ice yet again, near the Medvezh'i Ostrova. Getting under way again on 1 July 1925 she emerged from Bering Strait for a third time on 22 August 1925.

The chaos, and especially the breakdown of the railway system that resulted from the First World War, the Civil War and the Allied Intervention in Northern Russia, led to an attempt by the White Russian authorities to use the Kara Sea route in 1919 (Belov 1959). By that summer the north of European Russia was experiencing famine conditions, yet in West Siberia, also under White Russian control, there was a grain surplus. It was therefore decided to ship grain down the Ob' by river-craft, to rendezvous with sea-going vessels that would then haul the grain to Arkhangel'sk. A motley collection of freighters and icebreakers was assembled for his task. The operation met with only limited success; with the defeat of the White Russian forces by the Red Army in West Siberia, the transshipment operations at the mouth of the Ob' had to be abandoned when only half finished.

During the following summer (1920), with the railway system in an even worse state, and the food situation in northern European Russia also worse, the Bol'sheviks, now in complete control in both European Russia and West Siberia, organized another grain-hauling expedition from Arkhangel'sk to the Kara Sea and back. This time the operation was much more successful (Belov 1959). Leader of the expedition was Captain M.V. Nikolayev. The icebreaking steamers *Sedov*, *Rusanov*, *Malygin* and *Sibiryakov* escorted freighters *Kolguyev*, *Sever*, *Keret'*, *Maymaks*, *Nikolay*, *Proletariy* and *Il'ya* towing the lighters *Klara*, *Revo*, *Khatanga* and *Anna*. *Malygin* and *Maymaks* proceeded to Ust'-Port on the lower Yenisey and the remaining vessels to Nakhodka on Obskaya Guba. Both groups made rendez-vous with river craft laden with grain and returned to Arkhangel'sk successfully.

In 1921 a serious effort was made to place the Kara Sea operation on sounder footing. While the movement of grain from the Ob' and Yenisey remained a priority, emphasis was also placed on importing manufactured goods such as agricultural machinery from Western Europe and on exporting products such as graphite, hides and wool. The operation in 1921 involved 11 freighters, escorted by four icebreakers (Belov 1959).

Throughout the 1920's the Kara Sea operation increased steadily in scale. As the Soviet railway system was restored the coastwise movement of grain to Arkhangel'sk was phased out and greater stress was placed on importing machinery and exporting grain, timber and other raw materials to Western Europe. In 1929 26 freighters were involved; exports amounted to 60,000 tonnes and imports to 13,500 tonnes (Armstrong 1952).

From the earliest years of the Soviet regime, development of the Northern Sea Route as a commercial route had been given high priority by the government. But with other priorities claiming attention it was not until 1932 that an attempt was made at the first one-season transit of the route – an essential prerequisite for any commercial development. The ship selected was *Aleksandr Sibiryakov*, originally *Bellaventure*, built on the Clyde in 1909 for A.J. Harvey & Co. of St. John's, Newfoundland (Barr 1978). Since the primary function for which she was originally intended was participation in the annual Newfoundland seal-hunt among the ice, she was ice-strengthened, i.e. she was best described as an icebreaking steamer, rather than a true icebreaker. Sold to the Tsarist government during World War I to help maintain winter navigation to the all-important port of Arkhangel'sk, she had been "inherited" by the Soviet government.

Leader of the 1932 expedition was O.Yu. Shmidt, Director of the Arctic Institute; ship's captain was V.I. Voronin; and V.Yu. Vize was the scientist in charge of an extensive scientific programme. Having sailed from Arkhangel'sk, *Sibiryakov* emerged from Matochkin Shar into the Kara Sea on 1 August. Having called at Dikson *Sibiryakov* next stopped at Ostrov Domashniy off the west coast of Severnaya Zemlya where a four-man team led by G.A. Ushakov and traveling by dogteam, had just completed a detailed survey of that archipelago (Barr 1975). Here Shmidt picked up a copy of the map of that archipelago that the expedition's surveyor, N.N. Urvantsev, had just completed. Having thus determined the extent of the archipelago, Shmidt and Voronin decided to try to round Severnaya Zemlya on the north. In this they were successful, but *Sibirakov* ran into heavy ice as she headed south in the Laptev Sea, and damaged her propeller.

Entering open water again, she called at Tiksi for coal, then continued east. In the Chukchi Sea she again ran into heavy ice. As she worked her way through it her propeller came in contact with a tongue of tough multi-year ice and she lost all four propeller blades.

The blades were bolted onto the hub of the propeller, and for just such an emergency *Sibiryakov* carried a spare set of blades. With all on board, including scientists, working night and day, the contents of the forward hold were stacked on the fo'c's'lehead and the contents of the after hold (mainly coal) were transferred to the forward hold. The ship was thus trimmed down by the head so that the propeller was largely out of the water. A stage was rigged on some convenient floes under the ship's counter and the propeller blades were replaced.

Continuing on her way eastward, *Sibiryakov* was practically within sight of Mys Dezhnev when, as she worked through ice, the propeller shaft sheared and the propeller went to the bottom. Initially the ice-drift carried the ship south towards the open water just beyond Bering Strait. But then, off Mys Dezhnev, the drift direction reversed and the ice, and the ship with it, began drifting back north into the Chukchi Sea. But when the wind changed to northerly Voronin ordered sails improvised from tarpaulins and lifeboat sails to be hoisted, and he sailed this 3000 tonne steamer out of the ice. Having been towed south to Yokohama by a trawler summoned by radio, *Sibiryakov* was repaired there and returned to Leningrad via the Suez Canal.

An extremely important development in December of 1932 was the formation of Glavnoye Upravleniye Severnogo Morskogo Puti, otherwise Glavsevmorput' or GUSMP [Chief Administration of the Northern Sea Route], with O.Yu. Shmidt as its director

(Armstrong 1952). Its primary mandate was to develop and administer the Northern Sea Route. Since *Sibiryakov's* through-passage had been less than an unqualified success, one of the first operations undertaken by Glavsevmorput' was to make a further attempt at a one-season transit of the route. The vessel chosen was *Chelyuskin*, under construction at the yards of Burmeister and Wein in Copenhagen. A vessel with a displacement of 7500 tonnes, she had engines of 2400 hp and could attain a speed of 11-12 knots. But she was not an icebreaker! The government committee who inspected the ship on her delivery in Leningrad reported that she was totally unfit for work in arctic ice (Belov 1969). V.I. Voronin was persuaded, reluctantly, to take command of the new vessel despite his objections that her frames were "too far apart and not heavy enough for an icebreaking vessel"(Belov 1969:111).

With a crew of 52 *Chelyuskin* put to sea from Leningrad on 16 July 1933. Also on board were 29 scientists and about the same number of construction workers and a wintering party (including wives and children) bound for Ostrov Vrangelya – for a total complement of 112. She started to suffer hull damage as soon as she encountered the first ice in the Kara Sea. Much further east, off Mys Severnyy (now Mys Shmidta) she ran into close, heavy ice and by 20 September, off Kolyuchinskaya Guba, she was beset and drifting in the ice (Shmidt *et al.* 1935). Initially, as in *Sibiryakov's* case, the ice drift carried her southeast towards Bering Strait but in the narrowest part of the strait, off Mys Dezhnev, the ice drift direction reversed, carrying her back north into the Kara Sea. On 13 February 1934 the ship was crushed and sank very quickly, but not before a large depot of provisions, fuel, tents, clothing and scientific equipment had been offloaded onto the ice. A tent-village quickly sprang up. A radio message as to the expedition's plight

reached Moscow next day, and a major rescue operation was mounted. A total of 18 planes was assigned to attempting an airlift operation. Almost all traveled by rail from European Russia to Vladivostok or Khabarovo, and flew north from there, but some suffered damage in landing on emergency strips and not all reached Chukotka.

