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Recovery Strategy Report Series

Report on the Progress of Recovery Strategy Implementation for the North Atlantic Right Whale (*Eubalaena glacialis*) in Canada for the Period 2015 to 2020

North Atlantic Right Whale

2025

Canada

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For copies of the progress report, or for additional information on species at risk, including Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status reports and other related documents, please visit the Species at Risk Public Registry.

Cover illustration: The cover illustration depicts a female North Atlantic Right Whale known as Arpeggio, catalogue number 2753. Born in 1997, she has ranged from the calving ground along the coast of eastern Florida to the Bay of Fundy and the Gulf of St. Lawrence, and has been photographed in each year of her life in several different habitat areas. She survived a strike by a small vessel at the age of 8 and has been entangled at least 7 times throughout her lifetime. Arpeggio has been exposed to almost every type of research: tagging to learn about dive profiles and response to sound playback, skin biopsy sampling to learn about her genetic profile, and ultrasound measurements of blubber thickness to assess her health. Arpeggio gave birth to her first calf in 2007, her second in 2013, and her third in 2022. She has been observed in the calving ground without a calf in multiple years. Arpeggio was observed annually in the Bay of Fundy between 1997 and 2012 with gaps in her Canadian sightings history in 2003, 2006, 2009 to 2011, and 2013 to 2015. She was observed annually in the Gulf of St. Lawrence between 2016 and 2021 and was last seen in 2022 in the calving ground. Illustration credit: Scott Landry, Provincetown Center for Coastal Studies.

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Statement on the Government of Canada's North Atlantic Right Whale initiatives

This progress report describes activities undertaken to support the recovery of North Atlantic Right Whales in Canadian waters for a fixed period in time (2015 to 2020). This period included the unprecedented mortality events in the Gulf of St. Lawrence (GSL) in 2017 and 2019 and the subsequent responses from the Government of Canada, in collaboration with its partners, to reduce threats to the species and prevent further mortalities. This important work has continued beyond the reporting period, and details about the activities undertaken after 2020 will be included in the next progress report. In the interim, information on the Government of Canada's work to monitor North Atlantic Right Whales and reduce their threats in Canadian waters can be found at these links:

- Fishery management measures to reduce risk of entanglement in fishing gear
- Measures to reduce risk of a vessel strike
- Whale Insight – An interactive map of North Atlantic Right Whale detections in Canada
- Canadian Science Advisory Secretariat
- North Atlantic Right Whale species profile

Preface

The *Species at Risk Act* (S.C. 2002, c.29) (SARA), requires reporting on the implementation of the recovery strategy for a species at risk (via a progress report), and the progress towards meeting its objectives within 5 years of the date when the final recovery strategy was placed on the Species at Risk Public Registry, and every subsequent 5 years, until the recovery strategy is no longer required under SARA or the species' recovery is no longer feasible. This reporting must be done by the competent Minister.

The Minister of Fisheries and Oceans is the competent minister under SARA for the North Atlantic Right Whale and has prepared this progress report.

Reporting on the progress of recovery strategy implementation requires reporting on the collective efforts of the competent minister(s), provincial and territorial governments, and all other parties involved in conducting activities that contribute to the species' recovery. Recovery strategies identify broad strategies and approaches that will provide the best chance of recovering species at risk. Some of the identified strategies and approaches are sequential to the progress or completion of others and not all may be undertaken or show significant progress during the timeframe of a report on the progress of recovery strategy implementation (progress report).

As stated in the preamble to SARA, success in the recovery of species at risk depends on the commitment and cooperation of many different groups that will be involved in implementing the directions set out in the recovery strategy and will not be achieved by Fisheries and Oceans Canada (DFO), or any other jurisdiction alone. The cost of conserving species at risk is shared amongst different groups. All Canadians are invited to join in supporting and implementing the recovery strategy for the benefit of the North Atlantic Right Whale and Canadian society as a whole.

Acknowledgments

This progress report was prepared by DFO. Input from others was sought, as needed, to confirm or seek clarification on content. DFO would like to express its appreciation to all First Nations and other Indigenous organizations, other federal departments, and academic and non-governmental organization partners who have contributed to the recovery of the North Atlantic Right Whale.

Executive summary

The North Atlantic Right Whale (*Eubalaena glacialis*) was listed as endangered under SARA in 2005. The "Recovery Strategy for the North Atlantic Right Whale (*Eubalaena glacialis*) in Atlantic Canadian Waters" was finalized and published on the Species at Risk Public Registry in 2009, and was amended to include a more detailed description of existing critical habitat in April 2014.

The main threats identified for the North Atlantic Right Whale include: vessel strikes, entanglements in fishing gear, contaminants, acoustic disturbance, disturbance due to vessel presence, and changes in food supply.

The interim recovery goal for the North Atlantic Right Whale is "to achieve an increasing trend in population abundance over 3 generations", which was estimated to be approximately 60 years.

The "Report on the Progress of Recovery Strategy Implementation for the North Atlantic Right Whale (*Eubalaena glacialis*) in Canada for the Period 2015 to 2020" (progress report) reports on the progress made by Fisheries and Oceans Canada (DFO) and its partners towards implementing the recovery strategy and achieving its objectives. The objectives include: (1) reducing mortality and injury as a result of vessel strikes; (2) reducing mortality and injury as a result of fishing gear interactions; (3) reducing injury and disturbance as a result of vessel presence, exposure to contaminants, and other forms of habitat degradation; (4) monitoring population and threats; (5) increased understanding of life history characteristics, low reproductive rate, habitat, and threats to recovery through research; (6) supporting and promoting collaboration for recovery; and (7) developing and implementing education and stewardship activities.

There has been a significant increase in knowledge of annual North Atlantic Right Whale abundance, distribution, and habitat use in Atlantic Canada and Quebec. The development and use of novel whale detection technologies (for example, acoustic detection software and hardware packages on Viking buoys and Slocum gliders) have provided researchers and regulators with new tools to monitor and protect the species. Further testing and development of other technologies and platforms (for example, Remotely Piloted Aircraft Systems, high resolution satellite imagery, and thermal cameras) may expand detection capabilities in the future.

Our understanding of fishery interactions and vessel strikes, including sublethal impacts and cumulative effects, continues to grow, and risk analyses across Atlantic Canada and Quebec are being planned. Fishery interactions and vessel strikes are still considered to be the primary threats affecting the survival and recovery of this species. Research has increased knowledge of other threats (for example, ocean noise in North Atlantic Right Whale habitat areas and changes in prey availability due to climate change). Many North Atlantic Right Whale

educational products were developed and distributed in a variety of formats; in particular, the development and implementation of public data visualization tools and the use of social media for conservation outreach has risen in recent years. International research and conservation partnerships have continued and expanded, with increasing opportunities for collaboration expected in the future.

The majority of the 20 performance indicators identified in the recovery strategy were either met (for example, increasing involvement in mitigation efforts from fisheries, conducting necropsies, attempting disentanglements, collecting and disseminating information from monitoring programs) or partially met (for example, protecting and identifying critical habitat, understanding and reducing human impacts on food supply, regularly analyzing vessel and entanglement risk and the effectiveness of mitigation measures). These indicators will require continued attention over the next reporting period to advance progress toward the interim recovery goal. Performance indicators that were not met included achieving a decline in the rates of fisheries and vessel interactions in Canadian waters, assessing the impacts of contaminants, and measuring the level of awareness and support for recovery activities.

During the time period covered by this progress report, the North Atlantic Right Whale population decreased by approximately 27% (that is, from 470 to 340 individuals). This was attributed to increased mortalities from entanglements in fishing gear and vessel strikes range-wide. Recovery was further hindered due to low calving rates, including no observed calves in the 2018 calving season. Following the high numbers of North Atlantic Right Whales deaths detected in Canadian waters in 2017 and 2019, the Government of Canada implemented unprecedented mitigation measures designed to lessen the impacts and/or risk of entanglements and vessel strikes. While the species remains in decline, the Government of Canada is committed to maintaining and increasing efforts that support the species' recovery.

Priority focus areas for the next reporting period include: the refinement of existing critical habitat and identification of additional critical habitat for the species in Canadian waters; continuing and enhancing the North Atlantic Right Whale monitoring program across its Canadian range; continuing, refining, and enhancing fisheries and vessel management measures; and improving our understanding and management of other identified and emerging threats to the species.

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1 Introduction

The “Report on the Progress of Recovery Strategy Implementation for the North Atlantic Right Whale (*Eubalaena glacialis*) in Canada for the Period 2015 to 2020” outlines the progress made towards meeting the objectives listed in the “Recovery Strategy for the North Atlantic Right Whale (*Eubalaena glacialis*) in Canadian Waters” during the indicated time period and is part of a series of documents for this species that are linked and should be taken into consideration together; including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status reports (COSEWIC 2003; COSEWIC 2013), the science advisory report from the recovery potential assessment (RPA) (DFO 2007), a recovery strategy (DFO 2014), action plans (DFO 2020a; DFO 2021), and a previous progress report (DFO 2016).

Section 2 of the progress report provides an overview of key information on the threats to the species, the interim recovery goal, and recovery objectives and performance indicators to measure the progress of recovery. For more details, readers should refer back to the recovery strategy. Section 3 reports on the progress made towards the activities identified in the recovery strategy, to support achieving the interim recovery goal and objectives. Section 4 summarizes the progress toward achieving the interim recovery goal and objectives.

2 Background

2.1 COSEWIC assessment summary and threats to the species and its critical habitat

The listing of the North Atlantic Right Whale under SARA in 2005 led to the development and publication of the “Recovery Strategy for the North Atlantic Right Whale (*Eubalaena glacialis*) in Canadian Waters” in 2009 (Brown et al. 2009), with minor amendments in 2014 (DFO 2014). The recovery strategy is consistent with the information provided in the COSEWIC status report (COSEWIC 2003) and the COSEWIC summary information is included in section 1.1 of the recovery strategy. The listing and development of the recovery strategy were further informed by the “Recovery Potential Assessment of western North Atlantic right whale (*Eubalaena glacialis*) in Canadian waters” (DFO 2007).

In 2013, COSEWIC re-examined and confirmed the status of the North Atlantic Right Whale as endangered (COSEWIC 2013). The reasons for designation were not significantly different between the 2 assessments.

The recovery strategy identifies the threats to survival and recovery of the North Atlantic Right Whale and threats to its critical habitat.

Section 1.8 of the recovery strategy provides information on the threats to the species’ survival and recovery. Known or potential threats in Canadian waters include: vessel strikes, entanglement and entrapment in fishing gear, disturbance (for example, from the presence of vessels or underwater noise), habitat reduction or degradation (for example, from underwater noise or contaminants), and changes in food supply.

Critical habitat for the North Atlantic Right Whale has been identified, to the extent possible, in section 1.9 of the recovery strategy. The recovery strategy also provides examples of activities that are likely to result in the destruction of critical habitat (that is, threats to critical habitat). The list of activities provided in table 3 of the recovery strategy is neither exhaustive nor exclusive,

and their inclusion has been guided by the relevant threats to habitat described in the recovery strategy. For more details on the activities likely to result in the destruction of critical habitat, consult the recovery strategy.

Threats to North Atlantic Right Whale critical habitat include: human activities affecting prey abundance, acoustic disturbance, alteration of physical and biological oceanographic conditions, and contaminants.

2.2 Recovery

The interim recovery goal, as stated in the recovery strategy, is “to achieve an increasing trend in population abundance over 3 generations”, which was estimated to be approximately 60 years. Seven recovery objectives, outlined in table 1 of this document, were developed to support the achievement of the interim recovery goal. To facilitate the evaluation of progress toward recovery of the North Atlantic Right Whale, 20 performance indicators were included in the recovery strategy. These performance indicators are also listed in table 1.

Table 1. Recovery objectives and corresponding performance indicators for the North Atlantic Right Whale reproduced from the recovery strategy (DFO 2014). The performance indicators are numbered to allow for easy cross-referencing within this report and do not reflect prioritization.

Recovery objective	Performance indicator
Objective 1: reduce mortality and injury as a result of vessel strikes.	1. Rate of (vessel) interactions in Canadian waters declines 2. Regular analysis of vessel/Right Whale risk and mitigation measures is conducted
Objective 2: reduce mortality and injury as a result of fishing gear interactions (for example, entanglement and entrapment).	3. Rate of (fishery) interactions in Canadian waters declines 4. Regular analysis of gear/Right Whale risk and mitigation measures is conducted 5. Increased involvement in mitigation efforts by fisheries associated with higher risk gear 6. Possible disentanglement efforts are conducted
Objective 3: reduce injury and disturbance as a result of vessel presence or exposure to contaminants and other forms of habitat degradation.	7. Assessment of impacts of contaminants on Right Whales are completed 8. Harmful levels of noise in Right Whale habitat is taking place at acceptable levels and durations 9. Human-induced impacts on food supply are understood and reduced where possible
Objective 4: monitor population and threats.	10. Information collected in monitoring programs is disseminated 11. Regular forums to discuss monitoring results are held 12. Necropsies are conducted when possible
Objective 5: increase understanding of life history characteristics, low reproductive rate, habitat and threats to recovery through research.	13. Research is published 14. Regular forums to discuss research results and threat mitigation are held 15. Critical habitat in Canadian waters is identified and protected

Recovery objective	Performance indicator
Objective 6: support and promote collaboration for recovery between government agencies, academia, environmental non-government groups, Indigenous partners[1], coastal communities and international agencies and bodies.	16. Successful implementation of Right Whale conservation activities increases 17. Cooperative bilateral or multilateral arrangements to advance Right Whale research and conservation
Objective 7: develop and implement education and stewardship activities that promote recovery.	18. Measured increase in awareness and support for recovery activities 19. Key user groups work to develop and implement best practices (stewardship) 20. Right Whale emergencies are reported in a timely fashion

3 Progress towards recovery

Progress in carrying out the recovery objectives identified in the recovery strategy for the North Atlantic Right Whale (DFO 2014) is reported in section 3.1. Section 3.2 reports on the activities identified in the schedule of studies to identify critical habitat. Section 3.3 reports on the progress in meeting the performance indicators and other commitments (for example, development of 1 or more action plans and critical habitat order) identified in the recovery strategy, and information obtained through implementing the recovery strategy.

[1] Originally referred to as Aboriginal groups in the recovery strategy

3.1 Activities supporting recovery

Table 2 outlines recovery activities that were ongoing, initiated, or completed during the reporting period (January 1, 2015 to December 31, 2020). It does not account for activities completed during the first 5 years of recovery strategy implementation (see DFO 2016 for more details). Table 2 broadly represents work undertaken, but is not an exhaustive list of all activities. The level of detail provided under "Description and Results" is not necessarily an indication of the amount of progress made on that activity.

The activities that occurred during the reporting period supported all 7 recovery objectives. Many activities in table 2 were undertaken specifically to advance the recovery of the North Atlantic Right Whale, while others were undertaken for different or broader purposes but may result in benefits to the population. The extent to which each of the performance indicators were met during the reporting period is discussed in section 3.3.

Table 2. Details of activities supporting the recovery of the North Atlantic Right Whale from 2015 to 2020. Activities are organized into 4 categories (that is, management, threat prevention, and threat mitigation; international collaboration and other international initiatives; monitoring and research; and engagement, education, and outreach) and presented as sub-tables. The categories were chosen for grouping purposes only, and do not correspond directly to specific strategies or approaches in the recovery strategy. When more than 1 participant is associated with a recovery activity, they are listed in alphabetical order. Activities linked to completion of the critical habitat schedule of studies are described in table 3; however, there is some overlap with activities described in this table.

Table 2.1. Management, threat prevention, and threat mitigation for the North Atlantic Right Whale.

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
1.01: Considering protection of North Atlantic Right Whales and their habitat in relevant regulatory review processes	Activities affecting North Atlantic Right Whales were evaluated and/or authorized under SARA sections 73 and 74. Permits were issued for activities that met the pre-conditions under SARA, which include that the survival or recovery of the species not be jeopardized. When applicable, permit conditions included mitigation measures to ensure minimal impact to North Atlantic Right Whales. Permit explanations are available on the Species at Risk Public Registry. Works, Undertakings, and Activities (WUAs) were assessed for impacts to aquatic species listed under Schedule 1 of	3	7	Fisheries and Oceans Canada (DFO)

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	SARA, including North Atlantic Right Whales. Pathways of effects were reviewed while referring to the general prohibitions under section 32 and the protection of critical habitat under section 58 of SARA. This included assessing the introduction of underwater noise into waters that are frequented by fish and other aquatic species listed under Schedule 1 of SARA. In some cases, modelling of predicted noise was required with monitoring to validate model predictions. For seismic survey activities, the "Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment" (row 3.36), which specifies the mitigation requirements that must be met, was used in the regulatory review process.			
1.02: Amendments to the *Fisheries Act* and the *Marine Mammal Regulations* (MMRs)	Amendments to the *Fisheries Act* became law in 2019. Among other things, these amendments gave the Minister powers to take prompt action to address threats to the proper management and control of fisheries and the conservation and protection of fish and fish habitat (which, under the *Fisheries Act*, includes marine mammals) by making a fisheries management order. Amendments to the MMRs were published in the Canada Gazette, Part II (Vol. 152. No. 14), coming into force in July 2018. Among other things, these amendments expanded the scope of application of the regulations to include "conservation and protection of marine mammals" and established regulatory tools to achieve this aim, such as mandatory reporting of any accidental contact between a marine mammal and a vessel or fishing gear (row 1.20), clarification of the meaning of disturbance and approach distances, and establishing mandatory approach distances.	1, 2, 3	n/a	DFO

