

Report on the Progress of Recovery Strategy Implementation for the Leatherback Sea Turtle (*Dermochelys coriacea*) in Atlantic Canada for the Period 2013 to 2019

Leatherback Sea Turtle



2022

Recommended citation:

Fisheries and Oceans Canada. 2022. Report on the Progress of Recovery Strategy Implementation for the Leatherback Sea Turtle (*Dermochelys coriacea*) in Atlantic Canada for the Period 2013 to 2019. *Species at Risk Act Recovery Strategy Report Series*. Fisheries and Oceans Canada, Ottawa. iv + 46 pp.

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, recovery strategies, residence descriptions, action plans, and other related recovery documents, please visit the [Species at Risk Public Registry](#).

Cover illustration: Jeffrey C. Domm

Également disponible en français sous le titre
« Rapport sur les progrès de la mise en œuvre du Programme de rétablissement de la tortue luth (*Dermochelys coriacea*) dans les eaux canadiennes de l'Atlantique pour la période 2013 à 2019. »

© Her Majesty the Queen in Right of Canada, represented by the Minister of Fisheries and Oceans Canada, 2022. All rights reserved.
ISBN En3-4/14-1-2022E-PDF
Catalogue no. 978-0-660-41597-0

Content (excluding the cover illustration) may be used without permission, with appropriate credit to the source.

Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#) agreed to establish complementary legislation and programs that provide for the protection of species at risk throughout Canada. Under section 46 of the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the competent ministers are responsible for reporting on the implementation of the recovery strategy for a species at risk, and on the progress towards meeting its objectives within five years of the date when the final recovery strategy was placed on the Species at Risk Public Registry and in every subsequent five-year period, until its objectives have been achieved or the species' recovery is no longer feasible.

Reporting on the progress of recovery strategy implementation requires reporting on the collective efforts of the competent minister, 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).

The Minister of Fisheries and Oceans is the competent minister under SARA for the Leatherback Sea Turtle and has prepared this progress report.

As stated in the preamble to SARA, success in the recovery of this species 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, or any other jurisdiction, alone. The cost of conserving species at risk is shared amongst these groups. All Canadians are invited to join in supporting and implementing the recovery strategy for the benefit of the Leatherback Sea Turtle and Canadian society as a whole.

Acknowledgments

Fisheries and Oceans Canada expresses its appreciation to all individuals and organizations who have contributed to the recovery of the Leatherback Sea Turtle.

Executive summary

The Leatherback Sea Turtle (*Dermochelys coriacea*) was listed as endangered under the *Species at Risk Act* (SARA) in 2003. A [recovery strategy for the Atlantic population](#) was finalized and published on the Species at Risk Public Registry in 2007. A final [action plan](#) was published in March 2020, and an amended recovery strategy is in preparation. Known or potential threats to the species in Atlantic Canadian waters include bycatch (entanglement in active fisheries, foul-hooking), entanglement in abandoned, lost or discarded fishing gear (ALDFG), underwater noise, vessel strikes, marine pollution (plastic, oil, other contaminants), and climate change. Bycatch is the threat of greatest concern.

Six recovery objectives were included in the recovery strategy. This report outlines activities undertaken during the period from January 1, 2013 to December 31, 2019 in support of these recovery objectives. This is the second recovery strategy progress report for the species. The first progress report was prepared for the period 2007 to 2012 (DFO 2013). The next reporting period will be January 1, 2020 to December 31, 2024. Fisheries and Oceans Canada (DFO) is the authority responsible for the recovery of Leatherback Sea Turtles in Atlantic Canadian waters, and has been working to advance implementation of the recovery strategy in several ways. These efforts continue to be strongly supported and complemented by those of other government departments, the academic community, non-government organizations, Indigenous organizations, and stakeholders.

The “Report on the Progress of Recovery Strategy Implementation for the Leatherback Sea Turtle in Atlantic Canada for the Period 2013 to 2019” reports on the progress made by Fisheries and Oceans Canada (DFO) and its partners towards implementing the recovery strategy and achieving its objectives, which are: (1) understanding threats, (2) research and monitoring, (3) habitat identification and protection, (4) risk reduction, (5) education, and (6) international initiatives. There has been significant progress made on understanding Leatherback Sea Turtle abundance, distribution, and habitat use in Atlantic Canada. Our understanding of fishery interactions has grown, though requires refinement; whereas information on non-fishery threats remains very limited. When appropriate, mitigation measures were implemented to lessen the potential impacts of human activities on Leatherback Sea Turtles. The threat of marine debris is being addressed through several national and regional plastic reduction initiatives. There have been many Leatherback Sea Turtle education products developed and distributed in a variety of formats. The use of social media, in particular, has risen in recent years to promote awareness of the species. International research and conservation partnerships have continued and expanded, with opportunities for more collaboration likely in the near future.

The majority of the 21 performance indicators identified in the recovery strategy were either partially met or met. These indicators will require continued attention over the next reporting period to maintain and further advance recovery. Indicators that were not met related to assessing post-release survivorship (that is, following entanglement, hooking, or handling during research) and potential biological removal, identifying and documenting threats from offshore development, identifying critical habitat, and producing and distributing information to other government departments. Of these, the most significant gaps from a recovery perspective are the allowable harm assessment (that is potential biological removal) and critical habitat identification, which are anticipated to be addressed over the next two years. Other priority focus areas for the next reporting period include continuing and enhancing the Leatherback Sea

Turtle tagging and monitoring program off Nova Scotia, expanding on international collaboration and coordination, and improving fisheries monitoring data.

Table of contents

Preface	i
Acknowledgments.....	i
Executive summary.....	ii
Table of contents	iv
1. Introduction.....	1
2. Background.....	1
2.1 COSEWIC assessment summary	1
2.2 Threats	2
2.2.1 Threats to the species.....	2
2.2.2 Threats to critical habitat.....	2
2.3 Recovery	2
3. Progress towards recovery	4
3.1 Activities supporting recovery	4
3.2 Activities supporting the identification of critical habitat	31
3.3 Summary of progress towards recovery.....	34
3.3.1 Status of performance indicators.....	34
3.3.2 Completion of action plan	40
3.3.3 Critical habitat identification and protection	40
3.3.4 Recovery feasibility.....	41
4. Concluding statement	42
References	44

1. Introduction

This progress report describes the progress made toward meeting the objectives listed in the “Recovery Strategy for the Leatherback Turtle (*Dermochelys coriacea*) in Atlantic Canada” (Atlantic Leatherback Turtle Recovery Team [ALTRT] 2006) for the seven-year period since the last reporting interval (2007 to 2012). This report 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 report ([COSEWIC 2012](#)), a recovery strategy ([ALTRT 2006](#)), a five-year report on recovery strategy implementation ([DFO 2013](#)), an action plan ([DFO 2020a](#)), a series of science advisory reports (DFO 2004; DFO 2011; DFO 2012; DFO 2020b; 2020c; 2020d), and a Recovery Potential Assessment (DFO in press).

Section 2 of this report reproduces the COSEWIC assessment summary and outlines the threats to Leatherback Sea Turtles. Also reproduced in section 2 are the recovery goal, recovery objectives, and performance indicators from the recovery strategy. During the reporting period (January 2013 to December 2019), many activities were undertaken in support of the recovery objectives. These activities, along with an assessment of recovery progress according to the performance indicators, are presented in section 3. Section 4 provides a concluding statement about the implementation of the recovery strategy during the reporting period, as well as suggestions on areas of focus to guide future recovery efforts.

2. Background

2.1 COSEWIC assessment summary

The listing of the Leatherback Sea Turtle (Atlantic population) under SARA in 2003 led to the development and publication of the “Recovery Strategy for the Leatherback Turtle (*Dermochelys coriacea*) in Atlantic Canada” in 2006. The recovery strategy is consistent with the information provided in the COSEWIC status report (COSEWIC 2001). The more recent COSEWIC (2012) assessment summary is included below. The reasons for designation were not significantly different between the two assessments.

COSEWIC assessment summary: May 2012

Common name

Leatherback Sea Turtle (Atlantic population)

Scientific name*Dermochelys coriacea***Status**

Endangered

Reason for designation

Globally, this species is estimated to have declined by more than 70%. In the Atlantic, this species continues to be impacted by fisheries bycatch, coastal and offshore resource development, marine pollution, poaching of eggs, changes to nesting beaches and climate change. Canadian waters provide an important foraging area for these turtles. There they are threatened by entanglement in longline and fixed fishing gear.

Occurrence

Atlantic Ocean

Status history

The species was considered a single unit and designated endangered in April 1981. Status re-examined and confirmed in May 2001. Split into two populations in May 2012. The Atlantic population was designated endangered in May 2012.

2.2 Threats**2.2.1 Threats to the species**

Threats to the Leatherback Sea Turtle (Atlantic population) were identified in the relevant COSEWIC assessment reports (COSEWIC 2001; 2012) and addressed in the recovery strategy (ALTRT 2006). Known or potential threats in Canadian waters include bycatch (including entanglement in active fishing gear and foul-hooking), entanglement in abandoned, lost or discarded fishing gear (ALDFG), underwater noise, vessel strikes, marine pollution (plastic, oil, other contaminants), and climate change. Threats occurring outside of Canadian jurisdiction include poaching, coastal development, and artificial light on nesting beaches.

2.2.2 Threats to critical habitat

Critical habitat for the Leatherback Sea Turtle (Atlantic population) has not yet been identified. Appendix 2 of the recovery strategy includes a schedule of studies that outlines the research required to identify critical habitat to achieve the species' recovery goal. Progress in undertaking the schedule of studies is reported in section 3.2 of this document.

2.3 Recovery

A final recovery strategy for the Leatherback Sea Turtle in Atlantic Canada was published on the Species at Risk Public Registry in 2007 (ALTRT 2006). The overall recovery goal, as stated in the recovery strategy, is "to increase the population, such that the long-term viability of the Leatherback Sea Turtles frequenting Atlantic Canadian waters is achieved". Six recovery objectives, outlined in table 1, were developed to support the achievement of the overall recovery goal. To facilitate the evaluation of progress toward recovery of the Leatherback Sea Turtle (Atlantic population), measurable performance indicators were included in the recovery strategy. These performance indicators are reproduced in table 1.

Table 1. Recovery objectives and corresponding performance indicators for the Leatherback Sea Turtle reproduced from the recovery strategy (ALTRT 2006). 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 (understanding threats): identify and understand anthropogenic threats to Leatherback Sea Turtles in Atlantic Canadian waters	<ol style="list-style-type: none"> 1. Potential/known interactions of Leatherback Sea Turtles and fishing industry activities identified and documented. 2. Post-release survivorship determined. 3. Potential biological removal limit assessed. 4. Potential/known threats of offshore development activities on Leatherback Sea Turtles identified and documented.

