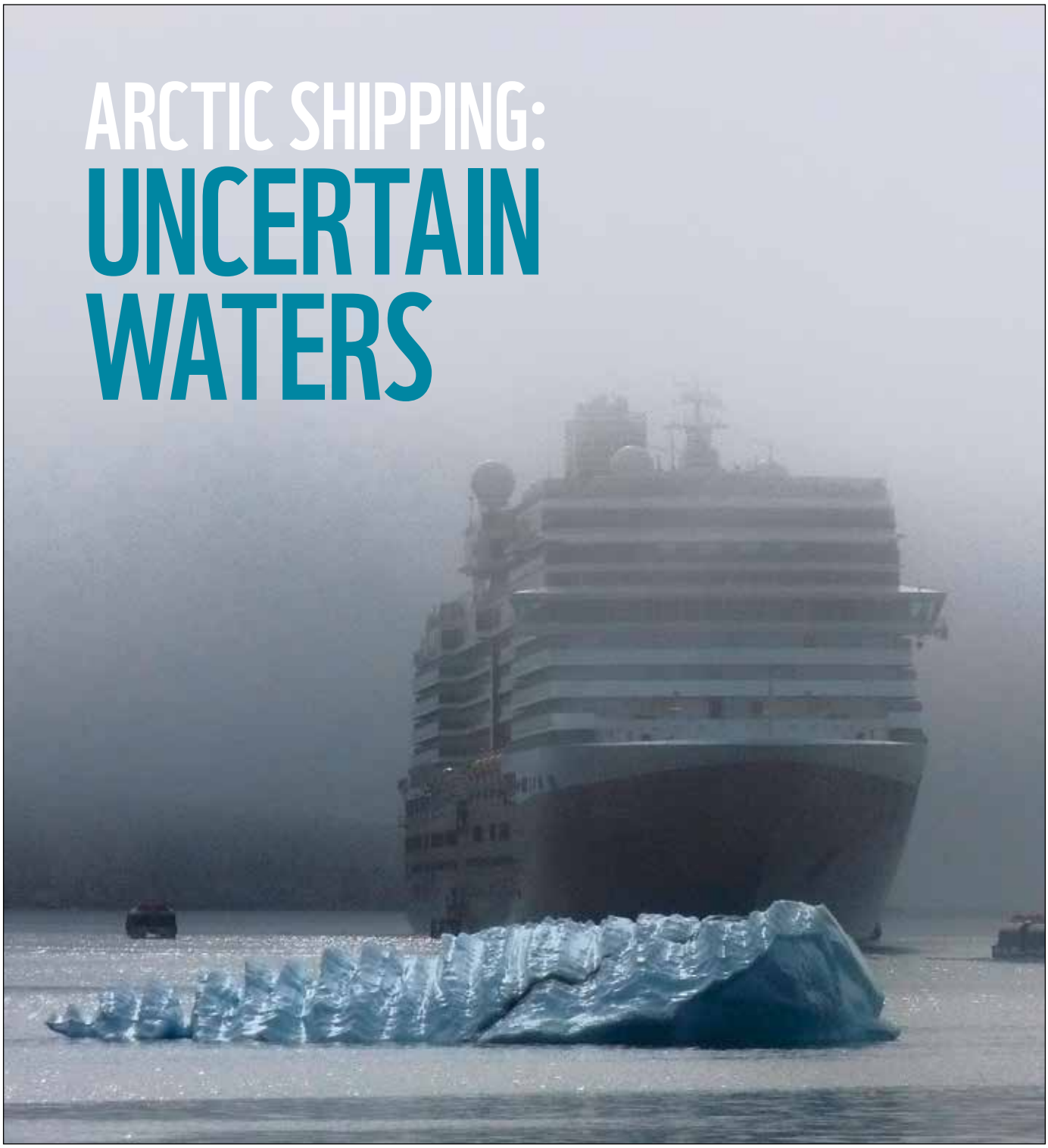
WWF
MAGAZINE
No. 3
2016

THE CIRCLE



ARCTIC SHIPPING: UNCERTAIN WATERS

PUBLISHED BY THE WWF ARCTIC PROGRAMME

ARCTIC SHIPPING

Contents

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Publisher:
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Internet: www.panda.org/arctic

ISSN 2073-980X = The Circle

Date of publication:
September 2016.

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Design and production:
Film & Form/Ketill Berger, ketill.berger@filmform.no

Printed by St. Joseph Communications

COVER: Cruiseship Eurodam, Nanortalik, Greenland
Photo: Edward Weston Follow, CC, Flickr.com

ABOVE: 60-foot plus wave hitting tanker headed south from Valdez, Alaska.
Photo: NOAA Photo Library, Captain Roger Wilson.

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The paradox of Arctic shipping

GLOBALLY, NINETY PERCENT of everything that we use has been transported by ship. Shipping is the backbone of most major economic activity, from the extraction of natural resources to manufacturing of goods. Quality of life and standard of living depend on global trade, and shipping is the vehicle for this trade, whether it is transporting ore across an ocean or bringing canned food to remote Arctic communities. Shipping can also cause serious environmental impacts and risks, especially in the Arctic. An increase in global population and commodity prices, and a decrease in sea ice are factors in what many experts say will boost ship transits in the Arctic. As the number of voyages rises so do the risks to marine habitats and species, which many northern and Indigenous peoples rely on for food and culture. In Canada for example, it's estimated that 50% of the daily diet of northerners comes from the ocean.

Underwater noise, oil spills, introduction of invasive species, air emissions including black carbon and GHGs, and disturbance of ice habitat, are all part of the complex risk profile which shipping brings to the Arctic.

Climate Change and its effects on sea ice are well documented, we're losing it fast and its decline is opening up the Arctic at unprecedented rates. This however doesn't mean ships won't encounter ice, and as development pressures increase, winter shipping is being contemplated where it was unthinkable in the past. Sue Wilson and Simon Goodman in their article describe the interaction between seals, pups and shipping in ice. And as Nancy Kinner describes in her article on spill response, remoteness adds to the already difficult task of cleaning up spills. Ice exacerbates the response and restoring a spoiled ecosystem is an impossible task.

As Arctic and other flag states grapple with the IMO's (International Maritime Organization) Polar Code, a set of Arctic specific shipping regulations, Michael Kingston has been leading an initiative for an *Arctic Marine Best Practice Information Forum*. It is a laudable project which could be a clearing house for the latest information and operational guidelines that cause the least impact.

There are opportunities for mitigation on many issues and then there are impacts and risks we just can't live with. Dr. Sian Prior makes a case for just that type of approach when it comes to heavy fuel oil (HFO) use in the Arctic. It is a particularly toxic and polluting fuel, and is being burned in the Arctic, unrestricted. Its elimination and phase out is needed now just as has been done in Antarctica and parts of Norway. For this fuel, in this region and for these impacts there is only one solution; elimination.

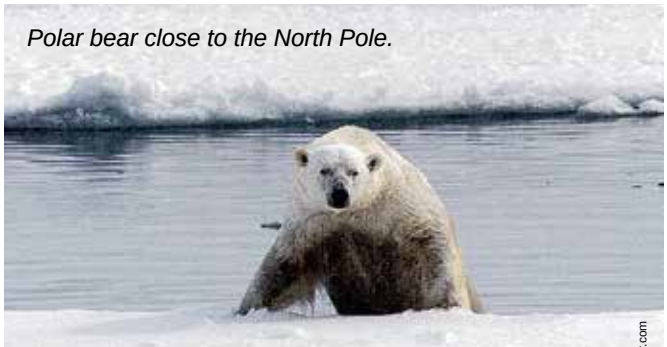
Northern communities are on the front lines of climate change, accidents, spill response, increased development and many associated impacts from shipping. Austin Ahmasuk describes impacts that shipping has had on his community. It's a voice that doesn't get heard often enough.