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
1.03: Amendments to the *Canada Shipping Act, 2001* (CSA 2001) and associated regulations	Amendments to the CSA 2001 were packaged with the Budget Implementation Act No. 2 (formerly C-86) and received Royal Assent in December 2018. The amendments clarify and enhance authorities for making regulations to protect the marine environment from navigation and shipping activity impacts, and allow immediate actions to be taken in urgent or unforeseen circumstances. The provisions in these amendments have been used to implement annual vessel traffic management measures for North Atlantic Right Whales in the Gulf of St. Lawrence (GSL). Amendments to the *Navigation Safety Regulations, 2020* expanding the Automatic Identification System (AIS) carriage requirements to a wider category of Canadian and non-Canadian passenger vessels were published in Canada Gazette, Part II (Vol. 153. No. 9), coming into force in June 2019. Expanding the AIS requirements to more vessels has strengthened enforcement of vessel traffic management measures put in place to protect North Atlantic Right Whales.	1, 3	n/a	Transport Canada (TC)
1.04: Enactment of the *Impact Assessment Act* (IAA)	The *Canadian Environmental Assessment Act, 2012* (CEAA 2012) was replaced by the IAA (IAA 2019). The IAA includes a new mandatory early planning and engagement phase to identify and discuss the potential impacts of a proposed project with Indigenous peoples, provinces, and stakeholders, as well as providing consistency in science based decision making. The new requirements will help ensure adverse effects of proposed projects on North Atlantic Right Whales are identified early in the process, thoroughly assessed, and appropriate mitigation measures are identified where applicable.	3, 6	17	DFO, IAAC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	In 2019, a memorandum of understanding (MOU) between the Impact Assessment Agency of Canada (IAAC) and DFO concerning participation in federal impact assessments was signed. Under the IAA, the MOU describes and confirms DFO's commitment to participate in impact assessments and regional and strategic assessments, primarily through the provision of specialist or expert information and knowledge related to DFO's mandate. This includes information on the implementation of SARA such as the protection, and management of aquatic species at risk.			
1.05: Establishment of Canada's Oceans Protection Plan (OPP) and the Whales Initiative	The Government of Canada (GoC) announced the OPP in 2016, which outlined new initiatives to address the threat of contaminants, reduced prey availability, and underwater noise to marine mammals in Canadian waters. The OPP also provided dedicated ongoing funding to strengthen DFO's capacity to assist in marine mammal response, and the surveillance and enforcement of marine protected areas. The Marine Environmental Quality Ecosystem and Ocean Science (MEQ-EOS) program, funded by the OPP in 2017, enabled DFO's Science sector to collaborate with partners to better understand how shipping-related noise affects 3 priority whale species, including the North Atlantic Right Whale. The OPP funding also revitalized the Marine Protection and Conservation MEQ program (MEQ-MPC). The MEQ-MPC program has authority under the *Oceans Act* to develop regulatory or non-regulatory tools and strategies (for example, objectives, criteria, guidelines, standards, and requirements) to assess and maintain healthy marine, coastal, and estuarine ecosystems. Funding contributed to research projects assessing North Atlantic Right Whale occurrence, measuring and modelling ambient and human-	1, 2, 3, 4, 5, 6	8, 12, 16, 20	GoC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	made noise levels, and exploring the impacts of noise on individuals. Additionally, under the *Oceans Act*, funding contributed to assessing and managing human activities and their potential risks to the marine environment, with a focus on underwater ocean noise and nutrients. The Whale Detection and Collision Avoidance (WDCA) Initiative was launched in 2018 under the OPP to support the development and testing of near real-time whale detection technologies for North Atlantic Right Whales by DFO and partners. Tested technologies included acoustic whale detection systems, thermal imaging technologies (for example, vessel-based thermal camera systems), and near real-time whale dissemination platforms. Two technologies successfully tested under this OPP program (that is, Viking buoys and Slocum gliders) are now being used in passive acoustic monitoring programs that inform management measures designed to protect North Atlantic Right Whales (row 1.20, 1.29, 3.02). The Whales Initiative was launched in 2018 to build upon the OPP. It included funding to advance research on factors affecting the North Atlantic Right Whale, which was 1 of 3 focal species, and to take actions to address threats from human activities (for example, annual allocations to the Marine Mammal Response Program [MMRP; row 1.31] to support safe and effective responses across Canada, the creation of a National Necropsy Fund to identify what caused the deaths of North Atlantic Right Whale in Canada, as well as the development and implementation of adaptive management measures to address the threat of entanglements and vessel strikes). Objectives of the Whales Initiative included reducing mortality, injury, and disturbance			

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	resulting from vessel strikes, underwater noise, fishing gear interactions, threats to food sources, and exposure to contaminants. Funding also increased DFO's capacity to enforce and verify compliance with the disturbance provisions of the MMRs (row 1.02) and the harassment prohibition under SARA. For additional information on some of the activities undertaken under the OPP and Whales initiative, refer to rows 1.06, 1.12, 1.16, 1.20, 3.02, 3.05, 3.06, 3.11, 3.13, 3.16, 3.17, 3.20, 3.22, 3.32, 3.33, 3.34.			
1.06: Development of an action plan to reduce the impact of ocean noise on marine mammals in the GSL estuary and collection of feedback on an Ocean Noise Strategy (ONS) for Canada	In 2020, DFO published an "Action Plan to Reduce the Impact of Noise on the Beluga Whale (*Delpinapterus leucas*) and Other Marine Mammals at Risk in the St. Lawrence Estuary" (DFO 2020a) on the Species at Risk Public Registry. The action plan includes several marine mammals listed under SARA in the St. Lawrence Estuary and in the Saguenay Fjord, including North Atlantic Right Whales. Under the OPP (row 1.05), the GoC committed to developing a forward-looking Ocean Noise Strategy (ONS) for Canada to inform a whole-of-government approach for addressing underwater noise. A 90-day public comment period was launched to seek feedback on a discussion document containing a proposed framework for the strategy. The discussion document included major principles, themes, objectives, and timelines for the ONS. Comments are being used to inform the draft ONS.	3	8	GoC
1.07: Development of the smartWhales initiative	A collaborative initiative in direct alignment with Canada's Space Strategy, known as smartWhales, was established in 2020 to support the investigation and development of novel whale detection and monitoring solutions. A request for	6	16	Academia, Canadian Space Agency, consulting and

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	proposals was developed and published. The initiative is supporting 5 consortia to advance solutions, using satellite data, that could help detect, monitor, and predict movements and habitat of North Atlantic Right Whales in Canada.			machine learning companies, DFO, earth observation industry, TC, non-governmental organizations (NGOs), research organizations
1.08: Establishment of G7 Ocean Plastics Charter and related initiatives	Canada led the development of the G7 Ocean Plastics Charter in 2018, whose signatories committed to accelerating implementation of the 2015 G7 Leaders' Action Plan to Combat Marine Litter. The action plan includes a commitment to make targeted investments to retrieve abandoned, lost or otherwise discarded fishing gear (ALDFG). The GoC is a signatory to the Global Ghost Gear Initiative (GGGI). DFO committed to removing ALDFG from Canadian waters in 2018, prioritizing areas where it poses a threat to species at risk, including North Atlantic Right Whales, and implementing initiatives to prevent gear loss. The Canadian Council of Ministers of the Environment introduced the Strategy on Zero Plastic Waste in 2018 to support implementation of the G7 Ocean Plastics Charter. The Strategy promotes initiatives to address the threat of ALDFG as a measure to reduce plastic pollution in aquatic ecosystems. The Canada-Wide Action Plan on Zero Plastic Waste (Phase 2) was published in 2020, and includes	2, 3	n/a	Canadian Council of Ministers of the Environment, GGGI, GoC, industry, NGOs

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	specific commitments to reduce plastic waste and pollution generated by aquatic activities, including ALDFG.			
1.09: Establishment of marine protected areas and other effective conservation measures (OECMs)	DFO continued establishing a conservation network of marine protected areas (MPAs) under the *Oceans Act*, and other OECMs (for example, marine refuges) that fall within the Canadian range of North Atlantic Right Whales, and continued to manage those already in place. In 2019, the GoC committed to conserving 25% of Canada's oceans by 2025 and 30% by 2030. Three MPAs came into force during the reporting period, including St. Anns Bank (SOR/2017-106), Laurentian Channel (SOR/2019-105), and Banc-des-Américains (SOR/2019-50). Research activities are ongoing to monitor for North Atlantic Right Whales and other cetaceans in these areas. Activities that disturb, damage, destroy, or remove any living marine organism or its habitat, or are likely to do so, are prohibited, with limited exceptions in accordance with different management zones. The MPAs were created with different conservation objectives; however, a conservation objective of the Banc-des-Américains MPA is to promote the recovery of at-risk whales. Several OECMs were established to conserve species inhabiting sensitive benthic areas (for example, corals and sponges) by prohibiting fishing activities using bottom-contact gear via variation order and/or conditions of licence. Some of the prohibited bottom-contact gear (for example, pots and traps) are known to entangle North Atlantic Right Whales. Many of the marine refuges and conservation areas are in known North Atlantic Right Whale habitat areas.	2, 4	n/a	Banc-des-Américains Scientific and Management Committee, DFO, Indigenous peoples, Laurentian Channel Advisory Committee, provincial governments, St. Anns Bank Advisory Committee, TC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
1.10: Development of an integrated governance strategy for North Atlantic Right Whales	An integrated governance strategy was developed in 2017 to facilitate a coordinated approach to the management of North Atlantic Right Whales, Southern Resident Killer Whales, and St. Lawrence Estuary Belugas. The Atlantic Steering Committee (ASC) for North Atlantic Right Whales was brought under this governance structure and reported to the Interdepartmental Assistant Deputy Minister Whale Committee. The ASC and its associated working groups provided oversight on scientific research, marine mammal response, recovery planning, and the development and coordination of fishery and vessel management measures to prevent mortality and to reduce harm to North Atlantic Right Whales in Canada.	6	16, 17	Canadian Coast Guard (CCG), DFO, Environment and Climate Change Canada (ECCC), TC
1.11: Hosting of Ministerial and annual North Atlantic Right Whale roundtables	In response to the unprecedented number of North Atlantic Right Whale mortalities in the GSL in 2017 (row 2.02), DFO hosted a Ministerial roundtable with partners and stakeholders. The feedback gathered helped inform the development and implementation of fishery and vessel traffic management measures for North Atlantic Right Whales in 2018 (rows 1.20, 1.29). DFO hosted another Ministerial roundtable in 2018 and a North Atlantic Right Whale roundtable in 2019 to further engage with partners and stakeholders. At these meetings, the outcomes of the North Atlantic Right Whale season in Canadian waters (for example, entanglements, mortalities, surveillance effort, fishery closures, research efforts), population status, challenges for fish harvesters, and considerations for future management measures were reviewed and discussed. Summaries of the comments from the 2 Ministerial roundtables were published online (2017, 2018).	1, 2, 4, 6	5, 10, 11, 14, 16	Academia, DFO, fishing industry, Indigenous fishers and organizations, National Oceanic and Atmospheric Administration (NOAA), NGOs, provincial governments, TC, shipping industry

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
1.12: Establishment of an Atlantic Marine Mammal Hub (AMMH)	DFO established the AMMH in 2019 under the Whales Initiative (row 1.05) to support the implementation of multi-regional North Atlantic Right Whale management measures in Atlantic Canada and Quebec. The AMMH ensures consistency across regions and oversees the adoption and maintenance of best practices related to marine mammal management initiatives within DFO. The AMMH coordinates North Atlantic Right Whale management measures and gear marking (row 1.20), plays a significant role in implementing the GoC's priority to reduce ocean plastics (row 1.08), and manages data related to lost and retrieved fishing gear (row 1.20, 1.22).	2, 3, 4	6, 12	DFO
1.13: Meetings of the national Marine Mammal Working Group (MMWG)	The DFO MMWG focuses on the regional implementation of management measures, consistent application of national policies, and the development of recommendations. Major accomplishments during the reporting period that supported North Atlantic Right Whale recovery included: 1) bringing all external response partners and regional coordinators together to discuss program planning and MMRP funding, 2) securing funding to maintain an effective MMRP (including annual support for marine mammal response across Canada, and for the National Necropsy Fund) (row 1.31) to support response partners and enhance their capacity to respond safely and effectively to large whale entanglement incidents (including entangled, distressed, or dead animals, and live-stranded animals on the shore), 3) contributing to the MMR amendments (row 1.02), 4) providing a coordinated national repository for marine mammal related information, and 5) coordinating the implementation of marine mammal management within DFO.	2, 4, 6	6, 12, 16	DFO

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
1.14: Meetings of the Cetacean Working Group	Established in 2014, the Cetacean Working Group coordinates marine animal response (including North Atlantic Right Whales) in Newfoundland and Labrador Region. Prior to the start of the fishing season the working group ran through an annual exercise with the AMMH (row 1.12) in preparation for potential North Atlantic Right Whale incidents.	2	n/a	DFO
1.15: Meetings of the Working Group to Reduce and Mitigate Fishing Gear Interactions with Cetaceans	Originally established in 2013 with a focus on North Atlantic Right Whales, this group expanded its scope to support the prevention and mitigation of fisheries interactions with marine mammals in the DFO Maritimes Region, with an emphasis on SARA-listed species. The group helped advance implementation of North Atlantic Right Whale recovery documents by providing input into the development of fisheries management measures (including the implementation of gear marking and whalesafe gear technology), providing feedback on measures to prevent or mitigate entanglement or entrapment, advancing the systematic documentation of North Atlantic Right Whale incidents within DFO, and initiating development of the MarineLife Incident Tracking System (MITS) database (row 3.06).	2	n/a	DFO
1.16: Establishment and meetings of a Right Whale Science Coordination Group	Established in 2018, this group met bi-weekly to discuss and coordinate North Atlantic Right Whale science activities and requests for advice in Canada. This group was responsible for planning the scientific aerial surveillance program (row 3.01) and research undertaken through the Whales Initiative (row 1.05).	4, 5	n/a	DFO
1.17: Development of an integrated	In 2020, DFO finalized a North Atlantic Right Whale integrated marine mammal management plan based on measures taken for North Atlantic Right Whales in 2018 and	2	5	DFO, fishing industry,

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
marine mammal management plan and continued consideration of North Atlantic Right Whales in integrated fisheries management plans	2019 (row 1.20). The document is evergreen and is updated as measures change. Integrated fisheries management plans or conservation harvest plans for fisheries that have known or potential interactions with North Atlantic Right Whales (for example, fixed gear fisheries such as groundfish, herring, hagfish, as well as inshore lobster, offshore lobster, snow crab, and Jonah crab) continued to outline North Atlantic Right Whale considerations and/or protection measures.			Indigenous fishers
1.18: Development and continuation of Voluntary Standards of Practice in fisheries	Fishers from Lobster Fishing Area (LFA) 33, LFA 34 (southwest Nova Scotia) and LFA 41 (offshore area) continued to implement previously established voluntary standards of practice in the lobster fishery to reduce the risk of North Atlantic Right Whale entanglements. In 2015, the fixed gear <45' fleet Groundfish Advisory Committee developed a voluntary standard of practice to minimize the risk of entangling and harming North Atlantic Right Whales, reduce the severity of entanglements, should they occur, and avoid vessel strikes. In addition, some snow crab fishers voluntarily used multi-trap trawls (particularly in Crab Fishing Area 17) to reduce the number of vertical lines in the water column.	1, 2, 6, 7	5, 16,19	Fishing industry, Indigenous fishers
1.19: Continuation of the Right Whale Bay of Fundy (BOF) lobster mitigation	This mitigation strategy, in place since 2006, continued to be implemented by the Grand Manan Fishermen's Association (GMFA) and partners. The strategy included the use of a telephone hotline and a website for reporting and mapping North Atlantic Right Whale sightings. To support this strategy, DFO conducted aerial surveys at the beginning of the lobster season in early November between 2015 and	2, 6, 7	5, 16, 19, 20	DFO, fishing industry, NGOs

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
strategy (LFAs 36 to 38)	2019. Between 2018 and 2020, the GMFA piloted additional innovative gear configurations in the LFA 38 lobster fishery to test the benefits of reducing the number of vertical lines when North Atlantic Right Whales were present.			
1.20: Development and implementation of fisheries management measures	Starting in 2018, annual fisheries management measures designed to protect North Atlantic Right Whales were implemented in Atlantic Canada and Quebec under the Whales Initiative (row 1.05), and in response to the unprecedented mortality events in the GSL in 2017 and 2019 (row 2.02). DFO, with input from partners and stakeholders, and considering the best available information (for example, results from previously implemented measures and species distribution), assessed, refined, and implemented these fisheries management measures to reduce entanglement risk. The measures comprised targeted closures of non-tended fixed gear fisheries, including trap and pot fisheries, in areas where North Atlantic Right Whales were seen or heard, as well as a requirement for those fisheries to reduce or eliminate rope floating on the surface. For more details on fishery closures and other fisheries management measures implemented between 2018 and 2020, refer to the following links: What we heard report, 2018, 2019, 2020. In addition to management measures developed specifically to reduce the risk of entanglement of North Atlantic Right Whales, other management actions likely benefited North Atlantic Right Whales, including: **Rope and Buoy Marking:** In 2018, snow crab harvesters in Crab Fishing Area 12 (southern GSL) were required to mark their vertical buoy lines with colours unique to their fishing area and mark their surface buoys with sequential numbers.	2, 3, 4, 7	5, 18, 19, 20	Academia, DFO, fishing industry, Indigenous fishers, NGOs

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Subsequently, a colour scheme for all non-tended fixed gear, including trap and pot fisheries, was developed for use in Atlantic Canada and Quebec to help identify the fishery associated with an entanglement or lost fishing gear. The colour scheme was designed to be distinct from that used in the United States (U.S.) and included over 90 unique coloured markings that enabled gear to be identified by country, region, fishery and, for crab and lobster fisheries only, by fishing area. It was phased in through an update to conditions of licence during the 2020 fishing season and will contribute to gear analysis recovered from entangled whales, including North Atlantic Right Whales (row 1.35). **Reporting of accidental contact:** Since 2018, all mariners in Canada, including commercial fish harvesters, are required, as stipulated in the MMRs (row 1.02), to report accidental contact with marine mammals with a vessel or fishing gear using a Marine Mammal Interaction Form. The location and relevant details of each interaction must be reported to DFO. **Reporting of lost gear:** DFO introduced a requirement to report lost fishing gear (that is, any active fishing gear previously set by the Licence Holder/Operator that was sought but not found) in some commercial fisheries through conditions of licence in 2018. This requirement was expanded to all commercial fishing licences in 2020. This requirement helps DFO quantify the extent of ALDFG in Canadian waters, identify priority areas for targeted gear retrieval, and analyze recovered gear from entangled whales. Data on the location, fishery type, and incidence of gear loss will help identify measures to address the threat of ALDFG.			