Meanwhile the members of the camp on the ice were preparing an ice airstrip. The first plane landed there safely on 5 March and evacuated 10 women and two young girls.

After a spell of bad weather the rescue operation was resumed on 7 April and by the 13th all the occupants of the drifting camp had been successfully airlifted to Chukotka. The seven pilots who evacuated the camp were made Heroes of the Soviet Union, the first time that this honour was bestowed.

Following this, the second less-than-successful attempt at a transit of the Northern Sea Route in one season, in 1934 Glavsevmorput' mounted yet a third attempt (Vize 1946; Nikolayeva and Sarankin 1963)) The ship chosen was the icebreaker *Fedor Litke*, originally the Canadian icebreaker *Earl Grey*, built in 1909 by Vickers of Barrow-in-Furness in 1909; her original primary function had been to maintain the winter mail service between Prince Edward Island and the Canadian mainland through the ice of Northumberland Strait. Like *Sibiryakov* she had been purchased by the Tsarist government during World War I. In 1934 she was based at Vladivostok, and hence she would attempt the through-passage from east to west.

Leader of the expedition was Captain D.S. Dublitskiy; N.M. Nikolayev was again in command of the ship and V.Yu. Vize in charge of the scientific programme.

Litke had received serious damage to her hull, especially to her bows, during her attempts at rescuing *Chelyuskin* in the latter months of 1933 and while she had undergone

repairs in Yokohama, these had been rather slipshod. Nonetheless *Litke* put to sea from Vladivostok on 28 June 1934; she passed Mys Dezhnev on 13 July but ran into heavy ice off Mys Shmidta and for a while was beset and drifting. Getting under way again, by 30 July she was off the mouth of the Kolyma and on 2 August was running through Proliv Lapteva. On 4 August she reached Tiksi where she coaled from barges towed by the veteran, *Lena*, that had accompanied Nordenskiöld's *Vega* over 50 years earlier.

Litke's next objective was to free three ships of the First Lena Expedition that had reached the mouth of the Lena from the west the previous year but had been forced to winter off the Ostrova Komsomol'skoy Pravdy. Their masts and funnels were spotted from *Litke* on 12 August but she was still separated from them by 10 km of unbroken fast ice. For five days *Litke* rammed the ice, making only very slow progress and with the leaks in her forepeak getting steadily worse. She reached the trapped ships on 17 August and freed them, but not without cost; she was making 50 tonnes of water per hour. Emergency repairs included filling the forepeak with cement.

Having freed the three freighters *Litke* headed northwest for Prolov Vil'kitskogo, which she found still choked with heavy ice, but she was assisted through this barrier by the icebreaker *Yermak* that had come from the west. *Litke* reached Dikson on 2 September, Murmansk on 20 September and Leningrad on 7 October 1934, to be greeted by a thunderous welcome. She had achieved the first through-passage of the Northern Sea Route in one season and without incurring serious damage during the through-passage *per se*. While her hull was in a seriously weakened condition on her arrival at Murmansk, this damage had been incurred while rescuing the three wintering ships rather than during the through-passage.

During the period of these successive attempts at the through-passage (1932-1934) two major expeditions had been mounted to escort convoys of freighters to the mouth of the Kolyma from the east and to the mouth of the Lena from the west. Over the period 1921-1933 the mouth of the Kolyma had been served by only one (occasionally two) freighters per year. In 1932 it was decided to send six freighters and a schooner, escorted by *Fedor Litke*, the latter under the command of N.M. Nikolayev (Barr 1979). In overall command of the expedition was Captain N.I. Yevgenov. This convoy was to deliver 12,000 tonnes of mining equipment and provisions for the development of the Kolyma Basin, and to establish a settlement and port at the mouth of the Kolyma. The operation was known as the Northeast Polar Expedition.

The various ships sailed from Vladivostok between 24 June and 5 July 1932. Right from Bering Strait they were battling heavy ice. They did not reach the mouth of the Kolyma until 4 September; there Bukhta Ambarchik was chosen as the site of the port and settlement. Unloading was achieved by means of barges towed by launches. By 21 September unloading was still unfinished but with freeze-up imminent Yevgenov decided to winter in the area. The site was chosen was at Pevek in Chaunskaya Guba. All the freighters reached there safely, with the exception of *Uritskiy* which was forced to winter adrift in the ice of the East Siberian Sea.

Litke and the other freighters got under way again on 5 July 1933 and unloading at Ambarchik was resumed and completed. Even *Uritskiy* was freed and finished unloading. As the freighters headed east they ran into heavy ice and despite *Litke's* best efforts the freighter *Anadyr'* was forced to winter yet again near Mys Yakan. *Litke*

reached Provideniya with the last of the freighters to escape from the Bering Sea on 24 September.

A comparable operation, the First Lena Expedition, was mounted to the mouth of the Lena in 1933 (Barr 1982). Three freighters were assigned to haul freight to the Lena and one to transport equipment for oil and gas exploration in the Nordvik area. A tug and a large, steel lighter that had previously operated on the Ob', were also to be transferred to the Lena. Expedition leader was B.V. Lavrov, while Captain M. Ya. Sorokin was in charge of the convoy. The main icebreaker escort was *Krasin* but *Sibiryakov*, *Sedov* and *Rusanov* also played support roles.

The freighters put to sea from Arkhangel'sk on 8 August 1933. They were joined by *Krasin* in Matochkin Shar on the 13th and reached Dikson on the 18th. On the 20th the tug and lighter also joined them. Despite quite heavy ice in the Kara Sea, and despite being beset for a time and subjected to ice pressures, the convoy reached Mys Chelyuskina on 31 August, the first freighters to do so. *Pravda* headed for Bukhta Nordvik, arriving there on 4 September, but shoal conditions prevented her from reaching her offloading point and her captain abandoned any attempt at offloading and retreated north to Bukhta Pronchishchevoy. The other two freighters reached Tiksi safely on 7 and 8 September respectively. The tug and lighter arrived on 12 September and played a major role in unloading the freighters. Leading a flotilla of 15 river craft the tug reached Yakutsk safely on 26 October.

The two freighters started back westwards on 16 September. They were joined by *Pravda* on the 20th, the latter having made a second, more successful attempt at unloading

at Nordvik. But heavy ice prevented the convoy from getting through Proliv Vil'kitskogo and they were forced to winter (with a skeleton crew of 27 men on each ship) off the Ostrova Komsomol'skoy Pravdy. As we have seen they were successfully broken free by *Fedor Litke* in the following summer.

As the next logical step following *Litke's* successful through-passage in 1934, in 1935 Glavsevmorput' decided to dispatch the freighters *Vantsetti* and *Iskra* through the Northern Sea Route (Belov 1969). They sailed from Murmansk on 25 July 1935 and were escorted from Yugorskiy Shar by *Lenin* and from Dikson by *Litke*. The latter escorted them through Proliv Vil'kitskogo on 15 August and then, two days later, handed them over to *Yermak*. She escorted them through quite heavy ice as far as Ostrova Petra, where they reached open water, and continued independently across the Laptev Sea. They reached the mouth of the Indigirka on the 19th and there discharged some cargo. Getting under way again they passed through Bering Strait on 31 August. Their passage from Murmansk to Bukhta Provideniya (3,221 nautical miles) had taken only 38 days, of which 15 had been spent at anchor at various locations. They unloaded their cargoes of grain at Nikolayevsk-na-Amure and loaded timber for Vladivostok, which port they reached on 8 October, having made the 7,700 nautical mile trip from Leningrad in only 93 days.

