

Report on the Progress of Management Plan Implementation for the Steller Sea Lion (*Eumetopias jubatus*) in Canada for the Period 2011- 2015

Steller Sea Lion



2018

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Compte rendu des progrès de la mise en œuvre du Plan de gestion de l'otarie de Steller
(*Eumetopias jubatus*) au Canada pour la période 2011- 2015

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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 effective protection of species at risk throughout Canada. Section 72 of the Species at Risk Act (S.C. 2002, c.29) (SARA) requires the competent minister to report on the implementation of the management plan for a species at risk, and on the progress towards meeting its goals and objectives within five years of the date when the management plan was placed on the Species at Risk Public Registry and in every subsequent five-year period, until its goals and objectives have been achieved or the status of the species changes to threatened or endangered under SARA.

Reporting on the progress of management plan implementation requires reporting on the collective efforts of the competent minister(s), provincial organizations and all other parties involved in conducting activities that contribute towards the species' conservation. Management plans set goals and objectives for maintaining sustainable population levels of one or more species that are particularly sensitive to environmental factors, but, which are not in danger of becoming extinct. 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 time frame of a report on the progress of management plan implementation (progress report).

The Minister of Fisheries and Oceans and the Minister responsible for the Parks Canada Agency (PCA) are the competent ministers under SARA for the Steller Sea Lion. Fisheries and Oceans Canada (DFO) has prepared this progress report with support from the PCA.

As stated in the preamble to SARA, success in the conservation 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 management plan and will not be achieved by DFO 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 management plan for the Steller Sea Lion for the benefit of the species and Canadian society as a whole.

Acknowledgments

This progress report was prepared by Christie McMillan with input from DFO Science and Fisheries Management Branches, as well as Parks Canada, the British Columbia Ministry of Agriculture and Lands, the United States' National Oceanographic and Atmospheric Administration (NOAA), the Makah Fisheries Management Marine Mammal Program, and Ocean Wise. Fisheries and Oceans Canada would like to express its appreciation to all individuals and organizations who have contributed to the conservation of the Steller Sea Lion.

Executive summary

The Steller Sea Lion (*Eumetopias jubatus*) was listed as a species of Special Concern under the Species at Risk Act (SARA) in 2004. The Management Plan for the Steller Sea Lion (*Eumetopias jubatus*) in Canada was finalized and published on the Species at Risk Public Registry in 2011. The population was reassessed and confirmed as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2013. This report documents the progress of management plan implementation from 2011-2015.

The main threats identified for the Steller Sea Lion include: prey reduction, environmental contaminants, acoustic or physical disturbance, toxic spills, entanglement, and illegal kills.

The management goals for the Steller Sea Lion are:

- to ensure that anthropogenic threats from Canadian sources do not cause unsustainable population declines, or a contraction of the current range or number of breeding sites in Canada
- support for, and contribution to, an environment where research and monitoring of Steller Sea Lions in British Columbia contributes to achieving an improved global knowledge of the Eastern Pacific Population

In order to achieve these goals, the management plan identified the following population and distribution objectives:

- maintain a viable population and prevent the population from declining to levels at which it would be considered at risk of extinction
- maintain the annual usage of all three main rookeries and support the establishment of the fourth breeding site as a permanent rookery
- maintain the number and utilization of existing haul-outs in British Columbia to ensure a widespread distribution along the British Columbia coast

This report summarizes progress that Fisheries and Oceans Canada (DFO) and the broader scientific community have made towards achieving the goals and objectives set out in the management plan. From 2011 to 2015, achievements have been made in:

- continued range-wide monitoring of the population through aerial and boat-based surveys
- efforts to better understand the non-breeding season diet and prey requirements of Steller Sea Lions through winter and year-round scat sampling
- international collaboration between DFO, the U.S. National Oceanographic and Atmospheric Administration (NOAA), and other agencies in the United States and Canada to undertake Steller Sea Lion research, including coordination of survey timing and contributing band re-sight information

- research into the rates of entanglement in fishing gear and marine debris for Steller Sea Lions, and implementation of a successful sea lion disentanglement program
- the formation of a Marine Mammal Response Network (MMRN) Advisory Team, and coast-wide training of DFO employees and members of First Nations and environmental non-government organizations, to improve response to marine mammals in distress
- outreach programs promoting responsible marine mammal viewing guidelines and raising awareness about anthropogenic threats to marine mammals have reached hundreds of thousands of citizens coast-wide

In 2013, the Eastern Distinct Population Segment of Steller Sea Lions in American waters was delisted from the United States' Endangered Species Act (National Marine Fisheries Service 2013). Canadian aerial surveys indicate the number of Steller Sea Lions in British Columbia has been increasing at an average annual rate of 3.8% (Olesiuk 2018). In British Columbia, Steller Sea Lions are now breeding at all four historic rookeries, as well as at least two new rookeries. Ongoing work will allow further understanding and mitigation of anthropogenic threats to Steller Sea Lions in Canada.

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1 Introduction

This document reports the progress made from 2011 to 2015 towards meeting the goals and objectives listed in the Management Plan for the Steller Sea Lion (*Eumetopias jubatus*) in Canada and is one in a series of documents for this species that are linked and should be taken into consideration together, including: the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status report (COSEWIC 2003), management plan (DFO 2011) and a multi-species action plan (Parks Canada Agency 2016).

Section 2 of the progress report summarizes key information on the threats to the species, the management goals and objectives, and actions and approaches for meeting the objectives. More detail is available in the management plan. Section 3 reports the progress of activities, identified in the management plan, to support achieving the management goals and objectives. Section 4 summarizes the progress toward achieving the management goals and objectives.

2 Background

2.1 COSEWIC assessment summary

The Steller Sea Lion was initially assessed and designated as special concern by COSEWIC in 2003 (COSEWIC 2003). The listing of Steller Sea Lion under the Species at Risk Act (SARA) in 2004 led to the development and publication of the management plan in 2011, based on information provided in the COSEWIC status report (COSEWIC 2003). This information is also included in section 1.1 of the management plan. In 2013, COSEWIC re-examined and confirmed the status of the Steller Sea Lion as special concern (COSEWIC 2013).

Assessment Summary – November 2013

Common name:

Steller Sea Lion

Scientific name:*Eumetopias jubatus***Status:**

Special concern

Reason for designation:

The Steller Sea Lion population is restricted to only five breeding locations (consisting of seven rookeries) in British Columbia that occupy less than 10 km², with approximately 70% of births occurring at a single location (Scott Islands). The population is increasing, but is sensitive to human disturbance while on land and is vulnerable to catastrophic events such as major oil spills due to its highly concentrated breeding aggregations. The species is near to qualifying for threatened, but has recovered from historical culling and deliberate persecution.

Occurrence:

British Columbia, Pacific Ocean

Status history:

Designated not at risk in April 1987. Status re-examined and designated special concern in November 2003 and November 2013.

2.2 Threats

This section summarizes the information found in the management plan on threats to the Steller Sea Lion.

2.2.1 Threats to the Steller Sea Lion

Table 1 summarizes the threats to the Steller Sea Lion. Please refer to section 1.5 of the management plan for more information on these threats.

Table 1. Summary of the population-level anthropogenic threats for the Steller Sea Lion, based on the management plan (DFO 2011).