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Prevention of marine pollution: Since 2019, DFO has been introducing, through fishery conditions of licence, a prohibition against discarding any item that may be harmful to fish or fish habitat including, but not limited to, plastics, ropes, fishing gear, garbage bags, fuel, oil, rags, glass, bottles, metal, Styrofoam, and tires. The main purpose of this prohibition is to prevent marine pollution and harm to fish and fish habitat and contribute to the overall sustainability of fisheries in Canada. **Other relevant measures with potential for incidental benefits for North Atlantic Right Whales**: A closure protocol for excessive catches of small fish or bycatch in effect in several fisheries, a maximum immersion time for non-tended fixed fishing gear, including lobster and crab of 72 hours, at-sea observer coverage by independent observers for a percentage of trips, mandatory vessel monitoring system in several fisheries, and, management measures to reduce the quantity of fishing gear deployed.			
1.21: Development and testing of new fishing gear technologies and configurations	DFO supported the development of technologies designed to minimize or eliminate entanglement risk for North Atlantic Right Whales. These technologies included on-demand fishing gear, which removes buoy lines from the water column by having them instead return to the surface when signaled by the harvester, and low breaking-strength gear. For example, through the Atlantic Fisheries Fund, DFO worked with partners on 2 gear pilot projects. The first was a 3-year project undertaken by the Association des Crabiers Acadiens for gear research and development. The second was a pilot project by Coldwater Lobster and GMFA to test on-demand gear in different fishing conditions.	2, 6, 7	5, 16, 18, 19	DFO, fishing industry and gear manufacturers, Indigenous fishers, NGOs, provincial governments, technology companies

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Association des Crabiers Acadiens and partners developed rope with a breaking strength of less than 1,700 pounds. This rope was trialed in Canadian snow crab and lobster trawl fisheries. The use of weak rope could help mitigate the severity of entanglements. In 2020, the first commercial fishing using on-demand gear occurred in Canadian waters. Ten snow crab harvesters in the southern GSL each deployed multi-pot trawls of on-demand gear to fish in areas closed to traditional fishing methods (single pots) due to the presence of North Atlantic Right Whales.			
1.22: Continued removal and re-purposing of ALDFG from Canadian waters	In 2019, DFO announced a Ghost Gear Program, including funding for a Ghost Gear Fund. This program facilitated the location and removal of ALDFG from Canadian waters, the responsible disposal of retrieved ALDFG and end-of-life fishing gear, and the acquisition and/or testing of market-ready technologies to reduce gear loss. In 2020, the Ghost Gear Fund supported 22 2-year projects in Canada, of which 14 were located in Atlantic Canada and Quebec. In 2020, 8 kilometres of rope and 298 tonnes of gear and aquaculture debris (excluding rope and buoys) were retrieved from Atlantic Canadian waters through this program. Within that retrieved gear were 610 units of traps/pots, which could have posed an entanglement risk to North Atlantic Right Whales. In addition to projects undertaken under the Ghost Gear Fund, other work was completed to address the threat of ALDFG in Atlantic Canadian waters, including (but not limited to):	2, 6, 7	5, 16, 18, 19	CCG, Coastal communities, DFO, fishing industry, Indigenous fishers and organizations, NGOs, research organizations

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Operation Ghost: DFO and the CCG undertook a 3-day ghost gear retrieval operation in the GSL in 2019. A total of 101 lost snow crab traps were recovered and over 9 kilometres of rope was removed from the water. Additional compliance and enforcement measures related to the removal of ALDFG also occurred (row 1.26). **Continuation of the Ghost Gear Retrieval Program:** In 2008, the Fundy North Fisherman's Association (FNFA) began a project to identify and retrieve ALDFG from the BOF. This project continued during the reporting period. Fish harvesters designed a grapnel to remove ALDFG from waters and dispose of it responsibly. FNFA also worked closely to engage neighbouring marine industries about ALDFG prevention. FNFA is looking to further identify hot spots for gear loss, refine their grapnel design, and expand their work towards prevention and repurposing old gear (for example, using traps to build retaining walls). **Development of a BOF end-of-life fishing gear disposal program:** The FNFA developed and implemented a BOF end-of-life fishing gear disposal program for lobster fishermen in LFA 36. The program focused on the collection, repurposing, and recycling of old lobster traps and rope in rural fishing communities. It increased awareness of the benefits of preventing old fishing gear from entering the ocean and resulted in a long-term process for recycling and/or repurposing that gear. **Debris Free Fundy Project:** The Huntsman Marine Science Centre launched a wharf-based rope disposal program in the BOF in 2018 to collect discarded rope. Collected rope is taken to a facility in New Brunswick for eventual recycling			

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	and rope that is still in good condition is re-purposed into items like mats and trivets through public workshops held at the Fundy Discovery Aquarium. This program collected over 29,000 pounds of rope for disposal by the end of 2020. **Development and testing of mapping/retrieval technologies:** Homarus Inc. tested different technologies in 2019 and 2020 to detect lost lobster pots. Some technologies showed promising results. More testing will be performed over the next reporting period. In 2019, Merinov worked to develop technologies capable of detecting and recovering lost fishing gear.			
1.23: Consideration of North Atlantic Right Whales in fishery eco-certification processes	The Marine Stewardship Council (MSC) continued to take North Atlantic Right Whales into consideration during certification processes and surveillance audits. Meeting MSC certification requirements is the responsibility of the industry client; however, DFO supported the process by providing data and undertaking work in support of the certification where it aligned with DFO's mandate, priorities, and available resources. All MSC-certified non-tended fixed-gear fisheries (including crab and lobster) and some mobile gear fisheries (for example, shrimp) in Canada that overlap with North Atlantic Right Whale habitat have conditions associated with their certifications that could prevent or reduce the potential impacts of fishing on North Atlantic Right Whales. Conditions must be met to maintain certification. In some cases, evidence of interactions with North Atlantic Right Whales has resulted in the suspension of certification. For example, an expedited audit of the southern GSL snow crab fishery in 2017, resulted in a temporary suspension of MSC	2, 7	5, 19	DFO, fishing industry, MSC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	certification for the 2018 fishing season. The MSC certification remained suspended for subsequent fishing seasons covered by this report, 2019 and 2020. To lift the suspension, this fishery must provide scientific evidence showing that the known direct effects of fishing are unlikely to hinder the recovery of the North Atlantic right whale and that the management measures put in place are very likely to meet national requirements for the protection of the species			
1.24: Establishment and meetings of the Surveillance Coordination Group	The Surveillance Coordination Group was established in 2017 and met weekly during annual surveillance seasons (spring to fall) to plan and coordinate near real-time acoustic monitoring and aerial surveillance efforts for North Atlantic Right Whales in Canadian waters to support population assessments, research, and management decisions (row 1.20, 1.29). Starting in 2018, daily aerial coordination calls took place between mid-April and November 15 to coordinate DFO and other government department aerial assets to support North Atlantic Right Whale surveillance and monitoring.	1, 2, 4, 6	10, 16	CCG, DFO, TC
1.25: Establishment of an annual North Atlantic Right Whale Stakeholder Workshop	The Canadian Wildlife Federation (CWF) hosted their first annual North Atlantic Right Whale Stakeholder Workshop in Halifax, Nova Scotia in 2020. The purpose of the meeting was to increase awareness and understanding of North Atlantic Right Whale entanglements and discuss efforts to reduce entanglement risk to the species in Canadian waters.	5, 6	14, 16	Academia, CWF, DFO, fishing industry, Indigenous fishers and organizations, NGOs, research organizations, TC
1.26: Enforcement,	Fishery officers played a crucial role in enforcing fishery management measures aimed to protect the North Atlantic	1, 2, 3, 4, 7	6	DFO

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
compliance, and promotion of fishery management measures	Right Whale. Fishery officers conducted patrols to promote compliance with fishery management measures and investigated, and enforced violations of the *Fisheries Act* and associated regulations (for example, seizure of gear in areas closed to fishing, with excess floating rope, secondary buoys, untended gear, or improperly marked gear). Whale-watching activities were monitored to ensure operators were not disturbing marine mammals as per the MMRs (row 1.02). During patrols, information about North Atlantic Right Whales and recovery activities was provided to vessel captains and crew. Compliance promotion activities increased in the GSL, following the introduction and expansion of management measures to protect North Atlantic Right Whales starting in 2017 (row 1.20). Surveillance efforts by fishery officers prioritized areas of overlap between fishing activity and North Atlantic Right Whale occurrence. Fishery officers patrolled land, air and sea for the presence of ALDFG or illegal fishing gear and removed it from the water to reduce ALDFG and minimize entanglement risk. Enhanced monitoring took place to ensure all fishing gear was removed from closed areas based on the Information Flow Protocol for North Atlantic Right Whale Management Actions.			
1.27: Establishment of a Right Whale – Vessel Interaction Advisory Working Group	TC formed the Vessel Interaction Advisory Working Group in 2017 as a forum to discuss the impacts of vessel traffic management measures on the shipping and fishing industries. Technical sub-committees were struck to identify and assess potential options for protecting North Atlantic Right Whales while minimizing the impacts of mitigation measures on the fishing and shipping industries.	1, 6	2, 14, 16	Academia, CCG, DFO, industry, NGOs, TC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
and Technical Sub-Committees				
1.28: Maintenance of Traffic Separation Scheme in the BOF and Area to be Avoided (ATBA) in Roseway Basin	Changes made to the BOF Traffic Separation Scheme in 2003 to protect North Atlantic Right Whales, as well as the International Maritime Organization recommendatory ATBA in Roseway Basin for large shipping vessels established in 2009, continued to be maintained throughout the reporting period. For information on participation in the ATBA refer to row 3.28.	1	n/a	International Maritime Organization, TC
1.29: Establishment of annual vessel traffic management measures	Annual vessel traffic management measures designed to protect North Atlantic Right Whales were implemented in the GSL in response to unprecedented mortality events in the GSL in 2017 and 2019 (row 2.02). Since 2017, TC, with input from partners and stakeholders, and considering the best available information (for example, results from previous years measures and species distribution), assessed, refined, and implemented these measures to prevent vessel strikes of North Atlantic Right Whales. Measures included both static and dynamic mandatory speed restrictions, voluntary speed restrictions, and the establishment of a seasonal restricted area in and near the Shediac Valley. For more details on the vessel traffic management measures, refer to the following links: 2018, 2019, 2020.	1	n/a	TC
1.30: Enforcement, compliance, and promotion of vessel	DFO and CCG communicated directly with vessels and compiled alleged cases of infractions during the reporting period. Compliance and enforcement officers within TC assessed alleged infractions with speed and area-based vessel management measures in the GSL using AIS data.	1	2	CCG, DFO, TC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
management measures	Lack of compliance can lead to vessel owners facing administrative monetary penalties of up to $250,000 and/or a penal sanction under the *CSA, 2001* (row 1.03). Between 2017 and 2020, of the 23,386 transits monitored, 44 penalties were issued. Compliance was over 99.5% each year.			
1.31: Continuation of the national MMRP	Under the MMRP, DFO continued to fund and collaborate with partners (row 1.32) to track and respond to incidents involving marine mammals and sea turtles, and contribute to identifying threats to these species. The MMRP, contributed funds and expertise, including investments in third-party hotlines, necropsy support, specialized equipment (for example, through the maintenance of a cache of large whale disentanglement tools for authorized experts across the country as well as telemetry buoy satellite tags to deploy on entangled whales), training, and capacity building to help mobilize appropriate responses to incidents involving North Atlantic Right Whales (row 1.32, 1.34, 1.35, 1.36) and other marine mammals. The MMRP also addressed geographic gaps in marine mammal response capacity. For example, the MMRP Capacity Building Fund provided funds for training and response equipment (including a response vessel) to a new disentanglement team (the Gulf Disentanglement Team), based out of Shippagan, New Brunswick and increased capacity within Indigenous communities. Annual reports are available for the MMRP.	2, 4, 6, 7	6, 12, 16, 18, 20	DFO, Indigenous communities, necropsy providers, NOAA, response organizations and networks
1.32: Ongoing operation and	Several regional marine mammal response organizations (for example, Marine Animal Response Society [MARS], Campobello Whale Rescue Team [CWRT], Réseau	2, 4, 6	6, 12, 16	Response organizations and networks

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
expansion of regional marine animal response organizations and networks	Québécois D'urgences pour les Mammifères Marins [RQUMM], Whale Release and Strandings – Newfoundland and Labrador [WRS-NL]) and broader response networks (for example, Maritime Marine Mammal Animal Response Network, Canadian Marine Animal Response Alliance) operated in Atlantic Canada and Quebec. The CWRT and WRS-NL continue to be on call to lead disentanglement efforts for North Atlantic Right Whales and other large whales. Other response teams were established on Brier Island, Nova Scotia (Fundy East Whale Rescue) and in Shippagan, New Brunswick (Gulf Disentanglement Team) in 2017 and 2018, respectively. The CWRT has and will continue to work with the new teams to enhance their disentanglement training (row 1.36).			
1.33: Development and implementation of national marine mammal incident response protocols and guidance, including internal DFO policies and protocols	Under the MMRP (row 1.31), and through collaboration and consultation with national and international experts, DFO developed a national marine mammal incident response protocol that clearly outlines roles and responsibilities as it relates to the MMRP (row 1.31), information flow, vessel- and aerial-based surveillance by fishery officers, and reporting incidents/accidental contact to DFO. The protocol enhances national coherence while recognizing unique regional and case-specific considerations (for example, the type of entanglement and animal involved), as well as responder expertise and ensures a coordinated response to North Atlantic Right Whales with MMRP partners and other implicated departmental sectors. Regional internal DFO policies and protocols were also refined to include specific reference to North Atlantic Right Whales, and include protocols for fishery officers to follow when North Atlantic Right Whales are observed from vessel and aerial platforms to support protection efforts in a nationally consistent manner.	2, 4, 6, 7	6, 12, 16, 19, 20	Academia, DFO, industry, NGOs, NOAA, research institutes, response organizations and networks, TC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	MARS developed recommendations in collaboration with their partners regarding a national marine mammal health surveillance and incident response program that would ensure consistent approaches to incident response. The focus was on the promotion of collaboration by recognizing the diversity of expertise and interests within Canada and the importance of national consistency in collecting information.			
1.34: Conducting necropsies	When feasible, necropsies were performed by response organizations and their partners on North Atlantic Right Whales found dead in Canadian waters. These were done to determine causes of death and to inform mitigation measures. Between 2015 and 2019, 12 full necropsies (2017 and 2019) and a partial necropsy (2015), were conducted. The MMRP provided targeted funding to response organizations to support the necropsies (rows 1.13, 1.31). Refer to Daoust et al. (2018); Sharp et al. (2019); and Bourque et al. (2020) for additional information.	4, 6	12, 16	DFO, response organizations, networks, and partners
1.35: Establishment of a Large Whale Disentanglement Advisory Committee and continued disentanglement response efforts	An advisory committee was established in 2018 under the MMRP (row 1.31) between DFO and partners to develop protocols regarding the identification and authorization of expert large whale disentanglers, succession planning, training, equipment standards, and development of a disentangler evaluation and recognition process. Participants discussed ongoing and planned actions for large whale disentanglement, and provided expert advice to inform government decision-making.	2, 6	4, 6, 16	Atlantic Large Whale Disentanglement Network, Center for Coastal Studies (CCS), DFO, NGOs, NOAA, response organizations and networks, TC, other

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Following the tragic death of Captain Joe Howlett after a successful North Atlantic Right Whale disentanglement in 2017, DFO instituted a moratorium on whale rescue for several months. TC conducted a labour code investigation and recommendations were made related to whale response in Canada. When disentanglement efforts resumed in the fall of 2017, authorized expert disentanglers (that is, CWRT, WRS-NL), when feasible, worked on individual whales found entangled in Canadian waters following Canadian protocols. When possible, the gear involved was recovered to support compliance/enforcement activities and/or perform gear analysis by federal government agencies to inform mitigation measures and identify the fishery/country of origin. DFO hired a gear expert in 2020 to increase capacity to perform gear analysis in Canada.			stakeholder groups
1.36: Training for incident response and capacity building for response organizations	**Disentanglement support training:** DFO fishery officers received training on how to provide support to response organizations conducting large whale disentanglements, including the attachment of satellite tags to live-entangled whales for relocation. **Incident command system (ICS) training:** DFO staff received introductory and basic training in ICS from ICS Canada and the Canadian Coast Guard to increase the department's capacity to handle large-scale marine mammal incidents. The training provided the foundation for higher level ICS training by describing the history, features and principles, and organizational structure of the ICS, as well as providing resources for personnel who are likely to assume a supervisory position within the ICS.	2, 4, 6, 7	6, 12, 16, 19, 20	DFO, fishing industry, Indigenous fishers, NGOs, response organizations and networks

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Response organization training and capacity building: Response organizations (for example, CWRT, CCS, Fundy East Whale Rescue, WRS-NL, Group for Research and Education on Marine Mammals [GREMM], and the Gulf Disentanglement Team) provided and/or received incident response training, in class and on-the-water. Training focused on capacity building (row 1.31) for large whale disentanglements, and were successful in adding more expert support for these efforts in Atlantic Canada and Quebec. Standard whale rescue training materials were reviewed and refined with input from response partners and DFO staff. Whale rescue training was also provided to GMFA fish harvesters. **Marine Mammal Medic Course**: MARS offered a marine mammal medic course to volunteers, response partners, industry, Indigenous partners, and fishery officers. Training on marine mammal identification, reporting incidents involving dead or distressed animals, and what information and imagery to collect and include in the report was provided. Participants received training on how to respond to dead and live stranded animals including the use of whale rescue refloation pontoons.			
1.37: Training on marine mammal reporting and species identification	DFO supported the training of at-sea observers in the identification and reporting of all observed whale interactions. Cetacean identification seminars were provided to fishery officers, Real Property Safety and Security staff, Provincial Airline pilots and technicians, and TC National Aerial Surveillance Program pilots and technicians to support the documentation of North Atlantic Right Whales during routine	6, 7	16, 18, 19, 20	At-sea observer service providers, DFO, TC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	aerial and vessel surveillance and dedicated marine mammal observation flights.			
1.38: Completion and review of a strategic environmental assessment (SEA) for offshore oil and gas activities	The Canada-Nova Scotia Offshore Petroleum Board (CNSOPB) completed a SEA for the Middle Scotian Shelf (SS) and Slope and the western Scotian Slope and Shelf area in 2019. Where applicable, potential effects on North Atlantic Right Whales and their habitat were considered in the assessment. DFO reviewed and provided comments on the SEA, which included recommended improved information about the presence of North Atlantic Right Whales, and emphasized the importance of avoiding harmful effects to the whales and their critical habitat. Public comments on the SEA were sought and recorded on the CNSOPB public registry. Refer to CNSOPB (2022a) for additional information.	3	7	CNSOPB, DFO, oil and gas industry
1.39: Completion and review of environmental assessments (EAs) for seismic and drilling programs and regional assessments for offshore oil and gas exploratory drilling	EAs were completed for 26 seismic and exploratory drilling programs in Atlantic Canadian waters. All of the EAs considered the North Atlantic Right Whale and its critical habitat. Public comments were sought and recorded on the Canadian Impact Assessment Registry and the Canada-Newfoundland and Labrador Offshore Petroleum Board (CNLOPB) and CNSOPB public registries. DFO provided comments on improving mitigation measures for marine mammals, including North Atlantic Right Whales. North Atlantic Right Whales were considered in the Marine Mammals and Sea Turtles assessment section of a report on the Regional Assessment of Offshore Oil and Gas Exploratory Drilling East of Newfoundland and Labrador, completed in February 2020. Recommendations from the report included for DFO to make sightings data publicly	3	7	CNLOPB, CNSOPB, DFO, IAAC, oil and gas industry

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	accessible; develop, communicate and implement standards/certifications for marine mammal observers that set out specific training and experience requirements; and, incorporate ongoing DFO marine mammal species distribution modelling into future updates of the regional assessment immediately upon completion. Refer to CNSOPB (2022b) and CNLOPB (2022a, b) for additional information.			
1.40: Performing oil pollution prevention and compliance monitoring	TC's National Aerial Surveillance Program and ECCC's Integrated Satellite Tracking of Pollution program continued to be used to monitor Canada's oceans for illegal or accidental oil discharges from vessels. Both programs have contributed to decreasing oil discharges through deterrence and successful prosecutions. Patrols contributed to monitoring the threat of oil contamination throughout the Canadian range of North Atlantic Right Whales. Refer to TC (2021) for additional information.	3	7	ECCC, TC

Table 2.2 International collaboration and other international initiatives for the North Atlantic Right Whale.

