

TRAFFIC



The bulk carrier *Pabal* (41,213 GT) approaching Pond Inlet NVT in high winds in September 2021. Photo by Nigel Greenwood.



ARCTIC TRAFFIC PATTERNS

IN THE ARCTIC

The realities of the polar waters

By RAdm Nigel Greenwood
and Captain David Snider

The popular media of the past two decades has been full of prognostications of a boom in traffic in the Arctic. In many instances, attention-grabbing headlines and titles have leveraged valid public concern for global climate change to produce an expectation of near-immediate changes in global marine traffic patterns. The concern over global climate change is well-placed, and the inevitability of change a fact of life, but the realities of maritime traffic in polar waters are more nuanced, deliberate, and cautiously progressive.

Arctic traffic is increasing, and this is somewhat driven by decreasing ice coverage, but perhaps not in such a rapid and dramatic way as expected. There are many reasons for this. Unavoidably, shipping economics is a leading constraint, which is related to the predictability of transit times, fuel expenditures, specialized ship costs, practicalities of routes, and varied risk appreciations such as availability of icebreaker assistance. But there are other issues at play also, including localized governance, which in some cases works to constrain the unfettered advance of industrial development. Our purpose here will be to touch on some of these issues to explain the current drivers or inhibitors of arctic maritime traffic, and how they interface with the geographic constraints of the area.

Drivers and attractors

There are four main incentives for navigating in polar waters: to get through them to obtain a distant destination more expeditiously; to get

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something out of the region; to bring something into the area; and to conduct scientific (or resource extraction) research.

The first is the historic driver of arctic exploration—to find a new and quicker route to markets, either by the Northwest Passage (NWP) or the Northeast Passage, now known as the (Russian) Northern Sea Route (NSR). The second is the exploitation of resources, either living or mineral. This started as early as the Vikings in Greenland, and expanded to encompass whaling and other natural harvests from the 17th to 19th centuries, but in recent decades has been largely constrained by international agreement to non-living resources. The third incentive—to bring something into the area—is the necessity of importing materials into the region, either to support resource extraction or to furnish the livelihood of communities, including indigenous peoples who cannot survive contact with modern civilization without this supplement to their traditional culture. The fourth driver, that of scientific research, is necessary for better understanding of causes and effects of global climate change and how these positively or negatively influence the three other drivers.

Missing from this list is the incentive to venture into arctic regions to defend national interests against the incursions of others. The military aspect of this is a topic fraught with a wholly different set of perceptions, suspicions, capabilities, and economics, related more to geostrategic considerations than to arctic realities. As such, it is the subject of spirited debate beyond the scope of this article. We will only observe that this interest follows, rather than leads, the increase in the commercial activity that is our main focus. One component that is more closely related to the four fundamental drivers is the need to provide adequate monitoring, policing, and response capabilities to attend to search and rescue, customs, and environmental protection, as well as regulation of shipping—all non-military elements of national sovereignty.

Given these incentives, arctic maritime traffic is usually sorted with a binary distinction as either transit or destination traffic. The first are

voyages with no other objective than to get through, with minimal interaction with the region; the second are those voyages that terminate within the area. For the NSR in 2017, complete through-transits numbered 27, while separate voyages into the Russian north from east or west, as well as voyages between NSR ports, numbered more than 1,900 altogether, with many of them to/from Russian north-European ports. In the Canadian north in the same year, NWP transits numbered only 23 among 348 voyages in polar waters. Let's examine some of the dynamics behind these numbers.

Overall traffic pattern

The NWP consists of seven numbered routes, of which the first was famously attempted by SS *Manhattan* in 1969 before it completed the voyage with Canadian icebreaker assistance through the secondary deep-water route of Prince of Wales Strait. The more commonly traveled routes of Amundsen and his successors have followed the usually less ice-obstructed shallow water passages with depth limitations of six to fourteen meters. The NSR is similarly varied and constrained: of the nine key navigational straits used to transit from Europe to Asia eastward, two are lim-

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ited to thirteen to fifteen meter drafts and one is as shallow as eight to nine meters. Given the increasing draft of commercially competitive modern ships, this is as much a constraint as the ice conditions, which limit the commonly available navigation season to July-November on the NSR and August-October in the NWP. Ice type (age and thickness) and concentration (expressed in 10ths of area coverage) are still the key factors in arctic accessibility, but within a certain range of capabilities, traffic volume is dependent on commercial incentives, as we will see later.

