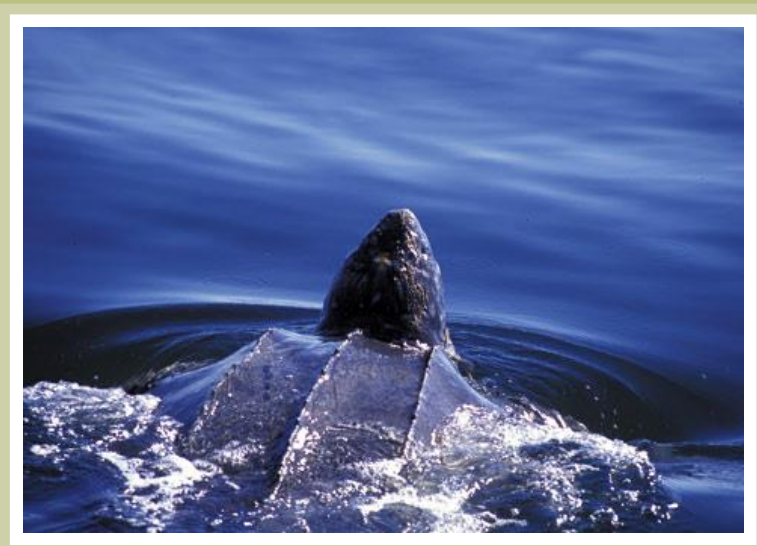


Report on the Progress of Recovery Strategy Implementation for Leatherback Sea Turtles (*Dermochelys coriacea*) in Canadian Pacific Waters for the Period 2013 to 2017

Leatherback Sea Turtle



2022

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

The Minister of Fisheries and Oceans (DFO) and the Minister responsible for the Parks Canada Agency (PCA) are the competent ministers under SARA for the Leatherback Sea Turtle in Canadian Pacific waters and have prepared this progress report.

As stated in the preamble to SARA, success in the recovery of species at risk depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in the recovery strategy and will not be achieved by Fisheries and Oceans Canada, PCA, or any other jurisdiction alone. The cost of conserving species at risk is shared amongst different constituencies. All Canadians are invited to join in supporting and implementing the recovery strategy for Leatherback Sea Turtle populations in Canadian Pacific waters, for the benefit of the species and Canadian society as a whole.

Acknowledgments

This progress report was prepared by Rhona Govender (DFO), with input from Heather Brekke (DFO), Paul Grant (DFO), Lisa Jones (DFO), Tatiana Lee (DFO), Lisa Spaven (DFO), and the Parks Canada Agency. Fisheries and Oceans Canada would also like to express 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. The “Recovery Strategy for Leatherback Turtles (*Dermochelys coriacea*) in Pacific Canadian Waters” was finalized and published on the Species at Risk Public Registry in 2006. In 2012, it was recognized that Atlantic and Pacific populations are discrete and evolutionarily significant. As such, the Atlantic and the Pacific populations are now recognized as discrete designatable units in Canada. Both populations are endangered. The “Action Plan for the Leatherback Sea Turtle (*Dermochelys coriacea*) in Canada (Pacific population)” was finalized and published on the Species at Risk Public Registry in 2019. The “Report on the Progress of Recovery Strategy Implementation for the Leatherback Sea Turtles (*Dermochelys coriacea*) in Canadian Pacific Waters for the Period 2007 to 2012” was finalized and published on the Species at Risk Public Registry in 2015. This current progress report covers the 2013 to 2017 time period, and should be read in conjunction with the previous progress report in order to capture progress made towards implementation of the 2006 recovery strategy.

The known threats identified for the Leatherback Sea Turtle in their foraging environment include accidental capture and entanglement, ingestion of debris, and collision with boats. Potential threats in their foraging environment include diseases and parasites, predation, oil exploration and extraction, environmental contamination, and aquaculture. Internationally, threats to Leatherback Sea Turtles include fisheries, egg harvesting, nest predation and parasitism, increased human presence, habitat loss, artificial lighting, exotic vegetation, contamination, and pollution.

The key factors limiting the recovery and survival of Leatherback Sea Turtles are their late age of maturity and the long duration between nesting periods, which lead to overall low productivity. Other high risk behaviours that limit survival include long-distance swimming just under the water’s surface (increases the risk of collisions with vessels), ingestion of floating objects (for example, plastic bags), preference for habitats like sandy beaches that overlap with human development, and hatchling orientation to anthropogenic light sources, which can potentially lead them away from the ocean.

The recovery goal for Leatherback Sea Turtle populations in Canadian Pacific waters is:

- the long-term viability of the Leatherback Sea Turtle population(s) that frequent Canadian Pacific waters

The recovery objectives for Leatherback Sea Turtle populations in Canadian Pacific waters are:

- conduct and support research that makes possible the development of measurable recovery criteria, within five years, for Leatherback Sea Turtle population(s) that frequent Canadian Pacific waters
- identify and understand threats to the Leatherback Sea Turtle and its habitat resulting from human activities in Canadian Pacific waters
- mitigate human-caused threats to Leatherback Sea Turtle in Canadian Pacific waters and protect their critical migratory and foraging habitats
- support the efforts of other countries to promote the recovery of the Leatherback Sea Turtle population(s) that frequent Canadian Pacific waters

- raise awareness of Pacific Leatherback Sea Turtles and engage Canadians in stewardship projects

During the time period covered by this report, progress has been made towards increasing scientific knowledge, threat clarification and mitigation, and public awareness. Examples include:

- publication of two reports providing science advice and information relevant to the identification of critical habitat
- implementation of a rigorous and standardised jellyfish sampling protocol, including dedicated on-board samplers
- continued maintenance and organisation of all sightings through a partnership with the British Columbia Cetacean Sightings Network
- Canada's adoption of a streamlined turtle response protocol; a collaboration with United States (U.S.) Fish and Wildlife Service and U.S. National Oceanic and Atmospheric Administration
- presentations, training sessions, and the distribution of print and digital material focusing on increasing public awareness of Leatherback Sea Turtles and threats to their recovery

The Leatherback Sea Turtle ranges widely, and its recovery necessitates international cooperation. The species' ability to recover depends on its lifetime reproductive capacity, addressing key knowledge gaps, and the mitigation of threats such as incidental capture in fisheries.