Recovery objective	Performance indicator
	5. Report produced on human activities known to, or having the potential to, threaten Leatherbacks in Atlantic Canada, with recommendations for actions.
Objective 2 (understanding Leatherback Sea Turtle life history characteristics): support research and monitoring that will fill knowledge gaps concerning general organismal traits of Leatherback Sea Turtles in Atlantic Canadian waters	6. Populations frequenting Atlantic Canadian waters identified. 7. Historic and current sightings compiled and organized in a centralized database. 8. Knowledge from research and monitoring activities compiled in a comprehensive, living, reference document that is regularly updated and accessible to a broad range of user groups. 9. Research initiated on foraging ecology, movements and behaviour of Leatherbacks in Canadian waters. 10. Research initiated on the oceanographic correlates that relate to the spatial/temporal distribution of Leatherbacks in Canadian waters. 11. Survey program established to develop indices of abundance (for example, long term in-water population trends in Northwest Atlantic waters).
Objective 3 (habitat identification and protection): identify and protect habitat of Leatherback Sea Turtles in Atlantic Canadian waters	12. Critical and/or important habitat in Atlantic Canada identified to the extent possible. 13. Tools for habitat protection assessed and evaluated. 14. Draft plan for protection of critical habitat in Atlantic Canada developed.
Objective 4 (risk reduction): minimize risk of harm to Leatherback Sea Turtles from anthropogenic activities under Canadian jurisdiction	15. Mitigation measures developed to reduce known harm from human activities. 16. Recovery and emergency response procedures implemented, along with specific threat reduction measures. 17. Programs developed to engage stakeholders in the implementation of mitigation measures.
Objective 5 (education): develop and implement education activities that support Leatherback Sea Turtle recovery in Canada	18. Information on Leatherbacks produced and distributed to federal and provincial government departments. 19. Public awareness materials produced and distributed, including but not limited to briefing kits, web resources, brochures. 20. Initiatives developed to educate and train stakeholders about their role in Leatherback Sea Turtle conservation (for example, continuation of fishers outreach/research via Nova Scotia Leatherback Turtle Working Group ¹).
Objective 6 (international initiatives): promote international initiatives contributing to the recovery of Leatherback Sea Turtles	21. Collaboration with other nations on Leatherback Sea Turtle conservation initiatives.

¹ Since publication of the recovery strategy in 2006, this working group became the Canadian Sea Turtle Network.

3. Progress towards recovery

3.1 Activities supporting recovery

Table 2 outlines recovery activities that have been ongoing, initiated, or completed during the period 2013 to 2019. It does not account for activities completed during the first five years of recovery strategy implementation (see DFO 2013 for more details on that period), nor does it account for all activities throughout the Northwest Atlantic population's range. The activities highlighted in this report mostly focus on work being done in Atlantic Canada or at major nesting beaches contributing the largest proportions of turtles in Atlantic Canada. Table 2 is not necessarily an exhaustive list of all relevant activities, but is meant to broadly represent work undertaken since 2013.

Recovery activities are organized under four broad headings: (1) research and monitoring; (2) management; (3) engagement, education, and outreach; and (4) international collaboration. The particular recovery objective(s) and performance indicator(s) related to each activity are also listed. The activities that occurred during this reporting period (January 1, 2013 to December 31, 2019) contributed to meeting all six recovery objectives. The extent to which each of the performance indicators were met during this period of recovery strategy implementation is discussed in section 3.3. Many of the activities listed in table 2 were undertaken specifically to advance the recovery of the Leatherback Sea Turtle, while others were undertaken for different or broader purposes but may result in benefits to the population.

List of acronyms used in tables 2, 3, and 4:

AOI	Area of Interest
BIO	Bedford Institute of Oceanography
CCG	Canadian Coast Guard
C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
CNSOPB	Canada-Nova Scotia Offshore Petroleum Board
CPAWS	Canadian Parks and Wilderness Society
CSTN	Canadian Sea Turtle Network
CWF	Canadian Wildlife Federation
DFO	Fisheries and Oceans Canada
ENSMSS	Eastern Nova Scotia Marine Stewardship Society
ECCC	Environment and Climate Change Canada
IAA	Impact Assessment Agency of Canada
IUCN	International Union for Conservation of Nature
MARS	Marine Animal Response Society
MMRP	Marine Mammal Response Program
MPA	Marine Protected Area
NGO	Non-government Organization
NL	Newfoundland and Labrador
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NSDLF	Nova Scotia Department of Lands and Forestry
PEI	Prince Edward Island
QLF	Quebec-Labrador Foundation
SARA	Species at Risk Act
SWFSC	Southwest Fisheries Science Center
WRS-NL	Whale Release and Strandings-Newfoundland and Labrador
WWF	World Wildlife Fund

Table 2. Recovery activities started or completed over the period 2013 to 2019 for the Leatherback Sea Turtle (Atlantic population), organized into four categories (that is, research and monitoring; management; engagement, education, and outreach; and international collaboration) 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 one 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. Research and monitoring

#	Recovery activity	Description and results	Recovery objectives	Performance indicators	Participants
1.01	Collection and sharing of biological samples	Blood and skin samples were collected from live-captured and stranded turtles in Atlantic Canada for analysis of hormones, DNA, and stable isotopes. Some samples were archived, and others were shared with the Marine Turtle Genetics Laboratory (US NOAA-NMFS-SWFSC). Some analyses of these samples have occurred (for example, recovery activities 1.16 and 1.19).	2, 6	6, 7, 9, 21	CSTN / DFO
1.02	Tagging programs	<p>Applying tags to Leatherback Sea Turtles provides insights into their distribution, movements, behaviour (for example, diving, foraging), and relationship with their environment. For a highly migratory marine species, tags are critical research and monitoring tools.</p> <p>Leatherback Sea Turtles foraging in Atlantic Canadian waters were tagged during each summer of the reporting period. A variety of tagging methods were employed, including: metal rear flipper tags; internal passive integrated transponder (PIT) tags; suction cup archival video and time-depth recorders; and satellite transmitters.</p> <p>Turtles were also tagged on Matura Beach in Trinidad, Grenada, Florida, and French Guiana to determine interesting movements and within-season nesting histories. Most satellite-tagged animals were tracked into Atlantic</p>	1, 2, 3	2, 7, 9, 11, 12	CSTN / DFO / NGOs

#	Recovery activity	Description and results	Recovery objectives	Performance indicators	Participants
		<p>Canadian waters and will contribute data on habitat use and migration routes.</p> <p>Reference: DFO (2020b)</p>			
1.03	Collection of opportunistic sightings	<p>Leatherback Sea Turtle sightings have been collected by a variety of groups throughout Atlantic Canada. The Canadian Sea Turtle Network continues to maintain a dedicated turtle hotline for sightings and incidents. Sightings data are held by individual groups and not in a centralized zonal database. Coordinating data across regions will be explored in the coming reporting period.</p>	2	7	Academia / CSTN / DFO / Indigenous organizations / NGOs
1.04	Aerial surveys	<p>In 2016, the Northwest Atlantic International Sightings Survey (NAISS) was conducted, and included a large-scale survey of marine megafauna, including Leatherback Sea Turtles, on the continental shelf from Northern Labrador to the Bay of Fundy.</p> <p>Aerial surveys of the Laurentian Channel AOI (now an MPA under the <i>Oceans Act</i>) were flown in multiple years to assess the presence of Leatherback Sea Turtles and their jellyfish prey.</p> <p>NOAA's aerial whale and turtle abundance surveys included transects in Atlantic Canadian waters. Sightings from those flights have been made accessible to DFO. DFO also conducted several aerial marine mammal abundance surveys during which turtle sightings were recorded.</p>	2	11	DFO / NOAA
1.05	Injury assessments	<p>During the period 2012 to 2015, Leatherback Sea Turtles sampled in Atlantic Canada and on a nesting beach (Matura) in Trinidad were subject to standardized external injury assessments (228 individual turtles were assessed). These assessments were conducted to better understand the rates of natural and human-</p>	1	1, 2	CSTN / DFO

#	Recovery activity	Description and results	Recovery objectives	Performance indicators	Participants
		<p>caused injuries in the population. Nineteen percent of the sampled turtles had suspected entanglement injuries and 17% appeared to have interacted with hooks. The data was also analysed for differences in the rate of injuries by location (low- versus high-latitude), sex, and size (age) and no significant differences were found.</p> <p>Reference: Archibald and James (2018)</p>			
1.06	Necropsies	<p>Necropsies were performed on stranded Leatherback Sea Turtles in Atlantic Canada whenever deemed feasible and valuable. These examinations provide insights into the biology of the species, disease, and threats (for example, the presence of marine debris in the digestive tract). One Leatherback Sea Turtle necropsied was the first confirmed record of the species in the Bras d'Or Lakes system in Nova Scotia.</p>	1, 2	1, 7	Atlantic Veterinary College / CSTN / DFO / MARS / WRS-NL
1.07	Development of photo catalogue	<p>Field research photos, and other contributed photos, of Leatherback Sea Turtles were organized in Adobe Lightroom, an image management software. Metadata and keywords are being added to each image to make it easier to search for certain injury types, for example. This is not a photo-identification catalogue. It is rather being used to a) support injury analyses, b) provide visual data in scientific publications, and c) support education and outreach initiatives.</p>	1, 2, 5	N/A	CSTN / DFO
1.08	Evaluation of long-term satellite tag attachment	<p>Satellite biotelemetry continues to be an important source of information on Leatherback Sea Turtle movements and ecology. A long-term assessment was conducted to determine tag retention, recovery, and attachment-site condition associated with harness and direct attachment tagging methods on Leatherback Sea Turtles handled off Nova Scotia. Evidence for long-term post-tagging survival, nesting success, and tag attachment site healing was compared for each tagging</p>	1, 2, 4	2, 15	CSTN / DFO

#	Recovery activity	Description and results	Recovery objectives	Performance indicators	Participants
		<p>method. This assessment was important to ensure that satellite tagging is not unduly impacting the health of individuals or the population. The direct attachment method was characterized as benign, and the preferred method over harness tags, which were associated with potentially long-term scarring and disfigurement at contact points. Neither tagging method appeared to affect turtle survival or nesting success. Direct attachment methods have been used by Canadian researchers since 2008. Ongoing tag optimization was recommended to further improve animal welfare and tag performance.</p> <p>Reference: Hamelin and James (2018)</p>			
1.09	Evaluation of the energetic importance of Atlantic Canadian waters	<p>An analysis of turtle-borne video data on daytime feeding rates and energy acquisition demonstrated the importance of seasonal foraging areas off Nova Scotia to Leatherback Sea Turtles. These areas provide a reliable source of abundant prey that allows individuals to satisfy a significant proportion (up to 59%) of their annual energy needs in a short period. The energetic value of Nova Scotia foraging areas makes them of particular importance in population growth, which will be taken into consideration when identifying critical habitat.</p> <p>Reference: Wallace et al. (2018)</p>	2	9	Conservation Science Partners Inc. / DFO / Duke University / Ecological Research Solutions
1.10	Assessment of entanglements in fixed gear fisheries	<p>Publicly-reported Leatherback Sea Turtle entanglements (n = 205) in Atlantic Canadian fixed gear fisheries (excluding pelagic longline) were examined for the period 1998 to 2014. The study assessed the following: the spatiotemporal distribution of entanglement events; the fisheries and gear types implicated in the entanglements; the mechanics of the entanglements; and the outcomes for the turtles involved. The highest proportions (44.4% and 25.8%, respectively) of reported</p>	1	1, 5	CSTN / DFO / WRS-NL