Increasing public and commercial awareness of climate change since 2000 was given special impetus by a reported low ice year in 2007. The Arctic Council's Arctic Marine Shipping Assessment of 2009 concluded that destination traffic would remain the dominant driver through 2020, and noted a lack of critical [marine] infrastructure in the north. A subsequent lull in arctic traffic in 2014 was seen as a consequence of freight rates, lower bunker costs, as well as lower consumption and more reliable schedules favoring the Suez route and undercutting the transit incentive. Being fraught with additional risks, arctic traffic remains more sensitive than other streams to the common factors of shipping profitability.

The general pattern of arctic traffic is dominated by the seasonality of this enterprise. The NSR is nominally "open" all year round, which means not that it is ice-free, but only that it is available to



Bulk carrier *Vitus Bering* (66,291 GT) enters Milne Inlet NVT under escort of *Botnia*, in company with *Gisela Oldendorff* in July 2020. Photo by Nigel Greenwood.

suitably classed or escorted ships. Non-ice-classed vessels do not travel the NSR between December and the end of May, and, during the winter period in 2017, there were no ships less than Arc4 (a Russian ice classification for ships capable of handling 0.7 m thickness of winter ice). The annual traffic pattern demonstrated in the 2017 season ranged from a winter low of 58-108 monthly voyages, increasing sharply in July to reach a peak of 393 in September, and returning to winter norms of 100 or less in November.

The NWP is similarly date-limited: while there are no winter voyages, traffic begins to make its way past Point Barrow eastward in mid-July, and the central bottleneck of the passage is generally open for only a brief window between mid-August and mid-September. The significant traffic to the Baffinland Iron Mines terminal at Milne Inlet, near the eastern entrance to the NWP on the north end of Baffin Island, starts with the disappearance of ice from Pond Inlet in mid-late July and wraps up with the last shipment in mid-October. The earliest and latest recorded transits of the NWP were west-east relocations of the Finnish icebreakers *Fennica* and *Nordica*, in mid-July and mid-November respectively. These ships are Polar Class 4 (the middle of the International Association of Classification Societies' scheme of PC1 (highest) to PC7 for ships constructed for polar use) and represent significant independent capability in ice up to 1.5 m thick. Generally, by late October, even the Canadian Coast Guard has withdrawn its icebreakers from the Arctic.

Since 2014, fully transiting traffic along both eastern and western arctic routes has been highly variable. Data for the NWP shows variation from a high of 33 in 2017, the year after *MV Crystal Serenity's* headline-making voyage with 1,100 passengers, to a recent low of 3 in 2018, a notoriously "heavy" year for ice. Of these vessels transiting Canadian waters, the vast majority—80% to 100% in any year—are private vessels, or cruise ships. On the NSR, from a low in 2014 of 4 international transits, the numbers have grown more or less steadily to 17 in 2018, and 14 in 2019, the majority of these being general cargo, bulk carriers, and tankers.

Destination traffic

Extensive data on destination traffic on the NSR, compiled by the Centre for High North Logistics in Murmansk, tell a clear story of particular growth: in 2017, the total number of voyages on the NSR was 1,908, up from 1,705 the previous year. By 2019, this number had grown to 2,694, of which 1,852 (69%) were tankers, general cargo, and liquefied natural gas (LNG) carriers, and a year later the number of voyages was 2,905. In this latter year, the dominant character of the traffic became clear, with only 64 oil and gas ships carrying 21% and 63% respectively of the total GRT on the NSR for the year 2020.

This volume of traffic was enabled by the fact that most of these vessels work year-round. Of the 2,694 voyages in 2019, 866 were conducted by tanker, LNG, and containerships of ice class Arc7 (a Russian ice classification roughly equivalent to PC3), capable of



The seven numbered routes of the Northwest Passage.

independent operation in up to 2.1 m of ice. General cargo ships of lower but still significant ice class were supported by more than 200 icebreaker voyages, the majority of which were between November and May.

