



Submission to the Arctic Shipping Best Practice Information Forum

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Circumpolar
Conservation
Union

WWF/CCU Submission to the Arctic Shipping Best Practice Information Forum

The Arctic is experiencing profound environmental changes, including a rapid decline in sea ice extent, thickness, and duration. Coupled with development pressures and other human uses, these changes have facilitated the increase of vessel traffic in Arctic waters, a trend that is expected to continue.

Vessel traffic in remote and challenging Arctic waters poses substantial safety and environmental risks, including possible impacts on cultural practices and the food security of Arctic indigenous peoples. Key threats vessel traffic poses to Arctic people and the environment include the adverse impacts of underwater noise, oil spills, pollution and discharges, introduction of invasive species, air emissions, and disturbance of ice habitat. Maintaining the ecological integrity of this region while ensuring essential goods and development reach people in the north can be accomplished with the implementation of realistic regulations and best practices.

WWF and CCU, as observers to the Arctic Council, and in consultation with other stakeholders, are pleased to provide our initial views to contribute to the discussion of how to promote and ensure safe and responsible shipping in the Arctic and Antarctic. An overview, examples of regulation or best practices, recommendations, and resources are outlined for the following issues, in no particular order:

- Polar Code: Reducing disturbance on marine mammals
- Discharge of Sewage and Grey Water
- Underwater Noise
- Vessel Traffic and Monitoring
- Routing Measures and Low Impact Corridors
- Use of Heavy Fuel Oil
- Air Emissions
- Invasive Species
- Ice Operations and the Protection of Ice Habitat

Best Practice Recommendations

Polar Code: Reducing disturbance on marine mammalsⁱ

Overview

The Polar Code provisions call upon mariners to take into account when considering a route through polar waters "current information and measures to be taken when marine mammals are encountered relating to known areas with densities of marine mammals, including seasonal

migration areas," (paragraph 11.3.6) and "current information on relevant ships' routing systems, speed recommendations and vessel traffic services relating to known areas with densities of marine mammals, including seasonal migration areas" (paragraph 11.3.7).

Information relevant to the implementation of the marine mammal avoidance provision includes population trends, spatial densities, and seasonal migrations of Arctic and Antarctic marine mammals. In the Arctic, this information is generally uncoordinated and fragmented across species, populations and geographic regions.

Examples of regulation or best practices:

Academic researchers, governments, and NGOs have published information on Arctic marine mammal densities and migrations that could supplement current government information made available to mariners. One recent example is the *Ecological Atlas of the Bering, Chukchi, and Beaufort Seas*, which collates oceanographic data, species ecology and habitat, and human uses in 44 maps of the Bering Strait region.ⁱⁱ An updated edition of this Synthesis is due for publication in July 2017. Another is the Hudson Strait Mariner's Guide, which is a visual aid for the bridge of ships that consists of a marine mammal identification guide, summer and winter maps of important marine mammal areas and an infographic illustrating the setback distance requirements for safe navigation around marine mammals.

In areas of known marine mammal concentrations, routing measures, such as ATBAs, have proven somewhat effective in mitigation of vessel strikes. These measures can be adopted by the IMO, or national regulation if within a territorial sea. For example, in 2007, the IMO adopted a voluntary seasonal ATBA (effective from 1 June through 31 December) in the Roseway Basin region on the Scotian Shelf of the Northwest Atlantic to protect endangered North Atlantic right whales from ship strikes. A 2009 study showed high rates of vessel compliance with the closure and concluded that implementation of the ATBA led to an "82% reduction in the risk of lethal vessel strikes to right whales due to vessel-operator compliance".ⁱⁱⁱ The study also concluded that high compliance was achieved because the ATBA was adopted by the IMO.

Recommendation

Ensuring best practices for marine mammal avoidance in the Arctic entails achieving a balance between providing mariners with tools and enacting enforceable regulations. There are many opportunities to improve the status of marine mammal information needed to implement the marine mammal avoidance provision. They include:

- Central collation of available marine mammal information including a gap analysis and survey schedule to collect updated information, especially considering the effects of Climate change on ice-associated species;
- Incorporation of TEK into marine mammal density data sets; and
- Standardized data collection and storage across agency and governments.