Although there has been significant progress made towards meeting many of the objectives and strategies outlined in the recovery strategy, ongoing work is required to better understand the threats to Leatherback Sea Turtle populations in Canadian Pacific waters, support its recovery, and to identify and protect its critical habitat.

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1 Introduction

The “Report on the Progress of Recovery Strategy Implementation for Leatherback Sea Turtles (*Dermochelys coriacea*) in Canadian Pacific Waters for the Period 2013 to 2017” outlines the progress made towards meeting the objectives listed in the “Recovery Strategy for Leatherback Turtles (*Dermochelys coriacea*) in Pacific Canadian Waters” ([DFO 2006](#)). This report is part of a series of documents for this population that are linked and should be taken into consideration together, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) “Assessment and Status Report on the Leatherback Sea Turtle (*Dermochelys coriacea*) Atlantic population Pacific population in Canada” ([COSEWIC 2012](#)), the “Recovery Strategy for Leatherback Turtles (*Dermochelys coriacea*) in Pacific Canadian Waters” ([DFO 2006](#)), the “Report on the Progress of Recovery Strategy Implementation for the Leatherback Sea Turtle (*Dermochelys coriacea*) in Canadian Pacific Waters for the Period 2007 to 2012” ([DFO 2015](#)), the “Multi-species Action Plan for Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site” ([PCA 2016](#)), the “Multi-species Action Plan for Pacific Rim National Park Reserve of Canada” ([PCA 2017](#)), and the “Action Plan for the Leatherback Sea Turtle (*Dermochelys coriacea*) in Canada (Pacific population)” ([DFO 2019](#)).

Section 2 of this progress report summarizes key information on the threats to the species, recovery objectives, and strategies to meet those objectives. For more details, readers should refer back to the recovery strategy. Section 3 reports on the progress of indicators identified in the recovery strategy that support achieving the recovery objectives. Section 4 summarizes the progress towards achieving the objectives.

2 Background

2.1 COSEWIC assessment summary

The 2003 listing of the Leatherback Sea Turtle as endangered under the *Species at Risk Act* (SARA) led to the development and publication of the recovery strategy (DFO 2006), which was based on the information provided in the 2001 COSEWIC assessment and status report (COSEWIC 2001). An updated COSEWIC assessment and status report was published in 2012 in which Leatherback Sea Turtle populations in Canadian Pacific waters retained their endangered status (COSEWIC 2012).

Assessment summary May 2012
Common name Leatherback Sea Turtle (Pacific population)
Scientific name <i>Dermochelys coriacea</i>
Status Endangered
Reason for designation The Leatherback Sea Turtle (Pacific population) has collapsed by over 90% in the last

generation. Continuing threats for this species include fisheries bycatch, marine debris, coastal and offshore resource development, illegal harvest of eggs and turtles, and climate change.

Occurrence

Pacific Ocean

Status history

The Leatherback Sea Turtle was considered a single unit and designated endangered in April 1981. Its status was re-examined and confirmed in May 2001. The single Leatherback Sea Turtle unit was split into two populations (Atlantic and Pacific populations) in May 2012. The Pacific population was designated endangered in May 2012.

2.2 Threats

This section summarizes the information found in the recovery strategy on threats to survival and recovery of Leatherback Sea Turtle populations in Canadian Pacific waters, as well as threats to its habitat.

2.2.1 Threats to the Leatherback Sea Turtle

Table 1 summarizes the threats to the Leatherback Sea Turtle. Please refer to section 2.11 of the recovery strategy for more information on these threats. The population-level risk for each threat is unknown because there was insufficient information available when the recovery strategy was written in 2006.

Table 1. Summary of the threats identified for the Leatherback Sea Turtle, based on the recovery strategy.

Threat Type	Threat	Description
Foraging environment: known threats	Accidental capture and entanglement	Leatherback Sea Turtles are caught accidentally in nets and on lines, especially in fisheries in pelagic and coastal foraging areas, and in migratory corridors. Leatherback Sea Turtles are especially vulnerable to entanglement in fishing gear because of their massive front flippers, and are vulnerable not only to gear in use (especially un-monitored gear), but also to abandoned, lost or discarded fishing gear (ALDFG, also known as “ghost gear”).
Foraging environment: known threats	Ingestion of debris	Marine debris originates from many sources. Leatherback Sea Turtles will ingest inedible objects such as plastic bags, balloons, tar balls and fishing nets that may resemble jellyfish (their intended prey).
Foraging environment: known threats	Collisions with boats	Turtles can be injured or killed if struck by boats and propellers. Leatherback Sea Turtles may be particularly at risk because of their habit of swimming just beneath the water’s surface. Perhaps the largest concern in Pacific Canada arises from transiting vessels. It is not known whether offshore collisions with large ships