Threat	Population-level threat risk	Description
Prey reduction – fisheries competition	Potentially high	Commercial harvesting of prey resources can deplete local abundance and availability of Steller Sea Lion prey, and may intensify the effects of natural prey fluctuations. While it is not known whether depletion of single prey species may limit population growth, it is widely acknowledged that prey availability was a factor in the decline of the western population of Steller Sea Lions, and prey availability around rookeries may be critical for the survival of nursing females and their young pups.
Prey reduction – environmental change and variability	Potentially high	Climate change and large-scale regime shifts may affect Steller Sea Lion prey distribution. Reduced prey availability coinciding with El Niño events has led to declines in pup production of other pinniped species, while shifts to lower energy prey species may affect Steller Sea Lion life history parameters, leading to population decline.
Environmental contaminants – regulated and unregulated POPs	Moderate	Persistent organic pollutants, including DDT, PCBs, PCDDs, PCDFs, and PBDEs, have been associated with adverse health effects in pinnipeds. Studies on wild pinnipeds have indicated links between contaminant levels and reproductive impairment, premature births, birth defects, suppression of immune response, and disruption of thyroid hormone physiology. These effects may be amplified when combined with other stressors, such as food shortage.
Physical disturbance (on or around terrestrial habitat)	Low at haul-outs Medium at rookeries	Disturbance by aircraft, boats, pedestrians, construction, or fishing activities can lead to temporary or permanent abandonment of haul-outs and rookeries. Steller Sea Lions are particularly vulnerable to disturbance at rookeries, where disturbances can result in increased pup mortality due to drowning, trampling, or separation from mothers, and may have energetic costs for both pups and mothers.
Acoustic disturbance (in aquatic habitat)	Likely low	Both acute (e.g., explosions, seismic or military tactical sonar) and chronic (e.g., vessel activity) acoustic disturbance have the potential to affect Steller Sea Lions. Noise stress may have long-term effects on Steller Sea Lion vital rates

Threat	Population-level threat risk	Description
		and body condition and may contribute to disruption of foraging and increased energetic costs.
Toxic spills	Low Moderate for Scott Island and Cape St. James rookeries	Toxic spills are most likely to affect Steller Sea Lions through contact with heavy oil accumulations, as well as from absorption of oil through the skin, incidental ingestion of oil, exposure to vapours, and partial fouling of fur. Although the impacts of most spills are unlikely to be population-wide, a spill affecting a rookery during breeding season could lead to a significant population-level impact.
Incidental take – fisheries and aquaculture	Low	Steller Sea Lions can be entangled and killed incidentally in various fisheries, particularly gillnet fisheries for salmon. Entanglement in finfish aquaculture is also known to occur; however, based on voluntary reporting, accidental drowning in aquaculture installations is relatively rare.
Entanglement in marine debris	Low, potentially severe effects on individual animals	Entanglement in marine debris, including net fragments, plastic bags, and packing bands, has been implicated in the decline of some pinniped populations. Net fragments and packing bands can get caught around the necks of Steller Sea Lions and cause serious injuries as the entangled individual grows. Knowledge gaps exist regarding entanglement rates; therefore, it is unknown whether entanglement in marine debris poses a population-wide threat to Steller Sea Lions.
Illegal kills	Unknown	Steller Sea Lions are likely to be the targets of illegal kills based on the perceived conflicts between Steller Sea Lions and fisheries. As these kills are largely undocumented, the impacts of illegal kills at a population level are unknown.
Predator control programs	Historically high Currently low	Predator control programs were the main factor limiting the Steller Sea Lion population throughout most of the 20 th century. These programs resulted in the eradication of a major rookery at the Sea Otter Group by the late 1930s and severely depleted the Eastern population of Steller Sea Lions until the species was protected under the Canadian Fisheries Act in 1970 and the American Marine Mammal Protection Act in 1972. Legal predator control of Steller Sea Lions at aquaculture operations in British Columbia (B.C.) occurred between 1990 and 2003, constituting the largest known sources of human-induced mortality for this species. Since the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listing of the Steller Sea Lion in 2004, lethal control of this species is no longer permitted; however, it is possible that Steller Sea Lions are killed due to being mistaken for California Sea Lions or Harbour Seals, for which lethal control is still allowed.
First Nations harvest	Low	Steller Sea Lions were traditionally hunted by Indigenous people in B.C. for food and cultural purposes. However, use of sea lions by First Nations declined over the 1800s. Hunting of Steller Sea Lions for subsistence and cultural purposes does still occur occasionally, but while harvest levels are unknown, this harvest

Threat	Population-level threat risk	Description
		appears to be very limited.
Disease and parasitism	Unknown	Parasites and diseases may have little impact on otherwise healthy animals, but effects of these threats may become significant if combined with other stressors. Pathogens and diseases can be introduced through sewage outflow, storm-water, and agricultural runoff, as well as through rehabilitation-reintroduction programs that include pinnipeds.

2.3 Conservation

This section summarizes the information found in the management plan (DFO 2011) on the management goals and objectives that are necessary for the conservation of the Steller Sea Lion.

2.3.1 Management goals and objectives

Section 2 of the management plan identified the following management goals and objectives:

Management goals:

1. Ensure that anthropogenic threats from Canadian sources do not cause unsustainable population declines, or a contraction of the current range or number of breeding sites in Canada
2. Support for, and contribution to, an environment where research and monitoring of Steller Sea Lions in British Columbia (B.C.) contributes to achieving an improved global knowledge of the Eastern Pacific Population

Population objectives:

- P1. Maintain a viable population and prevent the population from declining to levels at which it would be considered at risk of extinction

Distribution objectives:

- D1. Maintain the annual usage of all three main rookeries and support the establishment of the fourth breeding site as a permanent rookery
- D2. Maintain the number and utilization of existing haul-outs in B.C. to ensure a widespread distribution along the B.C. coast

Research and monitoring objectives:

- R1. Conduct range wide population assessments through coordinated Canadian and U.S. surveys, where feasible
- R2. Contribute to, and foster an improved understanding of Steller Sea Lion biology and habitat requirements in B.C.
- R3. Support, foster and contribute to research addressing knowledge gaps regarding identified (Table 1 in the management plan) and unidentified threats to this population
- R4. Determine total cumulative levels of human-caused annual mortalities for Steller Sea Lions in B.C. that can be sustained

Management objectives:

- M1. Promote international collaboration, independent research, education and outreach on management and conservation initiatives
- M2. Minimize the exposure of Steller Sea Lions to pollutants
- M3. Minimize the level of disturbance of Steller Sea Lions at rookeries during the breeding season
- M4. Reduce the risk of catastrophic spills impacting Steller Sea Lions or their habitat in Canada
- M5. Minimize the exposure of Steller Sea Lions to acute sound levels known to cause behavioural or physical harm in pinnipeds
- M6. Minimize the likelihood of prey limitation caused by anthropogenic factors

2.3.2 Performance measures

The management plan did not include performance measures. The progress towards achieving the management goals and objectives will be informed by the progression made under the actions and approaches outlined in section 3.1 below.

3 Progress towards conservation

The management plan for the Steller Sea Lion divides the conservation effort into six broad strategies: 1) protection; 2) management; 3) research on Steller Sea Lion biology; 4) research to clarify identified threats; 5) monitoring population status; and, 6) outreach and communication. Progress in carrying out these broad strategies is reported in section 3.1. Section 3.2 summarizes the progress made towards undertaking these actions and approaches.

3.1 Actions supporting management

Table 2 provides information on the implementation of activities undertaken to address the broad strategies, actions, and approaches identified in the implementation schedule (Table 3) of the management plan. The timelines in Table 2 have also been included from the implementation schedule. Each activity has been assigned one of four statuses:

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

See [Appendix A](#) for an index of the acronyms used throughout the report.

Table 2. Status of actions and approaches undertaken to address the management goals and objectives outlined in the management plan.

Actions	Approach	Timeline	Status	Details	Objectives	Participants
Broad strategy 1: Protection						
1. Protect Steller Sea Lions from disturbance at breeding sites and haul-outs	a) Continue enforcement of Marine Mammal Regulations (MMR), promote regional guidelines	Ongoing	In progress	<p>Fisheries and Oceans Canada (DFO) Fishery Officers follow up on reports of marine mammal disturbance and investigate potential incidents. Additionally, DFO conducts presentations in coastal communities on how to report marine mammal disturbance, and broadly promotes Be Whale Wise (BWW) guidelines (Cottrell pers. comm. 2016).</p> <p>Parks Canada Agency (PCA) wardens have authority within park boundaries to undertake enforcement of restricted access at haul-out sites. Holders of business</p>	D1, D2, M3	DFO¹, PCA

¹ Lead participant(s) is/are listed on top and in bold; other participants are listed alphabetically; not all activities have specific participants identified.