Further, there are multiple ways of communicating marine mammal information to masters now and in the future. These include the incorporation of information into:

- Electronic navigation charts;

- Voyage planning documents;
- Notices to Mariners and Notices to Shipping;
- Mariner's Guides, graphics, and apps;
- Risk assessment/decision support tools; and
- Real-time, satellite-based electronic notification systems.

For time being, whilst data is collected, made accessible, and communicated to mariners, the following actions can be taken:

- Implement appropriate routing measures (e.g. seasonal ATBAs) in areas of known marine mammal concentrations; and
- Implement speed restrictions in areas where slowing a vessel would protect vulnerable marine mammal species.

Resources

Arctic Marine Synthesis: Atlas of the Chukchi and Beaufort Seas (see update in July 2017): <http://ak.audubon.org/conservation/arctic-marine-synthesis-atlas-chukchi-and-beaufort-seas>

Hudson Strait Mariner's Guide:

http://awsassets.wwf.ca/downloads/hudsonstraitmarinersguide_2.pdf?_ga=1.39622627.1558178095.1469629046

ENGO submission to MEPC 71: Application of the Polar Code marine mammal avoidance provisions, <https://docs.imo.org/Category.aspx?cid=47&session=71>

Discharges of Sewage and Grey Water

Overview:

Discharges of sewage can lead to oxygen depletion, spread pathogenic bacteria and viruses, and increase nutrient levels in the surrounding ecosystem, possibly leading to toxic algal blooms and eutrophication that can cause harmful disturbances throughout food chains.^{iv,v} The low light and temperature conditions in the Arctic amplify the environmental impacts since the decomposition is slowed and the Arctic is less tolerant to rapid changes in the nutrient status of the water column or seabed.

Grey water has pollutant levels comparable to untreated sewage^{vi,vii} and can have harmful environmental impacts such as: dead zones caused by excessive algal growth because of excess nutrients^{viii,ix}, oil and grease coating the gills of fish and preventing respiration^x, the suffocation of small benthic species due to increased particulate matter^{xi}, and the introduction of invasive species^{xii}.

Current sewage regulations that apply to Arctic waters include MARPOL's requirement to treat sewage with an approved treatment plant (within 3nm of land) or comminute and disinfect sewage (from 3nm-12nm from land), and the Polar Code's requirements which applies the MARPOL distance requirements to the ice shelf and fast ice: for example, to discharge untreated

sewage, vessels not only must be at least 12 nm from shore, they also must be at least 12nm away from the ice shelf or fast ice.^{xiii} There are no provisions in MARPOL or the Polar Code regarding grey water.

Examples of regulation or best practices

Alaska law prohibits the discharge of any treated sewage, grey water, or other wastewater from a passenger vessel capable of carrying 250 passengers or more into Alaskan marine waters unless the vessel operates under a permit from the State. To comply with the permit, large commercial passenger vessels must use advanced wastewater treatment systems (AWTs) to meet sewage and grey water treatment standards (similar to recommended below). The permit requires cruise ships to maintain discharge logs, and submit these logs monthly. Vessels are also required to host an ocean ranger who monitors and records “information related to the engineering, sanitation, and health related operations of the vessel”.^{xiv} As of 2014, nearly half of the roughly 30 large commercial passenger vessels operating in Alaskan waters obtained a general permit to discharge into State waters.^{xv}

Recommendation

Best practice include zero discharge of untreated grey water and sewage under any circumstance within the Polar Code defined Arctic, and prohibiting discharge of treated sewage and grey water unless:

- Sewage and grey water contain no more than 14 fecal coliforms/100ml,^{xvi} and 30 mg/l of total suspended solids after treated by an approved water treatment system;^{xvii}
- The vessel is underway at a minimum of 6 knots;^{xviii}
- The vessel is at a distance of more than 3 nautical miles from the nearest land;^{xix}
- The vessel is at a distance of more than 3 nautical miles from any ice-shelf or fast ice and shall be as far as practical from the areas of ice concentration exceeding 1/10.^{xx}

It is also suggested that ship owners and operators conduct regular sampling and testing of sewage and grey water discharges to ensure compliance with the above requirements.