Threat Type	Threat	Description
		occur. However, given the slow swimming speeds of Leatherback Sea Turtles and the often high speeds of vessels, these types of impacts could cause mortality.
Foraging environment: potential threats	Diseases and parasites	Little is known about diseases and parasites in Leatherback Sea Turtles, including in Canadian waters. Fibropapillomatosis is a neoplastic disease that primarily affects Green Turtles and has been observed in Leatherback Sea Turtles in Mexico.
Foraging environment: potential threats	Predation	Sharks and Killer Whales have been reported to attack adult Leatherback Sea Turtles.
Foraging environment: potential threats	Oil exploration and extraction	Oil extraction from the seabed carries risks of spills, blowouts, and increased marine traffic. Oil exploration may also pose threats to foraging habitat, including the effects of drilling, anchoring, explosives, pollution, and noise.
Foraging environment: potential threats	Environmental contamination	Leatherbacks visiting Canadian Pacific waters are exposed to sewage and agricultural and industrial chemicals. Accumulation of heavy metals and Polychlorinated biphenyls has been demonstrated in Leatherback Sea Turtles.
Foraging environment: potential threats	Aquaculture	Salmon farms and shellfish aquaculture are concentrated in the inside passage between Vancouver Island and the mainland. Environmental threats posed by salmon farms include noise from predator-deterrent devices, fecal pollution, entanglement in net pens and anchoring systems, and the possibility of parasite transmission.
Nesting environment	Fisheries on adults and juveniles	Adult Leatherback Sea Turtles nesting in Malaysia and Indonesia are subject to incidental take in various fisheries throughout their range, and possibly the directed take by local villagers. However, there is limited harvest of adult and juvenile turtles and the extent to which populations are affected is unknown.
Nesting environment	Harvest of eggs	The eggs of Leatherback Sea Turtles, like those of other sea turtles, are aggressively harvested for subsistence and sale. Continued harvesting ensures reduced recruitment.
Nesting environment	Nest predation and parasitism	Many natural predators, such as rats, mongoose, birds, monitor lizards, snakes, crabs, and other invertebrates eat turtle eggs. Domesticated species such as cats, dogs, and pigs also pose a threat. Nest destruction by feral pigs is one of the biggest problems for Western Pacific Leatherback Sea Turtle populations, especially in Papua. Nesting beach parasite loads (that is, insects

Threat Type	Threat	Description
		such as fly larvae and mole crickets) are another natural threat.
Nesting environment	Increased human presence	Human activities on nesting beaches can disturb nesting females and their eggs. Females may abort nesting attempts, shift nesting beaches, delay egg-laying, and select poor sites. Compaction of sand from people walking over nests can slow hatchling emergence. Light sources such as flashlights and campfires can disorient hatchlings and females, making it more difficult for them to find their way to the sea. Vehicles driving on the beaches compact sand and nests, unearth nests, and create ruts that can trap hatchlings during their seaward migration.
Nesting environment	Habitat loss	A variety of activities result in elimination or degradation of nesting habitat. They include construction/mining and beach armoring such as sea walls, which can create obstacles and decrease the amount of sand available. Additionally, beach enhancement (such as, attempts to replace sand loss) may bury nests too deeply.
Nesting environment	Artificial lighting	Hatchlings and adults, once on land, rely on illumination to orient towards the sea. Lights from buildings, streets, and vehicles can cause turtles to migrate inland rather than to the sea.
Nesting environment	Exotic vegetation	Introduced plants can displace natural vegetation and proliferate on nesting beaches. Increased shade can result in cooler temperatures within nests, roots may entangle eggs and hatchlings, and nesting females can be entangled in vegetation, slowing or preventing their return to the sea.
Nesting environment	Contamination and pollution	Beaches tend to concentrate some of the same kinds of debris (that is, plastics, abandoned netting) and pollution (that is, oil spills).

2.2.2 Threats to critical habitat

Critical habitat for Leatherback Sea Turtles was not identified in the recovery strategy as there was insufficient information available to provide this advice (DFO 2006). The recovery strategy detailed a schedule of studies (SoS) that would allow for the identification of critical habitat.

The limited sightings and information on Leatherback Sea Turtle behaviour in Canadian Pacific waters are still insufficient to support the identification of critical habitat with the precision needed to be able to identify threats to critical habitat. Two studies, completed in 2014 and 2015, provided advice on critical habitat identification. However, there was still insufficient information to support its identification (see table 2 row 1). The recovery strategy provides a SoS to identify critical habitat. Please refer to table 3 for updates on the SoS. Activities likely to

destroy habitat will be determined when critical habitat is identified in a subsequent recovery document.

2.3 Recovery

This section summarizes the information found in the recovery strategy on the population and distribution objectives necessary for the recovery of the Leatherback Sea Turtle in Canadian Pacific waters.

2.3.1 Recovery goals and objectives

Section 3 of the recovery strategy identified the following recovery goal and objectives necessary for the recovery of Leatherback Sea Turtle populations in Canadian Pacific waters:

Recovery goal:

The long-term viability of the Leatherback Sea Turtle population(s) that frequent Canadian Pacific waters.