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
2.01: Enactment and implementation of amendments to the *Marine Mammal*	A final rule was published in August 2016 to implement import provisions of the United States (U.S.) MMPA. The final rule promotes the reduction of marine mammal bycatch by requiring that nations exporting fish and fish products to the U.S. be held to the same standards as U.S. commercial fishing operations. The import provisions of the MMPA will come into effect after December 31, 2025. A progress report	2	n/a	Fisheries and Oceans Canada (DFO), National Oceanic and Atmospheric Administration (NOAA)

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
Protection Act (MMPA)	was submitted by Canada for the MMPA in 2019. To remain compliant under MMPA import provisions and to retain comparability findings, which can be revoked by the U.S. at any time, Canadian fixed gear fisheries that interact or co-occur with North Atlantic Right Whales will have to ensure that risk reduction measures in Canadian waters continue to be comparable in effectiveness to risk reduction measures in U.S. waters.			
2.02: Declaration and continued investigation of a North Atlantic Right Whale Unusual Mortality Event (UME)	A UME was declared in 2017 following unprecedented numbers of North Atlantic Right Whale mortalities. Under the UME, an independent team of international experts was assembled to review and interpret the data collected, guide sampling of stranded whales, evaluate sightings effort, review logistical considerations, and determine the next steps for the investigation. Mortalities occurring since the UME declaration continue to be investigated. Preliminary findings support human interactions as the cause of death for the majority of the dead stranded whales, specifically vessel strikes or rope entanglements.	1, 2, 4, 5, 6	1, 3, 10, 12, 16	Academia, aquariums, DFO, non-governmental organizations (NGOs), NOAA, research institutes, response organizations and networks, Transport Canada (TC), veterinarians
2.03: Continued transboundary collaboration between Canada and the U.S.	Collaboration occurred between Canadian and U.S. government agencies on North Atlantic Right Whale initiatives through continued and expanded representation at international meetings, workshops (for example, Workshop on Trends and Threats to North Atlantic Right Whales), and conferences, as well as participation in relevant working groups (for example, Canada-U.S. Bilateral Marine Mammals Steering Committee and Working Group, Atlantic Scientific Review Group).	6	16, 17	Canadian and U.S. federal, provincial, and state government agencies

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
2.04: Meetings to coordinate fieldwork in Canadian waters	DFO hosted Cetacean Fieldwork Coordination Meetings for DFO and other researchers planning to undertake fieldwork or analytical studies on cetaceans, including North Atlantic Right Whales, in Canadian waters. Meetings provided opportunities for information sharing on the timing and location of vessel- and aircraft-based projects, facilitated collaboration between partners undertaking sampling and analysis of live and dead North Atlantic Right Whales, and helped ensure data and samples were shared and distributed effectively.	6	16	Academia, consulting companies, Defence Research and Development Canada (DRDC), DFO, fishing industry, NOAA, NGOs, response organizations and networks,
2.05: Establishment and meetings of the Northeast Implementation Team (NEIT)	The NEIT is a multi-disciplinary advisory team that assists NOAA with the implementation of the "Recovery plan for the North Atlantic Right Whale (*Eubalaena glacialis*)" (NMFS 2005) in the Northeast U.S. (Maine to Virginia). The NEIT is part of a broader U.S. Implementation Team that coordinates on coast-wide issues. DFO has participated on the team since its establishment in 2018. TC joined the team in 2020. Meeting summaries and the NEIT membership list are posted online.	6	16	Academia, DFO, NOAA, other U.S. state and federal government departments, research institutes, TC
2.06: Meetings of the North Atlantic Right Whale Consortium (NARWC)	The NARWC is a multi-disciplinary group dedicated to the conservation and recovery of the North Atlantic Right Whale. DFO and TC collaborated with international partners through participation in the NARWC. DFO continued to sit on the executive board. The NARWC met annually, and as of 2020, included over 400 members from the U.S. and Canadian governments, academia, non-governmental organizations, Indigenous partners, and industry. During annual meetings DFO (2015 through 2020) and TC (2018 through 2020) provided updates on management and science initiatives.	4, 5, 6	10, 11, 14, 16	Refer to the NARWC annual report cards for participant lists

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	The NARWC publishes annual report cards on the status of the species. Refer to Pettis and Hamilton (2015, 2016) and Pettis et al. (2018a, 2018b, and 2020) for additional information.			
2.07: Establishment and meetings of the International Ropeless Consortium	The establishment of an International Ropeless Consortium was triggered by the 2017 Right Whale UME (row 2.02), which drove significant interest in on-demand trap/pot fishing. An initial workshop was hosted in February 2018, followed by the first annual consortium meeting in the fall of 2018. Summaries of the annual meetings (2018 to 2020), as well as participant lists and relevant publications can be found on the Consortium website. Refer to Baumgartner et al. (2018) and Myers et al. (2019) for additional information.	2, 5, 6	5, 14, 16	Academia, aquariums, Center for Coastal Studies, DFO, fishing industry and gear manufacturers, NGOs, NOAA, other U.S. state and federal government departments, research institutes, response organizations and networks
2.08: Convening of an international Gear Innovation Summit	DFO held a 2-day Gear Innovation Summit in February 2020 that explored current and emerging whale safe fishing technologies and strategies, and focused on finding innovative ways to prevent, retrieve, and recycle abandoned, lost or otherwise discarded fishing gear. Over 250 participants attended. Participants contributed to panel discussions, as well as interactive exhibits that featured innovations in gear technology and innovative programming.	2, 6, 7	5, 16	Academia, DFO, fishing industry and gear manufacturers, NGOs, NOAA, other international government officials,

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
				response organizations and networks
2.09: Undertaking scenario planning	NOAA developed and performed a scenario planning initiative for North Atlantic Right Whales in 2018 to complement established management and conservation efforts. During the scenario planning exercise plausible future conditions for North Atlantic Right Whales were explored and possible options to address those conditions and improve recovery were developed. The specific objectives of this exercise were to: 1) better understand the challenges of North Atlantic Right Whale management in changing conditions; 2) identify potential research activities and recovery needs across the species' range; 3) increase coordination and collaboration related to recovery efforts; and 4) explore how scenario planning can be used to support decisions. Outcomes from this exercise serve as a reference for how NOAA and its partners can better prepare for multiple plausible futures for the species, while complementing and enhancing other on-going initiatives. Among other things, the scenario planning initiative identified the development and operation of offshore wind farms as an emerging threat. The results of this exercise are relevant throughout the range of the species, including Canadian waters, and may serve as a foundation for similar exercises, as appropriate, to explore other variables and geographic scales. Refer to Borggaard et al. (2020) for additional information.	6	16	Facilitation and scenario planning experts, Marine Mammal Commission, NOAA, United States Geological Survey

Table 2.3. Monitoring and research for the North Atlantic Right Whale.

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
3.01: Conducting systematic surveys and collecting opportunistic sightings	A large-scale systematic aerial survey of marine megafauna, the Northwest Atlantic International Sightings Survey (NAISS), was conducted by the Fisheries and Oceans Canada (DFO) Science sector in 2016 on the continental shelf from the Bay of Fundy (BOF) to northern Labrador. Since 2017, a broad-scale aerial-based monitoring program involving dedicated systematic surveys for North Atlantic Right Whales, and other marine megafauna, has included: 1) annual coverage starting in the Gulf of St. Lawrence (GSL) and critical habitats in Grand Manan and Roseway basins, and 2) coverage of the Scotian and Newfoundland shelves during alternate years. Annual aerial large-whale abundance surveys conducted by the National Oceanic and Atmospheric Administration (NOAA) continued, including transects in Atlantic Canadian waters. Mark-recapture surveys were conducted by NOAA in the GSL in partnership with DFO. Dedicated vessel-based surveys were led by academia and non-governmental organizations (NGOs) in areas including the BOF, Jacques Cartier Passage, and the GSL. DFO collected opportunistic sightings and behavioural information during research vessel cruises, Canadian Coast Guard (CCG) patrols, and Conservation and Protection (C&P) aerial and vessel-based enforcement and monitoring efforts. DFO incorporated opportunistic reports of North Atlantic Right Whales into databases (row 3.06) as appropriate. Observations occurred in the BOF, Scotian Shelf, GSL, and waters off Newfoundland and Labrador.	4, 5, 6	10, 16	Academia, Department of National Defense, CCG, DFO, general public, industry, NGOs, NOAA, research institutes, response networks and organizations, Transport Canada (TC), whale watch vessels

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Multiple other organizations and individuals also collected these types of opportunistic data. TC collected opportunistic sightings during aerial surveillance activities in the dynamic shipping zones and other areas of the GSL. Data collected from monitoring programs and opportunistic sightings is held by individuals or specific groups and many are submitted to centralized databases (row 3.06). Between 2018 and 2020, the submission of North Atlantic Right Whale sightings in near real-time for visualization on WhaleMap (row 3.08) was prioritized to inform static and dynamic fishery and vessel management measures (rows 1.20, 1.29) and survey planning. Overviews of major contributing organizations and summaries of aerial and vessel-based sightings are included in the North Atlantic Right Whale Consortium annual report cards. Refer to Pettis and Hamilton (2015, 2016), and Pettis et al. (2018a, 2018b, 2020) for additional information.			
3.02: Conducting archival and near real-time passive acoustic monitoring (PAM)	DFO conducted PAM using bottom-moored archival recorders to detect cetacean vocalizations and other underwater noise in nearshore and offshore deployment sites. This work was conducted under a number of different research programs (for example, Marine Environmental Quality-Ecosystem and Ocean Science [MEQ-EOS] North Atlantic Right Whale research program, Cetacean Research and Monitoring Program, Newfoundland and Labrador Acoustics Program, Quebec Region Acoustic Program, and the Marine Environmental Quality-Marine Protection and	3, 4, 5, 6	8, 16	Academia, DFO, NGOs, NOAA, private industry, research institutes, TC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Conservation program (MEQ-MPC) Coastal Acoustic Monitoring Project, among others) and in a variety of habitat areas (for example, Emerald Basin, Scotian Shelf, GSL, BOF, and the waters off Newfoundland and Labrador). In 2020, DFO and TC deployed near real-time PAM systems. DFO deployed fixed “Viking” buoys in the GSL and TC deployed 1 Slocum glider in the GSL shipping lanes. This work was undertaken to support monitoring North Atlantic Right Whales and, for the first time in Canadian waters, to support the implementation of dynamic fishery and vessel traffic management measures using validated acoustic detections (row 1.20, 1.29). Dalhousie University (DAL) and the University of New Brunswick (UNB) deployed additional near real-time PAM systems in the GSL and in the Roseway Basin critical habitat area. Under the MEQ-EOS initiative (row 1.05), archival bottom-moored recorders were deployed in critical habitat areas (Roseway and Grand Manan basins), Emerald Basin, and Jordan Basin to monitor noise and North Atlantic Right Whale vocalizations. To inform noise modelling efforts on the Scotian Shelf, an 8-channel vertical line array was deployed in St. Ann’s Bank and Roseway Basin, with the goal of improving source level estimates of vessel noise and natural background ambient noise (for example, wind and waves).			
3.03: Monitoring dead and distressed marine mammals	The Marine Animal Response Society (MARS) initiated a project with their partners to investigate the occurrence of dead and distressed marine mammals, including North Atlantic Right Whales, in the Maritime provinces. These data are important for understanding the impact of human activities on marine mammals. A pilot program to	1, 2, 4, 5, 6, 7	1, 2, 3, 4, 10, 12, 13, 16, 20	Academia, aquariums, DFO, industry, NGOs, NOAA, other Canadian and U.S.

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	systematically monitor areas for injured, dead, and distressed marine mammals was developed and key partners were engaged to participate. Researchers at DFO, NOAA, the Atlantic Veterinary College, the Canadian Wildlife Health Cooperative (CWHC), the International Fund for Animal Welfare, and their partners compiled information on natural and human-caused mortalities of North Atlantic Right Whales, as well as serious injury events, during the period 1987 to 2019. In the majority of cases where the cause of death could be determined a vessel strike or entanglement was identified as the cause of death. In some cases, entangling gear (for example, multifilament twisted lines or ropes, polyballs, bullet buoys, pots, traps) was identified to a specific fishery (for example, crab, lobster, or other fixed traps). The frequency of observed deaths increased significantly starting in 2015. Over time (1970 to 2002 compared to 2003 to 2018), the proportion of mortalities attributed to entanglements increased and the proportion of mortalities attributed to vessel strikes decreased. The Marine Mammal Protection Act (MMPA) (row 2.01) requires the U.S. National Marine Fisheries Service (NMFS) to estimate annual levels of human-caused serious injury and mortality to marine mammal stocks and categorize commercial fisheries based on how frequently they cause incidental serious injury and mortality of marine mammals. To fulfill this requirement, NOAA and partners published annual serious injury and mortality determinations for baleen whale stocks (including North Atlantic Right Whale) along the United States (U.S.) east coast into the Gulf of Mexico.			government departments, research institutes, response organizations and networks, zoos

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Researchers at the CWHC and partners compared the responses during the 2017 and 2019 mortality events in the GSL. More carcasses were in a fresher state in 2019 when first detected, coinciding with increased levels of surveillance and well-established response protocols compared to 2017. Despite this, over half of identified carcasses in 2017 and 2019 were in an advanced state of decomposition across both years, suggesting detection took days to weeks after death. However, the necropsy response rate improved between years. The conclusions from this analysis included stressing the importance of having trained personnel to perform at-sea assessments to complement information gathered during necropsies. The CWHC and their partners reviewed 45 reported North Atlantic Right Whale entrapments and entanglements that occurred between 1999 and 2019. There was an average of 1.5 individuals per year between 1999 and 2014, and an average of 4.2 individuals per year between 2015 and 2019. Gear was identifiable from 14 of the reported incidents documented between 2015 and 2018. Half were linked to the GSL snow crab fishery. Prior to 2015, the majority of incidents were reported in the Scotian Shelf or BOF. Refer to Henry et al. (2015, 2016, 2017, 2019, 2020); Themelis et al. (2016); Daoust et al. (2018); Sharp et al. (2019); and Bourque et al. (2020) for additional information.			
3.04: Completing genetic analyses	Saint Mary's University continued their long-term genetic analyses of North Atlantic Right Whale samples collected and provided by partners to support species monitoring. The results of these analyses included 1) identifying dead individuals too decomposed to be identified based on physical characteristics; 2) linking calves to mothers; 3)	4, 5, 6	16	Academia, NEAq

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	providing information on reproductive performance of males by continually updating paternity information; and 4) regularly comparing the photo-identification database maintained at the New England Aquarium (NEAq) and genetic databases to identify and correct errors.			
3.05: Initiation of tagging programs	DFO and partners initiated a tagging project in 2019 that included the deployment of supradermal satellite tags to collect data on diving behaviour and movement patterns of North Atlantic Right Whales in the GSL. Additionally, under the MEQ-EOS initiative (row 1.05), digital acoustic recording suction cup tags (DTAGs) were deployed to study North Atlantic Right Whale behaviour in response to noise exposure.	3, 4, 5, 6	8, 16	Academia, DFO, NGOs, NOAA
3.06: Data management	There are various long-term North Atlantic Right Whale datasets containing information collected opportunistically or from dedicated survey efforts. These datasets are updated on an ongoing basis, and some of them are described below. **DFO sightings, acoustics, and photo-catalog databases**: DFO maintains national and regional databases that include live sightings and acoustic vocalization records of cetaceans (including North Atlantic Right Whale) obtained from a variety of government assets and other contributors. Additionally, in 2017, DFO established a photo-catalog of preliminarily identified North Atlantic Right Whale individuals, which is submitted annually to the North Atlantic Right Whale Consortium (NARWC). **North Atlantic Right Whale Consortium databases**: These include databases held by specific researchers or organizations and managed by the NARWC. Information	4, 5, 6	10, 13, 16	Academia, data contributors, DFO, NGOs, research institutes, response organizations and networks

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	includes photo-identification, sightings, genetics, visual health assessments, contaminants, necropsies, blubber management, and blubber archive. **DFO enforcement databases:** DFO collected and stored data from fishery officers including hours spent on surveillance, monitoring, and compliance with fishery management measures aimed to protect North Atlantic Right Whale management measures. Efforts dedicated to the Marine Mammal Response Program (MMRP; row 1.31) and *Species at Risk Act* (SARA) were also recorded. **Incident data**: DFO and response organizations/networks collected and stored information regarding North Atlantic Right Whale incidents. DFO initiated the development of a MarineLife Incident Tracking System (MITS) database (row 1.15). **Marine Environmental Research Infrastructure for Data Integration and Application Network (MERIDIAN):** Under the MEQ-EOS Initiative (row 1.05) MERIDIAN compiled, collated, and integrated existing sources of information on ocean noise and developed analytic and visualization tools with focus on habitats of whales listed under the SARA.			
3.07: Collection and sharing of biological samples	Biological samples (for example, skin, blubber, feces, baleen, and blow [a cloud or column of moist air forcefully expelled through the blowhole when the whale surfaces to breathe]) continued to be collected and used in various research projects (for example, genetics, endocrine, feeding) both nationally and internationally. Samples were shared between research organizations and partners as appropriate (following required chain of custody	4, 5, 6	16	Academia, government organizations, NGOs, response organizations and networks, research institutes

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	arrangements and applicable permitting/international trade requirements).			
3.08: Development and implementation of data-visualization tools	**WhaleMap and Whale Insight:** With support from the Whale Detection and Collision Avoidance (WDCA) Initiative (row 1.05), researchers at DAL developed a data-visualization tool called WhaleMap in 2018 to collate and display sightings and acoustic detections of large baleen whales (including North Atlantic Right Whales) collected along the Northeast Atlantic coast in near real-time. Following the successful uptake of WhaleMap by North Atlantic Right Whale researchers and policy-makers, DFO invested in the development of a similar data visualization tool called Whale Insight to support the operational aspects of Canada's dynamic fishery and vessel management measures for North Atlantic Right Whales in Canada. Whale Insight was launched after the reporting period. WhaleMap and Whale Insight provide publicly accessible, interactive maps of sightings, acoustic detections, and track lines. They communicate the latest observations of North Atlantic Right Whales to the scientific, regulatory, and industrial sectors to inform more effective, dynamic planning of research and conservation activities. Refer to the WhaleMap and Whale Insight website for a full list of data contributors. **Passive Acoustic Cetacean Map (PACM):** NOAA worked on developing a passive acoustic mapping tool that shows when and where specific species, including North Atlantic Right Whales, were detected in the North Atlantic Ocean. The PACM website was launched outside of the reporting period.	1, 2, 4, 5, 6, 7	10, 13, 16, 19	Academia, data contributors, DFO

