What We Heard Report

Ocean Noise Strategy for Canada

DISCUSSION DOCUMENT

Government of Canada Gouvernement du Canada

Canada

Notes to readers

This report is based on input received during the 90-day consultation period on the Ocean Noise Discussion Document from October 14th, 2020 to January 12th, 2021. Every effort has been made to present comments received in a fair and balanced way. However, it was not possible to include every suggestion made by each respondent although all feedback was considered. In addition, the order and grouping of the feedback presented in this report does not reflect how the comments received were prioritized when developing *Canada's Ocean Noise Strategy* (the Strategy).

Unless specified otherwise, the term "ocean noise" refers to human-generated underwater sounds in the marine environment that have a wide range of impacts on marine animals. The term "manage" (in the context of "ocean noise") refers to all efforts aimed at preventing and reducing ocean noise, as well as addressing and mitigating its associated impacts. All questions from the Discussion Document remained unchanged. In this context, it is important to note that "underwater ocean noise" and "human-generated underwater noise" are synonymous with "ocean noise."

The Government of Canada works collaboratively with many partners and stakeholders to better understand and manage ocean noise. Unless specified otherwise, the term "partners" includes, but is not limited to Indigenous governments and communities, provinces, and territories that have decision-making powers within their jurisdictions, and those that jointly lead initiatives together with the Government of Canada. The term "stakeholders" refers to individuals, groups, or organizations who have an interest in or are affected by ocean noise and can be directly or indirectly included in decision-making processes.

The Government of Canada is committed to considering a diverse and inclusive range of perspectives on the subject of ocean noise. This includes input from Government of Canada departments and agencies that help to develop the Strategy. However, this report focuses solely on the input received from partners and stakeholders.

Feedback received on the Discussion Document has informed the development of the Strategy. For additional details regarding the Strategy and next steps, please refer to the following documents:

- Canada's Ocean Noise Strategy: A coordinated approach to minimize impacts on marine life
- Primer on Ocean Noise and its Impacts: provides general information about the importance of sound in the marine environment and the impact of ocean noise on marine life and cultural and societal practices of coastal and Indigenous communities
- Case studies: highlight some of the Government of Canada's collaborative ocean noise-related initiatives.

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Cover photo, top: Humpback whale (*Megaptera novaeangliae*). Credit: Alan Bedding.
Cover photo, bottom: Melting ice near Sirmilik National Park on Bylot Island. Pond Inlet, Nunavut. Credit: Colin Field.

Deployment of hydrophone listening station off the exploration vessel Nautilus. Credit: Ocean Networks Canada.

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Executive Summary

The Government of Canada has key responsibilities for assessing and managing ocean noise. In response to this complex and evolving problem, the Government has committed to developing a coordinated approach to help address the issue.

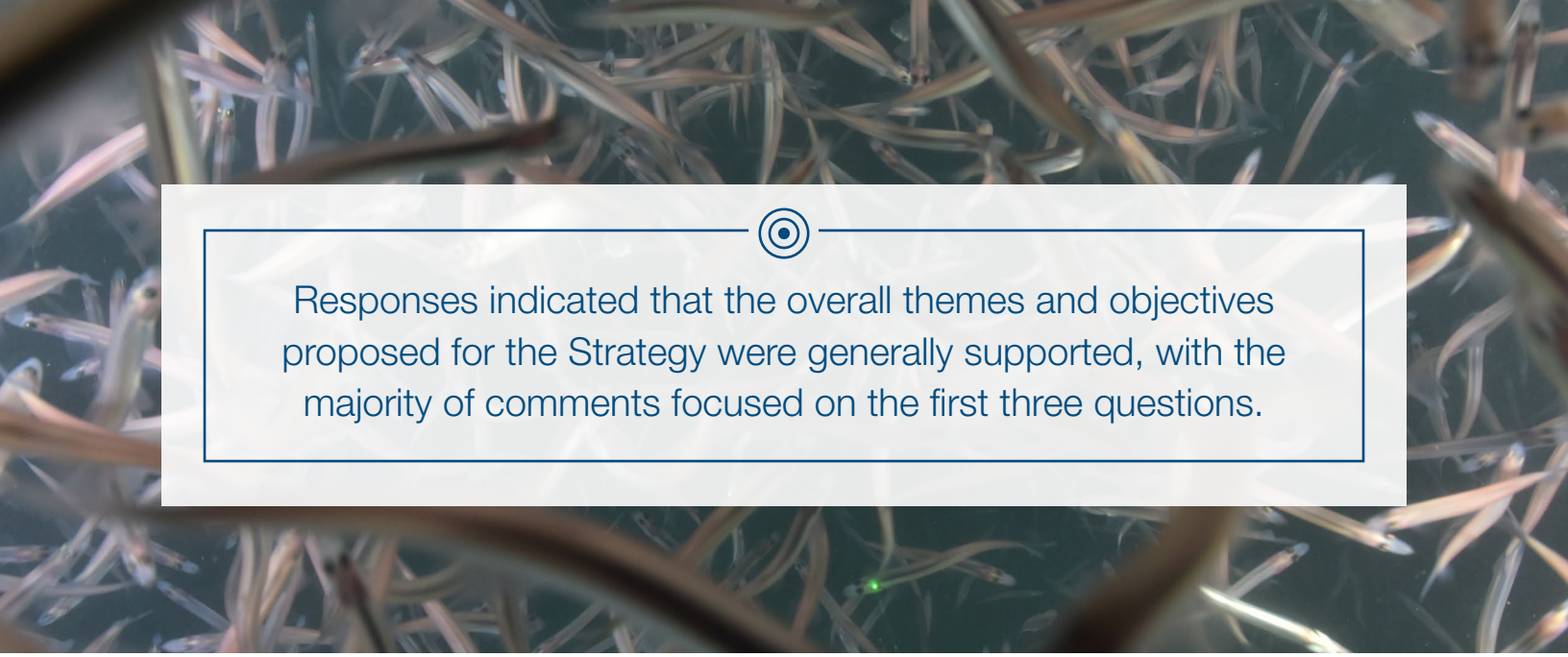
Turbulent Atlantic Ocean. Credit: Susann Guenther.

Led by Fisheries and Oceans Canada, a number of federal government departments and agencies worked together to develop a Discussion Document to provide information and obtain feedback on the framework proposed for an Ocean Noise Strategy for Canada (the Strategy). Federal departments and agencies partnering in the development of the Strategy include the Atlantic Canada Opportunities Agency, Crown-Indigenous Relations and Northern Affairs Canada, Canadian Coast Guard, Department of National Defence (including Defence Research and Development Canada), Impact Assessment Agency of Canada, National Research Council, Natural Resources Canada, Parks Canada, and Transport Canada.

The Discussion Document was available for comment between October 14, 2020, and January 12, 2021, with several different engagement mechanisms employed to compensate for restrictions imposed by the COVID-19 pandemic. In addition to responses received through an online portal, feedback was also obtained through opportunistic online meetings, and through emailed submissions from organizations representing Indigenous peoples and groups, industry stakeholders, and environmental interests. Researchers in academic institutions provided comments, as did other federal government departments, the Province of Nova Scotia, and regions and divisions within Fisheries and Oceans Canada. A list of self-identified respondents is available in **Annex 2**.

The Discussion Document provided background information on the impacts of ocean noise, and set out the principles proposed to guide the development of the Strategy. The Discussion Document described the three themes and 11 objectives proposed as a framework for the Strategy, and invited readers to respond to six questions designed to elicit feedback to help validate, change, or expand the proposed concept.

Vector illustration of diverse individuals shaping Canada's geographical boundaries. Credit: HobbitArt.



Responses indicated that the overall themes and objectives proposed for the Strategy were generally supported, with the majority of comments focused on the first three questions.

School of capelin (*Mallotus villosus*) around a remotely operated vehicle. Credit: Oceana Canada and Fisheries and Oceans Canada.

QUESTION 1

What is the most important thing that the Government of Canada should do to better understand and minimize the impacts of underwater ocean noise?