SHIPPING: IT'S AN ESSENTIAL SERVICE WHICH HAS ENVIRONMENTAL IMPACT

ANDREW DUMBRILLE is Senior Specialist, Sustainable Shipping WWF-Canada.

Vicki Aitaok paints a very positive community experience from the recent visit by the Crystal Serenity, the largest cruise ship to transit the Northwest Passage. The economic benefits are clear and the cultural exchange seems profound for passengers. Michael Byers would disagree. He argues tourism is possible because of climate change and more tourism means more climate change. That's the complex situation with shipping, it's an essential service which has environmental impact but can contribute significantly to economic growth and increased standard of living for many northerners.

As many of our authors have outlined, the impacts from shipping are severe and the risks real to both marine habitat and food security in the north. Risks are equally high if essential goods and development don't reach people in the north. Our challenge is to get the rules right that reduce accidents and conflicts, and provide opportunity for people in the Arctic. ○



Polar bear close to the North Pole.

Photo: Christopher Michel, CC, Flickr.com

Declining ice pressures Arctic wildlife

THE ARCTIC'S summer sea ice has hit a near-record low extent, putting pressure on the region's wildlife. Figures from the US National Snow and Ice Data Centre indicate the ice hit a low of just over four million square kilometres in early September, well below the average. The low occurs as a new paper shows that all 19 of the world's polar bear subpopulations are facing trends of declining ice coverage.

"We are seeing more species moving in to take advantage of warming Arctic waters, and specialized Arctic species such as polar bears showing signs of stress in some regions," says Melanie Lancaster of WWF's Arctic Programme. "Conservation action to preserve the Arctic is urgently needed to keep up with these rapid changes".

The Arctic is particularly vulnerable to extreme heat – the region is warming at twice the rate of the rest of the world. Globally, the past 16 months have each broken consecutive heat records, with July and August 2016 tied as the hottest months ever recorded. 2016 may go down as the hottest year ever recorded.

The continued warming trend turns up the heat on national governments to speed up ratification of the Paris agreement on tackling climate change. To enter into force, the agreement must be ratified by at least 55 countries representing at least 55 per cent of global greenhouse gas emissions. WWF believes urgent and accelerated implementation of the Paris deal is necessary in order to prevent the worst impacts of climate change.

Anthrax outbreak triggered by warming kills boy in Arctic Circle

A 12-YEAR-OLD BOY in the far north of Russia died in an outbreak of anthrax that experts believe was triggered when unusually warm weather caused the release of the bacteria.

The boy was one of 72 nomadic herders, including 41 children, hospitalised in the town of Salekhard in the Arctic Circle, after reindeer began dying en masse from anthrax.

Five adults and two other children have been diagnosed with the disease, which is known as "Siberian plague" in Russian and was last seen in the region in 1941.

More than 2,300 reindeer have died, and at least 63 people have been evacuated from a quarantine area around the site of the outbreak.

Anthrax can survive in frozen human and animal remains for hundreds of years, waiting to be released by a thaw, according to Alexei Kokorin, head of WWF Russia's climate and energy programme.

"Such anomalous heat is rare for Yamal, and that's probably a manifestation of climate change," he said.

Average temperatures in Russia have increased by 0.43C in the past 10 years, but the rise has been more pronounced in areas of the far north. The warmer climate has begun thawing the permafrost soil that covers much of Russia, including cemeteries and animal burial grounds. Thawing permafrost has also led to greater erosion of river banks where nomads often buried their dead, Kokorin said.

Russia puts hold on drilling

THE RUSSIAN government has announced a temporary moratorium on new offshore oil and gas licenses for drilling on the country's Arctic shelf.

"In light of macroeconomic instability, the government has declared a moratorium on the allocation of new offshore license areas in the Arctic," Natural Resources Minister Sergei Donskoi said at a meeting between President Vladimir Putin and government members.

WWF-Russia has long advocated for such a moratorium, which it says will allow Russia to redirect financial support for risky offshore Arctic development to less environmentally hazardous projects on land.

Offshore drilling in the Arctic is extremely perilous due to the Arctic's extreme environmental conditions, including tumultuous seas, extreme cold and long periods of darkness. When coupled with the looming threats of climate change in the region, WWF advocates

Ditching diesel in Arctic Canada

COMMUNITIES in the Canadian Arctic took major steps toward reducing reliance on diesel fuel at the Arctic Renewable Energy Summit in Iqaluit. The summit was organized by WWF-Canada and co-hosted by the Government of Canada, Government of the Nunavut territory and the Nunavut government-run Qulliq Energy Corporation.

During the summit: Nunavut committed to creating a territorial Climate Change Secretariat; the Waterloo Institute for Sustainable Energy presented new research that shows millions of dollars in savings for some Nunavut communities by shifting to more renewable energy generation; the Qulliq Energy Corporation announced it would open its electricity system to allow renewable sources. The Nunavut hamlet of Arviat, in a letter of support, stated its commitment to increasing renewable energy use; and WWF-Canada announced the launch of an Arctic habitat-friendly renewable energy training fund to drive local expertise and economic development.

Photo: Peter Ewins, WWF-Canada

Diesel storage facility in the Hamlet of Arviat.

Equally important was the information sharing with communities in Alaska and Russia already relying heavily on clean-energy power, and the relationship building among utility, industry and policy experts.

Diesel fuel has long been the primary source of energy in Arctic communities. While reliable, it has a negative environmental impact from pollution, carbon emissions and spill risk as well as logistical and financial costs. Habitat-friendly renewable energy from solar and wind offers a cost-effective way to reduce reliance on fossil fuels.

keeping fossil fuels in the ground and focusing on a more stable energy future

Dangers of Arctic shipping – 1845 edition

RESEARCHERS SAY the long-lost ship of British polar explorer Sir John Franklin, HMS Terror, has been found in pristine condition at the bottom of an Arctic bay. The discovery challenges the accepted history behind one of polar exploration's greatest mysteries. HMS Terror and Franklin's flagship, HMS Erebus, were abandoned in heavy sea ice far to the north of the eventual wreck site in 1848, during the explorer's doomed attempt to traverse the Northwest Passage.

All 129 men on the Franklin expedition died, in the worst disaster to hit Britain's Royal Navy in its long history of polar exploration. Search parties continued to look for the ships for 11 years after they disappeared, but found no trace.

Parks Canada underwater archeologists have led the mission since it began in 2008. Now they must confirm the wreck is Terror, either by examining the foundation's images or visiting the site themselves. This latest discovery was made in September, 2016, two years and a day after Canadian marine researchers found the wreck of the Erebus in the same area of eastern Queen Maud gulf where Inuit oral history had long said a large wooden ship sank.

The dirtiest fuel

Heavy fuel oil (HFO) is the residue and the heaviest elements from making refined oil. It is thick and sticky and breaks down very slowly, particularly in polar conditions. Dr. SIAN PRIOR **says it is environmentally destructive and should be banned from use in the Arctic.**

The Russian tanker Renda transits toward Nome, Alaska, Jan. 13, 2012 to deliver fuel to the city which was iced in by winter storms.

Photo: Charly Hengen, U.S. Coast Guard, CC, Flickr.com

THE GROUNDING OF the Norwegian tanker *Champion Ebony* off Nunivak Island in the Bering Sea in June 2016 is a stark reminder that the Arctic, adjacent seas and coastal communities need to be safeguarded from the risks of shipping in remote northern waters. The tanker was carrying over 14 million gallons of petroleum fuel to villages in the region. If ruptured, it could have devastated local resources, placing the community on the front line of an oil spill with virtually no capacity to handle a disaster of that magnitude.

HFO spills in the Arctic threaten the four million people living there, particularly the food security of people in Indigenous communities. The International Tanker Owners Pollution Federation (ITOPF) found that the consequences of heavy fuel oils can be more prolonged because of the persistent nature of the product, with the threat to vulnerable marine life such as seabirds as well as economically sensitive resources on occasion lasting longer in the event of a heavy fuel oil spill. In frozen waters, oil could be trapped in ice allowing it to persist even longer, and travel greater distances.

