



WHAT WE HEARD REPORT:

**REGIONAL PERSPECTIVES
ON ADAPTING
CANADIAN FISHERIES
TO A CHANGING
CLIMATE**



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Disclaimer

The following report contains opinions expressed by those who attended the regional workshop sessions and do not necessarily reflect the views of Fisheries and Oceans Canada (DFO).

Throughout this report, participant views are represented as received by DFO, however, in some instances there are discrepancies between participant interpretations and what is authorized by DFO. As such, participant comments may not correspond to the statutory, regulatory, and policy framework as understood by DFO. In addition, participant recommendations noted below reflect general consensus but should not be interpreted as having received unanimous consent.

Lastly, as the report covers comments from all regions across all discussion topics, some comments may be region-specific and therefore not applicable to all regions.

Executive Summary

Overview of the Regional Workshops

From May to December 2024, Fisheries and Oceans Canada (DFO) held a series of seven regionally focused workshops to discuss climate change impacts, barriers to adaptation, and actions to support the resilience of Canada's wild-capture fish harvesters and harvesting industry.

Key Takeaways

Impacts of the changing climate and areas of significant concern for participants include:

Rapid and significant environmental changes: Participants observed shifts in environmental factors such as warming water temperatures, shifting currents, reductions in snowpack and sea ice, thawing permafrost, and fluctuating and/or low levels of water.

Species impacts: Across all seven workshops, participants reported varying degrees of impacts on species, including marine mammals. Observations included changes to distribution, migration, abundance, and lifecycle patterns.

Invasive species: The presence of invasive species is increasing across all three coasts.

Fish health: Noticeable impacts on fish health, as participants reported increasing signs of disease, poor reproduction rates, and changes to the colour and texture of the flesh of some species.

Changing weather patterns: Predictability of harvesting seasons and harvester safety are being increasingly jeopardized by more frequent and intense storms, changing wind patterns, shifting freeze/thaw times, and the thickness of sea ice. On the west coast, there are significant concerns over climate-driven weather events such as heat domes, flooding, and landslides.

Economic impacts: There were significant concerns about potential financial impacts from fishery closures, which may become more frequent due to climate-related impacts on species viability (distribution, abundance, disease, etc.).

Cultural impacts: Participants noted significant concern over potential threats to culturally important species and traditional harvesting practices.

Food security: Participants expressed concerns that the changing climate could pose legitimate threats to food security, although there may also be opportunities to enhance food security.

Fisheries management: Participants shared broad concerns that the current fisheries management regime is not flexible enough to respond to the rapidly evolving impacts of climate change in a way that is timely and supports harvesters.

Adaptation efforts identified by participants include:

Research, monitoring, and data collection: Participants gave examples of some of their own research, monitoring, and data collection efforts, emphasizing the importance of standardized data collection to respond faster to climate impacts.

New technologies and methods: Ongoing efforts include adapting fishing gear for changing bait availability, using excluder devices to reduce bycatch, developing predictive tools, as well as investigating different harvesting methods and low-emission vessels.

Communication, education, and partnerships: Participants highlighted the interconnectedness of all resource users and the importance of collaboration across regions and sectors. They have also sought opportunities to share resources and knowledge. Many participants have continued to advocate for co-management processes and the incorporation of Indigenous knowledge (IK)¹²³ into DFO science and decision-making processes.

Planning and logistics: Some participants have engaged in risk assessments and/or adaptation planning exercises (e.g., scenario planning). We also heard about logistical adaptations such as shifting harvest times (e.g., to the very beginning of a fishing season) and the modification of boating practices in response to changing water levels.

Barriers to adaptation identified by participants include:

Funding supports: Participants highlighted the need for more flexible and accessible funding to support high costs related to fishery transitions, green technologies, habitat restoration, climate adaptation, and research.

Science and data: We heard that a lack of long-term, comprehensive, and trusted data—including social, economic, and cultural data—limits the ability to distinguish climate change impacts from other factors such as natural variability, and significantly hinders the

¹ Using the same definition found under the [Aboriginal Fund for Species at Risk \(ASFAR\)](#), Indigenous Knowledge (IK) refers to holistic approaches to understanding that may draw on past and current knowledge structures. It encompasses what is often referred to as 'Traditional Knowledge, but is not limited to that term and may involve the application of modern technologies.

² When used in this report, Indigenous Knowledge (IK) is understood to encompass First Nations or Métis Traditional Knowledge, and Inuit Qaujimajatuqangit (also referred to as Inuit Traditional Knowledge).

³ Using the same definition as Parks Canada for the [Tallurutiup Imanga National Marine Conservation Area](#) project, Inuit Qaujimajatuqangit (Khao-yee-muh-yah-tut-khanggeet) or IQ, also referred to as Inuit Traditional Knowledge, is a source of information based on historical and/or current observations by Inuit which has been passed on orally over several lifetimes.

predictive capacity needed for planning. This also tends to result in a reactive rather than proactive fisheries management regime that is often using outdated information for decision making.

Infrastructure: Participants emphasized the need for future-ready harbour infrastructure that is capable of supporting green fleets, resilient to climate impacts, and strategically located. Particularly in the Eastern Arctic workshop, participants highlighted the lack of food-processing facilities as a significant barrier to Inuit participation in fisheries and the need for emergency response infrastructure across the Arctic coast.

Current fisheries management regime: Participants across all regions viewed the current fisheries management regime as a major barrier to adaptation, citing its slow, rigid, and inflexible nature, which hinders timely responses to changing environmental conditions.

DFO's organizational structure: Participants noted that the structure of DFO can lead to a lack of coordination within the Department and across jurisdictions. This can result in slow, fragmented responses and hinders a broader comprehensive approach to fisheries management.

Inclusivity and Indigenous involvement: The lack of recognition and inclusion of IK, along with limited involvement in fisheries management governance and science, was seen as a barrier by participants.

Transparency, collaboration and communication: Participants emphasized the importance of strengthening transparency, trust, and communication. There was a strong desire for more inclusive and collaborative partnerships, clearer and more accessible communication channels, and open sharing of decision-making processes, scientific research, and climate change information. Enhancing these elements was seen as key to building trust between DFO, Indigenous groups, and other stakeholders, and to fostering more effective and equitable outcomes.

Recommendations for Ways Forward

Participants recommended several actions to support a shift to more resilient fisheries. For the purposes of this executive summary, they have been broadly characterized according to three categories:

1. Improve fisheries management for greater ecosystem protection and sustainable development;
2. Enhance data availability, transparency and strategic planning capacity to support modernized fisheries; and,
3. Support an adaptive and climate-ready fishing industry.

Improve fisheries management for greater ecosystem protection and sustainable development:

Ecosystem approach: Participants recommended a move away from single-species management to an ecosystem approach. Many indicated the need to consider species interactions—like predator-prey relationships—alongside social, cultural, and economic factors to support the long-term viability and resilience of fisheries.

Empower Indigenous communities: Participants placed emphasis was placed on recognizing the importance of IK and supporting Indigenous self-governance in fisheries management. Co-management models, and additional opportunities for Indigenous communities to actively participate in decision-making, science activities, and priority setting were viewed as effective strategies for supporting adaptation. Strengthening Indigenous leadership and fostering collaboration in these areas was identified as a crucial step toward achieving more effective and sustainable adaptation outcomes.

Pursue innovative solutions: Participants raised that given the current uncertainty and rate of change, it is crucial to support the exploration of bold, innovative, and collaborative solutions within DFO and across sectors.

Enhance data availability, transparency and strategic planning capacity to support modernized fisheries:

Science activities and data collection: To support climate-informed fisheries management, participants recommended standardizing data collection, identifying gaps, establishing baselines, setting priorities to triage work, developing social and economic indicators, focusing on proactive solutions, and integrating climate change considerations into management decisions. Additionally, data should be readily available and shared.

Recognize Indigenous and harvester knowledge: Participants would like to see the integration of local expertise into existing processes. Participants emphasized the need to integrate IK and the lived experiences of Indigenous harvesters into DFO's science and decision-making, recognizing IK as foundational and equally valuable as Western science for sustainable fisheries management. There was also recognition that non-Indigenous harvesters and industry participants living and working on the water have valuable insights and knowledge to share as they are often the first to observe changes. Their expertise should also be acknowledged and considered.

Forward planning activities and capacity building: Participants highlighted the need for forward planning and capacity building through inclusive, action-focused discussions that foster collaboration, generate solutions, and ensure long-term relevance in climate adaptation efforts. The utility of collaborative scenario planning or 'foresighting' exercises to increase predictive capacity and identify agreed upon fisheries management outcomes was raised repeatedly.

Collaboration, transparency, and communication: Participants noted that collaboration, transparency, and communication are critical to building trust and relationships. To strengthen climate adaptation, it is important to increase collaboration with Indigenous communities and harvesters, while also improving the transparency of decision-making processes. Timely and accessible communication should be ensured, alongside the facilitation of resource sharing across sectors. Research and climate risk information must be clear, accessible, and reflect the intended audience.

Support an adaptive and climate-ready fishing industry:

Legislative, regulatory and/or policy reviews: These were identified as critical steps to enhance the ability of harvesters and fisheries managers to be flexible in response to rapid environmental and industry changes.

Funding opportunities: Participants wish to see the development of more flexible, inclusive, and accessible funding mechanisms (e.g., grants and contributions) tailored to local needs and all resource users, including disaster funds and fisheries loan boards.

Establish a mechanism for further discussions: Participants expressed a strong interest in ongoing, action-oriented climate change adaptation discussions that are collaborative, inclusive of all sectors, recurring within existing committees or new working groups, and focused on interactive engagement rather than one-way information sharing.

Education: Participants highlighted the desire to engage in public awareness campaigns emphasizing climate change impacts on fisheries, the shared responsibility for adaptation efforts, and the vital role of fisheries in food security and its importance as a natural resource industry.

Conclusion

Climate change was widely seen as a major issue impacting all sectors. Participants felt that one of the most effective ways to support the resilience and long-term viability of Canada's fisheries and coastal communities is through working together to share and develop solutions that benefit the maximum number of users.

Overall, there was a sense of urgency among participants for DFO to take action, and a recognition that while there continues to be gaps, there is enough data available to begin making progress on adaptation. Many participants noted that the current unpredictability, combined with the absence of a stated long-term vision and defined objectives for the future of Canada's fisheries from DFO, impacts their ability to plan and leaves them unsure of what steps to take to better prepare. Participants repeatedly emphasized the importance of shifting the current fisheries management regime from reactive to proactive decision-making, building capacity for adapting and future planning, and expressed a desire to have a role in shaping the future of their livelihoods, cultures, and traditions.

Report

Context

In November 2023, DFO hosted a workshop entitled [*Adapting Canadian Fisheries to a Changing Climate*](#). Invitees represented Indigenous organizations and governments, and key stakeholders operating primarily at a national level. The workshop supported small group discussions focused on climate impacts on fisheries, adaptation barriers and needs, and ways of building resilience in Canada's marine wild-capture fisheries.

Over the duration of the workshop it was strongly recommended that DFO continue the conversation, and host similar workshops at the regional level, to better understand the varying climate impacts and considerations across Canada's three coasts. In response, DFO organized a series of seven region-specific workshops.

Regional Workshops

The regional workshops were held from May 31, 2024, to December 4, 2024, and largely followed the structure, composition, and discussion topics of the national workshop. Similar to the national workshop, the regional sessions were intended to be a listening exercise and an important step towards recognizing the challenges posed by climate change to fisheries. The breakdown was as follows:

- **May 31, 2024:** Adapting British Columbia's fisheries to a changing climate
- **October 30, 2024:** Adapting Maritimes fisheries to a changing climate
- **November 7, 2024:** Adapting northern fisheries (Northwest Territories, Inuvialuit Settlement Region and Yukon) to a changing climate
- **November 14, 2024:** Adapting eastern Arctic fisheries (Nunavut, Nunatsiavut, Nunavik and James Bay) to a changing climate
- **November 27, 2024:** Adapting Newfoundland and Labrador fisheries to a changing climate
- **December 2, 2024:** Adapting Gulf fisheries to a changing climate
- **December 4, 2024:** Adapting Quebec fisheries to a changing climate

Overview of the Workshops

The objectives of the regional workshops were to:

- Provide an opportunity for participants to come together to share experiences and perspectives on climate change impacts, adaptation actions and the future of fisheries under climate change;
- Build a broader understanding of the impacts of climate change on wild-capture fisheries; and,
- Identify barriers and opportunities for adaptation action; now and into the future.

The workshops provided a platform where Indigenous organization and governments, commercial and recreational harvesters, environmental non-governmental organizations, provincial and territorial governments, and academic leaders could come together to discuss climate change impacts and potential adaptation measures within wild-capture fisheries managed or co-managed by DFO.

Despite efforts to promote participation, several invitees were unable to attend, often due to logistical barriers such as scheduling conflicts or limited capacity within their organizations. Some organizations, particularly those directly involved in fisheries, may not have attended due to consultation fatigue, as they are frequently asked to engage in numerous meetings during their off-season. Additionally, several participants noted that in-person meetings are generally preferred by harvesters. It was suggested that holding the workshops in-person may have improved attendance among those directly involved in fisheries.

Summary Analysis

The following provides an overview of the common themes and differences from the seven regional workshops. This section is not an exhaustive analysis of all feedback but draws from the most common responses to questions that were asked across all the workshops. While more detailed, the input from these regional workshops was consistent with the themes raised in the November 2023 national workshop.

Impacts of the Changing Climate and Areas of Significant Concern

Participants identified current impacts of climate change in their respective regions and, in many cases, highlighted their biggest areas of concern. The key themes which emerged from this discussion and the most frequently raised points are reflected below.

Shifts in species distribution, migration patterns, population abundance, productivity and lifecycles

- Observations of geographic shifts in species distribution were reported in all seven workshops, with these changes mainly linked to a broad range of environmental factors such as warming water temperatures, shifting currents, reductions in snowpack and sea ice, thawing permafrost, fluctuating and/or low levels of water.
- Harvesters also noted changes in the lifecycles of various species, sometimes affecting their population abundances, productivity, and seasonality, which are not always aligning with DFO's harvesting season dates.
- Not all regions noted the same level of impacts, or consistent effects on the same species. Across Atlantic Canada, participants noted many species moving northward, causing concerns of declines in many native populations.
- In Quebec, participants reported some new predatory species, which are changing predator-prey relationships and affecting the whole ecosystem.
- Environmental changes are also influencing marine mammals and altering predation patterns. For example, participants in the Gulf region reported an increase in the presence of sharks and whales due to changes in migration patterns, the latter causing fishery closures and requiring gear changes.

Invasive species

- Invasive species were noted as becoming increasingly common across all three coasts as ocean temperatures warm and species move to either follow or escape temperature changes. For example:
 - Green crab and Pancake Batter Tunicate (Sea Vomit) are being seen more in the Maritimes region.
 - Participants in the northern fisheries workshop reported the rise of invasive species, and the northward expansion of some species into areas where they are not native. A prominent example of this are North American beavers, who have expanded into the Arctic and are building dams that are blocking fish migration.
 - Participants in British Columbia fisheries reported seeing higher levels of invasive species such as Pacific oysters, and a rise in sea lice outbreaks.

Fish health

- Significant concerns were raised regarding fish health, particularly among participants in the British Columbia workshop, and the northern and eastern Arctic workshops.
- Participants noted signs of disease and poor reproduction rates among some species. In particular, fish health was noted as a concern among salmon populations, due to warming waters and changes in river conditions.

- Others reported more diseases and noticeable changes to the colour and texture of the flesh of some species (e.g., Arctic char).

Changing weather patterns

- We heard that increases in storm frequency and intensity, shifting wind patterns, and changes in sea ice (freeze/thaw cycles and thickness) are major safety concerns for harvesters. These issues were especially raised by participants in the Atlantic, Quebec, northern and eastern Arctic workshops.
- In Quebec, participants explained that the safety concerns for harvesters and the uncertainty about changing weather patterns were also weighing heavily on harvesters' mental health.
- In British Columbia, participants shared concerns over increases in climate-driven weather events such as heat domes, flooding, and landslides.
- These weather changes are also impacting the predictability of harvesting seasons (e.g., timing and length) and can have impacts on bycatch levels (e.g., higher bycatch with longer seasons). Warming waters and changes to sea ice were frequently mentioned in connection to shifts in the timing of harvesting seasons.

On a broader scale, participants expressed concerns about the economic and cultural impacts of climate change. For example, participants in British Columbia raised concerns over financial challenges caused by fishery closures, while others spoke of threats to culturally important species, traditional harvesting practices, and food security. In Quebec, participants were worried about the effects of climate change on communities that rely heavily on the harvesting sector. Participants in Newfoundland and Labrador and the eastern Arctic noted that some climate impacts may be positive, such as the possibility of opening or expanding new fisheries and improving food security.

All workshops highlighted the expectation that managing fisheries will become more complicated. Many comments focused on how climate change is making it harder for the current fisheries management regime to keep pace. These issues will be expanded on in the section on barriers; however, they largely pointed to a mismatch between the rapid impacts of climate change requiring quick responses, and the slow, rigid fisheries management processes that currently exist.

Lastly, some participants expressed a degree of uncertainty about whether the changes they are seeing are specifically caused by climate change, citing a lack of long-term data to support that position. However, there was recognition among these participants that noticeable changes are occurring, regardless of the cause.

Adaptation Actions Underway

Participants shared some of the individual or collective actions that they and/or their organizations are taking to adapt to the impacts of climate change.

Research, monitoring and data collection

- We heard from participants that they and/or their organizations are focusing their efforts on research, monitoring, and data collection. For example, participants in British Columbia reported tracking water samples, phytoplankton, and fish stocks.
- Participants also emphasized the importance of standardized data collection in responding faster to climate impacts. For example, participants in the northern fisheries workshop identified this is an area of focus in some of their work.
- Some participants in the Maritimes region mentioned enhancing data collection and research efforts using technology, such as satellite telemetry and artificial intelligence.
- In the Gulf region, participants reported conducting whale occurrence modelling.

New technologies and methods

- Participants highlighted the potential of new technologies and ways of 'doing business.' For example:
 - In British Columbia, harvesters are adapting fishing gear to account for shifts in bait availability.
 - Harvesters operating in the eastern Arctic are using excluder devices to reduce the number of Greenland shark caught as bycatch.
 - Oceans North, an ENGO, has led the development of the Climate Risk Index for Biodiversity; a tool which can be used to predict how fish species in specific areas will be affected by climate impacts.
 - Participants in several workshops touched on efforts to diversify fisheries and licence holdings, develop tools for safer fishing practices, explore alternative harvesting methods to reduce environmental impacts and minimize bycatch, and experiment with, and/or adopt, new fishing gear. Examples included ropeless gear and new trawling technologies.
 - Some harvesters also reported looking into electric or low emission vessels.

Partnerships, communication, and education

- Several participants noted actively advocating for co-management processes and consideration of IK as part of climate change adaptation in fisheries.

- Participants largely recognized the interconnectedness of all resource users in the fisheries sector and the importance of working together to find common solutions. Participants reported a desire to work together, share resources, and exchange information across regions, sectors and organizations.
 - For example, participants in the eastern Arctic and northern fisheries workshops reported numerous community-level actions, including ones focused largely on increasing communication processes to support the sharing of information.
 - Participants in Newfoundland and Labrador promoted transdisciplinary research involving all user groups as a way to break down silos and reduce overlapping initiatives.
- Others reported an interest in pursuing more learning and training opportunities at the community level.

Planning and logistics

- Some participants described their involvement in planning activities, such as developing risk assessments and creating climate resilience and/or adaptation plans.
- Others mentioned taking more immediate, practical steps to adapt to changing conditions. For example, adjusting harvest times to as early as possible within a season or adjusting boating practices due to shallower rivers (low water levels).

Barriers to Adaptation

Participants discussed the most common barriers to adaptation. Many comments focused on the lack of accessible funding to expand on research and better support harvesters and communities to adapt to climate change.

Funding supports

- Overall, participants reported that current funding programs (e.g., grants and contributions) could benefit from increased flexibility and better alignment with the needs of harvesters.
- More funding was said to be needed to mitigate the high costs of:
 - Transitioning to new fisheries (e.g., new gear requirements).
 - Greening existing fisheries (e.g., electrification of the lobster fleet).
 - Testing technologies such as mitigation tools. For example, the excluder devices used to reduce bycatch of Greenland shark in the eastern Arctic and ropeless gear to reduce impacts on North Atlantic right whales.

- We heard from participants who attended the northern fisheries workshop identified a need for enhanced funding and capacity to support habitat restoration and policy efforts.
- Participants in Quebec emphasized the need for more financing initiatives for new entrants, especially given the high market price for certain licenses, thus limiting their access to the sector.
- Participants also requested greater transparency in funding: who receives it and how it is allocated.

Science and data

- Participants highlighted the importance of strengthening data collection and scientific capacity to support informed fisheries management. In particular, they noted gaps in baseline and forward-looking data needed for tracking changes over time and planning. A number of participants also emphasized the need to prioritize core scientific work such as stock assessments and habitat mapping, which they felt have not kept pace with current needs.
- Insufficient funding (e.g., budget cuts) combined with competing or unclear priorities were typically identified as the root cause of these gaps.

Data gaps and missing baselines

- Some participants expressed that a lack of longer-term data collection makes it difficult to know what changes are due to climate change versus other factors, highlighting a need for improved baseline data. In a few regions, people were reluctant to link changes directly to climate impacts without having long-term data available.
- Participants highlighted an opportunity for DFO to consider more social, economic, and cultural factors alongside empirical data and science. Many felt that the ability to consistently consider variables beyond physical science would enable DFO to adopt a more holistic approach to supporting fisheries and coastal communities.

Limited predictive capacity

- Participants widely reported that an increased amount of data and scientific information would allow them to better understand the current state of fisheries, and to anticipate what is coming and make informed plans.
- Many participants felt that more projections related to climate impacts, predator-prey relationships, and species movements are needed, and noted that the increased data would allow for these projections to be better communicated outside of government.

- Participants emphasized the importance of proactively looking ahead to what data will be needed in the future to support informed decision-making (e.g., tracking the arrival of new species).

Infrastructure

- Participants expressed concerns about whether the current fishing infrastructure is ready to meet future needs. Specifically, harbours:
 - Must have the capacity to accommodate greener fleets (e.g., by providing electric charging stations).
 - Need to be climate ready, meaning they can withstand increasingly severe and frequent storms, changes in water levels and shifting sea ice conditions.
 - Should be expanded and strategically located to support growth in emerging areas.
- It was also noted that the lack of food-processing facilities in the eastern Arctic is a major barrier for Inuit participation in some fisheries.

Current fisheries management regime

- Participants identified areas in which DFO could improve the current fisheries management regime. Participants noted areas in which DFO could improve the flexibility and speed of management decisions. For example:
 - In British Columbia, participants observed that the single-species approach to fisheries management is too rigid to adapt to changing environmental conditions.
 - Similar feelings were expressed in Newfoundland and Labrador, where the current system was seen as being improved by increasing flexibility and speed in decision-making to respond more quickly to changing conditions.
 - Harvesters in the Maritimes region cited rigid regulations mandating fishing times and gear types, along with slow regulatory processes, as significant barriers.
 - In Quebec region, participants called for more adaptable rules, particularly around licensing, bycatch, simultaneous fisheries, and fishing seasons.

Organizational structure

- Participants in several workshops expressed concerns about coordination challenges within DFO — across sectors and regions, and with other federal departments and jurisdictions — which they attributed to what they perceived as a siloed organizational structure.

- Participants expressed that improved coordination would result in faster response times, increase opportunities for collaboration and small-scale actions, enabling a more comprehensive approach to fisheries management.

Inclusivity and Indigenous involvement

- Participants emphasized that more work is needed to fully recognize and respect Indigenous rights and IK in fisheries management. This could include fostering better collaboration and representation of Indigenous Peoples and IK in science and decision-making processes.
- Co-management and co-development approaches, where Indigenous communities play a central role in decision-making, were seen as critical for effective adaptation strategies.

Transparency, collaboration and communication

- All three elements are closely tied to building trust, not only between DFO and resource users, but also among the users themselves.
- Many felt that DFO could more consistently share scientific research and clearly explain how decisions are made for those who fed into the research efforts and/or shared their knowledge.
- Participants in Newfoundland and Labrador described that improvements could be made to ensure consistency in how DFO collects and uses data by regularly accepting data from harvesters to avoid confusion and frustration.
- Participants recognized the need for better collaboration and information sharing between government departments, Indigenous groups, the harvesting industry, environmental non-governmental organizations, academia, and local communities.
- They expressed the need to communicate using clear, plain language, and information should be presented in a way that is accessible and easily understood by the intended audience.
- They would like additional efforts to be made to increase the awareness and understanding of climate change impacts both among resource users and the general public, particularly in coastal communities.

Looking to the Future

Participants identified some of the individual and collective actions they thought were needed to support adaptation efforts, and ultimately, the resilience of fisheries and coastal communities.

Funding opportunities

- Participants highlighted the need for greater financial support to adapt to changing conditions, invest in sustainable practices, and modernize their operations. Below are some examples of recommended actions:
 - Improve or create new funding streams across levels of government that are more flexible, accessible for all resource users, and responsive to local needs.
 - In British Columbia, participants suggested the creation of new funding mechanisms, such as a dedicated disaster relief fund and a fisheries loan board.
 - In Quebec region, participants recommended changes to licensing policies and financial incentives to make it easier for new entrants to access the sector.
 - In Gulf region, we heard a desire for expanding access to inclusive funding programs that help cover the high costs of adaptation for all resource users.

Collaboration and communication

- Collaboration and communication was a strong and consistent theme across all workshops. Participants called for increased collaboration between DFO, Indigenous communities and organizations, industry, fisheries organizations, and harvesters to support more effective climate adaptation efforts. Some of the suggested actions include:
 - Establishing ways to share resources across different sectors, regions, levels of government, and organizations to strengthen collective resilience, which requires trust and open communication about goals and expectations.
 - Improving DFO's communication with Indigenous communities, harvesters, industries, and fisheries organizations for research, management decisions, policy development, and scientific information.
 - Ensuring that research findings are communicated back to communities and research participants in a way that clearly highlights the purpose of the research and the practical application of results.
 - Presenting all information using plain language and providing translations where needed to improve accessibility.
 - Communicating both short- and long-term climate risks, while also developing strategies to manage these risks effectively.
 - Launching a public awareness campaign to improve education on how climate change affects fisheries, highlighting the shared responsibility for

adaptation across all sectors, and the importance of fisheries as a natural resource and vital source of food security.

Forward planning and capacity building

- Participants frequently emphasized the challenges posed by the pace of environmental change and the unpredictability of its impacts. At the Newfoundland and Labrador workshop, there was particular concern about the year-to-year variability in fisheries and around how environmental shifts are influencing fish stocks and ecosystems. It was noted that these factors are making it increasingly difficult for both fisheries managers and resource users to plan ahead.
- There was a strong call for increased capacity across all sectors—industry, government, and environmental organizations—to effectively engage in climate change adaptation. Participants stressed the importance of building knowledge, tools, and resources to support proactive and informed decision-making.
- In the Quebec region workshop, participants underscored the importance of diversifying markets for existing fisheries and finding ways to make better use of bycatch. They also recommended shifting away from volume-based harvesting and instead placing a greater focus on product quality as a means of increasing resilience and value.

Continued discussions

- Overall, there was a desire to continue having discussions on climate change adaptation. Participants highlighted a few common characteristics that should shape future discussions.
 - Make climate adaptation discussions a regular item on existing advisory and/or management committee agendas.
 - DFO could consider establishing a climate change working group focused on mixed-table discussions (members from across sectors).
 - Include all sectors in discussions to increase collaboration, build relationships and identify shared solutions.
 - Regardless of format, adopt a more interactive approach that supports open discussions, debate, and brainstorming, rather than one-way communication from DFO to participants; which was noted as increasingly common.
 - Participants also stated that in-person discussions would be even more beneficial than virtual-only formats.
- Importantly, it was noted across several workshops that any future working groups must be action oriented. To stay relevant, these groups should focus on concrete outcomes, such as developing an action plan or setting clear priorities.

Innovative thinking

Participants emphasized the necessity to be bold, and to look to new solutions, ideas, and ways of operating. They expressed that as climate change impacts all sectors, DFO and all implicated partners should seek opportunities to work together and be willing to take risks — even if that means some efforts might not succeed. Areas of exploration could include:

- Exploring innovative solutions to help adapt to funding limitations.
- Using alternative data collection methods, such as drones for remote or low-access fisheries.
- Leveraging artificial intelligence (AI) to analyze existing data and predict trends in data-scarce fisheries.