Resources

Grey water and its impacts:

http://assets.wwf.ca/downloads/grey_water_impacts_8_12_2016.pdf.

Marine Discharge of Treated Sewage, Treated Grey water, and Other Treated Wastewater from Large Commercial Passenger Vessels Operating in Alaska Fact Sheet

http://dec.alaska.gov/water/cruise_ships/gp/2014/2014GP_FactSheet_2013DB0004_Rev1.pdf

Underwater Noise

Overview

In most marine areas, low frequency noise from propellers and engines of commercial vessels are the dominant source of anthropogenic noise.^{xxi} Icebreakers generate higher and more variable noise levels from propeller cavitation due to the episodic nature of breaking ice, which often involves maneuvers such as backing-and-ramming into the ice.^{xxii, xxiii, xxiv} Some icebreaking vessels are equipped with bubbler systems that blow high pressure air into the water to push floating ice away from the ship, creating an additional noise source over short ranges.

Beluga whales have been shown to exhibit strong overt reactions to approaching icebreakers 35 to 50 km away and only return to the disturbed area nearly two days later.^{xxv} Similarly, bowhead whales have exhibited avoidance responses to icebreaking activity at ranges up to 25 km.^{xxvi} The displacement of animals from preferred areas could result in negative consequences such as: changes in food^{xxvii} and increased competition and predation.^{xxviii}

Exposure to anthropogenic sound can also lead to a variety of behavioural reactions, increase stress hormones,^{xxix} decrease reproduction, cause temporary and permanent hearing loss, and change the ecosystems as a result in a reduction of prey availability – all of which can negatively affect a population.^{xxx, xxxi}

Examples of regulations or best practices

The Vancouver Fraser Port Authority Enhancing Cetacean Habitat and Observation (ECHO) Program and the IMO Guidelines for the Reduction of Underwater Noise provide a starting point for implementing measures to reduce harm on marine life.

Recommendation: Technical and maintenance best practices for owners and operators to reduce vessel noise described in detail by the Vancouver Fraser Port Authority ECHO Program include:

- Regular propeller polishing and repair;
- Regular hull cleaning;
- Hull coating (e.g. decoupling coating, coatings that reduce fouling);
- Propeller design modified to reduce cavitation and improve wake flow (e.g. high skew, air injection);
- Alternate propulsion (e.g. water or jet pump);
- Use of quieter engines (e.g. diesel-electric drive);
- Reduce on-board engine and machinery noise (location, mounting and insulation of components); and
- Changes to hull form.

Additionally, vessel operators should undertake the following best practices during navigation to reduce underwater noise:

- **Speed Reduction:** for ships equipped with fixed pitch propellers, reducing ship speed can be a very effective operational measure for reducing underwater noise, especially when it becomes lower than the cavitation inception speed; and

- Rerouting: to avoid sensitive marine areas including well-known habitats or migratory pathways when in transit will help to reduce adverse impacts on marine life and behavioral responses.^{xxxii}

Resources

Information on the above listed options and how they can reduce vessel noise is available in the ECHO Program study summary: <http://www.portvancouver.com/wp-content/uploads/2017/01/Vessel-Quieting.pdf>.

For more information on Arctic shipping underwater noise and its impacts, view WWF-Canada's background research at the following link:

http://awsassets.wwf.ca/downloads/170412_underwater noises due to shipping.pdf? ga=1.31906808.735604524.1468957492

Vessel Traffic and Monitoring

Overview

The maritime industry is embracing the use of AIS technology and other e-Navigation technologies to aid the efficiency of maritime operations. By allowing vessels and on-shore observers to track ships, AIS helps avoid collisions, maintain safe distance from maritime hazards, locate vessels in distress, and assist in search and rescue efforts. Moreover, it makes possible vessel traffic and monitoring systems that may encourage safer maritime practices and compliance with both mandatory and voluntary regulatory measures.