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>licenses are required to adhere to MMR when in park waters (Helms pers. comm. 2016; Yakimishyn pers. comm. 2016)</p> <p>See broad strategy 6 action 20c for further details on promotion of BWW guidelines.</p>		
<p>2. Enforcement of regulations for discarding debris, develop new fishing standards</p>		<p>Ongoing</p>	<p>In progress</p>	<p>The absence of solid debris, including fishing gear and plastics from Canadian marine or estuarine waters is recommended under <u>Canadian Council of Ministers of the Environment (CCME) guidelines</u> (Canadian Council of Ministers of the Environment 1999).</p> <p>Enforcement of regulations prohibiting marine debris can also fall under the auspices of legislation such as the Fisheries Act (see pollution prevention) or the Canadian Environmental Protection Act.</p> <p>PCA wardens enforce regulations for discarding marine debris within park waters (Yakimishyn pers. comm. 2016).</p>	<p>M2</p>	<p>CCME, PCA</p>
<p>Broad strategy 2: Management</p>						
<p>3. Consider dietary needs when changes to current fisheries management regimes occur</p>		<p>As changes to fisheries management occur</p>	<p>In progress</p>	<p>No major changes to fisheries management regimes related to pinnipeds have occurred in B.C. during this progress report period (Cottrell pers. comm. 2016).</p> <p>The National Oceanographic and Atmospheric Administration (NOAA) implemented several Steller Sea Lion protection measures for fisheries in the Aleutian Islands in 2015. These protection measures included changes to closed</p>	<p>P1, M6</p>	<p>NOAA</p>

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>areas and harvest limits, with the aim of the reducing the impact of these fisheries on Steller Sea Lions and their critical habitat in the U.S. (Rotterman pers. comm. 2016).</p> <p>For information on diet studies see broad strategy 3, action10b and broad strategy 4, action 12.</p>		
<p>4. Review proposals with potential for disturbance at haul-outs and rookeries, and provide advice</p>		<p>Ongoing, enhance involvement where necessary</p>	<p>In progress</p>	<p>All research proposals for Steller Sea Lion studies conducted in B.C. waters are reviewed by DFO. From 2011 to 2015, 9 research permits were issued that included Steller Sea Lions as a focal species.</p> <p>Reviews include weighing risks, including potential for disturbance, against the value of the data to be collected (Cottrell, pers. comm. 2016). All research activities in Canada require permitting under the Species at Risk Act (SARA) and the Fisheries Act's MMR.</p> <p>PCA requires a research permit to conduct research on Steller Sea Lions in its heritage areas. The research permit system places controls on research activities, helps track research being conducted in heritage areas, and ensures the permit is SARA compliant (Parks Canada 2006).</p> <p>Proposals for Steller Sea Lion research in American waters must include estimates of and requests for a limited number of takes. These takes must be monitored throughout the project and reported on annually (Rotterman, pers. comm. 2016).</p>	<p>D1, D2, M3, M5</p>	<p>DFO, NOAA, PCA</p>

Actions	Approach	Timeline	Status	Details	Objectives	Participants
5. Manage and reduce input of chemical toxins, reduce toxic loading	a) Develop DFO emergency response plan to identify marine mammal expertise required in toxic spill response	4 years	Not started (during reporting period)	<p>Stronger regional emergency response plans are under development in collaboration with partners as part of the Government of Canada’s national <u>Ocean Protection Plan (OPP)</u> launched in November 2016. Four pilot studies have been launched across Canada, including one site in southern B.C. Marine mammal experts are engaged in the plan development and Indigenous and coastal community consultations will be held on the draft plans, once developed.²</p> <p>The Gwaii Haanas Public Safety Plan requires that a marine spill response kit (for small spills) be maintained and a field crew receives oil spill response training (Bartier pers. comm. 2018). In 2015, Gwaii Haanas began participating in a Transport Canada-led initiative to create a Port of Refuge Contingency Plan for Haida Gwaii.³</p>	P1, M2, M4	CCG DFO, Ocean Wise (formerly Vancouver Aquarium), Province of B.C., TC, PCA
	b) Marine mammal specific DFO operational manual for toxic spill response	4 years	<p>Not started during reporting period (Canada)</p> <p>Completed (U.S.)</p>	<p>Under OPP, a marine mammal-specific operational manual will be developed for the southern B.C. pilot site in 2019-2020.</p> <p>NOAA has developed guidelines to direct and inform response activities for marine mammals during oil spills. These guidelines allow for communication between agencies and maintain readiness for response to oiled wildlife at a national level in the U.S. (Ziccardi et al. 2015).</p>	M2, M4	NOAA

² While outside the reporting period, the Government of Canada’s recent emergency response initiatives under OPP are relevant for consideration and have been included in the table for information only.

³ The final plan was released in November 2017 (Bartier pers. comm. 2018).

Actions	Approach	Timeline	Status	Details	Objectives	Participants
	c) Review management of point-sources of toxins listed in Appendix I of the management plan	Ongoing	In progress	<p>The National Pollutant Release Inventory is a publicly available data source to which facilities are required to report pollutant releases to air, water, or land. This resource allows for identification of pollution prevention priorities and aids development of targeted regulations for reducing release of toxins (Environment and Climate Change Canada 2016). Sediment concentrations of PCBs, PBDEs, PCDDs, and PCDFs from disposal at sea sites at Sands Head, Point Grey, Brown Passage, and Douglas Channel, B.C. were measured to help inform Environment and Climate Change Canada's (ECCC's) Disposal at Sea Regulations (Ross et al. 2011; Ross et al. 2012).</p> <p>Based on declining concentrations of PCBs, PBDEs, PCDEs, and PCNs in a sentinel marine mammal species (Harbour Seals) in the Strait of Georgia, regulations and source controls have been effective in significantly reducing inputs of these contaminants into southern B.C. waters (Ross et al. 2013).</p>	R3, M2	DFO, ECCC, academia, ENGOS, WDFW
6. Support low-impact research		Ongoing	In progress	<p>DFO reviews all marine mammal research proposals annually for studies conducted in B.C. waters and weighs potential for disturbance against the value of the data to be collected (Cottrell pers. comm. 2016). From 2011 to 2015, DFO issued 9 Steller Sea Lion-related research permits.</p> <p>North Coast Cetacean Society (NCCS) conducts land-based surveys for Steller Sea Lions daily between May and</p>	R1 to R4, M1, M3	DFO, ENGOS

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>September from two platforms in the Caamano Sound area (Wray pers. comm. 2016).</p> <p>Pacific Wild uses a remote camera and a hydrophone to monitor Steller Sea Lion activity at Currie Rock, B.C. (McAllister pers. comm. 2016).</p>		
<p>7. Strengthen measures to reduce entanglement risk</p>	<p>a) Support Marine Mammal Response Network (MMRN) initiatives</p>	<p>Ongoing</p>	<p>In progress</p>	<p>A MMRN Advisory Team composed of representatives from DFO, Province of B.C., ENGOs, and PCA was formed in 2015 to lead efforts to support MMRN initiatives.</p> <p>Fisheries officers; ENGOs (including British Columbia Cetacean Sightings Network (BCCSN), Cetus, Marine Education and Research Society (MERS), and NCCS) and First Nations groups (including Haida Gwaii Marine Stewardship Group (HGMSG) and the Heiltsuk Species at Risk Stewardship Program) support MMRN initiatives by responding to marine mammal incidents throughout the B.C. coast. Training has been provided by DFO/MMRN to members of these organizations to act as first responders for marine mammal stranding and entanglement events.</p> <p>PCA contributes to data collection and coordinating responses for marine mammals in distress within park boundaries (Helms pers. comm. 2016).</p> <p>Ocean Wise and DFO successfully sedated and disentangled five Steller Sea Lions with potentially lethal entanglements in B.C.</p>	<p>R3, R4</p>	<p>DFO, Province of B.C., ENGOs, First Nations, PCA</p>

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				during this progress report period (Szaniszlo pers. comm. 2016).		
	b) Fisheries observer reporting standards and guidelines	3 years	Completed	<p>Standards for fisheries observer reporting are managed through individual Integrated Fishery Management Plans and license conditions (Cottrell pers. comm. 2016).</p> <p>The Pacific Integrated Commercial Fisheries Initiative (PICFI) includes measures to address the need for enhanced fisheries monitoring, catch reporting, and enforcement. The Government of Canada has been providing funding to implement this program since 2008 (DFO 2015).</p> <p>The Policy for Managing Bycatch was completed in 2013 and applies to all commercial, recreational, and Aboriginal fisheries (DFO 2013a). The Guidance on Implementation of the Policy on Managing Bycatch (DFO 2013b) provides recommendations of priorities for data collection and monitoring to assess the need for requirements for measures to reduce bycatch of all species, including marine mammals.</p> <p>Between 2011 and 2015, BCCSN provided 11 training workshops to employees of Archipelago Marine Research to familiarize fisheries observers with marine mammal species identification (Danelesko pers. comm. 2016).</p>	R3, R4	DFO, ENGOS
	c) Develop solutions to	Ongoing	Completed	In 2010, DFO implemented mandatory reporting of incidental drowning of marine	P1, R3, R4	DFO

