SHIPPING RISK MITIGATION RESEARCH AND PRACTICE IN CANADA:

CONSIDERING AREA-BASED MANAGEMENT APPROACHES

SUMMARY REPORT

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INTRODUCTION

On 30-31 August 2022 in Halifax, NS, the Ocean Frontier Institute (OFI) project "Safe Navigation and Environment Protection" (Module N), Clear Seas Centre for Responsible Marine Shipping (Clear Seas) and the Schulich School of Law at Dalhousie University convened a hybrid workshop entitled "**Shipping Risk Mitigation Research and Practice in Canada: Considering Area-Based Management Approaches"**.

The purpose of the workshop was to consider current and emerging practices of area-based management to mitigate the risks and impacts of shipping in Canada, and to learn from theory, research, and the experiences of practitioners, especially that of Indigenous rights-holders. The workshop was funded by the OFI Module N project with support from the Canada First Research Excellence Fund grant held by OFI. The workshop was attended by 70 people in Halifax, with another 80 participants online from across Canada.

An overview of the Module N Project "Safe Navigation and Environment Protection" is provided in Appendix A. The workshop programme is provided in Appendix B. Brief biographies for speakers, moderators, and commentators are provided in Appendix C.

Xinyue Zhang, Interdisciplinary Ph.D. candidate at Dalhousie University, was the rapporteur of the workshop.

CONTEXT AND OBJECTIVES

Shipping is vital to Canadian domestic and foreign trade. It also presents risks to Canada's unique and highly sensitive habitats and species in the marine environment. Shipping produces various wastes and emissions during operations and when ships become casualties, spilled cargo and fuel can cause devastating damage and loss to the marine environment. In the context of climate change, shipping is expected to decarbonize in support of the Paris climate goals. Although shipping has improved its environmental record over the years, it continues to have adverse impacts on the marine environment, human health, and the well-being of coastal communities.

Indigenous communities and the marine environment are affected by shipping in many ways. For example, underwater noise from shipping is a concern across Canadian waters. In the Arctic, shipping carries vital supplies to coastal communities, while at the same time introducing underwater noise that is deleterious to a range of marine species. In addition, shipping in the North often requires icebreaking support, which creates noise and affects the mobility of hunters and migrating animals. Changing ecosystems and movement patterns of marine animals have heightened concerns over ship strikes in all waters. On the Pacific and Atlantic coasts, particular types of shipping, such as tankers in the oil trade and tug and tow operations, may pose added

risks to the sensitive coastal environment upon which Indigenous and other coastal communities depend, with the threat of a spill of oil or hazardous and noxious substances.

The governance of shipping in Canada is changing. It is evolving from administration to collaborative planning and management. With respect to Indigenous peoples in Canada, the governance of shipping demands an inclusive and respectful approach in the spirit of reconciliation to ensure that rights protected under treaties, the Canadian constitution and under the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and Indigenous peoples are engaged as partners in a respectful and meaningful manner.

Several tools may be utilized in the collaborative governance of shipping to mitigate risks to Indigenous communities and the marine environment. Area-based marine management tools have emerged as important approaches to mitigate the impacts of shipping on the marine environment and coastal communities. While ship routeing has long enhanced navigational safety, recent routeing measures have been fashioned to address particular environmental and public health risks posed by ships in defined areas. In Canada, sensitive marine areas and species at risk have been protected from shipping impacts through mechanisms such as marine protected areas (MPAs) and routeing measures, such as areas to be avoided and altered traffic lanes. Further, the North American Emission Control Area (NAECA) was designated to reduce the emission of nitrogen oxides and sulphur oxides harmful to human health and the environment from ships operating within 200 nautical miles from shore, although this does not apply to Arctic waters. Restrictions on the discharge of certain wastes, such as oily residues, hazardous substances, sewage, greywater and garbage pursuant to international regulations have also been adopted and enforced. More recently, there is growing interest in marine spatial planning (MSP) as an integrated exercise to manage diverse and often competing ocean uses, including reducing conflicts between shipping other ocean uses.

The workshop addressed the above and related issues in two parts, each lasting a day. The first day examined the big picture of area-based management tools in response to particular risks posed by shipping. The second part focused on Indigenous perspectives and concerns over the interface between shipping and their rights and interests. The discussion included 18 paper presentations and four comments in the keynote and five themed sessions, which were concluded with a roundtable discussion on policy directions by five commentators. Speakers and commentators are from government, industry, non-government organizations, Indigenous communities, as well as Canadian and international academics. Speakers were both in-person and virtual, responding to in-person and online questions and comments.

OPENING

Dr. Aldo Chircop, Professor at the Schulich School of Law, opened the workshop by acknowledging that Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People. This territory is covered by the "Treaties of Peace and Friendship"

which Mi'kmaq and Wolastoqiyik (Maliseet) People first signed with the British Crown in 1725. The treaties did not deal with surrender of lands and resources but in fact recognized Mi'kmaq and Wolastoqiyik (Maliseet) title and established the rules for what was to be an ongoing relationship between nations. He then proceeded to introduce the opening session speakers.

Dr. Anya Waite, Scientific Director and CEO of the Ocean Frontier Institute and Associate Vice-President Research (Ocean) at Dalhousie, provided welcoming remarks. She pointed out that knowledge co-production between the research and Indigenous community requires true collaboration, "it involves humility, and willingness to accept that often less is more." She also emphasized that knowledge co-production covers topics that are broadened to a range of views, which means the specificity that the research community focuses on needs to be loosened and opened up. This conversation needs to be facilitated through real, creative, collaborative and co-designed methods. Successful knowledge co-production depends on open, continuous, and arduous communication that requires persistence and time.

Murray Coolican, Chair of the Board of Directors of Clear Seas, emphasized the importance of the conversation that "brings all perspectives together for a better understanding on shipping risks and mitigation." He highlighted that the governance of shipping in Canada is undergoing changes evolving from administration to collaborative planning and management. As Canada continues its journey of reconciliation with Indigenous peoples, the governance of shipping demands an inclusive and respectful approach.

KEYNOTE ADDRESS

Kenneth Paul of the Wolastoqey First Nation in the community of Neqotkuk in New Brunswick delivered the keynote speech on Indigenous knowledge systems. He elaborated on the frameworks of personal balance, societal balance, natural resources and sectorial balance management, which could integrate into a methodological structure of governance for sustainability. He pointed out that understanding this framework is also key to better engagement with Indigenous communities and getting their support. Mr. Paul highlighted features of Indigenous knowledge systems, such as being localized, culturally rooted, often language-based, and embedded in values. He emphasized that only by appreciating the values of Indigenous communities and integrating the separate systems of Western knowledge and Indigenous knowledge can a "Two-Eyed Seeing" approach be truly adopted. Finally, he highlighted the importance of respecting protocol with Indigenous knowledge such as data sovereignty and data security, as well as protocols with Indigenous communities, such as respecting the time and expertise of knowledge keepers and elders, and be aware of the duties of individuals as part of the Indigenous community that may limit their capacity to engage. The theme of a balanced, values-based approach raised by Mr. Paul was returned to by many other speakers over the course of the workshop.

SESSIONS

Session 1 – Vessel Traffic Management

Session 1 was moderated by Professor Ronald Pelot, Department of Industrial Engineering at Dalhousie University.

Professor Floris Goerlandt, Canada Research Chair in Risk Management and Resource Optimization for Marine Industries from the Department of Industrial Engineering at Dalhousie University, spoke on the application of risk analysis approaches for area-based management of shipping risks. He introduced several existing shipping risk databases, risk assessment systems, models, and efforts in Canada, identified opportunities and challenges for using area-based management and a risk analysis approach in mitigating shipping risks, and analyzed their implications for shipping risk governance. He urged participants to recognize the role of values in establishing context, considering evidence, and making decisions about shipping risks.

Professor Jens-Uwe Schröder-Hinrichs, Vice-President Academic of the IMO-World Maritime University, introduced vessel traffic management (VTM) experiences in European waters. He pointed out that EU VTM has moved away from the strictly traditional safety aspects of its function by integrating environmental dimensions as well. The focus going into the future is on increasing the efficiency of VTM, while also facing challenges such as managing ships with different levels of autonomy, new propulsion systems, and managing limited ocean space with more maritime traffic and new ocean industries and users. How to balance various interests and stakeholders would be a question that needs to be integrated into MSP and ocean governance.

Antonella Ferro, Director of Marine Navigation Programs from the Canadian Coast Guard (CCG), provided an overview of marine navigation services in Canadian waters and improvements that are fostered by interdepartmental efforts. She also introduced how new initiatives can support the mitigation of maritime risks through the advancement of digital service delivery.

The Q&A session considered the potential risks of emerging autonomous ships and the impact of the COVID-19 pandemic on VTM and risk assessment. Professor Schröder-Hinrichs pointed out that from a VTM point of view, risk management for autonomous shipping is still in its beginning and is more of a theoretical discussion. That said, in the foreseeable future, there are likely unanticipated side effects as has been the case whenever new technology has been introduced. Regarding the possibility of using water currents to sail autonomous vessels, he pointed out that the key issues are the reliability of technologies and the development of propulsion systems that allow for a longer period of unattended voyage.

Dr. Goerlandt highlighted that it is important to see autonomous shipping as a complete system consisting of information exchanges among different services. He argued that risk assessment of autonomous shipping would require paradigm shifts, and that the best way is to start from small-

scale testbed applications and to learn from those to understand the issues and challenges, and scale up from there to larger applications. During such a process, the shipping industry could explore technologies and collaborations that are needed to understand and manage risks.

Ms. Ferro pointed out that to the CCG, risk management of autonomous shipping means having the infrastructure and capabilities that allow autonomous ships to operate in Canadian waters, while proactively considering how autonomous ships interact with crewed vessels also matter.

Regarding the impact of the COVID-19 pandemic in European countries, Professor Schröder-Hinrichs pointed out that from a port approach, there are two principal challenges: one is related to individual quarantines, especially for seafarers from foreign countries, and the other is crew exchange. He highlighted that lessons learned from a global pandemic like COVID-19 should be elevated so that national authorities worldwide can develop a system that addresses seafarer issues in the right way.

Dr. Goerlandt pointed out that although there is increasing discussion about "Black Swan" events in risk assessment literature, he believes that a shift of thinking from a risk-focused perspective towards an organizational resilience perspective may be a more promising direction to handle unexpected events such as pandemics.

Session 2 – Marine Spatial Planning and Environment Protection

Session 2 was moderated by Professor Claudio Aporta, Canadian Chair in Marine Environment Protection at IMO-World Maritime University.