Also during the 1935 season two freighters (*Anadyr'* and *Stalingrad* made the passage in the opposite direction. Sailing from Vladivosotok on 23 and 25 June respectively, they reached Leningrad on 16 October. Yet another freighter made a round trip through most of the Northern Sea Route. *Rabochiy* sailed from Arkhangel'sk on 26

July with 2377 tonnes of freighter for the Kolyma and reached Ambarchik on 25 August. Starting back west, she was escorted through Proliv Vil'kitskogo by *Yermak* and reached Murmansk on 24 September. This first round-trip from Arkahngel'sk to the Kolyma and back to Murmansk had taken only 64 days.

In the following summer the tempo was ratcheted up considerably. A total of 12 freighters made the transit of the Northern sea Route from west to east and two (*Vantsetti* and *Iskra*) from east to west. These transits were achieved despite heavy ice in the northeast part of the Kara Sea until quite late in the season, whereby the convoys had to call on the assistance (at various times) of *Yermak*, *Lenin*, *Litke*, *Malygin*, *Sadko*, *Sedov* and *Sibiryakov*.

The 1936 season also saw the important achievement of the first transit of the Northern Sea Route by warships. These were the old, even obsolete, oil-burning destroyers, *Voykov* and *Stalin*. They were escorted by *Fedor Litke* and accompanied by two small tankers, *Maykop* and *Lok Batan*. The bows of the destroyers were specially strengthened and they were given temporary wooden ice-belts along their waterlines.

The small convoy emerged from the White Sea on 31 July and passed through Matochkin Shar on 2 August, having been joined there by the freighter, *Anadyr'*. They were delayed considerably (along with many other ships) by heavy ice in the northeastern part of the Kara Sea. Indeed it was 6 September before they emerged from Proliv Vil'kitskogo into the Laptev Sea. *Voykov*, in particular, had suffered some hull damage from ice pressures. Despite more heavy ice in the Chukchi Sea the destroyers emerged into the open waters of Bering Strait on 20 September, to be met by the tanker *Moskva* at Bukhta Lavrentiya. Having called at Petropavlovsk and the naval base at De Kastro, they

reached Vladivostok safely. The significance of this achievement, in terms of the ability to transfer warships rapidly and without detection from Atlantic to Pacific (or vice-versa) is obvious. While one must assume that the Soviet Navy has taken full advantage of this capability, there have been few later references to such transits in the Russian literature.

The plans for the 1937 season were quite ambitious. It was intended that two freighters would make a west-east transit of the Northern Sea Route, and that one of them would return to the west. Nine ships were to haul freight from Murmansk to the mouth of the Lena and five to Ambarchik at the mouth of the Kolyma. Things turned out differently, however. Ice conditions were very severe in the northeastern Kara Sea, Proliv Vil'kitskogo and the western Laptev Sea throughout the summer. Due to poor decisions by the "experts" at Glavsevmorput' in Moscow, e.g. insistence that most of the ships in the Laptev sea at the end of the season should attempt to fight their way back west rather than taking advantage of easier ice conditions to the east, a large number of ships, including all but two of the icebreakers, were forced to winter in the Arctic. Another contributing factor was the failure to deliver sufficient coal to Tiksi from the mines in the Lena basin for the ships in the Laptev Sea. Thus *Rusanov* and two freighters were forced to winter at Tikhaya Bujhta in Zemlya Frantsa-Iosifa; six Spanish timber-carriers wintered at Dikson; *Litke* with five freighters and a tug wintered in the ice in Proliv Vil'kitskogo; the icebreaker *Lenin*, with five ships (one of which, *Rabochiy*, was crushed and sank) wintered adrift in the southwestern part of the Laptev Sea (Barr 1980); the three icebreaking steamers, *Sedov*, *Sadko* and *Malygin*, wintered adrift to the northwest of the Novosibirskiye Ostrova; and the icebreaker *Krasin* wintered in Khatangskiy Zaliv.

Surplus personnel were evacuated by impressive airlift operations in the early months of 1938 from *Lenin's* convoy and from the three drifting icebreakers. *Yermak* and *Krasin* broke most of the wintering ships free in the early summer of 1938 but plans for the 1938 season were, inevitably, seriously disrupted. But one ship, *Sedov*, had suffered serious damage to her rudder and hence could not steer and had to be left adrift in the ice in the northern part of the Laptev Sea with a crew of 15 "volunteers" on board, the ship having been designated a "high-latitude drifting station." Following much the same route as Nansen's *Fram*, she drifted across the Arctic Basin and emerged from the ice off the East Greenland coast after a drift of 812 days (Armstrong 1958; Badigin 1950; Buynitskiy 1945; Barr 1979).

Inevitably the scale of operations in 1938 was significantly reduced as compared to the previous year. Only one ship, the tanker *Yukagir* completed a transit of the Northern Sea Route (from east to west). The total cargo transported for Glavsevmorput' was 271,000 tonnes, all but 78,400 tonnes of this being handled by ships of the Kara Sea operation.

The 1939 season saw a substantial increase in the movement of shipping via the Northern Sea Route. The icebreakers allocated to assist on various sections of the Route were *Lenin*, *Iosif Stalin*, *Yermak*, *Litke*, and the newly-built *L. Kaganovich*. The plans envisaged them escorting 13 Soviet vessels to different destinations from the west: five to the Kolyma, four to the Lena, one to the Yana, and finally three to Nordvik first, then on to Tiksi. As a novel experiment it was planned to transfer a convoy of four self-propelled dredges and four tugs from Atlantic to Pacific, with the steamer *Mossoviet* acting as

tender to this unusual convoy (Belov 1969). Despite some delays due to ice conditions almost all of these shipping movements were successfully executed. The only complete transit of the Northern Sea Route apart from that of the convoy of dredges and tugs, (which passed through Bering Strait on 28 August) was that by *Malygin* (from west to east) primarily aimed at oceanographic investigations en route.

Sibiryakov and *Rusanov* were kept busy resupplying arctic weather stations, with *Rusanov* making four separate voyages to stations on Novaya Zemlya and Zemlya Frantsa-Iosifa. An unknown number of vessels (both Soviet and foreign) called at Igarka on the Yenisey, primarily to load timber, while from 1935 onwards the coal and nickel mines of Noril'sk had been giving rise to further shipping movements, the ships unloading and loading at the port of Dudinka.

The end of the season saw a flurry of activity on the lower Yenisey and in the Kara Sea, accentuated by an early freeze-up (Belov 1969). On 1 October there were still 16 freighters on the lower Yenisey and in Yeniseyskiy Zaliv, all due to leave the Kara Sea before the end of the season. Only two of the freighters were ice-strengthened to any degree. The icebreakers *Litke*, *Lenin* and *Yermak* were assigned to escorting these vessels through the rapidly thickening ice to the Barents Sea. Although some of the freighters suffered some hull damage *Lenin* and *Yermak* escorted the last of these ships through Yugorskiy Shar on 29 October 1939.

During the 1940 season, despite ice conditions assessed to be just as difficult as in 1937, 27 freighters successfully transported cargoes to their destinations; no ships were forced to winter. The volume of freight handled reached 500,000 tonnes. The icebreakers *I. Stalin*, *Yermak* and *Lenin* were deployed in the west, *Litke* and *Krasin* in

the east. The start of the season saw very heavy ice blocking all the Novaya Zemlya straits and hence the first convoy (*Dikson*, *Uzbekistan*, *Revolutsioner* and *Sakko*) was successfully escorted north around Novaya Zemlya to reach Dikson; this was the first convoy to attempt this route. Several ships completed two round trips to the Yenisey, while *Dikson* made a round trip from Murmansk to Tiksi and back, followed by a second trip to the Yenisey and back (Belov 1969).