Actions	Approach	Timeline	Status	Details	Objectives	Participants
	predator interactions, quarterly reporting			<p>mammals at aquaculture sites. Mortalities must be reported within 24 hours of the incident. Data provided in reports includes date, time, and species identification, whether there were fish on site, mitigation measures in place prior to the incident, circumstances that led to the incident, and corrective measures to be taken after the incident (Shaw pers. comm. 2016).</p> <p>*Ongoing review and revision of reporting requirements as needed</p>		
	d) Develop and evaluate best management practices	Ongoing	Completed	<p>Certification standards and mandatory public reporting have led to the aquaculture industry developing best management practices to reduce Steller Sea Lion depredation and associated entanglement. These practices include making changes to the infrastructure and material of antipredator nets (Shaw pers. comm. 2016).</p> <p>*Ongoing review and revision of practices as needed</p>	P1, M2	DFO, industry
	e) Alternative gear types (fishing, aquaculture)	Ongoing as new information becomes available	In progress	<p>Industry-led shifts in some of the gear used in aquaculture operations are underway. These include changes to net materials used in antipredator nets to reduce the incidence of sea lion depredation and entanglement (Shaw pers. comm. 2016).</p> <p>The Pinniped Entanglement Group (PEG)⁴ is working with a company in Georgia to</p>	P1, M2	Alaska Department of Fish and Game (ADFG), Industry, NOAA

⁴ Pinniped Entanglement Group (PEG) was initiated by the U.S. National Marine Fisheries Service and Alaska Department of Fish and Game; also includes members from Canadian ENGOs and universities.

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>develop biodegradable packing bands to mitigate the threat of entanglement in marine debris to sea lions in the U.S. (Rotterman pers. comm. 2016).</p> <p>NOAA is undertaking a national effort to develop non-lethal deterrents for marine mammals, to reduce incidence of depredation and fisheries interactions (Rotterman pers. comm. 2016). This effort has included a three-day workshop to evaluate the risks of deterrents to marine mammals and to inform development of American guidelines on safely deterring both U.S. Endangered Species Act (ESA)-listed and non-listed marine mammals (Long et al. 2015).</p>		
<p>8. Determine risk associated with lifting of moratorium on offshore fossil fuel extraction</p>		<p>Ongoing</p>	<p>In progress</p>	<p>Several published studies and technical reports have assessed overall environmental and economic risks associated with offshore oil and gas development in Canadian waters (e.g., Elvin and Fraser 2012; Noble et al. 2013).</p> <p>A peer-reviewed study used marine mammal carcass recovery rates to illustrate that effects of offshore spills on marine mammals can be much greater than observed mortalities imply (Williams et al. 2011).</p> <p>There are no offshore fossil fuel extraction projects currently proposed or underway in B.C. waters. In the event a project is proposed, DFO conducts site-specific risk assessments.</p>	<p>P1, D1, D2, R3, M2 to M5</p>	<p>Academia</p>

Actions	Approach	Timeline	Status	Details	Objectives	Participants
Broad strategy 3: Research on Steller Sea Lion biology						
9. Data collection	a) Collection of tissue samples	Opportunistic ally	In progress	Steller Sea Lion tissue samples are collected during necropsies by DFO and members of the MMRN when possible (Cottrell pers. comm. 2016).	R2, R3, M1	DFO, PCA
	b) Brand re-sighting; photographs of branded animals	Ongoing	In progress	Annual dedicated brand re-sight surveys are undertaken by NOAA contractors in Canadian waters (Gearin pers. comm. 2016). NOAA collaborates with DFO, PCA, the University of British Columbia (UBC), Ocean Wise, and independent researchers to lead this effort and includes opportunistic data when available (Gearin pers. comm. 2016; Szaniszlo pers. comm. 2016). These brand re-sight data have been used to estimate apparent survival rates of Steller Sea Lions branded in California and Oregon (Wright et al. 2017).	R1, R2, R3, M1	NOAA, Academia, DFO, ENGOS, independent researchers, PCA
10. Contribute, support, foster research on:	a) Important foraging areas, seasonal distribution	Ongoing	In progress	Aerial survey data collected in summer, autumn, and winter from 2008 to 2013 were used to assess seasonal changes in Steller Sea Lion abundance and distribution in B.C. Dramatic seasonal shifts in distribution were observed, including far less aggregation in winter than in summer (Olesiuk 2018). UBC conducted boat-based surveys for Steller Sea Lions, including counts at haul-outs, scat collection, and brand re-sight data collection in July 2013.	P1, R2, R3, M1, M6	DFO, Academia, MFM, PCA

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>The Makah Fisheries Management (MFM) Marine Mammal Program has been conducting year-round boat-based surveys of Steller Sea Lions at haul-outs in NW Washington since 2007 to document seasonal distribution of Steller Sea Lions in this area (Scordino and Akmajian 2013).</p> <p>PCA conducts boat-based counts of Steller Sea Lions at three haul-out sites in Pacific Rim National Park during summer months (Yakimishyn pers. comm. 2016).</p>		
	b) Diet outside the breeding season	Ongoing	In progress	<p>DFO has been collecting winter scat samples in B.C. waters since 2013 to determine Steller Sea Lion diet outside the breeding season (Majewski pers. comm. 2016).</p> <p>Independent researchers collect scat samples at Long Beach Rocks (on the west coast of Vancouver Island, B.C.) four times per year; and continue to inform diet outside of breeding season (Szaniszlo pers. comm. 2016).</p> <p>A study by Oregon Department of Fish and Wildlife (ODFW) used 1,416 scat samples collected from Steller Sea Lions in Oregon and Northern California to describe the diet and seasonally important prey species of these animals. Diet composition varied between breeding and non-breeding seasons, with hake and salmonids as the most commonly identified prey in the summer, and hake and skate as the most commonly identified prey in the non-breeding season (Riemer et al. 2011).</p>	P1, R2, R3, M1, M6	Academia, DFO, Independent researchers, MFM, ODFW

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>776 Steller Sea Lion scat samples collected year-round in northern Washington State between 2010 and 2013 were analyzed to determine diet diversity, seasonal variation in diet, and overlap between the diets of Steller Sea Lions and California Sea Lions (Scordino et al. 2013).</p> <p>A total of 1,684 Steller Sea Lion scat samples collected during spring, summer, fall, and winter in Frederick Sound, Alaska were analyzed by UBC researchers to describe breeding and non-breeding season diet of Steller Sea Lions in this area. Pollock was the most important prey species in all seasons and years. Other significant prey types, including herring, hake, and arrowtooth flounder, showed seasonal variation in their importance (Tollit et al. 2015).</p> <p>Techniques to improve estimates of the proportions of various prey species in the diet of Steller Sea Lions have been developed by researchers with the UBC Marine Mammal Research Unit (e.g., Bowles et al. 2011).</p>		
	c) Maintenance of brand re-sight database	Ongoing	Completed (Ongoing effort)	<p>A central brand re-sight database is maintained by the ODFW and contains 12 years of data from all branding studies and brand re-sight surveys, including contributions from DFO (Gearin pers. comm. 2016).</p> <p>NOAA collaborates with Canadian researchers from DFO, PCA, UBC, Ocean</p>	R2, M1	<p>NOAA, ODFW, academia, DFO, ENGOS, independent researchers, PCA</p>

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				Wise, and other organizations and independent researchers to collect brand re-sight photographs (Gearin pers. comm. 2016).		
Broad strategy 4: Research to clarify identified threats						
11. Assess sustainability of total human caused mortality		Ongoing	Complete (US) In progress (Canada)	Based on currently available data, the total estimated human-caused mortality and serious injury for the Eastern Pacific U.S. stock of Steller Sea Lions (108 individuals) does not exceed the potential biological removal (PBR) (2,498 individuals) (Muto et al. 2017). PBR has not been calculated for Steller Sea Lions in Canadian waters. COSEWIC (2013) indicates that based on growth of the population, anthropogenic threats may be within sustainable levels.	P1, R4	NOAA, DFO, COSEWIC
12. Assess potential for fisheries competition for prey resources		Ongoing	In progress	UBC researchers used a nutrigenomic approach to detect and quantify nutritional stress in Steller Sea Lions (Spitz et al. 2015). This approach provides the potential for better understanding of when factors including competition with fisheries may be affecting Steller Sea Lions in Canada. Several studies undertaken by UBC and the Ocean Wise focused on Steller Sea Lion prey and energetic requirements (see review by Rosen et al. 2016) can inform the potential for competition between Steller Sea Lions and fisheries in Canada.	P1, R3, M6	Academia, ENGOs
13. Determine seasonal variation in		Ongoing	In progress	Wilson et al. (2012) modeled the relationship between summertime research disturbance and behaviour at rookeries in	D1, D2, R3, M3	Academia, NOAA, ENGOs