Silke Neve, Senior Director of MSP at Fisheries and Oceans Canada (DFO) began her presentation by introducing DFO's approach to the MSP, the advancement of MSP in Canada, and the opportunities that MSP has provided for incorporating emerging considerations and opportunities into planning efforts. These factors are being implemented through an MSP process blueprint with established steps and activities. She pointed out that although the MSP is a recognized tool worldwide, it remains in the planning stages in most countries as it is in Canada. She also introduced a new tool in development called the MSP Atlas, a web-based mapping tool to be launched in January 2023 to support planning and decision-making processes. Ms. Neve concluded by identifying key considerations for and potential barriers to the development and implementation of MSP in Canada.

Dr. Sam Davin, Specialist of Marine Shipping and Conservation at WWF-Canada identified several gaps in Canada's marine conservation practice, such as that minimum standards will only apply to new federal protected areas and will not include other effective area-based conservation measures (OECMs). He pointed out that vessel discharges may also remain a blind point as the definition of dumping (a non-permitted activity in MPAs) is ambiguous. He introduced the findings of WWF's "National Vessel Dumping Assessment" project that quantified the threat of

ship waste to Canada's MPAs and highlighted that ships produce 147 billion liters of waste annually, including sewage, bilge water, greywater and scrubber wastewater which equals 59,000 Olympic swimming pools. He concluded by providing recommendations to policymakers regarding the issues highlighted, including extending minimum standards to all protected areas, clarifying the definition of dumping, and introducing a national scrubber ban while supporting measures at the IMO to prohibit scrubbers globally. He also suggested that shipping practitioners should strengthen their pollution reduction efforts through measures such as avoiding discharging in designated protected areas, treating waste to the highest possible standard if discharging at sea, and enhancing reception facility availability when feasible, among others.

Professor Claudio Aporta, also serving as a panel speaker, highlighted the challenges in incorporating Indigenous and local knowledge in marine spatial planning decision-support tools (DSTs). He analyzed several underlying challenges, including the ontological and methodological differences between local knowledge systems and DSTs, and diverging outcomes between the approach of consultation and engagement with Indigenous communities. He also used examples of participatory mapping and Inuit place names to illustrate the distinctive nature and ontology of Indigenous knowledge. He concluded with recommended path forward strategies regarding how DSTs can better incorporate Indigenous and local knowledge.

In the Q&A session, discussions focused on feasible solutions for several issues such as vessel-sourced discharges, especially in MPAs, inadequate capacity to support MSP efforts in Canada, and the lack of methodologies to aggregate scientific and Indigenous knowledge systems.

Regarding mitigating shipping-sourced discharge, Dr. Davin advocated for stronger regulations to ensure more robust treatment of discharged waste, voluntary waste treatment by vessel operators with higher standards than regulatory requirements, and discharge to port reception facilities rather than to the sea. He also emphasized that scrubber wash-water could be 10,000 to 200,000 times more acidic than normal seawater, and vessels should avoid discharging such wastes in marine areas with lower alkalinity, such as the Arctic regions and coastal areas with river outflow. Ms. Neve pointed out that from an MSP perspective, mitigating the risk of unavoidable vessel-source discharges is about when and where such activities occur, and whether particularly sensitive areas and marine spaces with important ecological value, such as the migratory pathways of certain species, are considered in the overall planning landscape.

Regarding the challenges in MSP, Ms. Neve pointed out that there are many aspects to consider, including the rapid pace of technological change, limited capacity of the federal government and various partners, and how to ensure continuous engagement of local knowledge holders, in addition to aged demography in MSP capacity. She also warned that overreliance on technology may undermine MSP, resulting in a less inclusive process that misses important insights. In all, MSP is an extensive and long-term proposition that demands continuous commitment of time, expertise, resources and various stakeholders.

Session 3 – Prevention and Mitigation of Vessel Environmental Impacts on Marine Biological Diversity

Session 3 was moderated by Bruce Martin, Applied Sciences Manager at JASCO Applied Sciences Ltd. in Halifax.

Dr. David Barclay, Associate Professor and Canada Research Chair in Ocean Technology Systems in the Department of Oceanography at Dalhousie University, spoke on computing underwater acoustic vessel impact metrics. He began his presentation by addressing the complex and difficult problems of predicting animal sound exposure, with reference to his work to map the underwater soundscape with the best possible input data. He highlighted the challenges of measuring absolute acoustic impact due to various accumulating uncertainties such as highly variable propagation conditions. To get around those uncertainties, he introduced a research project adopting the Monte-Carlo approach to compute reference metrics, including detection range (at what distance should a marine animal hear the vessel), the animal's maximum communication range (at what distance a marine animal's call is totally masked by a vessel), and single vessel pass sound exposure levels. He believes that these reference metrics could also allow researchers to compare future improvements in variables that are related to acoustic habitat.

Dr. Sean Brillant, Senior Conservation Biologist of Marine Programs at the Canadian Wildlife Federation, spoke on vessel size and speed as factors preventing vessel strikes of marine mammals. He highlighted the North Atlantic Right Whales (NARW) as an example and emphasized that ship strikes, along with fishing gear entanglements, are the two primary reasons for NARW mortality. He argued that vessel size and speed had a negligible effect on reducing or eliminating the encounter rate of whales. And for reducing the lethality rate, deterring whales away is not feasible, though vessel traffic separation schemes, speed restrictions, as well as early detection and avoidance could be possible options. Based on recent research and simulations, he argued that though speed control of small- and medium-sized vessels can reduce the lethality of ship strikes, there is no safe speed for large vessels.

Michel Charron, Acting Director of Whale Protection Policy with Transport Canada, discussed the similarities and differences of both voluntary and mandatory VTM measures between the Atlantic coast for protecting North Atlantic Right Whales (NARW) and the Pacific coast for protecting Southern Resident Killer Whales (SRKW). He highlighted factors driving the differences, such as the distinct biological features of NARWs and SRKWs, different threats from shipping activities that the two kinds of whales are facing, and the essential nature of marine shipping along the Atlantic and Pacific coasts. When striving to protect whales, regulators also need to incorporate broader considerations for VTM such as the challenge of governing shipping activities beyond Canada's territorial seas, new emission and discharge requirements and regulations, the impact of climate change on whale distribution. Another important factor at play

is the ongoing reconciliation with Indigenous groups, recognizing the cultural and historical importance of these marine mammals.

The Q&A session concentrated on measures to mitigate the risk of vessel-sourced acoustic impact on marine mammals and ship strikes.

Mr. Martin pointed out that "impulsive" noise caused by seismic survey and pile driving (for which visual observers are mandatory) has a more damaging impact on marine mammals than vessel noise. Depending on the species detected in the environment, the shutdown period could range from 30 minutes to one hour and a half following a sighting.

Mr. Charron identified near real-time whale detection technologies that are currently being tested by the federal government and some commercial companies, including ship-mounted infrared cameras and drones. He also introduced a training program launched by the St. Lawrence Global Observatory (SLGO), WWF and Marine Mammal Observation Network (MMON) for mariners to detect and observe whales for the purpose of habitat data collection. Dr. Brillant pointed out that having on-board observers is currently recommended and adopted on some small fishing vessels operating in whale-rich waters to avoid ship strikes, as those vessels have higher maneuverability and can more quickly come to a full stop even at higher speeds.

The benefit of the voluntary slowdown zone in multi-jurisdictional waters on the West Coast was highlighted, including the mitigation of risks of environmental damage and underwater noise. Ship operators are active participants in vessel slowdown initiatives, and the Canadian commercial shipping industry has even started to get competitive about quietening. Class-specific speed limits were identified as contributing factors to high participation and compliance rates.

Session 4 – Managing Human Safety at Sea in Remote Areas

Session 4 was moderated by Gregory Wilkie, Commanding Officer of the CCG Atlantic Region.

Dr. Peter Kikkert, Irving Shipbuilding Chair in Arctic Policy from the Brian Mulroney Institute of Government at St Francis Xavier University and Professor Ronald Pelot jointly presented on the current issues and challenges facing search and rescue (SAR) in the Canadian Arctic, as well as solutions and pathways forward. Dr. Kikkert highlighted various strengths, deficiencies, and approaches of northern communities in improving their regional capacity for SAR. They also introduced their ongoing "Maximum Expected Time of Rescue (METR)" research project that aims to provide guidance to shipowners and operators regarding the METR and achieving a "place of safety" for rescued casualties in line with the Polar Code and SAR convention, with a methodology that may be applicable to other regions. This research effort involves air, marine and land responders to develop models for traffic and responses, with varying locations, times of the year, and numbers of persons to be rescued.

Mark Stoddard, Ph.D. candidate at the Department of Industrial Engineering at Dalhousie University, spoke on using ice-risk adjusted transit times to quantify the year-round remoteness and accessibility of coastal communities in the Arctic region. In the Canadian context, remoteness is determined based on a number of factors, many of which can change. The result of his research shows that remoteness varies significantly throughout the year, which is largely attributed to the changing environmental conditions. It also varies with respect to the Polar class ship type. Work remains to understand how to better use the proposed analysis method to support various research applications, such as monitoring the impact of climate change on the remoteness and accessibility of northern coastal communities.

Professor Desai Shan from the Faculty of Medicine at Memorial University elaborated on the multilayered physical and mental health challenges that Canadian Arctic mariners face, noting that these challenges were further exacerbated during the COIVD-19 pandemic. And fatigue, stress, isolation and mental health issues are all safety considerations. She argued that public health and maritime safety governance in the Arctic should adequately address the maritime occupational and health challenges. Port-based and community-based maritime welfare facilities should be developed as core Arctic maritime infrastructure to support seafarers.

In the Q&A session, Dr. Pelot further clarified that the outcome of the METR project is about base case scenarios with a typical range of response time in different circumstances. Regarding the feasibility of adopting a "trusted routes" regime in the Arctic (as is being encouraged in Singapore), Mr. Stoddard argued that such a regime could be useful for preplanning, but difficult to execute since it is based on historical waypoints and conditions can change rapidly. Dr. Pelot pointed out that trusted routes may help ships to get better communication and real-time information on ice and weather, though being overly prescriptive needs to be avoided. With respect to maritime safety in general, especially boating safety in the Arctic, Dr. Kikkert highlighted that though there are efforts at different government levels, there is need for more coherence and sense of direction.

Dr. Shan also provided further details on the limitations of the current fatigue management plans for Canadian seafarers in the context of the COVID-19 response. She elaborated on several issues, including the impact of working shifts on mariner fatigue, disputes between the companies and union regarding compensation for mariner's efforts and days spent on travelling and quarantine before boarding the ship for work, as well as the impact of isolation periods to prevent the transmission of COVID on mariner fatigue, stress, and well-being. She also highlighted a research project funded by Transport Canada that she was about to work on aiming to fill the policy gap.