(Background)

In response to Question 1, there was general agreement that the most important thing the Government of Canada could do was to fund more research and monitoring, particularly to identify levels at which ocean noise is harmful to various species. The need for further research focused on reducing vessel noise and finding alternatives to the seismic airguns used in oil and gas exploration was noted. At the same time, several respondents indicated that the sources and impacts of ocean noise are well understood and action is needed more than additional research. Respondents also acknowledged that finding and implementing solutions will take time as well as significant financial and human resources.

Responses to Question 2 were mixed with many commenters expressing uncertainty about the implementation of both Guiding Principles even while acknowledging their importance. A number of respondents asked for clarification of the meaning of a precautionary approach "based on risk" and an explanation of how an equitable balance would (or could) be struck between conservation and economic development. There were several suggestions for additional guiding principles, primarily related to the integration of Indigenous Knowledge in all aspects of the Strategy.

QUESTION 2

Do you agree with the guiding principles of sustainable development and a precautionary approach based on risk? Are there other guiding principles that should be included?

(Guiding Principles)

QUESTION 3

With respect to human-generated underwater noise, are there any marine ecosystems or species, technologies, and/or areas of science research that you think should be considered as future priorities?

(Theme 1)

There were many suggestions and significant commonality in the priorities identified in response to Question 3. Marine mammals topped the list of priority species in need of additional research for most respondents, although there was some divergence in the specific species, depending largely on the location of the commenter. The Arctic ecosystem was most frequently identified as a priority for increased action, although many respondents also took note of the Salish Sea, as well as the St. Lawrence Estuary and Saguenay Fjord. Respondents to Question 3 generally agreed that innovative new technologies need to be explored and more funding provided for research into the impacts of noise.

Most commenters chose not to indicate with any specificity how they had been affected by ocean noise in response to Question 4; notable exceptions included coastal residents who were affected by vessel noise as well as Indigenous peoples concerned about the impact of ocean noise on their food security, culture, and livelihoods. The majority of responses to Question 5 focused on the need for more public education and better science communication to raise awareness. Respondents pointed to the importance of having an efficient, transparent, collaborative, and inclusive approach to engagement that respected Canada's obligations to Indigenous peoples.

Question 6 asked respondents whether they agreed with the proposed themes and objectives, and directed them to indicate whether they felt there were other themes and objectives that should be considered. While there was general agreement on the broad thematic topics, there were suggestions for several new themes, and a number of commenters indicated that the objectives under each theme should be expanded in the Strategy for greater precision, transparency, and accountability.

QUESTIONS 4, 5, 6

How are you, your organization, or your community affected by underwater ocean noise, its potential effects or impacts, and its management?

What kinds of engagement and communication approaches are necessary to ensure the effective and collaborative development of an Ocean Noise Strategy for Canada?

Do you agree with the themes and objectives that have been proposed to guide the development of the Ocean Noise Strategy? Are there other themes and objectives that should be considered?

The federal departments and agencies involved in this project are grateful to everyone who took the time to share feedback, opinions, and concerns. All input is greatly appreciated and will be invaluable in moving forward on the Strategy.

CHAPTER 1

Overview of the Consultations

FEDERAL GOVERNMENT PARTNERS DEVELOPING THE STRATEGY

- Atlantic Canada Opportunities Agency
- Crown-Indigenous Relations and Northern Affairs
- Canadian Coast Guard
- Department of National Defence (including Defence Research and Development Canada)
- Fisheries and Oceans Canada
- Impact Assessment Agency of Canada
- National Research Council
- Natural Resources Canada
- Parks Canada Agency
- Transport Canada

Fisheries and Oceans Canada collaborated with various federal government departments and agencies to create a Discussion Document as an initial step to develop Canada's Ocean Noise Strategy. The purpose of the Discussion Document was to engage Canadians regarding their views on the subject of ocean noise, and solicit their ideas on the framework proposed for the Strategy.

The Discussion Document provided background information on the impacts of ocean noise, and set out the principles that were proposed to guide the development of the Strategy. The Discussion Document described the three themes and 11 objectives proposed as a framework for the Strategy, and invited readers to respond to six questions (listed in **Annex 1**) designed to elicit feedback to help validate, change, or expand the proposed concepts.

Close-up of mussels and sea anemones near Windy Bay. Credit: Stephen Underhay.

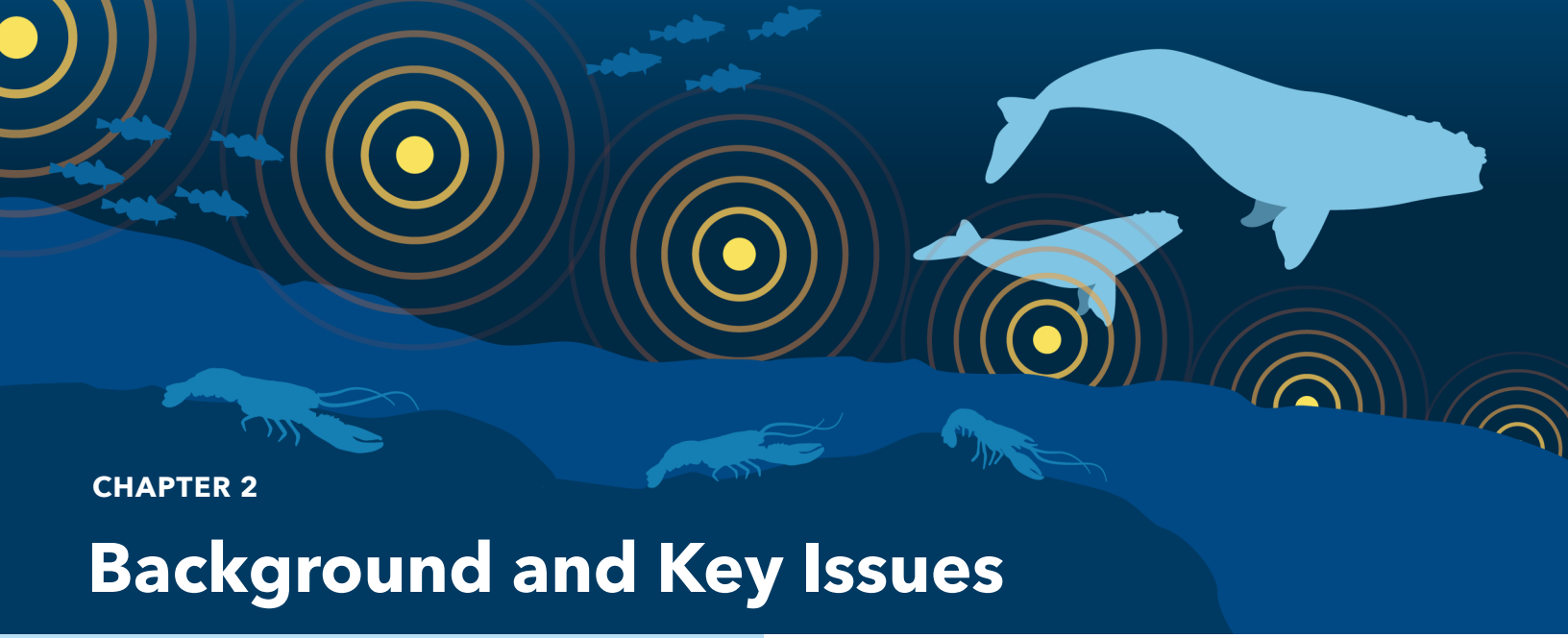
Several different engagement processes were conducted using the Discussion Document as well as a presentation that explained the background and processes. Various opportunities for feedback were provided:

- The public was invited to submit comments using an electronic form accessed through the Consulting With Canadians web portal.
- A targeted email campaign solicited direct feedback from internal Government of Canada partners as well as external partners and stakeholders. The Discussion Document and accompanying presentation were sent to 149 contacts in Government of Canada departments, agencies, and Crown Corporations; 23 in provinces and territories; 206 in Indigenous organizations and communities; and 189 in stakeholder associations.
- Opportunistic virtual engagement resulted in comments received from key internal and external partners, including Indigenous peoples, environmental organizations, and stakeholder associations.
- Additional submissions and questions were provided to a general Fisheries and Oceans email inbox.