A noteworthy feature of the 1940 season was the transit of the Northern Sea Route by the German raider *Komet* (alias *Schiff 45*) in the record time of 21½ days, of which only 14 days were spent under way (Armstrong 1958). This occurred during the “honeymoon” between Hitler and Stalin. She was only the third non/Soviet vessel to make the transit, after *Vega* and *Maud*. *Komet* (Captain Robert Eyssen) sailed from Gdynia on the Baltic on 3 July 1940. Reaching the Kara Sea via Matochkin Shar, she did encounter some ice in the Kara Sea but, surprisingly found Proliv Vil’kitskogo free of ice. The icebreaker *Lenin* was waiting for her there, but her services were not needed. Quite heavy ice was encountered in the western Laptev Sea, however, but *I. Stalin* escorted her through it. Reaching the East Siberian Sea via Proliv Sannikova she was escorted through more heavy ice east of the Medvezh’i Ostrova by *L. Kaganovich*.

But off Pevek Eyssen was informed, inexplicably, that he could go no further east and must return to the west. According to Belov (1969) the Russian authorities had given permission only for a transit by a merchant vessel, and it was on learning of the ship’s true identity (via some “loose talk” at a party on board *I. Stalin*) that they had issued the order for her not to proceed further east. Eyssen ignored this order and continued eastwards on his own and had the good fortune to encounter only a narrow belt of ice.

Komet emerged through Bering Strait on 5 September. Subsequently her career as a raider lasted 15 months, during which time she sank 10 Allied ships, mainly in the South Pacific, and returned safely to Hamburg (Armstrong 1958; Belov 1969; Sokol 1951).

By the start of the 1941 navigation season the Luftwaffe was well established at airfields in Northern Norway and Finland and Murmansk was exposed to heavy bombing and shelling. The icebreakers *Iosif Stalin* and *Lenin*, that had wintered there, were forced to run to safety, leaving Murmansk on the night of 30 July 1940 (Belov 1969). But even thereafter they (and the freighters they escorted) were exposed to attacks from the air and from U-boats in the Barents and Kara seas. The plan envisaged 16 freighters hauling cargoes to various destinations along the Northern Sea Route, including, as a precaution, a two-year supply of provisions and fuel to all the arctic weather stations. A unique operation was the evacuation, as part of the cargoes of five freighters, of the nickel smelter at Monchegorsk on Kol'skiy Poluostrov, threatened by the German advance, to Noril'sk via Dudinka. This was successfully accomplished.

In the eastern section of the northern Sea Route 16 freighters successfully reached their destinations from the Pacific, escorted where necessary by the icebreaker *Krasin* and another icebreaker. At the end of the season *Krasin* proceeded to Seattle for a refit, then continued eastwards via the Panama Canal, New York, Boston, Glasgow and Reykjavik to Murmansk. Also at the end of the season the icebreaking steamer *Sadko*, heading from Dikson for Tikhaya Bukhta on Zemlya Frantsa-Iosifa to resupply the station there, hit an uncharted rock in the vicinity of the Ostrova Izvestiy TSIK on 11 September. All her passengers and crew were safely rescued by *Lenin* before the ship sank (Belov 1969).

Despite the hazards represented by German bombs and shells at Murmansk and even Arkhangel'sk and by U-boats and mines in the Barents Sea, in 1942 22 freighters operated in the western section of the Sea Route, escorted by icebreakers *I. Stalin*, *Krasin* and *Lenin*. For the first time a convoy system was introduced, even in open water, for reasons of defence. Ten freighters attempted the through-passage from west to east. They sailed from Arkhangel'sk on 8 August, and reached Ambarchik safely. But in view of very heavy ice conditions in the vicinity of Chaunskaya Guba, these ships were ordered by Moscow to head back west, which they did successfully.

Despite these difficult ice conditions off the Chukotka coast 20 freighters hauled cargoes to Pevek, Ambarchik, Tiksi etc. from the Pacific. They were escorted by icebreakers including *I. Stalin* and the new icebreaker *A. Mikoyan*. In late September, due to the sudden deterioration in ice conditions in the Chukchi Sea all ships at Pevek were ordered to head west; this operation was successful. Only ships east of Mys Shelagskiy were ordered to return to the Pacific. Despite the best efforts of *I. Stalin* and *A. Mikoyan* a number of ships were forced to winter just west of Mys Vankarem; they were released only in July 1943.

A significant development in the 1942 season was the transit of the Northern Sea Route by warships of the Pacific Fleet: the flotilla-leader *Baku* and destroyers *Razumnyy* and *Raz'yarennyy*. They sailed from Vladivostok on 15 July and, escorted from Tiksi to Dikson by *A. Mikoyan*, reached Murmansk on 14 October.

Also of note during the 1942 season was the foray by the German pocket battleship, *Admiral Scheer into the Kara Sea*, with the aim of intercepting convoys reported to be coming from the Pacific. She failed to encounter any convoys but did

encounter and sink the icebreaking steamer *Sibiryakov*, with heavy loss of life, in the Kara Sea (Barr 1975) . Thereafter she mounted a less-than-successful attack on the port installations and ships lying at Dikson.

In 1943 the level of U-boat activity in the Kara Sea was greatly intensified. In anticipation of this, the first eastward-bound convoy sailed from Arkhangel'sk on 18 June, i.e. earlier than the Germans might have anticipated, and was escorted by at least four destroyers (Belov 1969). Escorting icebreakers were *A. Mikoyan*, *Krasin* and *F. Litke*. Despite the best efforts to protect the convoys in the west, there were some losses: the freighters *Dikson* and *Arkhangel'sk* were sunk by U-boats, while *Tbilisi* struck a mine between Dudinka and Dikson and sank. For safety reasons the unusually large number of 15 ships was ordered to winter at Dikson at the end of the season. They had all been fully bunkered and every possible means had been taken to render conditions for the crews as comfortable as possible.

In the east a total of 24 freighters, escorted by four icebreakers, hauled goods to and from the ports of Pevek, Ambarchik, Tiksi and Kozhevnikovo. A number of these ships were carrying Lend-Lease cargoes from west coast ports in the United States. The first convoy sailed from Provideniya and the fourth one in early August.

The first essential at the start of the 1944 season in the west was to free the 15 ships wintering at Dikson. *Sedov* and the icebreaker *Montkal'm* (formerly the Canadian icebreaker *Montcalm*) escorted three freighters westwards to meet the icebreaker *I. Stalin* which had made an early start from Arkhangel'sk. Then, on 11 August, along with *Litke* and *Montkal'm* *I. Stalin* set off eastwards from Dikson with two freighters. Ice conditions in the northeastern Kara Sea, Proliv Vil'kitskogo and the western Laptev Sea

were extremely difficult, and the first ships reached Nordvik only on 15 September. Two later convoys, heading in opposite directions through Proлив Vil'kitskogo in the second half of September, also encountered quite severe ice conditions (Belov 1969). The icebreakers escorting the west-bound convoy were *I. Stalin* and *Severnyy veter*, alias *Northwind*, on loan from the United States. The situation was aggravated by quite intense U-boat activity; a U-boat sank the escort vessel *SKR-29* in 23 September in the Kara Sea.

By far the majority of the freight handled on the Northern Sea Route in 1944 was in the eastern sector, namely 88% of all freight. The vessels involved included 31 freighters and five icebreakers. 27 Soviet ships hauled cargoes from west coast ports of the United States, mainly to ports in the Eastern Arctic, although 3382 tonnes were carried to Igarka on the Yenisey. The icebreakers involved were *A. Mikoyan*, *Krasin*, *Severnyy veter*, *I. Stalin* and *Litke*.