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Refer to Johnson (2018), the Whale Insight webpage, and the PACM webpage for additional information.			
3.09: Exploring machine learning using deep neural networks	Researchers at DAL, DFO, and their partners explored the potential for deep neural networks to detect North Atlantic Right Whale upcalls in acoustic datasets. The neural networks accurately identified upcalls recorded using different acoustic equipment and deployment types. Deep neural networks are used for the detection and classification of North Atlantic Right Whale upcalls on the near real-time PAM system operated by DFO in the St. Lawrence Estuary and GSL. Refer to Kirsebom et al. (2020) for additional information.	5	13	Academia, DFO, MERIDIAN
3.10: Detecting vessel behaviour using artificial intelligence	DFO worked to develop a predictive classification model using vessel monitoring systems and automatic identification systems. Models could be used to assess vessel compliance, monitor vessel behaviour (that is, to qualify and quantify the capabilities and performances of a vessel, with regard to regulatory criteria), and predict spatial and temporal hotspots of fishing activities, which could help inform future management measures.	1, 2, 5	2, 4	DFO
3.11: Assessing the performance of visual and acoustic detection methods to inform dynamic management	As part of the WDCA Initiative (row 1.05), near real-time acoustic detection technologies that could be used to inform dynamic management by providing information on the presence of North Atlantic Right Whales were reviewed. Their suitability and effectiveness for detecting North Atlantic Right Whales were evaluated. Researchers at DAL and their partners simulated the location uncertainty of North Atlantic Right Whales following visual and acoustic detections. With both detection methods	1, 2, 4, 5, 6	2, 4, 13, 16	Academia, DFO, NOAA, other government agencies, research institutes, TC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	the uncertainty in a whale's location increased quickly over time after the initial detection. The researchers cautioned against interpreting acoustic detections as static points since the locations of individuals can change rapidly. Consideration was given to how detection uncertainties affect dynamic management. Under the Whales Initiative (row 1.05), TC, in partnership with UNB, conducted a successful underwater glider deployment trial to advance understanding of the technology's capacity to acoustically detect North Atlantic Right Whales in near real-time in the Laurentian Channel. Refer to Johnson et al. (2020) and Theriault et al. (2020) for additional information.			
3.12: Exploring new technologies to visually detect whales	**Remotely Piloted Aircraft Systems (RPAS):** TC tested and evaluated RPAS as a tool for monitoring North Atlantic Right Whales. The potential for visually detecting whales was successfully demonstrated in the GSL. The technology was further developed with a focus on training the RPAS using artificial intelligence to detect whales. The RPAS had a successful mission as a surveillance platform over 2 Dynamic Shipping Zones in 2020, and informed vessel management measures in the GSL. **Thermal imaging:** LGL Limited, Woods Hole Oceanographic Institute (WHOI) and their partners explored the use of thermal imaging to detect whales and compared thermal imaging with other detection methods. Thermal imaging detected whale blows in polar, temperate, and subtropical oceans over a variety of distances, platform heights, and air and sea surface temperature combinations. Since then, DFO has worked with partners to test the use of	1, 2, 4, 5, 6	13, 16	Academia, Canadian Space Agency, DFO, private industry, research institutes, TC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	vessel-based thermal cameras to detect North Atlantic Right Whales in near real-time. While improvements are required before this technology can be considered a reliable tool for whale detection, testing is ongoing and the technology continues to be promising. **Satellite imagery:** Researchers at Stony Brook University, the British Antarctic Survey, and their partners made progress in assessing the use of high-resolution satellite imagery as a way to detect and describe whales, including training a model to automatically detect baleen whales. Projects funded under the SmartWhales Initiative (row 1.07) are also assessing the use of satellite imagery as a detection tool. Refer to Borowicz et al. (2019); Cubaynes et al. (2019); Smith et al. (2020); and Zitterbart et al. (2020) for additional information.			
3.13: Performing audits and reviews of the effectiveness of recovery activities and management measures	Scrutiny was placed on recovery activities and management measures taken to benefit North Atlantic Right Whales in Canadian waters. Under the Oceans Protection Plan (OPP) (row 1.05), DFO published a scientific review of North Atlantic Right Whale recovery activities assessing their effectiveness in achieving population recovery. DFO published science advice in 2019 and 2020 that reviewed the spatial and temporal distribution of North Atlantic Right Whales in areas subject to mandatory and voluntary vessel traffic management measures and provided advice on the mandatory slow-down zones for shipping traffic in the GSL. The advice also reviewed the risk of fishing gear entanglements and vessel strikes to North Atlantic Right Whales in Canadian waters to help inform	1, 2, 5, 6	2, 4, 13, 16	Academia, GoC, NGOs

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	monitoring programs and the development of fisheries and vessel management measures. The Commissioner of the Environment and Sustainable Development (CESD) completed an audit that focused on the adequacy of the Government of Canada's (GoC) efforts to protect marine mammals from the threats posed by vessels and fishing activities. Researchers with DAL, UNB, and their partners examined the GoC's response to the North Atlantic Right Whale mortality event between 2017 and 2019. Recommendations were provided in these reviews, and actions have been taken within the GoC with consideration of these recommendations. Refer to DFO (2017, 2018, 2019, 2020b), ACG (2018); and Davies and Brillant (2019) for additional information.			
3.14: Recommending strategies for monitoring North Atlantic Right Whales	Through science peer-review processes, recommendations were provided on surveillance and monitoring of North Atlantic Right Whales. In addition, since 2017, DFO Science has hosted annual post-field season meetings with DFO sectors and TC to discuss the outcomes of the most recent North Atlantic Right Whale field season and to assist in planning for scientific monitoring in the following season. A NOAA expert working group developed recommendations for monitoring and surveillance of North Atlantic Right Whales, including timing and location considerations to optimize species abundance and distribution monitoring, as well as the identification of individuals. These monitoring strategies can inform management decisions to avoid or	4, 5	13	DFO, TC, NOAA

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	mitigate threats (row 1.20, 1.29) and be used to develop proactive conservation approaches. Refer to DFO (2019) and Oleson et al. (2020) for additional information.			
3.15: Assessing cumulative impacts of threats	Researchers from Macquarie University and their partners reviewed the exploitation, monitoring, and recovery of North Atlantic, Southern, and North Pacific Right Whales. The need to develop an approach to assess cumulative effects of multiple stressors to support the implementation of effective management measures for these species was highlighted. Research priorities needed to move towards this goal were outlined. Refer to Harcourt et al. (2019) for additional information.	5	13	Academia, research institutes
3.16: Determining abundance, distribution, and migratory routes in Canadian waters	DFO, NOAA, and partners summarized visual and acoustic North Atlantic Right Whale detection data available in Canadian waters, which are largely affected by the spatial and temporal coverage of the monitoring platforms. Analyses indicated that North Atlantic Right Whales have been seen and/or heard in Canadian waters during almost every month of the year and across many different habitats (for example, Georges Basin, Emerald Bank, LaHave Bank, Scotian Shelf edge, Roseway Basin, Bay of Fundy, the GSL and southern waters off Newfoundland, and in the St. Lawrence Estuary). Although North Atlantic Right Whales have been observed in the GSL for many decades, larger, more consistent aggregations have been observed since 2015, coinciding with increased yearly survey and surveillance efforts in that area.	4, 5, 6	13, 16	Academia, consulting companies, DFO, NGOs, NOAA, private industry, research institutes, shipping industry

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	An analysis of sightings data from 2015, 2017, and 2018 in the southern GSL was used to obtain estimates of the stock size, age and sex ratio, abundance, and residency time of North Atlantic Right Whales. During the time period analyzed, slightly over one third of the population was documented in this habitat area. Analyses of systematic aerial surveys conducted by DFO in Canadian waters, and of acoustic data collected in the waters to the east and south of Newfoundland, were performed for the period 2017 to 2019. These analyses confirmed that a substantial proportion of North Atlantic Right Whales are using the southern GSL when in Canadian waters. Low numbers of individuals were detected in the Roseway and Grand Manan basins, and the northwestern GSL. Acoustic monitoring off Newfoundland confirmed 21 North Atlantic Right Whale vocalizations in Placentia Bay during the summer and early autumn in 2017 to 2019. Sightings collected in 2017 from a number of data sources (for example, aerial surveys, vessel surveys, opportunistic sightings, passive acoustic monitoring) and historical PAM data collected between 2011 to 2016 were analyzed to provide information on the seasonal extent of North Atlantic Right Whale occurrence and vocalizations in the GSL. North Atlantic Right Whale detections were present in the GSL between April until mid-January (when ice typically forms in the GSL). Under the MEQ-EOS initiative (row 1.05) and other initiatives, DFO continued analyzing PAM recordings collected since 2017 (row 3.02) to further investigate			

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	contemporary migratory routes and spatio-temporal distribution in Canadian waters. Refer to Cole and Henry (2015); Moore (2017); Davis et al. (2017); DFO (2017, 2019, 2020b); Delarue et al. (2018); Simard et al. (2019); and Cole et al. (2020) for additional information.			
3.17: Determining abundance, distribution, and residency of individuals in identified critical habitat areas	Researchers at DFO, DAL, UNB, NOAA, and their partners advanced knowledge on the abundance, distribution, and residency of North Atlantic Right Whales in the Roseway Basin and Grand Manan Basin critical habitat areas. An analysis of sightings data from 1980 to 2005 indicated the average residence time of individuals was 75 days in the Grand Manan Basin and 136 days in the Roseway Basin. Analyses from data collected in 2007 and 2009 in the Roseway Basin suggested aggregations occurred east to west along the southern basin margins. Oceanographic processes helped explain the interannual variability of prey and North Atlantic Right Whale abundance throughout this time period. Connectivity between Grand Manan and Roseway basins was assessed using data from 1987 to 2009. Relationships between interannual variation in North Atlantic Right Whale abundance and variation in prey availability were explored. Studies suggested that significant reductions in prey availability likely resulted in the abandonment of Roseway Basin in the 1990s. Visual detections and length of residency in the Grand Manan Basin declined since 2010, consistent with a decline in prey availability. However, changes in prey availability did not fully explain North Atlantic Right Whale abundance variations in the Grand	4, 5, 6	13, 16	Academia, DFO, NOAA, NGOs, Parks Canada , private industry, research institutes, shipping industry, TC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Manan Basin, suggesting the Grand Manan Basin had functions for the species other than feeding. North Atlantic Right Whale sightings data collected in Roseway Basin in 2004, 2005, 2014, and 2015 suggested a 40% decline in abundance across the study period; however, acoustic detection data collected during the same years did not support the same conclusion, instead suggesting no significant change in occupancy of the area. Under the MEQ-EOS initiative (row 1.05), continued analysis of PAM platforms deployed in critical habitats since 2017 (row 3.02) occurred. Refer to Cole and Henry (2015); Davies et al. (2015a, 2015b); Moore (2017); DFO (2019); and Durette-Morin et al. (2019) for additional information.			
3.18: Identifying shifts in foraging habitat	DFO, Bigelow Laboratory for Ocean Sciences, CWHC, Center for Coastal Studies (CCS), NEAq, NOAA, and partners identified shifts in foraging habitat across the North Atlantic Right Whale's range. The species' use of foraging habitats off the northeastern U.S. and Canada started shifting in 2008 and 2010, respectively. By 2015, habitat use appeared to stabilize, with some continued interannual variation. This shift in North Atlantic Right Whale habitat use is thought to be linked to changes in the abundance of their prey, *Calanus* copepods, that have occurred in eastern Canadian waters since 2010. Refer to Davis et al. (2017); Devine et al. (2017); Pettis et al. (2017); Johnson et al. (2017, 2018); Mayo et al. (2018); Meyer-Gutbrod and Greene (2018); Davies et al. (2019);	4, 5, 6	13, 16	Academia, DFO, NGOs, NOAA, other government departments, private industry, research institutes, response networks and organizations, TC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Davies and Brillant (2019); Plourde et al. (2019); Record et al. (2019); Simard et al. (2019); Sorochan et al. (2019); Bourque et al. (2020); Gavrilchuk et al (2020); and Lehoux et al. (2020) for additional information.			
3.19: Assessing and reporting on calving rates, abundance trends and the risk of extinction	Researchers at NOAA, NEAq, the University of California, and partners assessed population trends and calving rates on an annual basis. Using data as of September 4th 2019, the best estimate for the population at the end of 2018 was estimated to be 409 individuals (95% confidence interval +/- 11 and 10 respectively). Annual updates published outside of this reporting period can be found on the North Atlantic Right Whale Consortium website. North Atlantic Right Whales have been declining since 2010 due to increased mortality and decreased reproduction. The number of calves born each year during the reporting period ranged from zero (2018) to 17 (2015). Females were found to have a lower survival rate than males and there has been little evidence suggesting mortality rates are declining. Experts have predicted that extinction is possible in as little as 30 years if the long-term average mortality rate is not significantly reduced. NOAA published annual North Atlantic Right Whale stock assessments, including information on the geographic range, population size and trends, potential biological removal, annual human-caused serious injury and mortality, and stock status of the species. Refer to Petis and Hamilton (2015, 2016); Kraus et al. (2016); Pace et al. (2017); Corkeron et al. (2018); Meyer-	4, 5, 6	10, 13, 16	Academia, NGOs, NOAA, research institutes, response organizations and networks

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Gutbrod et al. (2018); and Pettis et al. (2018a, 2018b, 2020) for additional information.			
3.20: Incorporating acoustic data into modelling tools	Under the MEQ-EOS Initiative (row 1.05), the Ocean Research & Conservation Association launched a 3-year project to develop methods to incorporate acoustic data (including North Atlantic Right Whale detections and underwater noise) into existing population viability analyses (to determine the probability of extinction) and species distribution models. Findings from the investigation of methods were summarized in an internal report.	3, 4, 5	8	DFO, research institutes
3.21: Developing updated growth models and identifying size differences between sexes	Researchers at the University of British Columbia and their partners updated North Atlantic Right Whale body growth models, which suggested adults have a greater body mass than previously thought, and thus higher prey intake needs. This work has implications for conservation and management, as it indicates adults and juveniles reaching sexual maturity are more vulnerable to nutritional stress, and higher doses of medication may be needed to treat wounded animals. Sexual dimorphism (that is, a difference in size between males and females) exists for individuals 9 years of age and over. Refer to Fortune et al. (2021), published online in 2020, for additional information.	4, 5, 6	13, 16	Academia, NOAA, research institutes
3.22: Performing health assessments and hormone analysis	Under the MEQ-EOS Initiative (row 1.05), researchers at DFO, NEAq, and their partners collected whale blow and are working to validate its use in hormone analysis. Hormone extraction and measurement methodology for blow samples is being developed in Canada and validated for cross-comparison with labs in the U.S.	4, 5, 6	11, 13, 14, 16	Academia, aquariums, DFO, NOAA, research institutes, response organizations and networks

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Researchers from the NEAq and their partners assessed North Atlantic Right Whale health trends between 1980 and 2008. A steep decline in population health, overlapping with decreased calving rates was observed. Further research by the Aarhus Institute of Advanced Studies and their partners found the body condition and growth rate of North Atlantic Right Whales was lower than their southern counterparts, suggesting the poor body condition of this species may be affecting recovery. NOAA held a workshop in 2019 that brought together researchers and managers to assess health information and data gaps, as well as identify tools and/or techniques needed for the collection of standardized health information for the species. Refer to Rolland et al. (2016) ; Burgess et al. (2018) ; Fauquier et al. (2020); and Christiansen et al. (2020) for additional information.			
3.23: Identification and quantification of undetected deaths	Researchers at NOAA and their partners performed a modeling study to estimate the number of undetected North Atlantic Right Whale deaths (that is, cryptic mortality) that occurred between 1990 and 2017. The modeling indicated the observed deaths detected during that time period accounted for 36% of all estimated deaths, suggesting that observed deaths are poor predictors of the total annual number of whales dying. In 2017, observed deaths detected accounted for a greater proportion of the total deaths due to the unusually high carcass count and a dramatic increase in Canadian survey effort. The deaths of the majority of individuals presumed dead that were undetected were assumed to be the caused by entanglements in fishing gear	4, 5, 6	13, 16	NGOs, NOAA, research institutes

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	because they were observed with serious injuries from gear at their last known sighting. Refer to Pace et al. (2021), published online in 2020, for additional information.			
3.24: Testing fishing gear designed to mitigate or remove the risk of entanglement	The Association des Crabiers Acadiens Inc. and partners implemented initiatives aimed at minimizing the impact of the snow crab fishery on North Atlantic Right Whales. Among other things, they 1) tested the strength of existing rope; 2) developed a tool to simulate the inertia created by crabs filling the pot; 3) tested 3 versions of “whale safe” weak rope and Timed Tension Line Cutters; 4) tested the behaviour of existing ropes in the water column; and 5) tested acoustically triggered on-demand gear. Canadian Wildlife Federation (CWF) and partners initiated a project focusing on reducing mortality and serious injury of marine species at risk (including North Atlantic Right Whales) from entanglement in fishing gear. Working groups were formed with participants from industry and First Nations across New Brunswick, Prince Edward Island, and Nova Scotia. Seven on-demand gear developers were engaged and on-demand gear systems were acquired, trialed, and evaluated by fishers. CWF invited fishers to discuss their experiences at a North Atlantic Right Whale entanglement mitigation workshop.	2, 5, 6, 7	5, 14, 16, 19	DFO, fishing industry and gear manufacturers, Indigenous fishers and organizations, NGOs, Province of New Brunswick
3.25: Assessing entanglement risk and encounter rates with fishing gear	DFO undertook a simulation study to estimate potential encounters between North Atlantic Right Whales and snow crab fishing gear during the years 2015 to 2017 in the southern GSL. The results indicated that the majority of the simulated potential encounters across all 3 years would have occurred in the 2018 fisheries static closure zone.	2, 5	4, 13	Academia, DFO, NGOs, research institutes

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Researchers at DAL and their partners estimated the risk of lethal fishing gear entanglements in the BOF, Scotian Shelf (SS), and the southern GSL and identified measures that could be taken to reduce the likelihood of entanglement through spatial and temporal closures. NEAq assessed the entanglement risk in groundlines on the seafloor. Results suggested rope resting on, or floating above, the seafloor could pose an entanglement risk and using sinking groundlines likely reduces entanglement risk for whales making contact with the ocean floor. Researchers at WHOI and their partners assessed the role that diving and foraging behaviour played in mediating human-caused mortality using dive profiles collected from tagging data. The majority of tagged individuals dove to within 5 metres of the seafloor raising concerns about the use of floating groundlines in pot and trap gear in Canadian waters. Refer to Baumgartner et al. (2017); Brillant et al. (2017); DFO (2019); and Hamilton and Kraus (2019) for additional information.			
3.26: Protocol published for fisheries mapping in Atlantic Canada	An Atlantic Canadian protocol on mapping fishing activity was published, providing consistent methodology and guidance for mapping fishing activity across DFO regions. Fishery mapping products help with risk assessments, compliance monitoring, marine conservation planning, and other departmental objectives that directly, or indirectly, affect North Atlantic Right Whales.	2, 5	13	DFO

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Refer to Koropatnick and Coffen-Smout (2020) for additional information.			
3.27: Assessing the rate, severity, and sub-lethal effects of anthropogenic injuries	Researchers at the NEAq continued to monitor anthropogenic injuries to North Atlantic Right Whales using photographs that are submitted to the photoidentification database managed by the NARWC (row 3.06). Individuals with attached fixed gear, or with new or existing injuries consistent with a vessel strike or moderate to severe entanglement, are monitored biannually. Pre- and post-injury health conditions are evaluated using established visual health assessment techniques and the impact of the injury on health is determined. Outcomes of these assessments are published annually in the North Atlantic Right Whale Report Cards. CCS and NEAq developed a mark–recapture framework that was used to estimate the survival rate of North Atlantic Right Whales after entanglements and assess other factors that affect entanglement outcomes. They found both adults and juveniles were less likely to survive after being entangled, but disentangling the animals quickly improved their survival outcome. Researchers at NEAq, WHOI, the University of Massachusetts Boston, and their partners assessed the sub-lethal impacts of entanglements. They found that sub-lethal entanglements could increase energetic costs, and compete with the energetic requirements of reproduction, which may lead to increased calving intervals. State-space models using visual health data showed sub-lethal entanglements can cause reproductive failure and declining health during and after the entanglement event.	2, 4, 5, 6	4, 13, 16	Academia, NGOs, research institutes

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Researchers at WHOI and their partners assessed the effect of gear drag on entangled North Atlantic Right Whales and confirmed the importance of reducing trailing gear during disentanglement efforts. Swimming efficiency of entangled North Atlantic Right Whales was also assessed, revealing chronic entanglements significantly affected their ability to swim. Researchers at the NEAq, the University of Massachusetts Boston, and their partners assessed changes in body condition and validated the response of stress hormones from a chronic entanglement over time using baleen. This information can be used to assess the prognoses of injured whales and develop methods that could be applied to future forensic studies. The study found severe entanglements hastened declines in body condition, particularly for juveniles. Refer to Pettis and Hamilton (2015, 2016); Robbins et al. (2015); Rolland et al. (2016); van der Hoop et al. (2016, 2017a, 2017b, 2017c); Pettis et al. (2017, 2018a, 2018b, 2020); and Lysiak et al. (2018) for additional information.			
3.28: Undertaking research to understand and reduce the risk of vessel strikes	DFO and partners assessed the relative risk of a lethal vessel strike using a simulation model that incorporated data on vessel movements and speed with the density and distribution of North Atlantic Right Whales in the GSL in 2017. Mandatory speed restriction zones reduced risk of lethal vessel strike by 56%; however, relative risk increased in areas outside of mandatory zones northwest of Anticosti Island. DFO and the Canadian Whale Institute (CWI) assessed vessel compliance with voluntary and mandatory vessel	1, 4, 5, 6	2, 13, 16	Academia, DFO, NGOs, NOAA, research institutes, shipping industry, TC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	traffic management measures in the Roseway Basin Area to Be Avoided (ATBA). In the first 10 years of implementation of the voluntary ATBA (2008 to 2018) weekly and annual participation ranged from 14% (± 43%) to 100% (± 0%) and 64% to 82%, respectively. Annual participation estimates decreased from 2014 to 2017 (Angelia Vanderlaan, personal communication). DAL and the CWF assessed the lethality of vessel strikes of all sizes of vessels on large whales using a modeling approach. The model indicated that vessels of all sizes can result in stresses that could result in lethal injuries and that large vessels travelling at reduced speeds (that is, 10 knots) only provide small reductions in the probability of a vessel strike being lethal. NOAA and partners described observations of non-commercial vessel strikes on North Atlantic Right Whales and noted that when whales and vessels are not separated in space and time, the use of trained/informed crew combined with the slowing of ships to modeled sublethal speeds is the most reliable way to avoid lethal strikes. Syracuse University and partners studied the surface and acoustic behaviors of mother-calf pairs in multiple habitats to increase understanding of the risk of vessel strikes during this life history stage. Resting and nursing behaviours of mother-calf pairs in the BOF resulted in individuals staying at or near the surface, increasing the risk of interacting with a vessel. Refer to Wiley et al. (2016); Cusano et al. (2019); DFO (2019); and Kelley et al. (2020) for additional information.			