The consultation period ran from October 14, 2020, to January 12, 2021, a total of 90 days. During this period, the Discussion Document was accessed through the online portal 3,470 times, with 81 respondents submitting answers to all six questions. It is difficult to quantify the exact number of individual respondents or their affiliations as demographic information via the online Consulting with Canadians portal was not collected to respect anonymity.

The targeted email campaign also generated direct feedback from organizations representing Indigenous governments and peoples, industry stakeholders, and environmental interests. Researchers in academic institutions provided comments, as did other federal government departments, and one province. Some submissions received by email came from individuals while others were submitted on behalf of governing bodies and organizations representing many people. In total,120 submissions were received: 81 through the online portal and 39 by email. A list of self-identified respondents is contained in **Annex 2**.

BC Ferry in Howe Sound, British Columbia. Credit: EB Adventure Photography.



CHAPTER 2

Background and Key Issues

WHAT WE PROPOSED

The Discussion Document proposed that an Ocean Noise Strategy for Canada be developed to establish a long-term plan for further collaboration among federal organizations and outside partners to help address the issue of ocean noise. The Strategy would contain recommendations for further improvement of federal practices and management approaches and would be aligned with the three themes proposed in the Discussion Document:

- Science Research and Technology Development
- Ocean, Coastal, and Estuarial Impact Assessment and Management
- Outreach and Communication

The Background chapter of the Discussion Document provided information on sources of ocean noise, together with details regarding how ocean noise impacts marine animals and why more effort is needed to address these issues. The Strategy is proposed as a means of developing a more coordinated approach to addressing the increase in ocean noise and its impacts on species and ecosystems.

The Government is leading the development of this Strategy to better understand the impact of ocean noise on the marine ecosystem and determine how this threat can be addressed. This information can be used to help identify gaps, inform planning, and make recommendations for future research and management actions.

Striped pink shrimp underwater in the St. Lawrence Estuary. Credit: Shutterstock.

What We Heard

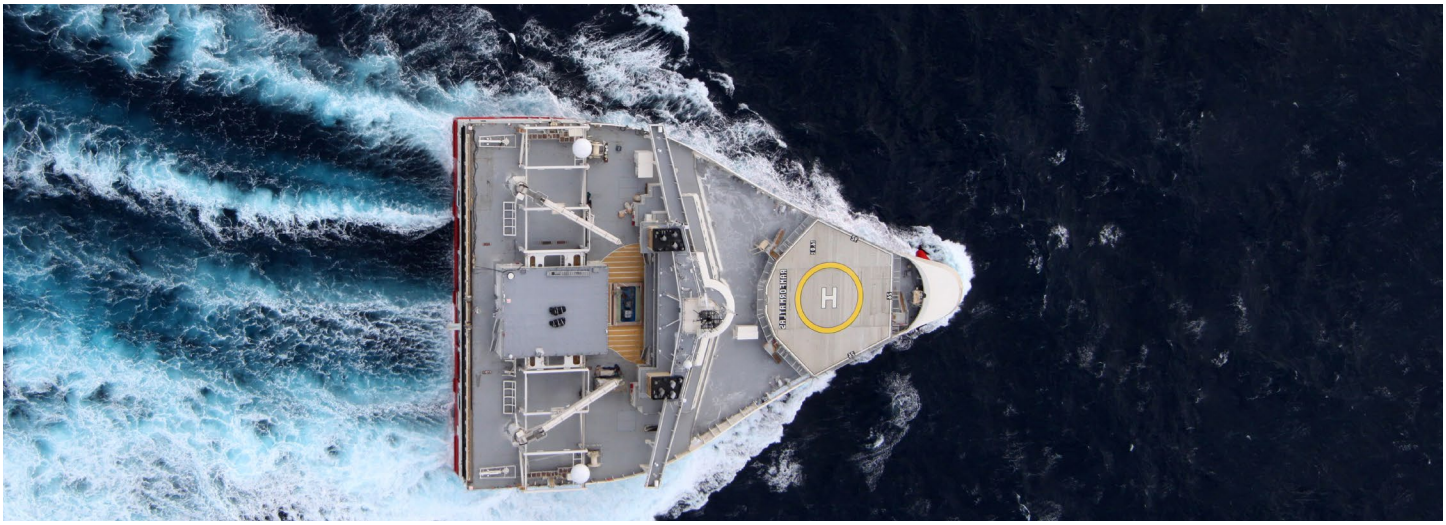
QUESTION 1

What is the most important thing that the Government of Canada should do to better understand and minimize the impacts of underwater ocean noise?

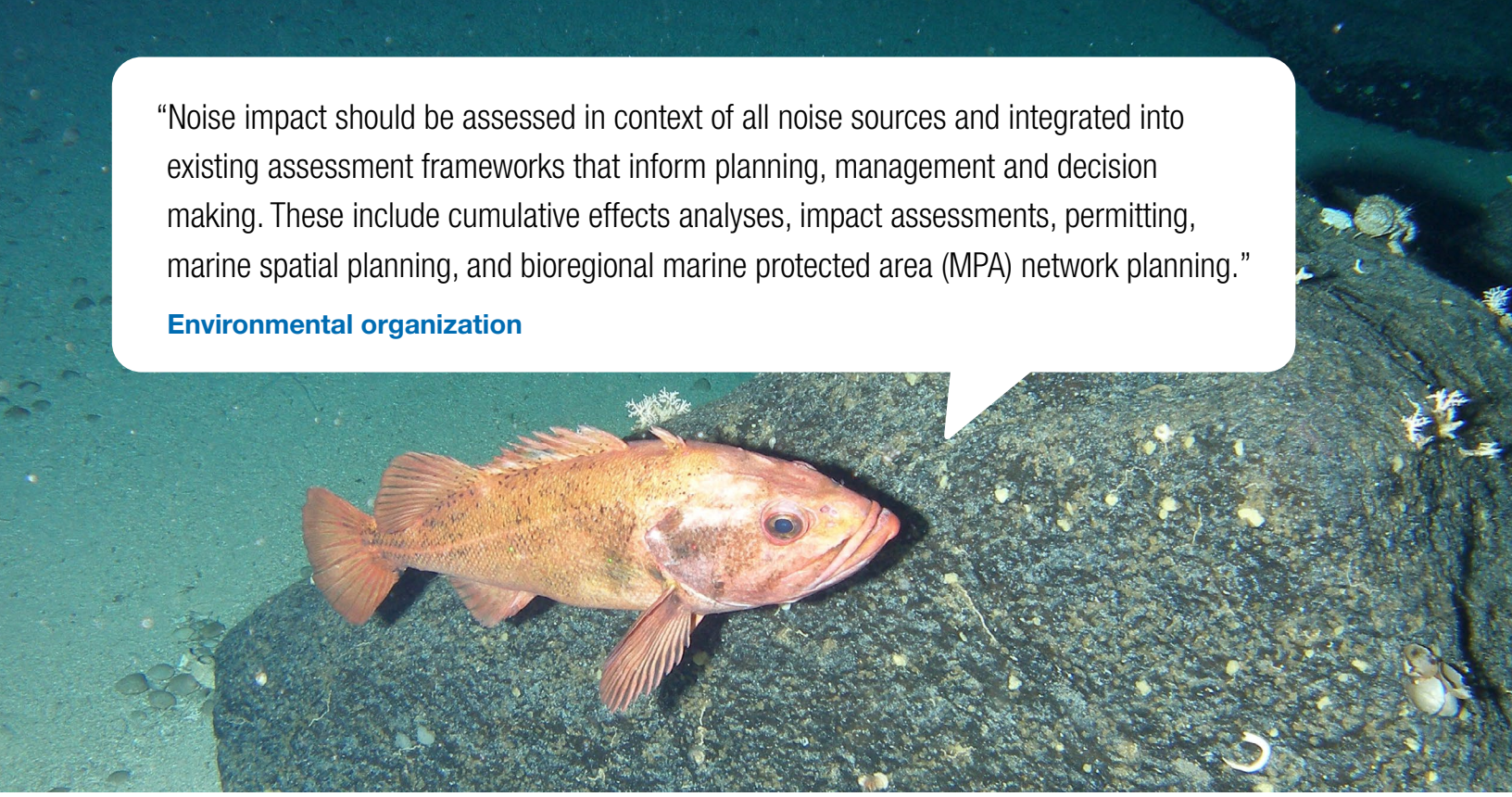
Question 1 elicited a large number of responses from all groups. Comments from the online portal focused on the noise impacts from seismic airgun surveys and from all types of vessels. For this group, the most important thing the government could do would be to conduct more research, especially in underwater monitoring, to get a more detailed understanding of marine animal activity in different regions and different seasons. These commenters noted that further research would be critical to the development of baseline data, including baselines in data-poor areas such as the Arctic, from which noise thresholds could be established. Respondents also suggested that data on sources and impacts of ocean noise could help to determine the level at which incentives or penalties may be set to encourage the development of new technologies or the implementation of existing ones.