Recovery objectives:

1. Conduct and support research that makes possible the development of measurable recovery criteria, within five years, for Leatherback Sea Turtle population(s) that frequent Canadian Pacific waters
2. Identify and understand threats to the Leatherback Sea Turtle and its habitat resulting from human activities in Canadian Pacific waters
3. Mitigate human-caused threats to Leatherback Sea Turtles in Canadian Pacific waters and protect their critical migratory and foraging habitats
4. Support the efforts of other countries to promote the recovery of the Leatherback Sea Turtle population(s) that frequent Canadian Pacific waters
5. Raise awareness of Pacific Leatherback Sea Turtles and engage Canadians in stewardship projects

2.3.2 Performance measures

The recovery strategy does not contain any performance indicators or measures to define and evaluate progress towards achieving the recovery goal and objectives. Progress will be informed by the advancement of the recovery strategy goal and objectives as described in section 3 below.

3 Progress towards recovery

Initial progress towards achieving the objectives identified in the recovery strategy has been documented in the previous progress report (DFO 2015). Section 3 of this report summarizes the achievements from 2013 to the end of 2017.

The recovery strategy divided the recovery effort into five broad strategies¹ 1) research; 2) threat clarification; 3) mitigation; 4) international cooperation; and 5) stewardship and awareness. Progress in these broad strategies is reported in section 3.1. Section 3.3.1 also reports on the status of progress indicators identified in the recovery strategy. Section 3.2 reports on the activities identified in the SoS to identify critical habitat.

¹ The term broad strategy refers to “Category of Activity” in section 3.7 of the “Recovery Strategy for Leatherback Turtles (*Dermochelys coriacea*) in Pacific Canadian Waters”.

3.1 Activities supporting recovery

Table 2 summarizes the implementation of activities undertaken to address the progress indicators identified in the five-year evaluation table found in section 3.7 of the recovery strategy. This progress report covers the period from 2013 to 2017. Please refer to the previous progress report for work completed from 2007 to the end of 2012 (DFO 2015). Each progress indicator has been assigned one of four statuses:

- 1) not met: the progress 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 progress indicator, and further work is ongoing or planned
- 3) met: the progress indicator has been met and no further action is required
- 4) met, ongoing: the progress indicator has been met, but efforts will continue until the population is considered to be recovered

Table 2. Details of activities supporting the recovery of the Leatherback Sea Turtle in Canadian Pacific waters from 2013 to 2017.

Indicators of progress	Broad category	Status	Details	Recovery objectives	Participants*
Critical and important habitat in Pacific Canada identified	Research	Partially met, underway	<p>Science advice for Leatherback Sea Turtle critical habitat has been developed. In 2014, Fisheries and Oceans Canada (DFO) published “Advice Relevant to the Identification of Critical Habitat for Leatherback Sea Turtles (Pacific Population)”. This Canadian Science Advisory Secretariat (CSAS) science advisory report reviewed the best available information which led to recommendations for the identification of critical habitat in Canadian Pacific waters.</p> <p>Further to this CSAS report, Gregr et al. (2015) published a research document on “Information Relevant to the Identification of Critical Habitat</p>	1	DFO, academia, industry

Indicators of progress	Broad category	Status	Details	Recovery objectives	Participants*
			<p>for Leatherback Sea Turtles (<i>Dermochelys coriacea</i>) in Canadian Pacific waters". The paucity of sightings data and minimal information on foraging behaviour in Canadian Pacific waters has limited the precision of critical habitat identification.</p> <p>Research is in progress that will assist in the identification of critical habitat. Please refer to table 3 for an update on the jellyfish sampling and analysis, the results of which may be used to determine the level of prey data still required to refine important habitat identified in DFO (2014) and Gregr et al. (2015).</p>		
Populations frequenting Pacific Canada identified	Research	Not met	Data are not yet sufficient to identify the Leatherback Sea Turtles' population in Canadian Pacific waters. The identification of the populations frequenting Canada requires the collection and analysis of genetic material. Eight confirmed live sightings and zero dead Leatherback Sea Turtles were reported in the period that this progress report covers and no sighting reports were received within a time period that would allow for biosampling efforts.	1	DFO, Parks Canada Agency (PCA)

Indicators of progress	Broad category	Status	Details	Recovery objectives	Participants*
<p>Contributions to the scientific literature on biology, physiology, behaviour, and demographics</p>	<p>Research</p>	<p>Met, ongoing</p>	<p>The global scientific community made several contributions to the scientific literature from 2013 through 2017, including the following:</p> <p>Tapilatu et al. (2013) used nesting surveys to develop more robust estimates of nesting population size and evaluate long-term nesting trends. Genetic fingerprinting was used to identify the natal origins of lesser understood male Leatherback Sea Turtles, and provided a guideline for future studies (Roden et al. 2017).</p> <p>Hamelin et al. (2014) identified high-resolution spatial and temporal patterns in Leatherback Sea Turtle movements in Eastern Canada. This research showed the influence of solar illumination on Leatherback Sea Turtle diving in north temperate waters.</p> <p>Casey et al. (2014) estimated that the metabolic rate necessary to support the thermal gradient of Leatherback Sea Turtles at high latitudes in colder waters was approximately three times higher than their resting metabolic rate.</p>	<p>1</p>	<p>DFO, academia</p>