#	Recovery activity	Description and results	Recovery objectives	Performance indicators	Participants
		<p>entanglements were in pot gear (for example, snow crab, lobster, whelk) and trap nets. Polypropylene rope in the upper water column, particularly buoy lines, was the most common component responsible for entanglements.</p> <p>Reference: Hamelin et al. (2017)</p>			
1.11	Assessment of fishery and non-fishery interactions	<p>A Canadian Science Advisory Secretariat (CSAS) Science Response meeting was held in March 2018 to review and update available information on sources of fishery and non-fishery interactions with Leatherback Sea Turtles in Atlantic Canadian waters. This assessment built upon a similar process held in 2012, as well as the work of Hamelin et al. (2017) (see recovery activity 1.10 in this table). There is still limited information on non-fishery interactions. To assess fishery interactions, data from citizen science reporting networks, at-sea fishery observers, and SARA logbooks were analyzed. This analysis confirmed that bycatch in fixed gear fisheries, including pelagic longline, pot, trap net, gillnet, and benthic longline, is a threat to the species in Canadian waters. Vertical lines extending to the surface, and horizontal lines at or near the surface, are of particular concern because Leatherback Sea Turtles spend most of their time in the upper water column when foraging.</p> <p>Reference: DFO (2020c)</p>	1	1, 4, 5	CSTN / DFO / Fishing industry / NOAA / North Carolina Wildlife Resources Commission
1.12	Examination of high-latitude dive patterns	<p>High-resolution archival dive records were recovered from Leatherback Sea Turtles originally tagged in Atlantic Canadian waters. High-resolution spatial and temporal patterns in diving behaviour were derived from the data collected. These patterns revealed that dives in Atlantic Canadian waters are primarily restricted to waters above the thermocline (average thermocline</p>	2	9, 10	Dalhousie University / DFO

#	Recovery activity	Description and results	Recovery objectives	Performance indicators	Participants
		<p>depth in sampled areas was 35 to 46 m). In addition, solar illumination appears to influence diving behaviour, with shorter, deeper dives occurring during the day while foraging is occurring. Understanding three-dimensional habitat use is important when considering potential bycatch reduction methods.</p> <p>Reference: Hamelin et al. (2014); Wallace et al. 2015</p>			
1.13	Examination of fine-scale foraging behaviour	<p>Using GPS-derived locations, high-resolution dive records (one second sampling rate), and turtle-borne video, a detailed description of Leatherback Sea Turtle foraging behaviour was obtained. Patterns of search and feeding effort were examined as a function of the variation in prey availability and density. Results indicated prey is detected visually and diving rates increase in areas of high prey abundance.</p> <p>Reference: Wallace et al. (2015)</p>	2	9, 10	DFO / Duke University / Ecological Research Solutions
1.14	Assessment of fine-scale behaviour and entanglement risk in coastal temperate waters	<p>A multi-year collaborative project was initiated in 2017 to test new tags and tagging platforms for Leatherback Sea Turtles. High-resolution suction cup tags were deployed off Cape Cod, Massachusetts, to determine how turtles interact with the environment and fishing gear. An expected outcome of this work is an improved understanding of how to effectively mitigate the risk of entanglement.</p>	1, 2, 6	21	Coonamesett Farm Foundation / DFO / NOAA
1.15	Identification of pre-nesting movements	<p>To better understand the timing and location of mating behaviours and vulnerability of Leatherback Sea Turtles in the Northwest Atlantic population to anthropogenic threats, the movements of satellite-tagged adult females prior to their first seasonal nesting events were analyzed and compared to the movements of adult males. High-use areas for reproductive turtles were identified offshore and in coastal areas adjacent to nesting</p>	2, 6	21	DFO

#	Recovery activity	Description and results	Recovery objectives	Performance indicators	Participants
		<p>beaches in Columbia, Trinidad, Guyana, and French Guiana. The offshore area, which all the tagged turtles used prior to moving close to the nesting beaches, was not previously known as important habitat. It is possible this area is used for foraging prior to an energetically-costly mating season. Information on high-use habitat areas may help inform a regional assessment of threat risk from fishing interactions, which is an important source of mortality for the population.</p> <p>Reference: Bond and James (2017)</p>			
1.16	Examination of trophic ecology	<p>Stable carbon and nitrogen isotope analyses were conducted on bulk skin samples from Leatherback Sea Turtles foraging in Atlantic Canadian waters. Stable isotope values can be used to determine trophic status, which may vary due to biological and/or environmental factors. Understanding how these factors influence trophic status is important for identifying habitats and their connectivity, as well as interpreting population dynamics.</p> <p>Reference: Wallace et al. (2014)</p>	2	9, 10	DFO / Duke University / NOAA
1.17	Examination of thermoregulation in high latitude foraging areas	<p>The body temperatures of foraging Leatherback Sea Turtles in Atlantic Canadian waters were measured for the first time. The data were used to evaluate how behavioural and physiological adjustments maintain the thermal gradient between the turtle and the surrounding water, and shed light on the thermoregulatory strategy employed in relatively cool high-latitude waters.</p> <p>Reference: Casey et al. (2014)</p>	2	9, 10	Barnard College / DFO / University of North Carolina
1.18	Long-term abundance monitoring	<p>The inter-annual relative abundance of Leatherback Sea Turtles in Atlantic Canada was assessed using opportunistic sightings data collected over a 14-year</p>	2	11	CSTN / DFO

#	Recovery activity	Description and results	Recovery objectives	Performance indicators	Participants
		<p>period off Cape Breton, Nova Scotia. This was the first recorded baseline for the species in Canadian waters. There was high inter-annual variability observed at the site, but relative abundance was thought to be stable. Monitoring effort at another Leatherback sampling field site off Nova Scotia will help detect changes in the population over time.</p> <p>Reference: Archibald and James (2016)</p>			
1.19	Determination of the natal origins of foraging turtles	<p>The natal origins of turtles handled in Atlantic Canadian waters were determined through genetic analyses of skin and blood samples. The proportion of animals assigned to each rookery (that is, group of nesting animals) represented in the sample corresponded to the relative sizes of the nesting assemblages. The majority of the turtles sampled originated from Trinidad and French Guiana, two of the largest nesting assemblages in the Western Atlantic. For the first time, the natal origins of male Leatherback Sea Turtles were identified, providing further insights into population dynamics, connectivity, and habitat use.</p> <p>References: Stewart et al. (2013); Roden et al. (2017)</p>	2	6	Aquarium La Rochelle / DFO / NOAA / The Ocean Foundation / Woods Hole Oceanographic Institution /
1.20	Review of contaminants in the Bay of Fundy and Scotian Shelf areas	<p>A literature review was conducted on contaminant types, levels, and effects in the Bay of Fundy and Scotian Shelf areas. The review revealed there is limited information available for the region, but that contaminant levels are thought to be relatively low overall. The compiled information will help support oceans and coastal management decisions in the Maritimes Region.</p> <p>Reference: Stewart et al. (2019)</p>	1	N/A	DFO

#	Recovery activity	Description and results	Recovery objectives	Performance indicators	Participants
1.21	Study of local fixed gear configurations	<p>In 2016, the Eastern Nova Scotia Marine Stewardship Society was formed in Louisbourg. This group has worked on documenting fishing gear and gear configurations used off eastern Cape Breton. They have collaborated with other NGOs, fish harvesters, academics, and fishing technology companies to better understand fishing-related threats to species at risk in the area and possible solutions.</p> <p>In 2018, DFO gathered information on gear configurations (for example, weight, traps used, rope used, amount of rope in water) in the lobster, snow crab, and hagfish fisheries in Maritimes Region. Information was collected through phone calls and written survey submissions. The purpose of the study was to better understand fishing practices and local variations so that feasible and effective fisheries management measures can be developed to minimize entanglements with North Atlantic Right Whales. Although the survey was designed for right whale, the data collected may also be useful in understanding and mitigating entanglement risks to Leatherback Sea Turtles. This work will contribute to finding collaborative solutions with the fishing industry.</p>	4	15, 17	DFO / ENSMSS / fishing industry

Table 2.2. Management

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
2.01	Development and ongoing implementation of SARA action plan	DFO prepared an action plan for the Leatherback Sea Turtle (Atlantic population). The action plan outlines 27 recovery measures to be undertaken by DFO and other jurisdictions or organizations to help achieve the objectives identified in the recovery strategy. A targeted external consultation period on the draft action plan was	All	1, 2, 4, 5, 6, 7, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21	Academia / DFO / Indigenous organizations / industry / NGOs / other government

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
		<p>held in 2015, and a 60-day public comment period on the proposed action plan was held through the Species at Risk Public Registry in 2018. The final action plan was not posted during the reporting period for this progress report, but was ultimately published in March 2020.</p> <p>References: DFO (2020a)</p>			<p>departments and regulators</p>
2.02	SARA permitting processes and exemptions	<p>Activities affecting Leatherback Sea Turtles were evaluated by DFO under SARA sections 73 and 74. Permits were issued when the activity met with SARA preconditions, including that it did not jeopardize the survival or recovery of the species. Permit conditions included mitigation measures to ensure minimal impact to the species when applicable. Permit explanations are available on the Species at Risk Public Registry.</p> <p>The recovery strategy includes a SARA section 83(4) exemption for commercial fishing activities subject to certain conditions, including reporting requirements (discussed in more detail below). A process is underway to review exemption conditions on a fishery-by-fishery basis to ensure all feasible measures are being taken to minimize impacts to Leatherback Sea Turtles.</p>	4	15	DFO/ fishing industry
2.03	Monitoring fishing interactions using SARA logbooks	<p>For fisheries with the potential to interact with Leatherback Sea Turtles, completion of a SARA monitoring document, or logbook, is a condition of licence. The date and position of each interaction must be recorded and submitted to DFO. Nil interactions must also be recorded in some fisheries. SARA monitoring requirements and logbook formats vary across regions. An examination of SARA logbook data, and the rate of compliance with this reporting mechanism, was completed and is being submitted for publication. The logbook format was updated in the Maritimes Region in 2017 to provide clearer formatting. In Gulf Region, the</p>	1	1	DFO / fishing industry