Ice conditions were noticeably more favourable than in the west. The first ship to proceed without icebreaker escort, *Iskra*, with a cargo of fuel from San Francisco, passed Bering Strait on 8 July and reached Pevek on the 11th, having encountered only some 3-4-tenths ice (Belov 1969). On 21-22 July the freighter *Dekabrist* steamed from Provideniya to Pevek, then continued in convoy to Tiksi, arriving there on 15 August. Ice conditions were worse in the Laptev Sea, however, and freeze-up here began very early. Thus when a convoy escorted by *A. Mikoyan* and *Litke* left Tiksi on 4 and 5 October the ships were steaming through new ice 20 cm thick. Nevertheless all the vessels reached Provideniya safely on 12 October or shortly afterwards.

In 1945 U-boats were operating in the Barents and Kara seas right up until the German surrender in May of that year, and mines laid earlier were still dangerous in

1945. The bulk of freight movements (2%) were still handled in the eastern sector in 1945. A total of five icebreakers and 24 freighters were operating in the east. After the USSR declared war on Japan the Japanese Navy blockaded Vladivostok; in the light of this four freighters from the United States were re-routed through the Northern Sea Route to Arkhangel'sk instead of to Vladivostok; despite difficult ice conditions and frequent fogs this operation was successful (Belov 1969). In this season 31 voyages were made with Lend-Lease cargoes from the United States to Soviet arctic ports.

For the entire period of the War these voyages totaled 120, mainly ports in the Eastern Arctic, although 13 of the voyages were to the Yenisey and five to Arkhangel'sk. The majority of the voyages (54) were to Tiksi, followed by those to Provideniya (35), Ambarchik (28) and Pevek (25). The total tonnage of freight involved was 452,000 tonnes (Armstrong 1952, Appendix V). Thus the Northern Sea Route played a crucial role in supplying Siberia with goods that would normally have reached there via the Trans-Siberian Railway and the rivers, thus freeing the railway system for the movement of vital military freight.

Voyages of Hudson's Bay Company's vessels to Hudson Bay.

Probably the most impressive record of voyages in ice-infested waters, both in terms of its length and its success, is that of the annual voyages by the ships of the Hudson's Bay Company from London to its trading posts in Hudson Bay. That record extended unbroken from the date of the founding of the Company in 1670, until 1913, the

date of the last round-trip voyage from London, i.e. for a total of 241 years (Cooke and Holland 1978).

The number of ships involved each year ranged between one and four, and was most commonly two; until 1892 when the first steam-powered vessel (*Erik*) was employed, these were all sailing vessels. The total number of voyages was 600. Sailing from London with cargoes of trade goods in early June, the ships would cross the Atlantic, negotiate the waters of Hudson Strait, a passage that usually meant tackling moderate to heavy ice, and run south to the Company's various posts. These varied over the years but the most important were Moose Factory, Albany, York Factory and Churchill. The cargoes were then moved ashore by schooners; the posts' annual returns of furs and other local products were loaded, and the ships then started for home. In some years early freeze-up meant that the ships were unable to overcome the ice of Hudson Strait and were forced to turn back to winter in the Bay, usually at Charlton Island in southern James Bay, York Factory or Churchill. It must be stressed that there were absolutely no navigational aids in Hudson Bay or Strait during the period in question, except for local beacons near the posts, such as the beacon on Point of Marsh at the mouth of the Hayes River for the guidance of vessels trying to locate York Factory.

Of the ships involved in these 600 voyages only 18 were wrecked, and the majority of these were not sunk by ice; most either ran aground or foundered in open water. One was forced to turn back on the outward voyage from London by heavy ice in Hudson Strait while 18, unable to leave the Bay due to heavy ice in Hudson Strait in the fall, were forced to winter in the Bay. Several periods saw particularly difficult ice conditions in Hudson Strait, namely 1813-1817, 1835-1837, 1843-1845, 1854-1855,

1858-1859, 1865-1866 and 1883-1885. The variations in severity of ice conditions as revealed by the ships' logs have been analyzed in detail by Catchpole (1992).

In 1912 the ships sailing annually from London were replaced by the steel-hulled steamer *Nascopie* sailing out of Montreal. With a length of 93.6 m; beam 14.4 m; depth of hold 6.6 m; tonnage 2520 grt; engines of 2300 hp; she had a top speed of 14 knots (Gray 1997). She served the various posts in the Bay and, as the Company's network expanded, also further north, until 1937. In that year she ran aground on an uncharted reef off Cape Dorset on 21 July; she later slid off the reef and sank. All passengers and crew were saved. But *Nascopie's* fate only serves to underline the achievements of the Hudson's Bay Company's earlier captains who safely made 581 voyages from London, through Hudson Strait to its various posts in the Bay, and back.

Arctic whaling voyages

Of the various types of natural resource harvesting the one that particularly resulted in ships heading into arctic waters was whaling. The species pursued was primarily the bowhead or Greenland whale (*Balaena mysticetus*). In that this species usually frequented ice-infested waters, the dangers of hunting it were considerable. Whaling vessels commonly became beset in the ice, and thereby ran considerable danger of being crushed.

The beginnings of commercial whaling in the Arctic are to be sought in Svalbard waters. On his return from his 1607 voyage Henry Hudson reported large numbers of whales in Kongsfjorden (Vaughan 1984). On this basis, in 1611 the Muscovy Company

of London dispatched two ships (commanded by Jonas Poole and Thomas Edge) to Svalbard to hunt whales. On board were six Basque harpooners. The Basques already had a long history of whaling in the Bay of Biscay and in the Strait of Belle Isle. On the basis of the reports of the six harpooners the French and Spanish ports of the Basque country sent 13 ships to Svalbard in 1613, although they were forced to pay “tribute” to the Muscovy Company. In the following year the Dutch formed the Noordsche Compagnie, claiming the sole right to hunt whales between Novaya Zemlya and Greenland.

Initially the Svalbard whaling was shore-based. Once a whale had been harpooned from open whaleboats it was towed ashore to a sheltered bay where it was flensed and the blubber tried-out in try-works on shore. The best known site was the Dutch establishment of Smeenburg on Amsterdamøya, where activity reached a peak in the 1620's and 1630's. It was probably served by about 15 whaleships at any one time (Vaughan 1994). It was purely a summer-establishment, with probably less than 200 men on shore (not the 15,000 to 18,000 reported by Lubbock (1937)). Archeologists have located only eight tryworks and 101 graves.

As the whale stocks in the inshore Svalbard waters were exterminated, the activity at the shore stations gave way to pelagic whaling whereby the whales were flensed alongside the whaleships and the blubber stored in casks to be carried back to the ship's home port in the Netherlands, England, Germany etc., to be tried out there. The number of vessels involved was substantial; thus in 1684 Dutch whaleships hunting whales between Svalbard and Greenland numbered 246. In the following year the German port of Hamburg sent 83 vessels to the whale fishery. In the decade 1680-89 voyages by ships

of the Dutch and German whaling fleets totalled 2522 (See Table 1) Hacquebord (1984) has discussed in detail the relationship between variations in ice conditions and the fluctuations in the level of whaling activity and whaling success.

Inevitably numerous ships were lost in the ice. Between 1661 and 1718 the number of Dutch ships whaling in the Greenland Sea averaged 149; losses averaged 6 ships per year. Usually when a ship was crushed in the ice her crew was able to abandon her before she sank and escape to another vessel nearby.

With the decline of the shore-based whaling the whalers, mainly Dutch, gradually shifted their attention westwards towards Greenland. For a variety of reasons British whaling practically ceased for about a century after 1670. When it resumed, in the second half of the 18th century (Jackson 1978) the whaling grounds most frequented were the Greenland grounds. For the period 1778-1800 an average of 62 British vessels sailed for the Greenland grounds, reaching a maximum of 153 in 1787 (Jones 1996), mainly from the ports of London, Liverpool, Hull and Whitby. Total number of British whaling voyages to Greenland for the decade 1780-89 was 762, while the maximum for any decade (in 1810-19) was 777. Thereafter there was a serious decline to only 116 voyages in the decade 1830-39, but they picked up again after mid-century, reaching a maximum of 361 voyages in 1850-59. By the 1830's Liverpool and London had ceased to be whaling ports and Hull also dropped out of the picture in 1869, leaving only the Scottish ports of Aberdeen and, especially, Peterhead and Dundee. The Scottish whalers continued to pursue whales on the Greenland grounds, with a high of 15 vessels in 1883, but even the Scottish whalers had deserted these grounds by 1899.