Actions	Approach	Timeline	Status	Details	Objectives	Participants
significance of research disturbance at haul-outs and rookeries				<p>Alaska. They found that although disturbance led to changes in proportions of sea lions exhibiting certain behaviours (agonistic, resting, and active), low-frequency disturbance did not appear to have long-term effects on sea lion behaviour or abundance at rookery sites.</p> <p>Keogh et al. (2013) studied endocrine profiles of Steller Sea Lion pups in Alaska during summer found that circulating concentrations of various stress hormones, including cortisol and thyroid hormones, were higher immediately following researchers' arrival on the rookery but that levels decreased with elapsed time following arrival, indicating that pups were able to begin to recover within the sampling period.</p>		
14. Gather information on entanglement rates observed by researchers		Ongoing	In progress	<p>Dedicated and opportunistic surveys to document Steller Sea Lion entanglements off the west coast of Vancouver Island, B.C. have been conducted since 2005. Preliminary results estimate that approximately 350 individual Steller Sea Lions were entangled in the Pacific Rim National Park Reserve and surrounding haul-outs between 2005 and 2013. Entangled individuals included members of both sexes and all age classes (Szaniszlo pers. comm. 2016).</p> <p>The minimum estimated mean annual mortality and serious injury rate due to interactions with fisheries between 2010 and 2014 in all American fisheries is 52 Steller Sea Lions (Muto et al. 2017).</p>	P1, R3, M1, M2	ENGOS, Independent researchers, MFM, NOAA

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>The Makah Fisheries Management Marine Mammal Program documents Steller Sea Lion entanglements during year-round boat-based surveys in northwestern Washington. Analyses of entanglement rates are in progress (Scordino pers. comm. 2016).</p>		
<p>15. Analysis of toxin and pathogen loading</p>		<p>Ongoing</p>	<p>In progress</p>	<p>Alava et al. (2012) analyzed PBDE and PCB concentrations in blubber of 22 Steller Sea Lions entering the Strait of Georgia, B.C. and found 80% of samples exceeded the toxicity reference value for PCBs.</p> <p>Recent analyses of pathogen loading in Steller Sea Lions in B.C. waters have not been conducted (Raverty pers. comm. 2016).</p> <p>Beckmen et al. (2016) analyzed concentrations of PCBs and DDT in tissues samples of Steller Sea Lions from eastern and western Alaska. This allowed for comparisons of patterns in the concentration of these toxins between tissues and between individuals from these two populations.</p> <p>Muscle samples from marine mammals, including 27 Steller Sea Lions that stranded along the Oregon and southern Washington coasts, were analyzed for levels of total mercury. Analyses concluded that total levels indicated limited accumulation (Wintle et al. 2011).</p> <p>A peer-reviewed study examined samples from free-ranging Steller Sea Lion pups and juveniles in Alaska to determine frequency</p>	<p>P1, R3, M2</p>	<p>Academia, ADFG, Alaska Veterinary Pathology Services, DFO, NMFS, WDFW</p>

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>of infection by a subset of common and pathogenic bacteria. Baseline data were obtained about strains of common bacteria in Steller Sea Lions from the western and eastern populations. Bacterial agents that can cause disease in animals with weakened immune systems or poor nutritional status were identified (Carrasco et al. 2011).</p>		
<p>16. Assess sources of biological pollutants</p>		<p>Ongoing</p>	<p>In progress</p>	<p>Scat samples collected from Steller Sea Lions in Washington State were analyzed for saxitoxin and domoic acid concentrations. Toxins in sea lion scat were significantly associated with a variety of planktivorous, benthic, and pelagic fish, indicating multiple sources and pathways for toxin exposure (Akmajian 2016).</p> <p>Peer-reviewed studies indicated that pathogenic parasites, including <i>Sarcocystis neurona</i>, were present in several stranded Steller Sea Lions sampled in southern B.C., Washington, and Oregon. The definitive host for this parasite is the Virginia Opossum, whose range is expanding northward (Barbosa et al. 2015). Based on temporal correlations between terrestrial runoff and sea otter deaths caused by these parasites, land-based runoff appears to be a major source of these biological pollutants (Shapiro et al. 2012).</p>	<p>R3, M2</p>	<p>Academia, MFM, B.C. Ministry of Agriculture and Lands, CDFW, NIAID, WDFW, ENGOS</p>
<p>17. Identify significant non-point source toxic contamination</p>		<p>Ongoing</p>	<p>In progress</p>	<p>In 2015, the Ocean Wise initiated "PollutionTracker," a monitoring framework with 51 stations along the coast of B.C. to provide coast-wide information about contaminant levels, types of contaminants,</p>	<p>R3, M2</p>	<p>Academia, DFO, ENGOS, WSDE, Environment</p>

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>and management. Contaminant data are collected from sediment and mussels and will be reported on every three years (Ross pers. comm. 2017).</p> <p>A peer-reviewed study assessed the regional impacts of municipal wastewater in the Strait of Georgia, B.C. Wastewater contributed <10% of PCBs but approximately 60% of PBDEs captured in the sediment. Wastewater is not likely to cause eutrophication or harmful algal blooms in this area; however, is a source of metals (including mercury and lead), and likely of pharmaceuticals and personal care products (Johannessen et al. 2015).</p> <p>Levels of PFCs were sampled in surface waters at several sites in Puget Sound, WA, and off the west coast of Vancouver Island, B.C. Levels of PFCs in samples from the relatively remote areas of Clayoquot and Barkley Sounds, B.C. were similar to those from the more urbanized sites in Puget Sound, suggesting that this toxic contamination results from regional sources, including wastewater and paper mills (Dinglasan-Panlilio et al. 2014).</p> <p>Ongoing research by the Ocean Wise's Ocean Pollution Research Program is focused on the concentrations and types of microplastic pollution off the coast of B.C (Ross pers. comm. 2017). Based on ingestion rates of microplastics by zooplankton at the base of the marine food web, adult salmon may ingest up to 91 microplastic particles per day, indicating</p>		<p>al consulting, Vancouver Fraser Port Authority</p>

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>that marine mammal predators, including Steller Sea Lions, are exposed to large amounts of this emerging contaminant through their prey (Desforges et al. 2015).</p> <p>Surface runoff in waters that flow into Puget Sound, WA were sampled in 2009 and 2010 as part of a study to understand the timing and sources of contaminant and pollutant loading in Puget Sound (Ecology 2011).</p>		
Broad strategy 5: Monitoring population status						
18. Support, contribute to coordination of range-wide surveys, every four years		Ongoing	Completed	<p>Aerial surveys of the B.C. coast continue to be conducted by DFO as part of range-wide breeding season surveys undertaken by DFO and NOAA. The most recent survey was conducted in 2013. The next range-wide surveys are planned for 2017 and 2021 (Majewski pers. comm. 2016).</p> <p>Analysis of Canadian aerial survey data collected by DFO indicates that the Canadian population has been growing rapidly, with non-pup counts increasing from 4,860 (SE = 254) during surveys between 1971-1982 surveys to 22,135 individuals in the most recent (2013) breeding season survey; growing at an average annual rate of 3.8% (Olesiuk 2018).</p> <p>NOAA surveys are ongoing as part of the Post-Delisting Monitoring Plan for this population. The most recent surveys of Steller Sea Lions in southeast Alaska were conducted in 2015 (Fritz et al. 2015), while</p>	P1, D1, D2, R1, M1	DFO, NOAA

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>the most recent counts from Washington, Oregon, and California occurred in 2013 (Muto et al. 2017). NOAA estimates the entire 2015 Eastern stock non-pup count as 52,139 (95% confidence interval: 45,428-59,111). This estimate does not account for individuals that are at sea (Muto et al. 2017).</p>		
<p>19. Consider biennial rookery surveys</p>		<p>Conducted in 2008, next survey is funding-dependent</p>	<p>Not started (Canada) In progress (U.S.)</p>	<p>Biennial rookery surveys have not been undertaken by DFO due to limited capacity (Majewski pers. comm. 2016). Biennial rookery surveys were conducted by NOAA in southeast Alaska in 2013 and 2015 (Muto et al. 2017); however, range-wide surveys of the Eastern population of Steller Sea Lions remain on a four-year cycle.</p>	<p>P1, D1, D2, R1, R2, M1</p>	<p>DFO, NOAA</p>
<p>Broad strategy 6: Outreach and communication</p>						
<p>20. Foster improved communication networks</p>	<p>a) Pro-actively build communication networks</p>	<p>3 years</p>	<p>In progress</p>	<p>A MMRN Advisory Team made up of representatives from DFO, Province of B.C., ENGOs, and PCA was formed in 2015 to facilitate communication regarding marine mammal response among agencies.⁵ The DFO-funded BC MMRN is a collaborative program between government, research, conservation and outreach groups, and others which aims to promote the conservation and protection of marine mammals and sea turtles in BC waters.</p>	<p>M1, M2</p>	<p>Academia, CCG, DFO, ECCC, ENGOs, NOAA, PCA, Province of B.C.</p>

⁵ CCG command systems are being strengthened under Canada’s national [Oceans Protection Plan](#) launched in 2016. TC, DFO, ECCC and their partners (e.g., Ocean Wise, Focus Wildlife, other contractors) are also reviewing and improving their communications to ensure readiness in the event of a spill.