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
		SARA logbook is reviewed annually to improve format and ease of use for reporting fishery interactions. Targeted outreach with fishery advisory committees and dockside monitoring companies is ongoing to increase compliance with SARA logbook requirements.			
2.04	Establishment of St. Anns Bank MPA	The St. Anns Bank Marine Protected Area Regulations (SOR/2017-106) came into force on June 2, 2017. The Leatherback Sea Turtle and its habitat are identified as one of the conservation priorities for the MPA, which overlaps with important habitat for the species. Activities that disturb, damage, destroy, or remove any living marine organism or its habitat are prohibited in the MPA. Certain exceptions apply in accordance with four management zones within the MPA.	3	N/A	DFO / St. Anns Bank Area of Interest Advisory Committee
2.05	Establishment of Laurentian Channel MPA	The Laurentian Channel Marine Protected Area Regulations (SOR/2019-105) came into force on April 15, 2019. The Leatherback Sea Turtle is identified as one of the conservation priorities for the MPA. Activities that disturb, damage, destroy, or remove any living marine organism or its habitat are prohibited in the MPA. Certain exceptions apply in accordance with two management zones within the MPA.	3	N/A	DFO / Laurentian Channel Advisory Committee
2.06	Establishment of marine refuges	Several marine refuges were established during the reporting period in areas where Leatherback Sea Turtles occur. The conservation objectives of these marine refuges include protecting cold-water corals and/or sponges and the ecosystem and biodiversity they support. All fishing activities that use bottom-contact gear have been prohibited via variation order and/or conditions of licence, and are in place for the long-term. This includes a prohibition on bottom trawls, dredges, bottom seining, traps, gillnets, bottom longlines, traps and pots. These long-term prohibitions provide secondary protection to Leatherback Sea Turtle by	3	N/A	DFO / fishing industry

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
		removing entanglement risk from bottom-contact gear that uses vertical lines or buoy lines.			
2.07	Establishment of G7 Ocean Plastics Charter and related government initiatives, including continued removal and re-purposing of abandoned, lost or otherwise discarded fishing gear (ALDFG).	<p>DFO has committed to removing ALDFG from Canadian waters, prioritizing areas where ALDFG pose a threat to species at risk such as the Leatherback Sea Turtle, and to implementing initiatives to prevent gear loss. Canada led the development of the 2018 G7 Ocean Plastics Charter, within which signatories committed to accelerating implementation of the 2015 “G7 Leaders’ Action Plan to Combat Marine Litter”. That action plan included a commitment to make targeted investments to retrieve ALDFG. The Government of Canada is a signatory to the Global Ghost Gear Initiative (GGGI), and DFO is helping support progress on addressing ALDFG through the Sustainable Fisheries Solutions and Retrieval Support Contribution Program. DFO also introduced a requirement to report lost gear in commercial fisheries across Atlantic Canada starting in 2018-19. The lost gear reporting helps identify priority areas for retrieval efforts, such as “Operation Ghost”, which was conducted by DFO and CCG in the Gulf of St. Lawrence in July 2019.</p> <p>In 2018, the Canadian Council of Ministers of the Environment (federal, provincial, territorial) introduced the Strategy on Zero Plastic Waste to support implementation of the 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 1 and Phase 2) includes specific commitments to reduce plastic waste and pollution.</p>	4, 6	15, 17	Canadian Council of Ministers of the Environment / ENGOs / Government of Canada / GGGI participants / industry

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
		<p>In 2018, Innovation, Science and Economic Development Canada issued a number of public challenges to encourage the development of novel technologies and approaches to complex problems, including plastics. Plastics challenges were awarded to a variety of innovators, who are working on finding solutions that will reduce plastic waste from fisheries, food packaging, and more.</p> <p>The initiatives detailed above contribute to lessening the threats of ALDFG and marine debris to Leatherback Sea Turtles, and other marine animals, by reducing the chances of interaction.</p>			
2.08	At-sea observer training and data collection protocols	<p>Historically, information regarding sea turtle fishery interactions and morphology has been recorded inconsistently by at-sea fisheries observers. In Maritimes Region, DFO Science has helped standardize the data collection methods used by observers to strengthen analyses relevant to science and management. The Department has worked with regional fishery observer companies to review training materials and data forms related to sea turtles. Direct training sessions from DFO have also been provided. Turtle handling and data collection protocols are updated when required. Communication with at-sea fisheries observer companies about sea turtle data collection standards has not been consistent across Atlantic Canada and Quebec, which is something that could be reviewed in coming years.</p>	1, 2	1, 5	DFO / at-sea fisheries observer companies
2.09	Disentanglement / dehooking training	<p>The CSTN offered training in the safe disentanglement and dehooking of sea turtles based on best practices adopted by NOAA. Completion of this training is a licence condition in the Atlantic Canadian Swordfish and Other Tunas fishery, as is the presence of appropriate disentanglement/dehooking gear onboard the vessel.</p>	4, 5	15, 16, 17, 20	CSTN

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
		The training has also been taken by DFO fishery officers in Maritimes Region, with recent expansion into Gulf, Quebec, and Newfoundland and Labrador (NL) Regions.			
2.10	Development and testing of innovative gear technologies and configurations	Significant North Atlantic Right Whale mortality events in 2017 and 2019 highlighted an urgent need to reduce the amount of vertical lines in the water column. Since 2018, DFO has supported the development of ropeless fishing and “whale safe” gear technologies that minimize or eliminate the risk of entanglement to marine mammals, and which also may have secondary benefits for Leatherback Sea Turtles.	4	15, 17	DFO / fishing industry / technology companies
2.11	Enforcement	DFO fishery officers conducted regular patrols of fishing activities, which included boarding vessels and checking for compliance with SARA-related licence conditions, some of which are specific to sea turtles. They also conducted wharf-based education and outreach to enhance compliance with regulatory requirements. Hundreds of enforcement hours were dedicated to Leatherback Sea Turtles over the reporting period.	1, 4, 5	1, 16, 20	DFO
2.12	Completion and review of strategic environmental assessments for offshore oil and gas exploration and development activities	Several strategic environmental assessments (SEAs) were completed for large areas of the Scotian Shelf and Slope during the reporting period. When applicable, potential effects on the Leatherback Sea Turtle and its habitat were considered in these assessments. Public comments on the SEAs were sought and recorded on the C-NLOPB and CNSOPB public registries. References: CNSOPB (2019a); C-NLOPB (2019a)	4	15	C-NLOPB / CNSOPB / oil and gas industry
2.13	Completion and review of environmental assessments for seismic and drilling programs	Several project-specific environmental assessments were either completed or are currently underway for seismic and drilling programs. When applicable, the potential effects of the activity on Leatherback Sea Turtles (for example, hearing impairment and disturbance from airgun array noise) were assessed and	4	15	C-NLOPB / CNSOPB / IAA / oil and gas industry

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
		<p>mitigation measures were established. Public comments on the EAs were sought and recorded on the C-NLOPB and CNSOPB public registries.</p> <p>References: CNSOPB (2019b); C-NLOPB (2019b)</p>			
2.14	Ongoing operation of the MMRP	<p>DFO is responsible for supporting marine mammals and sea turtles in distress, including Leatherback Sea Turtle. Under the umbrella of the National Marine Mammal Response Program (MMRP), DFO continues to collaborate with non-government organizations across the country to respond to marine mammal and sea turtle incidents. In addition to providing expert care and assistance to distressed animals, these response networks provide valuable data that can be used to help quantify threats to species at risk.</p> <p>The mandate of the program is to work with partners to track and respond to incidents involving marine mammals and sea turtles, quantify threats, and provide information in support of SARA recovery planning, mitigation activities, and policy development. The funds, expertise, and other resources this program contributes help mobilize appropriate responses to incidents.</p> <p>In 2018, Canada's federal budget announcement set aside \$167.4 million for Canada's Whales Initiative, including \$1 million annually to support marine mammal response organizations across Canada. Now identified as part of the Whales Initiative funding, the Marine Mammal Response Program Capacity Building Fund allocated \$4.5 million over four years to increase capacity for safe and effective incident response. These investments are anticipated to also benefit Leatherback Sea Turtle.</p>	1, 2, 4	1, 7, 16	DFO

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
2.15	Ongoing operation of regional marine animal response networks and hotlines	The CSTN continues to maintain an emergency response and sightings hotline for marine turtles in Atlantic Canada and recently added an online form . Emergency response hotlines are also maintained by MARS, WRS-NL and the Quebec Marine Mammal Emergency Response Network. These networks are well-established, well-publicized, and work together to respond to sea turtle strandings or other incidents.	1, 2, 4, 5	1, 7, 16, 19	CSTN / MARS / Quebec Marine Mammal Emergency Response Network / WRS-NL

Table 2.3. Engagement, education, and outreach

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
3.01	Targeted programs to reduce waste from fishing activities	The Ship-to-Shore program continued to engage commercial fish harvesters in enhanced waste management at sea and on the wharf with the objective of reducing marine debris, and extended into other Atlantic provinces, including PEI and NL. There was also some targeted engagement with lobster harvesters in NL to increase awareness of the threat of plastic bait box liners and work toward more sustainable gear options and disposal practices.	4	15, 17	Clean Foundation / CPAWS-NL / fishing industry / QLF
3.02	Shoreline clean-ups	There are several clean-up programs in Atlantic Canada that contribute to reducing the amount of debris entering or re-entering coastal waters. These include programs such as the Great Canadian Shoreline Clean-up (Ocean Wise and WWF-Canada), the Great Nova Scotia Pick-Me-Up and the Beach Sweep Program (NS Clean Foundation), and the Great Fundy Coastal Cleanup (Nature Trust of New Brunswick). These programs encourage coastal communities to pick up trash along their shorelines. For example, since its inception in 2016, the Great Fundy Coastal Cleanup has grown to include	4	15, 17	NGOs / Memorial University of Newfoundland / volunteers

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
		<p>20 cleanup sites, 25 partner organizations, and more than 150 volunteers. Data collected during cleanups are analyzed to better understand the marine debris problem (for example, the composition and abundance of litter).</p> <p>Since 2018, a group of researchers from Memorial University of Newfoundland have been collecting and studying marine debris along the shores of Placentia Bay (Placentia Bay Ocean Debris Survey). The objectives include establishing a baseline of marine debris for the area and its origins. Placentia Bay is a high-use habitat area for Leatherback Sea Turtles in Atlantic Canada.</p>			
3.03	Publication and distribution of species identification guides	<p>A number of new species identification guides were developed that feature sea turtles found in Atlantic Canada. These include, but are not necessarily limited to, the At-Sea Observers Marine Mammal Identification Guide, Marine Species Identification Chart (Newfoundland and Labrador Waters), and A Mariner's Guide to Whales in the Northwest Atlantic. These are all available online, but have also been distributed to targeted and public audiences through a variety of mechanisms.</p>	5	20	Dalhousie University / DFO / QLF/ Réseau d'observation de mammifères marins / Shipping Federation of Canada
3.04	Engagement with fish harvesters	<p>DFO regularly engages with fish harvesters on measures in fisheries designed to protect and recover Leatherback Sea Turtles, including logbook reporting requirements, through advisory committee meetings and other fora. In Gulf region, an information sheet on safely handling and releasing incidentally-caught Leatherback Sea Turtles was provided to fish harvesters.</p> <p>The CSTN regularly engages with fish harvesters across Nova Scotia by visiting their communities and hosting informal gatherings on wharves. During these sessions, they discuss Leatherback Sea Turtles and the stewardship role for fish harvesters in the species'</p>	4, 5	17, 19, 20	CSTN / DFO