Session 5 – Shipping's Interface with Indigenous Rights and Area-Based Management Perspectives

Session 5 was moderated by Meghan Mathieson, Director of Strategy and Innovation at Clear Seas.

Context

Dalhousie Interdisciplinary Ph.D. Candidate Weishan Wang set the context for the session by introducing the concept of MSP, highlighting examples of area-based management programs for shipping along the Pacific, Atlantic and Arctic coasts respectively. These examples include areas to be avoided, traffic separation schemes, no-fish zones, and marine protected areas, with emphasis on Indigenous peoples' involvement. She pointed out that shipping governance within an integrated and comprehensive MSP initiative is still far from being a common practice. To move forward, she suggested strengthening interdepartmental collaboration, implementing the UNDRIP Act for further progress on reconciliation, and applying a decolonizing lens to shipping governance, to which knowledge co-production with Indigenous communities is an important means.

Atlantic Region

Mélissa Whittom, Consultation Project Manager of the First Nations of Quebec and Labrador Sustainable Development Institute (FNGLSDI) and Coralie Lessard Bolâtre, Conservation Project Manager of the FNGLSDI made a joint presentation on projects undertaken by First Nations in the St. Lawrence region, especially initiatives relevant to maritime safety and environmental protection. Ms. Whittom presented on the marine planning and conservation project under which the FNGLSDI has helped First Nations to develop various sub-projects such as MSP, MPAs and MPA networks, and Blue Economy Strategy. She elaborated on several such sub-projects, including the Saguenay-St. Lawrence Marine Park which has developed successful practices to reduce vessel strikes of marine mammals. Effective regulatory measures include speed limits for various types of vessels, minimum required distance from marine mammals, and designation of restricted and transit zones for navigation.

Ms. Bolâtre spoke on several pilot projects and initiatives under Canada's Oceans Protection Plan (OPP). These projects and initiatives include the assessment of cumulative effects of marine vessel activities in St. Lawrence/Saguenay Rivers, such as the sociocultural effect on Indigenous communities and the physical effect on biophysical components; "Building Successful Partnerships" which aims to promote reconciliation, negotiate partnership agreements and measures with interested Indigenous groups, and improve safety and environmental response in marine and coastal areas. As an example, Ms. Bolâtre shared two pilot initiatives from the Conseil de la Première Nation des Innus Essipit and the Mohawk Council of Kahnawà:ke respectively

under the Enhanced Maritime Situational Awareness (EMSA) program; and a future project on "St. Lawrence River Regional Assessment" requested by the Mohawk Council of Kahnawà:ke. Ms. Bolâtre concluded that the engagement with First Nations needs to be further strengthened.

In the Q&A session, Ms. Bolâtre pointed out that the development of the co-governance model between the First Nations in Quebec and the federal and provincial governments on MSP is still in its beginning phase. Both Ms. Bolâtre and Ms. Whittom shared their experience as part of the FNGLSDI team to engage with First Nations as well as the federal and provincial governments to support the consultation process. They highlighted that stable and recurring funding and capacity building could help to enhance Indigenous communities' participation in decision-making, though sometimes the legal context, especially the Indian Act, remains an obstacle limiting their will and the action they want to take, despite advances such as the UNDRIP Act. They also identified factors such as in-person communication, trust-building, meaningful involvement of First Nations in decision-making, and knowledge co-production that are essential for successful collaboration and co-governance.

The panelists also highlighted the importance of collaboration across different government departments and among various stakeholders in response to a changing world, in which Indigenous communities could play a central and bridging role.

Pacific Region

Haida Hereditary Chief Russ Jones, Contractor of the Haida Marine Planning Program, Louise Murgatroyd, Regional Program Manager for the Proactive Vessel Management (PVM) at Transport Canada, and Robert Lewis-Manning, President of Chamber of Shipping, jointly presented on the challenges, success and lessons learned in the co-governance model for the Pacific Coast. They focused on the case of the Haida Gwaii Voluntary Protection Zone (VPZ) for shipping to operate 50 nautical miles offshore (excluding tugs, fishing vessels, and ferries).

Chief Jones reflected on the 2014 Simushir incident as a warning of the vulnerability of the marine environment of the Haida Nation. He highlighted that the VPZ is implemented by asking vessels to voluntarily observe relevant distance requirements when transiting on the west coast of Haida Gwaii to reduce the risks of grounding and oil spills by increasing the time available to respond to a vessel in distress. This voluntary measure was developed within a collaborative governance structure established under the Reconciliation Framework Agreement for Bioregional Oceans Management and Protection (RFA), where 14 First Nations and the Government of Canada committed to working together to develop and manage marine initiatives on the Pacific North Coast.

Ms. Murgatroyd pointed out the VPZ has been developed as part of the PVM initiative under the OPP, co-led by the Council of the Haida Nation and Transport Canada. PVM initiatives such as the VPZ focus on developing voluntary rather than regulatory management measures. The

advantages of voluntary measures include shorter timelines than conventional regulatory processes, more flexibility in developing solutions, as well as the opportunities to test management solutions and learn together. The VPZ is also able to adapt its policy options and measures based on changing circumstances, feedback and management goals and have an impact beyond the 12 nautical mile jurisdictional limit of the territorial sea. In addition, it fosters mutual understanding and information sharing between a broad range of water users.

Mr. Lewis-Manning noted that the Chamber of Shipping is one of eight industry associations supporting and enabling the creation of the VPZ. He pointed out that though information about the trial and implementation of the VPZ was distributed by industry associations to agents and ship operators, communication through federal government departments and agencies such as Transport Canada, the CCG and the Canadian Hydrographic Service (CHS) helped to improve awareness and the compliance rate. The monitoring of marine traffic patterns from September 2020 to July 2022 showed that the compliance rate reached 90%. He also highlighted the triple success of the project committee. The first is the acknowledgement of collective and individual values which, in the last five years, played an important role in helping to achieve successful outcomes. The second is the charter that the project committee created at an early stage to guide the approach and be a reference in the case of conflict. And the third is the recognition of and commitment to UNDRIP.

Regarding the challenges of the VPZ, Chief Jones emphasized that there is still a need to move vessels further offshore. He also argued that it is problematic that the two emergency towing vessels operating in the Pacific region are leased on a one-year contract to the CCG rather than being guaranteed over the long term, as maritime safety is contingent on the availability of these resources.[1]

There were further discussions at the Q&A session on the successful collaboration among the Council of the Haida Nation, Transport Canada, and the shipping industry in the development of the VPZ. Chief Jones identified multiple factors including the role of Reconciliation Framework Agreement, the Haida Nation's history and experiences of working with other federal departments, financial support, applying lessons learned from other pilot projects, and steps that were taken "outside of the boxes." Ms. Murgatroyd highlighted of the large body of background work, such as technical and risk analysis that the Haida Nation has accomplished, upon which the VPZ project could be built, as well as the "blank slate approach" that Transport Canada employed for full collaboration with other partners. Mr. Lewis-Manning emphasized the importance of establishing trust and mutual accountability in the process of VPZ development and implementation and the significant role of both leaders from the Council of the Haida Nation and Transport Canada.

[1] An analysis supporting the VPZ shows that there is a 99% chance of a save of a drifting vessel when ships transit at 50 nautical miles, which is based on the current situation of two emergency towing vessels.

Regarding how to build and maintain trust at an institutional level, Chief Jones stressed the important role of written agreements, from which relevant working procedures and protocols could be formalized and spelled out. Ms. Murgatroyd believes that through the OPP, the emphasis on Indigenous partnerships and ongoing work on co-governance, a culture shift has started to permeate various aspects of Transport Canada's work, which is critical as it can be applied to other situations.

With regard to how distance requirements for different vessel types transiting the VPZ were agreed upon, both Chief Jones and Mr. Lewis-Manning highlighted the principle that the initiation of the VPZ should be based on what is achievable for early success. Chief Jones emphasized that current distance requirements are medium-term measures that need to be further reviewed. He also noted that there is a dispute resolution process under the RFA in case of differences that could not be resolved through other means. Mr. Lewis-Manning pointed out that the process of risk analysis and decision-making was aligned with the Haida Nation's risk tolerances, which the shipping community has learned to respect.

Arctic Region

Sue McLennan, Manager of Arctic Projects and Governance of the CCG, Lindsey Raymond, Manager of Domestic Shipping Policy at Transport Canada, and René Chénier, Manager of Geodetic Engineering, Earth Observation and Geomatics from the CHS delivered a joint presentation on the Northern Low-Impact Shipping Corridors Initiative under the OPP. The three speakers introduced the objectives, current advancement, future timeline, and engagement approach with the Inuit and Northern communities. They also identified the gaps between the current advancement and the overall objectives and intention of the Initiative. For example, the design of the corridors has not considered the seasonal changes in sensitive marine areas. They concluded by highlighting the next step forward for the development of the Initiative.

Jody Illasiak from the Inuvialuit Game Council (IGC) and Leah Beveridge, Interdisciplinary Ph.D. Candidate of the Dalhousie University spoke jointly on decolonization and shipping in the Inuvialuit Settlement Region (ISR). They pointed out a number of issues and concerns with marine safety and shipping in the ISR, including wastewater dumping, the overlap between the proposed Northern Low-Impact Shipping Corridors and the Anguniaqvia Niqiqyuam MPA, negative impacts of increased shipping activities on marine wildlife and fish which in turn affect the subsistence of Inuvialuit, lack of information on shipping activities, lack of regulations, insufficient monitoring and enforcement, lack of baseline data, among others. In addition, they highlighted challenges experienced by Inuvialuit Game Council (IGC) members interacting with researchers and government officials. The overarching concern is the lack of listening to and respect for the Indigenous knowledge of IGC members in these interactions. Researchers and the government are asking the same questions but failing to retain the knowledge shared with them or share it at an institutional level. When it comes to shipping issues, IGC members perceive a lack of common understanding on key terms such as "Low Impact" Shipping Corridors and

"Reconciliation". Finally, IGC members are being asked for their input but not invited to the table where decisions are being made that will affect their communities and livelihoods. Ms. Beveridge concluded by providing recommendations for improvement, including ways to meaningfully consult and collaborate with Inuit communities. She also highlighted the need to implement UNDRIP, especially the provisions regarding Indigenous peoples' right to participate in decision-making (Article 18), and their right to maintain and strengthen the spiritual relationship with lands, territories, waters, coastal seas, and resources (Article 25).