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
3.29: Assessing needs, preferences, and constraints of mariners	DAL and partners used a questionnaire to determine mariner knowledge and awareness of endangered whales, existing conservation measures, and receptivity to near real-time conservation technology on the bridge. The results were summarized and recommendations on the effective implementation of near real-time alerts were provided. The Marine Mammal Observation Network (MMON), World Wildlife Fund-Canada, and the Shipping Federation of Canada worked with partners to assess the needs of mariners when developing the 2nd edition of the Mariner's Guide to Whales in the Northwest Atlantic. This guide was published in 2021 outside of the reporting period. Refer to Reimer et al. (2016) for additional information.	5, 7	13, 18	Academia, DFO, NOAA, NGOs, PC, research institutes, fishing industry, shipping industry, TC
3.30: Characterizing foraging habitat	DFO identified potential suitable North Atlantic Right Whale foraging habitats in the GSL, SS, and BOF using 3-dimensional preyscapes. Previously unknown habitats where *Calanus* copepod biomass exceeded the minimum levels suitable for foraging North Atlantic Right Whales were also identified. DFO and partners developed several model approaches (habitat suitability and, coupled physical-biological, generalized additive mixed, and bioenergetics) to predict and assess processes driving changes in the abundance of *Calanus* copepods in North Atlantic Right Whale foraging habitat (for example, environmental productivity envelopes, the role of advection). These models were also used to determine the potential relative contribution of these prey in specific habitat areas in the GSL. This work improves estimates of *Calanus* availability, quality, and dynamics to inform North Atlantic Right Whale management.	5, 6	13, 16	Academia, DFO, fishing industry, NGOs, NOAA, research institutes

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	DFO, WHOI, and partners are working to further characterize North Atlantic Right Whale foraging habitat in Canadian waters (Gulf of Maine [GoM], GSL, BOF, SS) by assessing concurrent zooplankton sampling and North Atlantic Right Whale foraging behaviour (for example, diving profiles collected from tagging data). The Grand Manan Whale and Seabird Research Station (GMWSRS) initiated a project to develop a predictive model for copepod abundance in collaboration with Canadian and U.S. lobster fishers, the shipping industry, and scientists in and around Grand Manan Basin. Preliminary analyses suggest fall and winter water temperatures can predict copepod abundance the following summer. Once developed, the model could be used to inform and implement conservation actions in years when more whales are anticipated in the Grand Manan Basin critical habitat area. Refer to Albouy-Boyer et al. (2016); Brennan et al. (2019); Plourde et al. (2019); Gavrilchuk et al. (2020); and Lehoux et al. (2020). for additional information.			
3.31: Documentation of processes affecting regional North Atlantic Right Whale abundance and local prey accumulation	DFO documented changes in abundance of *C. finmarchicus* and other zooplankton biomass on the Scotian Shelf and in the eastern GoM. This added to the evidence that, as warmer ocean conditions persist, the composition of zooplankton communities are shifting away from large, energy rich copepods like *C. finmarchicus*, towards smaller copepod species. This may lead to less productive conditions for planktivorous fish, marine mammals, and birds.	4, 5, 6	9, 13, 16	Academia, DFO, NOAA, research institutes

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	DFO and partners studied oceanographic processes affecting the vertical distribution, local accumulation, regional population levels, and interannual variations of *Calanus* copepods across various habitat areas (for example, GSL, SS). This work demonstrated a correlation over time between *Calanus* copepod abundance with increasing water temperatures and changes in the spatial distribution and calving rates of North Atlantic Right Whales. It also showed the importance of oceanographic mechanisms in supplying prey to North Atlantic Right Whale foraging areas on the continental shelf, and improved capacity to predict locations of diapausing *Calanus* copepods, as well as changes in distribution and population dynamics. Bigelow Laboratory for Ocean Sciences and partners assessed changes in seasonal patterns of North Atlantic Right Whales and *C. finmarchicus* during a period of rapid warming. They determined climate-driven changes in the GoM have restructured the ecosystem, altered the distribution of *C. finmarchicus*, and resulted in a change in range-wide seasonal North Atlantic Right Whale foraging patterns. The results suggested that oceanographic forecasts could be used as early warning systems to detect species-range shifts and facilitate dynamic management. Refer to Johnson et al. (2017); Krumhansl et al. (2018); Record et al. (2019); Sorochan et al. (2019); and Casault et al. (2020a, 2020b); for additional information. For additional studies completed by NOAA and partners focusing on *C. finmarchicus* on the northeast U.S. Shelf refer to Grieve et al. (2017).			

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
3.32: Developing guidelines for assessing effects of noise on marine mammals	NOAA revised their technical guidance for assessing the effects of human-generated noise on marine mammal hearing. DFO began to explore the applicability of the guidance in a Canadian context. Under the MEQ-MPC program (row 1.05) DFO held a noise metrics workshop to determine the most appropriate metrics for assessing impacts of noise on North Atlantic Right Whales in Canadian waters. During the workshop, North Atlantic Right Whale sound production and hearing range as well as ambient ocean noise sources were examined and discussed. Knowledge gaps and directions for future research were identified. Reports from this workshop are anticipated to be published during the next reporting period. Refer to NMFS (2018) for additional information.	3, 5, 6	8, 13, 14, 16	Academia, consulting companies, DFO, NOAA, private industry, research institutes, TC
3.33: Establishing noise baselines and developing models to explore ocean noise	Under the MEQ-MPC program's Coastal Acoustic Monitoring Project (rows 1.05, 3.02), DFO and partners conducted acoustic monitoring in areas along the coast of Nova Scotia to increase understanding of whale presence, with an emphasis on baleen whales and the noise generated from vessel traffic. While this work was not geared towards North Atlantic Right Whales, the data collected, including local soundscape characterization, could be useful for future risk assessments. Eastern Charlotte Waterways (ECW) and partners examined the coastal soundscape in the outer BOF, including the Grand Manan Basin, and evaluated the distribution of noise in time and space. Under the MEQ-EOS Initiative (row 1.05), researchers at DAL and DFO examined how environmental noise (for	3, 5, 6	8, 13, 16	Academia, aquariums, community groups, DFO, fishing industry, NGOs, NOAA, other government departments, private industry, research institutes, tourism operators

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	example, wind and rain) contributed to the ocean soundscape. Techniques for separating the sound field into environmental and human-generated noise were developed. An ocean noise model capable of predicting sound pressure levels from natural sources in waters inhabited by North Atlantic Right Whales is being developed. When combined with human-generated noise and species distribution models, this model could be used to predict natural and human-generated noise exposure levels in North Atlantic Right Whale habitat. Refer to ECW (2016) for additional information.			
3.34: Reviewing and modeling the effects of noise on whales	Researchers at Curtin University, DFO, and their partners performed literature reviews on the effects of noise on marine mammals. Studies published between 2004 and 2016 on North Atlantic Right Whales were summarized. Work was undertaken by DFO and partners through the MEQ-EOS Initiative (row 1.05) to monitor and assess the effects of noise on North Atlantic Right Whale communication. Preliminary results from the Emerald Basin showed received levels of upcalls increased with increasing background noise levels. Researchers at Syracuse University and partners explored the potential for acoustic crypsis (that is, an ability to avoid detection by other animals) in North Atlantic Right Whale mother-calf pairs. They found mothers with young calves produced a higher proportion of quiet call types that are rarely detected in recordings when calves are the most vulnerable to predation.	3, 4, 5, 6	8, 13, 16	Academia, consulting companies, DFO, NGOs

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Researchers at Pennsylvania State University and partners examined the effects of noise on communication between mother-calf pairs in the BOF. They found that noise may significantly limit upcall detection range, but North Atlantic Right Whales exhibit noise compensation behaviours resulting in less transmission loss. This study suggested that the documented increase in upcall frequency may be an adaptive response to compensate for globally increasing levels of ocean noise. The impacts of vessel noise on communication and the evidence that documented noise compensation behaviors can improve communication range in the presence of low-frequency ship noise were also discussed. ECW is developing a model for the outer BOF that links acoustic ship noise and its dissipation rate to visualize the impact of vessel noise on North Atlantic Right Whale communication space. Refer to Gomez et al. (2016); Tennessen and Parks (2016); Erbe et al. (2019); and Parks et al. (2019) for additional information.			
3.35: Mitigating underwater noise from vessels	Since 2017, Canada has been actively participating in the International Maritime Organization's (IMO) work to mitigate underwater vessel noise. This ongoing work is expected to ensure a common approach that best addresses shipping noise internationally, including in Canadian waters and in identified North Atlantic Right Whale habitats. In 2019, TC launched the Quiet Vessel Initiative (QVI), which is testing the most promising technologies, vessel designs, retrofits and operational practices to make vessels quieter and reduce the impacts of underwater noise on	3	8	IMO, TC,

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	vulnerable marine mammals. Several projects are underway, and findings could help support the reduction of ship-generated noise in North Atlantic Right Whale habitat.			
3.36: Reviewing the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP) and mitigation and monitoring measures for seismic survey activities on SARA-listed whales	Over the course of 2 peer review processes, DFO and partners performed a scientific review of the SOCP and reviewed mitigation and monitoring measures in the SOCP. The SOCP sets out minimum standards that apply in Canada's non-ice covered marine waters to all seismic survey activities that use air source arrays. These scientific reviews considered seismic surveying activities conducted in and near habitat of SARA-listed whales to determine if, among other things, they were likely to avoid SARA-prohibited impacts to individuals or their critical habitat. Twenty-nine recommendations were considered to inform a potential update to the SOCP, with the objective of minimizing potential impacts on whales and other species. Suggested considerations included additional protection for critical habitat, enhanced mitigation and monitoring, and more specific guidance on monitoring (visual and acoustic). Qualitative and quantitative acoustic thresholds were discussed during both review processes. Refer to DFO (2015, 2020c); Theriault and Moors-Murphy (2015); Moors-Murphy and Theriault (2017); and Moulton et al. (2020) for additional information.	3, 5, 6	13	Academia, DFO, fishing industry, NOAA, offshore petroleum boards, oil and gas industry, other government departments

Table 2.4. Education, outreach, and cultural practices for the North Atlantic Right Whale. Many of the activities referenced in this table include information available online. Since hyperlinks frequently break, they have not been embedded here.

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
4.01: Performing cultural ceremonies	Blessings from Elsipotog, Lennox Island, and Esgenoopetitj First Nation were given prior to some of the necropsies conducted in 2017 and 2019 (row 1.34).	6	n/a	First Nations, necropsy participants
4.02: Conducting targeted outreach to the fishing and shipping industries and promoting stewardship activities	Examples of work completed include (but are not limited to): Fisheries and Oceans Canada (DFO) communicated information on annual fisheries management measures and other requirements to protect North Atlantic Right Whales at fisheries advisory committee meetings, during fishery officer patrols, and through other fora. DFO also launched an annual awareness campaign in 2020 on the North Shore, PEI to raise awareness among fishermen, boaters and marine mammal observation companies about North Atlantic Right Whales and the management measures implemented to help protect them. DFO produced and distributed educational materials and information about species at risk, including North Atlantic Right Whales. This information was presented at fisheries advisory committee meetings and sent to inshore lobster licence holders. Telephone hotlines of response organizations were provided to fishers to report entangled or injured whales (row 1.19). Transport Canada (TC) issued navigational warnings (NAVWARNs) to notify vessels to watch for North Atlantic Right Whales in the Roseway and Grand Manan basin critical habitat areas and distributed postcards and information sheets related to the trial voluntary slowdown in	1, 2, 4, 5, 6, 7	5, 16, 18, 19	DFO, fishing industry, Indigenous organizations, non-governmental organizations (NGOs), research organizations, response organizations and networks, TC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Cabot Strait, which were developed in collaboration with the Canadian Whale Institute (CWI). The CWI and the Association des Crabiers Acadiens Inc. initiated a 3-year monitoring, stewardship, and outreach project that included activities to reduce the risk of vessel strikes and entanglements. Stewardship was facilitated by keeping industry stakeholders in the Gulf of St. Lawrence (GSL) aware of changes in North Atlantic Right Whale distribution in near real-time. Vessel-based monitoring surveys undertaken in partnership with snow crab fishers increased their capacity and willingness to engage in stewardship activities and enabled fishers and vessel owners/operators to become actively involved in North Atlantic Right Whale stewardship. The Marine Mammal Observation Network, World Wildlife Fund-Canada, St. Lawrence Global Observatory, and partners launched the Navigating Whale Habitat Platform for vessels in Eastern Canada. The platform shares documentation and online training for boaters and shipowners. Portals for fisheries and the ecotourism industry will be added during the next reporting period. Among other things, information is provided on whale identification, reporting whales in distress, safely navigating around whales, as well as collecting, reporting, and visualizing sightings. Green Marine continued their certification program for the marine transportation industry, requiring participants to adopt practices and technologies that reduce the environmental footprint of their operations (for example, reducing underwater noise to lessen impacts on marine			

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	mammals, reducing the risk of various pollutants to improve ecosystem health). Several participants in Atlantic Canada and Quebec maintained their certification or joined the certification program during the reporting period. The Shipping Federation of Canada developed and distributed statements on the North Atlantic Right Whale protection measures and updates on changes to vessel management measures to the shipping industry. The Eastern Nova Scotia Marine Stewardship Society and partners opened a physical location in Louisbourg, Nova Scotia to perform targeted outreach with fish harvesters in eastern Cape Breton on species at risk (including North Atlantic Right Whales) and fishing practices that could reduce entanglement. Fishing gear design, configuration, and new gear technologies (including on-demand) were discussed. The Society demonstrated technology (for example, WhaleAlert) to fishers to aid in species identification and reporting. Interviews with fishers were conducted to collect information on their knowledge of the threat of entanglement, collect input on options to prevent or mitigate entanglements, and determine interest in participating in a response support network to aid existing response organizations. Homarus Inc. and partners organized presentations and a panel discussion by fishers about the effort undertaken by industry to reduce the impact of fisheries on North Atlantic Right Whales and on the potential effects of climate change on their distribution. Three training sessions on “Science and Fishing” were provided to inshore fish harvesters, future fishers, and the general public. The sessions included			

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	information on the ecology and behaviour of cetaceans (including North Atlantic Right Whale) in the GSL, marine pollution, and responsible fishing practices. The Grand Manan Whale and Seabird Research Station (GMWSRS) continued to promote the Voluntary Fishing Code to people working around large whales, including North Atlantic Right Whales. They also undertook outreach and educational activities with lobster fishers and worked toward forming new partnerships with the shipping industry.			
4.03: Producing and distributing outreach material addressing the prevention of abandoned, lost or otherwise discarded fishing gear (ALDFG) and marine debris	Examples of work completed include (but are not limited to): DFO produced and published outreach material online describing what ALDFG is, the reporting requirements for the fishing industry, the Ghost Gear Fund and associated projects, and data collected from lost gear reporting. The Fundy North Fisherman's Association (FNFA) produced and distributed a "Fishing Gear Recycling and Disposal Option Guide" for fishers and a manual on best practices for retrieval of ALDFG. Two short films were developed highlighting the removal of ALDFG. The films and retrieval manual are accessible on their website and YouTube channel. The Ship-to-Shore program in Newfoundland and Labrador continued to engage commercial fish harvesters in enhanced waste management at sea and on the wharf with the objective of reducing marine debris. The Quebec-Labrador Foundation (QLF) conducted targeted engagement with lobster harvesters in Newfoundland and Labrador to increase awareness of the	2, 6, 7	5, 16, 18, 19	DFO, fishing industry, NGOs

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	threat of plastic bait box liners and work toward more sustainable gear options and disposal practices. They also explored alternatives to plastic products, encouraged producer and industry responsibility, and supported conservation actions to mitigate harm to marine species at risk. Homarus Inc. distributed surveys to fishers to collect information on fishing habits. The results of these surveys will feed into the creation of a “Clean Ocean Alliance”. A 3-minute video was developed to explain the purpose and mission of the Alliance to fishers. The Huntsman Marine Science Centre promoted their Rope Recycling Program by installing educational signs to rope recycling bins, producing a video highlighting the Debris Free Fundy project, and hosting rope repurposing workshops for community members. The Fishing Gear Coalition of Atlantic Canada (FGCAC), collaborated with stakeholders and rights holders to implement a product stewardship program for end-of-life fishing gear across Eastern Canada, beginning with a pilot project in Nova Scotia. The FGCAC developed a communications strategy that included program branding, education and promotional materials, and a website to clearly and effectively communicate the program and how to get involved.			
4.04: Promoting awareness of marine animal response	Examples of work completed include (but are not limited to): DFO continued to maintain information on how to report marine mammal incidents, including contact information for regional response organizations/networks.	6, 7	16, 18, 19, 20	DFO, Indigenous organizations, NGOs, response networks and organizations