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>UBC hosts an annual B.C. Marine Mammal Symposium to facilitate communication and sharing of information regarding marine mammal (including Steller Sea Lion) research, management, and outreach activities.</p> <p>The DFO Marine Mammal Coordinator meets with members of the whale watching community annually during pre- and post-season meetings to promote MMRN and BWV and to maintain communication with stakeholders in the whale watch industry (Cottrell pers. comm. 2016).</p> <p>See also action 20b for additional examples.</p>		
	<p>b) Trans-boundary and inter-jurisdictional collaboration</p>	<p>3 years</p>	<p>Completed (Ongoing effort)</p>	<p>DFO and several organizations in B.C. (PCA, the Ocean Wise, UBC, and independent researchers) assist U.S.-led research efforts by recovering tags and collecting brand re-sight data (Gearin pers. comm. 2016).</p> <p>Survey timing for range-wide Steller Sea Lion population assessments is coordinated between DFO and NOAA (Majewski pers. comm. 2016).</p> <p>PEG began a collaboration between NMFS and ADFG, but has recently expanded to include B.C. participants, including the Ocean Wise (Rotterman pers. comm. 2016; Szaniszlo pers. comm. 2016).</p> <p>Techniques for sea lion disentanglement developed in B.C. have been shared with</p>	<p>All</p>	<p>ADFG, DFO, ENGOS, NOAA, academia, independent researchers</p>

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>responders in Washington, Oregon, California, and Alaska through training workshops (Haulena pers. comm. 2016).</p> <p>An international workshop focused on pinniped entanglement was held at the Society for Marine Mammalogy Biennial conference in San Francisco in 2015 and included participants from B.C. (Szaniszlo pers. comm. 2016).</p> <p>A meeting hosted by NOAA attended by DFO, ADFG, ODFW, the U.S. National Park Service, UBC, the Ocean Wise, and several other organizations was held in spring 2016 to discuss, compile, and evaluate the results of monitoring efforts throughout the range of the eastern population of Steller Sea Lions (Majewski pers. comm. 2016).</p>		
	<p>c) Ongoing media communication and promotion of the MMR and BWW</p>	<p>Ongoing</p>	<p>Completed (Ongoing effort)</p>	<p>DFO fisheries officers provide information about BWW to stakeholders, members of the fishing industry, and members of the public (Cottrell pers. comm. 2016).</p> <p>ENGOS, including BCCSN, Cetus, MERS, and NCCS, promote BWW guidelines and responsible vessel operation around marine mammals through presentations, signage, and other outreach materials. Over 14,479 BWW brochures, 267 BWW posters, and 1,344 BWW stickers were distributed coast-wide by these organizations between 2011 and 2015.</p> <p>Gitga'at First Nation, HGMSG, Namgis First Nation inform fishing lodges and vessel</p>	<p>M1</p>	<p>DFO, ENGOS, First Nations, industry, PCA</p>

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>operators from the North Coast of B.C., Haida Gwaii, and Vancouver Island of appropriate marine mammal viewing protocols.</p> <p>Straitwatch promoted BWW guidelines via on-water and land-based programs in 2011, 2012, 2014, reaching over 4,945 vessel operators and passengers around Vancouver Island.</p> <p>Tourism industry associations operate according to codes of conduct/ Best Practices Guidelines to ensure responsible viewing of marine wildlife (North Island Marine Mammal Stewardship Association 2012; Pacific Whale Watch Association 2014).</p> <p>PCA includes information about BWW in their mandatory visitor orientation at Gwaii Haanas, B.C. and promotes BWW opportunistically in other parks (Helms pers. comm. 2016; Parks Canada Agency 2016).</p>		
	<p>d) Support, where feasible, independent education and awareness programs</p>	<p>Ongoing</p>	<p>Completed (Ongoing effort)</p>	<p>PEG has developed a “Lose the Loop” public outreach campaign aimed at reducing the number of Steller Sea Lion entanglements in marine debris. This campaign includes a video, posters, participation in outreach events, and ads in tide books (Rotterman pers. comm. 2016).</p> <p>Several ENGOs, including <u>Ocean Wise</u>, the <u>Global Ghost Gear Initiative</u>, and the <u>Living Oceans Society</u> have programs aimed at reducing marine debris through shoreline cleanups, retrieval of abandoned fishing</p>	<p>M1, M2</p>	<p>ENGOs, NOAA, PCA, ADFG, Olympic Coast National Marine Sanctuary, Seattle Aquarium, WDFW</p>

Actions	Approach	Timeline	Status	Details	Objectives	Participants
				<p>gear, and outreach activities.</p> <p>PCA develops and delivers interpretive programs focused on species at risk, including Steller Sea Lions (Helms, pers. comm. 2016).</p> <p>Sea View Marine Sciences and Archipelago Marine Research developed and delivered a First Nations education program that included information about threats to Steller Sea Lions (Hall pers. comm. 2016).</p> <p>MERS provides training to tourism operators, naturalists, and the public about marine mammal biology and conservation, including threats to Steller Sea Lions.</p> <p>The BCCSN provides information about anthropogenic threats to marine mammals, including Steller Sea Lions, to over 100,000 mariners, coastal citizens, and members of the public each year through outreach events, presentations, social media, and publications.</p> <p>The <u>Whale Trail</u>, a program to inspire marine mammal stewardship and raise awareness about threats to marine mammals, extended to B.C. in 2015 through cooperation with Ocean Wise.</p>		

3.2 Summary of progress towards conservation

3.2.1 Status of actions and approaches

Thirty-two actions and approaches from the management plan are identified in Table 2, columns 1 and 2. Of the 32 actions and approaches identified, 8 have been completed for Steller Sea Lions in Canadian waters (25%). Activities to meet 21 actions and approaches are in progress, and are not completed at this time (66%). The activities in progress may be ongoing with no specific endpoint. Activities in support of three approaches have not yet started (9%).

4 Concluding statement

Significant progress has been made toward meeting many of the objectives and strategies outlined in the management plan. These include:

- continued monitoring and assessment of the Steller Sea Lion population
- progress toward better understanding the year-round diet and prey requirements of Steller Sea Lions
- continued transboundary cooperation between DFO, NOAA, and other organizations in Canada and the U.S. to undertake Steller Sea Lion research and mitigate threats
- research into rates of entanglement for Steller Sea Lions and development of successful disentanglement methods
- ongoing outreach and education programs to raise awareness about threats to this population and how members of the public can aid in mitigating these threats

The majority of the actions and approaches outlined in the management plan are underway, and many of these activities are ongoing efforts that will continue to provide further understanding of Steller Sea Lion biology and anthropogenic threats to this species into the future.

Since the completion of the management plan, the Eastern Population Segment of Steller Sea Lions in American waters has been delisted (National Marine Fisheries Service 2013), and aerial surveys conducted by DFO indicate that the number of Steller Sea Lions in B.C. waters has been increasing at an average annual rate of 3.8% (Olesiuk 2018). Additionally, Steller Sea Lions are now breeding at all four historic rookeries in B.C., and have established at least two new rookeries (Olesiuk 2018). These trends toward continued population growth indicate that threats to Steller Sea Lions do not currently appear to have population-wide impacts and that conservation of this population is feasible.