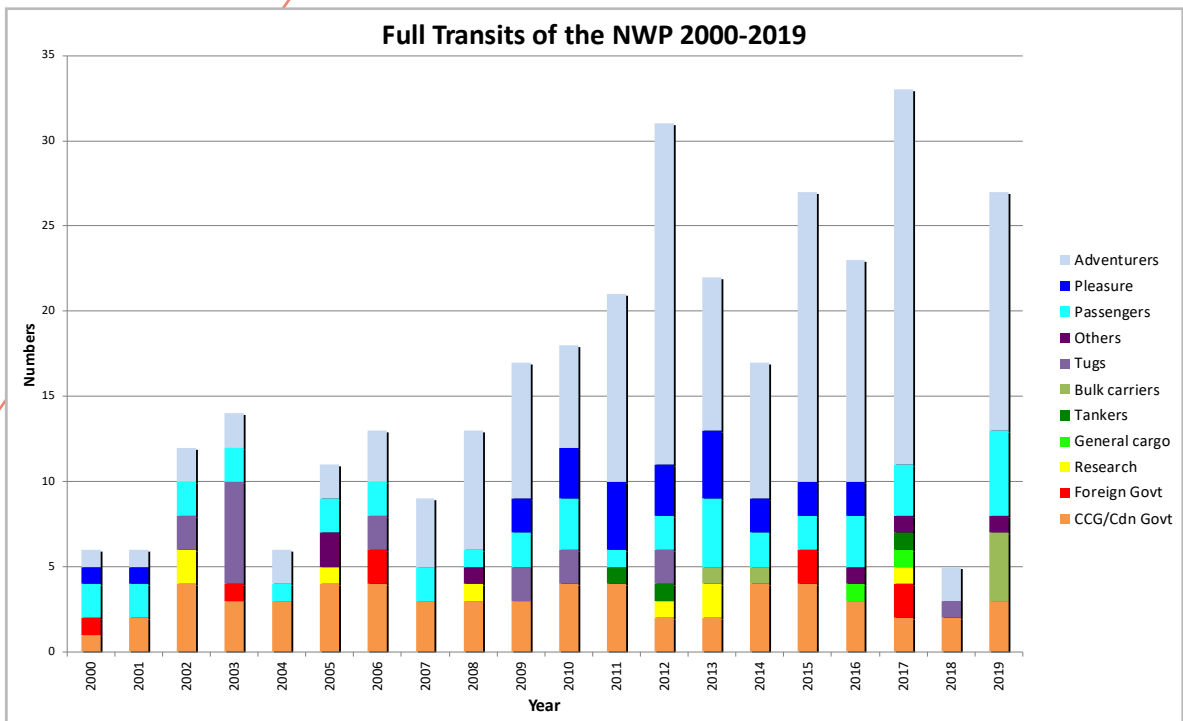
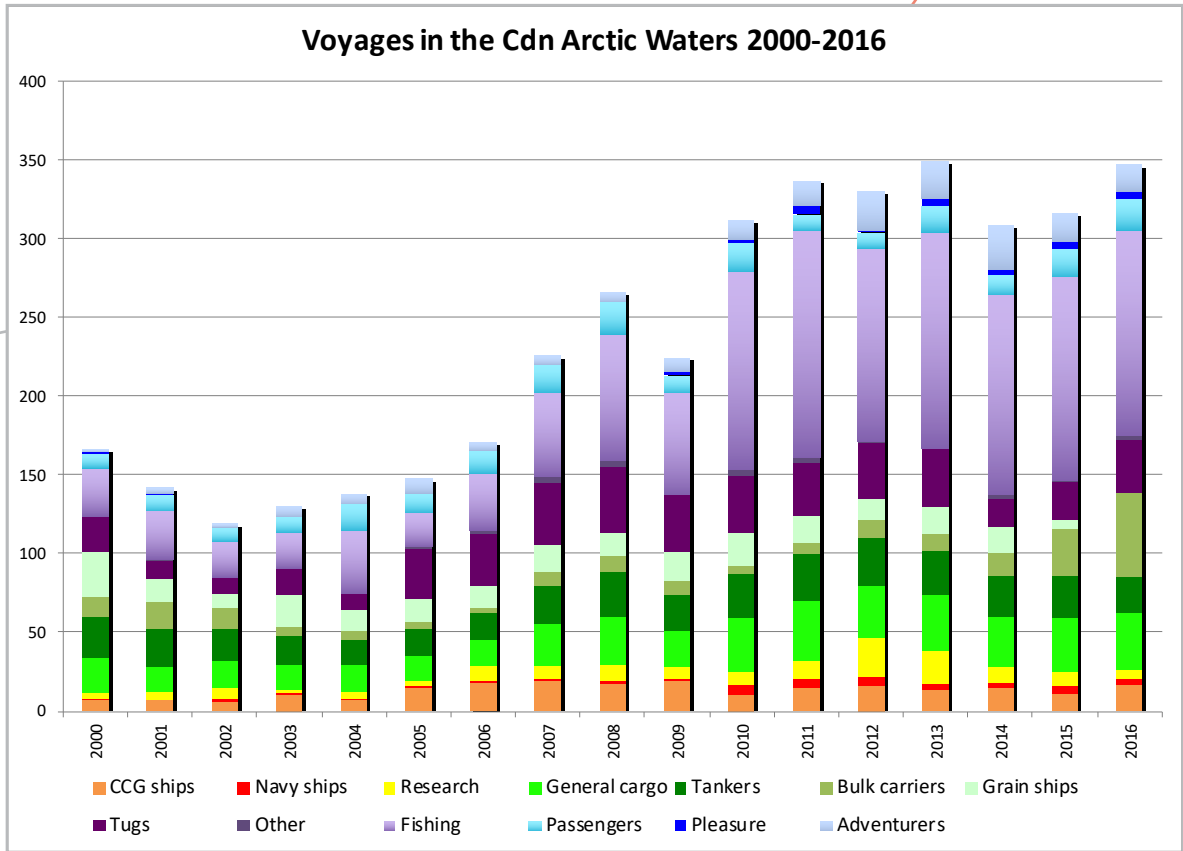
Clearly, in the Russian north, traffic volumes (both in numbers of ships and volumes of cargos) are driven by the development of mineral and hydrocarbon resource exploitation. This has a multiplying effect in the effort required to establish and sustain these northern industries. The construction of the LNG plant at Sabetta required the transport of 480,000 tons of modularized components from 10 yards in Asia in specially constructed ice-capable heavy lift ships and cargo ships. Similar logistic feats sustain and export other commodity streams such as Norilsk Nickel from Dudinka, and river traffic into central Siberia.