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
networks and organizations	The Canadian Wildlife Federation (CWF) increased public awareness of regional volunteer response organizations and networks, and how to recognize/report marine mammal incidents. Eight training videos were produced and multiple outreach events were held targeting various stakeholders (for example, fishermen, aquaculture industry, DFO fishery officers, port authorities, police, recreational boaters, and the general public). The Marine Animal Response Society (MARS) developed and distributed education and outreach materials focusing on marine animal incident response at-sea, an identification guide for identifying live, dead, and entangled North Atlantic Right Whales for the fishing industry, and a marine animal emergency reporting handout for shipping companies. Response networks were promoted through the production of outreach videos and promotion of marine animal incident hotlines to marine stakeholders and the general public. Whale Release and Strandings – Newfoundland and Labrador (WRS-NL) conducted public awareness programs for fish harvesters, school-aged children, and the general public. Information was provided on marine mammals, the services provided by the team, and the importance of reporting marine mammal incidents. WRS-NL developed a feature marine mammal exhibit that ran for a week at the Rooms Museum in St. John's, Newfoundland and participated annually in the Newfoundland and Labrador Whale Festival at Cape Spear National Historic Site.			
4.05:	The GMWSRS promoted best practices for whale-watching by distributing the Voluntary Code of Ethics for Water-based Tour Operators, established in 1997.	7	19	NGOs

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
Promoting whale-watching best practices	The Navigating Whale Habitat Platform (row 4.02) is expected to also contain information for tour companies that offer whale watching and promote stewardship practices to safeguard these species.			
4.06: Conducted public education and outreach	Examples of work completed include (but are not limited to): DFO produced and distributed outreach materials featuring North Atlantic Right Whales (for example, bookmarks, stickers, fact sheets) at annual Oceans Day events, expos, open houses, trade shows, and other venues. Promotional items containing the “Tell Jack” campaign slogan (Newfoundland and Labrador) encouraging reports of whale and turtle sightings were distributed (for example, picnic blankets, lunch coolers, and decals). Posters were distributed on wharves, community bulletin boards, ferries, and whale watch companies to encourage reporting of North Atlantic Right Whale sightings. Since 2018, DFO’s Atlantic Science Enterprise Centre has offered an immersive experience using virtual reality headsets to dive with a North Atlantic Right Whale. The "Dive with Boris" video was filmed in the Bay of Fundy. It was a popular activity within the aquatic science workshops that targeted middle school students and adults in the Greater Moncton area in New Brunswick. DFO continued to participate annually on a local radio talk-show where listeners can ask questions related to marine mammals. The “Stay off my Tail” campaign was also promoted, which was designed to raise awareness of the Marine Mammal Regulations and approach distances for marine mammals (including North Atlantic Right Whales).	6, 7	16, 18	Academia, DFO, educational centres, Indigenous organizations, museums, NGOs, research institutes, response organizations, virtual reality designers

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	DFO worked with the Royal Ontario Museum to support development of the exhibit “Great Whales: Up Close and Personal”, which launched in 2021. The objective of the exhibit was to educate the public about whale species including North Atlantic Right Whales, and recovery efforts such as fishing gear innovation. DFO, Dalhousie University (DAL), Ingenium (Canada’s Museums of Science and Innovation), and MARS collected, treated, and preserved the skeleton of Glacier, a 33 year-old North Atlantic Right Whale, recovered during a necropsy in 2017. The recovered bones were scanned to build 3D interactive models for public education with the eventual goal of building a virtual experience that will be housed at DFO’s Gulf Fisheries Centre. Homarus Inc. developed a mobile lab station on whales and ghost gear for students in New Brunswick as well as themed exhibits on North Atlantic Right Whales for the Homarus center (Shediac, New Brunswick) and Resurgo Place (Moncton, New Brunswick). The Huntsman Marine Science Centre designed and printed educational signage and a large educational display focusing on the threat of fishing rope to North Atlantic Right Whales. Included in the display is a life-sized North Atlantic Right Whale fluke made of recycled Styrofoam and wrapped in repurposed, used fishing rope. Saint Mary’s University, CWI, and QLF, among others, featured North Atlantic Right Whales in annual outreach programs to children/youth through presentations at			

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	schools, marine mammal summer camps, youth workshops, and other community events across Atlantic Canada and Quebec. GMWSRS continued their symbolic North Atlantic Right Whale Adoption Program, bringing awareness of recovery initiatives to adopters annually.			
4.07: Developing high school curriculum	North Atlantic Right Whales were featured in the National Film Board of Canada prototype high school curriculum called Ocean School. The “Whale Hello There!” video collection looks at how changes in the environment affects the ecosystem of North Atlantic Right Whales and featured collaborative work by research scientists at DFO, DAL, CWI, and the New England Aquarium (NEAq).	6, 7	18	Academia, DFO, film industry, NGOs
4.08: Developing and distributing marine mammal identification guides	Examples of work completed include (but are not limited to): Species identification guides were developed by a number of partners including DAL, DFO, Réseau d’observation de mammifères marins, QLF, MARS, and the Shipping Federation of Canada, among others. These include, but are not necessarily limited to, the At-Sea Observers Marine Mammal Identification Guide, Marine Species Identification Chart (Newfoundland and Labrador Waters), North Atlantic Right Whale identification sheet, and A Mariner’s Guide to Whales in the Northwest Atlantic. Many of these identification guides are available online and were distributed to targeted stakeholders and public audiences through a variety of mechanisms.	6, 7	18	Academia, DFO, NGOs, research institutes, shipping industry
4.09:	The Canadian Broadcasting Corporation (CBC) aired an episode of “Land and Sea” called “Right Whales”. The episode followed biologists Kimberley Davies (DAL), Moira	6, 7	18	Academia, film industry, NGOs, NOAA

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
Developing a television documentary	Brown (CWI), and their research partners at the NEAq and the National Oceanic and Atmospheric Administration (NOAA) as they worked to identify new habitat areas that North Atlantic Right Whales may be frequenting in Canadian waters.			
4.10: Maintaining and developing new public access portals	NEAq continued to manage a public-facing North Atlantic Right Whale Catalog that contains all submitted photographs of the species. DFO and the CWI entered into partnerships with the St. Lawrence Global Observatory (SLGO) to include North Atlantic Right Whale sightings and near real-time detections from Viking Buoys in the Gulf of St. Lawrence on their public web portal. SLGO provides crowdsourcing web tools to facilitate citizen science data contributions to document the presence and distribution of species in the GSL. The goal in 2017 was to share this website with the shipping industry to provide up-to-date North Atlantic Right Whale sightings information in Canadian waters. Woods Hole Oceanographic Institute continued maintaining a public facing Robots4Whales website, which displays raw and reviewed acoustic detections of whales (including North Atlantic Right Whales). These detections are also made available for display in other applications (for example, WhaleMap, WhaleAlert).	6, 7	16, 18, 19, 20	Academia, DFO, NOAA, NGOs, research institutes
4.11: Continuation of media coverage	North Atlantic Right Whales received unprecedented levels of media coverage (print, television, and radio) locally, nationally and internationally following the 2017 mortality event. Canadian coverage included CBC, The Globe and Mail, CTV News, Cape Breton Post, National Geographic, Science Magazine, Maclean's, Global News Canada, and	7	18	Academia, DFO, NGOs, NOAA, response organizations and networks, TC

Recovery activity	Descriptions and results	Recovery objective(s)	Performance indicator(s)	Participants
	Radio Canada International, among others. The media coverage primarily featured work by CWI, Campobello Whale Rescue Team (CWRT), DAL, DFO, MARS, NEAq, NOAA, TC, and the University of New Brunswick (UNB).			
4.12: Continuation of web profiles	North Atlantic Right Whales were featured on the webpages of several organizations, where information can be found on the species' physical and biological characteristics, threats, at-risk status, and management measures (for example, DFO, TC, World Wildlife Fund-Canada, CWI, CWF, Oceana, among others).	7	18	GoC, NGOs, response organizations and networks
4.13: Information shared using social media	DFO and TC regularly used X (formerly known as Twitter) (@FishOceansCAN; @DFO_MAR; @DFO_NL; @Transport_gc), Facebook (@FisheriesOceansCanada; @TransportandInfrastructureinCanada), and YouTube (FisheriesCanada) to share information on North Atlantic Right Whales, including interesting facts, research and management updates, how to report sightings (for example, the "Tell Jack" campaign), and progress towards recovery. Several Canadian NGOs and whale watch companies (for example, GMWSRS, MARS, CWI, CWF, World Wildlife Fund-Canada, Quoddy Link Marine, WRS-NL, the Ocean Tracking Network among others) regularly used social media to share information on the species.	7	18	DFO, NGOs, response organizations and networks, TC

3.2 Activities supporting the identification of critical habitat

Table 3 provides information on the implementation of the studies outlined in the schedule of studies to identify critical habitat found in the recovery strategy (DFO 2014). Each study has been assigned 1 of 4 statuses:

1) completed: the study has been carried out and is concluded
2) in progress: the planned study is underway and has not concluded
3) not started: the study has been planned but has yet to start
4) cancelled: the planned study will not be started or completed

Table 3. Status and details of the implementation of the schedule of studies outlined in the recovery strategy for the North Atlantic Right Whale. When more than 1 participant is associated with a recovery activity, they are listed in alphabetical order.

Study	Status	Descriptions and results	Participants
Evaluate prey distribution in Roseway Basin, Grand Manan Basin and surrounding areas to refine critical habitat boundaries	in progress	Work was undertaken to characterize North Atlantic Right Whale foraging habitat and assess the effects of environmental and oceanographic conditions on prey in identified critical habitat areas and across the Canadian range. This was accomplished through sampling, monitoring, and population modeling of *Calanus* copepods. Refer to recovery activities in table 2 for additional information (row 3.18, 3.30, 3.31).	Academia, Fisheries and Oceans Canada (DFO), non-governmental organizations (NGOs), National Oceanic and Atmospheric Administration (NOAA), other government departments, research institutes
Evaluate Right Whale use of areas outside of the Scotia-Fundy region (for example, Gaspé area in the Gulf of St. Lawrence [GSL])	in progress	Work was undertaken to evaluate North Atlantic Right Whale habitat use throughout the eastern Canada, especially in the GSL using a combination of visual and acoustic detection methods. Refer to recovery activities in table 2 for additional information (row 3.16, 3.18, 3.30, 3.31).	Academia, DFO, NGOs, NOAA, other government departments, research institutes

Study	Status	Descriptions and results	Participants
Determine migratory routes of Right Whales into and out of Canadian waters during their annual migration and evaluate potential as critical habitat	in progress	Work was undertaken to determine potential migratory routes of North Atlantic Right Whales in Canadian waters including the Cabot Strait and the Scotian Shelf using visual and acoustic data. Refer to recovery activities in table 2 for additional information (row 3.16).	Academia, DFO, NGOs, NOAA, research institutes

3.3 Summary of progress towards recovery

3.3.1 Status of performance indicators

Table 4 provides a summary of the progress made toward meeting the performance indicators outlined in table 1. Each indicator has been assigned 1 of 4 statuses:

1) not met: the performance indicator has not been met, and little to no progress has been made
2) partially met, underway: moderate to significant progress has been made toward meeting 1 or more elements of the performance indicator, and further work is ongoing or planned
3) met: the performance indicator has been met and no further action is required
4) met, ongoing: the performance indicator has been met, but efforts will continue as needed to achieve the objectives outlined in the species' recovery strategy

Table 4. Summary of progress made toward meeting the performance indicators outlined in the recovery strategy for the North Atlantic Right Whale.

Performance indicator	Status	Details
(1) Rate of (vessel) interactions in Canadian waters declines	not met	The number of observed serious injuries and mortalities of North Atlantic Right Whales due to vessel strikes increased during the reporting period in comparison to the previous reporting period. Necropsies attributed 11 mortalities documented range-wide during this

Performance indicator	Status	Details
		reporting period to vessel strikes (probable or suspected). Eight of these mortalities were detected in Canadian waters. In addition to serious injuries and mortalities, there were 7 confirmed non-serious injuries resulting from vessel strikes during the reporting period range-wide. Of these 7 cases, 1 vessel strike on a North Atlantic Right Whale was confirmed in the Bay of Fundy, while 2 North Atlantic Right Whales injured as a result of vessel strikes were first observed in Canadian waters (1 in the Bay of Fundy and 1 in the Gulf of St. Lawrence [GSL]) without being able to confirm the location of the events. The clear evidence of an increase in the rate of interactions – as demonstrated by the triggering of an Unusual Mortality Event for the species – supports the status of “not met” for this performance indicator. In response to increased incidences of vessel strikes in the GSL starting in 2017, Transport Canada (TC) enacted various vessel management strategies (for example, a combination of dynamic and static mandatory vessel speed restrictions and a restricted area over 65,000 square kilometres) to prevent and mitigate interactions with North Atlantic Right Whales. The implementation of these management measures has resulted in fewer observed mortalities associated with vessel strikes in this area. Relevant recovery activities (table 2): 1.29, 2.02, 3.03
(2) Regular analysis of vessel/Right Whale risk and mitigation measures is conducted	partially met, underway	The adequacy and effectiveness of mitigation measures established to protect North Atlantic Right Whales in Canadian waters were assessed, as was industry compliance, and the performance of near real-time detection methods to inform dynamic management. Prevention and mitigation measures were re-evaluated annually between 2017 and 2020 to allow for refinement based on the best available information. Additional work is needed to perform risk analyses where North Atlantic Right Whales and vessels co-occur throughout their range. Relevant recovery activities (table 2): 1.27, 1.30, 3.03, 3.10, 3.11, 3.13, 3.28
(3) Rate of (fishery) interactions in Canadian waters declines	not met	The number of serious injuries and mortalities reported for North Atlantic Right Whales due to entanglements increased during the reporting period in comparison to the previous reporting period. Of the 11 mortalities documented range-wide during this reporting period attributed to entanglements by necropsies (suspected, probable or confirmed), 8 of these

Performance indicator	Status	Details
		mortalities were detected in Canadian waters and 3 cases were definitively linked to Canadian fishing gear based on gear analysis. During the reporting period there were 23 confirmed serious injuries and 36 confirmed non-serious injuries due to entanglements range-wide. Based on recovered gear analysis, Canada has been identified as the country of gear origin for some of these entanglements. Included in these entanglement totals is 1 reported entrapment in a Canadian weir. Because North Atlantic Right Whales are highly mobile between Canadian and United States waters, it is not possible to determine where the majority of entanglements occurred unless the gear is recovered and an analysis on the gear is performed. As with vessel strikes (performance indicator 1), the clear evidence of an increase in the rate of interactions – as demonstrated by the triggering of an Unusual Mortality Event for the species – supports the status of “not met” for this performance indicator. In response to a high number of entanglements observed in the GSL in 2017, Fisheries and Oceans Canada (DFO) enacted various fisheries management measures (for example, static and dynamic closure protocols) to prevent and mitigate interactions with fishing gear. The annual implementation and enforcement of these management measures has resulted in decreased observed mortalities associated with entanglements in this area. Additional entanglement prevention and mitigation strategies were also implemented, including the development and testing of low breaking-strength and on-demand fishing gear, increased investments in response networks, mandatory reporting of marine mammal incidents, and initiation of mandatory gear marking to help link entanglements back to specific fisheries. Relevant recovery activities (table 2): 2.02, 3.03
(4) Regular analysis of gear/Right Whale risk and mitigation measures is conducted	partially met, underway	Models were used in several habitat areas to assess the risk of lethal entanglements from vertical lines and groundlines. Preliminary work was undertaken to assess changes in the patterns of fishing effort in the GSL snow crab fishery, and associated levels of risk to North Atlantic Right Whales, both before and after the implementation of time-area closures. Additional studies were carried out to estimate the survival rate of North Atlantic

Performance indicator	Status	Details
		Right Whales after entanglements, as well as the effects of sub-lethal entanglements on the species. Researchers, government, and industry worked to identify the types of gear that were involved in entanglements, and, if possible, linked the gear back to a specific fishery. This information was used to inform fishery management measures to benefit the species. As both sub-lethal and lethal entanglements remain a major threat to North Atlantic Right Whale recovery, ongoing analysis and refinement of mitigation measures is necessary. Additional work is needed to assess the impacts and risks of entanglements on the species in Canadian fisheries. Fishery mapping products developed during this reporting period could help with these assessments. Relevant recovery activities (table 2): 1.35, 3.03, 3.10, 3.11, 3.13, 3.25, 3.27, 4.02
(5) Increased involvement in mitigation efforts by fisheries associated with higher risk gear	met, ongoing	Participants in the lobster, snow crab, and groundfish fisheries in Atlantic Canada and Quebec were involved in a range of management and conservation activities including discussion-based information sharing, hands-on development and testing of low breaking-strength and on-demand fishing gear, implementation of gear marking requirements, and development and implementation of Voluntary Standards of Practice. Lobster, snow crab, and groundfish fishers participated in both mandatory and voluntary measures to reduce the volume of vertical lines in North Atlantic Right Whale habitat. DFO continues to collaborate with industry to develop and implement measures to mitigate the potential impact of fishing gear. Relevant recovery activities (table 2): 1.11, 1.17, 1.18, 1.19, 1.20, 1.21, 1.22, 1.23, 2.07, 2.08, 3.24, 4.03
(6) Possible disentanglement efforts are conducted	met, ongoing	During the reporting period, 9 disentanglement attempts were conducted in Canadian waters, resulting in the full disentanglement of 3 individuals and partial disentanglement of 3 individuals. Incident response protocols, disentanglement best practices, and internal protocols were developed and implemented to ensure the safety of both responders and North Atlantic Right Whales, and to define the roles and responsibilities of all parties involved in incident response, including disentanglements.

Performance indicator	Status	Details
		Increased levels of communication and coordination for marine mammal response were facilitated through the continuation of the DFO-administered national Marine Mammal Response Program (MMRP), the establishment of the Atlantic Marine Mammal Hub, Fisheries Mitigation Measures and MMRP National Coordination Team, and Large Whale Disentanglement Advisory Committee, and through continued meetings of the Marine Mammal Working Group. Increased disentanglement training and dedicated funding support was provided through the MMRP (and other funding streams) and marine animal response organizations (for example, the Marine Animal Response Society [MARS] and the Campobello Whale Rescue Team [CWRT]). Among other things, this allowed for the ongoing operation and expansion of regional marine animal response organizations as well as the establishment and training of first responders and new disentanglement teams. This expanded capacity will increase options for disentanglement in the future. New techniques and technologies continue to be developed to address known difficulties in tracking, relocating, and successfully disentangling whales. Given the inherent difficulties in whale disentanglement and the impacts of even brief entanglements on overall fitness, continued effort should be made to implement preventative measures. Relevant recovery activities (table 2): 1.12, 1.13, 1.26, 1.31, 1.32, 1.33, 1.35, 1.36
(7) Assessment of impacts of contaminants on Right Whales are completed	not met	The impacts of offshore oil and gas activities on North Atlantic Right Whales were considered during environmental assessments, but analyses on the potential impacts of hydrocarbon contamination were not conducted. The impact of contaminants on this species remains unknown. Biopsy samples are taken routinely from this species during field studies by various organizations, and have been archived. These samples were not analysed for contaminants during the reporting period. Relevant recovery activities (table 2): 1.01, 1.38, 1.39, 1.40
(8) Harmful levels of noise in Right Whale habitat is	partially met, underway	Efforts continued to advance understanding and management of ocean noise (for example, vessel and seismic) and its effect on marine mammals (including North Atlantic Right Whales).

