Action Plan for the Leatherback Sea Turtle (*Dermochelys coriacea*), Atlantic population, in Canada

Leatherback Sea Turtle

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For copies of the action plan, or for additional information on species at risk, including COSEWIC Status Reports, residence descriptions, recovery strategies, and other related recovery documents, please visit the SAR Public Registry.

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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 the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of action plans for species listed as extirpated, endangered, or threatened for which recovery has been deemed feasible. They are also required to report on progress five years after the publication of the final document on the Species at Risk Public Registry, and every subsequent five years following.

The Minister of Fisheries and Oceans is the competent minister under SARA for the Leatherback Sea Turtle and has prepared this action plan to implement the recovery strategy, as per section 47 of SARA. In preparing this action plan, the competent minister has considered, as per section 38 of SARA, the commitment of the Government of Canada to conserving biological diversity and to the principle that, if there are threats of serious or irreversible damage to the listed species, cost-effective measures to prevent the reduction or loss of the species should not be postponed for a lack of full scientific certainty.To the extent possible, this action plan has been prepared in cooperation with other federal government departments, provincial governments, Indigenous organizations, and any others as per section 48(1) of SARA.

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 and actions set out in this action plan 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 this action plan for the benefit of the Leatherback Sea Turtle and Canadian society as a whole.

Under SARA, an action plan provides the detailed recovery planning that supports the strategic direction set out in the recovery strategy for the species. The plan outlines recovery measures to be undertaken by Fisheries and Oceans Canada and other jurisdictions or organizations to help achieve the population and distribution objectives identified in the recovery strategy. Implementation of this action plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

Acknowledgments

This action plan was prepared by Species at Risk Program staff, with input from other DFO sectors, federal and provincial government departments, regulators, Indigenous organizations, non-government organizations, and academic partners. Early development of this document was informed by discussions with members of the former Atlantic Leatherback Turtle Recovery Team and other stakeholders.

Executive summary

The Leatherback Sea Turtle (*Dermochelys coriacea*) was listed as Endangered under the *Species at Risk Act* (SARA) in 2003, and again as two separate populations (Atlantic and Pacific) in 2017. This action plan is considered one in a series of documents that are linked and should be taken into consideration together, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Report and the recovery strategy.

The Leatherback Sea Turtle is the largest extant turtle species, and can be found in the Pacific, Atlantic, and Indian Oceans. Leatherbacks occur in Atlantic Canadian waters during the summer and fall to forage on jellyfish.

This action plan outlines measures that provide the best chance of achieving the recovery goal and objectives for the species, including the measures to be taken to address the threats and monitor the recovery of the species. The recovery goal for the Leatherback Sea Turtle (Atlantic population) is to increase the population such that the long-term viability of the Leatherback Sea Turtles frequenting Atlantic Canadian waters is achieved. This goal is supported by six recovery objectives: 1) understanding threats; 2) understanding Leatherback Sea Turtle life history characteristics; 3) habitat identification and protection; 4) risk reduction; 5) education; and 6) international initiatives. Twenty-seven recovery measures are described in section 1.2 of this action plan. The implementation schedule (tables 1 to 3) includes the priority level, current status, and timeline for each recovery measure, as well as a list of participants where applicable.

For the Leatherback Sea Turtle (Atlantic population), critical habitat will be identified to the extent possible in an amended recovery strategy (in development). Once identified, protection of the species' critical habitat from destruction 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.

An evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation is provided in section 3. Many of the measures included in this action plan represent a continuation of current activities or responsibilities and commitments of DFO and/or other groups into the foreseeable future. It is assumed that these activities would carry no incremental costs compared to baseline costs. Certain measures, however, such as research into the effects of marine noise on the Leatherback Sea Turtle may require large-scale investments in excess of $500,000 to complete. For several of the measures, insufficient information is available to provide an assessment of potential costs, so the total cost of fully implementing this action plan cannot be assessed at this time.

Successful recovery of the Leatherback Sea Turtle (Atlantic population) depends on the commitment and cooperation of many organizations that will implement the measures set out in this action plan.

Table of contents

1

1.   Recovery actions

1.1 Context and scope of the action plan

The Leatherback Sea Turtle was listed as Endangered under the *Species at Risk Act* (SARA) in 2003. In 2017, the species was re-listed under SARA as two separate populations (Atlantic and Pacific). This action plan is part of a series of documents regarding the Leatherback Sea Turtle (Atlantic population) that should be taken into consideration together, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Report (COSEWIC 2012) and the recovery strategy (Atlantic Leatherback Turtle Recovery Team 2006). Under SARA, an action plan provides the detailed recovery planning that supports the strategic direction set out in a recovery strategy for the species. A recovery strategy also provides background information on the species and its threats, as well as critical habitat information.

The Leatherback Sea Turtle (*Dermochelys coriacea*) is the world's largest and widest-ranging sea turtle, occurring in the Atlantic, Pacific, and Indian Ocean basins. Leatherbacks that nest on tropical and subtropical beaches in the western Atlantic migrate north annually to forage on gelatinous zooplankton (jellyfish) at high latitudes, including waters off Canada's east coast. Entanglement in fishing gear is considered the primary threat in these northern foraging areas. In Atlantic Canada, Leatherbacks are vulnerable to entanglement in pelagic longlines, buoy lines, mooring lines, and floating lines associated with a variety of fishing gears. Consequently, this action plan places an emphasis on addressing this threat, but also addresses the other threats identified for the species in Atlantic Canadian waters, including vessel collisions, marine pollution, acoustic disturbance, and climate change.

The recovery goal for the Leatherback Sea Turtle in Atlantic Canada, as stated in the recovery strategy (Atlantic Leatherback Turtle Recovery Team 2006), is to "increase the population such that the long-term viability of the Leatherback Sea Turtles frequenting Atlantic Canadian waters is achieved". To support the achievement of this goal, six recovery objectives were also identified in the recovery strategy:

1. **Understanding threats**: identify and understand anthropogenic threats to Leatherback Sea Turtles in Atlantic Canadian waters
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
3. **Habitat identification and protection**: identify and protect habitat of Leatherback Sea Turtles in Atlantic Canadian waters
4. **Risk reduction**: minimize risk of harm to Leatherback Sea Turtles from anthropogenic activities under Canadian jurisdiction
5. **Education**: develop and implement education activities that support Leatherback Sea Turtle recovery in Canada
6. **International initiatives**: promote international initiatives contributing to the recovery of Leatherback Sea Turtles

Under section 47 of SARA, the competent minister must prepare one or more action plans based on the recovery strategy. Therefore, action planning for species at risk recovery is an iterative process. This action plan may be modified in the future depending on the progression towards recovery.

1.2   Measures to be taken and implementation schedule

Successful recovery of this species is dependent on the actions of many different jurisdictions, organizations, and individuals. It requires the commitment and cooperation of these groups to implement the directions and measures set out in this action plan.