The Arctic Marine Shipping Assessment (AMSA) also found that the most significant threat from ships to the Arctic marine environment is the release of oil through accidental or illegal discharge. HFO spills are notoriously difficult to clean up and slow to disperse. The Arctic Council's Protection of the Arctic Marine Environment working group (PAME) says this risk can be greatly reduced "if the onboard oil type is of distillate type rather than HFO".

The evidence against using and transporting HFO continues to grow. A new report to the European Climate Foundation investigates the ecological, economic and social costs of marine/coastal spills of fuel oils. It concludes that the cost per tonne of oil spilled, the cost per tonne of oily waste recovered from sea surface and shoreline, and the cost per kilometre of coastline clean up strongly indicates that polar and sub-polar HFO spills are more expensive in terms of response and impact, than those occurring in environments which are neither remote nor polar/sub-polar. The report also concludes that polar and sub-polar HFO spills, by virtue of their remoteness, the extreme weather and sea state conditions, and the relative lack of data, are very difficult to respond to and may result in high levels of environmental and socio-economic impacts.

HFO SPILLS ARE NOTORIOUSLY DIFFICULT TO CLEAN UP AND SLOW TO DISPERSE

HFO also produces harmful and significantly higher emissions of sulphur and nitrogen oxides and black carbon (BC) than other fuels. Black carbon is transported according to regional meteorological conditions and strongly absorbs visible light. When it falls on light-coloured surfaces, such as Arctic snow and ice, the amount of sunlight reflected back into space is reduced and thus contributes to accelerated snow and ice melt. One study estimated that in 2010 Arctic shipping BC emissions amounted to 1,230 tonnes and would double by 2030 based on business as usual and high growth scenarios. Emissions from HFO use also impact human health: inhaling BC nanoparticles is associated with heart and lung disease and death. Burning HFO also produces other toxins such as polycyclic aromatic hydrocarbons (PAHs) and heavy metals.

Dr SIAN PRIOR is an expert in ocean governance and marine policy development.

The Arctic Monitoring and Assessment Programme's (AMAP) latest report on BC says "shipping currently accounts for about 5% of black carbon emissions [in the Arctic], but could double by 2030 and quadruple by 2050 under some projections of Arctic vessel traffic." At the same time, emissions from land-based sources are expected to fall due to stricter controls, increasing the relative importance of addressing emissions from shipping. Switching from HFO fuels to alternatives, such as low-sulphur distillate fuel will not eliminate BC emissions

but is expected to reduce BC emission levels by about 30% and possibly up to 80%.

More than a decade ago, the use of HFO in the Antarctic was prohibited due to conditions such as icebergs, sea ice and uncharted waters, and the high potential of environmental impacts associated with a spill. The resolution prohibits the use or carriage as fuel (or cargo) of HFO in the Antarctic area. The new measure took effect in August 2011, however an unforeseen loophole came to light in April 2013, when a Chinese-flagged vessel fishing for krill in the Southern Ocean, caught fire and sank off the Antarctic coast. It had been carrying HFO as ballast! An amendment was made and since March 2016, the presence of heavy fuel oil (HFO) on ships operating in the Antarctic or Southern Ocean has been prohibited.

Surely a similar approach should be adopted for the Arctic, where not only is there a risk of spills but the threat of emissions to air, and in particular the deposition of black carbon, is also a major concern.

During the development of the Polar Code, which takes effect January 2017, the Arctic and Antarctic protection measures for discharges of ships' wastes (oil, sewage, garbage, etc) were aligned. The Code however, failed to include mandatory requirements to address HFO in Arctic waters, although it recommends that Arctic shipping applies the same measures with respect to HFO as Antarctic shipping. Support for a ban on HFO in the Arctic was felt to be premature. The risks and threat to polar ecosystems and wildlife is similar but the nature of shipping in the two polar regions is very different. In Antarctica, shipping is largely comprised of passenger ships, fishing boats and government research vessels, whereas in the Arctic there are also cargo vessels servicing coastal communities in the Arctic and increasingly transiting the Northern Sea Route and Northwest Passage as summer sea ice recedes.

There has been some progress. Earlier this year the PAME Working Group invited proposals for mitigating the risks associated with the use and carriage of HFO by vessels in the Arctic. In March in the U.S.-Canada Joint Statement on Climate, Energy and Arctic Leadership, President Obama and Prime Minister Trudeau committed to "determine with Arctic partners how best to address the risks posed by heavy fuel oil use and black carbon emissions from Arctic shipping". In May, the U.S.–Nordic Leaders' Summit issued a Joint Statement which committed to working towards "the highest global standards, best international practice, and a precautionary approach, when considering new and existing commercial activities in the Arctic…" It could certainly be argued that "best international practice" with respect to HFO, is to ban its use and carriage, as has been done in the Antarctic.

The governments of Norway, Sweden and France have also indicated their desire to ban HFO use in the Arctic.

The ultimate goal is an HFO-free Arctic. However, until communities can move away from household dependence on this dirtiest of fuels, a tailored approach may be necessary. This could involve strict routing measures and mandatory reporting, to address the carriage of HFO cargoes, however the first milestone towards an HFO-free Arctic must be a ban on the use and carriage of HFO as a shipping fuel by 2020. ○

HFO PRODUCES HARMFUL AND SIGNIFICANTLY HIGHER EMISSIONS OF SULPHUR AND NITROGEN OXIDES AND BLACK CARBON THAN OTHER FUELS

Liquefied

ALEXEY KNIZHNIKOV
LUDMILA AMETISTOVA

LIQUEFIED NATURAL GAS (LNG) is becoming increasingly popular around the world for its high energy intensity. It is odorless, colorless, non-toxic and non-corrosive, easily stored and transported, and is considered more ecologically friendly compared to other kinds of fossil fuels because it gives off fewer emissions when burning. At the same time LNG projects have a negative effect on the environment. Liquefaction plants and re-gasification terminals, as well as transporting LNG by tankers are all harmful to air, soil, water bodies, flora, and fauna. The damage is particularly noticeable if LNG production is located in ecosystems such as the Arctic with low self-restoration capacity. Since LNG consists mainly of methane, the greatest environmental issue is greenhouse gas emissions (GHG) and contribution of LNG production and transportation to global climate change.

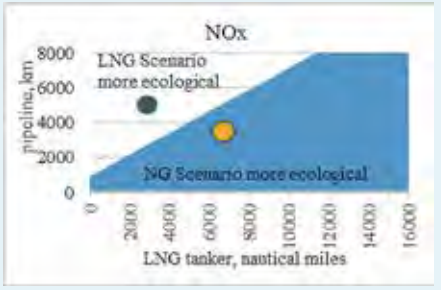
In the near future, substantial volumes of LNG are to be transported from the Yamal region in the Russian North through the Northern Sea Route to European and Asian markets. Development of industrial projects in Arctic regions, together with global warming and melting of ice in high latitudes, will contribute to intensified vessel traffic in Arctic waters. LNG tankers are expected to be the main driver for shipping traffic along the Northern Sea Route above Russia. This is expected to create a significant burden on the polar environment.

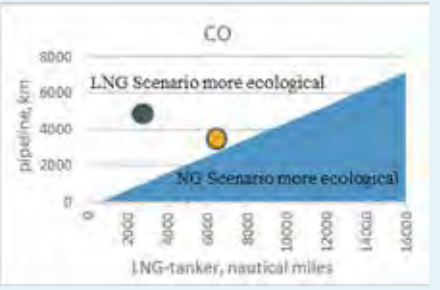
When making investment decisions, environmental considerations, and not only technical feasibility and economic

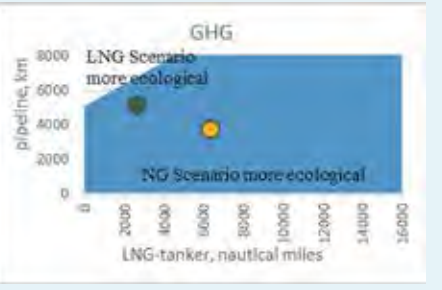
natural gas

FIGURE 1. Level of environmental impact of NG and LNG scenarios in Arctic regions depending on transportation distance for nitrous oxides (NOx), carbon monoxide (CO), and aggregate greenhouse gases (GHG).