British vessels were not the only ones cruising the Greenland grounds. During the period 1700-1740 Dutch and German vessels numbered over 200 annually, but by the 1770's this number had declined to around 160 vessels (Vaughan 1984). The German and Dutch fleets were greatly reduced by the disruptions of the French revolutionary wars and were effectively eliminated by the British continental blockade during the Napoleonic wars.

In the early years of the 18th century some Dutch captains began heading west around Kap Farvel to hunt whales in Davis Strait and along the west coast of Greenland. By 1719 29 Dutch vessels and four German vessels were working these grounds (Ross 1979). That year is generally taken to mark the start of the Davis Strait fishery (Table 2). These vessels were soon followed by an increasing number of British whaleships, which totaled 12 ships in 1778 (Jones 1996). The Germans had dropped out of the Davis Strait fishery by 1793 and the Dutch by 1795, although there was a brief minor resurgence (1-3 vessels) over the period 1821-26 (Ross 1979). This left the British as the only nation working the Davis Strait grounds, with 67 vessels in 1814 and a maximum total of 755 voyages in the decade 1820-29..

Following John Ross's voyage in HMS *Isabella* and *Alexander* in 1818, whereby he pushed north across Melville Bay to reach the North Water, then ran back south along the Baffin Island coast, and following his reports of numerous whales in these waters, the whalers followed his lead, and began to follow a similar circuit each year. They hunted whales along the Baffin Island coast and also penetrated into Lancaster Sound and, after Captain William Penny's rediscovery of this inlet in 1840, Cumberland Sound.

Almost immediately after the discovery of these new whaling grounds on the west side of Baffin Bay, in 1821 the Davis Strait fishery overtook the Greenland fishery in terms of number of British vessels working them; in that year around 80 vessels cruised each of these grounds (Jackson 1978).

Just as on the Greenland grounds, each year a certain number of ships on the Davis Straits grounds became beset and were crushed – on average one in 17 voyages ended in this manner. The worst season in this regard was 1830 when 19 out of 91 British ships were lost, many more were badly damaged and 21 ships returned home clean, i.e. without having taken any whales.

Until 1857 all the British whaling vessels were sailing vessels, but in that year steam engines were installed in the ships *Tay* of Dundee and *Diana* of Hull. The first purpose-built steam whalers were *Narwhal* and *Dundee*, both of Dundee and operating from 1859.. Thereafter the proportion of steam vessels increased rapidly. While steam power allowed the ships to push through much heavier and thicker ice than a sailing vessel, the whales quickly learned to associate the sound of the engine and of the propeller with danger and became more wary of ships.

Peterhead vessels continued working the Davis Strait grounds until 1893 and the Dundee whaleships, the last of the arctic whalers, until 1914, when the only two ships returned home clean. American vessels represented quite a significant minority on the Davis Strait grounds over the period 1846 to 1892. reaching a maximum of 15 vessels in 1867 (Ross 1979) and a total of 92 voyages in the decade 1860-69..

The first attempts at whaling in Hudson Bay were by sloops of the Hudson's Bay Company (Table 3); they sailed from Churchill over the period 1765-1772 to hunt

whales around Marble Island, but were less than brilliantly successful (Ross, W.G. 1973). They took only five whales during these attempts. In 1770 the sloop *Charlotte* encountered unusually heavy ice and did not even reach Marble Island.

After a hiatus of almost 90 years whaling resumed in Hudson Bay in 1860, but this was a totally different operation. The vessels involved were American, sailing out of New England ports such as New Bedford. This phase was initiated in 1860 by Christopher Chapel (*Syren Queen*) and his brother Edward (*Northern Light*) (Ross, W.G. 1975). Despite difficult ice conditions they reached the west coast of Hudson Bay and wintered near Depot Island. In the late summer of 1860 and in 1861 they hunted whales in Roes Welcome Sound and were unusually successful. News of their success led to other captains following their example, the number of American voyages totaling 73 for the decade 1860-69. Thus there were 5 American whaleships in Hudson Bay in 1862, 13 in 1863 and 19 in 1864, although these numbers dropped drastically thereafter, to only two ships in 1868 and rarely more thereafter. The last whaleship to visit Hudson Bay was in 1915.

These vessels almost invariably wintered in the Bay – at Marble island (in the almost land-locked harbour near the west end of the island), near Depot Island, Cape Fullerton, or Repulse Bay. Details of such winterings may be found in the accounts by Robert Ferguson, a harpooner on board *Abbie Bradford* of New Bedford, that wintered at Marble island in 1878-79 (Ferguson 1938) and by Captain George Comer, captain of *Era* of New Bedford, which described her voyage to Hudson Bay in 1903-1905, i.e. in the twilight of arctic whaling, when she wintered at Cape Fullerton (Ross, W.G. 1984).

The usual pattern was the ships to hunt whales in open water during the fall when they arrived, and then go into winter quarters. In the spring, long before the ships were released, whaleboats were hauled across the ice to the floe edge where a camp would be set up and whales hunted from there. This practice was widely followed except for the period 1873-1887 when Mable Island was the most popular wintering site, one where the ships were released relatively early. After 1890 a new pattern emerged: whaleboats would be sent on lengthy cruises from the floe-edge camps, cruises that might last for weeks, the men camping each night on the ice or on shore.

In total American whaleships spent 169 ship-seasons in Hudson Bay, and caught 532 whales (Ross 1979). For the period 1891-1911 they were joined by one British whaleship each season. That vessel was the Kinnes Brothers' ship, *Active* of Dundee. While her crew pursued whales when opportunity offered, the ship also transported the output of a mica mine in Repulse Bay that operated for a number of years. Also, in 1899 her first mate and two men were left at a trading post they established on Fisher Strait, Southampton Island, to trade with the Inuit, and she picked up its furs etc. each year thereafter (Lubbock 1937). Especially towards the end of the whaling period, trade with the Inuit became an increasingly important component of a whaleship's activities,. The captain traded for furs, especially fox and bear, muskox hides etc. but also for caribou, seals and fish for consumption by the ship's crew. Inuit women were also employed to sew fur clothing and boots for the crews. Inuit men were also employed as members of whaleboat crews, and on the basis of this experience, Inuit would also engage in "contract whaling." Using whaleboats and gear provided on loan by one of the whaleships they would hunt whales in the fall after the ship had left the Bay, or would operate

independently, in parallel with the ship's own boat crews, on the understanding that any whales they took would be delivered to the ship.

With the decline of the Pacific sperm whale stocks in the 1840's and the concurrent doubling in the price of baleen between 1841 and 1844 (driven by changes in female fashions) American whalers operating out of Hawaii shifted their attention northwards to the Kamchatka grounds and then to the Sea of Okhotsk (Kugler 1984). They were hunting right whales and also bowheads. Captain Thomas Soding of the Danish whaleship *Neptun* appears to have been the first whaler to take a bowhead in the North Pacific – off Kamchatka, in 1845. In that same summer Captain Mercator Cooper had taken his ship *Manhattan* into the Sea of Okhotsk for the first time; his vessel and two French vessels took eight right whales there. By 1847 there were 30 whaleships there: 26 American and four French; they took 341 right whales and 85 bowheads, the first large catch of the latter species in the North Pacific.