This action plan describes measures that are expected to provide the best chance of achieving the recovery goal and objectives for the Leatherback Sea Turtle (Atlantic population), including measures to be taken to address threats to the species and monitor its recovery, and which will guide activities to be undertaken by Fisheries and Oceans Canada (DFO) and its partners. As new information becomes available, these measures and the priority of these measures may change. DFO strongly encourages all Canadians to participate in the conservation of the Leatherback Sea Turtle by undertaking measures outlined in this action plan. To date, many of the accomplishments in Leatherback Sea Turtle conservation have resulted from collaboration among DFO, the Canadian Sea Turtle Network (CSTN) and other NGOs, scientists, concerned fishermen and fisheries associations, other industry associations, provincial and federal government departments, and the National Marine Fisheries Service in the United States. Many of these partners participated on the Atlantic Leatherback Turtle Recovery Team, formed by DFO to develop the recovery strategy. The recovery team did not continue as a formal group after the 2007 publication of the recovery strategy; however, many of these individuals and groups continue to work on Leatherback Sea Turtle conservation initiatives, collaborating as needed and/or meeting informally at conferences and other forums to exchange information and ideas. This informal recovery network has provided valuable input into the development of this action plan, and will continue to play a vital role in its implementation.

The measures presented in this action plan can be used to guide development of work plans by government agencies and other partners committed to Leatherback Sea Turtle recovery. The action plan builds upon many successful activities already underway while recognizing that other measures need to be initiated or enhanced.

In section 1.2.1, the recovery measures are broadly grouped according to responsibility in a three-table implementation schedule. Because of the structure of the implementation schedule, the recovery measures may appear out of order. Section 1.2.2 includes a narrative description of the recovery measures organized by recovery objective, and are presented in sequential order.

1.2.1 Implementation schedule

Table 1 identifies the measures to be undertaken by DFO to support the recovery of the Leatherback Sea Turtle.

Table 2 identifies the measures to be undertaken collaboratively between DFO and its partners. Implementation of these measures will be dependent on a collaborative approach, in which DFO is a partner in recovery efforts, but cannot implement the measures alone.

As all Canadians are invited to join in supporting and implementing this action plan, table 3 identifies the measures that represent opportunities for other jurisdictions, organizations, or individuals to lead for the recovery of the species. If your organization is interested in participating in one of these measures, please contact the Species at Risk Maritimes Region office at speciesatrisk.xmar@dfo-mpo.gc.ca or 1-866-891-0771.

Implementation of this action plan is subject to the appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations. Federal funding programs for species at risk may provide opportunities to obtain funding to carry out some of the outlined activities. These programs include the [Habitat Stewardship Program for Species at Risk](#), the [Aboriginal Fund for Species at Risk](#), and the [Interdepartmental Recovery Fund.](#)

Each recovery measure listed in the implementation schedule is linked to one of the six recovery objectives identified in the recovery strategy (section 1.1 of this document).

Partners identified in tables 2 and 3 are broad groups or specific organizations that have either a known or potential role in implementation of the measure. When a specific organization is named, it is not meant to be exclusive, but rather reflect a past or future commitment to an activity of the same or similar nature.

Each recovery measure has been assigned a priority level. The priority reflects the degree to which the measure contributes directly to the recovery of the species or is an essential precursor to a measure that contributes to the recovery of the species:

- "high" priority measures are considered likely to have an immediate and/or direct influence on the recovery of the species
- "medium" priority measures are important but considered to have an indirect or less immediate influence on the recovery of the species
- "low" priority measures are considered important contributions to the knowledge base about the species and mitigation of threats

The status of each recovery measure is designated as either "Not started" or "Underway".

One of four timelines is assigned to each recovery measure: <2 years; 2 to 5 years; >5 years; or continuous (that is, the activity is to be carried out on an ongoing basis or every time an opportunity arises, and has no fixed completion date). Timelines should be interpreted based on the publication date of the action plan. For example, a measure with an assigned timeline of <2 years may be reasonably expected to be completed within two years of the publication of the action plan.

This action plan does not present specific work planning details for each measure, but is rather meant to guide more detailed work planning processes within DFO and its partner organizations by identifying actions that may be taken to advance the recovery of the Leatherback Sea Turtle in Atlantic Canada.

The following acronyms are used in the implementation schedule (that is, tables 1 to 3):

CNLOPB   Canada-Newfoundland and Labrador Offshore Petroleum Board
CNSOPB   Canada-Nova Scotia Offshore Petroleum Board
DFO   Fisheries and Oceans Canada
ECCC   Environment and Climate Change Canada
NOAA   National Oceanic and Atmospheric Administration
NGO   Non-government organization

Table 1. Measures* to be undertaken by Fisheries and Oceans Canada.

#	Recovery measure	Recovery objective	Priority	Status/ timeline
13	Use information gained from the research activities outlined in the schedule of studies (recovery strategy) to identify and refine critical habitat.	3	Medium	Underway/ >5 years
14	Ensure that Leatherback Sea Turtle distribution and critical habitat are considered and evaluated in the marine protected area network planning process.	3	Low	Underway/ continuous
16	Use existing fisheries management tools to reduce threats to Leatherback Sea Turtles: a) include Leatherback Sea Turtle entanglement considerations and identified mitigation strategies in all relevant DFO Integrated Fishery Management Plans b) ensure that the recovery goal and objectives for the Leatherback Sea Turtle, as well as activities likely to destroy critical habitat, are considered when evaluating new emerging fisheries	4	High	a) Underway/ continuous b) Underway/ continuous
17	Evaluate and implement methods for tracking the levels of allowable harm to Leatherback Sea Turtles.	4	Medium	Underway/ 2 to 5 years

* Because of the structure of the implementation schedule, the recovery measures may appear out of order. In the table, recovery measures are organized first by recovery objective, and then presented in sequential order.

Table 2. Measures* to be undertaken collaboratively between Fisheries and Oceans Canada and its partners.