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
		<p>recovery, including disentanglement. They also put up sea turtle awareness posters on wharves.</p> <p>The CSTN conducted surveys with several fish harvesters to learn more about what types of entanglement issues they found most challenging and potential mitigation measures. Discussions on this topic are ongoing. The survey also asked about sea turtle topics of interest to them and the ways in which they would like to be engaged.</p>			
3.05	Outreach to enforcement officers	In addition to training (table 2.2), the CSTN regularly engages with DFO fishery officers and NSDLF staff on Leatherback Sea Turtles more generally, and provides stranding kits that include supplies such as DNA biopsy sampling tools, data sheets, and measuring tapes.	5	18	CSTN
3.06	“Hank the Tank” Leatherback Sea Turtle model	A life-sized fibreglass Leatherback Sea Turtle model, dubbed “Hank the Tank”, was constructed for simulating entanglement scenarios and testing disentanglement equipment. The buoyant model has moveable shoulder joints and handles for maneuverability. In March 2017, a small group of scientists and fish harvesters in NL participated in a workshop during which Hank was placed in a flume tank to consider different potential solutions to vertical line entanglement (that is, four weighted buoy line options and three line-cutting equipment prototypes). Further research and training using this model is expected in the future. In the interim, Hank has been on display at the Northwest Atlantic Fisheries Centre (NL) and at outreach events such as Oceans Day.	4, 5	15, 19, 20	DFO / Fish, Food and Allied Workers Union

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
3.07	“Dialogue on Plastic Waste” public consultation	<p>On April 22, 2018, the Government of Canada launched a consultation on managing plastic waste and reducing marine litter. Canadians were invited to share their ideas for solutions in the areas of sustainable design and production; collection and management; sustainable lifestyle and education; research and innovation; and action on the ground.</p> <p>Like other plastics initiatives, the results of this consultation will contribute to reducing the threat of marine debris to Leatherback Sea Turtles and other marine animals.</p>	4	17	ECCC
3.08	Better Bag Challenge	<p>Since 2015, NL Region has promoted a “Better Bag Challenge” through World Oceans Day activities. As part of the challenge, DFO fishery officers visit local grocery stores and distribute reusable bags. The bags feature a Leatherback Sea Turtle and are meant to promote awareness of the threat of plastic to ocean life.</p>	5	19	DFO
3.09	Web profiles	<p>The Leatherback Sea Turtle is featured on the webpages of several organizations, where information can be found on the species’ physical and biological characteristics, threats, and at-risk status.</p>	5	19	Numerous organizations (for example, DFO , CSTN , MARS , WRS-NL , Oceana)
3.10	Social media	<p>DFO and CSTN regularly use Twitter (@FishOceansCAN; @DFO_MAR; @DFO_NL; @canadaseaturtle) and Facebook (@FisheriesOceansCanada; @canadaseaturtle) to share information on Leatherback Sea Turtles, such as interesting species facts, research updates, how to report sightings, and recovery progress. In May 2017, DFO hosted a live Twitter chat with DFO sea turtle biologist Mike James. Social media has been used to promote the “Tell Jack” campaign in NL Region, an initiative to encourage individuals to provide information</p>	5	19	CSTN / CWF / DFO

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
		<p>on turtle and whale sightings to the regional DFO Science office.</p> <p>CSTN has a YouTube channel (Canadian Sea Turtle Network) that features a variety of video clips about Leatherback Sea Turtles.</p> <p>CSTN keeps a blog where more in-depth information is shared about field work, tagged turtles, and nesting activities. They also have a presence on Facebook, Twitter, and Instagram. CWF also frequently features the Leatherback Sea Turtle on their blog.</p>			
3.11	The Great Canadian Turtle Race	<p>The Great Canadian Turtle Race is a public outreach initiative that seeks to raise awareness of Leatherback Sea Turtles in Atlantic Canadian waters. To date, it has been held twice: in 2012 to 2013 and 2015 to 2016. During the event, individuals and school groups can track the progress of several turtles as they make their way south from Atlantic Canada over the fall and winter. Each of the turtles is given a name, and the turtle that logs the most kilometres before a certain date wins the race. There are weekly blog updates, including maps of the turtle tracks, a recap of each turtle’s progress, and information on Leatherback Sea Turtle biology and threats.</p>	5	19	CSTN / CWF
3.12	New sea turtle exhibits	<p>In 2016, a female Leatherback Sea Turtle was found dead and entangled off Cape Breton, Nova Scotia. A cast of the animal, taken prior to necropsy, was used to create a replica that is now on display as part of a larger BIO exhibit featuring all four sea turtle species found in Atlantic Canadian waters. The accompanying interpretive panels include information about the Leatherback’s nesting history and how she died.</p>	5	19	DFO / ENSMSS

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
		<p>The Leatherback Sea Turtle mold was used to create another model for public display at the Atlantic Science Enterprise Centre, housed at the Gulf Fisheries Centre in Moncton, NB. A portable and interactive touchscreen kiosk accompanies the model, and includes information on the species' status, biology, threats, habitat, and recovery measures.</p> <p>The Oceans of Opportunity Marine Science and Heritage Centre was recently established in Louisbourg, Nova Scotia. It is open to the public and features a Leatherback Sea Turtle model that was cast from an individual caught in fishing gear in 1979.</p>			
3.13	Development and distribution of public outreach materials	Outreach materials featuring the Leatherback Sea Turtle include bookmarks, stickers, activity sheets, colouring pages, fact sheets, and games. These materials have been distributed at annual Oceans Day events, BIO Expo 2017, DFO Gulf Region's 35 th anniversary open house, trade shows, and other venues. In DFO's NL Region, several promotional items containing the "Tell Jack" campaign slogan (encouraging reports of turtle and whale sightings) were distributed, including picnic blankets, lunch coolers, and decals.	5	19	DFO / Indigenous organizations / NGOs
3.14	Television documentaries	<p>On January 22, 2015, CBC aired an episode of "The Nature of Things with David Suzuki" called "Trek of the Titans" (available for streaming). This one-hour documentary followed the work of DFO biologist Mike James and his research partners, CSTN and the Nature Seekers (Trinidad), as they conducted fieldwork on Leatherback Sea Turtles at sea in Atlantic Canada and on one of their major nesting beaches in Trinidad.</p> <p>Leatherback Sea Turtle research in Atlantic Canada was also featured in documentary programs on the French</p>	5	19	CBC / DFO / NHK / TV5Unis / field research partners

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
		language specialty channel TV5Unis (available for streaming [in French only]) and Japan's NHK .			
3.15	School visits and similar outreach	Leatherback Sea Turtles were regularly featured in annual outreach to children/youth through presentations at schools, camps, and other community events across Atlantic Canada. Reducing plastic pollution is a common theme, as it is one way that all individuals can contribute to alleviating the threat of marine debris to sea turtles and other marine life.	5	19	DFO / NGOs
3.16	Canadian Sea Turtle Centre	CSTN launched their Sea Turtle Centre in 2013. The Centre was located at Peggys Cove, Nova Scotia, for the first two years and has since moved to the Halifax Waterfront. The Centre, which is open during the summer and fall, includes informational story-boards, Leatherback Sea Turtle specimens (for example, flipper skeleton, skulls, throat spines, egg model, hatchling model), and research equipment (for example, flipper tags, satellite tag). Photos and videos of sea turtle research play on an iPad and a TV. There is an interactive jellyfish craft station for children. Staff members are available to provide interpretation to visitors. Turtle and ocean-themed merchandise (for example, clothing, plush turtles, craft kits, jewelry, and art) is available for sale.	5	19	CSTN
3.17	WILD Webinars	Leatherback Sea Turtles have been the focus of two WILD Webinars (a series hosted by CWF on conservation, wildlife, and habitat). Each webinar is approximately 30 minutes in length and features experts talking about Leatherback Sea Turtle biology and research, with an opportunity for questions from viewers. The webinars are available online: Webinar 1 (2013), Webinar 2 (2016).	5	19	CSTN / CWF

#	Recovery activity	Description and results	Recovery objective	Performance indicator	Participants
3.18	News media	Leatherback Sea Turtle research has been profiled in the media (print and television) several times during the reporting period, including National Geographic Kids, Canadian Wildlife, CTV Morning Live, CBC News, The Weather Network, and The Chronicle Herald, among others.	5	19	Primarily featuring work by DFO, CSTN, and Dalhousie University

Table 2.4. International collaboration

#	Recovery activity	Description and results	Recovery objectives	Performance indicators	Participants
4.01	Population status assessment	The status of the Northwest Atlantic population of Leatherback Sea Turtles was recently reassessed by an expert panel of data-holders and researchers from the Caribbean, US, and Canada. When they compared the five-year average of annual nest abundance for a past time point (assumed to reflect abundance three generations ago) and a present time point, they found a ~60% decline. This status assessment was the basis for updating the IUCN Red List status to endangered from least concern in January 2019. References: NWALWG (2018; 2019)	1, 2, 6	5, 8, 11, 21	Northwest Atlantic Leatherback Working Group
4.02	Bycatch reduction workshop	WWF-Guianas organized and facilitated a workshop in March 2019 to identify priorities for bycatch reduction in Trinidad and the Guianas, both important nesting areas for the Northwest Atlantic population of Leatherback Sea Turtles. The workshop included participants from Suriname, French Guiana, Guyana, Trinidad, Canada, and the US.	1, 4, 6	1, 15, 21	WWF / numerous other organizations
4.03	Development of framework for regional action plan	Recognizing the declining abundance of Leatherback Sea Turtles in the Northwest Atlantic, the connectivity of their habitats, and the threats they face, a framework was developed for the creation of a multi-country	6	21	WWF / numerous other organizations

#	Recovery activity	Description and results	Recovery objectives	Performance indicators	Participants
		<p>regional action plan. This action plan will provide the foundation for a cohesive, coordinated approach to recovery and conservation of the population across its range from the Caribbean to Canadian waters. Several countries (including Canada), partners, and stakeholders have been identified as important participants in this process to develop a framework for action.</p> <p>Reference: Wallace (2019)</p>			
4.04	Relationship-building with nesting beach conservation groups	<p>CSTN and DFO have continued to build relationships with sea turtle conservation groups in Trinidad (where a significant proportion of Leatherback Sea Turtles using Canadian waters originate) and other nesting beach locations. This includes information sharing, supporting stewardship actions (for example, communications support), and supporting research (for example, tag collection and deployment, provision of scientific supplies). The CSTN has established two programs that help build relationships with the NatureSeekers conservation group in Trinidad: 1) an ecotour for Canadian volunteers to visit Trinidad and help with research and conservation efforts on Matura Beach and 2) exchange positions for NatureSeekers employees to conduct sea turtle research in Canada for five weeks.</p>	4, 5, 6	15, 20, 21	CSTN / DFO / international conservation partners
4.05	Collaborative research	<p>DFO regularly collaborates on sea turtle research with partners in the US, Grenada, French Guiana, and Trinidad. Examples of this work are included in table 2.1.</p>	1, 2, 6	1, 6, 9, 10, 21	DFO / numerous organizations (for example, NOAA, Nature Seekers)
4.06	Information-sharing with Saint-Pierre and Miquelon	<p>The Exclusive Economic Zone (EEZ) of Saint-Pierre and Miquelon, an overseas collectivity of France, is contained within the Canadian EEZ. Leatherback Sea Turtle distribution includes the French EEZ. DFO staff discuss fisheries interactions with species at risk during</p>	1, 6	21	DFO / Saint-Pierre and Miquelon

#	Recovery activity	Description and results	Recovery objectives	Performance indicators	Participants
		ongoing dialogue and information-sharing with their counterparts and French officials from Saint-Pierre and Miquelon. In addition, there is typically an annual presentation and discussion of species at risk issues during bilateral meetings.			