- Western route from Yamal
- Eastern route from Yamal







benefit, should be taken into account. This raises the question, usually at the investment feasibility stage: should LNG be exported from the point of production to end users by overland pipeline transport, or sea transport with preliminary liquefaction and transportation by LNG-powered gas carriers?

WWF Russia has done a comparative analysis of the environmental impacts of these two natural gas transportation options in the Arctic region – namely, by means of overland pipeline transfer (NG Scenario) and utilizing LNG tankers (LNG Scenario). The study indicates environmental benefits or drawbacks of either method of natural gas transportation from high latitudes, depending on the length of the routes (Figure 1).

THERE IS NO MECHANISM IN RUSSIA TO MANAGE ENVIRONMENTAL RISKS IN THE SHIPPING INDUSTRY

For example, if gas needs to be delivered from Yamal (Russian North) to Western Europe (green mark), LNG tanker is more ecologically friendly than the pipeline from the viewpoint of emitting major pollutants and less ecological from the viewpoint of influence on global climate. At the same time, for the gas export from Yamal to Asia (yellow mark), LNG-powered tankers provide an ecological advantage as compared to gas pipeline transportation regarding carbon monoxide emissions. Overland gas pipeline is more ecological from the nitrous oxides and greenhouse gasses point of view.

Currently, there is no mechanism in Russia to manage environmental risks in the shipping industry. Lack of statutory requirements to conduct Environmental Impact Assessments for marine transport creates uncertainty and a lack of plans for decreasing shipping impacts on fragile Arctic ecosystems.

To accurately assess the likely harm of shipping or pipelines associated with development of natural gas, a Strategic Environmental Assessment (SEA), one of the key international standards in environmental protection should be conducted. SEA assesses the potential influence of a strategy, plan or program implementation before it is approved to define ecological factors and possible environmental consequences. SEA is an important factor in ensuring environmental protection when implementing major infrastructure, regional, or industry projects and programs.

SEA must occur before implementing new LNG projects to conduct comparative analysis of gas transportation to end-users from the viewpoint of environmental risks. In future, SEA must be made obligatory at the legislative level in Russia, although this instrument can already be used now as a voluntary corporate standard. Integrating SEA in the decision-making process will help to minimize environmental risks in the Arctic region. Preserving this ecosystem is important not only for Russia, but for the global community. ○

Developing the Northern Sea Route

The Northeast Passage above Arctic Russia has long been touted as the most likely viable trade route through the Arctic as the Arctic shipping season in the region lengthens. But as Dr. BJØRN GUNNARSSON writes, developing the route requires a lot of investment which Russia likely cannot afford alone

Dr. BJØRN GUNNARSSON is Managing Director, Centre for High North Logistics Nord University Business School In Norway

IN 2015 a total of 5.4 million tons of goods and project cargo was transported on the NSR, up from about 4.0 million tons in 2014 and 3.9 million tons in 2013. Only a small fraction was transit cargo between two ports lying outside the Russian official boundaries of the NSR.

NSR cargo flow is expected to increase considerably with further development of Russian Arctic hydrocarbon projects. Year-round export of LNG from the Sabetta Port should reach 17.6 million tons per year starting with the year 2021; crude oil from the Novoport Oil Field 8.5 million tons per year by 2017 (through loading terminal off Cape Kamenny); and crude oil from the Payakha Oil Field 7.3 million tons per year by 2024; according to information from Rosatomflot.

This is in addition to year-round transport of 1.3 million tons per year of nickel and other nonferrous metals from Norilsk Nickel at the Dudinka Port on the Yenisei River. Other projects in the planning states are Novatek's Arctic LNG-2 on Yamal and Gydan with estimated 16.5 million tons of LNG produced per year; transport of 5-10 million tons of coal from the Taymyr Peninsula from the port of Dikson as part of the VOSTOK coal Project; and 45 million tons per year of crude oil as part of the Transneft-Arctic Project with development of an offshore loading terminal for crude oil in the Sabetta Port.

If all these energy projects come through then transport volumes on the NSR could reach 100 million tons per

TRANSPORT VOLUMES ON THE NSR COULD REACH 100 MILLION TONS PER YEAR BY 2030


Pacific Ocean
Bering Sea
Cold Bay
Kodiak
Bethel
Anchorage
Valdez
Juneau
Nome
ALASKA (USA)
Yukon
Point Hope
Prudhoe Bay
Inuvik
Barrow
Mackenzie River
Northwest Territories
Chukchi Sea
Chukchi Autonomous Okrug
Anadyr
Petropavlovsk Kamchatskiy
Kamchatka
Palana
Magadan
Nizhneyansk
Chukot
Tiksi
Lena River
Nunavut
Resolute
Arctic Bay
Arctic Ocean
Taymyr
Evenk
RUSSIA
Dickson
Yamal-Nenets
Khanty-Mansiy
Ob River
Nenets
Komi
Murmansk
Archangel
GREENLAND (DENMARK)
Iqaluit
Greenland Sea
Barents Sea
Norwegian Sea
ICELAND
Reykjavik
Tromsø
Murmansk
Trondheim
SWEDEN
FINLAND
NORWAY
Bergen
Oslo
Helsinki
Stockholm
København
Legend
Arctic shipping routes
Arctic Bridge Route
North East Passage
North West Passage
Northern Sea Route
Capital
City/town
Exclusive economic zone
Median ice extent. September 1981-2010
Record minimum sea ice extent. 16 September 2012
MAP: Ketill Berger, Film & Form
SOURCE: Natural Earth. National Snow & Ice Data Center, NSIDC. Arctic Council: Arctic Marine Shipping 2009 Report

year by 2030. Most of this cargo will be transported on the NSR westwards from the Yamal, Gydan and Taymyr Peninsulas to European markets and onwards through the Suez Canal to Asia. Part of the cargo will be transported eastwards on the NSR to Asian markets, but likely mainly during the five to six months of the summer-fall navigational season when sea-ice conditions are most favorable.

The large Russian rivers which all flow north into the Arctic Ocean can also act as major transport connections from the internal part of Russia to the NSR, but also the other way around as Russian rivers such as Ob, Yenisei and Lena Rivers offer logistical possibilities for transportation of goods and project cargo from the NSR into the inner parts of Russia promoting further industrial development.

In short, NSR is the ideal throughway for Russian Arctic resources and industrial products westwards to European markets and eastward to markets in NE Asian, and for promoting regional industrial development.

But what are long-term prospects for the NSR to develop not only into Russian-Asia and Russia-Europe maritime trade routes but into an international trade route between markets in the North-Atlantic and the North-Pacific?

A total of about 120 full transit voyages took place from 2010-2013 with ice-strengthened cargo vessels transporting different types of cargo at different times during the summer-autumn navigational season and encountering different sea-ice conditions and other weather-related operational conditions. These demonstration voyages showed that NSR can be relatively safe and reliable with escort and guidance from the Russian icebreaking fleet and use of Russian ice pilots (navigators). But to be of interest for commercial shipping, the NSR needs to provide not only needed safety but also predictability and punctuality of cargo transport. Regularity of year-round supply of goods is no less important than the cost of transportation. The current limited seasonal window for trans-Arctic voyages of five months (July-November) will be a limitation to the NSR's full development and economic viability.