On the basis of a comment by a Russian naval officer about large numbers of “strange whales” north of Bering Strait, in the following year (1848) Captain Thomas Roys, of the bark, *Superior*, out of Sag Harbour, New York, took a chance and headed for that strait. On 25 July he lowered for a whale in Bering Strait; to his amazement it yielded baleen plates 12 feet long and an astonishing 120 barrels of oil. Pushing north, Roys cruised in the Chukchi Sea for two weeks, during which time he took a further 11 whales that yielded 1600 barrels of oil, i.e. he had a full ship, and he headed south for Honolulu (Bockstoce 1986). He had encountered no ice in the Chukchi Sea, and the water was shallow with good holding ground.

A “whaling rush” to the northern Bering Sea and the Chukchi Sea followed immediately. When the fleet returned to Hawaii in 1849, the average catch per ship was 1324 barrels, with the whales averaging 150 barrels (Bockstoce 1986). In 1852 220 whaleships were whaling north of Bering Strait. A total of 1205 voyages was made (mainly by American vessels) to the Bering and Chukchi seas during the decade 1850-59 (Table 4). But, not surprisingly given the intensity of this hunt, the number of whales taken quickly declined, and with it the number of whaleships – to only five in 1855, 13 in 1856 and eight in 1857. It has been suggested that the surviving whales had quickly learned to avoid the whalers by rapidly migrating through the Bering and Chukchi seas and by spending the summer east of Point Barrow.

Most of the whaling captains switched their attention back to the Sea of Okhotsk, but in 1854, reassured by the information that HMS Plover (Commander Rochfort Maguire), engaged in the search for the missing Franklin expedition, had safely spent two winters in Elson Lagoon, just east of Point Barrow, five ships pushed east past Point Barrow. They took only a few small whales, however, and word began to spread that the waters north of Bering Strait were “fished out.”

As yields in the Sea of Okhotsk began to decline, the whalers returned to the Chukchi Sea, for lack of any alternative. Some 100 vessels pushed north through Bering Strait in 1860. When the autumn concentration of whales around Ostrov Gerald' da was discovered, the numbers of whales taken rose noticeably and the number of vessels cruising the Chukchi Sea again increased.

In 1865, however, the American fleet in these waters suffered a serious disaster that had nothing to do with ice or weather. Between 22 and 28 June, i.e. 2½ months after

the end of the Civil War, the Confederate raider *Shenandoah*, Captain James Waddell, captured and burned 20 whaleships and a further 3 were bonded. Another whaleship ran aground and burned while trying to evade capture (Bockstoce 1986; 2006).

Six years later the natural environment of the Chukchi Sea extracted an even heavier price. Caught between the pack and the fast ice along the Alaskan coast in the vicinity of Wainwright and Point Belcher during a period of persistent northwesterly winds, and with no prospect of being released, 33 American vessels were abandoned on 13 and 14 September. The crews escaped to the south in whaleboats along shore leads. Only one ship, *Minerva*, was salvaged the following summer (Bockstoce 1986;2006).

Due largely to this combination of disasters, by 1876 the American arctic fleet comprised only 20 vessels. But at the end of the season this reduced fleet suffered a comparable fate to that of 1871. Twelve ships were abandoned in the ice off Point Barrow on 5 September. At least 50 men elected to stay with their ships; they and their ships were never heard from again. One ship was salvaged the following year.

Two developments encouraged the whalers to continue the hunt in the Western Arctic for several more decades. The first of these was the introduction of steam to the whaling fleet. The first American steam whaler, *Mary and Helen*, was launched at Bath, Maine on 30 July 1879, for owner William Lewis (Bockstoce 1977). On her first cruise, to the Chukchi Sea, under Captain Leander Owen in 1880, she took 27 bowheads, which produced 2350 barrels of oil and 45,000 lbs of baleen. Thereafter nine new steam vessels were added to the fleet, while older vessels were converted, on the basis of this demonstration by *Mary and Helen* of the clear advantage obtained by a steam vessel from being able to more readily pursue the whales safely into the ice.

The other significant development, that extended the whaling grounds eastward as far as Amundsen Gulf, and prolonged the industry's life for a couple of decades, occurred in 1889. Prior to that whaling captains had been pushing progressively eastwards beyond Point Barrow and in 1888 *Orca* (Captain George Bauding) reached Barter Island. But he and his fellow captains were constrained by the fear of being unable to escape back west of Point Barrow before freeze-up. But in 1887 an Eskimo trader, returning to Point Barrow from the east, confirmed the suspicion that whales were numerous off the Mackenzie Delta in summer. On this basis Charlie Brower, in charge of the Pacific Steam Whaling Company's shore station at Point Barrow, dispatched one of his harpooners, "Little Joe" Tuckfield, eastwards with a whaleboat to check these rumours. Tuckfield returned in August 1889, and not only confirmed the rumour but also reported the existence of an excellent potential wintering harbour in Pauline Cove on southeastern Herschel Island. The outcome was that in 1890-91 three vessels, *Mary D. Hume*, *Grampus* and *Nicoline* wintered at Pauline Cove and were able to continue whaling off the Mackenzie Delta and in Amundsen Gulf till late in the fall the following season, before wintering again at Pauline Cove. By the end of that second season *Mary D. Hume* had taken 37 whales. Five vessels wintered at Herschel Island in 1891-92. By the winter of 1894-95 this number had risen to 15 – with crews totaling some 500 men. For that winter several captains' wives had joined their husbands; the five women (some with children) significantly raised the tone of the social life at Herschel Island.

But in 1897 three vessels were wrecked by the ice in September off the west coast of Alaska, and this coincided with the near extinction of the whales and the rapid drop in the price of baleen; this combination of factors sealed the fate of the industry. The end of

the industry effectively arrived with the advent of spring steel (replacing baleen) in 1907. From a price of \$15 per pound in 1907, the value of baleen dropped to 50¢ in 1908. For a further decade smaller vessels continued to pursue the whales in the Chukchi and Beaufort seas, but only by combining this activity with trading for furs with the Inuit were they able to make a profit.

Summation

Probably the most striking feature of the history of arctic marine shipping is its longevity. While the search for the Northwest Passage had begun as early as 1497 with John Cabot's voyage, that search penetrated into arctic waters only in 1576 with Sir Martin Frobisher's first voyage. But apart from the voyages by Bylot and Baffin in 1615 and 1616 into Baffin Bay (on the basis of which they concluded that this was a closed bay with no possible access to the Northwest Passage) from 1610 until 1747 all searches focused on Hudson Bay – and led to the correct conclusion that it too was not the entrance to the Northwest Passage. After a hiatus of over half a century the focus of the Royal Navy's searches (driven by the ambitions of Sir John Barrow, Second Secretary at the Admiralty) in the first half of the 19th century, was again on the Northwest Passage, but mainly via Lancaster Sound. That drive faltered and died, however, with the disappearance of the Franklin expedition in 1845, although the searches for that expedition led to the mapping of much of what is now the Canadian Arctic Archipelago. It was only after a further half-century that the first transit of the Passage was achieved (over a period of four years) by the Norwegian, Roald Amundsen in *Gjøa*.