Establishing vessel traffic and monitoring systems has been a priority of Arctic vessel operations for several years. A recommendation of the 2009 Arctic Marine Shipping Assessment says, "Arctic states should support continued development of a comprehensive Arctic marine traffic awareness system to improve monitoring and tracking of marine activity, to enhance data sharing in near real-time, and to augment vessel management service in order to reduce the risk of incidents, facilitate response and provide awareness of potential user conflict. The Arctic states should encourage shipping companies to cooperate in the improvement and development of national monitoring systems."

Examples of regulations or best practices

The US Coast Guard requires vessels that have called on a US port to adopt and adhere to enhanced prevention measures to reduce the risk of environmental damage from a vessel casualty, as national oil spill prevention and standards cannot be met in Alaska due to limited infrastructure. The Marine Exchange of Alaska, a non-profit organization based in Juneau, Alaska, is monitoring vessel traffic in Alaska 24/7 as an incident prevention measure. By on-shore tracking of ships via AIS, the MXA operations assist vessels in maintaining a safe distance from shore and maritime hazards, can locate and aid vessels in distress, and can monitor vessels that are not compliant with mandatory (and non-regulatory) navigation safety measures.

Recommendation

Coastal States should ensure a (public or private) vessel information, compliance monitoring and response system that establishes a relationship with each vessel that sails through their waters. This would entail the following:

- Communications protocols-How they can contact the vessel and the owner/operator via e-mail and phone (owner/operator) and the vessel master via satellite phone and e-mail to ensure safety and environmental information can be transmitted to the vessel;
- Establishing and disseminating preferred routing measures;
- Developing capabilities to transmit safety and environmental information to vessels via AIS transmitters and other means;
- Establishing processes for transmitting real time information on sea ice concentrations and other relevant information such as walrus haul outs;
- Ensuring the capability to immediately locate and communicate with response resources; and
- Request vessels engage with Coastal States upon approaching their waters to inform of their communications capabilities and voyage plan, and should ensure they have the technology to communicate with Coastal States or their representative organization as well as be able to receive, process and display AIS transmitted information.

Resources

Marine Exchange of Alaska: <http://www.mxak.org/>

Routing Measures and Low Impact Corridors

Overview

Routing measures can be established to increase vessel safety, guide vessels to the most appropriate areas, or divert them from inappropriate areas. Use of designated ship traffic lanes, especially in the Arctic, where most areas have not been surveyed by modern equipment, if at all, can ensure that vessels travel along safe routes that have been charted to modern standards. Areas to be avoided (ATBAs) can be established in hazardous areas or areas of ecological or biological significance to maximize safety and minimize risk to the environment.

Example of regulation or best practices

In the Aleutian Islands, the IMO designated five recommendatory ATBAs to reduce risks of a grounding.^{xxxiii} Similar actions are under consideration in the Bering Sea and Strait region, where the preliminary findings of a USCG Port Access Route Study (PARS) include recommendations for a shipping lane (that has been charted to modern standards) and complementary ATBAs that protect areas important to subsistence from various vessel traffic impacts. In the future, the USCG may undertake another PARS to explore routing needs in the Chukchi and Beaufort Sea areas.

Transport Canada and the Canadian Coast Guard are developing routing measures pursuant to the Northern Marine Transportation Corridors Initiative (NMTCI). An study, *The Integrated*

Arctic Corridors Framework – Planning for Responsible Arctic Shipping in Canada's Arctic Waters illustrates how through the integration of Canadian vessel traffic patterns, environmental protections and Inuit rights, Corridors can be built that ensure safe and low impact shipping.