To make the NSR safer and more reliable as a transport route both for Arctic resources as well as more attractive as an alternative trade route between markets in NW Europe and NE Asia, a number of important changes need to take place. This includes strengthening NSR's overall administration and management, transport services, and last but not least maritime infrastructure.

Today in Russia there is no single organization that oversees all NSR activities. Such an organization should determine tariff rates, predict future NSR traffic, cargo volumes, and demand for icebreaker assistance and other support services.

The NSR management also needs to find ways to reduce risks of shipping delays due to sea-ice by improving sea-ice predictions and ice reconnaissance. The tariff system needs to be user friendly and fees competitive and similar to canal fees on southerly routes (Suez/Panama). Icebreakers and ice pilot services are key elements of the NSR's support services. Sufficient icebreaking capacity needs to be available to assist vessels in transits and to keep the route open. The problem is that Russian icebreakers have since 2014 been primarily engaged in Arctic oil and gas projects and this will likely continue to be the case over the next several years.

We need a detailed study that shows the structural and design characteristics of a new NSR transport and logistics system – a system that we would like to see put in place in the near future, for example by 2040 or 2050, to satisfy our safety, reliability and environmental requirements. All stakeholders need a clearer picture of how various components of the logistics chain are tied together and how the whole logistics system should operate and function.

Full-scale, year-round transit shipping on the NSR requires different physical infrastructure and support services than the current seasonal operation during the five months of summer and early fall which is taking place in largely ice-free waters. The build-up of new infrastructure will take many years and will be costly. Infrastructure build-up is also needed along the whole length of the North East Passage not just the Russian-defined borders of the NSR. Without cost-sharing the up-front capital costs of establishing proper maritime infrastructure are prohibitive and too high for Russia to take on alone. If an agreement is reached on the design of a new NSR's maritime transportation and logistics system then the next step is establishing international cooperation and partnerships for putting the required infrastructure in place. Russia has already stated that ideal partners would be countries in NE Asia that see benefit in greater access to Russian Arctic resources and a shorter trade route to to NW Europe (China, South-Korea and Japan). ○

This piece is adapted from an article previously published in The Maritime Executive with the permission of the author.

Container ship, Murmansk; Russia. November 14, 2009

Photo: euno, CC, Flickr.com

Arctic Cruises: try staying home writes Michael Byers

ARCTIC CRUISES are the latest thing in high-end tourism. Icebergs, polar bears, beluga whales, awe-inspiring vistas and isolated Inuit communities – what's not to like for the jaded traveller?

This summer, thousands of people will sail the Arctic's increasingly ice-free waters. At the very top end, the world's most luxurious cruise ship, the Crystal Serenity, will traverse the Northwest Passage from Anchorage to New York City. The 1,070 passengers will pay up to $120,000 (U.S.) for the privilege.

But here's the thing: Arctic cruises involve greater hazards and environmental impact than just about any other kind of tourism.

Among the hazards are small chunks of icebergs called "growlers" that are exceptionally hard and float low in the water, making them difficult to spot. In 2007, a small ice-strengthened expedition cruise ship struck a growler and sank during an Antarctic voyage, in conditions similar to those now found in the Arctic. And while climate change is melting the sea ice, which forms on the surface of the ocean in winter, icebergs are actually increasing in number, as melt water lubricates the movement of land-based glaciers into the sea.

Running aground is another hazard, given that Arctic waters are poorly charted. In 2010, an expedition cruise ship ran onto a shoal in the Northwest Passage that was not shown on marine charts. Fortunately, the weather was good and a Canadian Coast Guard icebreaker was only two days' sailing away.

Arctic weather is unpredictable and often severe. "Icing," caused by ocean spray freezing onto the superstructure of a ship, is of particular concern because it can destabilize and even capsize a vessel.

Yet search-and-rescue systems would be overwhelmed by any accident in the Arctic involving more than a few dozen people. The Canadian Forces' search-and-rescue helicopters sometimes require two days to reach the Northwest Passage from their bases in Newfoundland, Nova Scotia and British Columbia.

Oil spills are also a concern. A cruise ship the size of Crystal Serenity carries more than a million litres of fuel oil. In 2004, a much smaller cargo ship lost power in Alaska's Aleutian Islands, was blown aground and broke apart, spilling 1.2 million litres of fuel oil. Almost none of it was recovered because of the remote location, severe weather, and the near-complete absence of oil-spill cleanup equipment and personnel.

Crystal Serenity is very professionally managed, which will minimize the risks. But the voyage will draw other cruise ships north, making a serious accident almost inevitable. No one expected, in 2012, that the Costa Concordia would run onto well-charted rocks along the coast of Italy.

Just as problematically, Arctic cruises constitute a form of "extinction tourism," in which people travel to see a species or culture while they still can.

Climate change is advancing quickly in the Arctic, threatening a food chain based upon plankton and Arctic cod that have evolved to live in cracks and crevices under the sea ice. As the ice disappears, so do these species and the predators they sustain, including beluga whales and polar bears.

ARCTIC CRUISES INVOLVE GREATER HAZARDS AND ENVIRONMENTAL IMPACT THAN JUST ABOUT ANY OTHER KIND OF TOURISM.

Worse yet, Arctic cruises create their own climate change "feedback loop." These trips are only possible because the sea ice is melting, and their carbon-dioxide emissions contribute to even more melting in years to come.

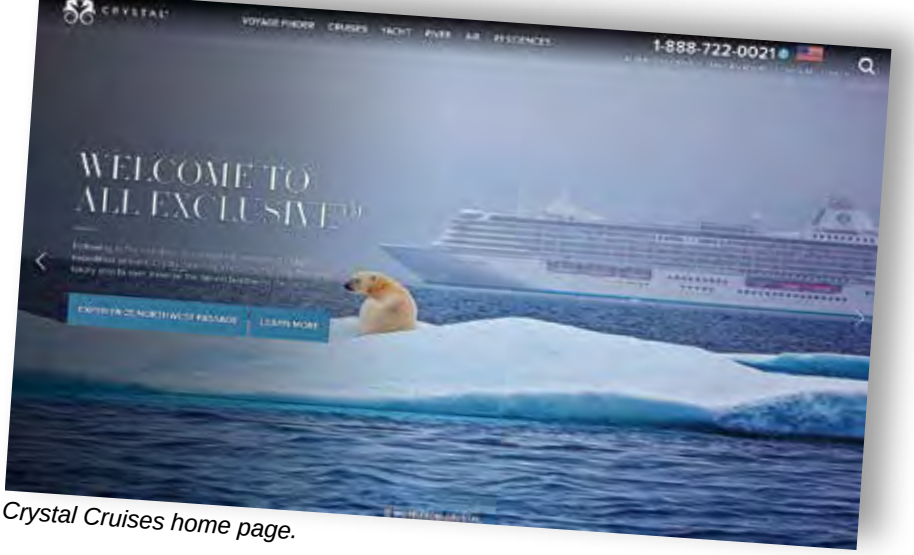
Consider the emissions associated with the Crystal Serenity: Passengers will fly from their homes to Anchorage, and return at journey's end from New York. On board the ship, they will enjoy food products that have also travelled great distances. They will be cared for by 655 crew members, each with their own smaller but still significant climate footprint. All the while, the ship will be burning fuel oil for propulsion, heat and electricity.

The best argument in favour of Arctic cruises is that they raise awareness about climate change. Witnessing a beautiful ecosystem under threat can move some people to action, but I have also seen climate-change deniers double down on their beliefs when sailing newly open Arctic waters. The issue is not whether the sea ice is melting, but whether we accept the scientific process that has produced thousands of peer-reviewed articles explaining the cause.

The Arctic is beautiful and threatened by greenhouse gas emissions, but so are the birds and flowers in your local park. If you want a safe, climate-conscious vacation, try staying closer to home. ○

MICHAEL BYERS holds the Canada Research Chair in Global Politics and International Law at the University of British Columbia. He is the author of International Law and the Arctic.