#	Recovery measure	Recovery objective	Partners (alphabetical order)	Priority	Status/ timeline
1	Identify and quantify the sources and rates of injury and mortality for the Leatherback Sea Turtle.	1	Academia DFO Indigenous organizations NGOs	High	Underway/ continuous
2	Determine the relative risk of entanglement for Leatherback Sea Turtles within Atlantic Canadian waters.	1	Academia DFO NGOs NOAA	High	Underway/ 2 to 5 years
3	Conduct research to determine Leatherback Sea Turtle post-release survival rates after entanglements.	1	Academia DFO NGOs	High	Underway/ continuous
4	Monitor for evidence of vessel interactions with Leatherback Sea Turtles.	1	DFO NGOs	Low	Underway/ continuous
5	Monitor the rate of scarring on Leatherback Sea Turtles that are caught, stranded, or deceased in Atlantic Canadian waters.	1	Academia DFO NGOs	Medium	Underway/ continuous

#	Recovery measure	Recovery objective	Partners (alphabetical order)	Priority	Status/ timeline
6	Monitor the presence and type of plastics and other marine debris in the gastrointestinal tracts of dead Leatherback Sea Turtles.	1	Academia DFO NGOs	Medium	Underway/ continuous
8	Evaluate the potential for long-term variation in Leatherback Sea Turtle distribution and abundance based on knowledge of current habitat use and predicted environmental change.	1	Academia DFO	Low	Not started/ 2 to 5 years
9	Collect information on Leatherback Sea Turtle health and mortality: a) whenever feasible, ensure necropsies are conducted on all Leatherback Sea Turtles reported deceased b) develop protocols for data and sample collection and sharing among researchers, and for the disposal of carcasses c) support research to assess the health of individual turtles including assessment of body and reproductive condition, contaminant loads, etc.	1	Academia DFO NGOs	High	a) Underway/ continuous b) Not started/ <2 years c) Underway/ continuous
10	Support population monitoring and research on Leatherback Sea Turtle ecology.	2	Academia DFO NGOs	High	Underway/ continuous
12	Establish mechanisms to compile, store, share, and maintain current and historic Leatherback Sea Turtle sightings data.	2	Academia DFO Indigenous organizations Industry NGOs	Medium	Underway/ continuous

#	Recovery measure	Recovery objective	Partners (alphabetical order)	Priority	Status/ timeline
15	Develop and implement mitigation measures to reduce risk of Leatherback Sea Turtle entanglement: a) for fisheries where higher risk has been identified, explore, evaluate, and implement regulatory and voluntary mitigation measures that reduce the probability of Leatherback Sea Turtles becoming entangled b) develop and implement ways to measure the level of compliance with mitigation measures (regulatory or voluntary) used in fisheries c) facilitate discussion among fishery groups to coordinate activities and share information regarding best practices that help prevent Leatherback Sea Turtle entanglement	4	Academia DFO Fishing industry NGOs	High	a) Not started/ 2 to 5 years b) Not started/ 2 to 5 years c) Not started/ continuous
18	Promote the application of best practices in Leatherback Sea Turtle disentanglement: a) provide resources and support to fishermen to acquire training and disentanglement equipment, where necessary, and promote implementation of these techniques b) provide logistical, resource, and personnel support to response teams to enable them to respond to Leatherback Sea Turtle strandings c) train DFO Conservation and Protection personnel in Leatherback Sea Turtle disentanglement techniques	4	DFO Fishing industry NGOs	High	a) Underway/ continuous b) Underway/ continuous c) Underway/ continuous
19	Identify and record gear types in Leatherback Sea Turtle entanglement events, and use the information to improve mitigation measures: a) develop standardized protocols for determining and recording gear type and other relevant information from entanglement events b) encourage the recording of accurate and relevant information at sea by fisheries observers regarding Leatherback Sea Turtle entanglement incidents and their outcome	4	DFO Fishing industry NGOs	High	a) Not started/ <2 years b) Underway/ continuous

#	Recovery measure	Recovery objective	Partners (alphabetical order)	Priority	Status/ timeline
20	Support the ongoing maintenance and publicity of emergency response and sightings hotlines.	4	DFO NGOs	High	Underway/ continuous
21	Reduce Leatherback Sea Turtle exposure to potentially harmful levels of underwater noise: a) evaluate the use of the "Statement of Canadian practice with respect to the mitigation of seismic sound in the marine environment" with respect to Leatherback Sea Turtles b) ensure that the recovery goal and objectives for the Leatherback Sea Turtle, as well as activities likely to destroy critical habitat, are taken into account in the review of projects with potential noise impacts	4	Academia CNLOPB CNSOPB DFO Oil & gas industry NGOs Other government departments	Low	a) Not started/ >5 years b) Underway/ continuous
22	Reduce the amount of marine debris of Canadian origin: a) work with Environment and Climate Change Canada (ECCC) to evaluate the need for new guidelines and/or codes of practice to prevent and reduce marine pollution from land-based sources b) ensure adequate disposal facilities at wharves across Atlantic Canada c) continue to develop and implement marine waste stewardship programs	4	DFO ECCC NGOs Transport Canada Port & harbour authorities	Low	a) Not started/ 2 to5 years b) Underway/ >5 years c) Underway/ continuous
23	If a need is identified, explore and implement mitigation measures to reduce the threat of vessels interacting with Leatherback Sea Turtles.	4	DFO Shipping Federation of Canada Transport Canada	Low	Not started/ >5 years

#	Recovery measure	Recovery objective	Partners (alphabetical order)	Priority	Status/ timeline
24	Continue to implement and develop targeted stakeholder education and awareness initiatives.	5	DFO Industry NGOs Transport Canada	High	Underway/ continuous
26	Participate in international agreements and conventions that promote Leatherback Sea Turtle protection and recovery.	6	DFO NGOs Other government departments	Medium	Underway/ continuous
27	Collaborate with the United States government, other countries, and international organizations on Leatherback Sea Turtle conservation initiatives.	6	DFO NGOs	High	Underway/ continuous

* Because of the structure of the implementation schedule, the recovery measures may appear out of order. In the table, recovery measures are organized first by recovery objective, and then presented in sequential order.

Table 3. Measures* that represent opportunities for other jurisdictions, organizations, or individuals to lead.

#	Recovery measure	Recovery objective	Suggested jurisdictions or organizations	Priority	Status/ timeline
7	Conduct research on noise levels in Leatherback Sea Turtle habitat and its effects on the health and behaviour of individuals.	1	Academia Consulting firms NGOs Oil and gas industry	Low	Not started/ >5 years
11	Conduct studies on Leatherback Sea Turtle prey distribution and abundance.	2	Academia Canadian Sea Turtle Network	Low	Underway/ >5 years
25	Educate coastal communities about Leatherback Sea Turtle conservation.	5	Canadian Sea Turtle Network Other NGOs	Low	Not started/ continuous

* Because of the structure of the implementation schedule, the recovery measures may appear out of order. In the table, recovery measures are organized first by recovery objective, and then presented in sequential order.

1.2.2   Objectives and recovery measures

Objective 1: understanding threats

1. Identify and quantify the sources and rates of injury and mortality for the Leatherback Sea Turtle

An assessment of Leatherback Sea Turtle fishery and non-fishery interactions in Atlantic Canadian waters was conducted as part of a DFO Science Advisory Process in 2012 (DFO 2012a) and reviewed in 2018 (DFO 2019). Of the identified threats to this species, entanglement in fishing gear is considered the most significant, yet it remains a poorly quantified threat. Mortality and injury rates for interactions with fisheries are uncertain. The ability to detect and evaluate non-fishery interactions is low.