The majority of online commenters were in favour of rewarding good behaviour (for example, by offering reductions in port fees for vessels upgraded with quieting technologies) and penalizing companies for not implementing new technologies to reduce ocean noise. Online respondents also advocated for action in the form of legislative change and better enforcement of existing regulations, development of standards and targets for noise reduction, and holding noise generators accountable through the imposition of fines and other penalties.

Many of the Indigenous governments and organizations that provided submissions prioritized incorporating Indigenous Knowledge systems (e.g., Inuit Qaujimajatuqangit (IQ)) into the Strategy, noting that there was little information in the Discussion Document regarding how Indigenous knowledge would be collected or used in the Strategy. Several organizations emphasized the importance of articulating clearly in the Strategy how western science will be balanced with Indigenous Knowledge. Commenters pointed out that Indigenous Knowledge can fill an important gap in areas where scientific, quantitative data are limited. Many Indigenous respondents also supported adoption of a regional approach, developing objectives and targets, defining noise as a pollutant, and treating the acoustic environment as part of species habitat.



Seismic survey vessel underway (Courtesy of https://www.pgs.com)



> "Noise impact should be assessed in context of all noise sources and integrated into existing assessment frameworks that inform planning, management and decision making. These include cumulative effects analyses, impact assessments, permitting, marine spatial planning, and bioregional marine protected area (MPA) network planning."
>
> **Environmental organization**

A Yelloweye Rockfish (*Sebastes ruberrimus*) swimming above the seafloor, Cobb Seamount. Credit: Fisheries and Oceans Canada.

Submissions from various environmental organizations struck a similar tone, prioritizing the need for clear, legally defined and enforceable thresholds for ocean noise levels. Many of these groups suggested that the time had come to recognize noise in the marine environment as a pollutant to facilitate establishing thresholds, setting standards, regulating, and penalizing noise-generating industries. Many environmental groups focused their comments on the Arctic, recommending that addressing knowledge gaps in this area be prioritized. Several submissions emphasized the importance of taking a regional approach that could be more reflective of different and unique environments and realities. Commenters noted that a regional approach could also be more conducive to greater integration of Indigenous Knowledge, and support the development of specific noise baselines and thresholds for different areas. This approach was mentioned a number of times in the context of developing appropriate solutions for the Arctic environment.

A number of groups recommended that noise be considered a threat or stressor in the design and establishment of Marine Protected Areas (MPAs), making it possible to prohibit noise-producing activities unless the impacts could be effectively mitigated. Several respondents also asked that the Strategy explain linkages with Marine Spatial Planning (MSP), possibly as a spatial platform indicating areas where vulnerable species may be exposed to harmful noise.

Submissions from industry associations prioritized the need for government to continue to work in collaboration with stakeholders involved in the ocean economy, using industry expertise and experience wherever possible. Many industry sectors have memberships in international bodies, and a number of industry submissions noted the importance of developing the Strategy in an international context. Commenters from many different groups expressed the view that there was no need to reinvent the wheel, as other maritime nations are ahead of Canada in developing best practices and finding solutions to the problems resulting from industrial ocean noise. Respondents pointed out that the international relationships the Government of Canada and Canadian industry sectors have could be used to identify technologies that could be implemented in Canadian waters.

Vessel operators noted the expense of refitting, suggesting that new requirements would be easier to accept if implementation costs were subsidized. Most respondents indicated that more information on sources and impacts was needed, with one group

suggesting that the Strategy include a comprehensive audit of all current and anticipated contributors to ocean noise, with the information generated made available on a publicly accessible web platform.

The members of academia who submitted comments prioritized the need for long-term funding (as much as a 30-year commitment) with data, including audio recordings, freely available to researchers. Researchers noted that defining "noise" will be difficult since an accurate definition would depend on being able to identify the differences in noise perception associated with the hearing abilities of each species or group of species, together with the differences in the frequency spectrum of noise sources. In this context, several respondents noted that while some sound may cause harm, that harm is not equal across all species in all places or under all conditions. Research dedicated to understanding these differences was also deemed a priority.

Many commenters requested clarification on how competing government priorities would be managed since port expansion projects, liquified natural gas expansion, and other major projects are adding to the volume of ocean noise. This point resonated with commenters who wanted to understand how Canada will balance an interest in encouraging and supporting an increase in international trade and economic development with the resulting increase in ocean noise and the consequent impacts on the marine environment.

For many commenters, the most important priority was finding a balance between economic security on the one hand, and environmental imperatives on the other. Researchers in the fishing sector emphasized the importance of acoustic devices to that industry, both in terms of locating and attracting fish (resulting in less time on the water) and in keeping marine mammals away from nets. Submissions from Indigenous governments and organizations noted that while the Arctic is recognized as an environmentally sensitive area, it is equally important to provide economic opportunities for the communities living there. Achieving an appropriate balance was a significant priority for many respondents across organizations.

Propeller and rudder of big ship. Credit: Denys Yelmanov.

CHAPTER 3

Guiding Principles for the Strategy

WHAT WE PROPOSED

The Discussion Document proposed that the Strategy be directed by the guiding principles of sustainable development and a precautionary approach based on risk. These specific principles are in addition to the broader Government of Canada priorities of ensuring openness and transparency, and working toward reconciliation with Indigenous peoples.

Canada has adopted the principle of sustainable development — promoting prosperity while protecting the environment — through its commitment to the United Nations Sustainable Development Goal 14. The Discussion Document proposed the Strategy could help achieve this common goal by ensuring that the economic, social, and environmental pillars of sustainable development are an integral part of every aspect of the management process. A precautionary approach is embedded in Canadian legislation (e.g., *Fisheries Act*, *Oceans Act*) as a means of protecting the environment and human health by erring on the side of caution in the absence of scientific certainty. The Discussion Document proposed adopting a precautionary approach based on risk to address differences in types of ocean noise and their impacts on different species.

Dumbo octopus (*Grimpoteuthis sp.*) on ocean floor. Credit: Fisheries and Oceans Canada.

Walrus (*Odobenus rosmarus*) entering the North Atlantic ocean. Credit: Alicia Barrett.

What We Heard

QUESTION 2

Do you agree with the two guiding principles (sustainable development and a precautionary approach based on risk) that have been proposed to guide the development of the Strategy? Are there other guiding principles that should be included?

There was considerable uncertainty about the validity and the application of the two guiding principles among the commenters responding through the online portal. Even those who generally agreed with the principles noted that the Government of Canada does not appear to apply them consistently or effectively. Other respondents commented that sustainable development is frequently an oxymoron with more weight given to "development" than to "sustainability," especially when development carries the potential for unintended consequences.

Many online commenters questioned the application of a precautionary approach, noting that it is too open to differing interpretations. A number of commenters linked a precautionary approach to a more holistic, ecosystem-based mitigation practice to lessen impacts, suggesting that this principle should include consideration of cumulative effects, such as how non-acoustic stressors like climate change or overfishing might interact with acoustic threats. Many respondents asked for clarification regarding the meaning of a precautionary approach "based on risk," including how risk would be objectively assessed and evaluated.