Recommendation

Establish low impact corridors which:

- Have sufficient and modern hydrographic data;
- Predictable and acceptable search and rescue response times which align with southern standards;
- Divert vessels from potentially hazardous regions;
- Protect known marine mammal feeding and calving areas and other vulnerable wildlife concentration areas; provide seasonal restrictions to account for marine mammal migration routes; and have guidance in place on speed limits to avoid disturbance to marine mammals including approach distances;
- Give precedence to hunting activities and subsistence use;
- Require reporting into national and international authorities;
- Provide guidance for reducing impact on ice habitats; and
- Frequent reporting into national and international authorities.

Resources

United States Coast Guard Port Access Route Proposal:

<https://www.regulations.gov/docket?D=USCG-2014-0941> (under supporting documents folder)

The Integrated Arctic Corridors Framework – Planning for Responsible Arctic Shipping in Canada's Arctic Waters: <http://www.pewtrusts.org/~media/assets/2016/04/the-integrated-arctic-corridors-framework.pdf>

Heavy Fuel Oil

Overview

Most large seagoing vessels use HFO, also known as residual fuel or bunker fuel, due to its low cost. In the event of a spill, HFO breaks down extremely slowly, is virtually impossible to clean up, and will have long term, devastating effects on both livelihoods and ecosystems. HFO is also the source of harmful and significantly higher emissions of air pollutants, including sulphur oxides, nitrogen oxides, particulate matter, and black carbon.^{xxxiv}

The U.S. and Canada announced a "phase down" of HFO from ships operating in the Arctic. The two governments had already acknowledged that a "heavy fuel oil spill in the Arctic could cause long-term damage to the environment" in a document submitted to the 70th session of the IMO Marine Environment Protection Committee (MEPC). Recently, the U.S. and Canada, with co-sponsorship from Finland, Iceland, Norway, Germany and the Netherlands, submitted a

proposal for a new output in the IMO MEPC work programme to develop measures to reduce risks of use and carriage of HFO as fuel by ships in Arctic waters. This proposal will be considered at the 71st session of MEPC in July 2017.

Examples of regulation or best practices

HFO is already banned throughout the Antarctic (south of 60°), and in protected areas off the coast of Svalbard, Norway, because of its potential spill impact on wildlife.

Recommendation

Follow the guidelines in the Polar Code Part II-B, 1.1 which encourages ships operating in the Arctic Ocean to apply MARPOL Regulation 43 (banning the use and carriage of HFO in the Southern Ocean).

Resources

Svalbard's HFO ban: <http://www.sysselmannen.no/en/Shortcuts/Ban-on-heavy-fuel-oil/>

Heavy fuel oil use in Arctic shipping in 2015. <http://www.theicct.org/heavy-fuel-oil-use-arctic-shipping-2015>

Alternatives to heavy fuel oil use in the Arctic: Economic and environmental tradeoffs: <http://www.theicct.org/alternatives-to-Arctic-HFO-use-economic-and-environmental-tradeoffs>

An analysis of heavy fuel oil use and carriage and black carbon emissions from ships in the Arctic in 2015, with projections to 2020 and 2025. [Available May 2017].

<http://www.theicct.org/2015-heavy-fuel-oil-use-and-black-carbon-emissions-from-ships-in-arctic-projections-2020-2025>

The Bering Strait Risk Assessment: Provides an overview of persistent fuel use and its risks in the Bering Strait Region: <http://www.oceanconservancy.org/places/arctic/bering-sea-vessel-traffic.pdf>

Air Emissions

Overview

The great majority of commercial vessels are powered by diesel engines that run on HFO, distillates, or fuel blends. These engines generate combustion exhaust, releasing long and short lived pollutants into the atmosphere. Many of these pollutants contribute to global warming, and all negatively impact human and environmental health.