Integration of Indigenous and harvester knowledge

- Participants highlighted the importance of meaningfully and consistently integrating IK, and the lived experiences of all harvesters into DFO's science and decision-making processes. Participants emphasized that the insights of those who live and work closely with the environment are essential for informed, responsive, and sustainable fisheries management. Numerous participants called for IK to be recognized and used alongside Western science. IK is rooted in generations of experience and deep connections to land, water, and ecosystems. Participants felt that it should be treated as foundational rather than supplementary in DFO research and management.
- Some participants suggested specific actions as a way to move forward. For example, in the eastern Arctic workshop participants recommended that DFO:
 - Look to international models that demonstrate successful integration of IK into fisheries science and policy.
- Engage Inuit partners early in the research process, including in the creation of research questions and hypotheses. Many stakeholders highlighted the value of commercial harvester knowledge and its role in research and decision-making. They noted that harvesters can provide critical insights and early observations of environmental changes.
- Participants shared that many commercial harvesters are eager to share their on-the-water knowledge and real-time observations with DFO to support decision-making and more responsive fisheries management. They emphasized the need for a clear and accessible mechanism to ensure this information can be gathered, valued, and integrated effectively.

Science activities and data collection

- To support climate-resilient fisheries management, the following science activities and data collection efforts were recommended:

- Standardize data collection to respond faster to climate impacts.
- Conduct a gap analysis and baseline analysis, followed by a prioritization exercise to determine areas of focus.
- Develop measurable social, cultural, and economic indicators to enable a more holistic understanding of fisheries and the Indigenous and coastal communities they contribute to.
- Focus on activities that will support predictive capacity and future decision making. For example, prioritize the assessment of redfish abundance, which are becoming increasingly present in many areas, including the eastern Arctic.
- Incorporate climate change indicators into robust stock assessments and reflect climate data in management decisions.

Fisheries management

- Overall, there was a desire for proactive and flexible fisheries management approaches to support harvesters, industry, and their communities in a time of uncertainty and rapid change.
- Participants also wanted to see better use of an ecosystem approach for fisheries management, taking species interactions and environmental conditions into account to protect ecosystem productivity in a sustainable way.
- Across all workshops, participants cited a need for increased regulatory, policy and licensing flexibilities that will support DFO and harvesters' capacity to respond to rapidly changing conditions – in particular, the capacity for quick decision-making and adaptive responses as new circumstances develop. Participants provided specific suggestions for both increasing responsiveness, and the future direction of fisheries. While more details are provided in the regional reports, some examples include:

Increasing responsive capacity:

- Diversify license portfolios and explore new economic opportunities, including adding value to bycatch fisheries.
- Look ahead to harvesting opportunities for emerging species in Canadian waters and for existing fisheries moving into new areas.
- Evaluate the current licensing regimes given the changes in species distribution (e.g., northward migration of lobster).
- Revise quota management for better adaptability.
- Explore policy and licensing flexibilities to reduce harvester costs and impacts, such as buddy up systems and shared or community-based licences.

Future directions:

- Move away from single species management and implement an ecosystem-based approach to fisheries management, consistent with public commitments.
- Require the integration of climate change data into all fisheries management decisions.
- Enhance local capacity for resource monitoring and knowledge application.
- Establishing mechanisms to integrate and support local expertise in management. This could include revamping advisory committee meetings to support more effective information sharing and discussion or holding workshops outside of industry-DFO advisory committee meetings, which could help reduce red tape.
- Move towards a stronger focus on habitat restoration and biodiversity.
- Proactive planning. Engage in future planning activities such as scenario planning (or 'foresighting') to prepare for anticipated future changes and increase predictability for harvesters.

Conclusion

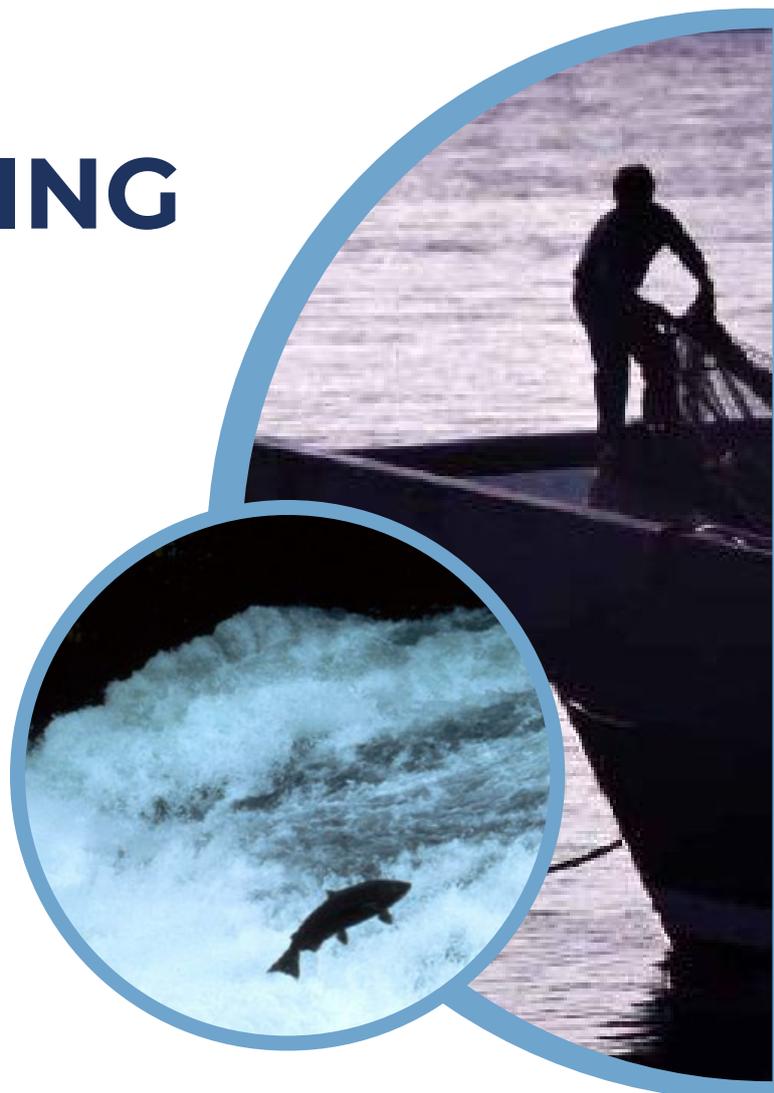
The workshops brought together Indigenous organizations and governments, along with key fishery stakeholders, to discuss the challenges posed by climate change. The insights shared during these events have contributed to DFO's understanding of how climate change is affecting resource users on each coast. Participants from diverse sectors and communities expressed a strong interest in continuing to engage on these issues, highlighting the value of ongoing dialogue and coordinated action.

Regional What We Heard Reports

The regional what we heard (WWH) reports were drafted to reflect the main discussion points as raised by participants as much as possible. Adjustments were made to the agenda from one workshop to the next, which explains some variance in the content of the reports. The WWH reports also include the results of a survey and written input from web-based mural boards when these tools were used. Additional input received via the online feedback survey was also considered in the writing of these reports, which can be found in the following chapters of this report.

ADAPTING BRITISH COLUMBIA'S FISHERIES TO A CHANGING CLIMATE

MAY 31, 2024



Executive Summary: Key Takeaways

Participants reported experiencing several **impacts as a result of climate change**, including:

- Environmental changes such as warming water temperatures, reduced snowpack, lower freshwater flows, and habitat loss, which disrupt fish migration, survival, and spawning success, making fish harder to find.
- Shifts in fish stock distributions which are complicating how fisheries are managed.
- Extreme weather events, invasive species, and diseases (e.g., sea lice outbreaks), which further stress ecosystems, fisheries, and traditional fishing practices.
- Economic hardships from fishing closures.

Participants reported several **threats to BC fisheries** in the era of climate change, including:

- Loss of culturally important species such as salmon and herring, habitat loss, and ecosystem stress due to warming waters, invasive species, and extreme weather, all of which threaten traditional harvesting practices and biodiversity.
- The mismatch between rapid climate impacts and slow fisheries management, compounded by external pressures like open-net aquaculture and conflicts over resource distribution.

Participants are **taking several actions to adapt to a changing climate**, including:

- Focusing on monitoring and data collection, such as tracking water samples, phytoplankton, and fish stocks.
- Adapting fishing gear to account for shifts in bait availability and adjusting boating practices due to shallower rivers.
- Creating climate resilience plans and advocating for co-management of fisheries with Fisheries and Oceans Canada (DFO) and a greater use of Indigenous Knowledge (IK).

Participants identified several **key barriers to adaptation**, including:

- Rigid funding programs and high costs of adapting to new fisheries, species or gear.
- Slow regulatory processes, lack of coordination between governments, and inadequate data, including the integration of IK.
- The single-species fisheries management approach is too rigid to adapt to changing environmental conditions.

Participants identified several **key actions to help fisheries adapt** to climate change, including:

- Improving or creating new funding mechanisms, such as a disaster fund and a British Columbia fisheries loan board.
- Updating regulations, policies and licensing to be more flexible and responsive.
- Integrating climate change data into fisheries management, building local capacity for resource monitoring and knowledge application, and increasing collaboration with Indigenous communities and harvesters for more effective adaptation.
- Plan ahead for future risks.

Report

Impacts of a Changing Climate on British Columbia's Fisheries

What impacts/vulnerabilities are you experiencing or witnessing from climate change?

Participants highlighted a variety of climate change impacts and vulnerabilities, particularly the economic hardships linked to fishing closures. Indigenous participants also described how closures have affected their communities' ability to fish for Food, Social and Ceremonial (FSC) needs. The loss of culturally important species, especially salmon, was a major concern, alongside shifting fish stock distributions and declines populations such as Chinook, Coho, and Sockeye. Participants reported that these changes have complicated the prediction of seasonal abundance, quota management, and the scheduling of fisheries, with some groups struggling to maintain agreements based on changing stock allocations.

Warming water temperatures, decreased snowpack, and low freshwater flows were also reported to exacerbate these issues, impacting salmon migration, survival rates, and spawning success. Additionally, participants raised concerns about shifts in herring spawning patterns, declining forage fish populations, and the increasing frequency of harmful algal blooms. The loss of nearshore habitats, such as kelp forests, and more extreme weather events are adding additional stress to ecosystems and were reported to be occurring at a much higher frequency and severity than in the past.

These challenges have made it increasingly difficult to predict fish availability and abundance and manage fisheries effectively. In addition, the unpredictability of environmental conditions, such as low water levels and increasing water temperatures in freshwater systems, is further disrupting traditional fishing practices and causing thermal stress for fish. In some areas, such as the Fraser River, participants noted that existing infrastructure like fish ladders have become inadequate in times of low water levels and drought, creating barriers for salmon migration. Workshop participants also reported seeing higher levels of invasive species, such as Pacific oysters, and a rise in sea lice outbreaks, particularly during the spring and summer in Clayoquot Sound.

These combined effects leave harvesters and Indigenous communities struggling to adapt and are resulting in a strong sense of concern about the predictability and anticipated loss of fishing in some areas due to climate impacts.

What has changed the most (in the fisheries you are familiar with) in recent decades or since you started fishing?

Participants noted several significant changes in fisheries over recent decades, many linked to shifting environmental conditions. One of the most noticeable has been the changes in fish biomass and distribution patterns. For example, in the Strait of Georgia, participants reported that herring have shifted from south to north, which is seemingly causing a significant reduction in both the length and timing of the spawning season. While there is still an abundance of fish, concerns about future biodiversity loss and potential

stock collapse due to harsh environmental conditions were raised. Similarly, changes in the timing and location of herring spawning were observed, and crab populations were reported as being increasingly found in deeper waters and their movements have become more unpredictable. A steady decline in salmon numbers, particularly in Fraser River stocks, was also highlighted.

Climate-related factors such as rising temperatures, more frequent droughts, and lower snowpacks were identified as key drivers behind these changes. Participants reported witnessing record-high water temperatures, with rivers warming up to 10 degrees above normal, leading to lower oxygen levels in freshwater systems and adding further stress on fish populations. The growing instability in fisheries was also noted, with concerns about the loss of cultural and IK as well as the increased effort and costs required to maintain fishing operations.

Lastly, while technological advancements in fishing in recent decades have made it easier to catch fish, some stakeholders raised concerns about the sustainability of more efficient methods and their impact on already stressed stocks. Participants emphasized that the combination of these changes has made fishing much more unpredictable and challenging.

What are the biggest threats to British Columbia's fisheries in the era of climate change?

Participants identified several significant threats to British Columbia's fisheries, most of which are linked to the impacts of climate change. The loss of culturally important species like herring and salmon is a major concern, especially in areas like Haida Gwaii, where the shifting distribution of herring has seemingly shortened spawning seasons, and salmon stocks have become less accessible. Additionally, the decline of kelp beds, riparian zones, and other critical habitats has further stressed ecosystems, disrupting both the ecosystem and traditional harvesting practices.

Salmon populations were specifically noted for their decline, citing reduced reproductive success associated with smaller body sizes and warmer, drier streams. In addition, it was noted that the current fisheries management system, which relies on a single-species approach, could be improved by becoming more flexible to increase adaptability to rapid climate changes. The increasing speed of ecosystem changes compared with the current pace of management responses was highlighted as a significant challenge for the future of fisheries.

Participants also expressed concerns about broader ecosystem impacts, including ocean acidification, invasive species, and habitat loss. Extreme weather events, such as marine heat waves, were cited as an increasing threat, further adding to the pressure on fisheries. The uncertainty surrounding climate projections was seen as a major barrier to effective planning and adaptation. Further, the cumulative impacts of climate change combined with risks from sectors like open-net aquaculture and forestry were noted. Participants expressed concerns about food security, particularly the impact on FSC fishing practices, and emphasized the need to recognize First Nations' rights to fish for FSC purposes. Conflicts over resource management, including shifts in stock distributions and external

pressures like Alaskan fisheries, were also highlighted as a key threat to British Columbia's fisheries.

Are there any opportunities associated with a changing climate?

Participants found it challenging to identify many opportunities linked to climate change, but several potential areas for action were highlighted, with a strong sense of urgency to take action immediately. These included ideas such as river restoration and water retention strategies to mitigate the impacts of droughts. Another opportunity was reassessing the commercial potential of species that have become more abundant due to climate change but are not currently harvested, which could open new economic avenues. Emerging fisheries such as bivalves, oysters, and pelagic species like mackerel and sardines were noted as potential options. Some participants suggested that given all the challenges facing fisheries, the time is right to reflect on how fisheries have traditionally been managed and explore opportunities to improve. Shifting towards an ecosystem approach to fisheries management, integrating multiple types of knowledge, and working more closely with Indigenous communities were seen as important ways to improve how fisheries are managed. Finally, fostering joint decision-making and co-management with First Nations was seen as vital for future sustainability.

Adapting to a Changing Climate

What actions are you currently/imminently taking to adapt to a changing climate?

Participants shared several planned and ongoing actions they are taking to adapt to the challenges posed by climate change, with a strong focus on practical measures in monitoring efforts, fishing practices, and habitat restoration. There was a lot of focus on monitoring and data collection as being central to adaptation efforts. Some groups highlighted that they are in the process of developing their own climate change resiliency plans, while another said they are using guardian programs to monitor marine biotoxins, particularly red algae blooms, by collecting water samples and tracking phytoplankton. A shift towards a multi-species approach for science and monitoring was also noted, with selective, non-invasive fishing traps being used to monitor fish stocks and reduce bycatch while assessing shifts in population dynamics. Additionally, some participants are seeking funding for proactive science initiatives and documenting harvesters' individual knowledge including what they are seeing on the water (e.g., changes to crab populations).

Many participants emphasized the importance of collaboration, noting efforts to combine Western science with IK to improve recovery measures. Some groups highlighted that they are adopting "two-eyed seeing" approaches to inform decision-making. Additionally, several participants noted that they continue to advocate for increased co-management of fisheries with Fisheries and Oceans Canada (DFO), and working towards more nimble collaborative management approaches. There was also a focus in discussions on establishing governance tables that include resource users from all sectors to foster collaboration,

allowing for a better understanding of climate change impacts and the identification of effective adaptive measures.

Several actions in response to changing conditions were also highlighted, including adapting fishing gear to account for shifts in bait availability and adjusting boating practices due to shallower rivers. Some participants are relocating fish, such as sockeye and coho salmon, during droughts or to mitigate predation threats, ensuring that migration continues despite low water levels. Additionally, the development of new fishways and community-led efforts to build barriers for fish passage were emphasized as critical for supporting salmon and other species. Participants are also exploring enhancement programs, such as emergency salmon enhancement, and have been successful in reducing predator populations such as trout, to help salmon recover to historical numbers within a few years. Lastly, habitat restoration was also noted as being a critical element in building resilience, with ongoing initiatives focused on restoring salmon and shellfish habitats.

What do you think are the biggest barriers to adaptation?

Participants in the workshop identified several barriers that are making it harder for harvesters to adapt to the impacts of climate change on fisheries. Financial challenges and a lack of capacity were a major concern, with many participants highlighting the high costs associated with research, monitoring, and upgrading fishing technology. They noted that entering new fisheries or adapting to new species is expensive, and the existing funding programs often present significant barriers to adaptation. They shared that the rigid structure of these programs makes the application process complicated and burdensome for harvesters, while the short duration of the funding fails to support long-term, complex challenges. Some Indigenous participants also noted that rising food costs are increasing reliance on subsistence fishing, yet these fisheries are themselves under growing threat due to the impacts of climate change, making it even harder for communities to adapt.

Ecological challenges were also a major concern. Participants explained the difficulty of managing the impacts caused by changing environmental conditions, such as warming waters and shifting species populations. There were concerns that some species will be unable to adapt to these changes and the availability of other species as alternatives may lead to increased conflict and competition over access. Many participants felt that single-species fisheries management approaches are not adaptable enough to address these challenges. They also shared a perception that ecosystem-based assessments and management approaches are lacking, which they said limits the ability to make more holistic and informed decisions.

Regulatory and policy barriers were issues raised during the workshop. There was a strong sense that existing policies and regulations could be amended to improve the ability to keep pace with the rapidly evolving environmental conditions. Some participants highlighted that decision-making could happen quicker with improved coordination within DFO, as well as

between different orders of government (federal, provincial, municipal, etc.), to make it easier to respond quickly in times of crisis. Several participants also mentioned that improved transparency in fisheries management decisions could further reduce barriers to adaptation. With clear and accessible information about future management changes or anticipated impacts to fish stocks, fish harvesters can have more certainty, allowing for them to plan and respond to the challenges posed by climate change. While many participants recognized the importance of a precautionary approach to conservation, some felt that it was another barrier that could place additional strain on harvesters.

Another enhancement identified was the increase of data and the integration of IK with scientific research. Participants emphasized that without a more holistic approach that includes both IK and scientific data, it is difficult to fully understand and address the impacts of climate change on fisheries. Finally, many participants called for more inclusive decision-making processes that engage local communities, especially those involved in fishing. They also called for greater public awareness of how climate change is affecting fisheries, stressing that adaptation requires both new strategies and a willingness from harvesters to embrace change.

What are the best opportunities to support adaptation: How can harvesters be better supported in adapting to climate change?

To better support harvesters in adapting to climate change, there was a clear call for greater flexibility in fisheries management. Many emphasized the need for harvesters to diversify into other species as traditional fisheries like salmon face increasing uncertainty. This diversification could be supported through better access to new species, support for marketing those species, and financial tools to give harvesters greater access to capital such as the creation of a British Columbia fisheries loan board, like those which exist in other provinces. Some participants stressed the importance of allowing for smaller harvests of higher-quality products, rather than larger volumes at lower prices, to help harvesters remain economically viable.

The importance of local knowledge and inclusion in decision-making was another key theme. Some participants stressed the need for more decentralized decision-making, with greater authority delegated to local communities, especially Indigenous and coastal communities who are often the first to witness changes in environmental conditions. Ensuring co-management of fisheries was highlighted as being essential, as IK can greatly inform adaptation and decision-making processes. Transparency, timely decisions, and participatory processes were also emphasized to ensure that harvesters can respond effectively to rapid changes brought on by climate change. Additionally, a strong focus was placed on the need for funding to support adaptation efforts, particularly for gear upgrades and the transition to new fisheries. Participants noted the importance of creating long-term, accessible funding mechanisms to address the barriers posed by short-term projects and

burdensome reporting requirements. Support for livelihood compensation in the face of lost fishing opportunities or declining stocks was also suggested to support harvesters.

A primary suggestion was to increase flexibility in fisheries management, particularly by allowing harvesters to adjust fishing locations and timing in response to shifts in fish populations. Participants called for responsive licensing processes and regulations that would allow harvesters to target different species as environmental conditions change.

What actions can harvesters take to better adapt to changing fisheries?

In response to changing fisheries, workshop participants offered some ideas for actions that harvesters can take. One key suggestion was for harvesters to engage more actively in data collection and monitoring efforts. Participants emphasized that harvesters are in a unique position to provide valuable on-the-water insights and recommended that they be more involved in surveys and sharing their observations with DFO scientists. They also suggested that harvesters explore opportunities to modify their fishing practices, such as adopting more selective gear to reduce bycatch and avoid overfished species. Finally, participants highlighted the value of local adaptation workshops, which could allow harvesters to better understand local challenges, utilize available resources, and share knowledge within their communities. These workshops would also serve to raise awareness within the general public about the impacts climate change is having on fisheries.

Looking to the Future

What are the most important steps / actions going forward so that British Columbia's wild-capture fisheries are better positioned to respond and adapt to a changing climate?

Workshop participants identified several important steps to better position British Columbia's wild capture fisheries to respond to the challenges posed by climate change. A key priority was improving funding mechanisms and the flexibility of regulations, policies, and licensing. Participants called for the establishment of responsive funding sources such as disaster funds to address urgent, unexpected climate adaptation needs, as well as a fisheries loan program to help harvesters access capital and diversify into other fisheries. It was also suggested that the fisheries licensing system and regulations be reviewed and updated to better address British Columbia-specific challenges and ensure they are flexible and responsive to anticipated climate risks.

Building local capacity and integrating climate change data into fisheries management decisions were also seen as crucial for long-term adaptation. Participants emphasized the need to focus on climate change impacts within stock assessments and ensuring that climate data is fully incorporated into fisheries management processes and decisions. Addressing existing gaps in this integration and developing tools to better combine scientific research with local knowledge were identified as key actions to strengthen decision-making and enhance resilience.

Another major focus was increasing collaboration by involving Indigenous communities and local harvesters in management processes, which was seen as essential for more effective, on-the-ground adaptation efforts. Additionally, fostering stronger partnerships between various orders of government and sectors was highlighted as a way to improve coordination and responsiveness. Participants also stressed the importance of communication, consultation, and planning. Transparent decision-making processes, and early and accessible engagement, especially for remote communities, were identified as essential for effective climate adaptation. The importance of planning for future risks, including emergency measures such as salmon enhancement and drought management strategies, were also highlighted. Lastly, the participants emphasized the need to invest in habitat restoration, particularly for critical species such as salmon and shellfish, and to explore innovative solutions, such as the use of artificial intelligence for stock management.

Mural Board Responses

This section reflects participants' responses to a mural board exercise that was done in this workshop.

Over the next twelve months, suggested key actions that were identified by participants for adapting British Columbia's fisheries to climate change included:

- **Increasing agility in fisheries management:** Identifying steps that DFO can take to become more agile in managing fisheries, including quicker responses to changing conditions and more flexible regulations.
- **Adhering to the precautionary approach:** Ensuring that if data is insufficient, fishing is not increased until sufficient data is available to support it.
- **Implementing an ecosystem approach to fisheries management (EAFM):** Putting EAFM into practice and accelerating research to better understand and incorporate environmental variables in stock assessments and management decisions.
- **Integrating climate change in fisheries management decisions:** Ensuring that climate change impacts are integrated into all stock assessments and Integrated Fisheries Management Plans to guide more informed decision-making.
- **Rebuilding fish stocks:** Prioritizing the development and implementation of fish stock rebuilding plans that include climate change impacts as a consideration.
- **Developing guidance on new and emerging species:** Developing clear guidance for managing newly emerged species in Canadian waters that are currently not covered by existing policies.
- **Respecting Aboriginal Rights and Title:** In all efforts to adapt to climate change, ensure that Aboriginal Rights and Title are fully respected and upheld in fisheries management and adaptation strategies.
- **Increasing funding for First Nations-led restoration and monitoring:** Prioritizing funding and support for First Nations-led restoration and monitoring programs to address climate impacts on fisheries.
- **Incorporating IK:** Actively incorporating IK into fisheries management decision-making and management practices. Ensure that IK holders are present in

discussions on climate change adaptation, providing their insights alongside scientific data in all climate-related decision-making processes.

- **Strengthening co-governance and co-management with Indigenous Peoples:** Ensuring that Indigenous communities have a meaningful role in the decision-making processes that impact their fisheries and rights.
- **Increasing funding for climate adaptation:** Prioritizing increased funding for climate change adaptation projects, including understanding the impacts of climate change on fisheries and supporting necessary mitigation measures.
- **Supporting under-funded initiatives:** Ensuring the North Pacific Salmon Expedition and other under-funded research projects receive appropriate funding and attention, as these are vital for understanding the impacts of climate change on salmon populations.
- **Investing in habitat restoration:** Investing in efforts that focus on rebuilding ecosystems affected by climate change, including salmon and shellfish habitats, to promote long-term resilience.
- **Expanding monitoring programs:** Investing in monitoring programs to ensure that adequate data is collected on the health of fish populations, water quality, and habitat conditions in order to support the development of effective adaptive measures.
- **Building stronger networks:** Creating or strengthen local, regional, and national networks to facilitate collaboration and information sharing between all parties involved in fisheries management.
- **Improving data sharing:** Focusing on improving the timely sharing of accessible data and information between DFO, Indigenous groups, and other stakeholders.
- **Focusing on disaster preparedness:** Planning for the worst-case scenarios (e.g., emergency salmon enhancement programs) to mitigate risks and ensure the resilience of fisheries, particularly during droughts and other extreme climate events.

Over the next five years, suggested key actions for adapting British Columbia's fisheries to climate change included:

- **Meaningful engagement:** Deepening engagement with Indigenous Peoples and exploring methods to increase participation of harvesters in fisheries management processes through alternative methods such as an app to collect local, real-time information.
- **Developing climate adaptation strategies:** For example, developing a national climate adaptation policy for fisheries, establish a drought management strategy for salmon, and a watershed-scale response plan.
- **Working towards the implementation of ecosystem-based fisheries management (EBFM):** With the implementation of an ecosystem approach to fisheries management (EAFM) across all fished species, building the science and management capacity to transition to ecosystem-based management approaches.
- **Modernizing fisheries licensing, policies and regulations for an era of climate change:** Developing nimble licensing policies that can respond to changing

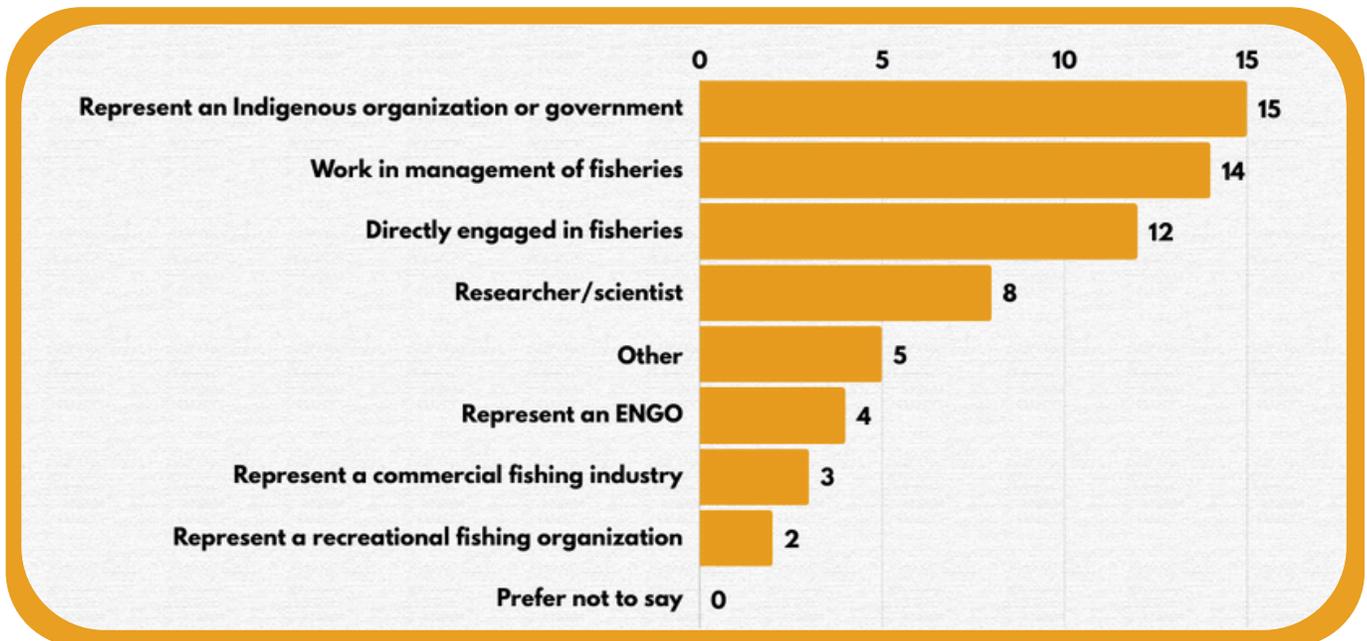
opportunities and establish a licensing and quota registry. Introduce stronger regulations to limit vessel discharges in British Columbia waters and stronger measures to reduce bycatch.