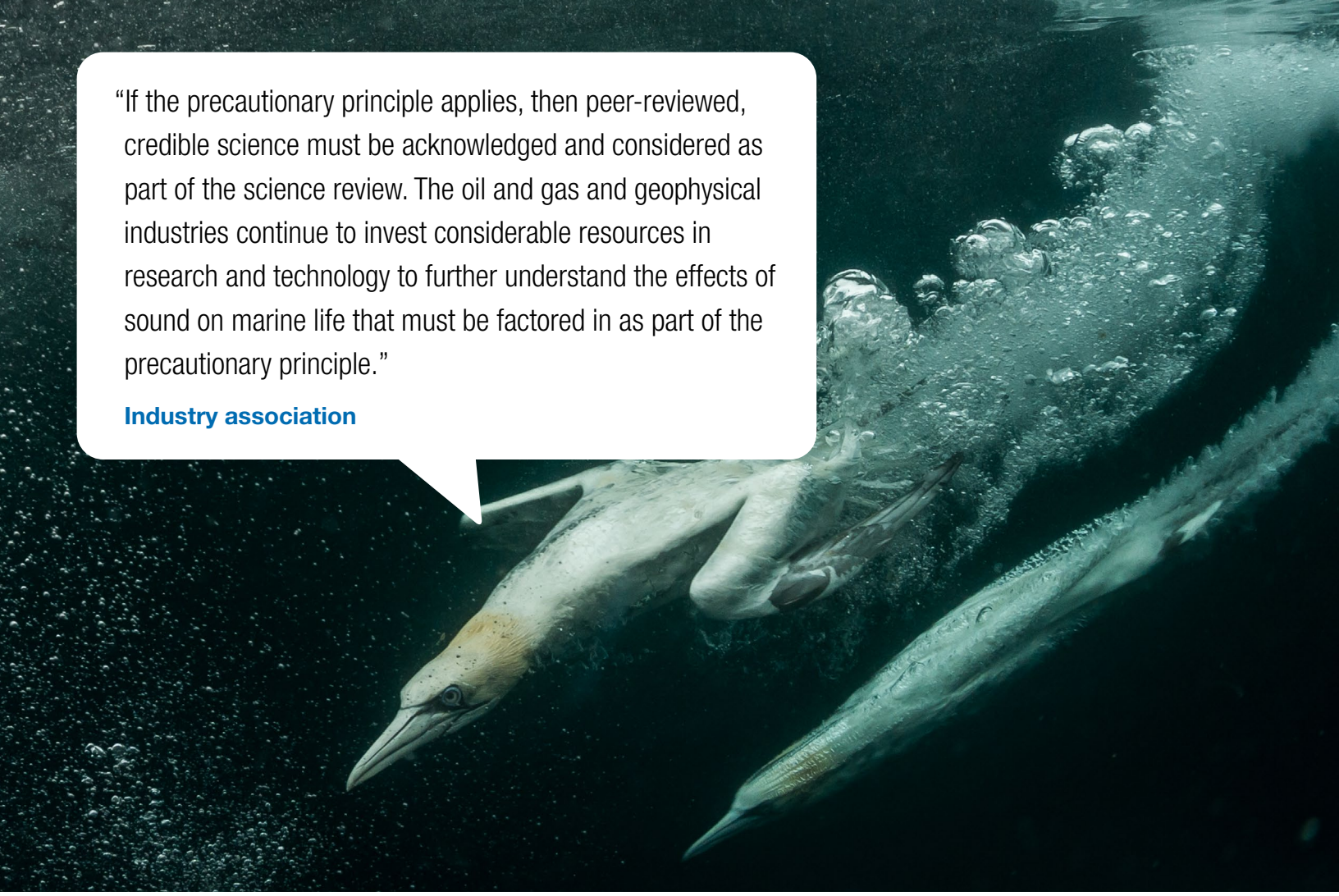
Submissions from environmental organizations and from Indigenous governments and organizations echoed many of the online comments. Respondents noted that the principles were important, but also acknowledged that they were often not applied consistently. Feedback on "Sustainable development" identified this principle as difficult to define other than as an aspirational concept. Indigenous groups noted the importance of including IQ and other forms of Indigenous Knowledge to promote respect for traditional economies based on a harmonious relationship with the natural environment.

Commenters agreed that these principles must be balanced carefully in the Arctic in order to provide economic opportunities for local communities in an environmentally sustainable way. In this context, every effort to reduce ship noise must be employed, and vessel traffic should be assessed against current ambient sound levels in the region rather than by setting thresholds derived from other areas. Environmental groups noted that noise is a recognized stressor for many species at risk, and questioned how the Strategy could be guided by precaution and sustainability when there were no thresholds.

Respondents from industry associations and from academia also expressed skepticism regarding the guiding principles, although from a different perspective. The emphasis in these comments was weighted toward the difficulties inherent in operationalizing the principles in a balanced way. Several commenters questioned whether Fisheries and Oceans Canada had sufficient research or reference data to be able to develop a precautionary approach "based on risk," especially in the absence of the scientific certainty the Principle requires. Industry groups were also wary of the possible unintended economic consequences of implementing limitations resulting from a lack of "scientific certainty." Many commenters asked that the Strategy contain guidance specifying how conflicting interests would be evaluated and resolved.

ADDITIONAL PRINCIPLES

There were numerous suggestions for additional principles. The one most commonly recommended for inclusion was a principle committing to evidence-based decision making that actively incorporated forms of



> "If the precautionary principle applies, then peer-reviewed, credible science must be acknowledged and considered as part of the science review. The oil and gas and geophysical industries continue to invest considerable resources in research and technology to further understand the effects of sound on marine life that must be factored in as part of the precautionary principle."
>
> **Industry association**

Northern Gannets (*Morus bassanus*) hunting fish underwater. Credit: Sallye photography.

Indigenous Knowledge in all aspects of the Strategy. Many commenters noted that including a principle specifically related to Indigenous Knowledge would reflect Canada's commitment to reconciliation.

Many commenters suggested adding the "polluter pays" principle;[1] noting that it would support transparency and accountability, as well as help ensure a balance between marine activities and noise mitigation measures. Several commenters asked that transparency and accountability themselves be identified as specific guiding principles.

A principle expressing the importance of an ecosystem approach was also suggested. Included in this concept were ideas of intrinsic value, animal welfare, ecosystem integrity, adaptive management, and consideration of cumulative impacts. Several respondents suggested a principle that would speak to the responsibility of all participants in the ocean economy to practice environmental stewardship, conservation, and protection, noting there is an onus upon all those engaged in marine industries to protect people, marine life, and habitat.

Several commenters suggested the need for a principle that would show how a balance between ocean noise mitigation and marine activities would be handled (and conflicts resolved), since reaching zero ocean noise is neither practical nor possible. The need for a pre-agreed dispute-resolution mechanism was also noted. Several commenters pointed out that the guiding principles did not address or include Theme 3 (Outreach and Communication).

1. The polluter pays principle means that the producers and users of harmful substances, pollutants and wastes have a responsibility for bearing the costs associated with the safe use and disposal of these substances and wastes. (*Canadian Environmental Protection Act* At-A-Glance)

CHAPTER 4: PROPOSED THEME 1

Science, Research, and Technology Development

WHAT WE PROPOSED: THEME 1

- Improve the Government of Canada's coordination and planning of science research and technology development activities, including monitoring.
- Improve the Government of Canada's ability to integrate and share the results and outcomes of science research and technology activities.
- Improve the Government of Canada's ability to identify knowledge gaps with respect to science research and noise technology development.

There is significant and ongoing science research and technology development in both the public and private sectors dedicated to better understanding the impact of ocean noise on marine species and finding ways to reduce these noise levels.

The Strategy is expected to guide a concentrated effort to further improve understanding of the potential impacts of ocean noise on marine species. Recommendations related to this theme are expected to support future management decisions regarding impacts to marine life and sustainable development, identification of knowledge gaps, and development of common platforms that can be used to plan future work and science and technology investments.

Beluga whale (*Delphinapterus leucas*) in estuary. Credit: Yvette Barnett.

What We Heard

QUESTION 3

With respect to human-generated underwater noise, are there any marine ecosystems or species, technologies, and/or areas of science research that you think should be considered as future priorities?