Contrast this situation with the marine traffic picture in the Canadian north. The numbers here are an order of magnitude smaller than the NSR figures, with the average over 2000-2016 being 237 voyages by 113 vessels annually. The average of complete transits of the NWP in this period was 15.6 voyages (6.5%), which is more than the NSR proportion of through traffic.

Port infrastructure

Another significant contrast between the NSR and the NWP is the presence of port infrastructure. The Russian north is more significantly populated with settlements serviced by river traffic supported by shallow-draft icebreakers. Significant terminals and ports exist at eight locations along the NSR other than Murmansk. The populations in the Canadian coastal north are much smaller and are generally sustained by transshipment from ramped barges across the beach due to lack of port infrastructure. There are no refueling facilities other than the repurposed Nanisivik jetty for the use of the Royal Canadian Navy and the Canadian Coast Guard. There are no ship repair facilities between Nuuk in Greenland and Dutch Harbor in the Aleutian Islands. And the construction

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Voyages in Canadian arctic waters (2000-2016), and NWP Transits (2000-2019). (Sources: NORDGREG Iqaluit/SPRI.)

of robust jetty facilities at Iqaluit, Qikiqtarjuaq, and Pond Inlet have yet to be completed. Other than a single berth community resupply jetty in Iqaluit, the facilities planned for Pangnirtung and Pond Inlet are intended to support only small-scale local vessels/small boat harbors. Qikiqtarjuaq will provide a deep-water fish product transshipment capability.

Fishing vessels make up the greatest single portion of the overall voyage record in the Canadian Arctic waters, with their share increasing from 5 voyages in 1980 to 131 in 2016, a 37.6% share of the total. This is almost exclusively in the waters of Baffin Bay and western Davis Strait, however, and therefore has to be distinguished from “NWP traffic.” In Russian waters, such vessels count for little traffic, only 38 of 1,908 voyages (2%) in 2017. While fishing numbers are very significant in the Bering, Norwegian, and Barents Seas, they are only notable in Canadian Arctic waters due to the relative lack of other traffic. With nine of ten signatories having ratified the 2018 Central Arctic Ocean Fisheries Agreement, limiting Arctic Basin commercial fisheries for sixteen years, and few bases of operation for Canadian fishing vessels in the Arctic, it is unlikely that these numbers will become any more significant to traffic “in the NWP.”