- **Respecting Indigenous rights and co-management:** Ensuring Indigenous Peoples are co-managers of fisheries, prioritizing FSC fishing and treaty rights alongside conservation efforts.
- **Increasing scientific research funding and monitoring efforts:** Enhancing salmon stock assessments and harvest monitoring to detect changes in productivity and abundance, and ensuring adequate funding for scientific research, monitoring, and data collection to respond to fisheries management needs and climate related changes. Enhancing collaborative monitoring with Indigenous groups to support informed fisheries management decisions through increased funding.
- **Supporting socio-economic research:** For example, assessing how climate change and loss of commercial fisheries access intersect, and evaluating the economic impacts of climate change impacts on harvesters and coastal communities with the goal of developing mitigation strategies.
- **Strengthening governance and decision-making:** Promoting timely and transparent decision-making, multi-stakeholder decision making processes, and a shifting to co-management of fisheries between Indigenous Peoples and DFO. Initiating a centre of excellence for climate change and bridge gaps between departments to streamline and enhance adaptation efforts.
- **Investing in habitat restoration and planning:** Prioritizing investment in habitat restoration efforts, moving beyond salmon to include other species for conservation, knowledge gathering, and adaptation. Planning at a watershed level to ensure resilience in ecosystems and fisheries.

Results of the Polling Exercise

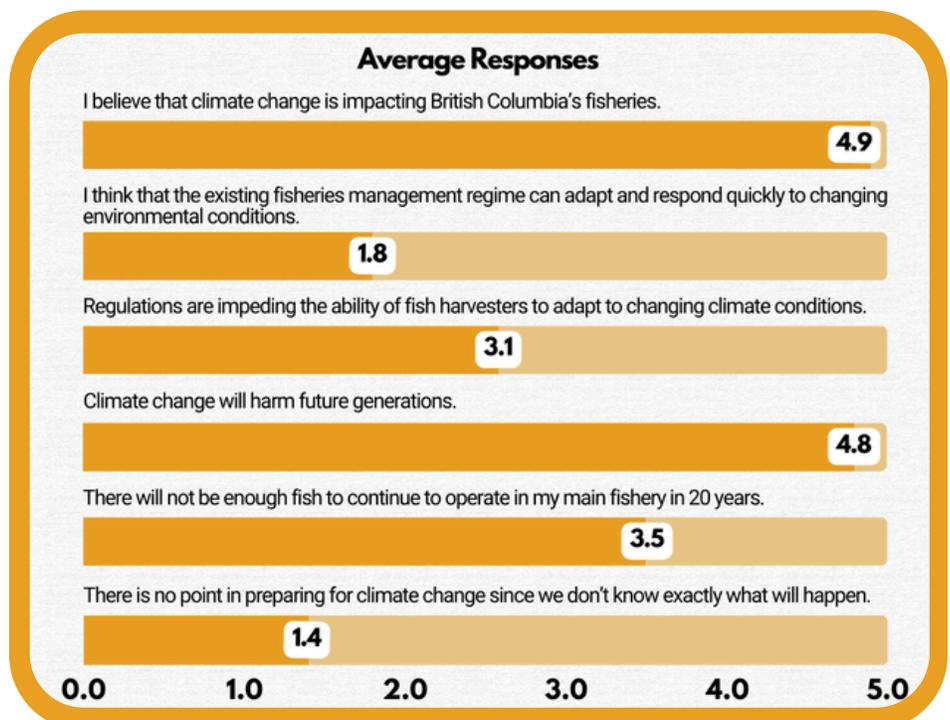
During the workshop, participants were asked to take part in an anonymous polling exercise. Responses are displayed below. Please note that Question 3 required participants to provide an open-text response; responses reflect the text as submitted.

Question 1: Choose all of the following that apply to you and your role:



Question 2:

On a scale of 1 to 5 (1 being the lowest and 5 being the highest), please indicate the extent to which you agree or disagree with the following statements:



Results of the Polling Exercise

Question 3: What could increase the agility and flexibility of the fisheries management regime to respond to future challenges?

- Open text responses:
- Ability to adapt processes that are quicker. E.g., we expect that smaller salmon systems will crash, and we are preparing to move these smaller populations to healthier systems that may survive climate change.
- Recognizing that it will take collaboration to make an impact. Local First Nation decision making powers. Climate change is a threat, not the only threat.
- Reviewing treaty fishery allocations, advancing aquaculture technology to support species impacted.
- Need to look at habitat restorations to mitigate and adapt. This should become a larger focus.
- There is a need for adoption of measures in support of more adaptive, equitable and flexible fisheries management and ocean governance to support resilient fisheries.
- Focus on climate change solutions such as direct air capture (DAC) and sequestration. Support research in marine carbon dioxide removal. British Columbia is well positioned to support this kind of research through real-time monitoring.
- More in-season management.
- Involve Indigenous organizations and local fishers in decision-making and learn from local communities.
- More coordination from science and management.
- A transparent, consistent mechanism to apply local and regional knowledge into decision making.
- Taking a two-eyed seeing approach with Indigenous people.
- Clearer timelines and structures within government to adapt existing regulatory regimes to climate change impacts.
- Support legislative and policy change to better enable co-management with Indigenous Peoples.
- Increase collaboration within DFO (avoid the stock vs spatial protection approach), and support IK and leadership (including co-management).
- Work with Indigenous Peoples to jointly manage and respond to climate change.
- DFO redesigning their process for fisheries management and working more collaboratively with harvesters.
- Improve change management capabilities within DFO and develop a change management centre of expertise or a change management unit in the organization.

Results of the Polling Exercise

Question 3: What could increase the agility and flexibility of the fisheries management regime to respond to future challenges? (continued)

- Shift towards more “generalist” approaches to fishing, greater flexibility of fishers to respond to in-season changes, address uncertainty via more precautionary catch limits and risk-based approaches.
- Enable increased control of the management of fisheries to communities. Many First Nations are directly impacted by these changes and often observe them in real time before science data is collected.
- Be precautionary. Use science to inform of current productivity and conditions. Invest in monitoring and DNA lab capacity.
- Increased resourcing to stock assessment including improved harvest monitoring for all salmon species and fisheries.
- Increased use of in-season monitoring to detect stock composition and abundance.
- Improved quality and quantity of timely and accurate catch data from all sectors.
- Increase flexibility in fisheries management to allow harvesters to target those emerging species due to climate change. Also, more flexibility on the fishing period/seasons would help.
- A regime shift away from fisheries solely as an economic commodity and towards sustainability, with First Nations rights at the forefront.
- Reduce commercial fishing.
- Address negative impacts that fisheries regulations may have on Indigenous communities as part of climate mitigation strategies.
- For salmon fisheries, there needs to be an abundance-based management framework developed to guide fishing, this would include escapement goals and management benchmarks. In-season management is also needed.
- Assist nations to identify species and populations that have similar traits and habitats, where populations can be transplanted (inland).
- Increase First Nations participation at the management table.
- A national approach to fish stock management; open and transparent sharing of data and results.
- Enable management or co-management by First Nations who have valuable knowledge of their waters that can be shared with DFO managers.
- Combine harvester knowledge into fisheries management.

Results of the Polling Exercise

Question 3: What could increase the agility and flexibility of the fisheries management regime to respond to future challenges? (continued)

- Offer more flexibility for fishers to rapidly shift (e.g., licensing allowing changes in target species in-season), but more precaution in setting catch levels for any one stock.
- Use ecosystem-based approaches but also understand underlying evolutionary processes at play; preserve genetic diversity between and among populations and runs to aid in resilience to change.
- Continue to support real-time ocean monitoring over long-time periods off the coast of British Columbia and elsewhere across Canada and make sure these data are open.
- Continue to work with local communities.

Participant List

Representatives from the following organizations, groups, ENGOS, institutions, and/or governments attended the workshop. In alphabetical order:

- Area A Crab Association (BC)
- BC Crab Fishermen's Association
- Canadian Parks and Wilderness Society (BC)
- Central Coast Indigenous Resource Alliance
- Coastal First Nations
- David Suzuki Foundation
- Fraser Salmon Management Council
- Gitanyow Fisheries Authority
- Government of British Columbia - Ministry of Water, Land, and Resource Stewardship
- Gulf Trollers Association (Salmon)
- Ka:'yu:'k't'h'/Che:k'tles7et'h' First Nations
- Maa-nulth Treaty Society
- Native Fishing Association
- Nisga'a Lisims Government
- North Coast Skeena First Nations Stewardship Society
- Northern Native Fishing Corporation
- Oceana
- Pacific Halibut Management Association
- Pacific Prawn Fishermen's Association
- Q'ul-Ihanumtsun Aquatic Resources Society
- Secretariat of the Haida Nation
- Secwepemc Fisheries Commission
- Sport Fishing Advisory Board
- Sport Fishing Institute of BC
- T.Buck Suzuki Environmental Foundation
- The UN Ocean Decade Regional Collaborative Center for the Northeast Pacific
- Tla'amin Nation
- Tsawwassen First Nation
- University of British Columbia - Institute for the Oceans and Fisheries
- University of Victoria
- Xwisten First Nation

ADAPTING MARITIMES FISHERIES TO A CHANGING CLIMATE

OCTOBER 30, 2024



Executive Summary: Key Takeaways

Participants reported experiencing several **impacts from climate change on their fisheries**, including:

- **Major shifts in species distribution:** Participants reported that many fish species are moving northward, causing a decline in native populations in the Maritimes. Tropical fish are emerging due to warming waters, complicating bycatch predictions.
- **Changes to fishing timing:** Participants reported that fishing is starting earlier in spring due to ice-free waters, but fluctuating sea temperatures result in unpredictable catches.
- **Invasive species:** Participants reported seeing more invasive species such as green crabs and sea vomit.

Participants reported several **concerns regarding fisheries in the era of climate change**, including:

- **Policy concerns:** Participants questioned existing policy's ability to address climate-driven changes, particularly regarding shifting species abundance and distribution.
- **Impacts on coastal communities:** Participants highlighted broader challenges, including employment, infrastructure, and the service sector, urging a focus on supporting thriving communities.
- **Data gaps:** Participants communicated a need for more research on the impacts of climate change on predator/prey relationships and beyond target species.

Participants are **taking several actions to adapt to the impacts of a changing climate**, including:

- **Enhancing data collection and research efforts** such as using satellite telemetry to track nesting habitats and migration routes, expanding research to include environmental data alongside biological sampling, using genomics research to ensure species survival in warmer waters, as well as studying sea level rise and storm events.
- **Diversifying fisheries, fishing gear, and harvesting methods**, such as developing tools for safer fishing practices, exploring alternative harvesting methods to reduce environmental impacts, developing new trawling technologies to minimize bycatch, researching access to adjacent fisheries, and exploring new fishing gear.

Participants highlighted what they consider to be some of the **biggest barriers to adaptation**, including:

- **Slow and siloed fisheries management systems**, causing coordination issues and slow adaptation to climate.

- **Rigid regulations** on fishing times and gear types, with very slow processes to change them.
- **Lack of future projections and predictions about climate impacts**, predator-prey relationships, and species movements.

Participants shared ideas for specific **actions, or opportunities, to support adaptation** efforts including:

- Diversifying fish species and exploring new economic opportunities.
- Communicating both short-term and long-term climate risks, while developing strategies to mitigate these risks.
- Implementing more inclusive, interactive consultation approaches such as a climate change working group focused on mixed-table discussions. Participants highlighted the need for building capacity across industry, government, and environmental non-governmental organizations to engage in effective climate change adaptation.
- Considering future management scenarios to facilitate in-season management decisions and to support long-term planning.
- Raising public awareness on the impacts of climate change of fisheries, including the shared responsibility for change and adaptation across all sectors.

Report

Impacts of a Changing Climate on Maritimes' Fisheries

How is climate change impacting your fisheries?

Workshop participants highlighted various climate change impacts and vulnerabilities, particularly the shifts in species distribution. Many noticed changes in migration patterns and routes, with species moving northward, leading to a decline in native populations in the Maritimes region. The warming waters are bringing new fish from tropical regions, complicating the prediction of bycatch and non-target species. A key concern for many was the impact of these shifts on food availability for target species, as they relocate to different areas or depths.

Additionally, Participants raised concerns about changes in the timing of fisheries have, noting they are now fishing at times they had not before—starting earlier in the spring—as ice-free waters have become more common. However, fluctuating and less predictable sea surface temperatures have led to lower and more unpredictable catches. As fish migrations and aggregations shift, participants said this is affecting fish quality and availability, and in some cases, leading to gear conflicts. These distributional and timing shifts were also described as causing more conflicts among harvesters. Moreover, participants noted that the overlapping changes in fisheries across international borders have increased tensions, particularly with harvesters from the United States, given that many fisheries are shared across jurisdictions.

We heard that lobster fisheries have been heavily impacted, with harvesters noting rapid changes in seasonality, size distribution, and product quality. It was highlighted that the southern regions are seeing declines in lobster populations, while the northern areas are experiencing gains, creating inequitable impacts. Discussions around lobster season changes have been frequent, with warmer and colder bottom temperatures affecting the timing of lobster moults and changes to the age of maturity.

Participants shared concerns over the inability to harvest traditional species, such as salmon, noting the significant cultural impacts this has on Indigenous communities. They also highlighted how climate change is deeply affecting commercial fishing and the broader processing chain in coastal communities. The increased frequency and severity of storms are raised safety concerns for harvesters, while also threatening infrastructure and leading to increased gear loss. Additionally, there is a sense that churning waters are disrupting species patterns and behaviours, making fishing less predictable.

The rise of invasive species like green crabs and sea vomit has become a growing concern, particularly in relation to at-risk species like salmon and eels, as these invaders outcompete native species for resources. In addition, participants reported an increase in diseases and vibrio, especially among shellfish like scallops and oysters. These combined climate change impacts are leaving both harvesters and Indigenous communities struggling to adapt, contributing to a growing sense of concern over the future predictability of fishing in the Maritimes region.

What are your biggest areas of challenge and concern related to these climate impacts?

Participants raised a number of significant concerns, many of which are linked to shifting environmental conditions and the impact this is having on fisheries. One of the most pressing concerns heard from participants was regarding current fisheries policies and management approaches. Participants noted that current policies and regulations require amendments to effectively address the extensive, climate-driven changes to fisheries. In particular, a key concern raised was how policies will respond to the shifting abundance and distribution of species. One major question that came up was how access to resources will be determined when species shift away. Species distribution and who should have access to resources in light of these changes were highlighted as a key concern.

Participants emphasized that a holistic approach to fisheries management that goes beyond the science of individual stocks to consider the broader picture, including all fisheries and communities, will allow Fisheries and Oceans Canada (DFO) to make future decisions. Expanding the current single-species management system will improve flexibility and increase the speed of response to rapid climate changes, with participants calling for a more proactive and flexible management regime, including in-season decisions to address anomalies.

The incorporation of climate impacts into management plans was another key point, with participants requesting that more attention and resources be directed towards incorporating climate considerations into all fisheries decisions going forward. Many

expressed that existing fisheries management processes should be updated in the near future to address increases in new species emerging in Canadian waters, disappearing stocks, and changing seasons as a result of climate change.

Participants also highlighted the broader impacts and challenges of climate change on coastal communities, including employment, the service sector, and infrastructure. Some suggested that changes should be considered not only to ensure fisheries survive but to allow them to thrive in support of coastal communities. There was also a notable concern about how Indigenous fisheries will be managed amid uncertainty, with questions about how Canada will ensure that its commitments to Indigenous communities and fisheries are upheld in the face of climate change.

Bait availability and the approval process for new bait were raised as concerns, particularly regarding the use of green crab as bait for lobster fisheries. Some participants are worried about the risks that green crab poses to lobster, such as spreading diseases like white-spot syndrome virus and other parasites.

Participants emphasized the need for increased data beyond target species to understand the impacts of climate change on predator/prey relationships, which are critical for managing fisheries. Additionally, increasing the capacity of coastal infrastructure, trying to reduce operating costs for replacing gear, and improving coordination between federal and provincial governments in accessing infrastructure were discussed. Extreme weather events and their impacts on fishing operations, science surveys, and fish food sources were also noted as significant concerns.

Participants expressed concerns about the impact of climate change on mollusks, particularly in relation to salinity, calcium carbonate production, food availability at increased depths, increased turbidity from storms, and the timing of algal blooms. The potential effects of climate change on salmon were also highlighted, especially in relation to changes in migration routes, spawning success, and the availability of prey, which are affecting salmon reproduction and survival rates.

A number of lobster-specific concerns were also raised, particularly related to the timing of lobster moults, which affect their survivability during transport. Additionally, it was noted that soft-shelled lobsters are facing increased mortality and loss of value due to increased handling during this vulnerable stage.

Finally, participants wrestled with the challenge of balancing precautionary measures with the need to support coastal communities that depend on fishing. The dilemma lies in planning for reduced yields while still allowing some fishing to take place to sustain local economies, raising tough questions about how to strike a balance between sustainability and economic livelihoods.

What has changed the most in your fisheries?

Participants reported that species patterns are becoming increasingly unpredictable, making fisheries more complex to manage. The impacts on productivity have varied dramatically across different species, with some experiencing declines while others are

shifting to new areas or emerging in unexpected locations. This unpredictability has added significant challenges to forecasting fish populations, making it harder to plan fishing efforts and manage resources effectively. As a result, there is growing concern about how to adapt to these changing conditions and ensure the sustainability of fisheries in the face of such variability.

Adapting to a Changing Climate

What actions are you taking to respond or adapt to the impacts of changing conditions?

Participants shared several ongoing and planned actions aimed at adapting to the challenges posed by climate change. Below, you will find some examples of key adaptation strategies being implemented in the Maritimes region.

Many participants are taking actions to **enhancing data collection and research efforts**, such as:

- Gathering critical data on Atlantic salmon using satellite telemetry, including nesting habitats and migration routes. This data is being shared with decision-makers and the public to improve understanding and management of salmon populations.
- Creating a framework to assess the impacts and risks of climate change on marine wildlife and working in collaboration with an ENGO to translate findings into actionable outputs for harvesters and fisheries management personnel, to support informed decision-making.
- Advocating for more tailored research. This includes gathering data on water temperature and catch trends for community fisheries, which can help inform adjustments to fishing seasons.
- Expanding research to include more environmental data alongside biological sampling. There is a particular focus on tracking changes in bait sourcing and lobster movements to adapt to new conditions.
- Training students to become future leaders in fisheries and climate change adaptation, alongside securing funding for continued fisheries research.
- Developing tools for shellfish monitoring. Genomics research is underway to understand how shellfish can be more tolerable to higher water temperatures helping to secure the future of these vital marine resources.
- Studying sea level rise and storm events, particularly in the intertidal zone, to assess their impact on seaweed and shellfish fisheries, with a focus on resilience and adaptation strategies.

Participants shared some of the actions they are taking, aimed at **diversifying fisheries, fishing gear and harvesting methods**, such as:

- Researching into other fisheries and exploring ways to access adjacent fisheries.

- Exploring new fishing gear for commercially viable species.
- Developing tools to make fishing practices safer for whales and reduce environmental risks.
- Adjusting fishing activities to adapt to shifting species habitats.
- Exploring alternative harvesting methods to reduce environmental impacts, alongside pushing for changes in fishing seasons and quotas through regulatory bodies.
- Indigenous nations are adjusting their fishing practices and traditional ways of life in response to environmental changes, ensuring the resilience of their communities and cultural practices.
- Developing new trawling technologies aimed at minimizing bycatch.

Participants emphasized the **need to work collaboratively** in adapting to climate change and shared a few examples of their strategies:

- Collaborating with DFO to help improve climate risk tools and identify species at highest risk.
- Advocating for collaborative, precautionary decision-making at advisory tables to ensure sustainable practices.
- Focusing on regional coordination and the consolidating information across branches to identify priority areas for investment in climate adaptation.

These collective efforts reflect a comprehensive and multi-faceted approach to adapting to the challenges posed by climate change, with a strong emphasis on research, innovation, collaboration, and the integration of both environmental and social science considerations.

What do you think are the biggest barriers to adaptation?

Participants identified several significant barriers that are making it harder for harvesters to adapt to the impacts of climate change on fisheries. Participants identified a significant need for more cohesive and flexible regulations in fisheries management, especially as climate change accelerates. The current regulatory systems could be amended to achieve a more holistic approach, reducing issues with licensing for harvesters and improving coordination between policies affecting different species and areas, and enabling DFO to act more swiftly and with more flexibility in response to emerging fisheries and species distribution shifts.

Participants explained that the current fisheries regime and regulatory system overall is too slow to adapt. For example, participants shared that regulations on fishing times and gear types take too long to change, making it difficult to remain agile in the face of shifting conditions. Participants called for a shift from reactive to proactive decision-making, implementing plans for likely crises, such as those linked to climate change, to promote industry stability and mitigate risks. Additionally, participants suggested that an increased

breadth of data be used by DFO to improve future projections and predictions about climate impacts, predator-prey relationships, and species movements.

The politicalization of fisheries decisions was identified as a major barrier. Participants find it challenging when policies and decisions shift based on political cycles rather than sound, long-term planning, and feel that it creates instabilities for harvesters. Furthermore, increasing enforcement could create a more harmonious environment for harvesters, improve certainty and strengthen the ability to achieve meaningful change. To improve the situation, participants called for a more integrated management approach that includes input from harvesters and environmental scientists, and a more balanced consideration of both adaptation and mitigation strategies. The decision-making process must include a broader understanding of regional and local dynamics, as well as support for owner-operator businesses and infrastructure investment. Participants noted that a fragmented regulatory framework and regional inconsistencies in decision-making could be addressed by a more unified, forward-thinking, and inclusive approach to address the challenges facing the fisheries industry, with particular attention to climate change and long-term sustainability.

What do you need to better adapt to the impacts of changing conditions?

Participants highlighted several areas of support that are needed to better adapt to climate change, focusing on proactive, flexible approaches to fisheries management and greater collaboration. The following key themes emerged at the workshop:

- **Proactive and flexible management:** Participants stressed the importance of adopting a proactive, flexible fisheries management approach that takes into account the evolving challenges faced by harvesters and communities. This includes better communication, more inclusive decision-making, and a deeper understanding of these challenges. Suggestions included considering experimental or short-term season changes and finding ways to adjust outside the constraints of current regulations and advisory board schedules.
- **Transparency and inclusivity in decision-making:** A key theme was the need for clearer communication and a more inclusive decision-making process. Participants called for better specificity in conveying the information and considerations behind fisheries decisions. They emphasized the importance of improving understanding among harvesters about the complexities of these decisions and called for DFO to review its processes to become more agile and responsive.
- **Financial stability:** Participants called for more certainty in helping harvesters to secure financing for new equipment and vessels.
- **Comprehensive approach to fisheries management:** Given the increasing impacts of climate change, participants stated that a comprehensive approach to fisheries management could be better accomplished by including social, cultural, and economic considerations when setting long-term goals.

- **Education:** Education was also identified as critical, particularly in engaging youth through fisheries-focused programs in schools, which would increase awareness of ocean conservation.
- **Relationship building:** Strengthening the relationships between harvesters and DFO is seen as a crucial step toward collaboration in adapting to challenges associated with climate change, and could be achieved by an increase in accepting valuable experiential knowledge from harvesters.
- **Evolving fisheries management tools:** As offshore wind and other ocean-related changes emerge, there is a need for fisheries management tools to evolve. Participants called for more openness in DFO, particularly in adjusting stock assessments based on real-time data. They shared that management methods, including gear types and deployment times, must be flexible to keep pace with changing conditions. They also noted that new tools are needed to manage emerging species in Canadian waters, and a collaborative approach to science, involving harvesters with multi-species experience, was seen as essential.
- **Improved fisheries monitoring and data collection:** Reliable decision-making in an era of change requires increased fisheries monitoring and data collection. Participants highlighted the importance of frequent stock assessments, baseline studies for comparison, and increased engagement with stakeholders to gather insights from all sectors. Participants also suggested integrating third-party consultants for more accurate stock assessments, which would improve the overall reliability of fisheries data.
- **Broader knowledge integration:** To effectively adapt, participants stressed the need to integrate a broader range of knowledge, including harvester-based insights and social sciences. This includes frequent stock assessments, ongoing stakeholder engagement, and a commitment to predictive work. Additionally, collaboration with climate scientists was recommended to identify the necessary data for better decision-making.
- **Socio-economic considerations for coastal communities:** Finally, participants emphasized the importance of considering the socio-economic needs of coastal communities in fisheries management. Increased collaboration with provincial governments was seen as essential in finding community-beneficial solutions to ensure long-term sustainability and resilience in the face of climate change.

In summary, participants called for a more flexible, inclusive, and transparent approach to fisheries management, one that recognizes the evolving challenges of climate change and integrates diverse knowledge and perspectives. Through ongoing dialogue, education, and collaboration, we can work towards sustainable fisheries.

Looking to the Future

What is your future vision for climate-adapted Maritimes fisheries?

Participants shared their future visions for climate-adapted Maritimes fisheries. Their visions emphasized a collaborative, team-oriented approach to fisheries management, prioritizing stakeholder and partner engagement to ensure sustainable and thriving fisheries.

A key priority identified at the workshop was maximizing collaboration within the fisheries sector and reducing conflict. A collaborative approach encourages mutual support and resource sharing, where all parties —Indigenous Peoples, stakeholders, environmental non-governmental organizations, and others—are brought together to work towards common goals. Participants emphasized the importance of inclusive stakeholder meetings that allow everyone to contribute to the decision-making process, while also breaking down barriers between different groups. A vision for successful future fisheries would incorporate a diverse range of voices, ensuring that the interests of all stakeholders are taken into account. Participants also highlighted the importance of ensuring that Indigenous and local communities are central to the fisheries decision-making process, ensuring that economic, ecological, and socio-cultural goals are aligned. The aim of climate-adapted Maritimes fisheries should be to support the health of fish populations while also nurturing vibrant, sustainable communities.

Participants emphasized the need for climate change to be at the forefront of fisheries management decisions. In participants' future vision, DFO would play an active role in implementing policies and strategies focused on climate-related issues. Management approaches would be nimble and responsive to climate challenges, providing harvesters with confidence in the adaptability of the system. A focus on integrating climate considerations at all stages—from data collection to decision-making— was identified as a crucial step in building resilient fisheries that can adapt to changing environmental conditions. To adapt to climate change, fisheries management should adopt agile practices that allow for quick, flexible responses to emerging challenges. Participants stressed the importance of predictive modelling, especially around surface and bottom temperatures, to help forecast changes and inform decision-making. Management systems should be integrated, with active involvement from diverse stakeholders, to ensure that fisheries remain resilient in the face of climate change.

Workshop participants' future vision for climate-adapted Maritimes fisheries revolves around collaboration, resilience, and inclusivity. Through a more integrated approach, with diverse stakeholders working together, the region can create sustainable fisheries that thrive economically, ecologically, and socially. The goal is to ensure that both the fisheries and the communities that depend on them remain resilient as they face the ongoing impacts of climate change.

What does success look like?

Participants identified several key perspectives on what successful fisheries could look like in the face of climate change. Success in fisheries management incorporates effective

information sharing among DFO and stakeholders and discussion during advisory committee meetings which will enhance agility, improve collaboration, and increase transparency with harvesters. It is also essential that meeting notes capture conflicts and encourage more efforts to seek consensus among stakeholders.

Incorporating predictive modelling into all stock assessment surveys was seen as a crucial step in guiding management decisions more effectively. Success also hinges on creating an inclusive environment for new entrants into the fishing industry, as they bring fresh perspectives and ideas for fisheries. Long-term sustainability should be incentivized, potentially by encouraging new entrants to invest in scientific research and adopt a longer-term view, even if this means sacrificing some short-term opportunities.