5 References

- Akmajian, A.M. 2016. Year-round algal toxin exposure in free-ranging sea lions: Implications of trophic exposure for declining populations. M.Sc. Thesis, Western Washington University, Bellingham, Washington. xii + 126 p.
- Alava, J.J., D. Lambourn, P. Olesiuk, M. Lance, S.J. Jeffries, F.A.P.C. Gobas and P.S. Ross. 2012. PBDE flame retardants and PCBs in migrating Steller sea lions (*Eumetopias jubatus*) in the Strait of Georgia, British Columbia, Canada. *Chemosphere* 88: 855–864.
- Barbosa, L., C.K. Johnson, D.M. Lambourn, A.K. Gibson, K.H. Haman, J.L. Huggins, A.R. Sweeny, N. Sundar, S.A. Raverty, and M.E. Grigg. 2015. A novel *Sarcocystis neurona* genotype XIII is associated with severe encephalitis in an unexpectedly broad range of marine mammals from the northeastern Pacific Ocean. *International Journal for Parasitology* 45(9-10): 595–603.
- Bartier, P., pers. comm. 2018. Email communication with S. Shaikh. March 2018. Gwaii Haanas Geomatics Coordinator, Parks Canada, British Columbia.
- Beckmen, K.B., M.J. Keogh, K.A. Burek-Huntington, G.M. Ylitalo, B.S. Fadely, and K.W. Pitcher. 2016. Organochlorine contaminant concentrations in multiple tissues of free-ranging Steller sea lions (*Eumetopias jubatus*) in Alaska. *Science of the Total Environment* 542: 441–452.
- Bowles, E., P.M. Schulte, D.J. Tollit, B.E. Deagle, and A.W. Trites, 2011. Proportion of prey consumed can be determined from faecal DNA using real-time PCR. *Molecular Ecology Resources* 11: 530–540.
- Canadian Council of Ministers of the Environment. 1999. Canadian water quality guidelines for the protection of aquatic life: Debris (Marine). In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.
- Carrasco, S.E., K.A. Burek, K.B. Beckmen, J.L. Oaks, M.A. Davis, K.N.K. Baker, and J.A.K. Mazet. 2011. Aerobic oral and rectal bacteria of free-ranging Steller Sea Lion pups and juveniles (*Eumetopias jubatus*) in Alaska. *Journal of Wildlife Diseases* 47: 807–820.
- COSEWIC 2003. COSEWIC assessment and update status report on the Steller sea lion *Eumetopias jubatus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 47 p.
- COSEWIC. 2013. COSEWIC assessment and status report on the Steller Sea Lion *Eumetopias jubatus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 54 p.
- Cottrell, P., pers. comm. 2016. In-person communication with C. McMillan. November 2016. Marine Mammals Coordinator, Pacific Region, Fisheries and Oceans Canada, Vancouver, British Columbia.

- Danelesko, T., pers. comm. 2016. E-mail correspondence with C. McMillan. November 2016. Coordinator, B.C. Cetacean Sightings Network, Ocean Wise, Vancouver, British Columbia.
- Desforges, J.-P. W., M. Galbraith, and P.S. Ross. 2015. Ingestion of microplastics by zooplankton in the northeast Pacific Ocean. *Archives of Environmental Contamination and Toxicology* 69: 320-330.
- DFO. 2011. Management Plan for the Steller Sea Lion (*Eumetopias jubatus*) in Canada [Final]. Species at Risk Act Management Plan Series. Fisheries and Oceans Canada, Ottawa. vi + 69 p.
- DFO. 2013a. Policy on managing bycatch. Accessed November 2016.
- DFO. 2013b. Guidance on implementation of the policy on managing bycatch. Accessed December 2016.
- DFO. 2015. Pacific Integrated Commercial Fisheries Initiative (PICFI). Accessed December 2016.
- Dinglasan-Panlilio, M.J., S.S. Prakash, and J.E. Baker. 2014. Perfluorinated compounds in the surface waters of Puget Sound, Washington and Clayoquot and Barkley Sounds, British Columbia. *Marine Pollution Bulletin* 78: 173–180.
- Ecology. 2011. Control of toxic chemicals in Puget Sound: Phase 3 data and load estimates. Washington State Department of Ecology, Publication No. 11-03-010.
- Elvin, S.S. and G.S. Fraser. 2012. Advancing a national strategic environmental assessment for the Canadian offshore oil and gas industry with special emphasis on cumulative effects. *Journal of Environmental Assessment Policy and Management* 14: 1–37.
- Environment and Climate Change Canada. 2016. National Pollutant Release Inventory. Accessed December 2016.
- Fritz, L., K. Sweeney, R. Towell, and T. Gelatt. 2015. Results of Steller sea lion surveys in Alaska, June-July 2015. Memorandum to D. DeMaster, J. Balsiger, J. Kurland, and L. Rotterman, December 28, 2015. Available from Marine Mammal Laboratory, AFSC, NMFS, 7600 Sand Point Way NE, Seattle, WA 98115.
- Gearin, P., pers. comm. 2016. Telephone correspondence with C. McMillan. December 2016. Research Biologist, National Oceanic and Atmospheric Administration, Seattle, Washington.
- Hall, A., pers. comm. 2016 Telephone correspondence with C. McMillan. November 2016. President, Porpoise Conservation Society, Victoria, British Columbia.
- Haulena, M., pers. comm. 2016. Telephone correspondence with C. McMillan. December 2016. Veterinarian, Ocean Wise, Vancouver, British Columbia.

- Helms, S., pers. comm. 2016. Telephone correspondence with C. McMillan. October 2016. Resource Management Officer, Gulf Islands National Park Reserve, Parks Canada, Sidney, British Columbia.
- Herborg, M., pers. comm. 2018. Email communication with S. Shaikh. Environmental Emergency Coordinator, MPO, Sidney, British Columbia.
- Johannessen, S.C., R.W. Macdonald, B. Burd, A. van Roodselaar, and S. Bertold. 2015. Local environmental conditions determine the footprint of municipal effluent in coastal waters: A case study in the Strait of Georgia, British Columbia. *Science of the Total Environment* 508: 228–239.
- Keogh, M.J., S. Atkinson, and J.M. Maniscalco. 2013. Body condition and endocrine profiles of Steller sea lion (*Eumetopias jubatus*) pups during the early postnatal period. *General and Comparative Endocrinology* 184: 42–50.
- Long, K.J., M.L. DeAngelis, L.K. Engleby, D.A. Fauquier, A.J. Johnson, S.D. Kraus, and S.P. Northridge. 2015. Marine Mammal Non-Lethal Deterrents: Summary of the Technical Expert Workshop on Marine Mammal Non-Lethal Deterrents, 10-12 February 2015, Seattle, Washington. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-50. 38 p.
- Majewski, S., pers. comm. 2016. In-person communication with C. McMillan. October 2016. Research Biologist, Fisheries and Oceans Canada, Nanaimo, British Columbia.
- McAllister, I., pers. comm. 2016. Telephone correspondence with C. McMillan. December 2016. Executive Director, Pacific Wild, Denny Island, British Columbia.
- Muto, M.M., V.T. Helker, R.P. Angliss, B.A. Allen, P.L. Boveng, J.M. Breiwick, M.F. Cameron, P.J. Clapham, S.P. Dahle, M.E. Dahlheim, B.S. Fadely, M.C. Ferguson, L.W. Fritz, R.C. Hobbs, Y.V. Ivashchenko, A.S. Kennedy, J.M. London, S.A. Mizroch, R.R. Ream, E.L. Richmond, K.E.W. Sheldon, R.G. Towell, P.R. Wade, J.M. Waite, and A.N. Zerbini. 2017. Alaska Marine Mammal Stock Assessments, 2016. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-355, 366 p.
- National Marine Fisheries Service. 2013. Status Review of The Eastern Distinct Population Segment of Steller Sea Lion (*Eumetopias jubatus*). 144pp + Appendices. Protected Resources Division, Alaska Region, National Marine Fisheries Service, 709 West 9th St, Juneau, Alaska 99802.
- Noble, B., S. Ketilson, A. Aitken, and G. Poelzer. 2013. Strategic environmental assessment opportunities and risks for Arctic offshore energy planning and development. *Marine Policy* 39: 296–302.
- North Island Marine Mammal Stewardship Association. 2012. NIMMSA Code of Conduct. Accessed November 2016.
- Olesiuk, P.F. 2018. Recent trends in abundance of Steller Sea Lions (*Eumetopias jubatus*) in British Columbia. DFO Canadian Science Advisory Secretariat Research Document. 2018/006. v + 68 p.