Carbon dioxide (CO₂) makes up the bulk of emissions from any diesel engine. As a long-lived GHG, CO₂ becomes well-mixed in the atmosphere and causes global warming.^{xxxv} In 2012, vessel traffic accounted for approximately 2.2 percent of total greenhouse gas emissions worldwide.^{xxxvi}

CO₂, SO_x, NO_x and PM diesel engine emissions are short lived and localized pollutants, yet can be extremely potent. Recently, there has been an increased focus on the effects of black carbon (BC), a form of PM, due to its significant climate forcing impact.^{xxxvii} BC is the most effective form of PM, by mass, at absorbing solar energy.^{xxxviii} While CO₂ persists longer, BC, which only remains in the atmosphere for days or weeks, has hundreds to thousands of times greater warming potential than CO₂.^{xxxix} After CO₂, BC is the second greatest contributor to human induced climate warming.^{xl} BC is of particular concern in the Arctic due to the fact that, when depositing on snow and ice surfaces, it reduces albedo and increases warming. The warming impact of BC is increased by at least a factor of three in the Arctic region.^{xli}

Other pollutant emissions that cause adverse localized air quality, acidification or human health impacts –like SO_x and NO_x—may also be prioritized for reduction/mitigation efforts. In 2012 the World Health Organization classified diesel engine exhaust as carcinogenic to humans.^{xlii} Airborne particles in SO_x, NO_x and PM emissions enter the lungs and can trigger inflammation that can lead to lung and heart failure.^{xliii} In addition, emissions of SO_x and NO_x cause acidification of soil and water. NO_x also contributes to the formation of ground level ozone, which is detrimental to vegetation and human health.^{xliiv}

Examples of regulations or best practices

A variety of vessels operating in Arctic waters have pledged to use more environmentally friendly means of propulsion to reduce emissions. For example, expedition cruise operator Hurtigruten recently ordered two hybrid battery powered vessels, and has pledged to never use HFO to propel its vessels.

Recommendations

Individual vessels can use a variety of techniques to reduce emissions from ships by:

- Switching from HFO to distillates, LNG, or other cleaner fuels;
- Slow steaming/derating;
- Using exhaust gas scrubbers, exhaust gas recirculation, and filters^{xlv};
- Using shore power in ports;
- Improving engine efficiency;
- Improving thrust efficiency (e.g., propeller polishing, propeller upgrade);
- Weather routing;^{xlvi}
- Improving hydrodynamics (e.g., hull cleaning, hull coating);
- Incorporating zero or low emission auxiliary propulsion (e.g., wind assist; battery electric power)

Resources

Black carbon measurement methods and emission factors from ships:

<http://www.theicct.org/black-carbon-measurement-methods-and-emission-factors-from-ships>

Long-term potential for increased shipping efficiency: <http://www.theicct.org/long-term-potential-increased-shipping-efficiency>

The impacts of Arctic shipping operations on Black Carbon emissions: <http://www.hfofreearctic.org/wp-content/uploads/2016/10/The-impacts-of-Arctic-shipping-operations-on-Black-Carbon-emissions.pdf>

The Impacts of an Arctic Shipping HFO Ban on Emissions of Black Carbon:

<http://www.hfofreearctic.org/wp-content/uploads/2016/10/The-Impacts-of-an-Arctic-Shipping-HFO-Ban-on-Emissions-of-Black-Carbon.pdf>

Invasive Species – Hull Fouling & Ballast Water

Overview

Invasive species prey on and/or compete with native species, resulting in alterations of habitats, biodiversity, food webs and ecological stability.^{xlvi} Aquatic invasive species have led to incidents as diverse as the collapse of commercially important fisheries to cholera outbreaks affecting human populations.^{xlvi, xlvii} Shipping is a significant vector in the spread of aquatic invasive species, mostly via ballast water and hull fouling.^{li}

While some areas of the marine Arctic (particularly areas in the North Atlantic not within the Polar Code) have already experienced notable non-native species invasions, most parts of the Arctic remain relatively undisturbed.^{lii} However, increasing surface water temperature and changing salinity levels will reduce the environmental barriers currently limiting the establishment of more temperate species.^{liii, liv} These factors, in combination with the potential increase of ballast water discharges and transport of organisms via hull fouling as shipping increases in the region, will increase the risk of non-indigenous invasive species introductions. As a result, in the future, invasive species could threaten the ecological and economic viability of the region.^{lv, lvi}