There is growing competition for space in the marine environment, with increasing pressures from marine protected areas, offshore wind development, transportation routes, and oil and gas projects. Success will require recognizing these spatial constraints and developing strategies that account for the impact of these pressures, particularly in the context of climate change. As stock ranges shift due to climate change, fisheries may face spatial limitations, with some needing to move into areas already constrained by other ocean uses or protections. Flexibility in management is key in responding to these challenges. Planning should focus on multispecies management, ecosystem approaches, and a climate-informed strategy that prioritizes both prosperous coastal communities and healthy oceans.

Participants advocated for new survey methodologies that can better capture climate change impacts. Additionally, participants put a strong emphasis on establishing a value-based management system. This system should be rooted in core values such as sustainability, long-term thinking, and holistic, collaborative approaches, such as taking inspiration from IK and practices, which advocate for a seven-generation perspective.

What are the best opportunities to support adaptation to get us there?

Participants identified several important opportunities to better position Maritimes fisheries to respond to the challenges posed by climate change. These actions emphasize structural changes, stronger collaboration, and increased awareness to ensure long-term sustainability.

- **Identifying specific action steps:** There was a call for clearer, tangible specifics, including identifying available resources, understanding the level of collaboration possible with DFO, and establishing steps to ensure flexibility and agility in decision-making. Participants stressed a focus towards real, actionable progress that can be implemented in the short term.
- **Diversification and innovation:** Diversification within the fisheries sector is necessary to ensure sustainability. Participants highlighted the importance of preventing overexploitation of individual stocks by exploring new opportunities and innovative products. This will require a renewed focus on safeguarding vital fishing areas through intentional management mechanisms like protected areas.

- **Collaboration with Indigenous groups:** Participants highlighted that there is significant potential for collaboration between industry stakeholders and Indigenous groups, especially in safeguarding critical areas and ensuring their future sustainability. This collaboration should focus on shared interests in the long-term health of fisheries, while respecting IK and governance systems.
- **Raising public awareness:** Raising public awareness on the impacts of climate change on fisheries is important. This includes stressing the shared responsibility across all sectors, such as conservation, Indigenous groups, and commercial interests. Participants emphasized the importance of educating the public, particularly children, and ensuring that harvesters understand not only local but global climate risks.
- **Balancing short-term and long-term goals:** It is essential to balance the immediate concerns of harvesters with the broader, long-term goals for the sector. Developing regional scenarios that account for uncertainties, while also leveraging the knowledge available to shape future outcomes, is vital for preparing for the challenges ahead. Participants also urged for a clear definition of “adaptation,” with a focus on both short-term survival and long-term, thriving fisheries.
- **Restructuring advisory committees:** Participants stressed the desire to revamp advisory committees. One suggestion for this revitalization would be to make written submissions mandatory for all participants, ensuring a more transparent and comprehensive decision-making process.
- **Access to fisheries and supporting coastal communities:** Participants shared that protecting access to fisheries for individual owner-operator enterprises within coastal communities is critical and that supporting these enterprises through funding and adaptation trials will help them remain resilient in the face of climate change.
- **Reevaluating consultation methods:** Participants suggested that a climate change working group be created, focused on mixed-table discussions be created to ensure that climate considerations are incorporated into the decision-making process using inclusive, interactive approaches. Participants highlighted the need for capacity-building across industry, government, and environmental non-governmental organizations to engage in effective climate change adaptation. Solutions may not be perfect from the outset, but fostering a willingness to engage and adapt will be essential to long-term success.
- **Diversifying:** As part of adaptation, diversifying harvested species and exploring new economic opportunities is crucial for the future of the industry. Participants emphasized the need to communicate both short-term and long-term risks, while developing strategies to mitigate these risks.

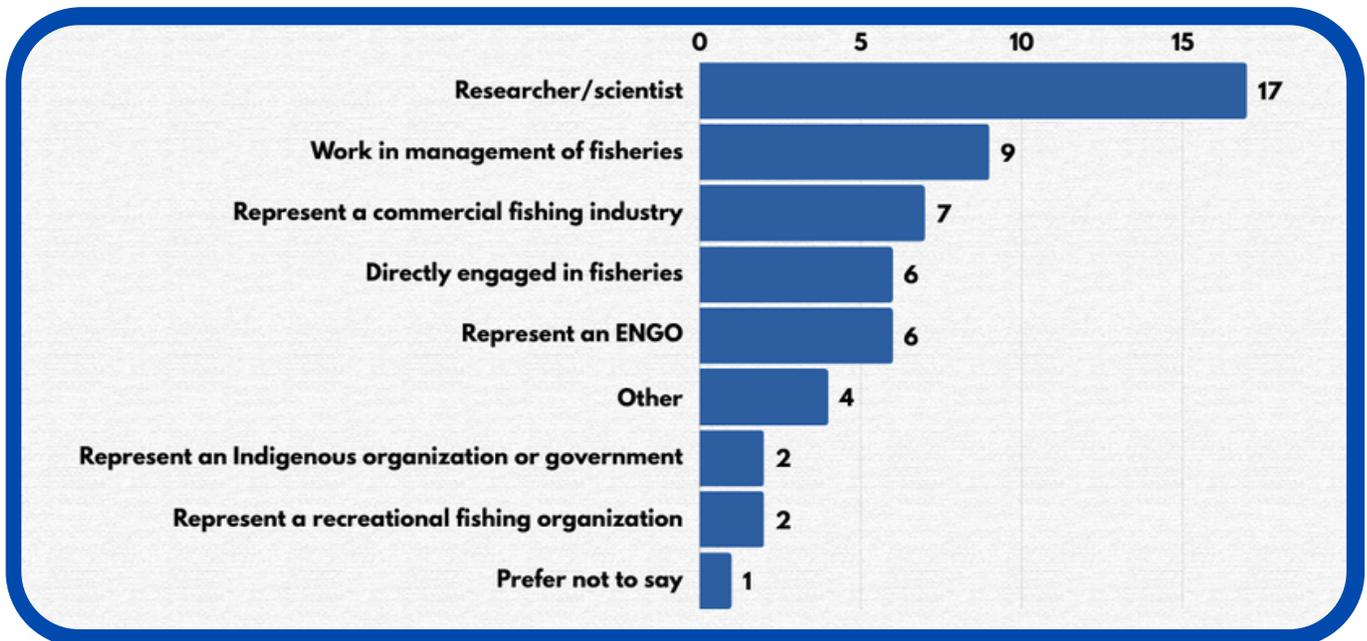
To ensure the Maritimes fisheries are resilient to climate change, a collaborative, proactive approach is needed. Key actions include ensuring more inclusive consultation processes,

diversifying the sector, and increasing public awareness. A long-term commitment to adaptability and sustainability, with a focus on protecting vital areas and fostering innovation, will be critical in navigating the climate uncertainties of the future.

Results of the Polling Exercise

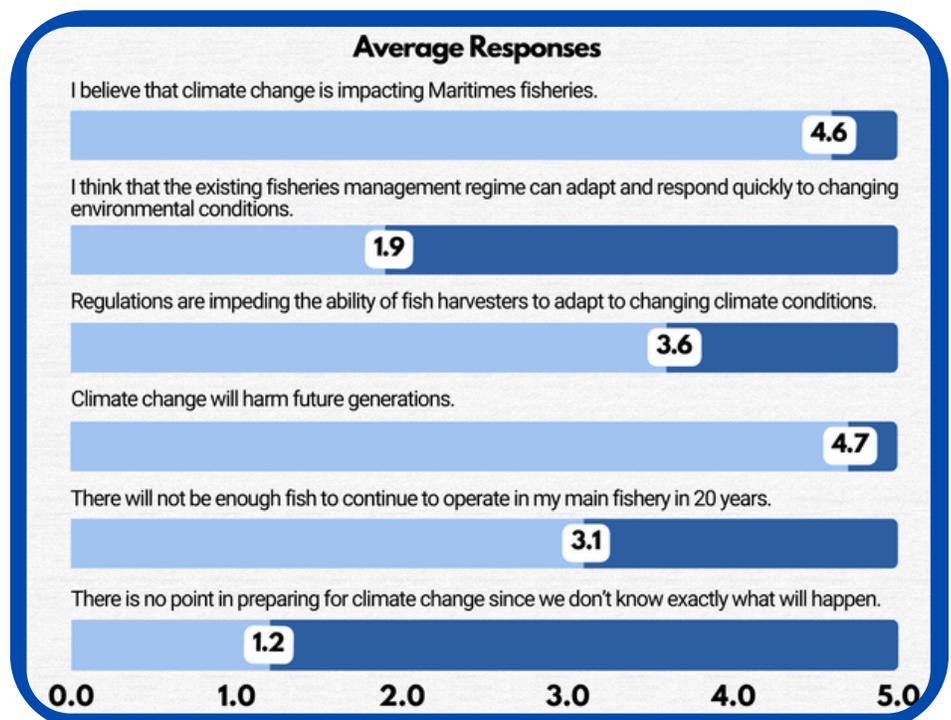
During the workshop, participants were asked to take part in an anonymous polling exercise. Participant responses are displayed below. Please note that Question 3 required participants to provide an open-text response; responses reflect the text as submitted.

Question 1: Choose all of the following that apply to you and your role:



Question 2:

On a scale of 1 to 5 (1 being the lowest and 5 being the highest), please indicate the extent to which you agree or disagree with the following statements:



Results of the Polling Exercise

Question 3: What could increase the agility and flexibility of the fisheries management regime to respond to future challenges?

Open text responses:

- Scenario planning to facilitate in-season management decisions and to support long-term planning.
- Stakeholders and managers working together to consider future management scenarios in an anticipatory way – how will decisions be made in a different future? What is needed to prepare?
- Aggregating data and making it available faster.
- Better understanding of the environmental, social, economic and policy contexts.
- More data and analyses that can be incorporated into fisheries modelling and then fisheries management decisions. Climate needs to be looked at as one of the key ecosystem pieces to inform management.
- Strengthening collaboration within DFO and harvester advisory committees.
- Working more closely with the provincial governments.
- DFO will need to be able to make quick and efficient fisheries management decisions with the existing datasets while also building them.
- Doing in-season reviews.
- Changing to the timing of fishing seasons.
- Creating regulatory mechanisms to support flexibility.
- More science directly tied to water temperature (surface and bottom temperature).
- Localized decision making and data.
- Improving engagement with all knowledge holders and more opportunities to work together. We're all in this together.
- Greater research capacity (data, ship time, personnel), increased decision-making transparency, explicit direction and support from the top to consider climate change in fisheries assessment/decision-making.
- Considering climate change science in decision making and using tools like climate vulnerability assessments and scenario planning.
- Having DFO policy or strategy that directs specific attention and time/resources to addressing management under climate change.
- Developing a climate change action plan from DFO.
- Creating baseline studies so we know what has changed.
- Having dynamic fishing rules in place to address issues like shifts in species distributions (e.g., quote allocation based on distribution of resource and not historical values).
- Incorporating climate change as a main factor (positive and negative) to mortality and reproduction of fish species and habitat.

Results of the Polling Exercise

Question 3: What could increase the agility and flexibility of the fisheries management regime to respond to future challenges? (continued)

- Enhancing leadership at the regional level, with more flexibility and decision-making capabilities.
- Regulatory change management: we need agility and speed to adjust (gear innovation, fishing techniques and tools).
- Better and more modern data collection.
- Building in climate considerations to advisory meetings. Providing information to help make good decisions as climate-driven changes occur.
- Focusing on the future of fisheries and coastal communities (social, cultural and economic).
- Better modelling – adjusting existing models to incorporate the level of climate change that harvesters are seeing on the water.
- DFO to prioritize planning for the future and address acute change. Implement EAFM across regions to incorporate ecosystem variables.
- Rebuilding stocks and more precautionary decision making.
- Training programs for things like targeting and handling new/alternate species, using and adopting new equipment.
- Reviewing regulations to ensure agility and flexibility or to identify where these might be lacking.
- Ecosystem based management – A more holistic approach, considering interconnectedness of species, habitats and environmental conditions.
- Adaptive management.
- Integrating new data testing.
- Strategies in real time to adjust fishing, quotas, seasons, closures and help foster resilience against environmental changes.
- Blending scientific data and IK to enhance the understanding of fish behavior and ecosystem changes. Allow for adjustments to protect fish populations and habitats.
- Climate integrated lens. Using climate projections like shown today to predict future habitat, shifts, support, proactive quota and ensure sustainability in changing conditions.

Participant List

Representatives from the following organizations, groups, ENGOS, institutions, and/or governments attended the workshop. In alphabetical order:

- 4VN Management Board
- Assembly of First Nations (AFN)
- Atlantic Salmon Federation
- Bluenose Coastal Action Foundation
- Canadian Wildlife Federation
- Cape Breton Fish Harvesters Association
- Clearwater & FNC Quota Ltd Partnership
- Coldwater Lobster Association
- Confederacy of Mainland Mi'kmaq (CMM)
- Conservation Council of New Brunswick (CCNB)
- Dalhousie University
- Ecology Action Centre (EAC)
- Full Bay Scallop Association
- Fundy North Fishermen's Association
- Fundy Weir
- Guysborough County Inshore Fisherman's Association
- Lobster Council of Canada
- Maritime Aboriginal Peoples Council /MAARS
- Maritime Fishermen's Union
- Maritime Fishermen's Union - Local 6
- Memorial University
- Nature United
- Nova Scotia Federation of Anglers and Hunters
- Oceans North
- Richmond County Inshore Fishermen's Assoc.
- Scotia Fundy Mobile Gear Fishermen's Association / Mersey Seafoods/ Scotia Harvest
- Southwest Fundy Progressive Protection Council
- St. Margaret's Bay Trap net fishermen
- University of British Columbia
- Université du Québec à Rimouski
- University of New Brunswick
- University of Victoria
- Wild Ocean Research
- Wolastoqey Nation in New Brunswick

ADAPTING NORTHERN FISHERIES TO A CHANGING CLIMATE

(NORTHWEST TERRITORIES,
INUUVIALUIT SETTLEMENT
REGION AND YUKON)

NOVEMBER 7, 2024



Executive Summary: Key Takeaways

Participants reported experiencing several **impacts from climate change on their fisheries**, including:

- A sharp decline in fishing participation due to environmental challenges like strong winds, and unpredictable ice conditions.
- Low water levels in rivers, thawing permafrost, and fluctuating water levels in the Great Slave Lake are disrupting fish migration, spawning and local ecosystems.
- The rise of invasive species and species experiencing northward expansions. For example, North American beavers are expanding their range into the Arctic and are blocking fish migrations.
- The increasing frequency of wildfires and their effects on aquatic life are adding new pressures on fisheries.
- Concerns about fish health, including signs of disease and poor reproduction rates, particularly among salmon populations, associated with warming waters and altered river conditions.

Participants are **taking actions to adapt to the impacts of changing conditions**, including:

- Actively monitoring and researching fish stocks, water chemistry, and the effects of climate change.
- Working to restore habitats and protect species like salmon by modifying creek beds, supporting hatcheries for juvenile salmon survival, and managing beaver impacts.
- Improving safety through infrastructure upgrades, adjusting fishing practices, and mapping reefs to ensure safer navigation.

Participants identified **key barriers to adaptation**, including:

- Limited resources for adaptation, including inadequate funding and capacity to support restoration and policy efforts.
- Uncertainty around environmental conditions and costly logistics are making it harder to implement research and adaptation strategies.
- Public awareness of climate change impacts and jurisdictional complexities are barriers to broader support and coordinated efforts.

Participants identified several **actions to support adaptation** efforts, including:

- Standardizing data collection and improve technology to respond faster to climate impacts.
- Share resources across regions and organizations, and provide flexible funding to support local projects.
- Adapting fisheries management to be more flexible, and putting a stronger focus on habitat restoration and biodiversity.

Report

Impacts of a Changing Climate and Barriers to Adaptation

How is climate change impacting your fisheries? What are your biggest areas of challenge and concern? What has changed the most?

Participants highlighted several ways that climate change is impacting fisheries. A major concern raised is the sharp decline in the number of people who are able to continue fishing, which they largely attribute to environmental challenges. They noted that these changes are happening more quickly than anticipated, with disruptions to ecosystems and the loss of fish habitats, particularly due to activities like clear-cutting. They reported that the rapidly changing environment is also making fishing more dangerous. Strong winds have become more frequent, resulting in more incidents of capsized boats and unsafe conditions. Fish harvesters shared that they are trying to use tools to predict wind conditions, but these tools are often unreliable, especially on the water where conditions can change quickly. Shifts in ice conditions were also highlighted, with earlier ice breakup and later freeze times posing challenges for those who rely on ice fishing. In areas like Great Slave Lake, participants noted that ice now lasts only about two weeks, compared to the traditional six months, making fishing seasons both unpredictable and hazardous.

Water levels and permafrost thawing are also causing additional issues. Participants reported that rivers such as the Kakisa and South Slave are experiencing historically low water levels, which prevent fish from migrating and spawning. Great Slave Lake has seen significant fluctuations in water levels, disrupting local ecosystems. Thawing permafrost is contributing to land slumping and affecting water quality, which further harms fish habitats. Participants also expressed concern about the decline in salmon populations, particularly Chinook and Chum in the Yukon River. These declines are attributed to warming waters, migration challenges, changes in seasonality and impacts to breeding grounds. Fish health is also a growing concern, with some participants observing sores and signs of algal growth on fish.

Invasive species and species undergoing northward range expansions are adding new pressures on fisheries. Participants reported a significant increase in the number of beavers, whose dams are blocking fish migration. Additionally, animals like otters and grizzly bears are moving into northern areas, potentially disrupting the balance of local ecosystems. Wildfires are another growing concern, with ash and contaminants from these fires entering rivers and lakes, harming fish and other aquatic species. Participants highlighted the need to strengthen monitoring capacity, noting that current staffing levels of fishery officers may be insufficient to effectively oversee fish populations and water quality. They emphasized that enhancing monitoring efforts could help prevent environmental issues from being overlooked.

The rapidly changing environment is making it more difficult to predict conditions from year to year, and to gather accurate data. Participants spoke about the increasing unpredictability of fish behavior, including changes in spawning and migration patterns, which are creating additional challenges for fisheries management. Fluctuating fish

populations, including significant decreases in whitefish numbers, were raised as being a serious concern for food security in communities. Many participants expressed concern about the pressure of facing multiple stressors each year, such as flooding, beaver dam blockages, and rising water temperatures, all of which are happening faster than expected and creating a sense of uncertainty about future fishing seasons.

What actions are you taking to adapt to the impacts of changing conditions?

Participants shared a range of actions being taken to adapt to the impacts of changing conditions in fisheries, with the majority focused on monitoring and research. Across the Northwest Territories, ongoing long-term monitoring efforts include water chemistry testing and data collection as part of broader research on aquatic ecosystem health and its impacts on fisheries. Research into the cumulative effects of climate change, habitat loss, and pollutants on fish populations was also highlighted as an ongoing priority. Community-based monitoring in Yellowknife is helping residents track changes in fish populations and distinguish the effects of climate change from other factors, such as mining and commercial fishing. Participants noted that monitoring empowers communities with the knowledge needed to advocate for their fisheries.

The importance of habitat restoration and protection was also discussed. Collaborative efforts with Fisheries and Oceans Canada (DFO) are underway, such as building a weir on the Hornaday River to monitor fish populations and modifying creek beds to improve fish habitats and support spawning. There was also a focus on efforts related to specific species, particularly salmon. Participants highlighted ongoing initiatives to support juvenile salmon survival, especially in hatcheries, by identifying the optimal conditions to improve their chances of survival. Efforts to understand and address the declining numbers of Chinook salmon in collaboration with biologists were also discussed. Active beaver management emerged as another key focus, with funding directed at mitigating the impact of beavers on local ecosystems and fisheries.

Additionally, participants highlighted efforts to improve safety and infrastructure in their communities, such as mapping reefs for safer navigation and upgrading docks, particularly on the south side of the Great Slave Lake. In the Inuvialuit Settlement Region (ISR) and Gwich'in regions, cautious harvest management practices have been implemented to protect fish populations and avoid overfishing. Some harvesters reported adjusting their fishing practices, including setting nets deeper and fishing earlier in the season due to warmer conditions affecting the ice. Lastly, subsistence harvesters discussed their ongoing advocacy to ensure governments address the challenges they face as conditions continue to change.

What do you think are the biggest barriers to adaptation?

Participants identified several key barriers to adapting to climate change impacts on fisheries, with funding and capacity being major concerns. They highlighted that adaptation efforts, such as habitat restoration, are costly and limited funding makes it difficult to support these activities. While science receives funding, participants noted there often is not enough capacity or flexibility to address other pressing needs, such as policy

development or restoration projects. First Nations communities, in particular, expressed that they face capacity challenges in managing fisheries restoration, even when funding is available. It was shared that additional challenges, such as road closures from wildfires and the impact of beaver dams, further strain the time and resources required to implement essential projects.

In addition to these resource challenges, participants highlighted that uncertainty and unpredictability further complicate adaptation efforts. For example, changes in water levels are often unpredictable, making it challenging to collect data or plan for future conditions. High costs and difficult ice conditions are also a barrier to overwintering monitoring, presenting challenges in collecting temperature and outmigration data. Participants also noted that the vast size of the region and high transport costs of the region add to the difficulty of conducting research and monitoring. Shifting government priorities and changing regulations were raised as additional barriers, impacting funding and focus. Finally, public perception was flagged as a concern, with many participants noting that the public is unaware of the impacts of climate change on fisheries, which makes it harder to build support for adaptation efforts. Jurisdictional issues, particularly around Great Slave Lake where the majority of the water comes from outside the Northwest Territories, were also mentioned as complicating local planning and response efforts.

What do you need to better adapt?

Participants identified several key needs to better adapt to climate change impacts on fisheries. One major priority is standardized data collection and better data management systems. While First Nations are using data loggers to track temperature, there is currently no consistent methodology for comparing data sets. This makes it harder to forecast trends and respond to changes. Participants emphasized the need for investment in technology to process accumulated data more efficiently, allowing for quicker, more responsive adaptation efforts and faster translation of science into appropriate management measures that can help harvesters. They also advocated for democratizing science, ensuring that the tools and methodology for data collection are accessible to all communities, with workshops and training to help communities collect and analyze data using standardized protocols.

Capacity sharing was another key theme. Rather than building capacity from scratch, participants suggested that regions and organizations should share resources and knowledge to scale-up adaptation efforts. They noted that this approach could help make comparisons across sectors, such as water quality monitoring, and lead to more effective, coordinated actions. Participants also called for more flexible funding to address emerging challenges and support local projects that can quickly adapt to changing conditions. Additionally, participants emphasized the importance of compensating harvesters for adaptation efforts and losses or reduced harvest levels, which would help ease the transition as fish stocks are managed more sustainably. In terms of management, there was strong support for climate-ready fisheries management systems that are more adaptable to the evolving challenges posed by climate change. Existing systems were seen as not responsive enough to ongoing shifts; participants therefore recommended faster

feedback loops, flexibility in policies and changing licensing approaches to improve fisheries management.

Finally, participants emphasized the importance of restoration and biodiversity efforts. They suggested actions such as planting trees for shade along water bodies to reduce temperature increases and providing shelter above fish passage routes to protect fish habitats. More focus on restoring ecosystems was seen as a key strategy to improve long-term adaptation. Alongside these efforts, participants highlighted the need for enforcement and guardianship programs, particularly in the summer, to ensure compliance in communities and to protect fish populations from growing threats. This comprehensive approach, combining technology, capacity sharing, and adaptive management, was seen as essential to building resilience in fisheries and adapting to the impacts of climate change.

Looking to the Future

What is your future vision for climate-adapted northern fisheries? What does success look like?

Participants shared their vision for climate-adapted northern fisheries emphasizing the need to prioritize future generations and ensure that communities can continue to harvest species while sustaining Indigenous Knowledge (IK). They noted that success is about prioritizing the health of fish populations over the amount harvested, ensuring future generations can continue to harvest species. Participants emphasized the importance of focusing on long-term resilience, including protecting vital species like salmon, which are seen as crucial for both the environment and people. They also called for more marine environment studies that bring all stakeholders together to better understand and address the impact of activities like trawling. Success, according to participants, would be measured by the abundance and health of wildlife, especially salmon stocks, and the ability to reconnect communities with these vital species.

Participants emphasized the importance of including First Nations in decision-making and integrating IK into adaptation efforts. They expressed the need for collaboration across governments, with a focus on working together to address the challenges of climate change. Strengthening Guardian programs and supporting community-based research were seen as key to building local knowledge and ensuring that adaptation efforts reflect the needs of communities.

Finally, participants emphasized the importance of conservation, with a focus on addressing the damage humans have caused to ecosystems. They raised the need to reconnect communities with important species and to increase awareness of the cascading impacts of biodiversity loss, especially how salmon decline affects other species like eagles and bears. The participants expressed a strong desire to pass on IK but noted that declining harvests make it harder to transmit these traditions to younger generations.

What are the best opportunities to support adaptation to get us there? These can include individual and/or collective actions.

Participants identified several key opportunities to support adaptation to climate change and strengthen fisheries resilience. A major focus of the discussion was on fostering resilient fish systems and reducing stressors that can help species like salmon adapt to climate change. Participants emphasized the importance of co-management and incorporating IK into fisheries management. They also highlighted the value of supporting IK alongside scientific data to ensure more comprehensive and effective management strategies. Participants noted the need for a strong conservation focus, with data collected by DFO playing a key role in management efforts. Local-led fisheries management and knowledge exchanges between communities were seen as essential for adaptation, as these initiatives empower communities to address emerging challenges. Additionally, platforms for communication and data sharing were identified as opportunities to enhance collaboration across regions, sectors, and communities.

Collaboration was seen as crucial for developing more effective solutions. Participants stressed the importance of engaging various sectors, including government agencies, industry, and academia, in discussions around adaptation strategies. One opportunity participants identified was the creation of research centres on climate change, which could aid in cross-sectoral collaboration and the development of effective actions. Another key opportunity was climate scenario planning, which would allow diverse groups to plan for a range of possible futures and help prepare for climate impacts as well as other potential impacts, like market changes and new technologies.

Finally, participants saw significant potential in empowering communities and harvesters, particularly younger generations, to get more involved in observing environmental changes and learning about adaptation. As adaptation efforts move forward, participants stressed the importance of balancing economic development with environmental protection, particularly when it comes to preserving vital ecosystems like those that support fish habitats.

What is the most useful way to continue these conversations?

Participants suggested that the most useful way to continue the conversations around adapting fisheries to climate change would include additional workshops and educational opportunities led by DFO, particularly to explain fisheries science processes and sharing up-to-date findings, and what they mean for fisheries. These workshops should be designed to engage a wider range of community members and focus on increasing awareness about the impacts of climate change on the marine environment.

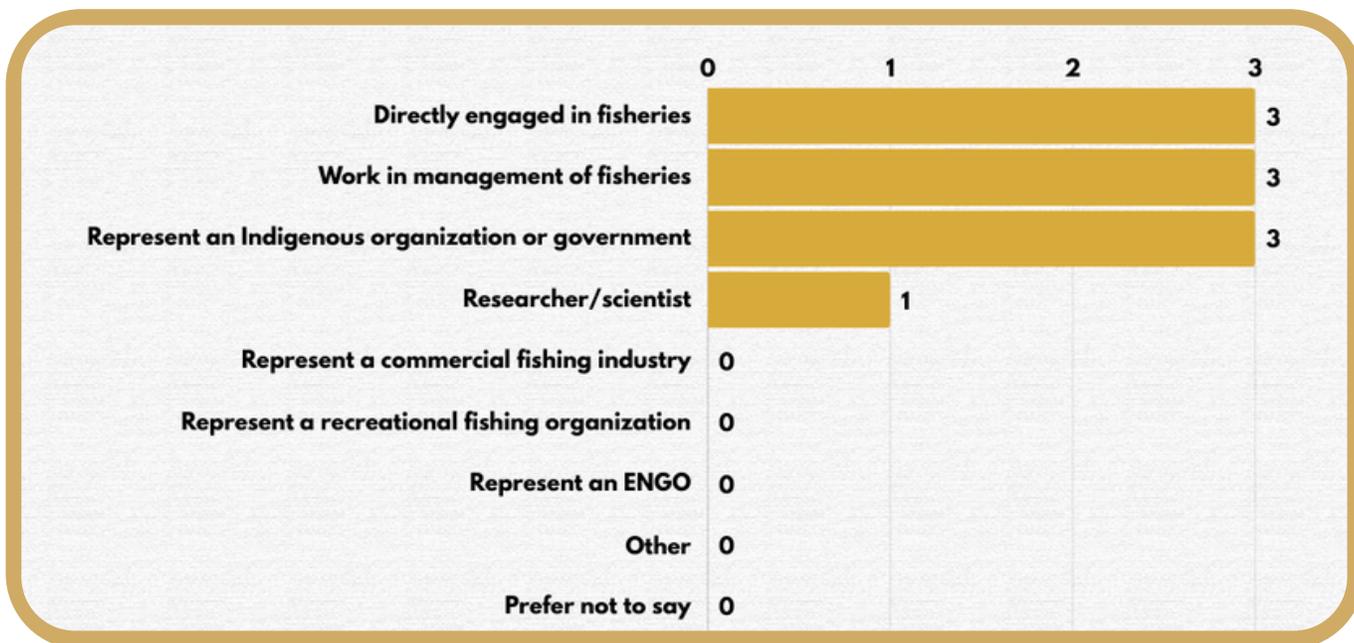
Participants also highlighted the importance of engaging diverse groups in collaborative climate scenario planning, where different futures could be mapped and participants can discuss how to adapt fisheries management to each scenario. There was a strong emphasis on involving harvesters and youth in these discussions, particularly to get younger generations more involved in observing changes in their environment and understanding the challenges ahead. Several participants noted the significance of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) as a valuable framework to foster collaboration between DFO and Indigenous communities. Additionally,

improving organizational collaboration and data sharing practices across sectors through these conversations, particularly through the FAIR (Findable, Accessible, Interoperable, and Reusable) principles, was seen as crucial for successful adaptation. Finally, creating dedicated forums for subsistence harvesters to engage directly with DFO was suggested to ensure that the concerns of those most impacted by changes are heard and addressed in decision-making.