In the Q&A session, the discussion focused on how to better engage Inuit and Northern communities and incorporate their knowledge into Arctic shipping governance, of which the Low-Impact Corridors Initiative is one example. It was acknowledged that engagement with Indigenous groups for Arctic shipping governance is improving, however, frustrations still exist when Inuit were included in the process and consulted for knowledge but excluded from decision-making. Both Ms. McLennan and Mr. Chénier emphasized the need for the second phase of the Corridors Initiative to make adjustments and be inclusive of Indigenous knowledge as much as reasonably possible. They also acknowledged that climate change has exacerbated the fast-changing Arctic environment. In such a context, the Corridors need to be more flexible and inclusive of Indigenous communities as their knowledge input could allow for a more efficient process. That said, developing an effective co-governance model remains a challenge.

Building on themes also raised in the previous segments focused on the Atlantic and Pacific coasts, the need for consistent and sustained efforts to build trust with Indigenous groups was discussed. Federal government departments making an effort to adopt an integrated approach for consultation and engagement was recognized as important, to reduce the burden such processes place on communities' limited capacities. Meanwhile, the subsistence lifestyle of Inuit in the Arctic and their indispensable role in their own small communities have also made it difficult for individuals to leave to attend learning and development programs in other parts of the country. Continuous commitment of funding resources and localized support are critical in supporting the development of skills and capacity.

Concluding Roundtable Discussion: Policy directions for Area-Based Management of Shipping in Canadian Waters

Following the presentation sessions, the workshop concluded with a roundtable discussion, moderated by Professor Chircop, during which panelists reflected on policies for area-based management of shipping risks in Canadian waters.

The panelists agreed that climate change constitutes both the context and driver for a paradigm shift of shipping governance. The rapidly and massively changing environment requires revisiting existing governance frameworks, such as the traditionally siloed configuration of federal departments with relations to provincial/territorial governments and Indigenous groups, in favour of a co-governance model that incorporates Indigenous self-determination and jurisdiction. The

federal government also needs to reform its approach to address various challenges and the delivery of specific programs.

The heart of paradigm shift is the important role of values, principles, and processes. The research community and the government have the responsibility to pave a way forward to reconcile and integrate Western science and Indigenous knowledge systems. Policy-making at all levels needs to be guided by the "Two-Eyed Seeing" approach to incorporate different ways of knowing. In particular, legislation and regulation should consider the Indigenous perspectives such as the methodological structure of governance for sustainability proposed by keynote speaker Ken Paul. And the legislative and regulatory process needs to integrate Indigenous values as well as historically and culturally significant evidence provided by the Indigenous knowledge systems. In addition, the social-economic impact analysis of regulations and policies should go beyond the concerns of southern society and take into consideration the cost to traditional values and culture of Indigenous communities on all coasts. All of these are major learning investments, but they are worth the effort.

The discussion also stressed the need for co-governance where the UNDRIP is applicable, especially with respect to Indigenous Peoples' rights to free, prior and informed consent as well as their title to lands, territories and resources in the marine environment. A written agreement is important to the consistency of the co-governance effort, and to engender trust between the different parties. A speaker shared Haida Nation's successful experience in documenting its traditional knowledge including maps and textual descriptions of values and species that are important for marine planning. These documents serve as important references for the Council of the Haida Nation when projects require the Haida Nation's approval. The Haida Nation also documented its ethics and values as part of the marine planning process in Haida Gwaii, which has been incorporated in the Haida Gwaii marine plan and Gwaii Haanas Land-Sea-People management plan. The values of the Haida Nation such as respect, balance, responsibility, and the importance of knowledge from elders fit well into MSP concepts of ecosystem-based management and integrated management. The synergy of Haida values and MSP concepts serve the MSP functions and purposes well, especially concerning issues related to risk analysis and risk tolerance. At the operational level, Indigenous communities and mariners need to be empowered to support compliance with area-based management.

In the Canadian context, it is important for policymaking to ensure community engagement. Government departments with different mandates and capabilities need to work together to address specific and often overlapping issues that pertain to a community, rather than only pursuing their individual mandates. Good governance requires community engagement (capacity) and necessitates political will and resource commitments, including for capacity-building in Indigenous communities. In the case of the Haida Nation, capacity-building for people who are involved in spatial planning is given importance and tools like Sea Sketch have helped them to get access to relevant information and monitor what is happening in their territory.

As an industry, shipping needs to become more dynamic and adaptive to future challenges, especially that of decarbonization. The scale of the challenge of shipping decarbonization is beginning to be understood, and it is important that technology and regulation work together to develop viable solutions for zero-emissions vessels, rather than lingering on transitional fuels with significant climate impacts. To reduce the immediate and cumulative impacts of shipping on the environment, mariners also need to embrace dynamic management with tools onboard to optimize operational performance for environmental outcomes – reducing noise and emissions, managing waste, and avoiding strikes – in addition to navigational safety and efficiency. And the development of such tools would require integrated knowledge and perspectives of various stakeholders across different disciplines, such as ecologists, logistics managers and Indigenous groups.

Finally, policymakers and practitioners need to be sensitive to working with uncertainty due to the limited understanding of complex risks and the rapidly changing environment. Currently, most area-based management practices are guided by a risk-based approach which focuses on risk anticipation and minimization. However, the precautionary approach should also be taken into consideration with respect to decision-making situations characterized by uncertainty, insufficient knowledge, and differing tolerance levels. Area-based management policy should be guided by trilateral perspectives of government, industry and Indigenous communities, identified best practices, risk-based management and precautions.

Current and Emerging Best Practices in Canada

Panelists agreed that Canada is improving in its efforts to engage Indigenous groups as rights' holders early, including in the design of consultation processes guided by reconciliation. A growing commitment to tripartite governance arrangements consisting of federal government, provincial/territorial government, and Indigenous government signals a shift towards mutually accountable governance. Tripartite engagement on an equal footing, funding of Indigenous capacity, and committed dialogue are critical to making progress in addressing Indigenous concerns with the impacts of shipping. In a world increasingly affected by climate change, Indigenous organizations represent environmental values that many Canadians also share.

Currently, risk management and analysis are evolving from being predominantly quantitative to mixed-methods and more qualitative approaches. In this way, it can better incorporate non-quantitative data, various forms of information, values, norms and other types of knowledge into its methodology. Such evolution could also enable practitioners to think and anticipate qualitatively what might happen and set up relevant monitoring mechanisms after implementing new measures to identify and keep track of the anticipated and unanticipated effects of new measures. This approach has been undertaken on both the West and East Coast of Canada. And the evolution of how we look at risks has entailed enhanced participation of Indigenous groups in decision-making.

Section 10(1)(c) of the *Canada Shipping Act, 2001* is arguably one of the most significant legislative changes made in 2018 because it allows the Minister of Transport or the Minister of Fisheries and Oceans to enter into agreements or arrangements with and authorize any person or organization – including a council or other entity authorized to act on behalf of an Indigenous group – to set up a local regime to exercise the powers or perform the duties and functions under the Act. Such unprecedented legislation could potentially enable the federal government to take a deliberate approach to delegate authority or formal roles to Indigenous groups in shipping governance. And in remote areas where the federal government has limited resources and presence, such as in the Arctic, there are already community-based initiatives around bathymetry, AIS, monitoring, etc., which could be formally included in the federal governance regime.

Challenges to Area-Based Management

In Canada, we are in the process of moving from theory to practice for area-based management, and learning what works well, and what does not. The proceedings provided examples of successes and challenges on each of the three coasts. In each situation, the importance of communication, values, and accountability was highlighted. Lack of commitment and mutual accountability could prevent negotiating parties from achieving progress in advancing area-based management. The SGaan Kinghlas–Bowie Seamount management plan took five years to adopt because the federal government initially did not appear to be committed to the initiative. The DFO was represented by ten managers over a ten-year period, raising concerns of lack of continuity and consistency. Only after the DFO, the provincial government of British Columbia and the Council of the Haida Nation formed a tripartite leadership did negotiations get back on track and are currently on the verge of significant progress in the implementation of an MPA network for the BC North Coast. The Pacific North Coast Integrated Management Area Initiative (PNCIMA) is another example where efforts to develop a marine spatial plan made little progress over many years, in part due to the federal government's failure to commit to an agreement on how to develop an MPA. It also lost its planned function to deal with fishery issues due to the lack of DFO guidance.

Aspects of MSP Not Sufficiently Understood in Canada

Few people in the shipping industry understand MSP, and the lack of capacity will likely be a constraint on efforts to achieve positive outcomes of MSP, which depend heavily on collaboration and commitment to a shared vision amongst many different parties. The federal government needs to elevate the visibility of MSP to encourage the shipping industry to prioritize its resources to support MSP capacity building and other relevant efforts.

While mariners and the public understand the concept of MPAs, they are not necessarily familiar with the policies and regulations of particular initiatives, such as the Haida Voluntary Protection Zone pilot program and the Gwaii Haanas National Park Reserve and Haida Heritage Site,

particularly why policies and regulations differ. Concerted efforts are required from the federal government, the shipping industry and First Nations to raise general awareness.

The shipping industry engages regularly with regulators, which gives regulators like Transport Canada an opportunity to increase awareness and strengthen environmental measures in support of particularly sensitive and important marine areas. The incorporation of rules for shipping in MPAs would not only support area-based management but also serve to raise public and industry awareness.

Policy Support for MSP and Area-Based Management for Shipping

As Canada continues to develop its own approach to MSP, it is important that an evidence-based approach is supported by different ways of knowing. The integration of Indigenous values into risk assessment and applying "Two-Eyed Seeing" to decision-support systems should be pursued in all stages of the planning process. Indigenous people and coastal communities who are impacted by MSP must be integrated into the process and their concerns need to be addressed. Examples of measures that should be co-developed with and signed off by Indigenous communities include planning for places of refuge, and emergency preparedness and response plans. The federal government also needs to provide sustained political and resource commitment to support capacity-building within the Indigenous groups so that the latter could fully participate in the co-development process.

Indigenous leadership can drive a governance structure that works for various partners. Federal departments involved in developing area-based management plans should be integrated. Some federal departments have a lower level of understanding of shipping issues and implications, particularly as people with relevant expertise and knowledge retire. To transfer knowledge and ensure MSP and area-based management efforts are based on good information, a "secretariat" should be established, consisting of a core group of people with relevant expertise and practical knowledge. Such mechanism could provide technical advice to regulators and help to support and sustain good governance over the long term.

Mariners also have a role to play in MSP and area-based management effort, but the current level of awareness and engagement is low. Notices to Mariners (NOTMAR), which provides mariners with real-time information relevant to their decision-making on board a vessel, could also be a useful communication tool to further area-based management. Transport Canada's PVM is one example of a voluntary area-based management measure that can achieve a high level of compliance and prevent and mitigate user conflicts in an inclusive way.

As shipping is an international business, Canada could contribute its area-based management best practices at multilateral venues such as the IMO, to educate and generate a broader understanding of MSP in the maritime community worldwide. Canada can also help other

countries develop guidelines and policies that could foster a culture of area-based adaptive management.