Putting aside fishing, and considering that resource extraction is feeding the greatest increase in numbers of voyages and tonnage of shipping, is it likely that a boom in resource exploitation will feed an explosion of traffic in the NWP similar to what is being seen in the NSR? This is unlikely given that such outcome is critically dependent on the willingness of local communities to accept significant increases in traffic. A proposed railway and additional terminal for cape-size ships at Milne Inlet, intended to double the output of the Mary River mine, has been stalled pending satisfaction of Inuit concerns. And Transport Canada’s undertaking with northern communities to delineate “low impact shipping corridors” will surely impose additional limitations of route and speed (including prohibitions on icebreaking) that will make a risky business more unattractively constrained.

There is perhaps a lesson here in the Russian experience. While the NSR has been developed for northern community sustainability and transit since the 1930s, it was only with the “opening” of the NSR under Gorbachev’s “Glasnost” in 1991 that international attention has been drawn to this route. Even then, and with the significant ice escort capacity that has been developed over a long time to support a heavily industrialized north, the NSR is not attracting a large number of straight-through transits. The increase in traffic rather has been firmly related to resource development.

The quickest or most interesting route?

The point has already been made that the NSR and NWP are fraught with challenges that sometimes mitigate against these being the quickest or most economical routes to destinations outside these areas. That does not mean that this is always the case. In the Baffinland iron ore trade, in the past two years, a dozen ships have made or are scheduled to make the voyage to China

over the NSR, some of these transiting as late as November. One of these ships, *MV Vitus Bering*, did the passage westward as a maiden voyage from the builder’s yard in China in November 2019. Significantly, none of the Baffinland ships have taken the far shorter route to China—westward through the NWP—as this window of opportunity is too short and too early in the BIM shipping season. Also, the only route generally available is limited to drafts less than desirable for economic cargo carriage of the BIM Panamax bulker fleet.