Results of the Polling Exercise

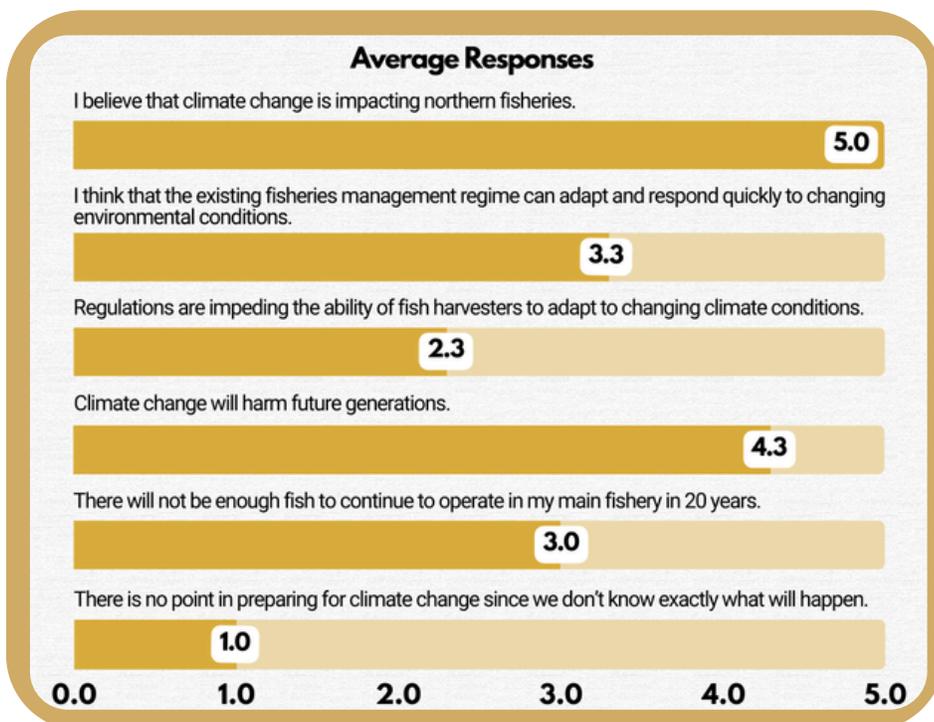
After the workshop, participants were asked to take part in an anonymous polling exercise. Participant responses are displayed below. Please note that Question 3 required participants to provide an open-text response; responses reflect the text as submitted.

Question 1: Choose all of the following that apply to you and your role:



Question 2:

On a scale of 1 to 5 (1 being the lowest and 5 being the highest), please indicate the extent to which you agree or disagree with the following statements:



Results of the Polling Exercise

Question 3: What could increase the agility and flexibility of the fisheries management regime to respond to future challenges?

Open Text Responses:

- Having enough people aware and that care, having enough people on the same page and involved in the process.
- Continued investments in climate change adaptation to reduce risks and management opportunities.
- Decoupling management systems from political bodies and industries. The influence of economics and Odum's Ratchet [4] needs to be reduced. Science and cultural management boards need decision making power.
- Economic systems compensating fishers while taking pressure of stocks by reducing/removing harvest. Large marine and freshwater protected areas with adjustable boards. Inland, freshwater food fish farm.
- Science and cultural management boards with appointed positions, government funding and decision-making authority with government oversight for accountability. Investment in technology improvements.

[4] Odum's ratchet refers to changes in ecological life-histories caused by over-exploitation. When ecosystem degradations occur, the past becomes hard to restore. The "ratchet" metaphor captures the one-way, stepwise decline that only moves in one direction.

Participant List

Representatives from the following organizations, groups, ENGOS, institutions, and/or governments attended the workshop. In alphabetical order:

- Akaitcho Territory Government
- Canadian Wildlife Federation
- Carcross/Tagish First Nations
- Council of Yukon First Nations
- Environmental Dynamics Inc
- eOceans
- Fisheries Joint Management Committee
- Government of Northwest Territories - Environment and Climate Change
- Government of Yukon - Fisheries Department
- Gwich'in Renewable Resources Board
- Inuvialuit Game Council
- Inuvialuit Regional Corporation (IRC)
- Kwanlin Dun First Nation
- Memorial University
- Nature United
- Pacific Salmon Foundation
- Ta'an Kwäch'än Council
- Tlicho Government
- Tr'ondëk Hwëch'in
- University of Quebec in Rimouski
- Wildlife Conservation Society
- Yukon First Nations Salmon Stewardship Alliance

ADAPTING EASTERN ARCTIC FISHERIES TO A CHANGING CLIMATE

(NUNAVUT, NUNATSIAVUT,
NUNAVIK AND JAMES BAY)

NOVEMBER 14, 2024



Executive Summary: Key Takeaways

Participants reported experiencing several **impacts from climate change on their fisheries**, including:

- Varying degrees of changes to species distribution, migration patterns and abundance; including impacts to marine mammals.
- The arrival of invasive species.
- Changes in fish health such as increases in disease, and changes to the color and texture of flesh.
- Increased frequency of storms shifts in wind patterns, and significant impacts to ice conditions are impacting the predictability of fishing seasons and jeopardizing safety.
- Some climate change impacts may also be positive.

Participants are **taking several actions to adapt to the impacts of a changing climate**, including:

- The use of excluder devices to reduce the number of Greenland shark caught as bycatch.
- The advancement of the Climate Risk Index for Biodiversity – a tool to predict how fish species in specific areas will be affected by climate impacts.
- Numerous community-based actions focused largely on increasing the amount and structure of communication, establishing communication structures, supporting the sharing of information, embracing learning and training opportunities.

Participants highlighted what they consider to be some of the **biggest barriers to adaptation**, including:

- **Insufficient or unreliable funding:** Limited investment in science, data collection, new technologies, and long-term maintenance, especially in Inuit communities. Also problematic is funding that ends abruptly, resulting in the collapse of joint projects or priority undertakings.
- **Data gaps & limited predictive capacity:** Lack of baseline data and predictive tools and processes hinders understanding of climate impacts and future planning capacity.
- **Need for localized research:** Broad-scale studies do not reflect local fisheries; better integration of Inuit Qaujimagatuqangit (IQ), also referred to as Inuit Traditional Knowledge, with scientific data is needed.
- **Need for improved information sharing:** Lack of transparency and communication from DFO, regarding how research findings are applied to decision-making. This makes it difficult for stakeholders to access and apply DFO data and research.
- **Reactive fisheries management:** Current management approaches tend to be reactive rather than proactive, limiting the development and use of predictive tools and slowing DFO's ability to respond effectively.

- **DFO structure:** Limited coordination across regions and sectors within DFO creates challenges for implementing a comprehensive approach to fisheries management and scientific activities.
- **Lack of infrastructure:** Inadequate harbors and food-processing facilities limit Inuit participation and climate resilience.

Participants identified several **key actions to help fisheries adapt** to climate change, including:

- **Funding:** Explore alternative models, invest in proactive resources, and ensure long-term support for collaboration, research, and community-led initiatives.
- **IQ:** Integrate IQ at all stages of research and decision-making; co-develop research questions and methodologies and communicate results clearly.
- **Future planning and scenario development:** Develop tools to predict and plan for ecological, economic, and climate uncertainties, using best- and worst-case projections. Build community-informed adaptation plans.
- **Science and data:** Focus on gap analyses, coordination across research efforts, innovative tools (e.g., drones, Artificial Intelligence), knowledge integration, and proactive planning for ecosystem-based fisheries management.
- **Strengthen communication and cultural respect:** Foster ongoing dialogue and continued respect for cultural norms, use plain-language reporting, and integrate IQ values across research and engagement.
- **Infrastructure:** Invest in northern infrastructure, plan for future harbour needs, and support food-processing facilities for Inuit communities.
- **Strengthen communities and build local capacity:** Foster community-led fisheries monitoring, education, locally managed research, and ensure equity in data ownership and decision-making.
- **Foster innovation and shared responsibility:** Explore innovative data collection methods, such as drones and Artificial Intelligence, and develop flexible fisheries management approaches that respond to changing conditions.
- **Integration of knowledge sources:** Integrate insights from multiple sources, including international examples, to inform adaptive fisheries planning in the eastern Arctic.

Report

Impacts of a Changing Climate and Barriers to Adaptation

How is climate change impacting your fisheries? What are your biggest areas of challenge and concern? What has changed the most?

The impacts of climate change on fisheries in the Eastern Arctic are complex and multifaceted. Participants reported changes to species distribution, migration and/or lifecycle patterns, abundance and health. It was noted that these types of changes are also being seen amongst marine mammals, which represent key predators in marine food webs. Participants also reported significant changes in weather patterns and ice conditions and noted concerns about climate impacts on food security. Variation in the degree of current climate impacts were noted, as were both areas of concern and potential opportunities. Overall, there was consensus that the degree and speed at which things are occurring should be considered alarming.

Impacts on species distribution, migration patterns, and abundance

Many participants reported observable changes in species distribution and migration patterns. Increasing water temperatures are contributing to shifts in distribution, with an overall movement northward. They reported that species that were once found in more temperate southern areas are moving farther north, while warmer-water species are becoming more abundant in Arctic waters. They mentioned that this is adding to growing concerns about the increased presence of invasive species and their potential to further destabilize local ecosystems and threaten native species. They noted that the migration patterns (e.g. timing and length of stay) of some species also appear to be changing, impacting traditional harvesting practices.

Some species-specific observations were made:

- Increased observations of groundfish, resulting in excellent catch rates for Halibut.
- Capelin has been reported as far north as Baffin Island.
- Arctic char was reported as being absent from some traditional fishing areas, while being found in new places. Participants have also observed char migrating upstream and downstream earlier.
- Turbot is not currently showing big changes.
- Participants noted that Arctic skate are not currently demonstrating noticeable distribution shifts, although future challenges are possible resulting from temperature changes.
- Redfish are observed to be more abundant. While there may be potential opportunities that come with this, there are also significant concerns about the threat they pose to shrimp.
- Shrimp abundance was described as variable, with participants generally observing a downward trend.

We were told that Hunters and Trappers Organizations (HTO) and Inuit are particularly concerned about how climate change appears to be impacting marine mammals.

Specifically referenced were bowhead, narwhal, and beluga whales, as well as ringed seals. Participants reported seeing an increased abundance of marine mammals; shifts in migration timing; seeing them in new places; and observing them remaining in expected areas for longer periods of time. This is raising questions about what these shifts mean for other species co-existing in the marine environment, including impacts on predator-prey relationships and if/how DFO is integrating changes among top predators into broader ecosystem assessments.

Impacts on fish health

Participants are either increasingly observing, or hearing concerns about, fish with health issues such as disease, injuries, and changes in body condition. For example, the flesh of Arctic char was reported as being paler in colour and softer in texture. This, combined with several fish die-offs in recent years, has raised concerns about the long-term health and sustainability of fish populations in the region.

Weather related impacts on safety and harvesting activities

Changing weather patterns and ice conditions emerged as an area of significant concern. Participants reported experiencing more frequent and severe storms. Additionally, increases in wind strength and changes in wind direction are resulting in high waves and unpredictable harvesting conditions. All of these conditions impact fishing seasons, as harvesters are forced to spend more time waiting out weather conditions, as well as jeopardize harvester safety at sea.

Observable changes to ice conditions were repeatedly raised and were reflected across all three of the breakout groups. Comments generally fell within three categories: freeze/thaw times; ice thickness; and increases in ice calving.

Ice is forming later and melting earlier, and there is more uncertainty and disagreement about when the ice is thick enough to be safe. The variability in freeze/thaw and on/off times is making it harder to predict when fishing seasons can begin or end, disrupting traditional fishing schedules, and creating safety risks for those relying on safe ice conditions for harvesting. Some participants reported snowmobiles going through the water.

The increase in ice calving and the presence of larger icebergs presents new risks to vessels, even those with ice protection. It makes navigation more dangerous, particularly in offshore fisheries, and adds uncertainty to fishing operations.

Potential future opportunities

Some participants stressed that not all current and projected climate impacts in the region are negative. For example:

- As species distribution and migration patterns continue to shift, there may be the potential for pursuing alternative fisheries, and/or increasing economic gain from existing fisheries.
- Changes to freeze/thaw times could result in longer harvest times and more catch. Although this was also noted to have potential adverse effects on things like bycatch of Greenland shark.
- Potential for more food security for the north.

Regardless of if climate impacts were noted as positive or negative, they all contribute to some degree of uncertainty for harvesters about the future of fisheries, ecosystem health, and food security in the Eastern Arctic.

What actions are you taking to respond, or adapt, to the impacts of changing conditions?

Participants spoke about some actions being taken at the industry, community or personal level to respond or adapt to climate change. These include mitigation measures to reduce bycatch of the Greenland shark; the advancement of a tool designed to increase predicative capacity; and numerous actions occurring at the community level.

Mitigation for Greenland shark bycatch:

Efforts are underway to develop and deploy excluder devices to reduce bycatch of Greenland sharks, and industry progress was recognized as commendable by non-industry participants. That said, it was noted that there is still work to be done, especially for longline and gillnet fisheries.

Climate risk index for biodiversity:

Developed by Oceans North, the Climate Risk Index for Biodiversity is a tool that maps critical risk areas for over 2000 marine species and 90 fish stocks in the northwest Atlantic Ocean. The tool generates detailed data about how fish species in specific areas will be affected under both high emissions and lower emissions scenarios over the next 75 years.

Community-based actions:

Participants reported a variety of actions being advanced at the community level, with communities working together to support the mobilization and sharing of information. Especially to support the safety of community members. Some examples of specific actions were given:

- Communities are dedicating specific individuals as responsible for ice safety.
- Collaborating with fisheries plants and HTOs to determine if ice is thick enough to be out on.

- Weekly conference calls are being instituted with the HTOs to exchange information on issues of concern, such as ice conditions.
- There has been an increase in the sharing of oral histories, with elders talking more about ice conditions and climate change.
- Wardens are now present in each community that goes out on land and sea. Collaboration with DFO has also been strengthened, as they join patrols with fisheries officers.

Participants also mentioned encouraging community members to capitalize on opportunities to learn about things like inshore fisheries, how to use equipment, etc. There are communities that want to participate in training opportunities and there are community members being trained with regards to science research conducted on a community level. It was noted that people that have that knowledge can share and train other individuals, and that Inuit communities are always thinking of the next generation.

What do you think are the biggest barriers to adaptation?

Many themes emerged as part of this discussion on barriers to climate adaptation, including financial barriers, barriers related to science and data, fisheries management, information sharing and communication, the organizational structure of DFO, and critical infrastructure.

Financial barriers:

The lack of funding invested into science and data collection activities to support filling knowledge gaps and forward planning was raised repeatedly. This funding constraint seemed to be top of mind for the majority of participants. Some of the other commonly cited financial barriers, apart from inadequate investment in science and data collection, were:

- Lack of funding to support investment in research and piloting new approaches. Participants noted that new technologies, equipment, etc. are costly.
- Lack of long-term budgets to support maintenance costs, particularly for equipment installed in Inuit communities (e.g., freezers and processing equipment)
- Lack of funding to support small organizations that do not have the capacity to understand climate impacts to the fisheries and/or respond to community questions and concerns. The following example was given: small organizations do not have the proper infrastructure in place to respond to the risks associated with changing ice conditions. If someone gets stranded on the ice, they do not have the infrastructure to rescue them.
- Unreliable funding (e.g., nonrenewal at the end of a funding cycle) that results in the collapse of joint projects or priority undertakings (Oceans Tracking Network, Baffin

Bay Observatory). This is particularly frustrating when money, time and effort has already been invested.

Science & data:

Participants remarked that gaps in data and a lack of baseline information makes it difficult to fully understand how climate change is impacting fisheries in the Eastern Arctic, and to determine with certainty the pace of change or the impacts. Participants noted that there is opportunity for DFO to recognize the importance of data for baseline comparison, and of monitoring at levels sufficient to provide the data needed to detect changes as they occur. Participants repeatedly highlighted the importance of conducting a data gap analysis, and of having access to baseline data, to not only track climate driven changes, but to also support the ability to make future predictions. They noted that an increase in science and data will improve certainty and bolster predictive capacity of harvesters' ability to engage in future planning and make investment decisions. Participants gave some specific examples of science and data improvements that could strengthen adaptation actions: increased insight into predator prey relationships and the spatial scale at which research is done; increased forward-looking data collection; more effective integration of Western science and IQ and improved transparency. Specifically:

- There needs to be an accurate understanding of predator prey relationships and the way in which climate change may be impacting them.
- Research has to occur at the local community and fishery level. Right now, there is a tendency to make broad scale assumptions based only on research done in certain areas, specifically those that support commercial fisheries. However, the Eastern Arctic is vast and these conclusions do not apply to all the local communities and fisheries.
- There is an important need to recognize the value of IQ and integrate it with scientific data. A participant gave the following example: Inuit have been following the whale behavior, movements, and changes for generations and they understand them. Previous disagreements have occurred when tags were placed on a few individual narwhals in specific regions resulting in broader scientific conclusions using limited data (like the issue of spatial scale mentioned above). Inuit know that narwhals are constantly moving in the summer, and their distribution is related to the food they are eating. They could be a great indicator of the entire ecosystem and impacts of climate change.
- The gaps in data impede the ability to predict, forecast and measure changes as they are occurring. Participants highlighted that we must pursue forward looking data collection to support future planning. Doing so will require an evaluation of what information is needed to increase predictive capacities and how we get a better handle on it. For example, it is necessary to try and get an appreciation of the alternatives for fisheries that may exist. There is already an observed increase in redfish, so it is important to track the increased abundance of groundfish, including redfish, to plan and ensure any future fishery is sustainably managed.

- Participants felt that it would be helpful for them to have more access to the results of studies, research projects, and data collected by DFO. Full and transparent access to information, along with more manageable rules around data management and collection, would improve the analytic abilities.

Reactive nature of fisheries management regimes and policies:

The reactive nature of fisheries management regimes and policies was raised repeatedly as a barrier. Many participants took the position that predictive capacity, cohesion and forward oriented management systems are urgently needed. They noted that proactive fisheries management could be achieved by using predictive tools and processes, and increasing capacity.

Insufficient information sharing & communication:

A large number of comments could be characterized as reflecting a desire for increased clarity and explanation when communicating information across a variety of sectors, including communication and information sharing between academics and communities; different levels of government; industry; and Inuit harvesters.

The importance of communicating results and findings back to the people who participated in research was raised as a key element for success. Based on participant input, harvesters and community members who contribute to research efforts would like to receive feedback once the research is conducted. Ensuring the communication of results will empower participants by acknowledging their contributions. When departmental results and reports are shared back with communities, participants felt that it would be very useful if some pragmatic suggestions were given on how to take the research in the report and use it to benefit communities, the food system, fisheries, and/or harvesting efforts.

Participants communicated a desire for clarity on how DFO and other organizations use information gathered and how it fits into the broader picture. Returning to the example of the role of marine mammals in the discussion when assessing climate impacts on fisheries ecosystems, participants wonder how marine mammals such as top predators or large species consumers—are accounted for. They noted that if research is focused on shrimp populations, then species like bowhead whales, other shrimp consumers, and the food sources that shrimp rely on should also be considered. The term "ecosystem approach" suggests that all these elements should be integrated, yet there is uncertainty among participants about how this integration is actually taking place.

Organizational structure of DFO:

Participants identified that increased collaboration among DFO regions (e.g., Arctic/Gulf) and across sectors (e.g., science/resource management) would result in improved coordination and connections across regions. This would ensure that region-specific

information is incorporated into a big picture synthesis and overview. (e.g., for Atlantic Canada) to better inform resource users.

Critical Infrastructure:

Participants noted that the necessary harbour infrastructure is not in place to support anticipated future changes. This comment applied to the presence of harbours as well as ensuring any existing infrastructure is climate resilient (ready to withstand the increases in storms, wind, etc.). The absence of food-related infrastructure in communities was identified repeatedly as major barrier for Inuit participation in the industry at the local level. Participants stated it is a challenge from the perspective of both food security and economic development. The following example was given: when community members would like to sell their Arctic char, it must be frozen immediately. If they do not have an active processing plant or freezer there is not the opportunity to freeze the char right away.

Lastly, participants noted there is not always a system of infrastructure in place to support harvesters as ice conditions change. For example, if someone is stranded while fishing, a community is unlikely to have the infrastructure in place to rescue them. Additionally, it was noted that the Coast Guard has not yet adjusted their schedules to reflect the shifts in ice freeze/thaw times.

Looking to the Future

What is your future vision for climate-adapted Eastern Arctic fisheries? What does success look like?

Understanding predator-prey relationships and learning from other jurisdictions:

Participants shared that predator-prey relationships are well understood by their communities, and this knowledge has the potential to significantly impact decision-making, particularly in the case of marine mammals. They underlined that engaging directly with communities to ensure that local knowledge and IQ is incorporated into decision-making processes is crucial. They noted that it is also important to draw from the observations and experiences of other jurisdictions in relation to managing predators to understand the changes they are making and the management actions they are implementing. Even at a high level, examining these actions can help harvesters in the Eastern Arctic consider potential changes in their own region.

The importance of collaboration:

Participants identified collaboration as essential in addressing the challenges posed by climate change, which affects all sectors, including offshore commercial, inshore, and subsistence fisheries. A cohesive and collaborative approach ensures that everyone benefits. A strong and meaningful partnership between IQ and Western science is crucial

for informed decision-making. Incorporating harvester knowledge and IQ alongside scientific research leads to more effective and inclusive outcomes.

Research, training, and community leadership:

Participants emphasized the importance of identifying research and training priorities, particularly those that are made with and for Inuit communities. This includes work on new or exploratory fisheries. They highlighted the value of training efforts focused on collecting data and standardizing physical sampling techniques, noting that introducing methodologies that Inuit can manage locally can allow them to take the lead while researchers play a supporting role.

Transparency and information sharing:

Participants stressed that sharing information is key to fostering collaboration and trust. This includes openly distributing data, survey results, and public consultation outcomes. They indicated that transparency should extend beyond merely sharing results—communities must also receive practical guidance on applying research findings to benefit their food systems, fisheries, and harvesting efforts. Participants also highlighted that open communication between sectors, such as commercial fisheries and DFO, ensures that all parties have clear expectations and an understanding of future plans.

Science, data collection, and future planning:

Participants noted that while science and data collection efforts are robust, there are identifiable gaps that require a plan to address them. Collaborative partnerships have been formed where necessary to strengthen research efforts. Baseline assessment tools have been implemented to support data collection and inform future decisions. Given the rapid environmental changes, proactive planning was highlighted as essential. Participants acknowledged that all the information needed may not be available, however, enough data exists to make reasonable predictions about future scenarios, such as warming waters and increased safety threats due to worsening ice conditions and extreme weather. They emphasized that future planning ensures that communities have strategies in place to respond to unexpected developments.

Community engagement in planning:

Participants highlighted the importance of involving communities in planning processes. They emphasized that engaging directly with communities—such as through collaborative mapping exercises—ensures that local knowledge is incorporated into decision-making processes. This participatory approach can lead to more effective and well-rounded strategies that reflect the needs and priorities of the people most affected by environmental and fisheries changes.

Sustainability and protecting future generations:

Participants voiced concerns about the long-term viability of fisheries. They emphasized that overharvesting today could have detrimental effects on future generations and that decision-making must continue to prioritize sustainability, ensuring that resources remain available for those who rely on them in the future. They stressed that responsible resource management is essential to balancing current needs with the needs of future generations.

The future of James Bay fisheries:

Participants shared a future vision for James Bay fisheries that includes contributions to the local economy and food security. They highlighted the need to establish a baseline understanding of coastal waters to support informed decision-making. They emphasized the need for a strong feedback loop to ensure that information is shared back with harvesters and communities, allowing for adaptive and sustainable fisheries management.

What are the best opportunities to support adaptation to get us there? These can include individual and/or collective actions.

Funding

- Explore alternative funding models, including industry-supported research and cross-sector partnerships.
- Invest in equitable access to resources and build capacity for proactive action before crises occur.
- Ensure long-term, reliable funding for sustained collaboration, research, and community-led initiatives.

Integrating IQ

- Fully integrate IQ at all stages of research and decision-making, co-develop research questions, and incorporate IQ into analysis and outcomes.
- Involve Inuit from the start in formulating research methodologies and frameworks.
- Learn from successful examples where Indigenous and scientific knowledge systems have been integrated.

Future planning and scenario development

- Develop tools to predict and plan for ecological, economic, and climate-related changes through collaborative scenario planning.
- Create scenarios reflecting best- and worst-case projections, incorporating scientific data, IQ, and community values.
- Design adaptive strategies with policy flexibility to respond to change, ensuring local relevance and support.

- Strengthen data collection to address knowledge gaps and anticipate future developments.

Science and data

- Conduct gap analyses to prioritize resource investments, improving coordination and reducing duplication across research efforts.
- Utilize innovative data collection methods like drones and AI and develop predictive models for proactive planning.
- Foster integration of IQ with Western science to guide informed, culturally grounded decisions.
- Support ecosystem-based fisheries management by incorporating socio-economic variables and emphasizing proactive planning and transparent data sharing.

Communication and cultural respect

- Foster ongoing dialogue and improve information sharing between scientists, communities, and government at all levels to build trust.
- Respect oral knowledge traditions and community norms in engagement strategies and ensure accessible formats for research findings.
- Translate materials into Inuit languages and communicate the practical benefits of research to support decision-making and local food systems.
- Encourage mutual learning through culturally grounded spaces, respecting local schedules and community priorities.

Infrastructure

- Invest in northern infrastructure to support local monitoring, emergency response, and future harbour needs.
- Support the development of food-processing facilities in Inuit communities to enhance food security and economic sustainability.

Strengthening communities and local capacity

- Focus on practical application of research, providing communities with actionable insights to improve food systems and fisheries.
- Build strong, culturally respectful community-scientist relationships through ongoing, informal engagements.
- Expand education and training to equip youth with skills in science, data collection, and monitoring, and provide communities with tools for leading research.
- Ensure equity in research and data ownership through partnerships that ensure communities retain control over their information.

Fostering innovation and shared responsibility

- Explore new data collection technologies (e.g., drones, Artificial Intelligence) and foster cross-sector partnerships to address data gaps and strengthen sustainability.
- Develop flexible fisheries management approaches that can adapt to changing conditions, such as adjusting fishing seasons, reallocating quotas, and incorporating IQ into decision-making.

Integration of knowledge sources

- Integrate insights from multiple sources, including national and global examples, to inform adaptive fisheries management and respond to emerging trends.
- Utilize regional workshops to share knowledge and inform future planning for the Eastern Arctic, ensuring the inclusion of both scientific and IQ in decision-making processes.

What is the most useful way to continue these conversations?

When asked about how to continue these discussions, participants indicated that to make future climate change discussions successful, there should be regular engagement, clear action plans with tangible outcomes, an effort to integrate insights from international, national, and regional work, meaningful Inuit involvement and accessible communication. These strategies will help ensure that the conversation remains productive and inclusive, with a clear path forward for addressing climate change.