Finally, the effort of shipping decarbonization needs to be strengthened, of which port development is an essential part. Canada has an opportunity to support this transition through the emerging concept and practice of "green shipping corridors" in Canadian waters to enable low- and zero-carbon navigation.

APPENDIXES

Appendix A: Overview of OFI Module N Project: Safe Navigation and Environment Protection

OCEAN FRONTIER INSTITUTE

MODULE N: SAFE NAVIGATION AND ENVIRONMENT PROTECTION

Co-principal Investigators and subproject leads:

Aldo Chircop (Schulich School of Law), Claudio Aporta (Marine Affairs Program), Floris Goerlandt (Industrial Engineering), Ron Pelot (Industrial Engineering), David Barclay (Oceanography)

Context and goal

The Canadian Arctic is undergoing fundamental change. Arctic sea ice is melting due to climate change and, as a result, this region of the ocean is becoming more accessible to summer commercial and recreational shipping, with consequential impacts on navigation routes. The Arctic is not static and has seasonal risk patterns, including bad weather, fog, a long winter and the frequent presence of ice in the summer. Most navigable waters in the Canadian Arctic lack infrastructure for safe navigation, search and rescue and pollution response. While increased shipping is beneficial to trade, resource development and scientific studies, it also results in adverse impacts. These include air pollution, risks for public health, greenhouse gas emissions, potential conflicts with other ocean users, safety of life at sea concerns, marine pollution, and disruption of marine life. Increased shipping will produce mixed impacts on Inuit communities, including disruption of Inuit uses of ice and marine areas.

Module N investigates how ocean change and anthropogenic impacts affect our understanding of risk, policy, management and regulation for safe navigation, environment protection, conflict management between ocean uses, and protection of Indigenous peoples' interests. We explore a range of tools to help mitigate risks and adverse impacts from shipping and identify respectful approaches for safeguarding Inuit interests, including through designation of shipping corridors and marine spatial planning. The project will produce a suite of risk assessment, spatial use planning and policy tools to assist Canadian regulators, Indigenous rightsholders and other stakeholders.

Research themes and questions

Module N's principal themes are maritime safety and environmental protection in the polar shipping context and with a focus on risk assessment, vessel safety, vessel-source marine and atmospheric pollution, underwater noise, spill response, search and rescue, fishing vessels, protection of seafarers, marine spatial planning, protection of Inuit interests and ocean uses, and maritime regulation. More specific questions pursued by researchers include the following, in no particular order of priority:

- What are good measures for quantifying shipping risks to the environment and what are appropriate frameworks to inform decision-making and policy development?
- What are the effects of "remoteness" on arctic community shipping for supply reliability, vessel safety, and preparedness and response activities?
- What are the required environmental parameters to accurately predict and map natural (e.g. wind, ice, temperature driven) ambient noise in the Canadian Arctic? How can sound propagation under sea-ice be reliably and efficiently modelled?
- What are the contributions of vessels and other human activity to the underwater soundscape of the Canadian Arctic?
- How can MSP add value to ocean management in the Canadian Arctic to help mitigate risks from air pollution from ships, noise, vessel spills and conflicts with Inuit interests? Marine spatial planning is conceived as driven largely by Inuit perspectives and interests, which includes seeing the changing land-, sea-, and ice-scapes as a continuity.
- How can MSP address Inuit concerns and incorporate Inuit approaches to marine and coastal areas?
- How can lessons learned from MSP in the Northeast Atlantic and European waters impact the development of MSP in Canadian Arctic waters?
- What roles can international and Canadian maritime regulation play to support the governance of shipping in Canadian Arctic waters?

Contribution to OFI vision and objectives

The Module team draws from Dalhousie and includes participants from other universities in Canada and Europe, the Canadian federal government and international organizations. Over the life of the project to date, the Module has focused greater emphasis on Arctic waters and attention to risks (safety and pollution), management (including Inuit-led) and regulatory challenges (compliance with international standards) in the governance of shipping in Canadian Arctic waters. More recently, and in preparation for the second major workshop, the Module re-oriented its work towards area-based management approaches to the management of the impacts of shipping, particularly with respect to impacts on Indigenous rights. Much of the early work was multidisciplinary and over the course of the project has become increasingly interdisciplinary.

OFI objectives	*Discover*	• Identify appropriate management approaches that are socially acceptable with Indigenous interests at the centre.
	Collaborate	• Has included a strong Dalhousie-Memorial collaboration and sought inputs from Transport Canada, DRDC, Canadian Federation of Shipping, international partners in Germany, France, Italy, Norway, Sweden, and the IMO/World Maritime University. • Engaged rightsholders (Inuit) and stakeholders (government) in work concerning risk, underwater noise and marine spatial planning aiming at deliverables which reflect the input of Indigenous peoples and stakeholders.
	Lead	• Attracted and nurtured talent while reflecting diversity (to date 24 HQPs)
	Enable	• Contributed ideas for the building of better, efficient and equitable organizational and governance structures • Sharing of research results (to date: x8 theses; x1 book; x23 articles; x23 book chapters; x48 conference presentations; plus reports, policy briefs, etc.

Place and role of the social sciences

Module N's mission is the governance of Arctic shipping and accordingly has a substantial social science component. The project employs perspectives and approaches from various disciplines: underwater noise (oceanography/engineering); spill response (industrial engineering/law); search and rescue (industrial engineering/law); risk assessment (industrial engineering); marine spatial planning (social anthropology/geography/law); and regulatory assessment (law). Two of the four co-PIs have law and social anthropology backgrounds. While starting with multidisciplinary collaboration, Module N's work has become progressively interdisciplinary. The Module's largest publication deliverable to date, *Governance of Arctic Shipping: Rethinking Risk, Human Impacts and Regulation* (print in July, open access; Springer, 2020; https://www.springer.com/gp/book/9783030449742), is co-edited by two social scientists and two industrial engineers, and contains 16 chapters most of which are in the social sciences and several of which are interdisciplinary collaborations.

Appendix B: Workshop Programme

Tuesday, 30 August

08.30-09.00 **Opening**	Acknowledgement of Mi'Kmaq ancestral lands, territories and Treaty rights Opening remarks • Anya Waite, Scientific Director & CEO, Ocean Frontier Institute; Dalhousie University Associate Vice-President Research (Ocean), Halifax, NS • Murray Coolican, Board Chair, Clear Seas Centre for Responsible Marine Shipping, Halifax, NS • Aldo Chircop, Professor of Law, Marine & Environmental Law Institute, Dalhousie University, Halifax, NS Workshop purposes and procedure
09.00-09.30 **Keynote Address**	Ken Paul, Wolastoqey Nation, New Brunswick
09.30-11.00 **Session 1** **Vessel traffic management**	**Moderator**: Ronald Pelot, Professor, Department of Industrial Engineering, Dalhousie University, Halifax, NS Waterway risk analysis as a basis for a framework for risk-based vessel traffic management • Floris Goerlandt, Assistant Professor & Canada Research Chair in Risk Management and Resource Optimization for Marine Industries, Department of Industrial Engineering, Dalhousie University, Halifax, NS Vessel traffic management experiences in European waters • Jens-Uwe Schröder-Hinrichs, Vice-President Academic, IMO-World Maritime University, Malmo, Sweden Canada's experience with vessel traffic management in its marine regions • Antonella Ferro, Director, Marine Navigation in the Fleet and Maritime Services (FMS) branch, Canadian Coast Guard, Ottawa, ON (virtual) **Commentator**: Paul Blomerus, Executive Director, Clear Seas Centre for Responsible Marine Shipping, Vancouver, BC (virtual)

11.00-11.15	Networking break
11.15-12.45 Session 2 Marine spatial planning and environment protection	Moderator: Claudio Aporta, Canadian Chair in Marine Environment Protection, IMO-World Maritime University, Malmo, Sweden Marine spatial planning in Canada • Silke Neve, Senior Director, Marine Spatial Planning, Fisheries and Oceans Canada, Ottawa, ON (virtual) Area-based management approaches to address marine and atmospheric pollution and impacts from shipping: Practices, successes and failures • Sam Davin, Specialist, Marine Shipping and Conservation, WWF-Canada, Ottawa, ON Challenges in incorporating local knowledge in marine spatial planning decision-support tools • Claudio Aporta, Canadian Chair in Marine Environment Protection, IMO-World Maritime University, Malmo, Sweden Commentator: Gerald Singh, Assistant Professor and Ocean Nexus Chair in Global Change and Sustainable Development, School of Environmental Studies, University of Victoria, Victoria, BC (virtual)
12.45-13.45	Lunch break
13.45-15.15 Session 3 Prevention and mitigation of vessel environmental impacts on marine biological diversity	Moderator: Bruce Martin, Applied Sciences Manager (Halifax), JASCO Applied Sciences (Canada) Ltd., Halifax, NS Understanding and mitigating underwater noise through routeing measures • David Barclay, Associate Professor, Department of Oceanography, Dalhousie University, Halifax, NS Understanding vessel size and speed as a factor in preventing ship strikes of marine mammals • Sean Brillant, Senior Conservation Biologist, Marine Programs, Canadian Wildlife Federation, Halifax, NS Comparing area-based management approaches on east and west coasts • Michel Charron, Acting Director, Whale Protection Policy, Transport Canada, Ottawa, ON (virtual)

	Commentator: Dr. Leah Trigg, Postdoctoral Fellow in Large Whale Conservation, Department of Oceanography, Dalhousie University, Halifax, NS
15.15-15.30	Networking break
15.30-17.00 Session 4 Managing human safety at sea in remote areas	**Moderator**: Gregory Wilkie, Commanding Officer, CCG Atlantic Region, Dartmouth, NS Arctic Search and Rescue (SAR): Issues, challenges, and pathways to solutions • Peter Kikkert, Irving Shipbuilding Chair in Arctic Policy, Brian Mulroney Institute of Government, St Francis Xavier University, Antigonish, NS (virtual) and • Ronald Pelot, Department of Industrial Engineering, Dalhousie University, Halifax, NS Community connectivity in Arctic SAR • Mark Stoddard, PhD Candidate, Department of Industrial Engineering, Dalhousie University, Halifax, NS The impact of COVID-19 on Arctic shipping: An occupational health and safety perspective • Desai Shan, Community Health and Humanities, Faculty of Medicine, Memorial University, St. John's, NL **Commentator**: Captain Jack Gallagher, Hammurabi Consulting, Halifax, NS