Indicators of progress	Broad category	Status	Details	Recovery objectives	Participants*
			<p>GPS-derived locations and dive records were used with turtle-borne video footage to understand natural Leatherback Sea Turtle foraging and behaviour at a fine-scale (Wallace et al. 2015). Results demonstrated that Leatherback Sea Turtles optimise time spent in warmer water temperatures in the water column.</p>		
<p>Historic and current sightings compiled and organized in a maintained database</p>	<p>Threat clarification</p>	<p>Met, ongoing</p>	<p>All sightings in Canadian Pacific waters from 1931 onwards are compiled and maintained in the cetacean and sea turtle sighting database managed by the British Columbia (BC) Cetacean Sightings Network (BCCSN). The BCCSN is a partnership between Ocean Wise’s Marine Mammal Research Program and DFO.</p> <p>DFO and the BCCSN are working on compiling and publishing all sea turtle occurrences from Canadian Pacific waters to date. This work, when completed, will be reported on in the next progress report for Leatherback Sea Turtles. New sightings information will be compiled into the databased to keep it current.</p>	<p>2</p>	<p>DFO, BCCSN</p>
<p>Report produced on human activities known</p>	<p>Threat clarification</p>	<p>Not met</p>	<p>The global scientific community has contributed to a better understanding</p>	<p>2</p>	<p>DFO, academia, Committee on the</p>

Indicators of progress	Broad category	Status	Details	Recovery objectives	Participants*
to affect Leatherback Sea Turtles in Pacific Canada ²			<p>of the threats to Leatherback Sea Turtles. Roe et al. (2014) used satellite tracking and longline fishing effort to assess the predicted bycatch risk in the Pacific Ocean. Further threats of incidental capture of Leatherback Sea Turtles by fixed-gear fisheries were detailed in Hamelin et al. (2016).</p> <p>A Mariners Guide was released in 2016 by the Coastal Ocean Research Institute. This guide aims to reduce vessel impacts to cetaceans and Leatherback Sea Turtles.</p> <p>A global analysis was conducted that found that amongst all turtles, Leatherback Sea Turtles are at the greatest risk of lethal and sub-lethal effects from ingesting marine debris such as plastics. They also found that the probability of ingesting debris has increased over time (Schuyler et al. 2013). In 2016, Schuyler et al. undertook a risk analysis producing a map of global hotspots for marine debris ingestion by sea turtles.</p>		Status of Endangered Wildlife in Canada, Coastal Ocean Research Institute

² Please refer to the previous progress report for a complete list of reports that contributed to the identification of human activities known to affect Leatherback Sea Turtles in Pacific Canada (DFO 2015).

Indicators of progress	Broad category	Status	Details	Recovery objectives	Participants*
			This information could contribute to the comprehensive report in the future.		
Draft plan for protection of critical habitat in Pacific Canada	Mitigation	Partially met, underway	A paucity of information has limited the ability to identify critical habitat to date. Please refer to row 1 in this table for information regarding the progress on identification of important habitat and research that is underway to address key knowledge gaps.	3	DFO
Recovery and emergency response procedures implemented, along with specific threat reduction measures	Mitigation	Met, ongoing	<p>DFO's Marine Mammal Response Program (MMRP), works with partners to respond to reports of dead and distressed marine mammals and sea turtles, and conducts disentanglements and necropsies.</p> <p>A Pacific Northwest Sea Turtle Stranding and Necropsy Workshop was organised by the United States Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) West Coast Region in Portland, Oregon and held on November 3 and 4, 2016. The workshop, attended by DFO, detailed the United States' (U.S.) live sea turtle response and necropsy protocols.</p>	3	DFO , Environmental non-governmental organization, Indigenous groups, NOAA, PCA, USFWS

Indicators of progress	Broad category	Status	Details	Recovery objectives	Participants*
			This workshop was an effort to increase capacity to respond to sea turtle strandings and ensure data collected are standardized.		
Make DFO a participant in international fora on sea turtles, in consultation with Environment and Climate Change Canada (ECCC) (Biodiversity Convention Office) and Global Affairs Canada (GAC)	International cooperation	Cancelled	Due to cancellation of a single opportunity, DFO did not participate in international fora on sea turtles, in consultation with ECCC (Biodiversity Convention Office) and GAC.	4	DFO
Canadian experts seconded to international projects	International Cooperation	Met, ongoing	DFO participated in the 2016 Pacific Northwest Sea Turtle Stranding and Necropsy Workshop, as detailed in row 3 of this table.	4	DFO
Information on Leatherbacks produced and distributed to federal and provincial government departments	Awareness and stewardship	Met, ongoing	<p>PCA, primarily through the Pacific Rim and Gwaii Haanas, continues to be aware of and involved with DFO on sightings and strandings. Information regarding the Leatherback Sea Turtle stranding and sightings protocol was shared with PCA.</p> <p>DFO and the BCCSN staff provide species ID training annually to the Department of National Defense</p>	5	DFO, MERS, PCA

Indicators of progress	Broad category	Status	Details	Recovery objectives	Participants*
			<p>Canadian Forces Marine Test Range staff in Nanoose Bay.</p> <p>The Marine Education and Research Society (MERS) video, detailed below, was distributed to several federal government departments. Presentations were given to employees of the Canadian Armed Forces and DFO fisheries officers.</p>		
<p>Public awareness materials produced and distributed, including, but not limited to, briefing kits, web resources, brochures</p>	<p>Awareness and stewardship</p>	<p>Met, ongoing</p>	<p>MERS was awarded two contracts in 2015 and 2016 to produce a video on awareness and threats to Leatherback Sea Turtles and for continued outreach. This collaborative awareness video was, and continues to be, distributed broadly through social media. The video has been viewed over 17,000 times through social media and YouTube.</p> <p>MERS also provides Leatherback Sea Turtle awareness in outreach talks and marine mammal training sessions, and regularly promotes Leatherback Sea Turtle awareness on their website, and in social and traditional media. Their Leatherback Sea Turtle promotion has resulted in over 1,170 Leatherback Sea Turtle website views and over 45,000 people reached through an album of</p>	<p>5</p>	<p>DFO, BCCSN, MERS, PCA</p>