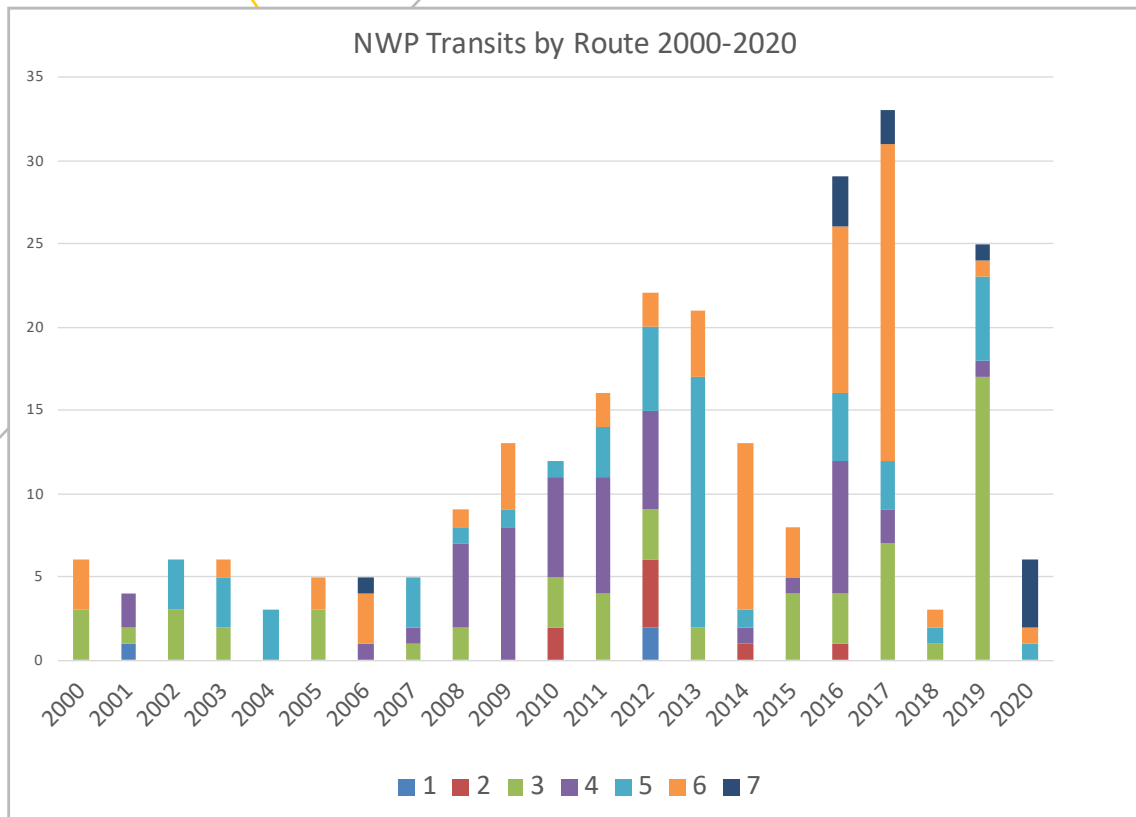
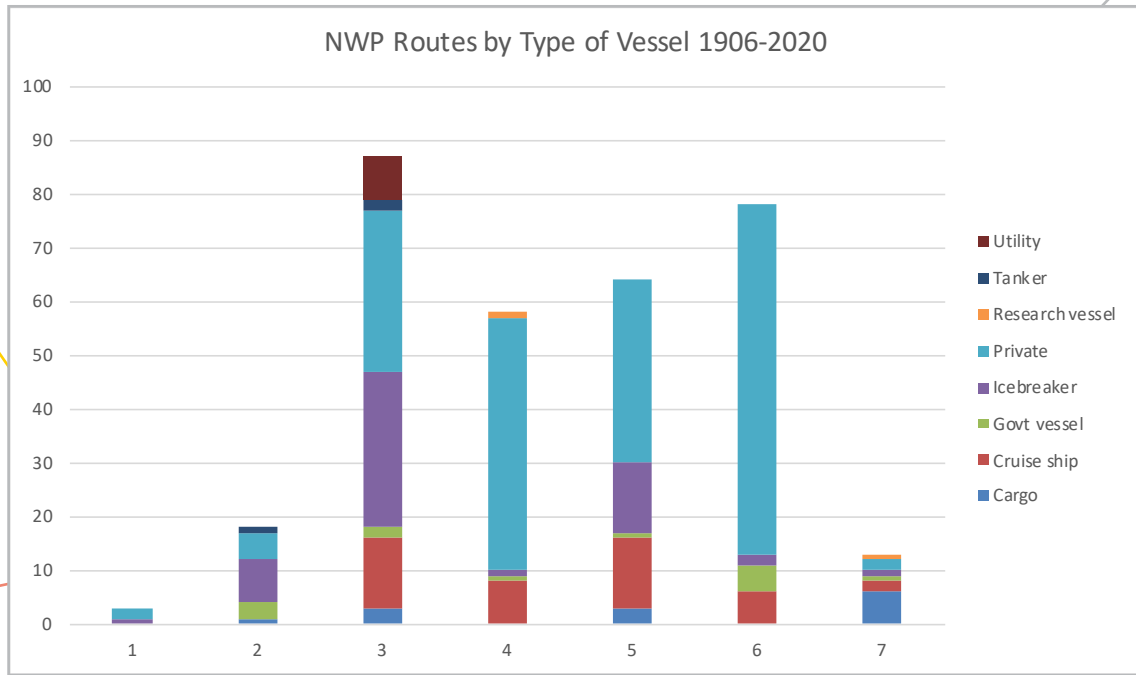
The NWP and the NSR have been crossed by several shipping companies as trial voyages. This was explicitly the case in the voyage of *MV Nordic Orion* in 2013 with coal from Vancouver eastward to Finland, and with the containership *MV Venta Maersk* in 2018 westward across the NSR. In the latter case, company spokesmen were clear about the objectives of testing the route, and the company has not followed with routine transits. One company that is

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making regular use of the NWP as a transit route, however, is the Dutch shipper Wagenborg. From 2016 to 2020, they conducted 11 voyages (5 of these in 2020), on 6 of those occasions following the challenging route 7 through Bellot and Fury & Hecla Straits. The nine different vessels they have used for this are relatively small general cargo ships of substantial ice class (PC7, capable in 0.7 m of winter ice), carrying cargos such as wood pulp from Canada to China. Wagenborg estimates that such routing saves 14 days and reduces emissions by 35%. But even this regular transit use of the NWP has occasionally been impeded by difficult ice conditions, as happened this year.