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 included in the 2007 recovery strategy. At the time the recovery strategy was published, these studies were expected to be completed within five years. The schedule of studies will be revisited in an amended version of the recovery strategy that is in preparation. For reporting purposes, each study has been assigned one of four statuses in table 3:

- 1) completed: the study has been carried out and 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 of the schedule of studies.

Study	Status	Description and results	Participants
Evaluate the spatial and temporal distribution and foraging ecology of Leatherback Sea Turtles in Canadian waters	Completed	<p>A combination of satellite telemetry, aerial surveys, vessel surveys, and opportunistic sightings contributed information on the spatial and temporal distribution of Leatherback Sea Turtles in Atlantic Canadian waters. Aerial survey effort, in particular, has increased since 2017 and is expected to be sustained until at least 2022. While aerial surveys are not targeting, nor designed for, sea turtles, all observations are being recorded. This is building a multi-year, systematic survey data source that has not existed in the past for Leatherbacks.</p> <p>Insights into foraging ecology have been advanced through the use of video tags and data loggers to study dive patterns and foraging behaviour. Isotope analyses of Leatherback Sea Turtle tissue samples have provided information on trophic status.</p> <p>Although this study is considered complete for the purpose of critical habitat identification, ongoing monitoring is required to identify shifts in habitat use over time.</p> <p>References: Hamelin et al. (2014); Wallace et al. (2014; 2015; 2018); Mosnier et al. (2019); DFO (2020b)</p>	Academia / CSTN / DFO / industry / NGOs / NOAA
Conduct satellite telemetry studies to identify	Completed	A Canadian Science Advisory Secretariat (CSAS) Science Response meeting was held in January 2019 to	CSTN / Dalhousie University / DFO / North

Study	Status	Description and results	Participants
seasonal foraging areas in Atlantic Canadian waters and migratory routes in the Western Atlantic		<p>review satellite telemetry data from 128 Leatherback Sea Turtles tracked in Atlantic Canadian waters during the period 1999 to 2018. The relative use of 0.25 x 0.25 degree grid cells by satellite-tracked turtles was mapped to visualize areas of important habitat. The results provide insights into habitat use and will be used to inform the identification of critical habitat in an amended recovery strategy.</p> <p>Although this study is considered complete for the purpose of critical habitat identification, ongoing monitoring is required to identify shifts in habitat use over time.</p> <p>Reference: DFO (2020b)</p>	Carolina Wildlife Resources Commission
Identify prey species and assess their spatial and temporal distribution in Canadian waters	In progress	<p>A regional jellyfish study was conducted using a combination of citizen science beach monitoring and DFO trawl survey data. The objectives of the study included obtaining data on jellyfish species composition, seasonal distribution, and environmental drivers. These data were then combined with Leatherback Sea Turtle movement and sightings data to explore if opportunistic monitoring of jellyfish could potentially indicate broader prey field patterns and correlate with turtle distributions. Continued work to build upon this baseline is needed.</p> <p>Reference: Nordstrom et al. (2019)</p>	CSTN / Dalhousie University / DFO
Identify and model oceanographic processes that influence the spatial and temporal Leatherback Sea Turtle distribution in Canadian waters	In progress	<p>Based on a limited number of Leatherback Sea Turtle observations, preliminary modelling was completed to assess the link between those observations and environmental correlates, including: sea surface temperature, sea surface height, water depth, bottom slope, and chlorophyll a concentration. The model predictions generally confirmed the location of preferred habitat areas identified through satellite telemetry and suggested the Grand Banks and the waters east of Anticosti Island could also be important for foraging turtles. The model should be refined over time as more data is collected.</p>	DFO

Study	Status	Description and results	Participants
		<p>Using data loggers recovered from three Leatherback Sea Turtles, information was gathered on environmental variables shaping three-dimensional habitat use in Atlantic Canadian waters. This led to an increased understanding of how water mass characteristics and solar illumination influence dive patterns.</p> <p>References: Hamelin et al. (2014); Mosnier et al. (2019)</p>	

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 one of four 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 one 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 until such time when the population is considered to be recovered

Table 4. Summary of progress made toward meeting performance indicators.

Performance indicator	Status	Comments
(1) Potential/known interactions of Leatherback Sea Turtles and fishing industry activities identified and documented	Met, ongoing	<p>Leatherback Sea Turtle interactions with fishing activities are recorded through the at-sea observer program, SARA logbooks, and enforcement. Other sources of information include necropsies, opportunistic observations by the public and research groups, and injury assessments; however, it is not often possible to identify the fishery of origin in those cases, making it challenging to implement appropriate mitigation measures. Recent studies such as Hamelin et al. (2017), Archibald and James (2018), DFO (2020c) have analysed fisheries interaction data. There are a number of inherent biases and uncertainties associated with the data used to assess fishery interactions. Ongoing work is needed to address these to the extent possible. In addition, interactions must be re-evaluated on an ongoing basis to monitor threats to recovery.</p> <p>Relevant recovery activities (table 2): 1.05, 1.06, 1.10, 1.11, 1.13, 2.01, 2.03, 2.08, 2.11, 2.14, 2.15, 4.02, 4.05.</p>
(2) Post-release survivorship determined	Not met	<p>While Archibald and James (2018) assessed external injuries to Leatherback Sea Turtles, they acknowledged that such assessments are of limited value in determining post-release survival rates due to inherent sampling biases. They did find, however, that more than a third of the animals sampled had sustained an injury suspected to be of anthropogenic origin. This suggests that although Leatherback Sea Turtles are frequently interacting with human activities, they are also frequently surviving.</p>

Performance indicator	Status	Comments
		<p>Overall, post-release survivorship is difficult to determine. The sample size of animals tagged post-entanglement in Canadian waters is opportunistic, and small, and the duration and severity of entanglement for associated turtles is unknown. Therefore, effort will continue over many more years to build the sample to better understand the issue. The sample is also biased toward animals with a greater likelihood of survival, as researchers avoid unnecessary handling of turtles in very poor condition to avoid jeopardizing survival further.</p> <p>Hamelin and James (2018) studied post-tagging effects and found no evidence to suggest that research tagging or handling activities themselves affected survival.</p> <p>Relevant recovery activities (table 2): 1.02, 1.05, 1.08, 2.01</p>
(3) Potential biological removal limit assessed	Not met	<p>The potential biological removal level is defined in the US <i>Marine Mammal Protection Act</i> as “the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population”. This concept is analogous to the allowable harm assessments included in DFO recovery potential assessments (RPAs), which evaluate the maximum human-induced mortality and habitat destruction that the species can sustain without jeopardizing its survival or recovery. An RPA was not completed for the Leatherback Sea Turtle (Atlantic population), but an allowable harm assessment was conducted separately in 2004. Allowable harm must be re-assessed periodically to reflect current population trends and threat levels, and is due to be revisited. Some foundational work was completed over the reporting period (for example, see performance indicator 1) that informed an assessment of allowable harm in 2020 (DFO in press).</p>
(4) Potential/known threats of offshore development activities on Leatherback Sea Turtles identified and documented	Met, ongoing	<p>The extent of knowledge on non-fishery threats to Leatherback Sea Turtles was documented in DFO (2020c). Very little is known about the impact of these threats on the species in Atlantic Canadian waters. The SARA action plan identifies measures to help fill knowledge gaps in this regard.</p> <p>Relevant recovery activities (table 2): 1.11, 2.01</p>
(5) Report produced on human activities known to, or having the potential to, threaten Leatherbacks in Atlantic	Partially met, underway	<p>A CSAS Science Response completed in 2018 resulted in a report (DFO 2020c) summarizing available information on threats in Atlantic Canadian waters.</p>

Performance indicator	Status	Comments
Canada, with recommendations for actions		<p>A 2018 status assessment (NWALWG 2018) for the broader Northwest Atlantic population included recommendations related to characterizing and reducing anthropogenic threats in foraging areas (primarily fishery-related).</p> <p>Relevant recovery activities (table 2): 1.10, 1.11, 2.01, 2.08, 4.01</p>
(6) Populations frequenting Atlantic Canadian waters identified	Met, ongoing	<p>Genetic analysis of samples collected from turtles handled in Atlantic Canada revealed the majority originated from Trinidad and the Guiana Shield area (mostly consisting of Venezuela, Guyana, Suriname, and French Guiana) nesting beaches. These analyses may need to be repeated in the future to monitor changes in population structure and habitat use.</p> <p>Relevant recovery activities (table 2): 1.01, 1.19, 2.01, 4.05</p>
(7) Historic and current sightings compiled and organized in a centralized database	Partially met, underway	<p>The CSTN manages a database that includes all sightings and strandings reported to them, as well as details on every turtle handled and sampled during collaborative field studies with DFO. Work is underway to migrate this database onto a cloud computing service to facilitate easier and wider access. All satellite telemetry data is already archived in a cloud format and managed by DFO.</p> <p>A centralized database that includes all sightings information from across Atlantic Canada has not been developed, but is an ongoing need. Working toward a common mode of data management across DFO regions and various organizations will require some time and coordination. There are several logistical and other considerations to take into account, including data standardization, quality control, organization, maintenance, access, intellectual property, and privacy.</p> <p>Relevant recovery activities (table 2): 1.01 to 1.03, 1.06, 2.01, 2.14, 2.15</p>
(8) Knowledge from research and monitoring activities compiled in a comprehensive, living, reference document that is regularly updated and accessible to a broad range of user groups	Not met	<p>Research and monitoring activities have not been compiled in a living reference document. This is no longer considered a priority because other mechanisms have been adopted to track this information.</p> <p>COSEWIC status assessments are comprehensive documents that include information on species biology, distribution, population abundance and trends, habitat, and threats. They are typically updated on a 10-year cycle. The next status report for Leatherback Sea Turtles is expected after 2022. SARA recovery documents also provide an overview of research and</p>