Wednesday, 31 August

09.00-10.15 Session 5 Shipping's interface with Indigenous rights and area-based management perspectives	Moderator: Meghan Mathieson, Director of Strategy & Innovation, Clear Seas Centre for Responsible Marine Shipping, Vancouver, BC Context: Area-based management for shipping and Indigenous Peoples' involvement on three coasts • Weishan Wang, Interdisciplinary PhD Candidate, Dalhousie University, Halifax, NS Atlantic Region: Initiatives and collaborations to make marine navigation safer and more respectful of the environment and Indigenous rights in the St. Lawrence Region • Institut de développement durable des Premières Nations du Québec et du Labrador | First Nations of Quebec and Labrador Sustainable Development Institute, Wendake, QC o Mélissa Whittom, Consultation Project Manager, Centre of Expertise in Consultation and Accommodation o Coralie Lessard Bolâtre, Conservation Project Manager, Planning and Marine Conservation
10.15-10.45	Networking break
10.45-12.00 Session 5 (continued)	Pacific: Voluntary Protection Zone for Shipping on the West Coast of Haida Gwaii • Chief Russ Jones, Contractor Marine Planning Program, Council of the Haida Nation, Skidegate, BC • Louise Murgatroyd, Regional Program Manager, Proactive Vessel Management, Transport Canada, Vancouver, BC (virtual) • Robert Lewis-Manning, President, Chamber of Shipping, Vancouver, BC
12.00-13.00	Lunch break
13.00-14.15 Session 5 (continued)	Arctic Region: Northern Low-Impact Shipping Corridors initiative and engagement with Inuit, First Nations, and Métis organizations and governments, industry and other Northern partners • Sue McLennan, Manager, Arctic Projects and Governance for the Canadian Coast Guard Arctic Region, Ottawa, ON • Lindsey Raymond, Manager, Domestic Shipping Policy, Transport Canada, Ottawa, ON • René Chénier, Manager, Geodetic Engineering, Earth Observation and Geomatics, Canadian Hydrographic Service, Ottawa, ON

	Arctic Region: Decolonization and Shipping in the Inuvialuit Settlement Region • Jody Illasiak, Shipping Lead, Inuvialuit Game Council, Paulatuk, NT • Leah Beveridge, Interdisciplinary PhD Candidate, Dalhousie University, Ottawa, ON
14.15-14.45	General discussion
14.45-15.00	Networking break
15.00-16.30 Concluding roundtable discussion	Policy directions for area-based management of shipping in Canadian waters Moderator: Aldo Chircop, Professor of Law, Marine & Environmental Law Institute, Dalhousie University, Halifax, NS • Erin Abou-Abssi, Director of Policy, Oceans North, Ottawa, ON (virtual) • Floris Goerlandt, Assistant Professor & Canada Research Chair in Risk Management and Resource Optimization for Marine Industries, Department of Industrial Engineering, Dalhousie University, Halifax, NS • Chief Russ Jones, Contractor, Marine Planning Program, Council of the Haida Nation, Skidegate, BC • Robert Lewis-Manning, President, Chamber of Shipping, Vancouver, BC • Bud Streeter, Director, Clear Seas Centre for Responsible Marine Shipping, Halifax, NS
16.30-16.45	Workshop closure

Appendix C: Speaker Biographies

PRESENTERS

Erin Abou-Abssi, Director of Policy, Oceans North, Ottawa, ON

Focusing on interdisciplinary policy solutions, Erin Abou-Abssi works to address issues related to climate change and industrial and commercial pressures in the Arctic. She draws on experience in the private sector and with the auditor general of Canada, the First Nations in British Columbia and the Public Health Agency of Canada. She earned her master's degree in natural resource management and regional planning at Simon Fraser University and has conducted paleoecological climate change research. She is based in Ottawa, Ontario

David Barclay, Associate Professor, Department of Oceanography, Dalhousie University, Halifax, NS

Dr. David Barclay is the Canada Research Chair in Ocean Technology Systems in the Department of Oceanography, Dalhousie University. He received a Ph.D. in 2011 from the Scripps Institution of Oceanography, UC San Diego, and is an associate editor at the Journal of the Acoustical Society of America – Express Letters.

Leah Beveridge, Interdisciplinary PhD Candidate, Dalhousie University, Halifax, NS

Leah is an Interdisciplinary Ph.D. candidate under the supervision of Dr. Aldo Chircop and Dr. Claudio Aporta. She is partnering with the Inuvialuit Game Council to contribute to the Game Council's efforts to advance their interests priorities for marine safety and shipping. Her research focuses on identifying policy options for addressing key concerns of the Game Council with shipping in the ISR, and to suggest ways the Government of Canada can improve how they work with Inuvialuit moving forward.

Coralie Lessard Bolâtre, Conservation Project Manager, Planning and Marine Conservation, Institut de développement durable des Premières Nations du Québec et du Labrador | First Nations of Quebec and Labrador Sustainable Development Institute, Wendake, QC

Ms. Coralie Lessard Bolâtre holds a technical degree in Bioecology, a bachelor's degree in marine biology from the Université du Québec à Rimouski, a professional master's degree in water sciences from the Institut national de la recherche scientifique and a graduate diploma in college teaching from Université Laval. Born on the Côte-Nord and raised near the St. Lawrence River, she has always been interested in its protection. Newly hired as a conservation project manager - planning and marine conservation at the FNQLSDI, Coralie is deepening her expertise on conservation, marine spatial planning and First Nations governance in the estuary and Gulf of St. Lawrence in Quebec. One of her main mandates is to support First Nations' understanding and action on issues related to marine conservation, management and planning in Quebec.

Sean Brillant, Senior Conservation Biologist, Marine Programs, Canadian Wildlife Federation, Halifax, NS

Sean Brillant is the Senior Conservation Biologist for Marine Programs at the Canadian Wildlife Federation. He is a marine biologist with a PhD in experimental ecology and a masters in pollution ecology. Since 1993 Sean has collaborated with wide ranges of resource users, landowners, governments, NGOs, and scientists to solve a variety of environmental issues. In 2007, Sean began working to reduce harmful interactions between human activities and marine wildlife, focusing particularly on entanglements of and ship strikes on whales. Sean is an active member of many local, national, and international initiatives working on marine conservation and education and is based at Dalhousie University in Halifax Nova Scotia, where he is an Adjunct with the Department of Oceanography. Originally from Saint John NB, Sean spent his school years exploring, studying, fishing, and freezing in the Bay of Fundy.

Michel Charron, Acting Director, Whale Protection Policy, Transport Canada, Ottawa, ON

Michel Charron is the Acting Director of Whale Protection Policy with Transport Canada. Formerly, he was the Manager and Senior Policy Advisor of the Clean Water Policy Division with Transport Canada. Before water, Michel worked for the Canadian Forest Service as an Innovation Program Officer and Senior Economist for Natural Resources Canada. Michel has a master's degree in physical geography and is based in Ottawa.

René Chénier, Manager, Geodetic Engineering, Earth Observation and Geomatics, Canadian Hydrographic Service, Ottawa, ON

René Chénier is a manager at the Canadian Hydrographic service (CHS) where he is managing the Geodesic, Geomatics and Remote Sensing groups. René has been working at CHS for the last 13 years here he has established the CHS Geomatics and Remote Sensing centre of expertise.

Murray Coolican, Board Chair, Clear Seas Centre for Responsible Marine Shipping

Murray Coolican has held leadership positions across a number of sectors including not-for-profit, government, and the private sector. He has worked on environmental and aboriginal issues, in the energy and natural resources sectors, and in financial services. He served as Senior Executive Vice President at Maritime Life, and Vice President at a number of companies including Nova Scotia Power, Corporate Communications Limited and National Sea Products. In government he worked as Deputy Minister of Energy and Business in the Government of Nova Scotia, Deputy Minister of Native Affairs in the Government of Ontario and Special Assistant to the Rt. Hon. Robert Stanfield. He was also Executive Director of the Canadian Arctic Resources Committee, an environmental NGO when it won the Governor General's Conservation Award. As a volunteer he Chaired the Halifax Metro United Way, the Halifax Chamber of Commerce and served as Vice-Chair of the Dalhousie University Board of Governors. He has also served as a Director of the

Canadian Geographic Society and the World Wildlife Fund (Canada.) Mr. Coolican was appointed Chair of the Board of Directors of Clear Seas in January 2022.

Sam Davin, Specialist, Marine Shipping and Conservation, WWF-Canada, Ottawa, ON

Sam Davin works for World Wildlife Fund Canada as a member of the Wildlife & Industry team where he advises on sustainable shipping practices with a focus on pollution prevention and voyage planning.

Antonella Ferro, Director, Marine Navigation in the Fleet and Maritime Services (FMS) branch, Canadian Coast Guard, Ottawa, ON

Antonella Ferro is the Director, Marine Navigation Programs within the Fleet and Maritime Services Directorate at the Canadian Coast Guard. Her team manages the operational and program policy work for the four marine navigation programs and e-Navigation. Antonella joined Coast Guard in 2000 as a Marine Communications and Traffic Services Officer and has more than 20 years public service experience. Within CCG, Antonella has held roles with increasing responsibility including acting at the executive level and in various management roles within Maritime Security; Oceans Protection Plan (OPP) Implementation Team; and, Marine Navigation Branch. Antonella has extensive policy, operational, and program implementation experience. Antonella holds a Master of Public Administration from Lake Superior State University and a Bachelor of Arts Sociology/Criminology form the University of Windsor; and she completed the National Security Program at the Canadian Forces College in Toronto, ON.

Floris Goerlandt, Assistant Professor & Canada Research Chair in Risk Management and Resource Optimization for Marine Industries, Department of Industrial Engineering, Dalhousie University, Halifax, NS

Floris Goerlandt is an assistant professor at the Department of Industrial Engineering at Dalhousie University. He is also the Canada Research Chair in Risk Management and Resource Optimization for Marine Industries. He obtained an MSc. degree in Maritime Sciences from the University of Antwerp, an MSc. degree in Marine Technology from Ghent University in 2005, and a PhD in Maritime Risk and Safety in 2015 from Aalto University in Finland. His expertise is in risk analysis and management, safety engineering and management, maritime transportation, modelling and optimization of transportation systems, and emergency/disaster planning and response. He received the 2020 Dalhousie University President's Research Excellence Awards for Emerging Investigators in recognition of his achievements.

Jody Illasiak, Inuvialuit Game Council, Inuvik, NT

Jody Illasiak is a subsistence harvester from Paulatuk, Northwest Territories. He has been involved with the Hunters and Trappers Committee for four years and this is his third year with the Inuvialuit Game Council (IGC) where he holds the Shipping File and advises the IGC on all

matters pertaining to marine shipping. He is also the working group chair for the Anguniaqvia Niqiqyuam Marine Protected Area (ANMPA), located in Darnley Bay, NT.