This article first appeared in the Canadian national newspaper, the Globe & Mail and is reprinted with the permission of the author.



Crystal Cruises home page.

The view from shore

There has been a lot of interest in the voyage of the Crystal Serenity cruise ship through the Northwest Passage this summer, not least from the communities where the giant liner stopped. VICKI AITAOK **says future cruise operators could learn from the Serenity's visit.**

DOUBLING OUR POPULATION for a day sounds crazy. Can we do this? Do we even *want* to do this?

These were only two of the questions I kept asking myself as the residents of Cambridge Bay (Cambridge Baymiut) prepared for the arrival of the Crystal Serenity cruise ship and its more than 1000 passengers and 600 plus crew on Monday, August 29, 2016. In order to make this a memorable day for the passengers and for the people of Cambridge Bay, the whole town had to be involved. I have been organizing events around the arrivals of cruise ships for the past ten summers. But this was the largest ship we have ever had visit our community!

VICKI AITAOK is an entrepreneur and an educator. She runs the airport concession and an outfitting company called Qaigguit Tours and teaches adult education programs at the local college.

Since 2007 I have worked with a small group of people in the community who like to help out during the cruise ship season. Tour guides, performers, elders, children, athletes, drivers. Five days a year I can provide them with employment and there is never a shortage of helpers.

The cruise ships spend about half a day in the community and it is important to me to make their day authentic and memorable. We offer guided tours where they get to know the guide on a first-name basis. Our cultural performances provide education – we teach the guests a few Inuinnaqtun words, some arctic sports, throat singing and drum dancing. We provide a fun fashion show with elders and youth dressed in traditional clothing and carrying tools and hunting equipment of the past.

The community members and passengers build relationships that last a lifetime. Personal details are shared about community life, city life, the merits of northern living vs southern, and so on. These relationships are great but you can't feed your children on them. Our community members also expect the cruise ship passengers to buy local arts and crafts and to contribute to the economy in some way. Paying for the performances and tours is crucial but not always enough. We hold artists' markets and provide every opportunity for the passengers to take a piece of the Arctic back with them. We love having the passengers try on sealskin hats and mitts, talk to carvers about their unique sculptures made from soap stone, musk ox bone, caribou antler and sample new foods such as muskox sliders, caribou stew, smoked arctic char, muktuk (whale blubber), char jerky and cranberries. But this visit was going to test our capacity.

When the Crystal Serenity anchored off the shore of Cambridge Bay, the tourists came into town in groups of 100 and stayed for two and a half hours. By breaking into these smaller groups, the town was never overflowing with people nor were we ever unable to handle them. The numbers worked wonderfully!

Economic advantages are huge on cruise ship days if we have the right products and services. Passengers pay for the services provided to transport them into town, show them around, and ensure facilities are open and ready. Serenity passengers left donations of over $500 at the local Anglican church out of the kindness of their hearts and spent more than $110,000 in products, souvenirs and services throughout the town.

I'm happy to say we didn't have any bad experiences with the Serenity. The

ECONOMIC ADVANTAGES ARE HUGE ON CRUISE SHIP DAYS IF WE HAVE THE RIGHT PRODUCTS AND SERVICES

people were very friendly and interested. One couple came off the first bus in the morning, stood and listened to my welcoming spiel about where to go and what to do and then politely requested to go back on the bus and back to the ship. I was quite shocked to tell you the truth! However, I learned later that this particular couple had done the same thing at every one of their Northern stops. They wanted to be the first to get off the ship, the first to be in town, and then the first to get back on to the ship! But they were the exception and not the rule.

In order for the community tours to be successful, the visitors need to show respect and be polite and kind. They may not be interested in trying muktuk, but no need to turn their nose up at it or make a rude remark as this would be very insulting to us. None of these passengers did that. They all handled the new experiences with class and style.

We anticipate and welcome a growing number of ships coming to Cambridge Bay. However, the Crystal Serenity spent two years preparing and talking and listening before arriving. Other ships need to do the same type of advance preparation in order for their visits to be successful.

Cruise ship operators can prepare their passengers by having Inuit guides on their ships who are able to talk about the culture and code of ethics before arriving at the communities. There are expectations that northern communities cannot meet due to lack of infrastructure, such as high speed internet. Passengers and crew need to know this before they get here so they won't be disappointed.

The residents of Cambridge Bay also need to be better prepared. If we are to see more ships coming here and host them properly, then more Cambridge Baymiut need to come out and get involved. There are lots of opportunities for guiding, hosting, transporting, feeding, performing, etc. We need advance commitment and reliability from all of our residents in order to provide proper services and products. ○

Crystal Serenity off Nome, Alaska.

Photo: Austin Ahmasuk

Shipping and Indigenous communities

Austin Ahmasuk

FOR OVER 100 YEARS increased Arctic shipping has resulted in Nome, Alaska's Native population having their land base taken out from underneath them. Merchant vessels, fishing and transport vessels need piers, docks, and shoreside infrastructure. This has required the Indigenous population to relinquish or have extinguished all of their aboriginal rights for the sake of high seas global commerce and trade. In that unrelenting quest for shoreside infrastructure no obstacle must lay in the way: if a river mouth was put in the wrong place by nature, it must be moved to the proper location; if an archeological site is in the way it must be destroyed according to the U.S. Army Corps of Engineers (USACE) on repeated occasions.

One of the traditional place names for my home town of Nome is "Sanispik". The area is also called Sandspit by longtime Nome locals including myself. Sandspit is now a totally different and highly engineered landform. Inner harbor placements have changed what was a traditional area for my fellow Alaska Native people. Several Alaska Native families lived at Sandspit until they were forced out by port development which occurs at an alarming pace. In 2015 the Alaska Arctic Policy Commission (AAPC) recommended to: "*Facilitate the development of Arctic port systems in the Bering Strait region to support export, response and regional development.*"

The USACE facilitates these grandiose recommendations and has routinely executed them in the Port of Nome since at least 1989. For all of its environmental assessments in accordance with the National Environmental Protection Act, National Historic Preservation Act and the Clean Water Act among others, the USACE repeatedly reported "Findings of No Significant Impact" in each of its port development feasibility studies.

AUSTIN AHMASUK is an Inupiaq born and raised in Nome. He is a hunter, fisher, trapper, and occasional environmental activist in his community

The AAPC must look to history for Arctic Port systems to become mainstream. Take for instance the Act of Congress approved March 3, 1891, titled "An Act to repeal timber culture laws, and for other purposes" which allowed among other things for the town of Nome to file and survey its townsite. In all my years living in Nome I have never heard a visitor describe Nome as having any sort "timber culture" except in reference to how we Nome-ites reuse wooden pallets. That historic and

sweeping act of Congress laid the foundation for what was the first of many allowing Congress to pave the way for further development in Nome. According to the field notes of United States Survey No. 451 "*of the outboundaries of Nome Townsite*" made by the U.S. Deputy Surveyor for Alaska, from August 1, 1903 to August 10, 1903 on page 288 he solemnly swore the following:

"that said survey includes no land to which the Natives of Alaska have prior right by virtue of occupation;"

We are the first people of Alaska. There are hundreds of photographs that depict the historic life of Alaska Native people including dog sleds, Eskimo dances, beautiful works of art, and native peoples themselves. Thankfully the photographers of the day captioned their work.

The April 2016 U.S. Committee on the Marine Transportation System conservatively estimates that ship traffic in the Bering Strait may double from 2013 to 2025. For northwest Alaska, The Alaska Department of Environmental Conservation documented 14,653 gallons of oil or hazardous substances were spilled into the environment in 2014. It turns out that is an average amount spilled annually in northwest Alaska. I have reviewed many of those situation reports and there are two striking takeaways from reading them: rural Alaska Native communities are the first responders to those events and secondly, rural Alaska Native communities don't have enough resources to respond to spills.