Examples of regulations or best practices

Hull Fouling

The 2011 IMO Guidelines for the Control and Management of Ships' Anti-fouling to Minimize the Transfer of Invasive Aquatic Species (IMO Anti-fouling Guidelines) voluntary guidelines recommend installation and maintenance of an anti-fouling coating, the development of a plan to manage hull fouling, and provides inspection, cleaning and record keeping suggestions.^{lvii} The Polar Code recommends ships follow the IMO Anti-fouling Guidelines, and specifically recommends “measures should be considered to minimize the risk of more rapid degradation of anti-fouling coatings associated with polar ice conditions”.^{lviii}

Some nations have created mandatory measures to address hull-fouling. Beginning May 15, 2018, all vessels traveling to New Zealand that will anchor, berth or be brought ashore after a voyage outside of its waters must comply with specific “clean hull” regulations, which essential means no biofouling other than a slime layer, with the exception of fast turnaround vessels that

can have a small amount of biofouling.^{lix,lx} The regulations also “provide three options for the proper management of biofouling: a) cleaning before entry (carried out less than 30 days before arrival in New Zealand or within 24 hours after arrival); b) continuous maintenance using best practice, e.g. the IMO’s guidelines for management of ships’ biofouling in Res.MEPC.207(62); or c) application of approved treatments”.^{lxi}

Ballast

The International Convention for the Control and Management of Ships' Ballast Water and Sediments enters into force September 2017 and applies to all waters, including the Arctic. Whether the Convention’s measures are sufficient to protect the unique Arctic region from species invasions is yet to be seen. Some regions have already elected to have more stringent requirements than those of the convention. The state of California established (and is soon to implement) limits on total bacteria and virus concentrations that do not exist in US or IMO standards.^{lxii}

Recommendation

Hull-fouling

The IMO biofouling guidelines should not only be mandatory but have polar specific measures including enhanced levels of hull cleaning, which should match precaution regarding the translocation of alien species on ships hull niche area in such sensitive areas.

In addition, an assessment of the effectiveness of the most appropriate antifouling coatings for Arctic operations would be timely as the Polar Code begins to take effect. The Polar Code or other appropriate mechanisms should specify fit for purpose polar anti fouling systems which have no biocide content, be suitable for ice operations, and linked to the IMO biofouling guidelines.

Ballast

Monitor the effectiveness of the ballast water convention treatment requirements in the Arctic, and consider more stringent requirements (e.g. higher treatment standards, strengthening of enforcement, etc.) in the future if needed.

Resources

New Zealand’s hull fouling regulations:

<http://www.customs.govt.nz/news/resources/Documents/New-Zealands-new-border-rules-on-hull-fouling.pdf>

California’s ballast treatment standards:

<http://www.slc.ca.gov/Programs/MISP/InfoShts/PerfStd.pdf>

Ice Operations and the Protection of Ice Habitat

Overview

Sea ice serves as an important habitat. Therefore, shipping through sea ice could lead to increased negative interactions with ice-bound marine mammals.^{lxiii} For example, ships breaking ice through the breeding grounds of seals have resulted in direct mortality from collisions.^{lxiv} Seal pups that are concealed in lairs are especially vulnerable.^{lxv, lxvi} Operations through sea ice creates channels of brash ice, which may remain if the ice does not refreeze rapidly. Seals use these channels as leads into the ice and often create whelping sites along the edge of these open channels.^{lxvii} This places them at risk of ship strikes from further shipping in the same channel.

It has been speculated that operations through sea ice was the cause of a few recent ice entrapment occurrences.^{lxviii} The passage of a ship creates a temporary opening in the sea ice, which can act as an artificial polynya. This can confuse marine mammals, causing them to become trapped too far from the ice edge as the channel eventually refreezes.