Performance indicator	Status	Details
taking place at acceptable levels and durations		Under the Ocean Protection Plan (OPP), the Government of Canada (GoC) committed to developing a whole-of-government approach for addressing underwater noise, and directed funding towards research to establish baselines and model current ambient and human-made noise levels in North Atlantic Right Whale habitat, explore the impacts of noise on individuals (including how noise influences communication), and assess how to reduce disturbance resulting from ocean noise. Consideration was also given to developing technical guidance for assessing the effects of human-generated noise on marine mammal hearing, as well as appropriate metrics for assessing the impacts of noise on North Atlantic Right Whales in Canadian waters. Transport Canada is actively working towards reducing the impacts of underwater vessel noise on vulnerable marine mammals (including the North Atlantic Right Whale) through the Quiet Vessel Initiative (QVI) and their ongoing work with the International Maritime Organization. Further, the “Action Plan to Reduce the Impact of Noise on the Beluga Whale (*Delphinapterus leucas*) and Other Marine Mammals at Risk in the St. Lawrence Estuary” (DFO 2020a) aims to characterize noise sources in this habitat area, and assess and implement other management measures to reduce levels of ocean noise in the Estuary. Although our understanding has increased, many challenges and uncertainties remain. The parameters for “acceptable levels and durations” of noise in North Atlantic Right Whale habitats are still unknown. Research to determine baseline or ambient sound levels in North Atlantic Right Whale habitat, development of noise thresholds, and further work assessing the behavioural and physiological effects of acute and chronic noise on individuals are needed to meet this performance indicator. Relevant recovery activities (table 2): 1.05, 1.06, 3.02, 3.05, 3.06, 3.20, 3.32, 3.33, 3.34, 3.35
(9) Human-induced impacts on food supply are understood and reduced where possible	partially met, underway	There was an increase in knowledge on the distribution of the North Atlantic Right Whale’s primary prey species (*Calanus finmarchicus*), and the importance of other *Calanus* species in the GSL (for example, *C. hyperboreus* and *C. glacialis*), in addition to *C. finmarchicus*. Research continued to support the hypothesis that increased ocean temperatures resulting from climate change have contributed to oceanographic shifts that

Performance indicator	Status	Details
		are influencing the distribution of prey species. The shift in prey distribution resulted in shifts in the distribution of North Atlantic Right Whales. Research into the drivers behind *Calanus* copepod distribution as a result of climate change, and how *Calanus* population dynamics may respond to future changes in environmental conditions, is expected to continue, as are the collaborative efforts between researchers in Canada and the United States to understand this issue. Climate change may not be the only factor affecting food supply for North Atlantic Right Whales. Research assessing other factors that may affect prey now or in the future (for example, ocean noise, contaminants, and offshore wind developments) is necessary. Reducing human-caused impacts on North Atlantic Right Whale prey species requires long-term and large-scale measures beyond the scope of single species recovery efforts. Relevant recovery activities (table 2): 3.31
(10) Information collected in monitoring programs is disseminated	met, ongoing	Information collected through monitoring by DFO and partners was disseminated in many formats, including, in-person and virtual meetings (for example, annual North Atlantic Right Whale Consortium meetings and Ministerial and North Atlantic Right Whale roundtables), near real-time interactive whale sightings and acoustics maps (for example, WhaleMap, Whale Insight, and the Passive Acoustic Cetacean Map), the public release of stock assessments, serious injury and mortality reports, and information concerning the Unusual Mortality Event. The North Atlantic Right Whale research community is highly collaborative and this sharing of information is expected to continue in the future. Relevant recovery activities (table 2): 1.11, 1.24, 2.02, 2.06, 3.01, 3.03, 3.06, 3.08, 3.19
(11) Regular forums to discuss monitoring results are held	met, ongoing	Monitoring results related to North Atlantic Right Whales and their threats were discussed at various forums (for example, the annual North Atlantic Right Whale Consortium and a workshop assessing health information).

Performance indicator	Status	Details
		New forums for discussion introduced during the reporting period included annual meetings of the Ropeless Consortium and Ministerial and North Atlantic Right Whale roundtables, among others. Research and monitoring information sharing should continue through existing, continuing, and future forums. Relevant recovery activities (table 2): 1.11, 2.06, 3.22
(12) Necropsies are conducted when possible	met, ongoing	Between 2015 and 2020, 22 North Atlantic Right Whale carcasses were detected in Canadian waters. Full necropsies were conducted on 12, and a partial necropsy was conducted on 1. The cause of death was identified with various levels of certainty (that is, confirmed, probable, or suspected) for 11 of the 12 carcasses where a necropsy could be performed. In all cases where cause of death could be definitively confirmed or reliably assumed, the cause of death was either vessel strike or entanglement. Necropsies were not completed for the remaining carcasses. Incident response protocols were developed and implemented to ensure the safety of both responders and North Atlantic Right Whales, to define the roles and responsibilities of all parties involved in incident response, and to provide a standardized approach to necropsies and sampling. Increased support was provided for response to North Atlantic Right Whale incidents through funding streams such as the Whales Initiative, which provided ongoing funds to support responses across Canada, including large whale disentanglement, and the National Necropsy Fund. Among other things, this allowed for the ongoing operation and expansion of regional marine animal response organizations as well as the recruitment and training of first responders. As with disentanglement efforts, increased levels of communication and coordination for marine mammal necropsy response were facilitated through the continuation of the national MMRP, the establishment of the Atlantic Marine Mammal Hub, the Fisheries Mitigation Measures and MMRP National Coordination Team, and continued meetings of the Marine Mammal Working Group.

Performance indicator	Status	Details
		The expanded capacity and increased levels of collaboration and coordination between DFO and partners increased the speed of necropsy responses during the reporting period. However, over half of the carcasses identified in 2017 and 2019 were in an advanced state of decomposition, suggesting detection took days to weeks after death. Challenges remain in responding to carcasses that are observed offshore and in remote coastal areas, particularly given the speed at which North Atlantic Right Whale carcasses begin to decay. Increased capacity should address some of these gaps but full response capacity throughout the North Atlantic Right Whale's Canadian range is not yet feasible. Relevant recovery activities (table 2): 1.05, 1.12, 1.13, 1.16, 1.31, 1.32, 1.33, 1.34, 1.36, 2.02, 3.03
(13) Research is published	met, ongoing	Peer-reviewed research and other relevant documents (for example, technical reports) continued to be published during this reporting period and this is expected to continue throughout the next reporting period. Refer to the references section in this document for a selection of publications relevant to North Atlantic Right Whales in Canadian waters that were published during this reporting period. Relevant recovery activities (table 2): 3.03, 3.06, 3.08, 3.09, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.18, 3.19, 3.21, 3.22, 3.23, 3.25, 3.26, 3.28, 3.29, 3.30, 3.31, 3.32, 3.33, 3.34, 3.36
(14) Regular forums to discuss research results and threat mitigation are held	met, ongoing	Results of research were shared annually through pre-existing (for example, annual meetings of the North Atlantic Right Whale Consortium) and new forums (for example, annual meetings of the Ropeless Consortium). Additionally, several forums to discuss threat mitigation and ongoing management measures with affected stakeholders were established (for example, the Ministerial and annual North Atlantic Right Whale roundtables, the Vessel Interaction Advisory Working Group, and Technical Sub-Committees). During the next reporting period, research results and threat mitigation information should continue to be shared through existing and new forums as appropriate. Industries that develop and implement mitigation measures are encouraged to participate.

Performance indicator	Status	Details
		Relevant recovery activities (table 2): 1.11, 1.25, 1.27, 2.06, 2.07, 3.22, 3.24, 3.27, 3.32
(15) Critical habitat in Canadian waters is identified and protected	partially met, underway	A Critical Habitat Order triggering the prohibition in subsection 58(1) of the *Species at Risk Act* against the destruction of any part of the critical habitat was established for critical habitat identified in the Grand Manan and Roseway basins. Table 3 describes the progress on the schedule of studies. All of the studies are in progress; however, significant advances have been made since the last progress report. Science advice from DFO identifying additional important habitat in Canadian waters is anticipated during the next reporting period. This information will be used to inform the identification of additional critical habitat for the species in an amended recovery strategy. Relevant recovery activities (table 2): 3.16, 3.18, 3.30, 3.31
(16) Successful implementation of Right Whale conservation activities increases	partially met, underway	The recovery strategy provided strategic direction for North Atlantic Right Whale recovery in Canadian waters and continued to influence activities being undertaken, as described in this report. With support from the OPP and associated funding initiatives, and increased levels of coordination and collaboration within and between Canadian and United States government departments, Indigenous peoples, and stakeholders, and the launching of new initiatives (for example, the Ropeless Consortium, convening an international Gear Innovation Summit), the support and coordination of implementation activities for North Atlantic Right Whales in Canadian waters has increased. No quantitative analysis measuring the effectiveness of recovery activities (including fisheries and vessel management measures) occurred during the reporting period. These analyses will rely on developing methods and processes to measure their effectiveness. With the publication of the action plan in 2021 and continued investments by the GoC and others, it is expected that the implementation of recovery and conservation activities will continue during the next reporting period. Relevant recovery activities (table 2): 1.05, 1.07, 1.10, 1.11, 1.16, 1.18, 1.19, 1.21, 1.22, 1.24, 1.25, 1.27, 1.31, 1.32, 1.33, 1.34, 1.35, 1.36, 1.37, 2.02, 2.03, 2.04, 2.05, 2.06, 2.07, 2.08, 2.09, 3.01, 3.02, 3.03, 3.04, 3.05, 3.06, 3.07, 3.08, 3.11, 3.12, 3.13, 3.16, 3.17, 3.18, 3.19, 3.21, 3.22, 3.23, 3.24, 3.27, 3.28, 3.30, 3.31, 3.32, 3.33, 3.34, 4.01, 4.03, 4.04, 4.06, 4.10

Performance indicator	Status	Details
(17) Cooperative bilateral or multilateral arrangements to advance Right Whale research and conservation	met, ongoing	Cooperative bilateral arrangements to advance research and conservation activities were undertaken with partnerships between DFO and other federal government agencies, provincial governments, and international governments (for example, the National Oceanic and Atmospheric Administration). Canada and the United States have a strong history of collaboration on North Atlantic Right Whale activities, and these cooperative arrangements are expected to continue. Relevant recovery activities (table 2): 1.04, 1.10, 2.03
(18) Measured increase in awareness and support for recovery activities	not met	Numerous and diverse awareness activities were undertaken during this reporting period. Although it is likely that awareness of and support for North Atlantic Right Whale recovery has increased, no actions were taken to measure and confirm an increase in awareness or support for recovery. Measurement of progress towards this performance indicator will rely on developing methods and processes to measure their effectiveness. Relevant recovery activities (table 2): 1.20, 1.21, 1.22, 1.31, 1.37, 3.29, 4.01, 4.02, 4.03, 4.04, 4.06, 4.07, 4.08, 4.09, 4.10, 4.11, 4.12, 4.13
(19) Key user groups work to develop and implement best practices (stewardship)	met, ongoing	Many marine users (for example, fisheries associations, aquaculture partners, and shipping industry members) have undertaken activities to reduce their potential impact to North Atlantic Right Whales (for example, through participation in fisheries closures, mandatory and voluntary speed reductions, and participation in low breaking-strength and on-demand gear trials). These efforts need to be sustained and further enhanced into the future to achieve recovery of the species. Relevant recovery activities (table 2): 1.18, 1.19, 1.20, 1.21, 1.22, 1.23, 1.33, 1.36, 1.37, 3.08, 3.24, 4.01, 4.02, 4.03, 4.04, 4.05, 4.10
(20) Right Whale emergencies are reported in a timely fashion	met, ongoing	During the reporting period the presence, visibility, and funding allocated to response networks (for example, MMRP investments) and associated outreach projects continued to increase, which may have increased the likelihood that sightings of North Atlantic Right Whale incidents were reported. A requirement introduced in 2018 for all commercial fish harvesters in Canada to report any interactions with marine mammals using a Marine Mammal Interaction Form may also increase the likelihood of incidents being reported. Increased opportunities for training and increased levels of surveillance and monitoring by the GoC and its partners in areas with high concentrations of North Atlantic Right Whales

Performance indicator	Status	Details
		helped facilitate rapid reporting when incidents were detected (for example, some entanglements were identified and reported within 1 to 5 hours of the entanglement occurring). Monitoring and surveillance efforts should continue in areas where North Atlantic Right Whales occur. Education and outreach with marine users who are likely to come into contact with North Atlantic Right Whales must continue to support timely reporting of emergencies. The incidence of observed emergencies (for example, entanglements, obvious injuries, floating carcasses) significantly increased during this reporting period. Timely and thorough responses to these incidents were of vital importance for understanding the causes of death and frequency of incidents, which informed the implementation of fishery and vessel management measures. Relevant recovery activities (table 2): 1.05, 1.13, 1.19, 1.20, 1.31, 1.33, 1.36, 1.37, 3.03, 4.04, 4.10

3.3.2 Completion of action plan

The “Action Plan for the North Atlantic Right Whale in Canada” was published in 2021 (DFO 2021). It is a comprehensive plan addressing all identified threats to the species in Canadian waters.

The “Action Plan to Reduce the Impact of Noise on the Beluga Whale (*Delphinapterus leucas*) and other Marine Mammals at risk in the St. Lawrence Estuary” was published in 2020 (DFO 2020a). It aims to reduce the impact of noise on marine mammals at risk in the St. Lawrence Estuary and in the Saguenay Fjord, including North Atlantic Right Whales.

3.3.3 Critical habitat identification and protection

Critical habitat for the North Atlantic Right Whale is identified in the recovery strategy in the Grand Manan and Roseway basins (DFO 2014).

Critical habitat was protected in 2017 by a SARA Critical Habitat Order made under subsections 58(4) and (5), which invoked the prohibition in subsection 58(1) against the destruction of the identified critical habitat (SOR/2017-262).

Significant progress was made on the implementation of the schedule of studies to refine existing, and identify additional critical habitat (Table 3). DFO Science advice on important habitat in Canadian waters is anticipated during the next reporting period, and will be used to inform any updates to critical habitat in Canadian waters in an amended recovery strategy.

3.3.4 Recovery feasibility

Recovery of the North Atlantic Right Whale was assessed as feasible in the recovery strategy (DFO 2014). The biological and technical feasibility of North Atlantic Right Whale recovery was not reassessed during the reporting period.

4 Concluding statement

Between 2015 and 2020, there was significant progress made on implementing the “Recovery Strategy for the North Atlantic Right Whale (*Eubalaena glacialis*) in Atlantic Canadian Waters”. Despite these efforts, the population declined from 470 (+/- 8) individuals in 2015 to 348 (+/- 7) individuals in 2020 (based on an August 2022 run of the Pace et al. [2017] population model). The interim recovery goal set in 2009 was “to achieve an increasing trend in population abundance over 3 generations”, which was estimated to be approximately 60 years. Enough time has not passed to assess achievement of this goal; however, for this interim goal to be met, the current population trajectory must reverse. Although the population continues to decline, significant efforts have been made to implement fisheries and vessel traffic management measures in Canadian waters to prevent and mitigate threats to North Atlantic Right Whales. The extent of this effort is clear from the information presented in tables 2 to 4 and the effects of these measures will continue to be assessed throughout the next reporting period.

The Government of Canada and partners undertook activities during the reporting period in support of all 7 recovery objectives in the recovery strategy, and most notably objectives 1 and

2 (reduce risk of vessel strikes and entanglements), 4 (monitoring population and threats), and 5 (research).

Sixteen of the 20 performance indicators identified in the recovery strategy were met or partially met. Many of the performance indicators that were met will require ongoing action to maintain progress and reverse the species' decline. Indicators that were not met, despite the actions and efforts of collaborators, related to the expected decline in the rates of fisheries and vessel interactions in Canadian waters, assessing the impacts of contaminants, and measuring an increase in awareness and support for recovery activities.

In comparison with the last reporting period, the statuses of 17 performance indicators were unchanged. Of these, 8 remained "met, ongoing" (performance indicators 10 to 14, 17, 19, and 20), 6 remained "partially met, underway" (performance indicators 2, 4, 8, 9, 15, 16), and 3 remained "not met" (performance indicators 3, 7, and 18). The status of performance indicators 5 and 6 improved (from "partially met, underway" to "met, ongoing"), while the progress on performance indicator 1 decreased (from "partially met, underway" to "not met").

North Atlantic Right Whale critical habitat was legally protected under SARA in 2017. Additional critical habitat was not identified during this reporting period; however, significant progress was made on completing the schedule of studies identified in the recovery strategy. Critical habitat will be refined and identified in an amended recovery strategy, and informed by an updated Recovery Potential Assessment occurring in 2024. Other priorities for the next reporting period are outlined below, each of which are captured by recovery measures in the SARA action plan. DFO will continue to work in collaboration with partners and stakeholders to advance these priorities. The priorities are not listed in order of importance.

Priority 1: continue to undertake, expand upon, and make publicly available data from the long-term population monitoring and near real-time detection efforts by DFO and partners. These data should be used to inform the implementation of management measures; identify and support incident response; and expand knowledge of population structure, abundance, distribution, life history, health, and habitat use patterns. Although population monitoring is well-established in areas where there are high concentrations of North Atlantic Right Whales, these efforts could be enhanced in other areas. For example, there continues to be a portion of the populations unaccounted for during the summer months.

Priority 2: continue and expand collaboration with the United States on North Atlantic Right Whale recovery. Since this is a transboundary species, coordination and collaboration is necessary to achieve recovery. The 2 most significant threats to recovery, entanglement in fishing gear and vessel strikes, are the cause of all confirmed anthropogenic mortalities, and are a threat throughout the full range of the North Atlantic Right Whale. Continued collaboration between both countries is needed to further understand threats to the species and prevent and mitigate them to the greatest extent possible.

Priority 3: continue to increase our understanding of threats to the species (for example, risk of interactions with human activities range-wide), including anthropogenic underwater noise and emerging threats such as the development and operation of offshore wind farms.

Priority 4: evaluate, modify, expand, and increase participation in management measures (including education, outreach, and awareness outreach campaigns) range-wide for threats including fishery and vessel interactions. This priority is supported by the ongoing Unusual

Mortality Event and recent modelling efforts that suggest high levels of cryptic mortality is occurring.

Priority 5: improve our understanding of the quality, quantity, abundance, and distribution of prey (*Calanus* copepods), and how it is influenced by climate change, in waters in Atlantic Canada, Quebec, and further north. North Atlantic Right Whales forage in Canadian waters, and the high concentration of individuals has most likely shifted as a result of changes in the quantity and/or quality of *Calanus finmarchicus* in the Bay of Fundy (BOF). Better understanding prey may facilitate the identification of areas of current and future risk to North Atlantic Right Whales and help ensure appropriate prevention and mitigation measures are in place to protect them.

The progress made during this reporting period builds upon that made during the first reporting period (2009 to 2014). Waters in Atlantic Canada and Quebec serve many functions for this species (for example, foraging, socializing, and nursery areas). Although the proportion of the population using the Grand Manan Basin critical habitat area has decreased, there is still a consistent acoustic presence of North Atlantic Right Whales in the BOF and in other areas outside the GSL. North Atlantic Right Whale abundance and distribution will continue to be closely monitored, especially as environmental conditions shift due to climate change. Changes in *Calanus* distribution and/or patterns of human activities could result in higher threat risk to the species depending on temporal and spatial overlap. Emerging threats (for example, offshore wind development) will need to be closely monitored and mitigated as needed.

DFO remains committed to recovering the North Atlantic Right Whale. The work started and completed to date has built a strong foundation for continued research and management of the threats to this species over the next reporting period. Progress made to date would not have been achieved without the contributions from partners. DFO is looking forward to continuing this successful collaboration and welcomes the participation of additional partners.

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