Indicators of progress	Broad category	Status	Details	Recovery objectives	Participants*
			<p>Leatherback Sea Turtle photographs and memes on Facebook.</p> <p>The BCCSN held 43 targeted and 123 general outreach sessions aimed to increase awareness of Leatherback Sea Turtles. These events reached 9,964 people, and a total of 9,426 brochures, posters, ID guides, and post cards were distributed. Additionally, an ID guide for Leatherback Sea Turtles and commonly spotted cetaceans was created. This was distributed to 72 airplane and helicopter pilots throughout BC in 2017. The BCCSN also continues to create awareness of Leatherback Sea Turtles through the use of blog posts, social media, publications, print, and digital media.</p> <p>PCA distributes Leatherback Sea Turtle outreach materials to Gwaii Haanas tour operators and visitors, as well as at outreach events in Haida Gwaii communities in collaboration with the Haida Gwaii Marine Stewardship Group.</p>		

*Lead participant(s) is/are listed on top and in bold; other participants are listed alphabetically. Not all activities have specific participants identified.

3.2 Activities supporting the identification of critical habitat

Table 3 provides information on the implementation of the studies outlined in the SoS of the recovery strategy. Each study has been assigned one of four statuses:

- 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

Current information on the species' habitat in Canadian Pacific waters is insufficient to identify critical habitat at this time. The "Information Relevant to the Identification of Critical Habitat for Leatherback Sea Turtles (*Dermochelys coriacea*) in Canadian Pacific Waters" (Gregr et al. 2015) provides information on progress made to date on critical habitat identification. Detailed progress updates with respect to the SoS are summarized in table 3.

Table 3. Status and details of the implementation of the schedule of studies outlined in the recovery strategy.

Study	Timeline	Status	Descriptions and results	Participants*
Seasonality of occurrences: evaluate seasonality of occurrences in Canadian Pacific waters and assess distribution ³	2006 to 2011	In progress (ongoing effort)	<p>The occurrence of Leatherback Sea Turtle populations in Canadian Pacific waters is collected through sightings network reports, as well as incidentally through vessel and aerial surveys (all of which are focused on cetacean sightings, but include Leatherback Sea Turtles as a target species). There were a total of eight Leatherback Sea Turtle sightings in 2013 to 2017 submitted to the British Columbia (BC) Cetacean Sightings Network (BCCSN) (seven confirmed and one possible).</p> <p>Fisheries and Oceans Canada's (DFO) Cetacean Research Program's cetacean-focused multi-species large-vessel surveys occurred three times a year (from March to September) from 2013 to 2017 resulting in one of the eight confirmed Leatherback Sea Turtle sightings. Additionally,</p>	DFO, general public (anyone on the water)

³ Please refer to the previous progress report for a complete list of reports that have contributed to evaluating the seasonality of leatherback occurrences (DFO 2015).

			<p>targeted small-boat reconnaissance efforts are conducted on the west coast of Vancouver Island from May to October annually.</p> <p>Thirty-four days of aerial cetacean surveys occurred off the west coast of Vancouver Island from 2013 to 2015. The surveys were completed in all months of the year except April, May, and August. This was done in partnership with Transport Canada’s Marine Aerial Reconnaissance Team as part of a project to model ship strike risk to cetaceans (Nichol et al. 2017). No Leatherback Sea Turtles were sighted during the aerial surveys.</p> <p>In October 2014, the BCCSN, in collaboration with DFO’s Cetacean Research Program, surveyed commercial fishers and marine stakeholders about sea turtle occurrence in BC waters. A total of 1,652 surveys were distributed, and as of March 31, 2017, 222 were returned. The BCCSN continues to receive survey submissions. Two of the eight sighting reports came from these survey submissions. The BCCSN continues to work with DFO to collect and archive reports of volunteer and opportunistic Leatherback Sea Turtle sightings.</p> <p>Rechsteiner et al. (2013) quantified observer effort for opportunistically collected cetacean and Leatherback Sea Turtle sightings. This resulted in the seasonal predictions of turtle hot-spots in BC waters.</p>	
Migratory routes: collaborate in international research programs to identify migratory routes	2006 to 2011, ongoing	Not started	<p>There was limited collaboration in international research programs to identify migratory routes from 2013 to 2017.</p> <p>Western Pacific Leatherback Sea Turtles, the population that occurs in Washington state, and those believed to occur in Canadian Pacific waters primarily nest in two sites in West Papua (Indonesia). Sato (2016) reported that some</p>	DFO , commercial fishery vessel masters