Ongoing and regular engagement:

Overall, there was a consensus on the need to continue these discussions. Participants suggested an ongoing forum could be created in order to keep climate change in the forefront of people's minds. Some participants also suggested that existing forums, such as round tables and Advisory Committees could be used to have further discussions like what was done in the workshop itself.

Create a tangible action plan:

Participants emphasized that maintaining momentum requires moving beyond discussions and focusing on tangible outcomes. They highlighted the need for a clear work plan with concrete steps, whether that be improving data analysis, addressing data gaps, or identifying available options. This should be an iterative process, inclusive of all stakeholders, and show clear progress. Without this, participants reported that the conversation risks losing momentum.

Integration of knowledge sources:

Participants highlighted the importance of integrating insights and findings from multiple sources. They emphasized the need for continuous exposure to these issues, and noted that integrating observations and changes from other jurisdictions can help highlight potential shifts and inspire actionable thinking. Sharing examples from other jurisdictions, even globally, can encourage reflection on possible changes and the kinds of responses that may be needed. Participants mentioned that the work, successes and lessons learned from other harvesting nations (e.g., Australia and Norway), and international bodies, can serve as a starting point.

The six additional regional workshops that DFO held were also referenced. Participants wanted to know if the What We Heard reports from the other sessions would be accessible. There was interest in seeing how other discussions compared to this one. Participants noted that looking at all the reports in unison can reveal shared challenges and areas of agreement across Canada's regions, while also recognizing and addressing regional differences.

Additionally, some participants noted that all interested parties should take any opportunity to exchange IQ and science. It was noted that this does not have to occur in a formal setting, such as a big conference or as part of a specific study. Knowledge sharing can be boots on the ground conversations in the field, and in fact some of the best sharing is done in the field.

Inuit engagement:

Participants emphasized the importance of continued and meaningful engagement with Inuit communities, designed and led by them. They noted that the success of these engagements should be evaluated by how well they meet the community's needs and how effectively they communicate relevant information.

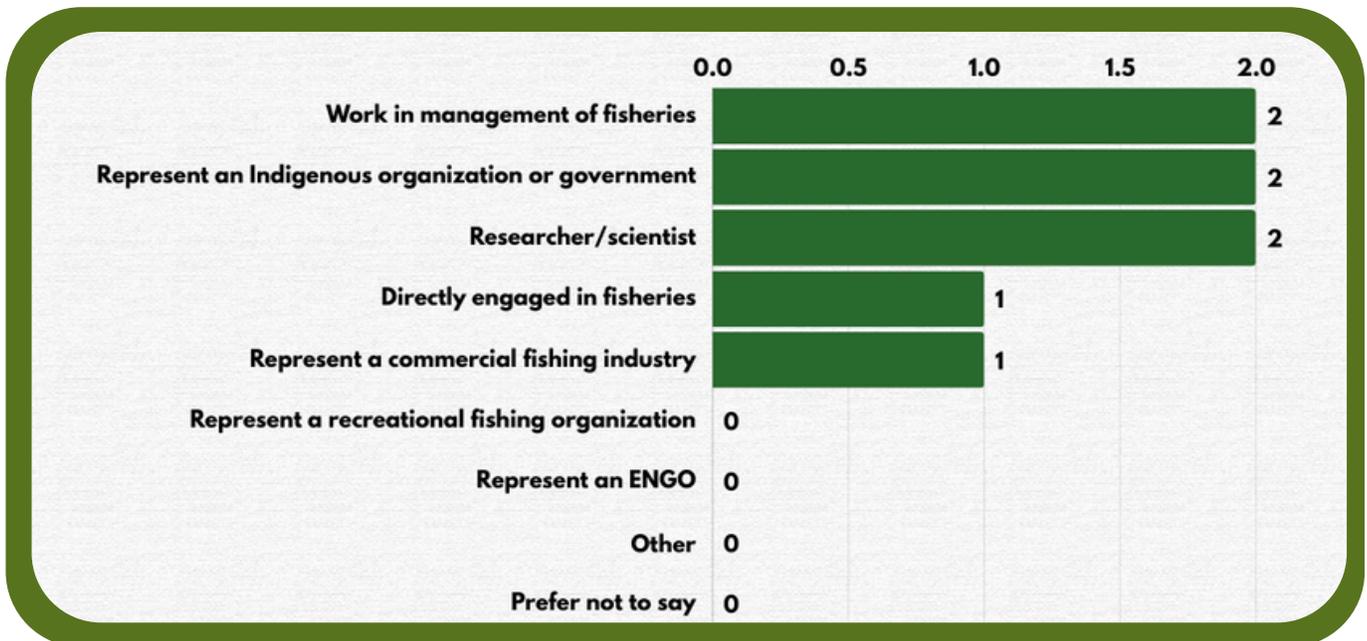
Clear and accessible communication:

Participants highlighted the need for communications about climate change to be clear and accessible, especially for Inuit communities that may face language barriers or limited access to technical information. They suggested that using plain language and ensuring materials are translated into relevant languages can enhance understanding and participation.

Results of the Polling Exercise

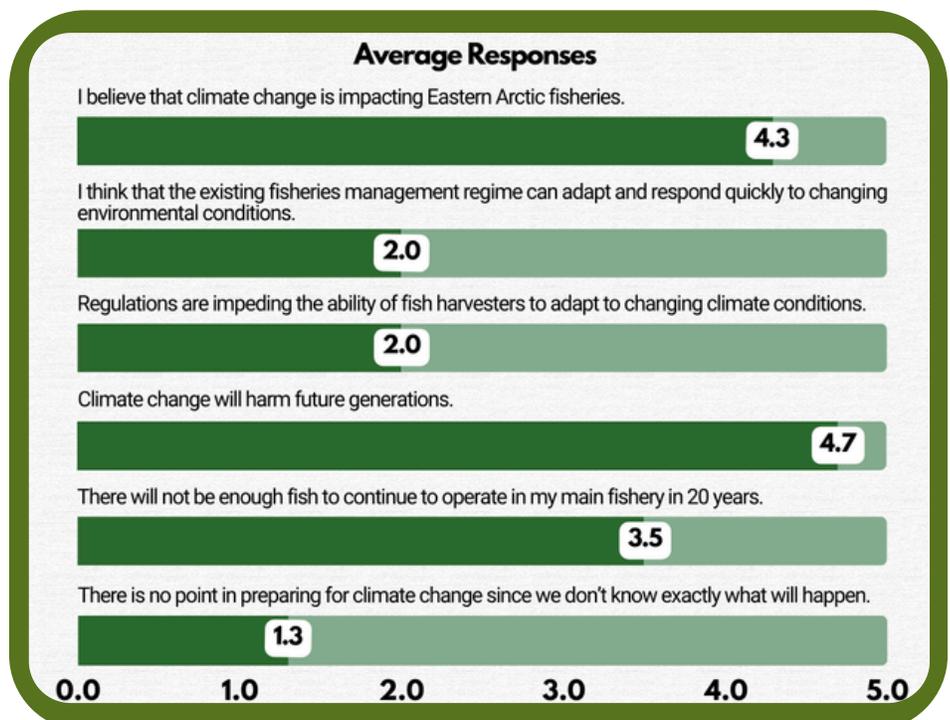
After the workshop, participants were asked to take part in an anonymous polling exercise. Participant responses are displayed below. Please note that Question 3 required participants to provide an open-text response; responses reflect the text as submitted.

Question 1: Choose all of the following that apply to you and your role:



Question 2:

On a scale of 1 to 5 (1 being the lowest and 5 being the highest), please indicate the extent to which you agree or disagree with the following statements:



Results of the Polling Exercise

Question 3: What could increase the agility and flexibility of the fisheries management regime to respond to future challenges?

Open text responses:

- Increased communication
- Arctic communities need investment in capacity and infrastructure. Commercial fisheries need flexibility in harvesting times and quotas. Researchers need greater data collection standardizations.

Participant List

Representatives from the following organizations, groups, ENGOS, institutions, and/or governments attended the workshop. In alphabetical order:

- Atlantic Groundfish Council
- Canadian Wildlife Federation
- Eeyou Marine Region Wildlife Board
- eOceans
- Government of Nunavut
- Kativik Regional Government (KRG)
- Kivalliq Wildlife Board
- Makivvik
- Marine Institute of Memorial University
- Memorial University
- Nature United
- Northern Coalition Corporation
- Nunavut Development Corporation
- Nunavut Fisheries Association (NFA)
- Oceans North
- Qikiqtaaluk Corporation
- Qikiqtaaluk Wildlife Board
- Regional Cree Trappers Association
- Torngat Joint Fisheries Board
- TriNav Fisheries Consultants
- Université Laval
- University of British Columbia
- University of Guelph
- University of Quebec at Rimouski
- University of Victoria
- Wild Ocean Research
- Windsor University

ADAPTING NEWFOUNDLAND AND LABRADOR FISHERIES TO A CHANGING CLIMATE

NOVEMBER 27, 2024



Executive Summary: Key Takeaways

Participants reported experiencing several **impacts as a result of climate change**, including:

- Species distribution changes.
- Temperature and ice condition changes.
- Changes to seasonality/timing of harvesting.
- Change in population abundance and productivity.
- Increase in frequency and intensity of storms.
- Invasive species and predation changes.

Participants reported **several threats to Newfoundland and Labrador fisheries** in the era of climate change, including:

- Lack of science and data, including robust stock assessment and surveys.
- Management challenges (lack of flexibility, cohesion, projections, modelling, etc.).
- Challenges in communication, education, and transparency.
- Difficulties with collaboration.
- Lack of resources and funds.
- Insufficient strategic plans, standards, and tools.
- Uncertainty about the impacts of climate change in the future.
- Threats to community and socioeconomic impacts for the area.

Participants are **taking actions to adapt to the impacts of changing conditions**, including:

- Looking into electric or low emission vessels.
- Adjusting to go out to harvest as early as possible within their harvesting season.
- Diversification of licence holdings.

Participants identified several key **barriers to adaptation**, including:

- Lack of data and scientific information.
- Slow and inflexible fisheries management incapable to keep up with the rapidly changing conditions.
- Lack of education/communication in sharing scientific information and building awareness on the threats of climate change.
- Limited collaboration opportunities between Fisheries and Oceans Canada (DFO) and Indigenous communities, industries, harvesters, and fisheries organizations.
- Lack of resources and funds to expand on research and better support harvesters and communities to adapt to climate change.

Participants identified several **actions and/or opportunities to support adaption** efforts, including:

- Improve education, communication, and collaboration between DFO and Indigenous communities, harvesters, industries, and fisheries organizations around data collection, research, management decisions, and policy planning.

- Expand data collection and analysis to include further information (such as climate change indicators in stock assessments).
- Further implement an ecosystem based approach to fisheries management and implement quicker and more flexible management processes.
- Develop a strategic plan with Indigenous Peoples, stakeholders, and communities to ensure more cohesive planning and decision making.

Report

Impacts of a Changing Climate and Barriers to Adaptation

How is climate change impacting your fisheries?

Workshop participants highlighted a variety of climate change impacts that have been noticed in Newfoundland and Labrador. The primary impacts expressed were: warming water temperatures, changes in ice condition, and increases in the frequency and intensity of extreme weather (e.g., storms).

Another important impact mentioned by many participants throughout the meeting is the change in species distribution. Participants explained that while this change can lead to positive impacts in certain communities, others may face negative impacts, including socio-economic consequences. They are also noticing changes in migration patterns, as well as in the reproductive and life cycle patterns of different species. Harvesters shared that it is now taking longer to access the stock they are fishing and also taking them longer to catch their quotas, partly because of these distributional changes. This not only has an impact on their costs (increased fuel costs due to traveling longer distances), but also on their safety (having to travel longer distances and spending more time on the water).

Participants also mentioned changes in the population abundance and productivity of certain species, leading to impacts on stocks and the outcomes of stock assessments. They noted that the rise in invasive species and changes in predation further complicate these challenges, with direct impacts on livelihoods and communal fisheries. Finally, uncertainty and unpredictability related to climate change and its impacts were recurring themes during the meeting. Changes in the timing and seasonality of various harvesting activities were noted as creating additional complexity.

What are your biggest areas of challenge and concern? What has changed the most?

Impacts from environmental changes are leading to significant challenges and concerns in Newfoundland and Labrador region. One major concern raised in regards fisheries management was: how can fisheries be sustainably managed with these changes happening, while also considering the socio-economic aspects of local communities? Participants are worried about managing fisheries in a way that both protects stocks, while also ensuring the viability of the commercial fishing industry in the future. They are worried about new species that are moving northward, including invasive species, raising concerns about the ability of fisheries management to respond. Participants also raised concerns

regarding “spatial squeeze” where increasing numbers of ocean users are limiting the ability of fisheries to easily adapt.

Another important challenge that was highlighted many times during the workshop is uncertainty. Participants felt that the uncertainty surrounding the actual impact of environmental changes on fisheries is very challenging. Some also expressed concerns around the communication of scientific information, particularly long-term projections (referring to a particular study with projections over the next 75 years). They highlighted that the uncertainties around those long-term projections need to be communicated carefully, as it affects harvesters’ ability to plan and sell their licenses in the future.

Participants attributed some of this uncertainty to what they perceive to be insufficient science, data, and stock assessments, which may complicate decision-making and hinder adaptation, potentially putting the livelihoods of communities on the line. Participants explained that sound decision-making and management requires robust science and data to provide a good understanding of what is actually happening. There was also concern expressed around having sufficient information to understand species interactions and the effects of climate change on ecosystems. They highlighted that distinguishing between climate change impacts and changes resulting from other stressors in the ecosystem (e.g., wind turbines affecting water temperature and microplastic impacts on certain species) is challenging. The current political context also raised concerns, especially with expected budget cuts.

In the face of uncertainty, some participants voiced frustrations with Canada’s fisheries management regime, which they felt tends to be overly cautious with quotas, relying heavily on the precautionary approach. In addition to the challenge of uncertainty, participants shared concerns regarding the governance of Canada’s fisheries overall. Workshop participants expressed a need to increase flexibility for DFO to address changes needed in managing harvesting practices and allocation (e.g., changes in timing and areas for harvesting), which also leads to reduced safety concerns. They shared that there is a lot of support from harvesters to increase both resources for stock assessments and transparency regarding where that funding goes, who receives it, and how it is allocated. They also indicated that consistent data collection by DFO from harvesters could be improved, along with ensuring to provide clarity when communicating across all generations, particularly with older harvesters.

Finally, there were significant concerns regarding the safety of harvesters related to climate change impacts. With the need to travel farther out for quotas and the increasing frequency and intensity of storms and extreme weather events, participants expressed concerns about the safety of harvesters on the water.

What actions are you taking to respond or adapt to the impacts of changing conditions?

A few key actions in response to the impacts of climate change were raised during the workshop. Participants mentioned a desire to change the timing of fishing seasons to adapt to the changing conditions (i.e., fish earlier in the season). They also noted actively

acquiring additional licences to diversify their portfolio and planning for the future state of the environment. Harvesters are looking into making the shift to electric vessels, hoping to help with greenhouse gas emissions, but also with the increasing cost of fuel brought on by longer fishing routes. Participants are also looking for DFO to increase flexibilities where possible. This would help harvesters avoid taking unnecessary risks at sea (e.g., more flexible fishing windows, allowing harvesters to choose safer times to be at sea).

Regarding research and decision-making, participants are keen to get more involved. They are looking for ways to bring information directly from harvesters to decision-makers frequently and quickly. Some participants have been exploring partnerships with DFO within their communities to do research on the changes that are happening and how their community could adapt to and benefit from them.

What do you think are the biggest barriers to adaptation?

For many of the participants, the biggest barriers to adaptation in Newfoundland and Labrador can be summarized into two broad categories: uncertainty and a lack of data and transparency.

Uncertainty was identified as one of the biggest limiting factors to adaptation. Participants explained that shifts in seasonality and the optimal timing of harvest could change from one year to the next. Participants noted that consistent alignment of season dates with these will reduce challenges to business planning. They also raised that there is uncertainty in the complexity of ecosystem changes in knowing what changes are due to climate change and what changes are due to other factors. The compounding impacts from other environmental drivers, aside from climate change, also makes adaptation difficult for everyone.

Regarding the lack of data and transparency, communities want to work in partnership with DFO to conduct research on the changes they are seeing and how to improve the situation for their communities. Having an efficient process to share observations with DFO would help improve data sufficiency. Participants also expressed that increased sharing of information and data by DFO would improve the ability of harvesters, industries, and communities to adapt.

Funding was another barrier mentioned during the workshop. It was highlighted that in order to have better core science, sufficient, improve data and enhance management, there needs to be investments made. Participants noted that there is a growing demand for scientific information with smaller budgets, and explained that while there have been many studies and policy changes, there remains great opportunity to increase engagement by consulting with harvesters.

Looking to the Future

What is your future vision for climate-adapted fisheries in Newfoundland and Labrador? What does success look like?

Workshop participants shared different elements of their future vision and what success would look like for climate-adapted fisheries in their region. A key element was the goal of having well-managed fisheries in the future that are both profitable and sustainable. This would require having the capacity, resources, and information needed to make informed decisions, ensuring commercial fisheries can produce food for the world and provide economic opportunities for harvesters and their communities.

Participants shared that fisheries management would need more flexibility, more engagement from harvesters in decision-making, and processes that would allow for quicker decision-making. They mentioned that this could include dynamic reference points and systems in place that are built to adapt by default, instead of having to go through regulatory frameworks to make changes. Participants expressed that their ideal future vision would include a plan for minimizing risks for harvesters and reducing safety concerns (e.g., addressing safety concerns related to timing, areas for harvesting, and extreme weather events like storms).

An ecosystem-based approach for managing fisheries was highlighted as an important initiative for climate-adapted fisheries. Participants emphasized that this should include having the proper tools and frameworks for better planning, in addition to a common definition of an “ecosystem approach” to build a solid foundation. This approach should also take species interactions and environmental conditions into account, helping to protect ecosystem productivity in a sustainable way.

Participants also envisioned a future for Canada’s fisheries that would include state-of-the-art and robust core stock assessments and modelling that factor in environmental variables. They emphasized that climate indicators should be integrated into stock assessments and management processes to better understand the changes happening and distinguish between long- and short-term trends. Participants noted that consistency on what is measured across all assessments and the capacity to support these robust stock assessments would allow for forward-looking management that considers the long-term sustainability of fisheries.

A few other elements of the participants’ vision of the future include: vessels running on renewable energy (including electric or low-emission vessels); stability in access and allocation; greater transparency and collaboration in fisheries for decision-making; investment in education for future generations of harvesters; improved domestic market access; protection of food security; and, enabling a diversification of fisheries.

What are the best opportunities to support adaptation to get us there? These can include individual and/or collective actions.

One of the main points discussed was the need to work collaboratively to resolve these complex issues. Participants noted that this means communities working in partnership with DFO to conduct research, industry collaborating on data collection, analysis, and research, and increasing Indigenous-led science, research projects, and opportunities. They also highlighted the importance of continuous dialogue with representatives from various harvesting interests to discuss priorities, and the sharing of resources and

information among all parties involved (DFO, industries, etc.). They would like this to involve making investments of both money and resources to better share information and understand climate impacts. Participants also raised the importance of transparency in funding, for example: showing what funding is available, how money is spent, and what scientific capacity exists for specific stocks in various regions. Participants indicated that transparency would help build trust between all parties, ensuring that the observations and considerations of Indigenous Peoples, harvesters, industries, and communities are considered. It would also promote more transdisciplinary research and help reduce overlap between initiatives.

Further to this collaborative work, participants mentioned that it would also be important to have a strategic plan developed to ensure more cohesive decisions. This strategic plan would need to be built by engaging with Indigenous Peoples, harvesters, industries, and communities. Furthermore, it was suggested that scenario planning and mapping projections should be pursued to better understand natural variability and directional changes. Having greater information available would allow stakeholders to respond more effectively to sudden changes. Tools like artificial intelligence could help to process the data available. Participants further reinforced the need for implementing an ecosystem approach to support adaptation.

Finally, participants expressed the need to keep thinking about the long-term. For example, they suggested that DFO should be looking at the type of gear harvesters will need and the economic investments that might be needed to address the impacts from climate change. Safety was also identified as a key consideration for adaptation. Participants discussed how policy could help mitigate safety or economic concerns for harvesters. In this case, they noted that greater flexibility from both DFO and harvesters would be needed regarding seasonality, responsive options for harvesters, and the diversification of license holdings.

What is the most useful way to continue these conversations?

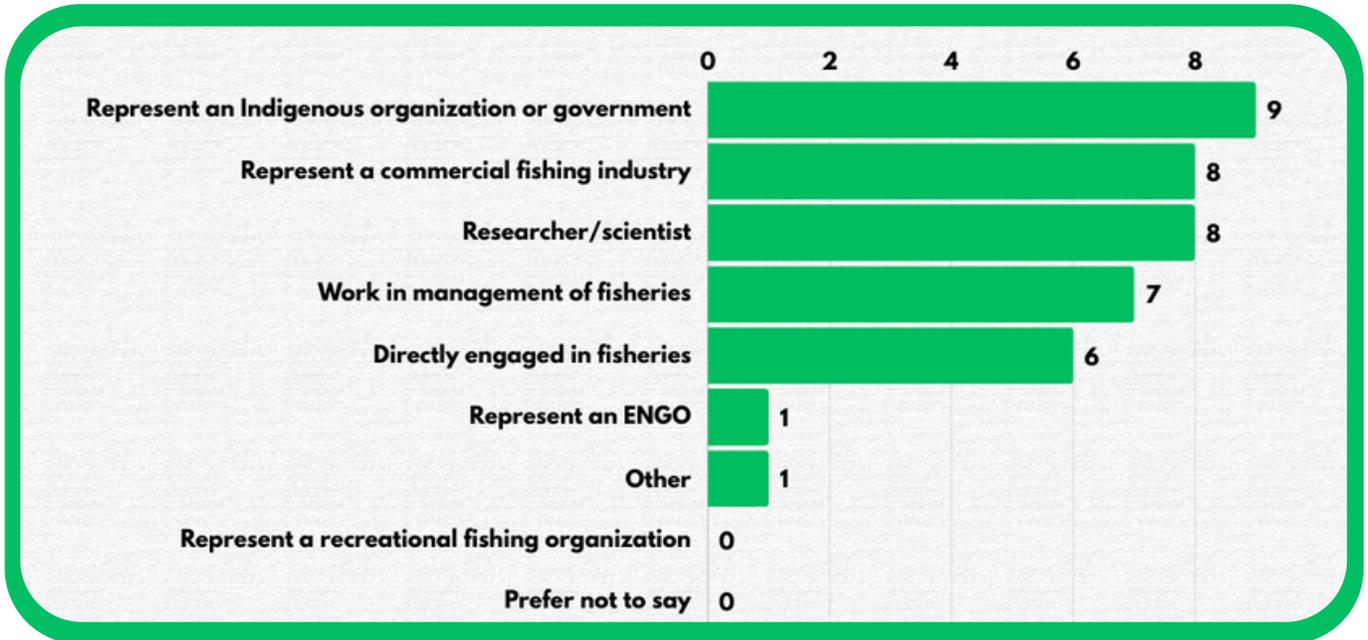
Above all, participants agreed that more opportunities for similar workshops and meetings like this one would be needed and that in-person discussions would be even more beneficial than virtual workshops. Many highlighted that industry representation at the workshop was low and that a greater industry presence would be beneficial for the discussions. Participants appreciated hearing from a diverse range of people and perspectives.

Participants added that engagement in strategic plans and priorities would also be a useful way to continue these conversations, ensuring that all voices are included and heard in the process.

Results of the Polling Exercise

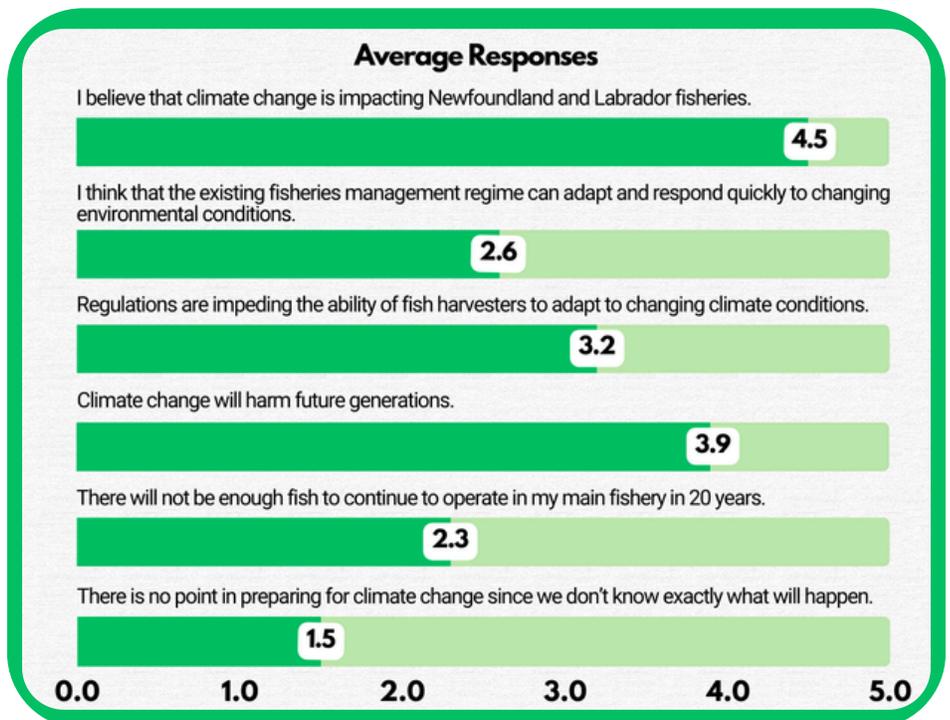
During the workshop, participants were asked to take part in an anonymous polling exercise. Participant responses are displayed below. Please note that Question 3 required participants to provide an open-text response; responses reflect the text as submitted.

Question 1: Choose all of the following that apply to you and your role:



Question 2:

On a scale of 1 to 5 (1 being the lowest and 5 being the highest), please indicate the extent to which you agree or disagree with the following statements:



Results of the Polling Exercise

Question 3: What could increase the agility and flexibility of the fisheries management regime to respond to future challenges?

Open text responses:

- Dynamic reference points.
- A national climate change strategy for fisheries, more resources (funding, human resources), political will to address climate change.
- Gather more information from harvesters. They are on or near the water every day and are therefore well positioned to see changes that are happening in the marine environment.
- Productivity based decision tools.
- To start chatting and doing more research with fishers and Indigenous Peoples.
- Multidisciplinary teams in science, including social sciences as fisheries are at the base of socioeconomic resources in coastal communities in Canada. Scenario planning is also a viable option.
- Work towards ecosystem-based fisheries management and use a climate risk index to determine how vulnerable commercial species/stocks are to different climate scenarios in the future.
- Incorporate local ecological knowledge.
- Faster response and inclusion of observational data in stock assessments. More emphasis on experimental fisheries to determine if observational data is persistent and repeatable.
- Increased resources for core fisheries science work (e.g., Management Strategy Evaluation development, Research Vessel (RV) surveys, availability of and succession planning for stock assessment experts, etc.)
- Transparency, more leverage to science.
- Tracking movement and seasonality. No relying on a single survey fixed in time (RV) or space (mackerel) without other data. Listen and respect on the water experience. Not projecting 50 years forward.
- Adaptive management, but this will be severely constrained/precluded by the precautionary approach and data limitations that will handcuff DFO management.

Participant List

Representatives from the following organizations, groups, ENGOS, institutions, and/or governments attended the workshop. In alphabetical order:

- Atlantic Groundfish Council
- Atlantic Policy Congress of First Nations Chiefs Secretariat
- Canadian Association of Prawn Producers (CAPP)
- Canadian Sealers Association
- Fish, Food and Allied Workers Union
- Gov. of Newfoundland & Labrador - Fisheries, Forestry and Agriculture (FFA)
- Innu Nation - Ueushuk Fisheries
- Marine Institute of Memorial University
- Miawpukek First Nation
- Miawpukek First Nation/Netukulimk Fisheries Ltd
- Nature United
- Newfoundland Resources Ltd.
- NunatuKavut Community Council Inc.
- Ocean Choice International (OCI)
- Oceans North
- Professional Fish Harvesters Certification Board (St. John's, NL)
- Qalipu First Nation
- Wild Ocean Research

ADAPTING GULF FISHERIES TO A CHANGING CLIMATE

DECEMBER 2, 2024



Executive Summary: Key Takeaways

Participants reported experiencing several **impacts as a result of climate change**, including:

- Major shifts in species distribution and declines in some fisheries. Participants noted the observation of shifting species distribution and migration patterns, and the decline in certain species including shrimp, mackerel and herring, and Atlantic salmon.
- Increased extreme weather events. Participants reported that increased intensity of post tropical storms, rising ocean temperatures and shifting currents are impacting the vulnerability of certain species and affecting maturation cycles.
- Participants reported an increase in the presence of whales and sharks, causing fisheries closures and gear adjustments.