- Pacific Whale Watch Association. 2014. Pacific Whale Watch Association Guidelines. Accessed November 2016.
- Parks Canada Agency. 2006. Research and Collection Permit System. Accessed December 2016.
- Parks Canada Agency. 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 p.
- Raverty, S., pers. comm. 2016. Telephone correspondence with C. McMillan. November 2016. Veterinary Pathologist, Ministry of Agriculture and Lands, Animal Health Centre, Abbotsford, British Columbia.
- Riemer, S.D., B E. Wright, and R.F. Brown. 2011. Food habits of Steller sea lions (*Eumetopias jubatus*) off Oregon and northern California, 1986-2007. *Fishery Bulletin* 109: 369–381.
- Rosen, D.A.S., A.G. Hindle, C.D. Gerlinsky, E. Goundie, G.D. Hastie, B.L. Volpov, and A.W. Trites. 2016. Physiological constraints and energetic costs of diving behaviour in marine mammals: a review of studies using trained Steller sea lions diving in the open ocean. *Journal of Comparative Physiology B*: 1–22.
- Ross, P., pers. comm. 2017. In-person communication with C. McMillan. January 2017. Director and Senior Scientist, Ocean Pollution Research Program, Ocean Wise, Vancouver, British Columbia.
- Ross, P.S., H. Frouin, N.J. Dangerfield, N.F. Crewe, C. Dubetz, M.B. Fischer, T.L. Fraser, and A.R.S. Ross. 2012. Sediment concentrations of PCBs, PBDEs, PCDDs and PCDFs from disposal at sea sites at Brown Passage and Douglas Channel, British Columbia in 2011. *Canadian Data Report of Fisheries and Aquatic Sciences* 1243: ix + 113 p.
- Ross, P.S., K.A. Harris, N.J. Dangerfield, N.F. Crewe, C.P. Dubetz, M.B. Fischer, T.L. Fraser, and A.R.S. Ross. 2011. Sediment concentrations of PCBs, PBDEs, PCDDs and PCDFs from the Point Grey and Sand Heads disposal at sea sites, British Columbia in 2010. *Canadian Data Report of Fisheries and Aquatic Sciences* 1239: 1–115.
- Ross, P.S., M. Noël, D. Lambourn, N. Dangerfield, J. Calambokidis, and S. Jeffries. 2013. Declining concentrations of persistent PCBs, PBDEs, PCDEs, and PCNs in harbor seals (*Phoca vitulina*) from the Salish Sea. *Progress in Oceanography* 115:160–170.
- Rotterman, L., pers. comm. 2016. Telephone correspondence with C. McMillan. December 2016. Steller Sea Lion Coordinator, Protected Resources Division, Alaska Region, National Marine Fisheries Service, Anchorage, Alaska.
- Scordino, J., pers. comm. 2016. Telephone correspondence with C. McMillan. December 2016. Marine Mammal Biologist, Makah Fisheries Management, Makah Tribe, Neah Bay, Washington.
- Scordino, J.J. and A.M. Akmajian. 2013. Chapter 9: California and Steller sea lion seasonal use patterns at haulouts in northwest Washington. In *Research and Education/Outreach to*

Benefit ESA Listed and Recently Delisted Marine Mammals of Northwest Washington: Final report for Species Recovery Grant award NA10NMF4720372.

- Scordino, J.J., A.M. Akmajian, and S.D. Riemer. 2013. Chapter 5: California and Steller sea lion diets in northwest Washington, 2010-2013. In Research and Education/Outreach to Benefit ESA Listed and Recently Delisted Marine Mammals of Northwest Washington: Final report for Species Recovery Grant award NA10NMF4720372.
- Shapiro, K., M. Miller, and J. Mazet. 2012. Temporal association between land-based runoff events and California sea otter (*Enhydra lutris nereis*) protozoal mortalities. *Journal of Wildlife Diseases* 48: 394–404.
- Shaw, K., pers. comm. 2016. Telephone correspondence with C. McMillan. November 2016. Senior Aquaculture Biologist, Fisheries and Oceans Canada, Campbell River, British Columbia.
- Spitz, J., V. Becquet, D.A.S. Rosen, and A.W. Trites. 2015. A nutrigenomic approach to detect nutritional stress from gene expression in blood samples drawn from Steller sea lions. *Comparative Biochemistry and Physiology Part A: Molecular and Integrative Physiology* 187: 214–223.
- Szaniszlo, W., pers. comm. 2016. Telephone correspondence with C. McMillan. October 2016. Research Associate, Ocean Wise, Vancouver, British Columbia.
- Tollit, D.J., M.A. Wong, and A.W. Trites. 2015. Diet composition of Steller sea lions (*Eumetopias jubatus*) in Frederick Sound, southeast Alaska: A comparison of quantification methods using scats to describe temporal and spatial variabilities. *Canadian Journal of Zoology* 376: 361–376.
- Williams, R., S. Gero, L. Bejder, J. Calambokidis, S.D. Kraus, D. Lusseau, A.J. Read, and J. Robbins. 2011. Underestimating the damage: Interpreting cetacean carcass recoveries in the context of the Deepwater Horizon/BP incident. *Conservation Letters* 4: 228–233.
- Wilson, K., L. Fritz, E. Kunisch, K. Chumbley, and D. Johnson. 2012. Effects of research disturbance on the behavior and abundance of Steller Sea Lions (*Eumetopias jubatus*) at two rookeries in Alaska. *Marine Mammal Science* 28(1): E58 – E74.
- Wintle, N.J.P., D.A. Duffield, N.B. Barros, R.D. Jones, and J.M. Rice. 2011. Total mercury in stranded marine mammals from the Oregon and southern Washington coasts. *Marine Mammal Science* 27(4): 268–278.
- Wray, J., pers. comm. 2016. E-mail correspondence with C. McMillan. November 2016. Founder, North Coast Cetacean Society, Gil Island, British Columbia.
- Wright, B.E., R.F. Brown, R.L. DeLong, P.J. Gearin, S.D. Riemer, J.L. Laake, and J.J. Scordino (2017). Survival rates of eastern Distinct Population Segment Steller sea lions from Oregon and California. *Journal of Mammalogy* 98(3): 885-894.

Yakimishyn, J., pers. comm. 2016. Telephone correspondence with C. McMillan. December 2016. Acting Monitoring Ecologist, Pacific Rim National Park Reserve of Canada, Parks Canada, Ucluelet, British Columbia.

Ziccardi, M.H., S.M. Wilkin, T.K. Rowles, and S. Johnson. 2015. Pinniped and cetacean oil spill response guidelines. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-52, 138 p.

Appendix A: Acronyms

ADFG	Alaska Department of Fish and Game
BCCSN	British Columbia Cetacean Sightings Network
B.C.	British Columbia
BWW	Be Whale Wise
CCGS	Canadian Coast Guard Services
CCME	Canadian Council of Ministers of the Environment
CDFW	California Department of Fish and Wildlife
Cetus	Cetus Research and Conservation Society
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DDT	dichlorodiphenyl trichloroethane
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
ENGOS	Environmental Non-governmental Organizations
ESA	U.S. Endangered Species Act
HGMSG	Haida Gwaii Marine Stewardship Group
KCDNRP	King County Department of Natural Resources and Parks
MERS	Marine Education and Research Society
MFM	Makah Fisheries Management
MMR	Marine Mammal Regulations under Canada's Fisheries Act
MMRN	Marine Mammal Response Network
NCCS	North Coast Cetacean Society
NIAID	National Institute of Allergy and Infectious Diseases
NMFS	U.S. National Marine Fisheries Service
NOAA	U.S. National Oceanic and Atmospheric Administration
ODFW	Oregon Department of Fish and Wildlife
OPP	Oceans Protection Plan
PBDEs	polybrominated diphenyl ethers
PBR	Potential Biological Removal
PCA	Parks Canada Agency
PCBs	polychlorinated biphenyls
PCNs	polychlorinated naphthalenes
PCDDs	polychlorinated dibenzo-p-dioxins
PCDFs	polychlorinated dibenzofurans
PEG	Pinniped Entanglement Group –
PFCs	perfluorinated compounds
PICFI	Pacific Integrated Commercial Fisheries Initiative
SARA	Species at Risk Act
TC	Transport Canada
UBC	University of British Columbia
WDFW	Washington Department of Fish and Wildlife
WSDE	Washington State Department of Ecology