			<p>Leatherback Sea Turtles from smaller sites in the Solomon Islands and Papua New Guinea may also be linked to a northeast Pacific migration. Future collaboration in confirming Canadian Pacific Leatherback Sea Turtle migratory routes will be an important part of helping international partners mitigate threats in nesting grounds.</p>	
<p>Prey/food sources: identify and investigate distribution of prey/food sources</p>	<p>2008 to 2011, ongoing</p>	<p>In progress</p>	<p>In November of 2015, meetings were held with scientists and the pelagic fish survey teams to assess the efficiency of the jellyfish sampling protocol. This meeting evaluated the previous jellyfish survey protocol, available jellyfish survey data, data collection, and vessel protocols. As a result of these meetings, the jellyfish sampling protocol was refined, and made systematic. The protocol involves the identification of jellyfish species through a Jellyfish Identification Guide and the collection of volume information in order to assess abundance. The protocol also includes dedicated jellyfish samplers on board the salmon stock assessment offshore surveys.</p> <p>Beginning in the summer of 2016 and continuing into 2017, this updated jellyfish sampling protocol was implemented. Analyses are currently being conducted within DFO to assess whether the current data on jellyfish distribution is sufficient, or if additional data needs to be collected. The result of this will be reported on in the next progress report.</p>	<p>DFO, commercial fishery vessel masters</p>
<p>Distribution of Leatherback Sea Turtles: model biotic and abiotic factors that influence the distribution of Leatherbacks in Canadian Pacific waters in order to</p>	<p>2010 to 2011, ongoing</p>	<p>In progress</p>	<p>Foraging “hot spots” were identified in Gregr et al. (2015) by modelling both abiotic and biotic factors. Two oceanographic drivers, chlorophyll-a concentration and ocean currents, were used as proxies for processes that likely contribute to jellyfish production and aggregation, and ultimately areas of suitable foraging habitat for Leatherback Sea Turtles.</p> <p>Please refer to table 2 for information on current efforts to assess the distribution of Leatherback Sea Turtle populations in Canadian Pacific waters.</p>	<p>DFO</p>

identify and track foraging areas and predict locations and times where Leatherback Sea Turtle turtles may be found				
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*Lead participant(s) is/are listed on top and in bold; other participants are listed alphabetically. Not all activities have specific participants identified.

3.3 Summary of progress towards recovery

3.3.1 Status of progress indicators

Eleven progress indicators from the recovery strategy are identified in table 2 of this report. Of the eleven indicators, six (55%) were met and are ongoing, two (18%) were partially met and are underway, two (18%) was not met, and one (9%) indicator has been cancelled. Progress continues to be made on the six items that have been completed where further research is deemed useful.

3.3.2 Completion of action plan

A action plan for the Leatherback Sea Turtle (*Dermochelys coriacea*) in Canada (Pacific population) was finalized and published on the Species at Risk Public Registry in 2019.

3.3.3 Critical habitat identification and protection

Critical habitat under SARA is not yet identified for the Leatherback Sea Turtle in Canadian Pacific waters. Protection of critical habitat will occur once it is identified. Detailed progress towards identifying critical habitat is summarized in section 3.2 and is described in greater detail in the “Information Relevant to the Identification of Critical Habitat for Leatherback Sea Turtles (*Dermochelys coriacea*) in Canadian Pacific Waters” report (Gregr et al. 2015).

3.3.4 Recovery feasibility

As stated in the recovery strategy, it is difficult to predict the recovery feasibility until the population biology and status of Leatherback Sea Turtle populations in Canadian Pacific waters are known. A scarcity of sightings (only 142 sightings reported from 1931 to 2017) make analyses relating to population biology and status problematic. Furthermore, recovery feasibility is highly dependent on a concerted international effort due to the number of threats Leatherback Sea Turtles face during their extensive migrations.

In 2013, Fisheries and Oceans Canada began funding a Leatherback Sea Turtle nest protection program in Papua, Indonesia. The Leatherback Sea Turtle population in Canadian Pacific waters is believed to be the same population that frequents the United States’ Pacific waters. Recovery feasibility is also linked to a considerable amount of research being conducted by the National Oceanic and Atmospheric Association (NOAA), which is undergoing concurrent efforts to identify critical habitat, and has identified priority actions to be undertaken from 2016 to 2020 to assist in the recovery of this population (NOAA 2016). The studies and initiatives outlined in sections 3.1 and 3.2 of this report demonstrate progress towards understanding of this species and their distribution in Canadian Pacific waters. Further implementation of the recovery measures outlined in the recovery strategy will provide researchers with the information needed to determine the recovery feasibility of Leatherback Sea Turtle populations in Canadian Pacific waters.

4 Concluding statement

Progress has been made towards meeting many of the objectives outlined in the recovery strategy for the Leatherback Sea Turtle in Canadian Pacific waters, including increased scientific knowledge, threat clarification and mitigation, and public awareness. Many of these

indicators are still in progress, and steps continue to be taken toward species' recovery. Progress has been made in identifying critical habitat through the publication of two reports providing scientific advice and information relevant to the identification of critical habitat. Further to this, advanced jellyfish sampling protocols have been implemented which, in conjunction with other information, will be used to progress critical habitat identification. Several studies from the global scientific community have contributed to a better understanding of the threats to Leatherback Sea Turtle populations in Canadian Pacific waters through the analyses of fisheries that may pose a risk, such as longlining and other fixed-gear fisheries. More work needs to be done in Canada to produce a report on activities known to affect Leatherback Sea Turtle populations in Canadian Pacific waters. Canada's adoption of a streamlined turtle response protocol and the development of a national threat-based action plan for entanglement demonstrate progress towards threat mitigation for Leatherback Sea Turtles. Significant progress has been made in increasing the public awareness of Leatherback Sea Turtles through presentations, training sessions, and the distribution of print and digital material.

The recovery of Leatherback Sea Turtle populations in Canadian Pacific waters is not likely to be realized in the short-term due to their long lifespan, very high rate of hatchling mortality, and the paucity of sightings. Ongoing work is needed to clearly understand the distribution of Leatherback Sea Turtle populations in Canadian Pacific waters and to develop a plan for the protection of critical habitat, once it is identified.