DFO intends to facilitate a peer-review process every five years, in conjunction with partners, to compile the latest information on Leatherback Sea Turtle mortality from all sources in Atlantic Canadian waters. Several measures in this action plan are expected to help improve the quantity and quality of data available for assessing the sources and rates of Leatherback Sea Turtle mortality. This information, combined with the latest information on population size and trend, must be put in the context of mortalities at all life stages across the population's entire range, including nesting beaches, to provide a holistic understanding of progress toward recovery. This will require international collaboration and coordination (see recovery measures 26 and 27).

2. Determine the relative risk of entanglement for Leatherback Sea Turtles within Atlantic Canadian waters

A comprehensive region-wide analysis of the risk of fishery interactions in all areas used by Leatherback Sea Turtles in Atlantic Canada is needed to help guide the development of mitigation measures. This may include, for example, an analysis of the spatial overlap between Leatherback Sea Turtle distribution and fishing activity (by fishery, gear type, etc.). Ongoing spatial risk analyses will likely be needed to account for new scientific information and shifts in fishing patterns over time. An understanding of how Leatherback Sea Turtles behave around fishing gear is also necessary. DFO recently partnered with the National Oceanic and Atmospheric Administration (NOAA) and NGOs in the United States (US) to study Leatherback Sea Turtle behaviour in Cape Cod Bay, a high-density fishing area. Such studies will contribute valuable data for addressing this recovery measure.

3. Conduct research to determine Leatherback Sea Turtle post-release survival rates after entanglements

Many Leatherback Sea Turtles are disentangled and released alive by fishermen who encounter them in their gear. Leatherbacks frequently bear scars that appear to be caused by lines, suggesting they survived an entanglement encounter. Little is known about post-release survival rates (DFO 2012a), and they are difficult to study. Entangled Leatherbacks encountered by research scientists in the field will continue to be opportunistically tagged, and their post-release behaviours monitored. The accumulation of this data over time should lead to a better understanding of the factors contributing to either survival or mortality following entanglement.

4. Monitor for evidence of vessel interactions with Leatherback Sea Turtles

To date, there has been just one reported vessel strike of a Leatherback Sea Turtle in Atlantic Canadian waters (DFO 2019). Two stranded Leatherback Sea Turtles had injuries consistent with vessel strike, but the causes of death in these cases were not confirmed. While it is possible such incidents are under-reported, there is no evidence to suggest vessel interactions are more than a negligible threat to the species when in Canadian waters. Even so, this threat must continue to be monitored. Such efforts will include ongoing opportunistic monitoring of stranded and live-capture turtles for evidence of vessel interactions (see also recovery measure 5), as well as keeping a record of reports to the sea turtle incident hotline. Necropsies may also reveal evidence of vessel interactions (recovery measure 9). Should the number of incidents increase over time, a spatial risk analysis or other studies may be warranted to better understand this threat and guide mitigation.

5. Monitor the rate of scarring/injury on Leatherback Sea Turtles that are caught, stranded, or deceased in Atlantic Canadian waters

Studying the rate of visible scarring/injury on Leatherback Sea Turtles in Atlantic Canadian waters could improve our understanding of anthropogenic threats, such as fishing interactions. Changes in scarring rates over time could also indicate the effectiveness of mitigation measures. The CSTN developed an Injury Assessment Protocol to ensure consistent documentation of Leatherback Sea Turtle injuries. The data collected using this protocol are more statistically rigorous, and will allow for stronger analyses.

6. Monitor the presence and type of plastics and other marine debris in the gastrointestinal tracts of dead Leatherback Sea Turtles

Little is known about how marine debris affects Leatherback Sea Turtles in Atlantic Canada. To date, there has been one instance of gastrointestinal blockage caused by marine debris in a necropsied Leatherback Sea Turtle found in Newfoundland and Labrador. Plastic fragments have been found in the stomach contents of other necropsied Leatherbacks, but were not identified as the cause of death in those cases (DFO 2019). It is important to continue to monitor for evidence of debris ingestion by conducting necropsies on deceased animals (see also recovery measure 9).

7. Conduct research on noise levels in Leatherback Sea Turtle habitat and its effects on the health and behaviour of individuals

Research on anthropogenic sound, its propagation in critical habitat areas (once identified), and its effects on marine turtles is needed to better understand this threat. Resources may be available for this kind of research through the Environmental Studies Research Funds (ESRF), funded through levies on oil and gas companies.

8. Evaluate the potential for long-term variation in Leatherback Sea Turtle distribution and abundance based on knowledge of current habitat use and predicted environmental change

The exact nature of the study, or studies, that would address this measure remains to be determined, but could build upon the work of McMahon and Hay (2006) and Casey et al. (2014). Such studies may provide further insights into the potential implications of climate change for Leatherback Sea Turtles foraging in Atlantic Canadian waters.

9. Collect information on Leatherback Sea Turtle health and mortality

a) whenever feasible, ensure necropsies are conducted on all Leatherback Sea Turtles reported deceased

DFO and other partners will attempt to ensure any Leatherback Sea Turtle carcass that is recovered in Atlantic Canada is necropsied. Given the importance of understanding the cause of mortalities, this is a high priority activity that is conducted whenever logistically feasible.

b) develop protocols for data and sample collection and sharing among researchers, and for the disposal of carcasses

The Maritime Marine Animal Response Network (MMARN), which consists of NGOs, research institutions, and provincial and federal agencies is working to improve protocols for collecting and sharing data obtained during necropsies.

c) support research to assess the health of individual turtles including assessment of body and reproductive condition, contaminant loads, etc.

DFO will work with the CSTN and other partners to support research aimed at assessing the health of turtles handled in the course of field research. Such work may involve assessment of body and reproductive condition, contaminant loads, etc. Any evidence suggesting interaction of the turtle with human activities should also be documented.

Objective 2: understanding Leatherback Sea Turtle life history characteristics

10. Support population monitoring and research on Leatherback Sea Turtle ecology

For many years, Leatherback Sea Turtles have been surveyed by vessel in the same foraging area off Nova Scotia (Archibald and James 2016). The inter-annual relative abundance of Leatherbacks in Atlantic Canada has been estimated using these data. Continuation of this monitoring program is necessary to maintain an index of population variability over time.

Tagging and genetic studies will contribute to the body of knowledge about Leatherback Sea Turtle life history. Stock structure, migratory patterns, age at maturity, foraging ecology, and longevity are being studied throughout the species' range with the use of flipper and PIT (passive inductive transponder) tags, satellite and archival telemetry, and molecular genetics.

While the population structure and migratory behaviour of Leatherback Sea Turtles are increasingly well understood, a long-term monitoring commitment is required because of the species' late age at maturity (~30 years). Quantified life history characteristics are necessary to calculate population size and trends, which in turn are needed to prioritize recovery measures and to accurately monitor the recovery of the species.