Alaska Native ways of knowing are seldom incorporated in state or federal decision making and that sad truth should be remedied. We have something to offer and can help make better decisions that will address social, economic, and environmental needs. We have traditional knowledge; we have assisted in the development of science, and adapted old ways with modern life. You need to consult us as partners in protecting the Arctic environment. ○

A whitecoat harp seal pup lying on the ice in the Gulf of St. Lawrence, Canada, 2003.

Photo: International Fund for Animal Welfare Animal Rescue Blog, CC, Flickr.com

Icebreakers and ice-breeding seals

When Arctic seals select a birthing site, many choose a location where the ice is stable enough to last until the newborn pup is ready to enter the water. If a ship comes crashing through the nursery site, the pup's survival is seriously compromised. SUSAN WILSON **and** SIMON GOODMAN **say steps can be taken to reduce the threat of Arctic shipping to ice-breeding seals.**

Overlap between pinniped species ranges and main Arctic and sub-Arctic shipping routes

Species	Overlap with shipping route					
	NWP[1]	NSR[2]	TSR[3]	ABR[4]	Baltic	Caspian
Harp seal	X	X	X	X		
Ringed seal	X	X	X	X	X	
Bearded seal	X	X	X	X		
Hooded seal	X		X	X		
Walrus	X	X	X	X		
Ribbon seal		X				
Largha seal		X				
Harbour seal		X				
Grey seal		X			X	
Caspian seal						X

1. Northwest Passage. 2. Northern Sea Route. 3. Transpolar Sea Route. 4. Arctic Bridge Route.

Map showing principal northern shipping routes where ice-breaking vessels and seals are likely to overlap.

THE RANGES OF TEN SPECIES of ice-breeding pinnipeds (seals and walruses) are overlapped by principal shipping routes in the Arctic as well as in the Baltic and Caspian seas. In addition, localised shipping, in areas such as in the Russian White, Pechora, N. Okhotsk and Kara seas, also traverses the breeding range of some species. When ships plough through breeding sites, mothers usually try to escape with their pups across the ice. Those that can't are often crushed; those that can are displaced from the nursery site, and pup and mother can become separated. Even if a mother does manage to lead her pup to comparative safety, the stress and energy loss to both is considerable.

SUSAN WILSON is director of Tara Seal Research, chair of the Seal Conservation Society & co-director of Seal Conservation Solutions

SIMON GOODMAN'S research focuses on marine mammals, conservation biology, disease ecology and population genetics.

Mammal scientists began raising concerns over the effects of Arctic shipping on breeding and birthing sites in the early 1980s. Increases in oil and mineral extraction, bigger and more powerful vessels along with new shipping routes for transportation of goods facilitated by a warmer Arctic allowing ever-increasing shipping traffic have only increased these threats. But the devastation of pinniped herds can be avoided.

The first step is for international shipping regulators to have seasonal breeding seal distribution maps for all shipping routes, thus avoiding the most vulnerable seal ice. Such mapping will require updated aerial surveys and possibly also satellite imaging. This can help identify locations and time periods of elevated risk of shipping on seals. Regulators and shipping operators could then decide to reduce traffic in those areas at sensitive times, or develop codes of practice for responsive mitigation measures when transiting through them.

THE DEVASTATION OF PINNIPED HERDS CAN BE AVOIDED

Vessel captains and crews also need to develop awareness and assume responsibility for ensuring their ships do not penetrate seal areas and especially do not cause disturbance to mothers and young. This will require a communication network between seal survey teams, contract company management, shipping logistics control and vessel captains. Safe ship-seal distances are already known for some species – for example 500m for harbour seals on ice floes in Alaska, 600–800m for walruses in Alaska and 150–200m for Caspian seals, although safe distances for most species still need to be determined. Ultimately it is the vessel Captain's responsibility to ensure that safe distances between ship and seals on ice are maintained at all times. It is possible that modern drone technology will facilitate surveying vessel paths in potential seal areas. Avoidance of ringed seals during

the breeding season is an exceptionally difficult challenge, because these seals are not only widely dispersed (up to 2 seals per km^2) but are mostly invisible in the water beneath the ice and with pups in snow-covered lairs which are invisible from the surface. It is possible that modern defence-grade infrared technology may be used to detect lairs ahead of vessels, either from drones or from high points on the vessel.

All ships known to be traversing potential seal ice should carry specially trained seal observers who will identify seals on ice at a distance and advise the captain accordingly. They would also record species and location, presence of young, distance from the vessel, vessel speed, vessel/seal encounters less than the designated safe distance for each species, and report back to contracting companies and any regulatory authorities. This would provide quantitative information to help assess potential impacts and refine mitigation measures and operating procedures.

AVOIDANCE OF RINGED SEALS DURING THE BREEDING SEASON IS AN EXCEPTIONALLY DIFFICULT CHALLENGE

Legal frameworks for protecting pinnipeds from international shipping are currently poorly defined or absent. The U.S. Marine Mammal Protection Act protects seals in US waters, and designates a statutory safe distance between ships and walruses. Framework protection exists in Norway for all seals and walruses, in Russian waters for the Baltic ringed seal and grey seals, and in Kazakhstan for the Caspian seal, but regulatory protocols and practical implementation outside the U.S. have yet to be developed. The International Maritime Organization (IMO) Polar Code includes a code for marine mammal avoidance to minimise the risk of ship strikes with cetaceans, which could be developed to also apply to pinnipeds on ice. The Arctic Council's Protection of the Arctic Marine Environment recommends working on this with IMO, while the Conservation of Arctic Flora and Fauna recommends flexible and adaptable wildlife and habitat management and marine spatial planning. Thus far, therefore, we are seeing only good intentions directed towards marine mammals in general, mainly cetaceans in open waters, and not yet targeting the protection of seals on ice. ○

Russian nucelar-povered ice breaker 50 Let Pobedy (50 Years of Victory).

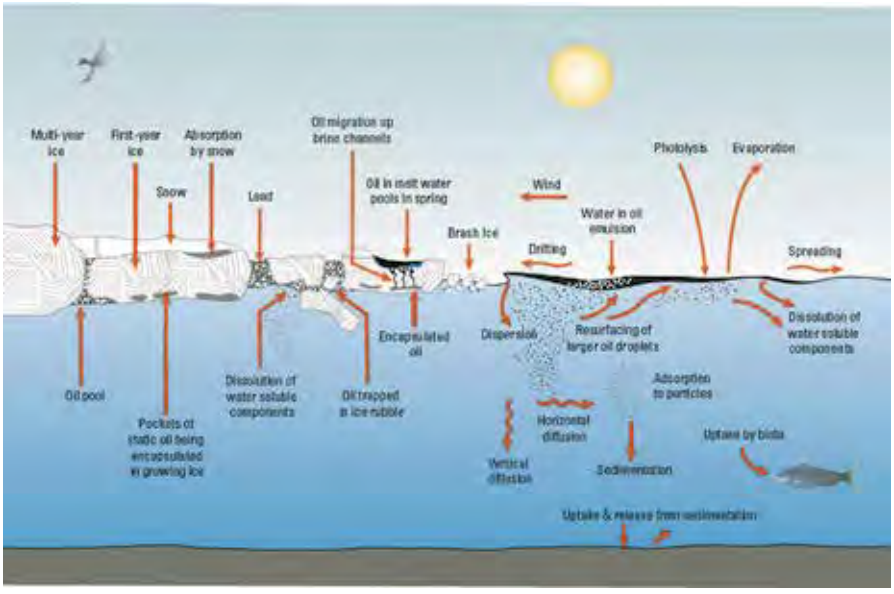
Photo: Christopher Michel, CC, Flickr.com

Arctic Spills

The ability to combat Arctic oil spills is limited. NANCY KINNER **says even in open waters, oil recovery will likely be much lower than in other regions because equipment such as skimmers and booms isn't quickly available to prevent extensive spreading.**

ONCE ON SITE, oil recovery equipment is further hampered by limited power availability and often spotty internet connectivity. Natural weathering processes such as ultraviolet light from the sun, evaporation and dispersion by wind and waves may lead to persistent slicks comprised of heavier and less degradable oil compounds. Use of chemical dispersants is considered one of the few viable response tools in open waters because they can be more rapidly deployed by aircraft. The key is having the correct dispersant formulation for colder and less saline water. Dispersants are also viewed negatively by some sectors of the public.