In the case of the Northeast Passage, or at least of part of it, the history of arctic marine shipping is even longer. By 1500 there was a steady movement of Russian shipping from Arkhangel'sk via the White and Barents seas, around Scandinavia, heading for Western Europe. By 1600 the standard route to and from the fur-boom-town of Mangazeya in Western Siberia was via the Barents and Kara seas. By 1650 commercial vessels were plying the waters off the arctic coast of Siberia from the Olenek in the west to the Kolyma in the east, and there had been at least one attempt at sailing around Poluostrov Taymyr. One has to assume that ice conditions at the time were relatively favourable. This was in very striking contrast to conditions a century later when the various detachments of the Great Northern Expedition (1733-43) encountered endless difficulties due to ice in trying to explore the arctic coast of Russia. The first successful transit of the entire Northeast Passage, or Northern Sea Route, was made by the Swede, A.E. Nordenskiöld in 1878-79 in *Vega*. During the closing years of the Tsarist regime the Russian Navy made a determined effort to survey and chart the entire Northern Sea Route, using the specially built small icebreakers *Taymyr* and *Vaygach* over the period 1910-1915. Under the Soviet regime, after the less-than-successful attempts by *Sibiryakov* in 1932 and *Chelyuskin* in 1933, in 1934 the icebreaker *Fedor Litke* made the first accident-free one-season passage of the Northern Sea Route, and thereafter commercial traffic along the route, either in terms of through-passages or traffic to and from the mouths of the major Siberian rivers, built up rapidly.

In terms of commercial shipping, however, one of the most successful sustained operations involving arctic marine shipping was represented by the annual voyages by ships of the Hudson's Bay Company from London, via Hudson Strait to the Company's

various posts in Hudson Bay and James Bay and back again, over the period 1670-1913. These voyages invariably involved some amount of ice-navigation in Hudson Strait and Hudson Bay, on possibly both outward and homeward voyages. During a total of 600 voyages, by far the majority of which were under sail, only 18 ships were lost, and many of these losses were caused by hazards other than ice.

But undoubtedly the most massive, sustained activity in terms of arctic marine shipping, was that of whaling. Over the period 1610-1915, a minimum of 39,000 ships headed to the Arctic in pursuit of the bowhead whale (*Balaena mysticetus*) (Table 5). This activity focused on four main areas: the Svalbard/Greenland Sea area, Davis Strait and Baffin Bay, Hudson Bay, and the Bering, Chukchi and Beaufort seas. The main participating nations were the Netherlands, Germany (or its predecessors), Britain, and the United States. This activity was pursued mainly in ice-infested waters and the number of ships and men lost was extremely high. At the same time the whaling industry resulted in the accumulation of a vast amount of specialized knowledge of patterns of ice distribution and of ship-handling in ice, knowledge upon which the Royal Navy, for example, capitalized by appointing usually two whaling captains as ice-pilots on board each of the vessels engaged in the search for the missing Franklin expedition in 1848-1855.

Suggested areas of future research

In light of this overview of the history of arctic marine shipping several possible directions for future research come to mind. One of these is the extraction of sea-ice data

from historical journals and log-books from exploring expeditions and whaling ships, along the lines of Catchpole's more narrowly focused work (1992) on ice-conditions in Hudson Bay and Strait based on the log-books of ships of the Hudson's Bay Company.

A possible, more widely-ranging topic is an investigation of possible correlations between reported ice conditions and the available meteorological data, either that collected by the various exploring expeditions, or by land-based meteorological stations.

Thirdly a study of the history of the evolution of the design of icebreakers would be of great utility.

And finally, while it probably would not add much to our existing knowledge of ice-drift patterns, a circumpolar map of the ice drifts (mainly involuntary) of various ships would be quite interesting. One thinks of the drifts of *Terror* (1837), *Enterprise* and *Investigator* (1849), *Advance* and *Rescue* (1850-51), *Resolute* (1854-55), *Fox* (1857-58), *Hansa* (1869-70), *Tegetthoff* (1872-74), *Jeannette* (1879-81), *Varna* and *Dijmphna* (1882-83), *Fram* (1893-96), *Sv. Anna* 1912-14), *Karluk* (1913-14), *Maud* (1922-25), *Sedov* (1937-40) and *Lenin* (1937-38)

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Table 1¹

Whaling voyages, Svalbard/Greenland Sea

	Dutch	German ²	British	French	Spanish	Danish	Total
1610-19	126		81	17	14	4	242
1620-29	87		56			6	149
1630-39	127		21	17		13	178
1640-49	246						246
1650-59	410		17	60			487
1660-69	970	37					1007
1670-79	985	573					1558
1680-89	1982	540					2522
1690-99	944	574					1518
1700-09	1631	544					2175
1710-19	1406	538					1944
1720-29	1328	629	107				2064
1730-39	905	312	95				1312
1740-49	1358	243	35				1636
1750-59	1358	185	522				2065
1760-69	1304	231	458				1993
1770-79	852	350	658				1860

¹Data for 1610-1660 represent minimum figures. Source: Holland, 1994.

²From cities within present-day Germany.

1780-89	455	247	762				1464
1790-99	315	288	352				955
1800-09	26	69	369				464
1810-19	5		777				782
1820-29	12	1	387				400
1830-39			116				116
1840-49			189				189
1850-59			361				361
1860-69			219				219
1870-79			259				259
1880-89			104				104
1890-99			35				35
1900-09			6				6
1900-15			4				4
Totals	16832	5361	5990	94	14	23	28314

Table 2
Whaling voyages, Davis Strait/Baffin Bay

	Dutch	German	British	American	Total
1719-29	846	91			937
1730-39	942	82			1024
1740-49	354	6			360
1750-59	334	20			354
1760-69	316	30			346
1770-79	437	26	18		481
1780-89	86	8	546		640
1790-99	45	6	379		430
1800-09			401		401
1810-19			473		473
1820-29			755		755
1830-39			531		531
1840-49			137	4	141
1850-59			150	9	159
1860-69			178	92	270
1870-79			134	39	173
1880-89			99	15	114
1890-99			54	3	57
1900-09			58		58

1910-11			11		11
Total	3360	269	3924	162	7715

Sources: Ross, 1979; Holland, 1994.

Table 3
Whaling voyages, Hudson Bay

	British	American	Total
1860-69	3	73	76
1870-79		28	28
1880-89		29	29
1890-99	3	23	26
19100-09	13	10	23
1910-15	3	6	9
Total	22	169	191

Sources: Ross, 1975; Holland 1994.

Table 4
Whaling voyages, Western Arctic

	American	German	French	Australian	Chilean	Hawaiian	Total
1849	67	2	2				71
1850-59	1112	17	39	19	2	16	1205
1860-69	898	8	9	4		45	967
1870-79	284					37	321
1880-89	142					1	143
1890-99	236						
1900-09	142						
1910-14	20						
Total	2901	27	50	23	2	99	3102

Sources: Bockstoce and Botkin, 1983; Bockstoce, Botkin, Philp, Collins and George, 2005; Holland 1994.

Table 5
Whaling voyages, Total Arctic

	Svalbard/Greenland	Davis Strait/Baffin Bay	Hudson Bay	Western Arctic	Total
1610-19	242				
242					
1620-29	149				149
1630-39	178				178
1640-49	246				246
1650-59	487				487
1660-69	1007				1007
1670-79	1558				1558
1680-89	2522				2522
1690-99	1518				1518
1700-09	2175				2175
1710-19	1944				1944
1720-29	2064	937			3001
1730-39	1312	1024			2336
1740-49	1636	360			1996
1750-59	2065	354			2419
1760-69	1993	346			2339
1770-79	1860	481			2341
1780-89	1464	640			2104

1790-99	955	430			1385
1800-09	464	401			865
1810-19	782	473			1255
1820-29	400	755			1155
1830-39	116	531			647
1840-49	189	141		71	401
1850-59	361	159		1134	1654
1860-69	219	270	76	967	1532
1870-79	259	173	28	321	781
1880-89	104	114	29	143	390
1890-99	35	57	26	233	351
1900-09	6	58	23	142	229
1910-15	4	11	9	20	44
Total	28314	7715	191	3031	39251

Sources: Bockstoe and Botkin, 1983; Bockstoe, Botkin, Philp, Collins and George, 2005; Holland, 1994; Ross, 1975; 1979.