11. Conduct studies on Leatherback Sea Turtle prey distribution and abundance

There have been few studies of jellyfish abundance and distribution in Atlantic Canada. Nordstrom et al. (2019) conducted a regional jellyfish study 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.

12. Establish mechanisms to compile, store, share, and maintain current and historic Leatherback Sea Turtle sightings data

A sea turtle sightings database is maintained by CSTN. There are several sources of sightings data, including research scientists, fisheries observers, marine mammal observers, and fishermen. In addition, some Indigenous groups in eastern Canada have gathered traditional knowledge about the Leatherback Sea Turtle (for example, MAMKA 2010; AMIK 2013). Additional studies of this nature would be beneficial. Mechanisms to support the ongoing organization and sharing of all available sightings data will be fostered so that these data can be used to analyze patterns of distribution and relative abundance.

Objective 3: habitat identification and protection

13. Use information gained from the research activities outlined in the schedule of studies (recovery strategy) to identify and refine critical habitat

Satellite telemetry data has helped identify areas of high Leatherback Sea Turtle feeding activity (James et al. 2006; DFO 2012b). This research is being used to identify critical habitat for the Leatherback Sea Turtle in Atlantic Canada. Completion of the schedule of studies in the recovery strategy is expected to lead to a better understanding of the functions, features, and attributes of Leatherback Sea Turtle critical habitat.

14. Ensure that Leatherback Sea Turtle distribution and critical habitat are considered and evaluated in the marine protected area network planning process

DFO is leading a process to develop a network of marine protected areas (MPAs). Available Leatherback Sea Turtle data were included as one of many layers of information within a region-wide biodiversity conservation analysis. The St. Anns Bank and Laurentian Channel MPAs were designated under the *Oceans Act* (S.C. 1996, c. 31) in 2017 and 2019, respectively. These areas overlap with known Leatherback Sea Turtle occurrences. In fact, the St. Anns Bank MPA includes key foraging habitat for the species (DFO 2012b).

Objective 4: risk reduction

15. Develop and implement mitigation measures to reduce risk of Leatherback Sea Turtle entanglement

a) for fisheries where higher risk has been identified, explore, evaluate, and implement regulatory and voluntary mitigation measures that reduce the probability of Leatherback Sea Turtles becoming entangled

Mitigation measures (either voluntary or regulatory) to reduce the risk of entanglements cannot be predicted at this time but may include changes in gear configurations, reducing the amount of gear or line in the water, and other measures. The selection and implementation of specific mitigation measures will rely in part on the outcomes of other recovery measures in this action plan, such as recovery measures 1 to 3. Implementation will also be guided by discussions with

fishermen, who can offer valuable insights into the potential impacts of modifying fishing gear configurations, which can vary across fisheries.

A fundamental part of reducing entanglement risk is to decrease the amount of line in the water where and when Leatherback Sea Turtles are present. Leatherbacks are more likely to become entangled in line than to ingest hooks after targeting bait, although external hooking can accompany entanglement (James et al. 2005). In 2003, the Nova Scotia Swordfishermen's Association proactively developed and implemented a code of conduct for sea turtle handling that was soon after added to their Conservation Harvesting Plan (that is, a fishing plan submitted to DFO by each gear sector that identifies, among other things, harvesting methods that will minimize bycatch). Several elements in the Code of Conduct are now included in the fleet's license conditions.

Current examples of measures that may reduce Leatherback Sea Turtle mortality in Atlantic Canadian pelagic longline fisheries include the licensing requirement for the fleet to use corrodible circle hooks, and to be trained in techniques to de-hook and disentangle sea turtles. Management measures put in place for other reasons may also be beneficial to Leatherback Sea Turtle (for example, temporal or spatial shifts in fishing). Collaborative and locally adaptable solutions to minimize interaction between Leatherbacks and fishing activities should continue to be developed, improved, and implemented.

b) develop and implement ways to measure the level of compliance with mitigation measures (regulatory or voluntary) used in fisheries

Whether mitigation measures are voluntary or regulatory, their potential impact on fisheries and their effectiveness at reducing entanglement risk to Leatherbacks should be investigated further, using measurable standards. It continues to be important to develop measures that incorporate performance indicators.

c) facilitate discussion among fishery groups to coordinate activities and share information regarding best practices that help prevent Leatherback Sea Turtle entanglement

A collaborative learning environment should be fostered to ensure that best practices in Leatherback Sea Turtle entanglement prevention and disentanglement techniques are adopted within affected fisheries throughout Atlantic Canada. An ongoing assessment of regional lessons learned, challenges, and successes should be undertaken. The mechanism(s) through which this could be accomplished will be explored by DFO in cooperation with non-government and industry partners.

16. Utilize existing fisheries management tools to reduce threats to Leatherback Sea Turtles

a) include Leatherback Sea Turtle entanglement considerations in all relevant DFO Integrated Fishery Management Plans, and identify mitigation strategies

DFO uses Integrated Fisheries Management Plans (IFMPs) to guide the conservation and sustainable use of marine resources. These plans incorporate the best available science on the species in question, outlining harvest objectives and management measures. IFMPs are also the primary mechanism used to implement DFO's Policy for Managing Bycatch (DFO 2013a). They provide a direct means of incorporating Leatherback Sea Turtle recovery actions into

fisheries management, for example, the pelagic longline IFMP (DFO 2013b). As part of their annual review, IFMPs should be updated with the best available information regarding entanglement risks to Leatherback Sea Turtles and should incorporate appropriate mitigation measures as they are developed.

b) ensure that Leatherback Sea Turtles are considered when evaluating new emerging fisheries

The evaluation and licencing of new fisheries is guided by DFO's New Emerging Fisheries Policy (DFO 2008a). Under this policy, all applicants must "provide an indication of how other species and/or the ecosystem might be affected by the proposed activity". DFO will ensure that the Leatherback Sea Turtle is taken into consideration in all applications where co-occurrence of the activity and foraging Leatherbacks is expected. Furthermore, Leatherback Sea Turtles will be taken into account should any fishery be proposed that may compromise their foraging success (for example, a jellyfish fishery).

17. Evaluate and implement methods for tracking fishing interactions with Leatherback Sea Turtles

Currently, SARA logbooks are the primary means for fishing license holders to record and communicate information to DFO related to species at risk, including Leatherback Sea Turtles. The completion of SARA logbooks is a license condition in most fisheries. Consequently, fishermen are required to record all encounters with Leatherback Sea Turtles, including incidental captures and entanglements. Inaccurate data and inconsistent returns of SARA logbooks make it difficult to track the levels of allowable harm to Leatherback Sea Turtles while in Canadian waters. DFO recognizes the shortfalls associated with the SARA logbook reporting system, and continues to work on finding more effective means of collecting this information. Reliable estimates of allowable harm are necessary to support the recovery of the Leatherback Sea Turtle population in Canadian waters. In the interim, the Department will continue to educate fishermen on the use of SARA logbooks and will increase efforts to monitor compliance.