Participants reported several **concerns regarding fisheries in the era of climate change**, including:

- Funding concerns: Participants were concerned with Fisheries and Oceans Canada's (DFO) ability to address climate-driven changes without expanded science funding, and noted that many cannot afford costs associated with adaptation.
- Data gaps: Participants communicated a need for more socioeconomic research on the impacts of climate change on resource users.

Participants are taking several **actions to adapt to a changing climate**, including:

- Enhancing the scope of research and monitoring of sharks and whale occurrence modelling
- Experimenting with and adopting the use of whale-safe (or ropeless) gear, allowing harvesting activities to continue in closed areas.
- Developing risk assessments, strategies and adaptation plans.

Participants identified several key **barriers to adaptation**, including:

- Slow and siloed fisheries management systems and regions, causing coordination issues and slow adaptation to climate.
- Lack of coordination among federal and provincial governments and fishing associations.
- Budget uncertainty and cuts leading to inadequate scientific data collection and analysis, leaving fisheries management decisions to be made using outdated information.

Participants identified several **key actions to help fisheries adapt** to climate change, including:

- Proactive and flexible fisheries management to account for the evolving challenges faced by harvesters, industry, and their communities.

- Implementing more inclusive, collaborative discussions within management committees to identify possible solutions for numerous groups.
- Increasing access for all resource users to more inclusive funding and programs to mitigate the high cost of adaptation.
- Raising public awareness on the impacts of climate change of fisheries, and the importance of fisheries as a vital link to food security in the Gulf.

Report

Impacts of a Changing Climate and Barriers to Adaptation

How is climate change impacting your fisheries?

Participants identified numerous concerns related to climate change and associated vulnerabilities, primarily the observation of shifting species distribution and migration patterns, and the decline in certain species including shrimp, mackerel, herring and Atlantic salmon. Impacts to habitats, the introduction of new and invasive species, and the resulting interaction between predator and prey are also a concern in terms of the impact on stocks, fisheries management decisions, and stability in fisheries. While many participants discussed the impacts of the significant decrease in Gulf shrimp, the possibility of success stories because of these shifts was identified, specifically the recovery of striped bass in the Gulf of St. Lawrence. However, as a primary predator for Atlantic salmon smolts, participants reported that the increase in striped bass has created conflict among fisheries due to the effects on smolt production and the resulting decline of salmon.

Participants noted that climate change seems to be impacting fisheries and aquaculture much sooner than anticipated, and expressed concerns regarding extreme weather events and patterns such as the increased intensity of post tropical storms, increasing water temperatures, atmospheric heat waves, and the shifting of the Gulf Stream and Labrador currents. Impacts included the vulnerability of certain fisheries during hurricane season, such as tuna, as well as season dates requiring modification in response to earlier warming of sea temperatures. Increased water temperatures have species-specific effects, including rapid changes in seasonality, maturation and molting, and overall quality of lobster, and increases in population in new areas creating perceived inequitable gains. Participants indicated that species like herring and snow crab are shifting their distributions toward deeper, colder waters and different regional territories, impacting existing harvesters and creating issues with gear requirements and policy conflicts.

Changing species distributions and stock rebuilding, while positive in some respects, were a concern for participants who have been impacted by increased sightings and incidental deaths of North Atlantic Right Whales (NARW) and the presence of white sharks in the Gulf of St. Lawrence. While generally beneficial from a conservation perspective, recovering stocks increases prey for sharks and consequently increases their interaction in fisheries and humans. Increasing water temperature has impacted both the timing and migration patterns of NARW, causing them to shift away from traditional feeding areas. This

increased presence in the Gulf directly impacts the ability for some harvesters to fish due to fisheries closures, and participants indicated that responsive efforts, such as changing gear to adapt to closures, only works for certain fisheries.

Along with these impacts, we heard significant concerns from participants related to the future stability and predictability of future fishing in the Gulf region, specifically the ability for fisheries management decision-making processes to become responsive and adapt to climate change. Many participants expressed concern related to a perceived lack of timely science data collection by the Department and the knock-on effects to fisheries like Gulf shrimp.

What are your biggest areas of challenge and concern related to these climate impacts?

Changes in seasonality came up in discussion with participants frequently, specifically the increased need to adjust season dates due to rising sea temperatures, changes in species abundance, and most notably the impact of shifting NARW migration patterns and timing. Participants noted that these increased whale sightings significantly influence their ability to plan fishing expeditions due to the short evacuation period, the magnitude of area covered by a closure, and the inability to effectively track and predict the presence of whales.

The reduction of Total Available Catch (TAC) in some fisheries due to changes in distribution, increased predation, and changing ocean environment (most notably Gulf shrimp) has caused concern for many participants wondering how other fisheries may respond to these changes and, in turn, how DFO will continue to manage decisions in an effective and time-sensitive manner. Participants shared that the decrease in TAC for Gulf shrimp created considerable difficulties for not only harvesters to maintain their livelihoods but also caused serious financial problems in a fishery with a high debt burden.

Additionally, impacts were also felt by processors and plant workers, who were forced to lay off staff, shut down operations, or transform their facilities in order to process different species.

Participants identified that there is an opportunity for DFO to increase the amount of social science research being conducted, which would help to more effectively measure the impacts of fisheries management decisions on people and their communities. They expressed that the resources needed to conduct relevant research and timely tools to inform communities, managers and decision-makers can be difficult to obtain, the process to obtain them is rather lengthy and the amounts are not sufficient to have an impact quickly or as nimbly as is required. Participants felt that increasing overall accessibility to these tools and ensuring that harvester data and feedback regarding issues identified during a fishing season will better enable participants to effectively conduct their business planning. Many expressed the need for more opportunities to communicate with DFO, as well as expanding the breadth of membership in some fora in order to include additional perspectives that could provide a more holistic representation of what is “happening on the water,” including fish processors and buyers. They felt that this approach would improve the Department’s access to available data and ensure a more thorough audience is

receiving information that can impact the productivity of coastal communities quickly and more effectively.

The centre of many of the identified challenges includes the difficulty in securing appropriate funding and the perceived lack of considerable investment by DFO into solving increasing complications associated with shifting environmental conditions. Participants noted that improved accessibility of funding by DFO would help make the decision-making processes faster, more efficient, and more flexible, and provide the resources required to conduct accurate and timely research. Many noted that there is a need to adapt the way that problems are identified and solutions are synthesized as a result of climate change. Some expressed frustration with a perceived lack of timely and efficient adaptability in fisheries management decisions, indicating that it is often the case that as they finally become adapted to a change, another is required, and the cycle begins again. Many find themselves unable to financially afford the adaptation needed for new requirements or experience significant difficulty accessing funding outside of highly specified funding eligibility requirements.

Participants identified that funding offered by DFO (such as the Fisheries Funds) is typically too restrictive, focusing more on research and development projects than providing appropriate adaptation assistance to both harvesters and industry. The inability to predict the next big “boom or bust” also has substantial effect on income reliance with a reverberating impact within communities in terms of livelihoods and the ability for harvesters and industry to plan their businesses from one season to the next.

What has changed the most in your fisheries?

Participants reported that shifting species distributions are making fisheries more complex to manage, along with rising predator populations that are threatening other species (e.g., such as Striped bass which are threaten species like lobster and Atlantic salmon). Rising temperatures have driven some species into colder, deeper depths which can conflict with species-specific gear, vessels, and enterprise capabilities. Other fisheries are experiencing a significant increase in severe weather events, creating harsh conditions and heightened safety risks. Finally, many participants spoke to the increased presence of NARW adding stress to local economies due to closures and interruptions to fishing accessibility, but also to harvesters themselves.

What actions are you taking to respond or adapt to the impacts of changing conditions?

Participants shared several ongoing and planned actions aimed at adapting to the challenges posed by climate change. Several examples of responsive adaptation actions taken were shared by participants, including:

- Experimenting with and adopting the use of whale-safe (or ropeless) gear, giving interested harvesters the opportunity to fish in areas closed due to NARW.

- When funding is denied, pooling resources and shouldering the cost of new gear types to maintain resilience.
- Collaboration between academia and harvesters in the development of ropeless gear trials and accompanying criteria and standards to evaluate various whale-safe systems.
- Creation of the CanFISH Lending Gear Program, which lends new and adaptive whale-safe gear to harvesters shut out of fishing areas due to NARW closures.
- Development of Provincial Climate Change Risk Assessment and Adaptation plans, along with funds to support projects related to climate change such as whale-safe gear, local food, and fishing diversification efforts.
- Increasing the scope of research and monitoring of sharks and whale occurrence modelling.
- Diversifying markets and products with a focus on quality over quantity.
- Exploring Adaptation Fund development.
- Development of Seafood Sector Risk Assessment and Adaptation Strategy.

These collective efforts reflect a comprehensive and multi-faceted approach to adapting to the challenges posed by climate change, with a strong emphasis on research, innovation, collaboration, and the integration of both environmental and social science considerations.

What do you think are the biggest barriers to adaptation?

Some of the most significant barriers identified by participants centre around departmental decision making and internal operations. Many noted that, after over a decade of discussions, the continued focus on the ecosystem approach to fisheries management often loses momentum due to staff turnover, a lack of consistent budget approvals, and a slow science process. Others noted that with the changes to biology and behaviour occurring more rapidly than the publication of pertinent scientific data, there is a need for DFO to adapt surveying methodology and timing to be more reflective of the current state of fisheries.

Another discussion noted the fragmented regional organization of the Department was possibly creating an unintended obstacle to engaging appropriate teams required to enable the effective sharing of experiences and best practices in Atlantic Canada. However, participants felt that developing and maintaining a unified and collaborative forward trajectory would be enabled by adapting regionally-specific policies and practices, as well as internal governance structures, to ensure consistent practices and common client service delivery methods.

Participants identified that increased coordination among federal and provincial governments and fishing associations is key to enabling cohesive and collaborative approaches to fisheries management built from shared experiences – visibility in what

partners are doing facilitates precise and accelerated interventions that will positively impact the fish and seafood sector as a whole.

What do you need to better adapt to the impacts of changing conditions?

Participants highlighted several areas of support that are needed to better adapt to climate change, focusing on proactive, flexible approaches to fisheries management and greater collaboration. The following key themes emerged at the workshop:

- **Proactive and flexible management:** Participants stressed the importance of adopting a proactive, flexible fisheries management approach that takes into account the evolving challenges faced by harvesters, industry, and their communities. This includes a deeper understanding of species-specific challenges, improved communication quality and speed, and inclusive fisheries management decision-making. Suggestions included added research efforts to gather data on reproduction, larval survival rates, mortality rates, and species recruitment, along with changes to advisory board membership, acceptance of citizen science, and more reactive decision-making. The need for large, targeted investments was identified as a requirement to support rapid and effective adaptations in the absence of a faster regulatory development and implementation process.
- **Transparency and inclusivity in decision-making:** A key theme was the need for clearer communication and a more inclusive decision-making process. Participants called for more specificity in conveying the information and considerations behind fisheries decisions. They emphasized the importance of improving understanding among harvesters about the complexities of these decisions and called for DFO to review its processes to become more agile and responsive. They also identified room for improvement by increasing transparency between DFO and the sector when it comes to conversations about climate change and the impacts to fisheries, as well as regional communication and collaboration across DFO. Expanding the breadth and focus of scientific research was seen as a critical step for DFO to take in order to gather data required to answer new questions arising from the impacts of climate change.
- **Financial stability and accessibility:** Participants called for more certainty in helping harvesters to secure financing for rising operating costs, such as the need for new and adaptive technology, fuel prices, and the impending uncertainty of the impacts of a new American administration such as customs and/or tariffs.
- **Comprehensive approach to fisheries management:** Given the increasing impacts of climate change, participants urged DFO to take a more comprehensive approach to fisheries management that incorporates social aspects into policies. Social, cultural, and economic considerations must be included in setting long-term goals.
- **Relationship building:** Conflicts among harvesters are increasingly being seen in highly lucrative fisheries such as lobster and elvers, creating unsafe environments and bolstering a belief that compliance is being sacrificed for financial gains and

motivations. Participants felt that increased enforcement activities would reduce conflict among harvesters while enhancing trust between the sector and DFO.

In summary, participants called for more flexible, inclusive, and transparent approaches to fisheries management, recognizing the evolution of challenges presented by climate change and incorporating a more holistic approach that integrates the perspectives and knowledge from various groups. Improving data collection and financial stability, building comprehensive and inclusive management processes, and repairing relationships are seen as first steps in working towards more resilient fisheries.

Looking to the Future

What is your future vision for climate-adapted Gulf fisheries? What does success look like?

A key priority identified at the workshop was minimizing silos in the fisheries sector and reducing conflict, as well as working together and in consultation with as many resource users as possible. A collaborative approach encourages increased access to many different types of solutions from a broad spectrum of groups, leading to an enhanced decision-making process that is responsive to a wide breadth of concerns and issues. Participants noted that while the future vision of fisheries is one that ensures climate-adaptability to support the health of fish populations and the ecosystem, it must also concurrently nurture the sustainability of communities central to the fishing industry and contributors to the local coastal economy.

Participants shared numerous important perspectives defining what a future vision and success could look like. There was significant consensus that the key signs of success would be DFO's transition from reactive fisheries management to a more proactive approach. This would include using holistic scientific data to provide more comprehensive advice related to the full life cycles of all species, while incorporating the use of different decision-making functions and methodologies such as scenario planning or 'foresighting' exercises. This would allow resource users to better predict possible outcomes in different scenarios and to anticipate potential future impacts. A more comprehensive approach would enhance stakeholder's abilities to weigh the trade-offs of different possible scenarios (e.g., consequences for the stock, consequences for the economics of the fishery, as well as consequences for the social dimensions of coastal communities).

Examining how other countries manage fisheries resources and markets in the face of climate change was seen by participants as a key step in finding new and innovate ways to adapt Canadian practices to reflect more modernized approaches to fisheries management. For example, Alaska's co-management models were referenced as a possible solution to ensuring a broad spectrum of interests and ideas are captured when making decisions. Additionally, transitioning from single-species fisheries to more adaptable multi-species fisheries was also suggested.

Considering recent distributional shifts and Total Allowable Catch (TAC) reductions, participants noted that the development of fisheries that are focused more on quality,

rather than quantity, would help maintain healthy and resilient stocks, as opposed to the existing regime of economically-focused over-exploitation. Participants noted that this would require additional research to find new and effective ways to manage fisheries in ways that allow for profitability while keeping resources in the Gulf healthy, such as incorporating more innovative technologies that are accessible to harvesters and industry.

Participants shared that a more harmonious consultation process with stakeholders in the fisheries management process would be an important signal of success. Enabling information sharing between DFO and the resource users would bolster collaboration among groups. It would also provide an opportunity for fresh ideas and new perspectives to be built upon the vast knowledge of harvesters and industry. Participants also highlighted that expanding membership inclusivity in management committees and boards would have a significant effect on resource users by enhancing a stronger, more integrated sense of connection between government and coastal communities.

Finally, participants noted that improved quality and quantity of research efforts and scientific data would increase support to industry when facing challenges with the rising prevalence of diseases, predation, storms and weather events, and shifting migration patterns. Participants suggested that advancements in data collection would better inform resource users and enable them to make adaptive decisions in response to rapid environmental and social changes, while being nimble and flexible enough to prepare for future challenges. Ensuring that science receives the appropriate levels of funding to support our understanding of, and response to, the escalation of climate-related impacts being observed in the Gulf is seen as paramount to successfully implementing an adaptable and resilient fisheries management regime.

What are the best opportunities to support adaptation to get us there?

Participants identified several important opportunities to better position Gulf fisheries to respond to the challenges posed by climate change. These actions focus on improved and more inclusive collaboration efforts, making concerted efforts to understand underlying drivers of climate change, and co-developing a new culture of fishing to help evolve into a more responsive, adaptable, and flexible regime.

- **Inclusive collaboration within management committees:** Participants stressed the desire to include a wider breadth of membership at committees to ensure a more holistic exchange of cross-cutting issues that overlap with many interests. Including communities, associations, industry members and harvesters, along with those focused on ecosystem management was seen as key to creating synergies and identifying possible solutions that help more than one group.
- **Public awareness:** Participants highlighted the need to raise public awareness about the impacts of climate change on the fish and seafood sector, including the shared responsibility across all resource users, such as Indigenous groups, commercial operations, and industry. Participants emphasized the importance of educating the public about the impacts of climate change on our oceans and fishing sector, and the vital link between fishing and food security. Participants also felt that fishing

should be reframed from an ancillary activity limited to small rural communities to an integral part of Canada's environmental sustainability and national food security, similar to agriculture.

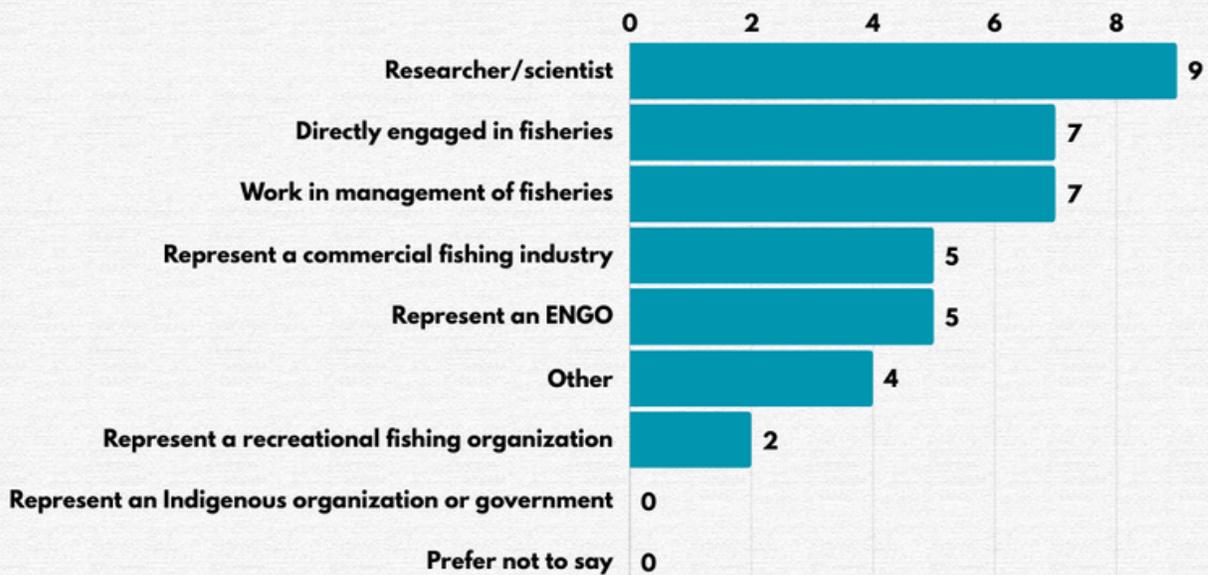
- **Education and training:** Participants underscored the importance of incorporating education to harvesters and resource users as part of their training to ensure that their knowledge of existing challenges related to climate change and the continued risk of new and more complex ones and how these will impact their businesses. Participants felt that by providing more awareness of existing risks and sharing experiences, resource users will be able to make more informed decisions when starting up and maintaining a business in the fishing sector. This could potentially help to reduce the request for and reliance on financial support and subsidies.
- **Restructuring fisheries management:** Participants noted the urgent need to restructure and adapt fisheries management decisions to more accurately respond to current and future uncertainties and challenges facing the sector. This includes moving from a single-species to multi-species approach, and pursuing adaptable management that better allows for responsiveness to change. The accelerating impacts of climate change were cited as a major driver of this need. Participants also pointed to the necessity of modernizing stock assessment methods—such as moving away from fixed survey locations—to reflect shifting species distributions.
- **Access to funding and programs:** Participants identified increasing access to funding and programs that are inclusive as a key enabler of adaptation. Participants noted that even with new advancements in technology designed to be more sustainable and adaptive, it is the prohibitive cost that prevents many resource users from adopting new designs rather than resistance to change. They explained that supporting small fishing businesses in becoming resilient requires appropriate funding options to enable the implementation and use of new technology and gear, and diversifying fishing portfolios. The creation and or/expansion of insurance programs was also suggested to help reduce costs related to sudden TAC declines or other market shocks, as well as increased weather-related damage to infrastructure and gear.

To ensure the resilience of Gulf fisheries to respond effectively to climate change, participants indicated that increased and inclusive collaboration and more proactive approaches are needed, with key actions including ensuring more inclusive consultation processes, diversifying the sector, and increasing public awareness. Participants felt that a long-term commitment to adaptability and sustainability, with a focus on protecting vital areas and fostering innovation, will be critical in navigating the climate uncertainties of the future.

Results of the Polling Exercise

During the workshop, participants were asked to take part in an anonymous polling exercise. Participant responses are displayed below. Please note that Question 3 required participants to provide an open-text response; responses reflect the text as submitted.

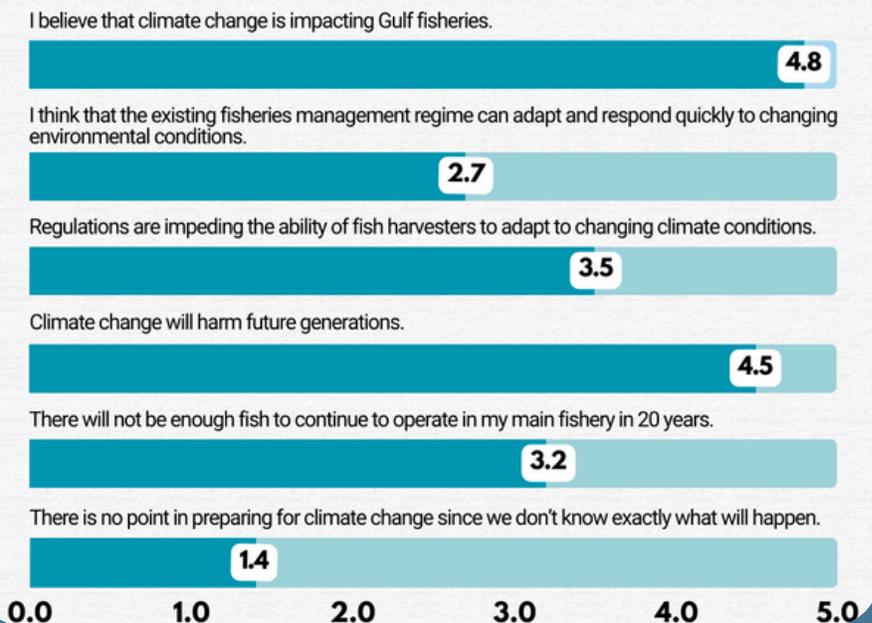
Question 1: Choose all of the following that apply to you and your role:



Question 2:

On a scale of 1 to 5 (1 being the lowest and 5 being the highest), please indicate the extent to which you agree or disagree with the following statements:

Average Responses



Results of the Polling Exercise

Question 3: What could increase the agility and flexibility of the fisheries management regime to respond to future challenges?

Open text responses:

- More communication between harvesters and DFO, proactive/adaptive management.
- Have more conservation measures with adaptive structure for fisheries restrictions, comparable to the NARW adaptive management examples.
- Include as much data on climate change outcomes in each assessment and stop managing by socioeconomic considerations.
- Ethical, transparent collaboration and real-time fisheries assessments that combine with other sources of data (e.g., whales, pollution).
- More support for climate research, core DFO research (stock assessment), a national climate adaptation strategy for fisheries, a greater separation of science and politics at DFO.
- Increase environmental monitoring and speed up the process of stock assessment year-to-year.
- To get predictions of the impact of known climate change effects on various stocks and find ways to mitigate rather than remediate.
- Region-based approach and approvals rather than Ministerial level where delays and decisions impact capacity and ability to fish responsibly.
- Greater prioritization of climate adaptation and funding. Less interference of political interests, more of DFO science and advice. A unified approach (e.g., National Adaptation Strategy).
- Maintain detailed actions to ensure knowledge transfer to future managers.
- Fisheries management in Canada requires fast tracking toward full adoption of ecosystem management. At this point, focus appears to be on single species and single issues.
- Rebuilding depleted fish populations in place now will aid fisheries management to be flexible in the future. Implementing rebuilding plans for depleted stocks is required for climate resiliency.
- Some experience or mentorship prior to elevation to program or fisheries lead position.
- Clear top-down national policy guidance.
- Decisions based on science and accurate data reporting become more efficient to help policy and regulations adjust with input from key stakeholders.
- Integrate the precautionary approach into fishery management regulations; implement science recommendations in advance of stocks becoming critically depleted and supplement fisheries when needed.
- Revisiting business models.

Results of the Polling Exercise

Question 3: What could increase the agility and flexibility of the fisheries management regime to respond to future challenges? (continued)

- Change accounting practices.
- Secure income (citizenship income) to reduce the precarity of fishermen's helpers and dependence on coupons.
- Reliable, high-quality and rapidly available data. Prediction models that take climate change scenarios into account.
- Enhancing the value of an industry focused on the local distribution of resources.
- Rethink the licensing model (speculative-pension scheme).
- Develop operating models based on a collective approach, so that the burden on individuals is minimized (including debt) and the community impact of fisheries is enhanced.
- Putting more emphasis in collecting harvester data.

Participant List

Representatives from the following organizations, groups, ENGOS, institutions, and/or governments attended the workshop. In alphabetical order:

- Area 19 Snow Crab Fishermen’s Association
- Association des pêcheurs spécialistes de poisson de fond
- Atlantic Salmon Federation
- Canadian Wildlife Federation
- Connor Bros / Clover Leaf Seafoods
- Dalhousie University - Ocean Frontier Institute
- Elsipogtog First Nation
- eOceans
- Foundation for Conservation of Atlantic Salmon
- FRAPP
- Gulf Nova Scotia Fishermen’s Coalition
- Maritimes Fishermen's Union
- New Brunswick Department of Agriculture, Aquaculture and Fisheries
- New Brunswick Aboriginal Peoples Council
- New Brunswick Wildlife Federation
- North of Smokey Fishermen's Association
- Oceana Canada
- Oceans North
- Ocearch
- PEI Department of Fisheries
- PEI Snow Crab Fisherman Inc.
- Tuna Charters Nova Scotia Association
- University of Laval
- University of Quebec at Rimouski
- Wild Ocean Research

ADAPTING QUEBEC FISHERIES TO A CHANGING CLIMATE

DECEMBER 4, 2024



Executive Summary: Key Takeaways

Participants reported several **impacts of climate change**, including:

- Environmental changes (increased water temperature, decreased oxygen levels in the water, and changes in ice cover).
- Changes in species distribution, life cycles, and fishing conditions and seasons.
- Increased costs for industries in terms of infrastructure and investment.

Participants reported several **threats to Quebec's fisheries** due to climate change, including:

- Slow and rigid management and regulatory systems, as well as concerns about the science that guides forecasting and decision-making for fishing activities.
- Challenges in terms of resource abundance (increase for some and decrease or even closure of fishing for others).
- Species-specific models and market unsuited to the continual changes of the ecosystem.
- Concerns for the health and safety of harvesters who face more difficult fishing conditions and spend more and more time at sea.

Participants are taking **several actions to adapt to changing conditions**, including:

- Developing new markets in order to create better market diversification.
- Working to diversify licence portfolios to better adapt to changing environmental conditions.
- Putting greater emphasis on the valuation of catches: fishing less but adding value to the product.

Participants identified **several key barriers to adaptation**, including:

- An increase in the operating costs of a fishing business, which leads to a culture of overfishing, bankruptcy situations, and impacts on the mental health of harvesters.
- Slow and inflexible licensing and regulatory system, unable to keep pace with climate change.
- A perceived lack of cooperation between Fisheries and Oceans Canada (DFO) and the many other players in the fishing community.
- Lack of essential knowledge and data on the ecosystem and on the evolving environmental conditions.

Participants identified **several key actions to help fisheries adapt to** the changes, including:

- Amending policies and regulations to allow for simultaneous multi-species fishing and to develop methods to add value to bycatch that will minimize waste and encourage conservation.