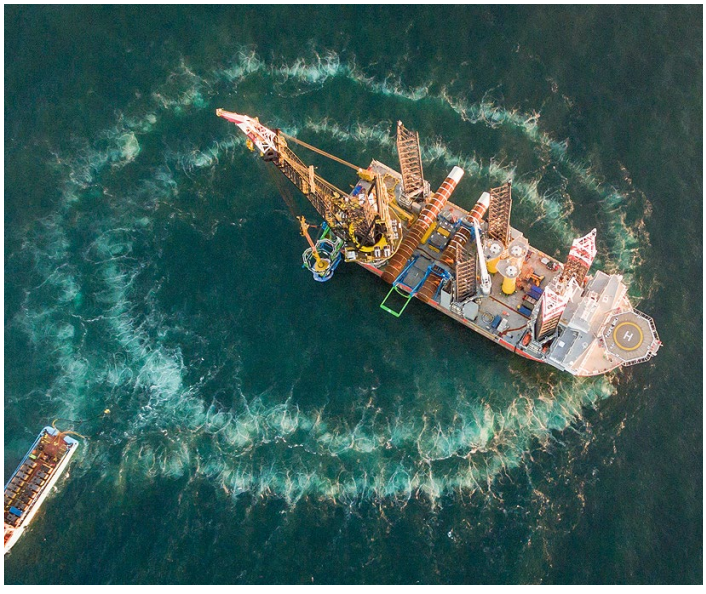
ECOSYSTEMS AND SPECIES

In terms of priority ecosystems and species, there was significant commonality across all responding groups. Most commenters identified the Salish Sea, Arctic waters (including the Northwest Passage and the Davis Strait), and the St. Lawrence Estuary/Saguenay Fjord as the areas where the confluence of ocean noise and marine mammals were of greatest concern. It is not surprising then to find that the highest priority species fall within these waters: Southern Resident killer whales (Salish Sea), St. Lawrence Estuary beluga (St. Lawrence Estuary/Saguenay Fjord), and beluga and bowhead whales (Arctic). While some commenters thought that the focus should be on whales, others argued that the emphasis on marine mammals is already excessive. These respondents noted that key commercial species such as salmon, herring, lobster, and crab may also be impacted by ocean noise but little is done because they are not listed as species at risk. Respondents also mentioned lower trophic-level species, invertebrates, sea birds, polar bear, and other species at risk as being of interest.

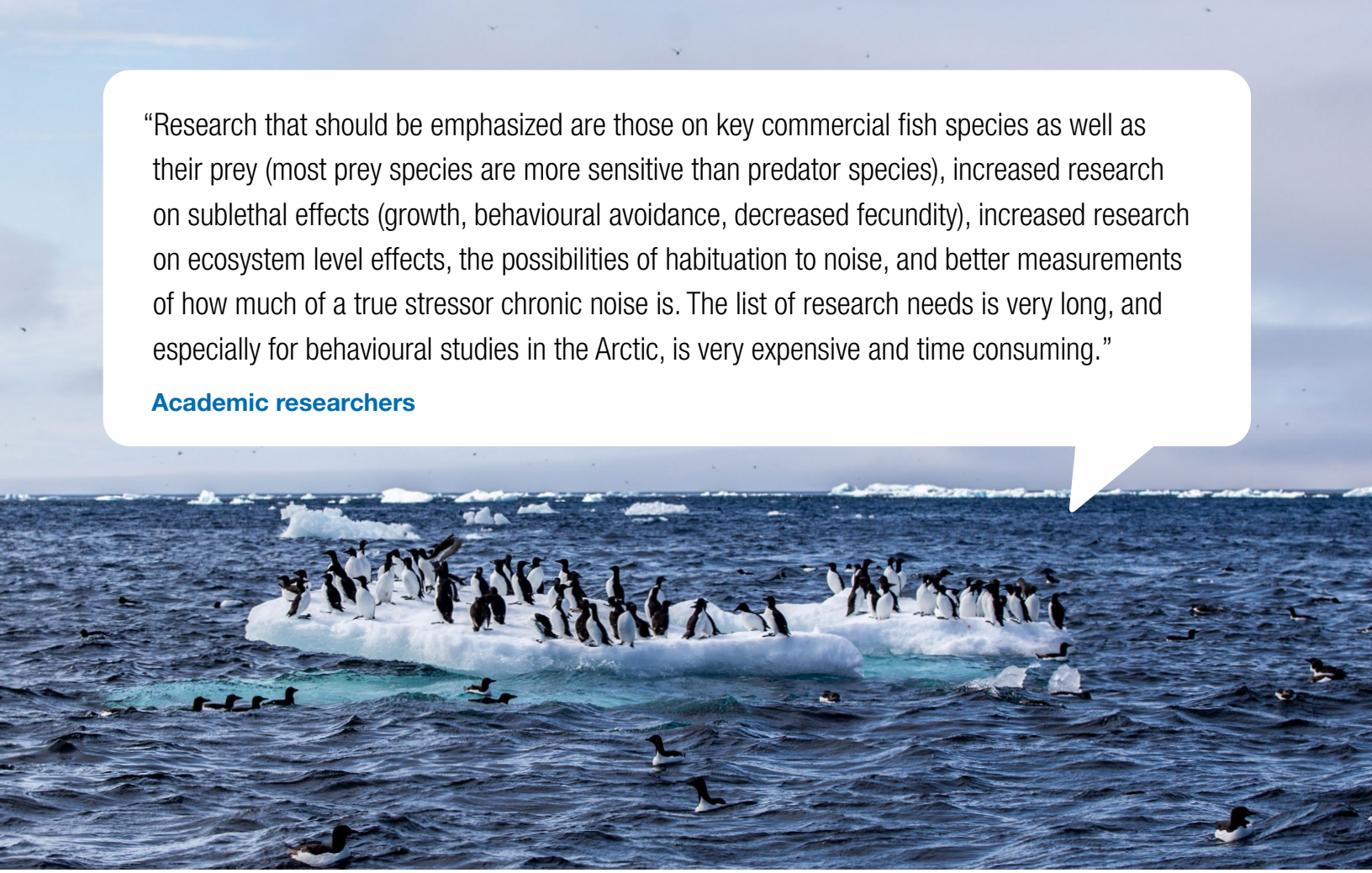
TECHNOLOGIES

There was general agreement among many respondents that the technologies to prioritize are those that reduce or limit the amount of ocean noise, with the most immediate focus on reducing vessel noise and mitigating or eliminating the noise from seismic airguns. Many respondents expressed their belief that seismic testing (and indeed the entire oil and gas industry) was unsustainable and should be banned completely in Canada. Several commenters noted that alternative technologies already exist for use in oil and gas exploration, and governments could incentivize their use and further development. Many commented that governments could offer incentives to the shipping industry in the form of lower port fees for those vessels that were refitted to accommodate quieting technologies. For example, the Enhancing Cetacean Habitat and Observation (ECHO) Program has proposed that the Port of Vancouver replace gross tonnage with shipping noise in determining port fees. An incremental management approach was recommended to allow for new technologies to be considered and adopted, thereby avoiding unintended consequences as much as possible.

Mandatory vessel slowdowns, better monitoring using drones and artificial intelligence, and attaching Global Positioning System tracking devices to whales were also mentioned by many respondents as ways of enhancing real-time detection of marine mammals and notifications to vessels. In that context, several respondents emphasized the importance of investing in big-data storage, analytical capabilities, and management.



Big Bubble Barrier in Position. Credit: https://www.hydrotechnik-luebeck.de



"Research that should be emphasized are those on key commercial fish species as well as their prey (most prey species are more sensitive than predator species), increased research on sublethal effects (growth, behavioural avoidance, decreased fecundity), increased research on ecosystem level effects, the possibilities of habituation to noise, and better measurements of how much of a true stressor chronic noise is. The list of research needs is very long, and especially for behavioural studies in the Arctic, is very expensive and time consuming."

Academic researchers

Thick-billed murre (*Uria lomvia*) aggregated on iceberg, Hantzsch Island. Credit: Michelle Munkittrick.

AREAS OF SCIENCE RESEARCH

Consistent with some of the technology-related feedback, most respondents agreed that areas of science research should focus on reducing noise generated by vessels, and reducing or eliminating the use of seismic airguns, sonar, use of explosives, and other similar acoustic technologies known to cause harm to marine mammals. Many respondents linked research to the ecosystems and species identified as priorities, suggesting, for example, a focus on the approaches to major ports where shipping noise is greatest, or placing buoys with microphones in the St. Lawrence Estuary and the Saguenay Fjord to measure the correlation between ocean noise and marine mammal activity. Others noted that understanding the source levels of noise generators would be extremely valuable in accurately measuring noise propagation and estimating ranges of potential impacts on different species to determine the level at which chronic noise becomes a true stressor.