18. Promote the application of best practices in Leatherback Sea Turtle disentanglement

a) provide resources and support to fishermen to acquire training and disentanglement equipment, where necessary, and promote implementation of these techniques

In the majority of cases, fishermen are the first to encounter entangled or hooked Leatherback Sea Turtles. They are in the best position to respond and may be motivated to help the turtle and retrieve their valuable gear. It is therefore in the best interest of turtles, fishermen, NGOs, and DFO to encourage the training and facilitation of fishermen as first responders.

Regulators, scientists, and industry need to work together to provide resources, instruction, and support to relevant fisheries, including necessary training and disentanglement gear, and to implement these techniques. Instruction on disentanglement techniques is available from CSTN and the National Marine Fisheries Service (US NOAA). To date, formal disentanglement training sessions for fishermen have mostly occurred within Nova Scotia and have focused on the pelagic longline fishery. The feasibility of extending this training program to other fisheries throughout Atlantic Canada will be explored.

Currently, the licence conditions for the Atlantic Canadian pelagic longline fleet include a requirement to carry de-hooking and disentanglement equipment onboard the vessel. There is also a requirement that the operator receive certification in the use of that equipment to free turtles causing the least harm. The inclusion of similar licence conditions in other fisheries will be explored, as will mechanisms for ensuring compliance with this condition. An attempt will be made to evaluate how frequently de-hooking and disentanglement gear is used, including an assessment of success rates and inhibiting factors.

b) provide logistical, resource, and personnel support to response teams to enable them to respond to Leatherback Sea Turtle strandings

Through the Marine Mammal Response Program, DFO supports incident response capacity for marine mammals and sea turtles. There are several response networks across Atlantic Canada that respond to sea turtle strandings in partnership with DFO, including CSTN, Whale Release and Strandings-Newfoundland and Labrador (WRS-NL), and the Quebec Marine Mammal Emergency Response Network. These response networks require ongoing funding, trained personnel, equipment, and storage facilities.

c) train DFO Conservation and Protection (C&P) personnel in Leatherback Sea Turtle disentanglement techniques

Many C&P officers from detachments in Nova Scotia, New Brunswick, and Prince Edward Island have received training in sea turtle disentanglement from CSTN. Continued effort is needed to provide training to the remaining officers in these provinces, as well as in Newfoundland and Labrador. A timely re-certification plan (approximately every five years) is also required.

19. Identify and record gear types in Leatherback Sea Turtle entanglement events, and use the information to improve mitigation measures

a) develop standardized protocols for determining and recording gear type and other relevant information from entanglement events

DFO will work with its partners to establish and implement standardized protocols for systematically recording data on all Leatherback Sea Turtle entanglements, including location, time, gear type, depth, etc. These protocols should be used by fish harvesters, fishery observers, and any others who may encounter an entangled turtle.

b) encourage the recording of accurate and relevant information at sea by fisheries observers regarding Leatherback Sea Turtle entanglement incidents and their outcome

Fisheries observer records are also a source of information on the rate and nature of Leatherback Sea Turtle interactions with fishing gear. DFO should continue to refine guidelines, set standards, and ensure that fisheries observer information is collected, analyzed, and reported to DFO. Records should be entered into an accessible database (see also recovery measure 12).

20. Support the ongoing maintenance and publicity of emergency response and sightings hotlines

Since 1997, the CSTN has maintained an emergency response and sightings hotline for marine turtles in Atlantic Canada. The public also occasionally calls DFO and the Marine Animal Response Society (MARS) with information regarding sea turtles, who then contact CSTN. CSTN coordinates responses that are appropriate to the circumstances. DFO will work with partners to encourage and support, when possible, coordinated response to sightings reported by the public throughout Atlantic Canada. Emergency response hotlines are also maintained by WRS-NL and the Quebec Marine Mammal Emergency Response Network. All of these hotlines are well-established and publicized. Current efforts should continue, but new ways of raising awareness could also be explored.

21. Reduce Leatherback Sea Turtle exposure to potentially harmful levels of underwater noise

a) evaluate the use of the "Statement of Canadian practice with respect to the mitigation of seismic sound in the marine environment" with respect to Leatherback Sea Turtles

The "Statement of Canadian Practice with Respect to the Mitigation of Seismic Noise in the Marine Environment" (DFO 2007) includes a provision (section 13) whereby seismic projects may be required to put in place environmental mitigation measures that exceed or differ from the standard. As new information becomes available about the effects of anthropogenic noise on Leatherback Sea Turtles, it may be necessary to re-evaluate whether standard operating procedures are sufficient to mitigate those effects. If species-specific mitigation measures are recommended, these measures should be considered by government and industry during project review and operation.

b) ensure that the recovery goal and objectives for the Leatherback Sea Turtle, as well as activities likely to destroy critical habitat, are taken into account in the review of projects with potential noise impacts

Leatherback Sea Turtles must be taken into consideration when activities that may produce noise (for example, seismic surveys or military activities) or pollution (for example, oil spills) are planned and undertaken. Information about Leatherback Sea Turtles and their critical habitat (once identified) will be shared with the military, shipping industry, and the oil and gas industry to aid in decision-making and in the development and implementation of appropriate mitigation.

22. Reduce the amount of marine debris of Canadian origin

a) work with Environment and Climate Change Canada (ECCC) to evaluate the need for new guidelines and/or codes of practice to prevent and reduce marine pollution from land-based sources

ECCC has the mandate to implement part 7, division 2 of the *Canadian Environmental Protection Act, 1999* (S.C. 1999, c.33), which deals with the protection of the marine environment from land-based sources of pollution. DFO will engage with ECCC to discuss possible mitigation options for reducing the threat of marine debris.

b) ensure adequate disposal facilities at wharves across Atlantic Canada

DFO's Small Craft Harbours Branch and local harbour authorities have been working with partners in Nova Scotia to ensure adequate disposal facilities at fishing wharves (see also recovery measure 22c). Similar efforts at fishing harbours in other Atlantic provinces are needed. Follow-up visits to wharves are important to reinforce the objectives of newly-introduced waste management practices. DFO will also engage with Transport Canada and the Association of Canadian Port Authorities to explore possible ways that larger shipping ports could improve their waste handling facilities and policies.

c) continue to develop and implement marine waste stewardship programs

There are several initiatives underway to reduce marine debris that include leadership and partnership from government, industry, NGOs, and the public. Some examples are provided below. The continuation and expansion of these and other initiatives, and the development of new ones as necessary, is of great importance for reducing marine debris.