Lastly, oil spills from vessels operating in ice can be hard to detect and clean up and could also contaminate marine mammal prey or haul-out areas.

Examples of regulations or best practices

The Voisey's Bay mine in eastern Canada has implemented safety and environmental measures for ship transits in ice. For example, shipping is suspended during seal whelping periods, local Inuit observers are on board ships during select transits, and pontoon bridges installed to provide safe travel for hunters.

Recommendation

The following is a list of best practices relating to species habitat, socioeconomics, and safety for ship owners and operators, which can be followed when operating in sea ice.

Species habitat

- Follow a pre-existing ship track through sea ice as best as possible;
- Conduct landfast ice monitoring (including the number of ship transits that used the same track and the area of landfast ice disrupted annually);
- Reduce speeds to a maximum of 11 km/h (6 kts) in landfast ice and 13 km/h (7 kts) in pack ice to moderate the bow-wave and wake effects on the ice;
- Avoid operations through sea ice during ice formation (until ice is >20 cm thick) to avoid introducing cracks into the new ice sheet;
- Should large pieces of landfast ice prematurely break away as a result of ice breaking, ship routes (during spring only) should be modified to follow a zig-zag pattern;
- Re-rout or halt operations through sea ice during sensitive times of the year for wildlife, such as: over ice caribou migration routes and seal pupping areas;

- Support scientific research on the impacts of operations in sea ice (such as the number of marine mammals attracted to ship tracks) by providing access to ships for sampling by governmental and research groups; and
- Implement appropriate measures to mitigate disturbance to wildlife, including stoppage of movement until wildlife have moved away from the immediate area.

Socioeconomics

- Should operations in sea ice interfere with access to hunting grounds, ship owners should mark the ship tracks to make them visible to travelers, install ice bridging, such as pontoon bridges and keep the public informed on icebreaking activities by providing a minimum of 24 hour notice prior to icebreaking.

Safety

- Increased reporting; report into national vessel monitoring regime every four hours.

Resources

For more information on Arctic shipping ice operations and their impacts, view WWF-Canada's background research at the following link:

http://awsassets.wwf.ca/downloads/170412_shippingthroughseice.pdf?_ga=1.170365158.735604524.1468957492

Voisey's Bay ice operations:

<http://www.nunavut.ca/files/CD/TAB%2024%20Pages%20from%20140415-08MN053-App%20N.02%20-%20Shipping%20and%20Marine%20Wildlife%20Management%20Plan.pdf>

ⁱ International Maritime Organization, Marine Safety Committee. (2017). *MSC 98/17/2 - Implementation on of Instruments and Related Matters Application of the Polar Code marine mammal avoidance provisions*. Submitted by FOEI, WWF and PE. <http://www.usmsa.org/wp-content/uploads/2017/04/MSC-98-17-2.pdf>

ⁱⁱ Audubon Society. (2011). A multi-layered look at America's Arctic Ocean. <http://ak.audubon.org/conservation/arctic-marine-synthesis-atlas-chukchi-and-beaufort-seas>

ⁱⁱⁱ Vanderlaan, A. S. M., & Taggart, C. T. (2009). Efficacy of a voluntary area to be avoided to reduce risk of lethal vessel strikes to endangered whales. *Conserv. Biol.* 23(6): 1467–74. doi: 10.1111/j.1523-1739.2009.01329.x

^{iv} Karydis, M. (2009). Eutrophication Assessment of Coastal Waters Based on Indicators: a Literature Review. *Global NEST Journal*, 11(4), 373–390.

^v The Environmental Protection Agency. (2008). *Cruise Ship Discharge Assessment Report Section 3: Graywater*.

^{vi} United States' submission to the 44th session of the Marine Environment Protection Committee of the International Maritime Organization. *Interpretations and Amendments of MARPOL 73/78 and Related Codes; Proposed Amendments to MARPOL Annex IV* (December 1999)

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