Many respondents emphasized the importance of establishing baseline sound measurements in all regions so that increases or decreases in sound can be measured. In this context, commenters also noted the importance of having targets for noise reduction in order for the Strategy to be successful. Several respondents cautioned that the methodologies for establishing baseline sound measurements must be based on accepted science.

Research into cumulative effects and population-level impacts were also indicated by many as priorities, together with research into the sub-lethal behavioural and physiological impacts of noise (for example, locating food, finding mates, producing offspring) on different species under different conditions. Several respondents noted that past research has only measured sound pressure, ignoring the particle motion component of sound which is an important factor for many species, particularly finfish. A number of commenters pointed to international research efforts underway to measure sound impacts on marine animals, and encouraged Canadian participation in this work.

CHAPTER 5: PROPOSED THEME 2

Ocean, Coastal, and Estuarine Impact Assessment and Management

WHAT WE PROPOSED: THEME 2

- Clarify national management of ocean noise in support of sustainable development and biodiversity protection.
- Support greater coordination and information sharing among ocean users and ocean regulators to better inform and implement effective management measures for noise.
- Improve the Government of Canada's ability to identify gaps in ocean noise management.
- Provide long-term guidance for the Government of Canada on the management of human activities that contribute to ocean noise, together with recommendations for all aspects of coordinated management.
- Improve the Government of Canada's ability to contribute to management of ocean noise in areas that cross international boundaries.

Assessing the ecosystem impacts of ocean noise involves analyzing and interpreting volumes of different types of information from multiple sources, sometimes without a standardized methodology for measuring or reporting. Management responsibilities are spread across many federal departments and agencies, with some responsibilities also within the purview of provinces and territories.

The Strategy will highlight ocean noise management efforts and activities across governments, organizations, and institutions. The integration of management activities can also provide an opportunity to develop a plan to address the impacts of ocean noise on species found in Canadian waters. An integrated approach is proposed for the Strategy to enable an assessment of the effectiveness of existing management measures, and facilitate identification of future initiatives to further mitigate the impacts of ocean noise.

Green sea turtle (*Chelonia mydas*). Credit: Victor Ene.

What We Heard

QUESTION 4

How are you, your organization, or your community affected by underwater noise, its potential effects or impacts, and its management?

The majority of those responding through the online portal did not declare an affiliation or provide a specific response to this question. Of those who did, most were residents of coastal communities or affiliated with environmental organizations whose mandate focused on marine mammal protection. Many of these respondents emphasized their affection for marine mammals, particularly whales, and criticized governments for prioritizing economic matters over environmental protection.

Submissions from respondents in the Arctic noted how Arctic residents have been affected by increased large-vessel traffic and expressed concern regarding anticipated additional noise from oil and gas exploration. These noise sources have had negative impacts on marine wildlife and threatened the food security of northern communities. Several commenters noted that development potential, particularly in the Arctic, depends on effective management of the marine environment. Submissions from environmental and industry associations provided background on their mandates, specifying their connections to the issue and what they are doing to address ocean noise.

Blessing of narwhals (*Monodon monoceros*) surfacing in the Arctic. Credit: Fisheries and Oceans Canada.

"We do not see it is the sole domain or responsibility of federal government departments to hold authority for the stewardship of natural resources and environments for those who have a greater vested interest in this regard. . . . Indigenous groups must play a major role in shaping government policy on oceans, particularly in northern regions where our Inuit Traditional Knowledge is superordinate."

Indigenous organization

CHAPTER 6: PROPOSED THEME 3

Outreach and Communication

WHAT WE PROPOSED: THEME 3

- Increase transparency through improved education and communication of ocean noise impacts and management approaches.
- Increase awareness among ocean users and the public of the impacts of ocean noise.
- Facilitate dissemination and communication of science research and technology to ocean users and the public.

Ongoing and coordinated communication with partners, Indigenous peoples, and stakeholders is key to the successful development and implementation of the Strategy. For such a complex issue, the best results can only be achieved by gathering all available information and sharing it as broadly as possible.

The Strategy is designed to enhance communication, coordination, and engagement to raise awareness and encourage greater participation in the management of ocean noise. It seeks to improve the federal methods of involving and informing Canadians about the significant issue of ocean noise through a set of recommendations. The Strategy will also help to clarify and coordinate ocean noise management responsibilities, thereby reducing overlap and duplication of effort, highlighting opportunities for further collaboration, and providing greater transparency for Canadians through improved communication.

Spyhopping behavior of a southern resident killer whale (*Orcinus orca*) from J pod, near Cape Lazo. Credit: Fisheries and Oceans Canada.

What We Heard

QUESTION 5

What kinds of engagement and communication approaches are necessary to ensure the effective and collaborative development of an Ocean Noise Strategy for Canada?

There was general agreement across all responding groups that most Canadians, including marine users, are unaware of the pervasive impacts of ocean noise. Comments received through the online portal emphasized the need for a public education campaign using all available tools (advertising, exhibits, presentations, workshops, social media, etc.) to educate Canadians on all aspects of ocean noise. In this context, the need for more and better science communication, including how the potential risks to marine life are identified and assessed, was also highlighted by a number of commenters.

Respondents identified the need to work collaboratively to ensure that the Strategy is developed in an equitable manner that does not favour the interests of any particular group, and strikes an appropriate balance between socio-economic priorities and ecological imperatives. Engagement and consultations were obvious requirements for most respondents. Commenters were clear that these processes need to be efficient, transparent, collaborative, inclusive, and respectful of Canada's obligations to Indigenous peoples, particularly regarding traditional rights for food, social and ceremonial (FSC) fishing as well as those negotiated under Modern Treaties. Working through existing mechanisms was also a priority, especially for Indigenous groups and industry stakeholders, many of whom are already experiencing fatigue and frustration with the number of government consultations and the ways in which they overlap.

Commenters in all responding groups indicated a willingness to be involved in any engagement initiatives with most also offering their expertise as the Strategy is developed. All groups cautioned that communication and collaboration should be carried on throughout the process, rather than just at the final review stage. Several commenters recommended the development of a Government of Canada website that would pull together all information related to ocean noise, including links to initiatives, data, documents, legislation, science reports, technological developments, etc. Such a platform could also be used to encourage an exchange of views and draw more Canadians into the process, thereby raising awareness.

A number of commenters requested clarification of the objectives associated with this theme. Several respondents expressed confusion regarding the relationship of this theme to the overall objectives of the Strategy and to activities regulated by the Government of Canada.

American lobster (*Homarus americanus*) foraging for food on rocky bottom. Credit: RLS Photo.

CHAPTER 7

Additional Themes and Objectives

What We Heard

QUESTION 6

Do you agree with the themes and objectives that have been proposed to guide the development of the Ocean Noise Strategy? Are there other themes and objectives that should be considered?

The Discussion Document asked readers to indicate their agreement with the themes and objectives proposed to guide the development of the Strategy, and to add other themes and objectives that should be considered. While most respondents agreed with the proposed themes and objectives, many commenters offered interesting and valuable suggestions, many of which are collected here. The additional objectives are presented according to the theme under which they were proposed.

A number of respondents questioned why the proposed themes and objectives were so far removed from actions. Many emphasized the urgent need to reduce ocean noise now, even while impacts are still being studied, noting that this approach would be in line with the precautionary principle.

Harbour seal (*Phoca vitulina*), Saltspring Island. Credit: Andrew McKinlay.

ADDITIONAL THEMES

- Many respondents saw value in developing a specific theme to capture the ways in which Indigenous Knowledge would contribute to the development of the Strategy. Such a theme could provide more specifics regarding how Indigenous peoples would be involved, and how Indigenous Knowledge would be gathered and used.
- Several commenters (especially those from industry associations) noted that the issue of ocean noise is one that is being tackled internationally. These commenters felt that a new theme to emphasize the need for collaboration, communication, and partnerships, both domestic and international, would be beneficial.
- The issues of cumulative effects, climate change, and the risk of unintended consequences were brought forward many times, with several respondents suggesting a new theme that would address how a balance between economic interests and environmental priorities would be achieved and conflicts resolved.