Oil spilled in ice-infested waters is even more problematic. While oil can be trapped in the leads in the ice, facilitating its collection, it is also likely oil released from a ship may be trapped under the ice. If the ice is forming, oil may be trapped within it. When the ice melts months later, relatively fresh oil can be re-released onto the surface of the ice or into the water column. Oil can also be transported by brine channels within the ice to the critical ice-seawater interface where many organisms collect and feed during the winter. Finding and removing oil frozen into the ice has not been adequately addressed, though research is on-going.



Informed decision-making is key to effective spill response. That means responders must have access to the most current and accurate conditions to minimize the uncertainties associated with their actions. Furthermore, decision-makers must have good estimates of where and when the oil will be transported and what its fate will be. Some of the most important data necessary to make the best decisions concern the potential impacts of the oil on biota and humans (e.g., natural and human resources). Decision-makers know oil spills are "bad" and their job is to select from the available response strategies that make the impacts the "least bad". The reality is that environmental trade offs must often be made, especially when there are not many response or equipment options available. Additionally, our knowledge of Arctic ecosystems is limited because they are rapidly shifting due to climate change. Data available on the ecosystems has increased

Oil spill response barge and support ship in the port of Valdez, Alaska, United States.

Photo: Scott Dickerson / WWF-US

in the past several years as part of the inventories required for oil drilling. The Arctic nations have also decided to use Arctic ERMA® (the Environmental Response Management Application) as a common operating picture for data during response. Still, vast areas exist where "baseline" data are not available to inform spill response decision-making.

Greater vessel traffic in Arctic waters will increase the probability of oil spills. While these spills will be limited to the maximum capacity of oil/petroleum products on the ship, they pose a very significant threat to the sensitive ecosystems of the Arctic, especially when these natural and human resources are already threatened by the rapidly changing conditions brought on by climate change. Only with a coordinated effort by the Arctic nations can the issues of effective oil spill response be addressed. It is particularly important that Russia be actively engaged in these endeavors because that nation has the longest Arctic coastline and the most active sea route, and the U.S./Russian boundary is in the constricted Bering Sea region.

GREATER VESSEL TRAFFIC IN ARCTIC WATERS WILL INCREASE THE PROBABILITY OF OIL SPILLS.

The best approach to the problem of Arctic oil spills from ships is improved prevention, planning and preparedness. When an accident happens, there must be: response equipment readily available, effective communication, and rapid access to data, especially along the planned vessel routes. In addition, U.S. law requires that a damage assessment of natural and human resources be conducted, so that restoration can be performed to return the environment to pre-spill conditions.

Whether the spill is from a cruise liner, merchant ship, or barge; the cause is bad weather, poor charting or human error; the release is a crude Bunker C or soybean oil; the impacts on Arctic ecosystems will likely be devastating and very difficult to mitigate/restore. The reality is not if there will be an Arctic oil spill due to shipping, but when and how frequently such accidents will happen. The question we must answer is how effective the responses will be in minimizing the impacts. Only time will tell if national and international cooperation will be sufficient to meet the challenge. ○

NANCY KINNER is director of the University of New Hampshire coastal Response Research Center & the Center for Spills & Environmental Hazards

The Polar Code

Implementation of the Polar Code is scheduled to take place in January 2017. MICHAEL KINGSTON **says all concerned parties including operators, flag states, insurers, financial markets, and port state control must be educated about its provisions.**

MICHAEL KINGSTON is an expert on Arctic risk and the Polar Code. He is working with PAME's Shipping Expert Group on the Arctic Marine Best Practice Information Forum.

THE POLAR CODE is a binding international framework to protect the two Polar Regions from maritime and environmental risks. It is being implemented through amendments to the three cornerstone International Maritime Organisation Conventions that deal with Safety of Life at Sea (SOLAS), pollution (MARPOL, the International Convention for the Prevention of Pollution from Ships), and Crew Training and Certification (STCW). This means that it has avoided the delays familiar with other standalone Conventions that take years to ratify. The Polar Code is therefore an example of what we can achieve before a major disaster occurs – but it will only be as effective as we make it through education and enforcement. We all have a duty to assist in that process. Ensuring all concerned parties are aware of the rules lessens the risk of a third party or a rogue operator causing an environmental crisis in a sensitive place like the Arctic.

Determining the potential worst case scenario needs to be explained in the Operator's Polar Waters Operation Manual, which must include information such as hydrographical data, meteorology, crew training, communication, ice charting, etc. Getting the best standards for these inputs would equate to navigational safety, and help educate all decision makers in the stages of the process.

This can best be accomplished by inviting the experts in these navigational inputs, (for example the World Meteorological Organisation, the Inter-

Photo: Crew and Officers of NOAA Ship Miller Freeman, CC, Flickr.com

Iced up off the Alaska Peninsula. Too much ice can dangerously affect a ship's stability.

national Ice Charting Working Group, Indigenous knowledge etc.) together with operators, flag states, insurers, financial markets, and port state control – to participate in an annual forum to explain the latest developments in their specific areas of expertise. This forum, the Arctic Marine Best Practice Information Forum would require that each participant be responsible for gathering the latest developments on a cross-jurisdictional basis and for updating the forum. It is also recommended participants maintain an up-to-date website with the best standards as they are created and evolve. The ultimate aim would be a "go to" site for the best information, practices and procedures on a continual basis as well as a place to find out how to make productive further enquiries. Currently, that knowledge is lacking – put simply, people do not know where to get reliable information.

The Arctic Council working group – Protection of the Arctic Marine Environment (PAME) – unanimously backed further investigation into the proposal for an annual forum and work is currently being carried out by their Shipping Expert Group to achieve this. It is hoped that the proposal will then be recommended to the Senior Arctic officials from each Arctic State for each country to endorse this.

Clearly this is a great opportunity for the Arctic Council to show how it is working with industry and the International Maritime Organization. It is also refreshing to see the leadership being shown by PAME and representatives from other involved Arctic Council Groups. It should be noted that at an important meeting on Arctic shipping in Seattle, Washington earlier this year,

PUT SIMPLY, PEOPLE DO NOT KNOW WHERE TO GET RELIABLE INFORMATION.

a number of NGOs such as the World Wildlife Fund, the Pisces Foundation, Pacific Environment, the Wildlife Conservation Society, Ocean Conservatory, the Oak Foundation and Climateworks unanimously backed this proposal in principle.

It is possible that, with supreme effort, such a forum could be established in time for the April 2017 handover of the Arctic Council Chairmanship from the US to Finland. Of course the Polar Code comes into force as of January, 2017 so this effort is extremely timely and important.

It is also heartening to see this level of cross-jurisdictional collaboration across the Arctic between governments, industry, NGOs, Indigenous peoples and other players working to promote the correct atmosphere and actions concerning marine operations, the impact of which can ultimately be broadened to operations currently not covered by the Polar Code such as fishing and leisure craft. ○

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THE PICTURE

Lost expedition's ship found

Archaeologists have found the long lost ship of British polar explorer Sir John Franklin. The HMS Terror was found in the eastern Queen Maud gulf in September, 2016. The discovery challenges the accepted history behind one of polar exploration's greatest mysteries. HMS Terror and Franklin's flagship, HMS Erebus, were abandoned in heavy sea ice far to the north of the eventual wreck site in 1848, during the explorer's doomed attempt to traverse the Northwest Passage. All 129 men on the Franklin expedition died.

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