5 References

- Casey, J.P., James, M.C., and Williard, A.S. 2014. Behavioral and metabolic contributions to thermoregulation in freely swimming leatherback turtles at high latitudes. *J. Exp. Biol.* 217: 2331-2337.
- Coastal Ocean Research Institute. 2016. *Mariner's Guide to whales, dolphins, and porpoises of western Canada*. Vancouver Aquarium Marine Science Centre. Vancouver, Canada. 60 pp.
- COSEWIC. 2001. COSEWIC assessment and update status report on the leatherback turtle *Dermochelys coriacea* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 25 pp.
- COSEWIC. 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. 2006. [Recovery Strategy for Leatherback Turtles \(*Dermochelys coriacea*\) in Pacific Canadian Waters](#). Species at Risk Act Recovery Strategy Series. Vancouver. Fisheries and Oceans Canada. v + 41 pp.
- DFO. 2014. [Advice relevant to the identification of critical habitat for Leatherback Sea Turtles \(Pacific Population\)](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2013/075.
- DFO. 2015. [Report on the Progress of Recovery Strategy Implementation for Leatherback Sea Turtle \(*Dermochelys coriacea*\) in Canadian Pacific Waters for the Period 2007-2012](#). Species at Risk Act Recovery Strategy Report Series. Fisheries and Oceans Canada, Ottawa. v + 12 pp.
- DFO. 2019. [Action Plan for the Leatherback Sea Turtle \(*Dermochelys coriacea*\) in Canada \(Pacific population\)](#). Species at Risk Act Action Plan Series. Fisheries and Oceans Canada, Ottawa. iv + 23 pp.
- Gregg, E.J., Gryba, R., James, M.C., Brotz, L., and Thornton, S.J. 2015. [Information relevant to the identification of critical habitat for Leatherback Sea Turtles \(*Dermochelys coriacea*\) in Canadian Pacific waters](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2015/079. vii + 32p.
- Hamelin, K.M., Kelley, D.E., Taggart, C.T., and James, M.C. 2014. Water mass characteristics and solar illumination influence leatherback turtle dive patterns at high latitudes. *Ecosphere*. 5(2):19.
- Hamelin, K.M., James, M.C., Ledwell, W., Huntington, J., and Martin, K. 2017. Incidental capture of Leatherback Sea Turtles in fixed fishing gear off Atlantic Canada. *Aquat. Conserv. Mar. Freshw. Ecosyst.* 1–12.
- Nichol, L.M., Wright, B.M., O'Hara, P., and Ford, J.K.B. 2017. [Assessing the risk of lethal ship strikes to humpback \(*Megaptera novaeangliae*\) and fin \(*Balaenoptera physalus*\) whales off the west coast of Vancouver Island, Canada](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2017/007. vii + 33 p.

- NOAA. 2016. [Species in the Spotlight, Priority Actions: 2016–2020 Pacific Leatherback Turtle *Dermochelys coriacea*](#). 23 pp.
- PCA. 2016. Multi-species Action Plan for Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site. Species at Risk Act Action Plan Series. Parks Canada Agency, Ottawa. vi+ 25 pp.
- PCA. 2017. [Multi-species Action Plan for Pacific Rim National Park Reserve of Canada Species at Risk Act Action Plan Series](#). Parks Canada Agency, Ottawa. v + 29 pp.
- Roden, S.E., Stewart, K.R., James, M.C., Didge, K.L., Dell’Amico, F., and Dutton, P.H. 2017. Genetic fingerprinting reveals natal origins of male leatherback turtles encountered in the Atlantic Ocean and Mediterranean Sea. *Mar. Biol.* 164:181.
- Roe, J.H, Morreale, S.J., Paladino, F.V., Shillinger, G.L., Benson, S.R., Eckert, S.A., Bailey, H., Tomillo, P.S., Bograd, S.J., Eguchi, T., Dutton, P.H., Seminoff, J.A., Block, B.A., and Spotila, J.R. 2014. Predicting bycatch hotspots for endangered leatherback turtles on longlines in the Pacific Ocean. *Proc. R. Soc. B* 281.
- Rechsteiner, E.U., Birdsall, C.F.C., Sanilands, D., Smith, I.U., Phillips, A.V., and Barret-Lennard, L.G. 2013. Quantifying observer effort for opportunistically-collected wildlife sightings. BC Cetacean Sightings Network: Technical Report, 43 pp.
- Sato, C. L. 2016. Periodic status review for the Leatherback Sea Turtle in Washington. Washington Department of Fish and Wildlife, Olympia, Washington. 17+iii pp.
- Schuyler, Q., Hardesty, B.D., Wilcox, C., and Townsend, K. 2013. Global Analysis of Anthropogenic Debris Ingestion by Sea Turtles. *Conserv. Biol.* 28(1) 129–139.
- Schuyler, Q., Wilcox, C., Townsend, K.A., Wedemeyer-Strombel, K.R., Balazs, G., Seville, E.V., and Hardesty, B.D. 2016. Risk analysis reveals global hotspots for marine debris ingestion by sea turtles. *Glob. Chang. Biol.* 22:567–576.
- Tapilatu, R.F., Dutton, P.H., Tiwari, M., Wibbels, T., Ferdinandus, H.V., Iwanggin, W.G., and Nugroho, B.H. 2013. Long-term decline of the western Pacific leatherback, *Dermochelys coriacea*: a globally important sea turtle population. *Ecosphere*. 4(2): 1-15.
- Wallace, B.P., Zolkewitz, M., and James, M.C. 2015. Fine-scale foraging ecology of leatherback turtles. *Front. Ecol. Evol.* 3:15.