Performance indicator	Status	Comments
		monitoring activities, and are reviewed and updated periodically. The recovery strategy for the Leatherback Sea Turtle is undergoing a comprehensive amendment, and will reflect the current best available information for the population once complete. Progress reports also provide regular overviews of research and monitoring activities.
(9) Research initiated on foraging ecology, movements and behaviour of Leatherbacks in Canadian waters	Met, ongoing	See narratives in table 3. Relevant recovery activities (table 2): 1.01, 1.02, 1.09, 1.12, 1.13, 1.16, 1.17, 2.01, 4.05
(10) Research initiated on the oceanographic correlates that relate to the spatial / temporal distribution of Leatherbacks in Canadian waters	Met, ongoing	See narratives in table 3. Relevant recovery activities (table 2): 1.12, 1.13, 1.16, 1.17, 2.01, 4.05
(11) Survey program established to develop indices of abundance (for example, long term in-water population trends in Northwest Atlantic waters)	Met, ongoing	A survey program, in which Leatherback Sea Turtles are systematically monitored and sampled by a vessel off Nova Scotia, is well-established and has been running for approximately two decades. Long-term data collected at a site off Cape Breton (Archibald and James 2016) and a site off Halifax are used to estimate inter-annual relative abundances of Leatherback Sea Turtles in Atlantic Canada. Continuation of this monitoring program is necessary to maintain an index of population variability over time. Relevant recovery activities (table 2): 1.02, 1.04, 1.18, 2.01, 4.01
(12) Critical and/or important habitat in Atlantic Canada identified to the extent possible	Not met	See narratives in table 3. A CSAS Science Response process held in 2019 will inform the identification of critical habitat in an amended recovery strategy. Relevant recovery activities (table 2): 1.02, 2.01
(13) Tools for habitat protection assessed and evaluated	Partially met, underway	Habitat protection may be achieved using a variety of legislative tools, including, but not limited to, SARA, the <i>Oceans Act</i> , and the <i>Fisheries Act</i> . These tools have been used to protect biophysical functions, features, and attributes of Leatherback Sea Turtle habitat, even before critical habitat has been identified. A strategic gap analysis has not been conducted on how to maximize legislative and non-legislative habitat protection tools. Relevant recovery activities (table 2): 2.01
(14) Draft plan for protection of critical habitat in Atlantic Canada developed	Not met	Critical habitat has not yet been identified. It will be identified in an amended recovery strategy that is in preparation. Once the amended recovery strategy is

Performance indicator	Status	Comments
		finalized, it is expected that a Critical Habitat Order will be used to legally protect the identified critical habitat under SARA.
(15) Mitigation measures developed to reduce known harm from human activities	Met, ongoing	<p>Mitigation measures to minimize harm to incidentally caught sea turtles are included in commercial fishing licence conditions (for example, mandatory sea turtle disentanglement and dehooking training in the pelagic longline fishery). Mitigation measures are also included as conditions for each section 73 or 74 permit issued under SARA for activities affecting Leatherback Sea Turtles. New marine protected areas and marine refuges have introduced spatial restrictions on certain human activities that may interact with Leatherback Sea Turtles. Measures to mitigate the potential effects of oil and gas activities on sea turtles, such as the application of the “Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment”, were identified in relevant environmental assessment reports (for example, Scotian Basin Exploration Drilling Project). Through a variety of initiatives, efforts are being taken to reduce the use of single-use plastics and minimize the amount of marine debris in the ocean (for example, Canada-wide Strategy on Zero Plastic Waste; Ship-to-Shore Program; shoreline clean-ups).</p> <p>Relevant recovery activities (table 2): 1.08, 1.21, 2.01, 2.02, 2.06, 2.07, 2.09, 2.10, 2.12, 2.13, 3.01, 3.02, 3.06, 4.02, 4.04</p>
(16) Recovery and emergency response procedures implemented, along with specific threat reduction measures	Met, ongoing	<p>The implementation of threat reduction measures is covered under performance indicators 15 and 17. DFO's MMRP continues to provide funding and other support for sea turtle incident response, including necropsies. Regional response organizations maintain hotlines and, in collaboration with partners, capacity to disentangle live turtles and document, sample, and recover dead turtles to the extent possible. Fish harvesters are almost always the first responders to assist entangled sea turtles and disentanglement/dehooking training is a condition of licence for the pelagic longline fishery, in particular. Fishery officers are similarly trained. Expansion of the training program to other fisheries will be explored. A standardized protocol for the recovery and analysis of recovered gear from entangled marine animals is being developed by DFO. This will help maximize the information gained about threats to species at risk and possible mitigation measures.</p> <p>Relevant recovery activities (table 2): 2.01, 2.09, 2.11, 2.14, 2.15</p>
(17) Programs developed to engage stakeholders in the	Met, ongoing	Recent surveys and conversations with commercial fish harvesters on local gear configurations and non-target

Performance indicator	Status	Comments
implementation of mitigation measures		<p>species interactions are informing discussions on possible gear modifications and other mitigation measures.</p> <p>Through development and testing of innovative gear technologies, such as ropeless gear, stakeholders are engaging directly in entanglement prevention and mitigation solutions for the future.</p> <p>Programs such as the Global Ghost Gear Initiative, the Better Bag Challenge, and Canada's Dialogue on Plastic Waste are all meant to engage stakeholders and the public in becoming part of the solution to the marine debris problem.</p> <p>Relevant recovery activities (table 2): 1.21, 2.01, 2.07, 2.09, 2.10, 3.01, 3.02, 3.04, 3.07</p>
(18) Information on Leatherbacks produced and distributed to federal and provincial government departments	Not met	<p>DFO works closely with other federal and provincial regulators. Regular information exchange is a core component of these relationships; however, specific materials on Leatherback Sea Turtles for this audience have not been produced and distributed.</p> <p>Relevant recovery activities (table 2): 2.01, 3.05</p>
(19) Public awareness materials produced and distributed, including but not limited to briefing kits, web resources, brochures	Met, ongoing	<p>There were many relevant public awareness materials produced and distributed during the reporting period. These included, but were not limited to, bookmarks, bags, stickers, and fact sheets, which were distributed at events and schools, for example. Web-based communication increased with regular social media content, species web profiles, and webinars. Leatherback Sea Turtles were featured in the news media and in multiple television documentary programs. Permanent public exhibits with sea turtle models were created at various venues. The Canadian Sea Turtle Centre, an interactive information kiosk, was opened on the Halifax waterfront. Maintaining public engagement in sea turtle recovery will continue to be important in the future.</p> <p>Relevant recovery activities (table 2): 2.01, 2.15, 3.04, 3.06, 3.08 to 3.18</p>
(20) Initiatives developed to educate and train stakeholders about their role in Leatherback Sea Turtle conservation (for example, continuation of fishers outreach/research via NS Leatherback Turtle Working Group)	Met, ongoing	<p>The CSTN has engaged and worked with fish harvesters on sea turtle conservation for many years. Relationship-building and education are cornerstones of their programs. CSTN regularly visits fishing communities and wharves in the Maritimes to talk to fish harvesters. They continue to discuss the entanglement issue and work on collaborative prevention and mitigation solutions.</p>

Performance indicator	Status	Comments
		<p>Sightings and incident reporting has been encouraged through targeted poster campaigns and other communications. The development of various species identification guides promotes more reliable data collection.</p> <p>The development of “Hank the Tank” in DFO’s NL Region to simulate entanglement scenarios engaged fish harvesters directly in testing disentanglement methods.</p> <p>In addition to their role in enforcement, fishery officers have an important role in ongoing education. They are interacting with fish harvesters regularly and have many opportunities to provide information.</p> <p>Relevant recovery activities (table 2): 2.01, 2.09, 2.11, 3.03, 3.04, 3.06, 4.04</p>
(21) Collaboration with other nations on Leatherback Sea Turtle conservation initiatives	Met, ongoing	<p>Several long-standing international research and conservation partnerships (for example, with Trinidad, French Guiana, Grenada, and the US) have continued or started during the reporting period. Since 2018, there have been increasing efforts to work collaboratively across nations to address the threat of bycatch.</p> <p>Relevant recovery activities (table 2): 1.01, 1.14, 1.15, 2.01, 4.01 to 4.05</p>

3.3.2 Completion of action plan

The “Action Plan for the Leatherback Sea Turtle (*Dermochelys coriacea*), Atlantic population, in Canada” was published as Proposed on the Species at Risk Public Registry on September 27, 2018. The final version of the action plan was not completed during the reporting period for this progress report, but is now published ([DFO 2020a](#)). The action plan identifies recovery measures to address all identified threats to the species in Atlantic Canadian waters.

3.3.3 Critical habitat identification and protection

Critical habitat for the Leatherback Sea Turtle (Atlantic population) will be identified in an amended recovery strategy. Under SARA, critical habitat must be legally protected from destruction within 180 days of being identified in a recovery strategy or action plan. For the Leatherback Sea Turtle critical habitat, it is anticipated that this will be accomplished through a SARA Critical Habitat Order made under subsections 58(4) and (5), which will invoke the prohibition in subsection 58(1) against the destruction of the identified critical habitat.

3.3.4 Recovery feasibility

Recovery of the Leatherback Sea Turtle was assessed as feasible in the 2007 recovery strategy. The biological and technical feasibility of Leatherback Sea Turtle recovery was not reassessed during the reporting period.

4. Concluding statement

The information presented in tables 2 to 4 provides many examples of how, and to what extent, the Leatherback Sea Turtle recovery strategy has been implemented by DFO and its partners during the reporting period (2013 to 2019). Activities have been undertaken in support of all six recovery objectives. The most significant progress has been made on recovery objectives 2 (understanding Leatherback Sea Turtle life history characteristics), 4 (risk reduction), and 5 (education). Twelve of the 21 performance indicators have been met; however, all of these will require ongoing action to maintain the progress made on recovery strategy implementation. Three performance indicators were partially met and six were not met. Indicators that were not met related to assessing post-release survivorship and potential biological removal, producing an evergreen reference document outlining research and monitoring activities, identifying and protecting critical habitat, and producing and distributing information to other government departments. Of these, the most significant gaps are updating the allowable harm assessment (that is, potential biological removal) and critical habitat identification. The allowable harm assessment (DFO 2004), which informs permitting decisions under SARA, is being updated to account for current population trends, species distribution, and threat risk levels (DFO in press). Critical habitat will be identified in an amended recovery strategy, expected to be finalized within the next two years. Protection is expected to be achieved using a Critical Habitat Order under subsections 58(4) and 58(5) of SARA. Other priorities for the next reporting period are outlined below (each of which are captured by recovery measures in the SARA action plan).