ADDITIONAL OBJECTIVES: THEME 1

- Improve the Government of Canada's ability to support inclusion and integration of Indigenous ecological knowledge with scientific knowledge.
- Improve the Government of Canada's inclusion of regional and Indigenous communities in Arctic and northern research on ocean noise, including setting priorities, undertaking the research, and enhancing community-based observation to contribute to research.
- Increase the Government of Canada's support of investment in research and technology focused on investments in innovation, including big data, artificial intelligence monitoring, quieting technologies, and other advancements that could help in reducing human use of non-renewal natural resources.
- Include a commitment to complementarity to emphasize the importance of using public funding to leverage science research and technology done by outside partners with the goal of maximizing efficiency of resources.
- Identify alignment or discontinuity between national and international vessel requirements and application to foreign operators.
- Strengthen the Government of Canada's support of global governance and collaboration to reduce the harms of ocean noise from human activities.

Jellyfish, Laurentian Channel. Credit: Canadian Healthy Oceans Network.

Two suction hopper vessels engaged in dredging. Credit: Alexey Seafarer.

ADDITIONAL OBJECTIVES: THEME 2

- Provide long-term guidance for the Government of Canada on developing infrastructure, systems, and approaches that reduce or eliminate human activities that generate ocean noise, in support of building a resource-efficient and climate-resilient society.
- Add an objective incorporating Indigenous Knowledge into the concept of impact assessment and management. These knowledge sources can provide invaluable information about what aspects of impact assessment should be prioritized.
- Add an objective to develop tools for increased collaboration between federal government departments, such as working groups, and Memoranda of Understanding to better manage activities.

ADDITIONAL OBJECTIVES: THEME 3

- Increase public awareness of how human activities that generate ocean noise harmful to marine life might be effectively reduced.
- Add an objective explicit to the use of Indigenous Knowledge to recognize the value of Indigenous perspectives and signal that their concerns will be addressed.

Finally, there were a number of comments of a more general nature that were considered when drafting the Strategy. Many of these comments relate to the Purpose and Scope sections of the Discussion Document:

- A number of respondents asked for clarification regarding the geographical boundaries of the Strategy, with many wanting to understand why the Great Lakes (and other freshwater systems) were excluded. There were many comments relating to the Saguenay Fjord, but several respondents noted that this area was not expressly included in the geographical boundaries.
- Numerous commenters wanted more and better definitions, especially of “noise” in general and “underwater ocean noise” in particular. The definition should be placed in an international context since many of the issues are already being discussed in other maritime nations.
- Respondents asked that the Strategy include a review of all policies and legislation relevant to the issue of ocean noise, including ecosystems valuation.
- Many commenters asked that the concepts of evaluation and integration be more clearly identified in the themes and objectives to ensure that objectives can be measured and duplication avoided.
- A number of respondents asked that the objectives be made more action-oriented to ensure that all objectives linked back to the purpose of the Strategy.

CHAPTER 8

Conclusion and Next Steps

The Government of Canada has committed to developing a comprehensive strategy to address the complex and evolving problem of ocean noise and we would like to thank all those who took the time to read the Discussion Document and provide thoughtful, provocative, and valuable responses. All of the feedback has been considered; in many cases, it has sparked rethinking and refinements that have been incorporated into the Strategy. The input received was extremely valuable in helping shape and update the themes and objectives of the Strategy, and in showing all the creative and exciting ways these objectives can be achieved.

A draft Strategy is anticipated for release in 2024, with a public comment period and engagement sessions planned. This schedule will give all those interested an opportunity to have input into the development of the final Strategy as well as time to comment on the draft.

We extend an invitation to individuals to actively participate in the Strategy engagement process, taking the opportunity to read and contribute to the next steps.

Giant Pacific octopus (*Enteroctopus dofleini*) on the ocean floor. Credit: Martin Voeller.

ANNEX 1

List of questions posed in the Discussion Document

What is the most important thing that the Government of Canada should do to better understand and minimize the impacts of underwater ocean noise? (Background)

Do you agree with the guiding principles of sustainable development and a precautionary approach based on risk? Are there other guiding principles that should be included? (Guiding Principles)

With respect to human-generated underwater noise, are there any marine ecosystems or species, technologies, and/or areas of science research that you think should be considered as future priorities? (Theme 1)

How are you, your organization, or your community affected by underwater ocean noise, its potential effects or impacts, and its management? (Theme 2)

What kinds of engagement and communication approaches are necessary to ensure the effective and collaborative development of an Ocean Noise Strategy for Canada? (Theme 3)

Do you agree with the themes and objectives that have been proposed to guide the development of the Ocean Noise Strategy? Are there other themes and objectives that should be considered?

ANNEX 2

List of self-identified respondents

FEDERAL DEPARTMENTS AND AGENCIES

Federal departments and agencies, many of which worked with Fisheries and Oceans Canada in developing the Discussion Document, were also asked to submit their comments. These included submissions from the following:

- Canadian Coast Guard
- Crown-Indigenous Relations and Northern Affairs Canada
- Defence Research and Development Canada
- Department of National Defence
- Environment and Climate Change Canada
- Impact Assessment Agency of Canada
- Parks Canada
- Transport Canada

INDIGENOUS GOVERNING BODIES AND ORGANIZATIONS

Several online meetings were held with Inuit organizations in the Arctic and with Indigenous peoples and groups in other parts of Canada. All were invited to send in written submissions. Responses were received from the following organizations:

- Conseil de la Première Nation des Innus Essipit
- Inuvialuit Regional Corporation
- NunatuKavut Community Council
- Nunavut Impact Review Board
- Nunavut Marine Council

and the following organizations or groups:

- Beaufort Sea Partnership
- Maritime Aboriginal Peoples Council

ONLINE PORTAL

The online consultation was activated on October 14, 2020, and closed January 12, 2021, a total of 90 days. During this period, the Discussion Document was accessed 3,470 times. Of this number, 88 respondents answered at least some of the six questions, while 81 submitted answers to all six questions, for a completion rate of 92 per cent. No information was solicited regarding participants' names, occupations, or affiliations. Commenters who did indicate an affiliation to a group often emphasized that they were submitting their views as individuals, not as representatives of their organizations.

PROVINCES AND TERRITORIES

The submissions from Nunavut are included under "Indigenous governing bodies and organizations," along with comments from the Inuvialuit Regional Corporation in the western Arctic. The only province to submit comments was the Province of Nova Scotia (Department of Intergovernmental Affairs).

STAKEHOLDER GROUPS

Academic institutions

Comments were received from researchers working on ocean noise issues in the following universities:

- Fisheries and Marine Institute of Memorial University
- University of New Brunswick
- University of Windsor

Environmental organizations

Comments were submitted by several environmental groups, many with a special interest in the Arctic and the problems associated with increased vessel traffic:

- Canadian Parks and Wilderness Society
- Comox Valley Project Watershed Society
- International Fund for Animal Welfare
- OceanCare
- Sierra Club Canada
- Société du Pont sur le Saguenay à Tadoussac
- West Coast Environmental Law
- World Conservation Society Canada
- World Wildlife Fund

Industry associations

- Association of Arctic Expedition Cruise Operators
- Canadian Association of Petroleum Producers
- Canadian Ferry Association
- Chamber of Shipping
- Newfoundland and Labrador Oil & Gas Industries Association
- Shipping Federation of Canada
- Vancouver Fraser Port Authority

VIRTUAL FACE-TO-FACE MEETINGS

Several opportunistic, face-to-face meetings were held on MS Teams. Many of the groups so engaged submitted comments and are listed in this Annex. Where comments were not submitted, feedback obtained during these meetings was recorded and is represented in this report.

Ship on the St. Lawrence river. Credit: Pierre Jarry.

Photo, top: Tsawwassen ferry, Delta, BC. Credit: Pavol Svantner.
Photo, bottom: Killer whale (*Orcinus orca*), Strait of Juan de Fuca, BC. Credit: Dick Martin.