A market segment that most certainly does have potential for expansion in arctic voyaging, however, is the cruise sector. Before 2021, yachts, cruise ships, and adventurers made up 12.1% of total voyages in the Canadian Arctic. While the cruise industry has been eviscerated by the COVID pandemic in the past two years, construction before this has produced upscale expedition cruise ships of impressive ice capabilities. Crystal Cruises followed up their 2016/2017 voyages of *MV Crystal Serenity* with construction of two 25,000 GT, 200-passenger ships of PC6 ice class. Planned deliveries for other companies in 2019 included 10 ships of polar capability with 2007 berths, while 2020-2024 commitments included 30 ships of combined 6516-berth capacity. The Lindblad *National Geographic Endurance* is representative of the trend at 12,300 GT, with capacity for 126 passengers and PC5 ice class. More impressive in capability and cost will be Ponant’s *Commandante Charcot*,

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NWP transits by type and route. The routes are: 1: M'Clure Str; 2: Prince of Wales Str; 3: Peel-Victoria; 4: Rae-Simpson Str; 5: Bellot-Victoria; 6: Bellot-Simpson; and 7: Fury & Hecla-Bellot. (Source: SPRI.)



Bulk carrier *Vitus Bering* drifting in unusually calm conditions for Baffin Bay, east of Pond Inlet, awaiting clearance into Milne Inlet in July 2020.

with ice-class PC2, enabling true polar expeditions in ice up to 3.0 m, unsupported by icebreaker.

Very high latitudes

Research voyages have made regular forays to very high latitudes in the past 20 years. The icebreaker *Polarstern* made the voyage to the North Pole in 2019 and was frozen-in for a year to make a continuous set of scientific observations. This type of voyage requires either good fortune or the kind of brute power and endurance that few flags possess. While the Russians do not have a monopoly on this kind of capability, the confidence of their nuclear icebreaker fleet is shown in recurrent tracks from Svalbard north to the Pole in the years 2009-2016. Some ten other nations have also voyaged to high latitudes in the Arctic Basin and four ships other than Russian (*Healy* of the U.S., *Louis St Laurent* of Canada, *Polarstern* of Germany, and *Xue Long* of China) have been repeat visitors to 90 degrees north.

The mention of polar voyages recalls the most extreme of climate warnings, that the arctic basin will be “ice-free” by 2035, a claim that is rarely sufficiently qualified by when, for how long, and for what purpose? As with the NWP and the NSR, a trans-polar shipping route for the immediate future will be subject to a narrow window of opportunity, under widely variable conditions, unreliable scheduling, and lack of support (or search and rescue). Before this most northerly route becomes commercially attractive, the more southerly NWP and NSR are likely to become much more viable and regularly traveled. Even there, the prospect of remaining mobile ice in summer months will prevent this being a risk-free undertaking.

Reactive considerations

In the wake of the MV *Ever Given* Suez incident, some questioned whether this was the moment to reconsider the value of Arctic shipping routes, while others wondered if ships were just getting too big. Such reactive considerations connect with the dire prophecies of declining ice coverage, but ignore the increasing

inter-annual and day-to-day unpredictability in spatial distribution of ice. The year 2018 was a particularly difficult year after a couple years of easy navigation, in which the resupply of northern communities was significantly interrupted. And the more sober market calculations of freight rate/fuel costs balance, transit time and reliability, and availability of icebreaker escort, seriously impact discretionary voyaging.

Those who have studied this issue deeply point out that melting of ice is an enabler, but not a sufficient trigger, for transit traffic, and the real driver will be (globalized) resource exploitation in the north. They point out there is a large difference between the operational decisions of individual ships and a macro view of long-term trends

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driving infrastructure development. In this view, Russian efforts to provide year-round icebreaker capacity to serve LNG export to China may serve increased international transit traffic after 2020. The Arctic Council is suggested as a model of multilateral stability for economic development in the Arctic with a mantra of “High Arctic, Low Tension.” On the other hand, perceptions of increased militarization may impede some foreign investment in arctic shipping.

For many shipping companies, concern about environmental risk and reputation will find too many uncertainties in this area. For many others, this uncertainty, challenge, and mystique of the Arctic is just part of the undeniable attraction. **MT**

Adm Nigel Greenwood and Captain David (Duke) Snider are former officers of the Royal Canadian Navy and the Canadian Coast Guard respectively, who now specialize in marine risk consultation and practical polar navigation.