Priority 1: continue and build upon the long-term tagging and monitoring program off Nova Scotia. In conjunction with other research, this program contributes information on population structure, abundance, distribution, life history, and habitat use. This information is critical for setting SMART (specific, measurable, achievable, realistic, time-bound) population and distribution objectives. It is also of fundamental importance for making management decisions. Although the Canadian research program is well-established, there are still areas where improvements could be made. For example, methods for increasing sampling efficiency will be evaluated. Sea turtles cannot be detected using acoustic methods, and are typically more difficult to visually detect than whales. Including aerial support in vessel-based sea turtle research programs has been shown to increase efficiency in other jurisdictions, wherein a spotter aircraft surveys the study area and directs sampling effort on the water. The feasibility of this approach will be considered in the Canadian context.

Priority 2: continue and expand collaboration with other countries on Leatherback Sea Turtle recovery. Since this is a transboundary species involving many countries, coordination and collaboration is necessary to achieve recovery. Some of the most significant threats to survival and recovery of the population fall outside of Canadian jurisdiction (for example, NWALWG 2018). DFO will identify new opportunities to expand its participation in international recovery initiatives.

Priority 3: improve fisheries monitoring data. Bycatch in fixed gear fisheries is the threat of highest concern for Leatherback Sea Turtles in Atlantic Canadian waters. Two major sources of fisheries interaction data are SARA logbooks and at-sea observers, each of which have issues affecting data quality. Variable compliance with SARA reporting requirements, lack of data standardization, and unequal or inconsistent observer effort across fisheries and regions have all been identified as challenges (DFO 2020c). Each of these challenges can be addressed to some extent, and work is underway to make improvements. Other methods of data collection will also be explored.

Priority 4: improve understanding of prey (jellyfish) abundance and distribution in Atlantic Canadian waters. Leatherback Sea Turtles are using Canadian habitat areas specifically to forage, so understanding the oceanographic and environmental factors that influence aggregations of prey is important. Being able to predict shifts in prey distribution may help anticipate threats and ensure appropriate prevention and mitigation measures are in place to protect Leatherback Sea Turtles while in Canadian waters. Surveying and enumerating jellyfish is very challenging due to their fragile, soft bodies, so progress toward building a knowledgebase on abundance and distribution is expected to be slow.

Overall, important progress was made toward implementing the Leatherback Sea Turtle recovery strategy during the period 2013 to 2019. This progress builds upon that made during the first reporting period (2007 to 2012). The recovery goal from the recovery strategy (ALTRT 2006), which is “to increase the population, such that the long-term viability of the Leatherback Sea Turtles frequenting Atlantic Canadian waters is achieved”, was not met. The Northwest Atlantic subpopulation has been declining (NVALWG 2018; 2019), believed to be driven primarily by threats on and around nesting beaches. However, the importance of Atlantic Canadian waters to recovery cannot be overstated. These waters are thought to host among the densest foraging populations of Leatherback Sea Turtles in the world. Long-term monitoring suggests that relative abundance of Leatherback Sea Turtles using these waters was stable over the period 2002 to 2015 (Archibald and James 2016). Habitat use in Atlantic Canadian waters has also remained predictable. Abundance and distribution will continue to be closely monitored, especially as environmental conditions shift due to climate change. Changes in turtle distribution and/or patterns of human activities could result in higher threat risk to the population, depending on temporal and spatial overlap.

The work started and completed to date has built a strong foundation for continued research and management of this species over the next reporting period.

References

- Archibald, D.W., and M.C. James. 2016. Evaluating inter-annual relative abundance of leatherback sea turtles in Atlantic Canada. *Marine Ecology Progress Series* 547: 233-246.
- Archibald, D.W., and M.C. James. 2018. Prevalence of visible injuries to leatherback sea turtles (*Dermochelys coriacea*) in the Northwest Atlantic. *Endangered Species Research* 37: 149-163
- ALTRT (Atlantic Leatherback Turtle Recovery Team). 2006. Recovery Strategy for Leatherback Turtle (*Dermochelys coriacea*) in Atlantic Canada. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa, vi + 45 pp.
- Bond, E.P., and M.C. James. 2017. Pre-nesting movements of leatherback sea turtles, *Dermochelys coriacea*, in the western Atlantic. *Frontiers in Marine Science* 4: Article 223.
- Casey, J.P., M.C. James, and A.S. Willard. 2014. Behavioral and metabolic contributions to thermoregulation in freely swimming leatherback turtles at high latitudes. *The Journal of Experimental Biology* 217: 2331-2337.
- C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2019a. [Strategic environmental assessment](#). [accessed December 2019].
- C-NLOPB. 2019b. [Project-based environmental assessments](#). [accessed December 2019].
- CNSOPB (Canada-Nova Scotia Offshore Petroleum Board). 2019a. [Public registry: SEAs](#). [accessed December 2019].
- CNSOPB. 2019b. [Public registry: EAs](#). [accessed December 2019].
- COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2012. [COSEWIC assessment and status report on the Leatherback Sea Turtle \(*Dermochelys coriacea*\) in Canada](#). Committee on the Status of Endangered Wildlife in Canada. Ottawa. xv + 58 pp.
- DFO (Fisheries and Oceans Canada). 2004. Allowable harm assessment for leatherback turtle in Atlantic Canadian waters. DFO Science Stock Status Report 2004/035.
- DFO. 2011. Using Satellite Tracking Data to Define Important Habitat for Leatherback Turtles in Atlantic Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/036.
- DFO. 2012. Assessment of Leatherback Turtle (*Dermochelys coriacea*) Fishery and Non-fishery Interactions in Atlantic Canadian Waters. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/041.
- DFO. 2013. Report on the progress of recovery strategy implementation for the Leatherback Sea Turtle (*Dermochelys coriacea*) in Atlantic Canada for the period 2007-2012. *Species*

- at Risk Act* Recovery Strategy Report Series. Fisheries and Oceans Canada, Ottawa. iv-15 pp.
- DFO. 2020a. Action Plan for the Leatherback Sea Turtle (*Dermochelys coriacea*), Atlantic population, in Canada. *Species at Risk Act* Action Plan Series. Fisheries and Oceans Canada, Ottawa. iv + 28 p.
- DFO. 2020b. Using satellite tracking data to define important habitat for Leatherback Turtles in Atlantic Canada: 2019 update. DFO Can. Sci. Advis. Sec. Sci. Resp. 2020/041.
- DFO. 2020c. Assessment of Leatherback Sea Turtle (*Dermochelys coriacea*) Fishery and non-fishery interactions in Canadian waters: 2018 update. DFO Can. Sci. Advis. Sec. Sci. Resp. 2019/032.
- DFO. 2020d. Threat Assessment for the Leatherback Sea Turtle (*Dermochelys coriacea*), Northwest Atlantic Subpopulation. DFO Can. Sci. Advis. Sec. Sci. Resp. 2020/039.
- DFO. In press. Recovery Potential Assessment for the Leatherback Sea Turtle (*Dermochelys coriacea*), Northwest Atlantic Subpopulation. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep.
- Hamelin, K.M., D.E. Kelley, C.T. Taggart, and M.C. James. 2014. Water mass characteristics and solar illumination influence leatherback turtle dive patterns in high latitudes. *Ecosphere* 5(2): Article 19.
- Hamelin, K.M., M.C. James, W. Ledwell, J. Huntington, and K. Martin. 2017. Incidental capture of leatherback sea turtles in fixed gear off Atlantic Canada. *Aquatic Conservation: Marine and Freshwater Ecosystems* 27: 631-642.
- Hamelin, K.M., and M.C. James. 2018. Evaluating outcomes of long-term satellite tag attachment on leatherback sea turtles. *Animal Biotelemetry* 6:18.
- Mosnier, A., J-F. Gosselin, J. Lawson, S. Plourde, and V. Lesage. 2019. Predicting seasonal occurrence of leatherback turtles (*Dermochelys coriacea*) in eastern Canadian waters from turtle and ocean sunfish (*Mola mola*) sighting data and habitat characteristics. *Canadian Journal of Zoology* 97: 464-478.
- Nordstrom, B., M.C. James, K. Martin, and B. Worm. 2019. Tracking jellyfish and leatherback sea turtle seasonality through citizen science observers. *Marine Ecology Progress Series* 620: 15-32.
- NWALWG (Northwest Atlantic Leatherback Working Group). 2018. Northwest Atlantic Leatherback Turtle (*Dermochelys coriacea*) Status Assessment (Bryan Wallace and Karen Eckert, Compilers and Editors). Conservation Science Partners and the Wider Caribbean Sea Turtle Conservation Network (WIDECAST). WIDECAST Technical Report No. 16. Godfrey, Illinois. 36 pp.
- NWALWG (Northwest Atlantic Leatherback Working Group). 2019. [Dermochelys coriacea \(Northwest Atlantic Ocean subpopulation\)](#). The IUCN Red List of Threatened Species 2019: e.T46967827A83327767. [accessed October 2019].

- Roden, S.E., K.R. Stewart, M.C. James, K.L. Dodge, F. Dell'Amico, and P.H. Dutton. 2017. Genetic fingerprinting reveals natal origins of male leatherback turtles encountered in the Atlantic Ocean and Mediterranean Sea. *Marine Biology* 164: 181.
- Stewart, K.R., M.C. James, S. Roden, and P.H. Dutton. 2013. Assignment tests, telemetry and tag-recapture data converge to identify natal origins of leatherback turtles foraging in Atlantic Canadian waters. *Journal of Animal Ecology* 82: 791-803.
- Stewart, P.L., V.J. Kendall, and H.J. Breeze. 2019. Marine environmental contaminants in the Scotian Shelf bioregion: Scotian Shelf, Bay of Fundy and adjacent coastal and offshore waters—1995-present. *Can. Tech. Rep. Fish. Aquat. Sci.* 3291: xiv + 152 pp. + appendices.
- Wallace, B.P., J. Schumacher, J.A. Seminoff, and M.C. James. 2014. Biological and environmental influences on the trophic ecology of leatherback turtles in the northwest Atlantic Ocean. *Marine Biology* 161: 1711-1724.
- Wallace, B.P., M. Zolkewitz, and M.C. James. 2015. Fine-scale foraging ecology of leatherback turtles. *Frontiers in Ecology and Evolution* 3: Article 15.
- Wallace, B.P., M. Zolkewitz, and M.C. James. 2018. Discrete, high-latitude foraging areas are important to energy budgets and population dynamics of migratory leatherback turtles. *Scientific Reports* 8: 11017.
- Wallace, B. 2019. Framework for a regional action plan for Northwest Atlantic leatherback sea turtles, *Dermochelys coriacea*, with a focus on the Guianas-Trinidad & Tobago population. Prepared for WWF-Guiana, WWF-Canada, WWF-Netherlands. 34 pp.