Peter Kikkert, Irving Shipbuilding Chair in Arctic Policy, Brian Mulroney Institute of Government, St Francis Xavier University, Antigonish, NS

Dr. Peter Kikkert is Irving Shipbuilding Chair in Arctic Policy in the Brian Mulroney Institute of Government and Assistant Professor in the Public Policy and Governance program at St Francis Xavier University. Dr. Kikkert has written extensively on historic and contemporary safety, security, and sovereignty issues in the polar regions. His current research program focuses on how to strengthen search and rescue, disaster and emergency management capabilities, and community disaster resilience in the North.

Chief Russ Jones, Contractor, Marine Planning Program, Council of the Haida Nation, Skidegate, BC

Nang Jingwas Russ Jones is a marine scientist, Haida Hereditary Chief, and former Manager of Marine Planning for the Haida Nation. He played a key role in establishing the Marine Plan Partnership for the North Pacific Coast (MaPP) - a co-led process between 17 First Nations and the Government of the Province of British Columbia that developed and is implementing plans for marine uses on B.C.'s North Pacific Coast, now and into the future. The MaPP initiative is notable also for the diversity of stakeholders involved and the number of marine uses, activities and values addressed. He has worked with other First Nation technical teams on the North Coast, Central Coast and northern Vancouver Island who are also involved in marine planning. Mr. Jones was a co-lead in development of the Haida Gwaii Marine Plan (approved in 2015) that provides management direction and spatial zoning for marine uses in order to support sustainable communities on Haida Gwaii while protecting marine ecosystems. The plan was developed by the Haida Nation in partnership with the Province of British Columbia over a period of three years. It was supported by a marine advisory committee and was informed by a comprehensive Haida Marine Traditional Knowledge study. He has published papers on a variety of topics including marine planning and marine protected area policy, Haida ethics and values, and fisheries co-management.

Robert Lewis-Manning, President, Chamber of Shipping, Vancouver, BC

Robert is the President of the Chamber of Shipping, a leading Canadian marine transportation industry association championing responsible international marine trade. In his role as President, he is intimately involved with the development of international and national marine trade, safety, and environmental policy. He is also a member of the National Species at Risk Advisory Committee. A former senior officer in the Royal Canadian Navy, Robert served in various sea-going and staff positions in Canada as well as internationally. Upon departing the Navy, Robert joined the Canadian Shipowners Association as the President, where he was instrumental in progressing the interests of Canadian ship owners and promoting short-sea-shipping. He is passionate about promoting solutions related to environmental stewardship, sustainability, and

the innovation of technology in the transportation sector. Robert holds degrees in Political Science, International Relations, and Business Administration. He enjoys the tranquility of the outdoors including snowboarding, sailing, biking and hiking.

Sue McLennan, Manager, Arctic Projects and Governance for the Canadian Coast Guard Arctic Region, Ottawa, ON

Sue McLennan is a chemical engineer with a master's degree in Sustainability and Environmental Management from Harvard University. She has over twenty years of experience in project management and stakeholder engagement. Sue has been with the Canadian Coast Guard Arctic Region for three years and is based in Ottawa.

Louise Murgatroyd, Regional Program Manager, Proactive Vessel Management, Transport Canada, Vancouver, BC

Louise is the Pacific regional manager for the Ocean Protection Plan's Proactive Vessel Management (PVM) initiative and has been with Transport Canada since 2015. Through PVM, the department works in partnership with Indigenous Nations, and in collaboration with the marine shipping industry, to develop voluntary management measures that enhance marine safety and environmental protection. Prior to joining Transport Canada, Louise worked with Parks Canada leading partnering and engagement activities to support the protection and enjoyment of national parks and historic sites in Coastal BC and the Lower Mainland. Louise has an extensive background in marine tourism, environmental education and stewardship, and recreational sailing and boating safety instruction. She earned her master's degree in Marine Management from Dalhousie University a very long time ago.

Silke Neve, Senior Director, National Marine Spatial Planning Program, Fisheries and Oceans Canada

Silke leads the implementation of marine spatial planning activities, supported by trilateral governance structures and strengthened federal coordination through improved governance and information sharing to increase availability of marine data for improved evidence-based decision making. She was previously at Environment and Climate Change Canada's (ECCC) Strategic Policy Branch where she was the Director responsible for the Canadian Environmental Sustainability Indicators (CESI) program. In this role, she supported the reporting on environmental sustainability outcomes to Canadians as well as in context of reporting progress against a number of domestic and international strategies and frameworks (most notably the Federal Sustainable Development Strategy). Prior to that, Silke worked for several years at ECCC's Canadian Wildlife Service (CWS) where she worked in both the regional office (Pacific Region) and the National Capital Region on various efforts related to the conservation of habitat and species. Silke holds a bachelor's degree in Biology and Environmental Sciences from McGill University and a Master of Resource Management from the University of British Columbia.

Ken Paul, Lead Fisheries Negotiator and Research Coordinator, Wolastoqey Nation, New Brunswick

Ken is a member of the Wolastoqey First Nation in the community of Neqotkuk whose traditional territory is located on the northern Atlantic coast spanning the Canada/US border between Maine, New Brunswick and Quebec. For the past 9 years, Ken has advocated for First Nations Chiefs regionally, nationally and internationally on all aspects relating to fisheries, aquaculture, oceans governance and aquatic resources as they relate to inherent and treaty rights, legislation, and policy. This includes Indigenous Knowledge Systems, economic prosperity, community engagement and resource management. Previously, he worked in field-based ocean mapping with the Canadian Hydrographic Service and as a Senior Policy Advisor with Parks Canada in the Atlantic region and the Field Unit Superintendent in the Northwest Territories. Ken has an MBA with St Mary's University and a BSc from Dalhousie University in Halifax, Nova Scotia and has extensive training in leadership, policy development, mediation, labour relations, First Nations governance and traditional teachings. Ken is currently the Lead Fisheries Negotiator and Research Coordinator for the Wolastoqey Nation of New Brunswick.

Lindsey Raymond, Manager, Domestic Shipping Policy, Transport Canada, Ottawa, ON

Lindsey Raymond is Manager, Domestic Shipping Policy at Transport Canada. Since joining the department in 2021, she has led work on key initiatives under Canada's Oceans Protection Plan. Lindsey has held a variety of positions within the Government of Canada focused on economic issues at Employment and Social Development Canada, Finance Canada, the Privy Council Office, and Innovation, Science and Economic Development Canada. She is a graduate of the Government of Canada's Accelerated Economist Training Program, holds a Bachelor of Commerce from Dalhousie University, and an M.A. from the Norman Paterson School of International Affairs at Carleton University.

Jens-Uwe Schröder-Hinrichs, Vice-President Academic, IMO-World Maritime University, Malmo, Sweden

Professor Jens-Uwe Schröder-Hinrichs is responsible for the academic developments needed to keep WMU as the global centre of excellence in maritime and ocean education, research and capacity building. Professor Schröder-Hinrichs is an internationally recognized maritime safety expert with special emphasis on the implementation and enforcement of the legal instruments of the IMO and has been involved for more than 20 years in numerous capacity-building missions during which he advised IMO member State administrations in Europe, Asia, the Middle East, the Caribbean, and Northern America as well as the Black Sea and Caspian Sea areas on issues related to their international obligations under various instruments of the IMO. His special research interests relate to maritime risk and accident causation modelling. His work with the maritime industry focussed on practical applications of risk assessment tools. His recent work has focussed on the safety of passenger ships not engaged in international voyages. He also has a strong interest in the implications of increased levels of automation and new technologies in

maritime transport. Professor Schröder-Hinrichs initially pursued a seafaring career, then studied maritime transport engineering and earned a PhD in safety science.

Desai Shan, Community Health and Humanities, Faculty of Medicine, Memorial University, St. John's, NL

Desai Shan is an Assistant Professor at the Faculty of Medicine, Memorial University of Newfoundland. As a dedicated researcher in the fields of maritime law and occupational health and safety (OHS), she has published more than 20 research articles and book chapters on Canadian and international seafarers' rights to occupational health and safety. She is now conducting research projects on Maritime Occupational Health and Safety in Canada, including the Canadian Maritime Welfare System, Arctic maritime occupational health and safety issues, and occupational noise exposure on merchant and fishing vessels. Her research projects have been funded by Transport Canada, Canadian Institutes of Health Research, Ocean Frontier Institute and Social Sciences and Humanities Research Council.

Mark Stoddard, PhD Candidate, Department of Industrial Engineering, Dalhousie University, Halifax, NS

Mr. Stoddard's research is focused on extending existing land-based measures of remoteness into the maritime domain and developing new measures to address the unique challenge of measuring maritime remoteness in the Canadian arctic. In addition to his Ph.D. studies, Mark is a defence scientist working for Defence Research and Development Canada (DRDC). Since joining DRDC his research has focussed on arctic maritime domain awareness, undersea surveillance, and acoustic intelligence operations. Mr. Stoddard is currently the leader of the Operational Analysis and System Integration Support (OASIS) Group at the DRDC Atlantic Research Centre in Halifax, Nova Scotia.

Bud Streeter, Director, Clear Seas Centre for Responsible Marine Shipping, Halifax, NS

Bud Streeter recently retired after a career spanning nearly 50 years in the marine business. He graduated from the Canadian Coast Guard College in 1973. He served as an Engineering Officer on various ships, as an Instructor and as a Marine Safety Surveyor, Examiner and Manager. In 1987, he joined Marine Atlantic Inc. as Manager of Marine Technical Services. He left as Vice President Safety and Regulatory Affairs in 1996 to join Transport Canada as Director General Marine Safety. In that role, he led many Canadian delegations to the IMO and led the development of the Canada Shipping Act, 2001. Bud joined Lloyd's Register in 2002, and retired as President, Lloyd's Register Canada Limited and Americas Regional Manager of Naval Business and External Affairs. He has served as a Board Member for Meridian Shipping Limited and for many Lloyd's Register entities. He was appointed to the Canadian Advisory Council on National Security and served as a marine security advisor between 2005 and 2009. In 2013, he was presented with the inaugural Medal of Excellence by Canadian Institute of Marine Engineering. Bud is a Director and past Chair of the Board of the Clear Seas Centre for Responsible Marine Shipping.