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 abandoned, lost, or otherwise discarded fishing gear (ALDFG), which includes ghost gear. An Ocean Plastic and Ghost Gear Action Plan is being developed by DFO, and will address the threat of ghost gear to marine species. The Government of Canada is a participant in the Global Ghost Gear Initiative (GGGI). The Fundy North Fishermen's Association, also a GGGI participant, has been retrieving ALDFG from the Bay of Fundy for several years.

The Nova Scotia (NS) Clean Foundation is responsible for the "Ship-to-Shore" program, which targets fishermen and fishing harbours. The program aims to improve waste disposal practices at sea, as well as on-shore waste management. Over 160 harbours and 3000 fishermen have been engaged through this program since it began in 2008.

National and regional onshore clean-up programs, such as the Great Canadian Shoreline Clean-up (Vancouver Aquarium/WWF-Canada) or the Great Nova Scotia Pick-Me-Up (NS Clean Foundation), also make valuable contributions to reducing the amount of waste entering or re-entering the ocean.

23. If a need is identified, explore and implement mitigation measures to reduce the threat of vessels interacting with Leatherback Sea Turtles

Should there be an increase in the number of documented vessel strikes in Canadian waters (see recovery measure 4), it will be necessary to assess possible mitigation options. These might include recommendations for seasonal vessel speed reductions in high-risk areas, for example.

Objective 5: education

24. Continue to implement and develop targeted stakeholder education and awareness initiatives

Engaging fishermen is necessary to develop solutions to the threat of entanglement. This requires building trust and inspiring concern. While many are already well-informed and

participating in conservation efforts, outreach programs need to be updated and expanded periodically. The CSTN and the commercial fishermen they train as sea turtle conservation representatives have conducted outreach work since 1998. This work has included informal discussions on fishing wharves and in fishermen's homes, and formal presentations in community halls. Sea turtle outreach and education also occurs through non-government organizations, such as WRS-NL and Amphibia-Nature. Ongoing dialogue and information sharing among fishermen, NGOs, and government regarding fishery interactions is needed to support the development of the most effective mitigation.

Education and awareness of the threat of marine debris to Leatherback Sea Turtles is being accomplished through stewardship programs such as those outlined in recovery measure 22. This issue is also covered frequently in global environmental awareness campaigns. However, there may be additional actions that could be taken locally to increase awareness, and these should be explored.

To date, there has not been a concerted effort to raise awareness of Leatherback Sea Turtles among mariners, largely due to the lack of evidence supporting vessel interactions as a significant threat within Atlantic Canada. However, given the potential for interactions, proactive outreach to the commercial shipping industry and recreational boaters is advisable. The Leatherback Sea Turtle is profiled in "A Mariner's Guide to Whales in the Northwest Atlantic" (ROMM 2014), geared toward the commercial shipping industry. The Canadian Coast Guard's Notices to Mariners could be used to convey information about Leatherback Sea Turtle critical habitat areas once they are identified. In addition, there may be opportunities to engage recreational boaters through fliers, posters, or public meetings.

25. Educate coastal communities about Leatherback Sea Turtle conservation

Providing educational outreach programs to elementary and high school students in coastal communities can be effective in promoting Leatherback Sea Turtle conservation, as many of these students are directly involved in the fishing industry, or will be in the future. Moreover, they may serve as an effective way of channelling information to parents and extended family who are employed in the fishery, including those who work at sea and are most likely to encounter turtles. High school students are a particularly important audience to engage since they may become the next generation of commercial fishermen.

Educational programs about how coastal communities can help species at risk such as the Leatherback Sea Turtle may be implemented through partnerships involving governments, NGOs, the fishing industry, and the school system in coastal communities. High school education programs delivered by the CSTN in the past were very effective.

Objective 6: international initiatives

26. Participate in international agreements and conventions that promote Leatherback Sea Turtle protection and recovery

Canada is a signatory to several international agreements and conventions that support the conservation of Leatherback Sea Turtles, including the Convention on Biological Diversity (CBD) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Canada has in the past participated in meetings of the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), but has not formally joined

the IAC. Canada will, however, explore how it might collaborate with the IAC on their initiatives in the future.

27. Collaborate with the United States government, other countries, and international organizations on Leatherback Sea Turtle conservation initiatives

Canada will continue to collaborate with the United States on Leatherback Sea Turtle conservation issues through DFO's participation in the Canada/USA Species at Risk Working Group. The working group consists of managers and scientists from DFO (Maritimes Region) and the Northeast Region of the National Marine Fisheries Service (NMFS).

Researchers from DFO, NMFS, universities, and NGOs in several countries collaborate on Leatherback Sea Turtle research and conservation initiatives, including the reporting of findings in peer-reviewed journals and at international conferences. Continued international collaboration is needed to ensure the threats facing the Atlantic population of Leatherbacks are mitigated appropriately throughout their range.

2.   Critical habitat

2.1.   Identification of the species' critical habitat

Critical habitat is defined in SARA as the "…*habitat necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species*" (subsection 2(1)).

SARA defines habitat for aquatic species as: "… *spawning grounds and nursery, rearing, food supply, migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced*" (subsection 2(1)).

Critical habitat for the Leatherback Sea Turtle in Atlantic Canada will be identified to the extent possible in an amended recovery strategy (in development), which will include information about the geographic location of the critical habitat, as well as its biophysical functions, features, and attributes.

2.2   Activities likely to result in the destruction of critical habitat

Examples of activities likely to result in destruction of critical habitat will be included in an amended recovery strategy (in development).

2.3.   Measures to protect critical habitat

Under SARA, critical habitat must be legally protected from destruction within 180 days of being identified in a final recovery strategy or action plan. For the Leatherback Sea Turtle critical habitat, once identified, 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.

If applicable, for those portions of critical habitat located within a national park, marine protected area, migratory bird sanctuary, or national wildlife area, a description of the critical habitat will be published in the Canada Gazette pursuant to subsection 58(2). Ninety days following publication in the Canada Gazette, the subsection 58(1) prohibition against destroying critical habitat will apply to those portions of critical habitat.

3.   Evaluation of socio-economic costs and benefits

Subsection 49(1)(e) of SARA requires that an action plan include "an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation". The evaluation below addresses only the incremental socio-economic costs of implementing this action plan from a national perspective, as well as the social and environmental benefits that would occur if the action plan were implemented in its entirety, recognizing that not all aspects of its implementation are under the jurisdiction of the federal government. It does not address the cumulative costs of species recovery in general nor does it attempt a full cost-benefit analysis. Its intent is to inform the public and to guide decision making by partners regarding the implementation of the measures included in the action plan.

Much of the recovery progress to date, including recovery activities currently underway, has been made possible by successful collaborations among governments, industry, environmental organizations, universities and other organizations and groups in both Canada and internationally. Future recovery efforts, including those detailed in this action plan, are dependent upon the continued collaboration among these many organizations and groups. For those measures identified as requiring collaborative effort (table 2), a list of the groups currently or potentially involved is provided.