- Improving Indigenous representation in the decision-making process, allowing for better knowledge sharing to improve the status of the fishery.
- Greater collaboration between DFO and the various stakeholders in the fishing community to improve data collection and use, while increasing at-sea sightings.
- Promoting Quebec fishery products and prioritize local markets.
- Being proactive in actions that respond to climate change and mitigate uncertainty.
- Developing the aquaculture sector to reduce pressure on resources and to be more resilient.
- Bettering support from DFO to enhance the value of the fishing profession and ensure their safety.

Report

Impacts of a Changing Climate and Barriers to Adaptation

What is the impact of climate change on your fisheries?

The discussion identified a variety of impacts of climate change on fisheries in the Quebec region. The most notable environmental change already being noticed by the participants are changes in water temperature. Some participants noted that the increase in water temperature seems to lead to a decrease in catches in some cases and seems to be ideal for the recruitment and life cycle of other species. Decreasing oxygen levels in the water was also raised. They also noted that the acidity level of the water has already changed, leading to difficulties for the growth of some species (e.g., bivalves that rely on calcium carbonate to build and maintain their shells). Harvesters also reported that ice cover appears to be generally retreating earlier in the season, which may have positive effects (opening of harbours and fishing activities earlier), but may also have negative effects on some species and fisheries. Finally, increasing coastal erosion has been observed, which has an effect on habitat.

Participants reported that they have noticed changes in the distribution of species, with these shifts having positive impacts for some but negative impacts for others. For some species, their yield and population have increased (resulting in larger landings), while other species have seen a significant decrease (some fisheries have even been closed altogether). Many harvesters reported that the movement of species have led to changes in fishing seasons, compared to previous years. This redistribution of species also has an effect on predator-prey relationships, with some even noticing the arrival of new predatory species, thus impacting the entire ecosystem. The redistribution of species was also reported to be affecting major commercial fisheries and their infrastructure, which in turn affects the harvesters and their communities. Finally, participants pointed out that changes in the distribution of species also have broader impacts, such as the presence of whales that influence a variety of fishing activities in the region.

Participants noted that climate impacts in the region are increasing the uncertainty about seasonality, fishing conditions and the species that can be fished. They explained that the abundance of some species can vary from year to year and unreliable data is making it difficult to plan future fishing activities. They pointed out that it remains difficult to say whether these variations in abundance are actually related to climate change or rather to other normal changes in the ecosystem or other factors. Participants pointed out that fishing patterns have changed in recent years, shifting the fishing locations for some species. They noted that warming waters, which currently seem ideal for the recruitment of certain species in the region, could eventually become too warm if water temperature continues to rise, which could lead to a reduction in catches. Additionally, the workshop discussions reported that people in the region are seeing an increasing number of storms and that they are also stronger than before. Harvesters must be on alert at all times, as conditions can change quickly.

Participants shared that the impacts of climate change are being felt by industry through rising costs. They noted that climate change has an impact on commercially-fished species, as well as on fisheries infrastructure (such as harbours and processing plants). Participants also emphasized that growing uncertainty complicates investments that involve greater risk-taking. Harvesters noted that vessels are getting larger to be better adapted to stronger currents and winds resulting from climate change, which also leads to increased costs.

In addition, participants mentioned that the impacts of climate change are affecting the growth and life cycle of some species, which no longer appear to be growing at the same rate or are laying eggs much earlier in the season. These changes are affecting harvesters, who are reporting challenges with finding the stocks towards the end of their fishing season. Additionally, participants noted that some species are having more difficulty adapting than others, which limits the ability to make accurate projections for these fisheries. In some cases, participants explained that the declines of some species are affecting the ability of communities to maintain full fishing seasons.

What are your main challenges and concerns? What has changed the most in your fisheries?

Several challenges and concerns were raised, mainly in relation to the abundance of the resource, issues related to science and management of the resource, the adaptability of industry, and the safety of fish harvesters.

Participants spoke of significant decreases in certain species, as well as the warming of the water temperature, making them fear the potential collapse of some fisheries. Changes in ice cover are also a concern, as they are not predictable and can vary from year to year. With all these changes, fish harvesters have greater concerns about losing more fishing gear (ghost traps).

Participants also raised several challenges and concerns related to science and resource management. In the context of climate change, they feel that it is becoming even more important to have adaptive fisheries management, in order to better adapt to the impacts in the region. Given the variety of impacts in the Quebec region, participants suggested that the centralization of management decision-making could cause problems in terms of adaptation. They noted that management measures of the past no longer seem to “do the trick” and that the relative importance of different indicators is difficult to distinguish. Additionally, they were adamant that decisions must be made quickly to allow for effective adaptation.

Participants expressed concern that environmental changes appear to be occurring faster than the rate at which DFO can adapt its policies and regulations. There is also a concern about whether climatic factors, as well as other uncontrollable factors, are reflected in DFO's approach (e.g., predator/prey linkages and bycatch information). In terms of management, participants are concerned that they will have to repeat all of the work that has already been done to adapt their fisheries to North Atlantic Right Whale patterns. They worry about whether the whole process will have to be repeated every time new endangered species arrive in the area (e.g., the white shark). Regarding the licensing regime, they noted that climate change is occurring at such a rapid rate that it is felt to be exacerbating inequalities of the licensing system. They shared that long-term forecasting and operations planning are difficult and present a real challenge, especially when it comes to dredging harbours. Some also shared concerns about overfishing practices, which they felt is an important factor explaining the current state of fishing in the region. Harvesters noted that fishing has become an increasingly complex activity.

Participants expressed concern that the industry's reliance on a single-species model is ill-suited to the continual changes in the ecosystem. They noted that when new opportunities arise, responsibility should not rest solely with DFO; the industry itself must also be ready and adapt its infrastructure to climate change (e.g., vessels, equipment, and processing plants). Participants highlighted that the rapid pace of change presents many challenges, including complicating investment predictions and risk profiles from the perspective of lenders. In particular, participants reported that they are having difficulty deciding where to invest, both in terms of equipment and licenses.

Finally, participants are concerned that many harvesters will become exhausted more quickly, given that fishing conditions are more difficult. They reported that they often must go further out to fish for the resource and spend more time at sea, while also binding themselves to a greater number of rules. They also mentioned that a recent study highlights that the mental health of fishers in Quebec is affected by climate change.

What steps are you taking to respond to or adapt to changing conditions?

Participants shared a variety of different measures they have taken to adapt to changing conditions. They agreed that all players in the chain have a responsibility to play in the current context, regardless of what led to this situation, and that major changes will have to be put in place.

It was noted that industry has developed, or is in the process of developing, new markets to foster market diversification and reduce dependence on United States markets. Some participants also shared that they will adjust their activities due to changes in the species harvested. Harvesters are noticing an increased prevalence of species that were not previously found in their fishing areas, which could result in access to new fisheries for some harvesters. As a result, some harvesters reported that they are working to diversify their license portfolio in order to better adapt to the changing conditions of their environment. In addition, participants want to focus on making better use of their catches: fishing less but adding value to the product.

What do you see as the main barriers to adaptation?

Participants identified several barriers to adaptation in the Quebec region, including industry, markets, government, historical traditions and management.

At the industry level, it was noted that there is a problem related to labour and new operating costs. Participants noted that the expenses of a fishing company are no longer the same as in the past. For example, they have to pay more for security costs, insurance and employment insurance costs. In addition, the current market situation is a stressor for the fishing community. Participants explained that because fishing activities are currently concentrated on harvesting a very large volume of resources in a short period of time, it is not possible to sell all this volume locally in such a short period, even if there is a good market in Quebec. They noted that this demonstrates how the system seems to be more oriented towards an export market, even though the market is growing rapidly in Quebec. Participants explained that there is overfishing because harvesters have to repay their loans. All of this has an effect on the mental health and anxiety of harvesters, which is palpable right now, as is the uncertainty in the fishery, which also weighs heavily on communities. By being so closely linked to the market and investment, participants indicated that industry also has a role to play in the problem of adapting to climate change.

Participants highlighted that climate change is occurring at such a rapid pace that it is leading to inequalities in the sector, which are further exacerbated by the slow and stringent licensing system and affect the adaptive capacity of the environment. Harvesters noted that licences that are specific to species limit access to the resource and create a system that operates in a seesawing pattern alternating between boom-and-bust cycles. For example, it was expressed that shrimp harvesters should have been able to transfer their shrimp quota

to redfish directly, but that was not possible with the current structure of the system. In addition, harvesters have noticed that the value of licences have changed a lot: the return on investment is no longer always there, and they fear that this new reality does not encourage the next generation of harvesters to enter the industry. Participants also noted that the financial incentives put in place to help new entrants to the fishery sector could even potentially contribute to the problem, as licence “sellers” adjust their prices based on these incentives. Furthermore, they noted that the high value of licences combined with the increase in prices in recent years makes it very difficult for new entrants to access the fishery. They explained that industry is currently struggling to be economically prosperous as species are becoming increasingly scarce. Participants felt that major improvements that could benefit the sector would be to update the licensing system, which would allow for greater flexibility and the ability for adaptation and business planning.

In addition to this financial burden, more harvesters indicated that they are looking to diversify their activities, which implies an additional investment in their licences. Some even see their business put at risk in order to diversify their licences and activities. Harvesters find themselves putting additional pressure on the resource by overfishing in order to be able to repay their funding. Participants stressed that they do not know whether the resource will sustain their communities for a long time (fisheries often provide support, for example, in terms of education and social programs in communities). They also explained that they feel subject to over-regulation, which is expensive, and they do not have enough at-sea observers to enforce these regulations. Uncertainty and the difficulty of predicting what is coming remains a major barrier.

Participants admitted to feeling trapped by the regulations: species are adapting to climate change, but government needs to adapt at a more rapid pace. Participants suggested that increased speed in making changes to management rules are key to allow for adaptation and improved profitability (e.g., fleet rules, restrictions on simultaneous fishing and the obligation to release bycatch). They also noted that it is important to develop and implement intervention plans for species. Participants stated that DFO policies and regulations need to adapt more quickly to allow harvesters and industry to benefit from new species in their region.

Participants noted that there is opportunity for DFO to capitalize on harvester expertise. It was suggested that developing more inclusive and accessible approaches to receiving and considering information would increase collaboration, ease the facilitation of new projects, reduce the complexity of bureaucracy, and allow flexibility within the existing system. Participants also noted that there does not seem to be a sufficient number of at-sea observers to adequately cover the territory and the regulations in place. This, coupled with a lack of fulsome ecosystem data, leaves harvesters concerned that there may be too many resources being fished now—more than should actually be removed.

Many expressed that the ways of doing things still seem to be based on tradition, despite the fact that conditions have changed. They feel that fishing gear and seasons need to change, as do the quantities of fish removed. Participants noted that they are still working in a culture of quantity, where buyers (the vast majority of whom are American) want large quantities of fish, rather than smaller, higher-quality products. Canada should examine other countries who have made this change in culture, particularly as has been done in Europe.

Looking to the Future

What is your vision for the future of the region's climate-smart fisheries? What does success look like?

The vision of the future for fisheries in the Quebec region is one of collaboration, adaptation and enhancement. Many would like to see DFO develop methods to add value to bycatch to minimize waste and encourage the conservation of all bycatch. They would also like DFO to amend its policies and regulations to allow for a simultaneous harvest of multiple species at once, maximizing profitability by balancing costs and revenues and reducing operational costs. Participants want faster adaptation and more flexibility, as well as less centralization in management. Finally, participants said that there should be increased Indigenous representation in the decision-making process. They would like to be inspired and work together with Indigenous Peoples because they believe that the Indigenous harvesting system is in a fairly good position and seems to offer an interesting model of harvesting for their communities and of sharing resources.

Industry is interested in increasing their collaboration with DFO to improve the collection and use of data, as well as increase the number of at-sea observers. They suggest further exploring the option of hiring scientific staff for data collection on board fishing vessels. They think that the deployment of innovations and new technologies in the fishery, such as cameras and electronic logbooks, could improve data collection and sharing between DFO and industry. In the future, and in order to ensure success, the regions should all work more together and have more discussions with Indigenous peoples and harvesters' associations. Participants would especially like to have better predictive capabilities in order to be more proactive, and want to see decisions based more on science and less on policy.

According to the participants, an important element in ensuring a better future would be to conduct a communication campaign to help change the mindset of consumers to encourage the principle of "fish less, but fish better." People in the industry want Quebec products to be highlighted over imported products at the various sale outlets. They also want to see better promotion of Quebec products in provincial and federal institutions (e.g., in early childhood centres, hospitals and prisons).

We heard that, currently, the vision for success for the industry would be to have the ability to cover all its expenses and to be able to prepare for the next season. The industry would also like to see its image upgraded, which seems to have lost luster in recent years.

Participants indicated that in the future, there may be a need to consider increasing the presence of aquaculture in the province. Quebec has great water bodies and aquaculture could be a way to extend the seasons and be more resilient, while reducing pressure on natural resources. The participants noted that more and more products consumed are coming from aquaculture. There is also the possibility of encouraging greater market value for wild products as luxury products compared to farmed products. It was also mentioned that the future could lie in lesser-known species and that it could be interesting to innovate to develop new fisheries (e.g., starfish). Another vision for success would be to focus on local markets and further develop the province's food self-sufficiency. Participants would also like to see incentives to reduce vessel emissions, as they note that the trend seems to be going in the opposite direction with larger and larger fishing vessels.

The health and safety of harvesters is also an important consideration for the future. Participants want to see an improvement in mental health and a reduction in anxiety among harvesters for whom the uncertainty of the fishery currently weighs heavily within the community. They would like to see support from DFO to enhance the value of the fishing profession, as well as to ensure their safety and to further help them with new technologies.

What are the best opportunities to support adaptation to achieve this? These can include individual and/or collective actions.

The workshop discussions raised several opportunities to support adaptation in the Quebec region. Whether in terms of new species, management options or industries, a wide range of options were proposed by the participants. Given that there seems to be fewer resources to be fished, adding value to catch could be a way to maintain incomes. In addition, participants reiterated the importance of encouraging responsible, local and proud fishing, while taking advantage of new opportunities that may also arise from climate change (e.g., with the arrival of new species in Canadian waters and fishing activities in new seasons).

Several participants suggested regulatory changes to the licensing system and emphasized the need to address administrative delays. They would like the emphasis to be placed on the development of fisheries and on greater regulatory flexibility, both in terms of access to new species and for the adjustment of fishing seasons. They noted that the amendments should include concrete measures to encourage a multi-species and more diverse fisheries, with smaller quantities that would be taken at once for a single species. Several mentioned the importance of portfolio diversification and bycatch management for the future. They indicated that they should be able to conserve and value bycatches, as in some other countries. This would require changes to the content of the licence (i.e., licences that are issued by species), in order to allow the possibility of concurrent and simultaneous fishing. Participants also suggested that DFO should consider the possibility of implementing a fishing model where all catches must be retained and reported. They believe this model could allow for the commercialization and use of by-products from a variety of species. The desire to implement fishing quotas for all landed species was also raised. Participants noted that the biodiversity of an ecosystem is essential for the resilience of communities and that communities must be considered in these approaches.

There is also a desire to explore options that facilitate diversification and reduce industrial and single-species fisheries.

Participants also want to see a reflection on the value of licences or how to ensure a pension for harvesters without it depending on the value of the licence. It was also suggested that other fishing structures could also be explored in order to keep fishing revenues in the community. For example, participants suggested considering a collective multi-species pool model where licences could be leased to fleets in difficulty or to the next generation to help them get started. In addition, some participants expressed concerns with the voluntary surrender process intended to advance reconciliation. They noted that it has an impact on the value of the licences of certain groups and does not allow the young independent successor to be able to buy back these licences compared to certain groups that are in a more favourable financial position. Participants proposed nationalizing licences, which equates to a system of returning licences to DFO for the use of future generations and new entrants. Some participants suggested that licences should be rationalized and bought back in order to reduce the number of harvesters in the future since there are not enough resources to support everyone. However, others proposed instead to work more together to distribute the resource to all harvesters, in order to keep the same number of harvesters within the communities.

The industry would like to see DFO relax its regulations and administrative timelines so that trials for new fishing methods can be done by the industry. They also want to see an acceleration of the process from an exploratory fishery to a commercial fishery under the New Emerging Fisheries Policy. Participants also recommended the use of an ecosystem approach for the fisheries management system and a communal fisheries licensing system, including for Indigenous Peoples. They further explained that an ecosystem approach to fisheries management should not be used in silos but should be a more holistic approach and should also be used in advisory committees. With climate change and species redistribution, participants stated that it is important to promote an ecosystem approach that takes into account the departure and arrival of different species, environmental changes (such as ice cover), and the challenges that all this entails for the region's fishing industries. Finally, participants want to have de facto access to new species with their existing licences that could allow all species to be harvested using gillnets.

From an industry perspective, participants believe that there should be a focus on domestic markets and that provincial markets should be further developed. The participants would like to see a reduction in exports and to be able to find a better balance between import and export markets. Participants also want to see the industry focus on the quality of the product landed and market it to maximize its value instead of focusing on the quantity of product landed. The industry's vision is to have a better added-value of the product. The way forward for fisheries also involves processing. The industry wants to be more proactive in its actions to respond to climate change and wants to be better informed about the risks and consequences of climate change, particularly in relation to the licence renewal process. In fact, some fishing companies and industries are currently operating at a loss and they suggest putting in place a system to help them be more resilient to climate

change in order to overcome certain factors such as the cost of licences. Participants mentioned that it would be possible to draw inspiration from the model used by farmers with the implementation of a regulatory tool such as "Farm Credit Canada," in place to help agricultural businesses with climate change by helping with their investments. Harvesters are also subject to enormous unpredictability, such as species redistribution, management measures and the influence of federal policies. Putting such a structure in place could really help businesses and industries in the region be more resilient. Participants expressed a desire to add value to bycatches and the establishment of infrastructure adapted to environmental changes. They also explain that they would like to see more incentives to reduce their greenhouse gas emissions, to counter the current trend of seeing bigger and bigger fishing vessels. Finally, taking Prince Edward Island as an example, some explained that aquaculture could be another option to explore in order to reduce pressure on the resource, increase certain stocks, extend fishing seasons and be more resilient with other species.

Collaboration and communication were also two themes that came up strongly during the workshop discussions. Participants explained that fish harvesters have a lot of experience in their community and it would be beneficial to see greater collaboration between industry and DFO in the context of climate change. They further stated that the industry wants to be more involved and contribute more to scientific data collection activities. It was highlighted that harvesters, with the right tools, are the eyes on the water and should be able to contribute to data collection, especially when several reports in recent years indicate a lack of DFO data. They point out that it is important to be able to quantify the impact of climate change, in order to be able to adjust models and obtain the right data. Overall, participants want to see greater collaboration between the federal and provincial governments, industries, different fishing organizations and harvesters. They stated that better education, accountability and communication for harvesters, but also between different groups, would also be necessary and would allow for the faster imposition of penalties for those who have bad intentions. Some have suggested that collaboration between harvesters should be encouraged in order to compensate for the current reduction in the labour force in the area.

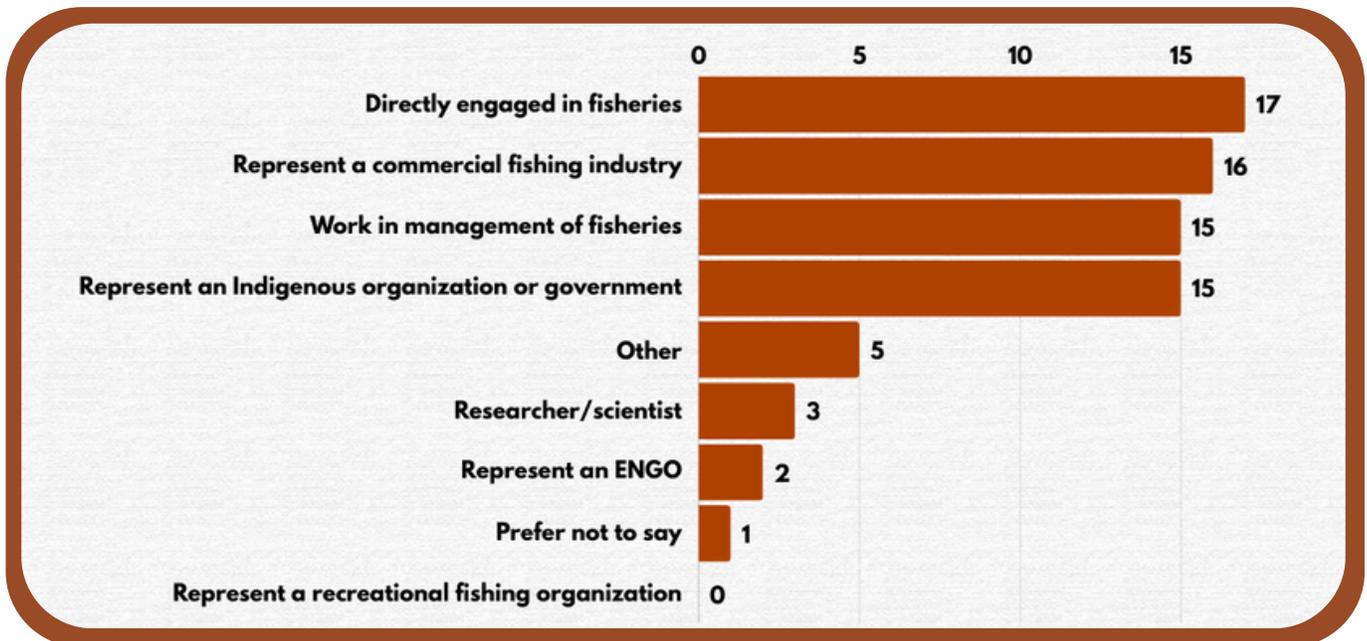
What is the best way to continue these conversations?

Several participants reported on the importance of holding face-to-face meetings with DFO, industry and Indigenous Peoples. Workshops outside of industry-DFO advisory committee meetings could also be held to reduce red tape. Some suggested that the best way to continue these conversations would be in a more informal environment, with refreshments, to encourage good collaboration and the free exchange of ideas. Focus groups should include members of government, industry, but also the public. The participants added that committees should also be held and the level of decision-making should be brought closer to the harvesters, particularly in the maritime sectors. There was general agreement that there should be more opportunities to have these conversations and not just within DFO. These conversations could also be used to educate some of the fishery and the public about the role of harvesters and industry, as well as about Indigenous fisheries, in order to better represent reality and break down preconceived notions.

Results of the Polling Exercise

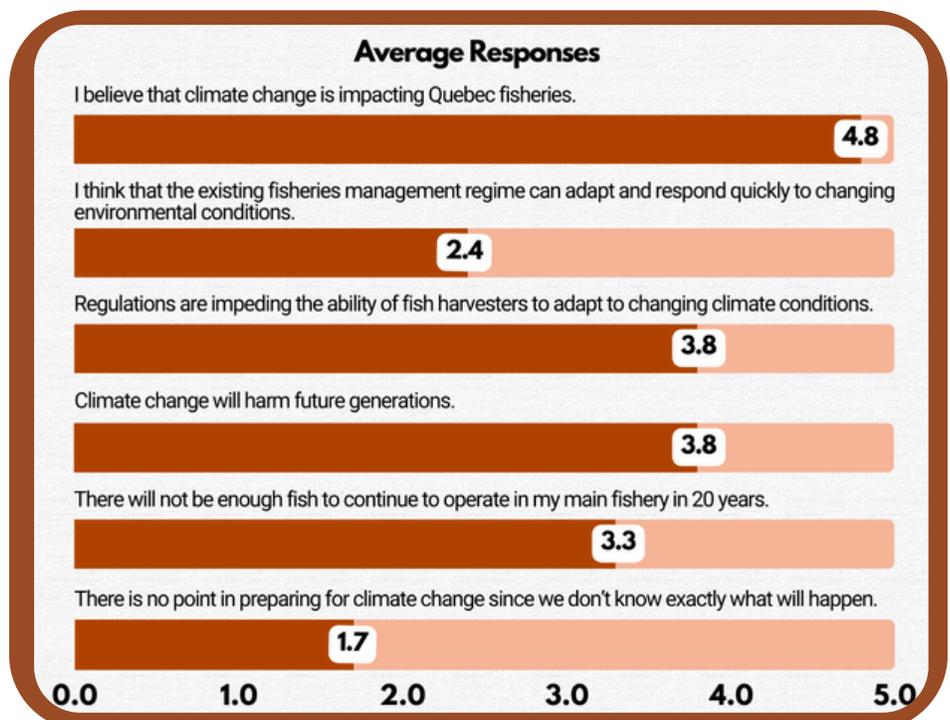
During the workshop, participants were asked to take part in an anonymous polling exercise. Participant responses are displayed below. Please note that Question 3 required participants to provide an open-text response; responses reflect the text as submitted.

Question 1: Choose all of the following that apply to you and your role:



Question 2:

On a scale of 1 to 5 (1 being the lowest and 5 being the highest), please indicate the extent to which you agree or disagree with the following statements:



Results of the Polling Exercise

Question 3: What could increase the agility and flexibility of the fisheries management regime to respond to future challenges?

Open text responses:

- More flexibility.
- Increased involvement of Indigenous communities in decision making processes.
- Ecosystems approach, diversity and increase value of current quota.
- Bring decisions closer to regional offices.
- Collaborate with an industry-based committee.
- Check how fisheries are managed elsewhere. Need more flexible regulation; ecosystem approach, including predator/prey relations is a must.
- An ecosystem approach, be more inclusive, less divide between Indigenous and commercial harvesters, more access to resources, etc.
- Be quicker to review management measures.
- Review the rules that govern harvesting. Avoid the waste that comes from harvesting for quantity rather than quality.
- Streamline regulatory processes and try to predict the future.
- Continuous environmental and ecosystem monitoring.
- Collaboration with fish science.
- Listen to harvesters and their needs.
- Better partnership between harvesters and DFO.
- Change in license management, allow flexibility, include harvesters in data acquisition models.
- Increased data collection in collaboration with industry to enable rapid adaptability.
- Planning to adapt to change, diversify.
- Better knowledge and electronic tools.
- Frequent meetings with harvesters and associations to understand the realities on the ground and work together on solutions.
- Better scientific knowledge of the marine ecosystem, take account of knowledge in the field, let bycatch be kept.
- Diversity and acceptance of bycatch.
- Simultaneous harvesting, relaxed administrative rules, zero discards.
- Collaboration with harvesters who have eyes on the water.
- A regional committee of harvesters from each coastal region, with regulations on management flexibility.
- Latitude in decision-making. Climate change impacts are local and cannot be dealt with uniformly. Flexibility and contextualization are needed.

Results of the Polling Exercise

Question 3: What could increase the agility and flexibility of the fisheries management regime to respond to future challenges? (continued)

- Decentralization based on different regional realities.
- Listen to harvesters: they have the right ideas and observations of climate change. Their observations are just as valuable as those of scientists.
- Greater predictability of stock status.
- Multi-species fleets and management approach.
- Conserving resources for future generations.
- Diversification of fishing activities and technology.
- More flexible and adaptive management by the department. A paradigm shift, avoiding waste and rationalizing fleets, because there are already too many players.

Participant List

Representatives from the following organizations, groups, ENGOS, institutions, and/or governments attended the workshop. In alphabetical order:

- Agence Mamu Innu Kaikusseht
- Association des pêcheurs de la Basse Côte-Nord
- Association des crabiers Gaspésiens (ACG)
- Association de gestion halieutique autochtone Mi'gmaq et Wolastoqey
- Association des capitaines-proprétaires de la Gaspésie Inc.
- Association des pêcheurs de crabe de la zone 17
- Association des pêcheurs propriétaires des Îles-de-la-Madeleine / Association of inshore fishermen of the Magdalen Island (Inshore)
- Comité de gestion de la zone 16 inc.
- Conseil de la Première Nation des Innus d'Essipit
- Conseil des Innus de Ekuanitshit
- Conseil des Innus de Nutashkuan
- Conseil des Innus de Pakua Shipi
- Conseil des Innus de Pessamit
- Conseil des Innus d'Unamen Shipu
- Conseil Innu Takuaikan Uashat mak Mani Utenam
- Groupe de pêcheurs de la zone F Inc.
- Listuguj Mi'gmaq Gouvernement
- Micmacs of Gespgapegiag Band
- Municipalité régionale de comté de Côte-de-Gaspé
- Première nation Micmac de Gespeg
- Première nation Wolastogiyik (Malecite) Wahsipekuk
- Rassemblement des pêcheurs et pêcheuses des Côtes des Îles
- Regroupement des pêcheurs professionnels de la Haute et Moyenne Côte-Nord
- Rassemblement des pêcheurs et pêcheuses des Îles (RPPIM)
- Regroupement des pêcheurs professionnels de homard du sud de la Gaspésie (RPPSG)