Anya Waite, Scientific Director & CEO, Ocean Frontier Institute; Dalhousie University Associate Vice-President Research (Ocean), Halifax, NS

Anya Waite is CEO and Scientific Director of the Ocean Frontier Institute, and Associate Vice-President Research (Ocean), Dalhousie University. Previously, she was Section Head of Polar Biological Oceanography at the Alfred Wegener Institute (AWI) in Bremerhaven, and Professor of Oceanography in the Department of Biology at the University of Bremen. Prof. Waite's research career spans thirty-five years of education, service and international scholarship, with scientific research publications in areas as diverse as aquaculture, rock lobster fisheries, conservation genetics, physical oceanography, and the impacts of climate change. Her most recent work includes innovations in oceanographic technologies and sensors. Prof. Waite's international service includes membership on numerous Boards and committees including co-chair of the prestigious Global Ocean Observation System steering committee - the first woman at the head of this body since its creation in 2011. She also serves on a wide range of technical, scientific and policy advisory panels, in the US, the UK, Australia, Germany, Norway, Sweden and Canada. Prof. Waite has a BSc Hons. from Dalhousie University and a PhD in oceanography from the University of British Columbia, followed by a postdoctoral position at Woods Hole Oceanographic Institution (USA) and a professorship at University of Western Australia (UWA) in Perth.

Weishan Wang, Interdisciplinary PhD Candidate, Dalhousie University, Halifax

Weishan Wang is a doctoral candidate in the Interdisciplinary PhD Program, Dalhousie University. Her current research aims to explore how Marine Spatial Planning can improve marine shipping governance in the Canadian Arctic regarding better Inuit knowledge integration and decision-making. She is particularly interested in exploring the potential to apply Marine Spatial Planning as a governance framework for the Low Impact Shipping Corridors. Recently, her work has focused on the potential interface between indigenous rights and Arctic shipping governance and how Inuit can be better involved in managing Arctic shipping as rights holders. Her research aims to stimulate discussion about how the shipping Corridors initiative can become an opportunity for Canada to meaningfully engage Inuit in the spirit of reconciliation.

Mélissa Whittom, Consultation Project Manager, Centre of Expertise in Consultation and Accommodation, Institut de développement durable des Premières Nations du Québec et du Labrador | First Nations of Quebec and Labrador Sustainable Development Institute, Wendake, QC

Ms. Whittom holds a bachelor's degree in Political Science and a master's degree in Public Affairs from Université Laval. She has always been passionate about everything related to the environment and First Nations' rights. She joined the FNQLSDI in the summer of 2020 as a consultation project manager at the Centre of Expertise in Consultation and Accommodation. Her main mandate is to accompany and support First Nations in Quebec within the framework

of public and indigenous consultations conducted by the various levels of government in Canada. The consultation sector also informs governments on the best practices to adopt in order to respect their constitutional obligation in terms of consultation and accommodation of Indigenous peoples.

MODERATORS

Claudio Aporta, Canadian Chair in Marine Environment Protection, IMO-World Maritime University, Malmo, Sweden

Claudio Aporta is Professor and Canadian Chair (Marine Environmental Protection) at the World Maritime University, in Malmö, Sweden. He was born and raised in the province of Mendoza, Argentina – where he completed his BA in Communication at Universidad Nacional de Cuyo. He moved to Canada in 1997, and he earned a Ph.D. in Anthropology from the University of Alberta. He was also a Postdoctoral Fellow at Université Laval, in Quebec. He was a faculty member in the Department of Sociology and Anthropology at Carleton University (2005-2013) and at the Marine Affairs Program at Dalhousie University (currently on leave). He held the Canada-US Fulbright Chair at the University of Washington in 2012. His research is at a crossroads between Marine Management, Anthropology and Geography. His ongoing projects include documenting Inuit mobility networks in Arctic Canada, researching the impact of shipping in areas of significance to Inuit communities, and exploring knowledge visualization and knowledge sharing of benthic ecosystems in several marine and coastal areas of Nova Scotia.

Aldo Chircop, Professor of Law, Marine & Environmental Law Institute, Dalhousie University, Halifax, NS

Aldo Chircop, JSD, is Professor of Law and former Canada Research Chair in Maritime Law and Policy (Tier I). Based at the Marine and Environmental Law Institute, Schulich School of Law, Dalhousie University, his fields of research and teaching are Canadian maritime law, international maritime law, and the law of the sea. He is currently working on the regulation of Artic shipping, decarbonization, autonomous ships, and area-based management in shipping. He is the current chair of the CMI International Working Group on Polar Shipping. Professor Chircop has advised several governments, international organizations, law firms, non-governmental organizations, and community organizations. He has published extensively and is co-editor of the *Ocean Yearbook* (Brill). Professor Chircop is a member of the Nova Scotia Barristers Society and the Canadian Maritime Law Association.

Bruce Martin, Applied Sciences Manager (Halifax), JASCO Applied Sciences (Canada) Ltd., Halifax, NS

Bruce Martin has been researching underwater acoustic data analysis since 1990 with academic, industrial and defence applications. Bruce leads a team at JASCO Applied Sciences, Halifax, NS, Canada that performs soundscape measurement programs in the arctic, Atlantic and Pacific

Oceans. The team has expertise in determining the presence of marine mammals in passive acoustic recordings. JASCO's services include quantifying the source level of pile driving, seismic airgun surveys, vessels and sonars. They employ the measurement results to model the effects of the sources on marine life. In 2022, the team lead by Bruce completed a project for Transport Canada that evaluated methods of measuring vessel sources in shallow water. The project results are informing the development of ISO standard 17208-3. Bruce is also an Adjunct Professor in Oceanography at Dalhousie University.

Meghan Mathieson, Director of Strategy & Innovation, Clear Seas Centre for Responsible Marine Shipping, Vancouver, BC

At Clear Seas, Meghan builds relationships, identifies collaborative opportunities and contributes to ongoing research efforts. Through her work, she aims to provide a better understanding of the marine environment by sharing complex information in an accessible way and applying evidence to support better decision making. In the past six years with Clear Seas, she has had the opportunity to identify and work on a range of issues affecting commercial marine shipping in Canada, including vessel traffic patterns, drift rates, emergency towing, coastal sensitivity, air emissions, ship waste and alternative marine fuels. She is also the co-lead for the Canadian Marine Shipping Risk Forum community of practice. Prior to working with Clear Seas, Meghan facilitated multi-stakeholder qualitative risk assessment workshops for large capital projects such as mines and marine terminals. Meghan has a BA (English) and MBA from the University of British Columbia.

Ronald Pelot, Professor, Department of Industrial Engineering, Dalhousie University, Halifax, NS

Ronald Pelot has been a professor since 1994. In 1997, he founded the Maritime Activity and Risk Investigation Network (MARIN) at Dalhousie. Over the past two decades, he and his team have developed new software tools and analysis methods applied to maritime traffic safety (accidents) and environmental impacts, and coastal zone risk management. Research methods encompass spatial risk analysis, vessel traffic modelling, data processing and pattern analysis, location models for response resource allocation, safety analyses, and risk assessment. Ron spent a decade as the Associate Scientific Director of the national research network MEOPAR NCE (Marine Environmental Observation, Prediction and Response Network of National Centres of Excellence). This network, founded in 2012, supports research and training in areas involving changing oceans, and changing uses of the ocean, including coastal impacts. He is the Assistant Dean of Co-op in the Faculty of Engineering at Dalhousie, a role which connects university programs with industry needs through the placement of our students in a wide variety of jobs.

Gregory Wilkie, Commanding Officer, CCG Atlantic Region, Dartmouth, NS

Gregory Wilkie lives in Halifax, Nova Scotia. He started his nautical career with sailing as a child on the Northwest Arm, then attended the Canadian Coast Guard College for a Bachelor of Technology (Nautical Sciences). During his career, Captain Wilkie has served on 23 different ships,

ranging from the small, CCGS Cape Light, to the largest vessel, the CCGS Louis S. St-Laurent, including voyages in the Beaufort Sea and through the Northwest Passage. Last year, he was Commanding Officer for the acceptance and delivery voyage of the CCGS John Cabot from Vancouver, through the Panama Canal, to St. John's, NL. Gregory's most recent assignment was to the CCGS Capt Jacques Cartier, and he is currently working in the Atlantic Region Fleet Office as a Senior Fleet Officer Ashore.

COMMENTATORS

Paul Blomerus, Executive Director, Clear Seas Centre for Responsible Marine Shipping, Vancouver, BC

Paul Blomerus is an internationally experienced researcher and leader in innovation with experience in industry as well as university research management. As Senior Advisor, Research and Industry Partnerships with the University of British Columbia (UBC), he developed two successful research clusters focused on clean energy and marine systems. Dr. Blomerus also built up a successful independent consulting practice specializing in clean energy and policy deployment helping government agencies understand the impact of technology on the transportation sector. He is a published author on a range of marine shipping and transportation issues. His industry experience includes leadership roles in supply chain, intellectual property and customer relationship management for Rolls-Royce Aerospace. Dr. Blomerus holds a PhD in Engineering Science from the University of Oxford and a Mechanical Engineering degree from the University of Cape Town.

Leah Trigg, Postdoctoral Fellow in Large Whale Conservation, Department of Oceanography, Dalhousie University, Halifax, NS

Dr. Leah Trigg is a postdoctoral fellow in the Department of Oceanography at Dalhousie University where she is studying the behavioural impacts of vessel noise on marine mammals in the Arctic. She completed her PhD at Plymouth University on the topic of "Assessing the exposure and behavioural response of grey seals (Halichoerus grypus) to shipping noise."

Captain Jack Gallagher, Hammurabi Consulting, Halifax, NS

Jack Gallagher, a Master Mariner, enjoyed a 22-year career with the Canadian Coast Guard gathering a broad range of operational and management experience. For the past twenty-two years Jack has run Hammurabi Consulting, an international practice based in Halifax. The spectrum of work has included high level policy and legislation development, risk assessment and mitigation, auditing against international standards, development and delivery of bespoke training and operational level guidance. Captain Gallagher has been an adjunct instructor at the Center for Marine Simulation and a guest lecturer at several universities and maritime schools in Canada, Taiwan, and the Philippines.

Gerald Singh, Assistant Professor and Ocean Nexus Chair in Global Change and Sustainable Development, School of Environmental Studies, University of Victoria, Victoria, BC

Dr. Gerald Singh is Assistant Professor and Ocean Nexus Chair in Global Change and Sustainable Development at the University of Victoria and the Deputy Science Director for the Nippon Foundation Ocean Nexus Center at UW EarthLab. His research is primarily situated in the science-policy interface, and focused on understanding the dynamics between social, economic, and environmental dimensions in sustainable development. This focus takes form in the following ways: 1) assessing cumulative anthropogenic impacts on the environment and understanding the consequences to people; 2) determine priority policy actions and plans to achieve specific sustainable development objectives (particularly the Sustainable Development Goals); 3) understand risk and uncertainty in sustainability policy and management. Doing work in any one of these areas means navigating data gaps, and he uses a combination of quantitative and qualitative approaches, as well as structured expert elicitation.