3.1   Methodology

This section identifies the anticipated socio-economic impacts associated with the proposed measures listed in tables 1, 2 and 3. The evaluation addresses the costs and benefits that would be anticipated to occur if each of the measures is implemented. The analysis only considers costs and benefits which are incremental to the baseline (for example, costs/benefits associated with new activities or enhancements to existing activities that are above-and-beyond what is part of current practice or formal commitments). Costs and benefits that are real or reasonably expected to occur are included while those of a highly speculative or uncertain nature are not. An order-of-magnitude estimate of potential costs and benefits is provided where sufficient information is available to provide an evaluation. Otherwise, a qualitative statement regarding potential impacts is provided.

Costs and benefits associated with the identification and protection of critical habitat for the Leatherback Sea Turtle are not considered in this evaluation. A detailed analysis of the incremental impacts associated with critical habitat protection will be completed as part of the regulatory process associated with making the Critical Habitat Order (see section 2.3).

3.2   Socio-economic costs of implementing this action plan

Many of the recovery measures identified in the implementation schedule of this action plan represent a continuation of current activities or responsibilities and commitments of DFO and/or other groups into the foreseeable future, and are noted as being underway. Unless there is an indication that these activities would cease in the absence of this action plan they are

considered to be a continuation of the baseline. It is assumed that these activities would carry no incremental costs.

For the majority of the other listed measures, insufficient information is available at this time to provide an accurate assessment of potential costs of implementation. As a result, the overall magnitude of the investment that would be required to fully implement this plan is largely unknown at the present time.

For those measures where sufficient information does exist to provide an assessment of potential costs of implementing the measure, the largest costs would be associated with conducting research on noise levels and their effects on the health and behaviour of Leatherback Sea Turtles (recovery measure 7). Work associated with this measure is expected to cost in excess of $500,000 to complete. Other identifiable costs are anticipated for measures associated with entanglement response capacity (recovery measure 19) and for those measures associated with the development and sharing of science-supported advice. These could involve investments in the order of tens of thousands of dollars. Other measures may either require only minor investments or contain insufficient information to assess anticipated costs. Potential participants in undertaking the measures outlined in the action plan include, among others, DFO, Indigenous organizations, the fishing industry, academics, NGOs, and other government departments.

3.3   Benefits of implementing this action plan

The overall recovery goal for the species is to increase the population such that the long-term viability of Leatherback Sea Turtles frequenting Atlantic Canadian waters is achieved. It is expected that the implementation of this action plan would result in an important contribution towards this recovery goal. Recovery would be facilitated by enhancing our understanding of threats faced by the Leatherback Sea Turtle, understanding its life history characteristics, protecting its habitat, minimizing risk of harm to the turtle, undertaking educational activities, and exploring opportunities for international collaboration on recovery efforts. Detailed descriptions and explanations of each of the identified recovery measures is provided in section 1.2.2.

This action plan may also result in benefits to other species. In particular, many of the stated measures could be beneficial to other species of sea turtles and marine mammals as new research and capacity could be used to improve the management and stewardship of these species.

Many of the benefits derived from biodiversity conservation, including the protection and recovery of species at risk, are non-market commodities that are difficult to quantify or attribute a monetary value. The Act recognizes that "wildlife, in all its forms, has value in and of itself and is valued by Canadians for aesthetic, cultural, spiritual, recreational, educational, historical, economic, medical, ecological, and scientific reasons" (SARA Preamble). A review of the literature confirms that Canadians value the preservation and conservation of species in and of themselves. Actions taken to preserve a species, such as habitat protection and restoration, are also valued. In addition, the more an action contributes to the recovery of a species, the higher the value the public places on such actions (Loomis and White 1996; DFO 2008b). Self-sustaining and healthy ecosystems, with their various elements in place, including species at risk, contribute positively to the livelihoods and the quality of life of all Canadians.

3.4   Distributional impacts

As discussed in section 1.2.1, implementation of this action plan will require collaboration not only among DFO, but also with other jurisdictions, organizations, and individuals. This includes contributions from various levels of government, non-governmental organizations, the fishing industry, Indigenous groups, universities and others. It is also possible that new groups would become involved in future recovery efforts. Probable partners for each collaborative measure are noted in table 2. However, at this time it is not possible to determine the extent to which each of these groups would contribute (financially or otherwise) to this action plan.

4   Measuring progress

The performance indicators presented in the recovery strategy (Atlantic Leatherback Turtle Recovery Team 2006) provide a way to define and measure progress toward achieving the population and distribution objectives. Methods to monitor the recovery of the species, including population and distribution monitoring (for example, recovery measures 10, 12, 13), are outlined in tables 1 to 3.

Reporting on implementation of the action plan (under section 55 of SARA) will be done by assessing progress towards implementing the recovery objectives and strategies.

Reporting on the ecological and socio-economic impacts of the action plan (under section 55 of SARA) will be done by assessing the results of monitoring the recovery of the species and its long term viability, and by assessing the implementation of the action plan.

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Appendix A: effects on the environment and other species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or achievement of any of the Federal Sustainable Development Strategy's (FSDS) goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that implementation of action plans may inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the action plan itself, but are also summarized below in this statement.

While the implementation of this action plan is anticipated to benefit the environment by promoting the recovery of the Leatherback Sea Turtle, the potential for the plan to inadvertently lead to adverse effects on other species was considered. No such adverse effects were identified. This action plan is expected to benefit other species and the ecosystem as a whole. In particular, many of the stated measures would be beneficial to other populations of marine turtles that frequent Atlantic Canadian waters. The reader should refer to the sections of the document outlining the recovery actions for specific details on potential environmental benefits of this action plan. Furthermore, implementation of the recovery measures in this action plan will contribute to achieving the following 2016 to 2019 FSDS goals:

Healthy coasts and oceans: coasts and oceans support healthy, resilient and productive ecosystems

Healthy wildlife populations: all species have healthy and viable populations

Appendix B: record of cooperation and consultation

Early engagement on the development of this action plan was sought in 2011 from former members of the Atlantic Leatherback Turtle Recovery Team, as well as other representatives from the provincial government, the Canada-Nova Scotia Offshore Petroleum Board, Indigenous organizations, environmental non-government organizations, academia, the fishing industry, and the shipping industry. Input into the action plan was collected via email and phone interviews.

In June 2015, a draft version of the action plan was circulated to representatives from relevant federal and provincial government departments, First Nations and other Indigenous organizations, and stakeholder groups for review and comment. Comments received during this targeted consultation period were considered and incorporated where appropriate into the Proposed version of the document. The action plan was posted as Proposed on the Species at Risk Registry for a 60-day public comment period beginning on September 27, 2018. All of the comments received during these consultation processes were considered and incorporated in the Final version of this document, as appropriate.