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Report on the Progress of Management Plan Implementation for the Sea Otter (*Enhydra lutris*) in Canada for the Period 2014 to 2020

Sea Otter

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Canada

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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 72 of the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the competent ministers must monitor the implementation of the management plan and must assess its implementation 5 years after the plan is included in the public registry, and in every subsequent 5 year period until its objectives have been achieved.

Reporting on the progress of management plan implementation requires reporting on the collective efforts of the competent ministers, provincial and territorial governments, and all other parties involved in conducting activities that contribute to 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 broad 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 management plan implementation (progress report).

The Minister of Fisheries and Oceans and the Minister responsible for the Parks Canada (PC) are the competent ministers under SARA for the Sea Otter and have prepared this progress report.

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 Fisheries and Oceans Canada (DFO), PC or any other jurisdiction alone. The cost of recovering and conserving species at risk is shared amongst different constituencies. All Canadians are invited to join in supporting and implementing the management plan for the Sea Otter for the benefit of the species and Canadian society as a whole.

Acknowledgments

This progress report was prepared by Tatiana Lee with input from Paul Cottrell, Annely Greene, Linda Nichol, Robyn Abernethy, Christie McMillan, Heather Brekke, Rhona Govender, Jessica Banning (DFO); as well as Parks Canada. DFO would like to express its appreciation to all individuals and organizations who contribute to the conservation of the Sea Otter.

Executive summary

The Sea Otter (*Enhydra lutris*) status was changed from threatened to special concern under the *Species at Risk Act* (SARA) in 2009. The "Management Plan for the Sea Otter (*Enhydra lutris*) in Canada" (DFO 2014) was finalized and published on the Species at Risk Public Registry in 2014.

The main classes of threats identified for the Sea Otter include: environmental contaminants (oil spill), illegal kill, entanglement in fishing gear, environmental contaminants (persistent bioaccumulating toxins), disease and parasites, vessel strikes, human disturbance, and directed harvest. Adverse effects to the species may arise from the effect of any combination of threats, in conjunction with limiting factors.

The management objective for the Sea Otter is to conserve abundance and distribution as observed in 2008, and promote the continued population growth and expansion into formerly occupied regions such as Haida Gwaii, Barkley Sound, and north mainland British Columbia coast. The management plan identifies3 performance measures and 16 conservation measures to support this objective.

The "Report on the Progress of Management Plan Implementation for the Sea Otter (*Enhydra lutris*) in Canada for the Period 2014 to 2020" (progress report) reports on the progress made by Fisheries and Oceans Canada (DFO) and its partners, along with other federal agencies, and highlights some of the known achievements of the broader conservation community towards implementing the management plan and achieving its objective. Due to delays in completing the report on a 5 year cycle, an extension to the reporting period was established in order to capture the most up to date information. During this time period, progress has been made in:

- Documenting Sea Otter population growth since 2008 and expansion of geographic range beyond the 2008 continuous range (Nichol et al. 2015; DFO 2020). These findings:
    - partially satisfy the management plan objective in the short term and
    - meet 2 of the 3 management plan performance measures, established to gauge progress towards conservation, namely:
        - did the geographic range of Sea Otters continue to expand naturally beyond the 2008 continuous range?
        - did the number of Sea Otters increase (compared to the 2008 estimate) to correspond to the range expansion?

Since re-introduction, the Sea Otter population in Canada has grown and expanded its range (Nichol et al. 2015; DFO 2020). While the growth and expansion of the Sea Otter population in Canada is progressing towards meeting the management objective, additional effort is required to continue population growth and expansion into formerly occupied regions and conserve abundance and distribution for the future. To do so, it is important to better understand and mitigate threats to Sea Otters and their habitat; including toxic spill response planning, fisheries interactions, human disturbances and potential impacts of Sea Otters on related species at risk such as the endangered Northern Abalone.

Risk posed by these threats may change overtime; for example, as the Sea Otter population increases and expands into new regions, the risk of fisheries interactions, vessel strikes and other human disturbances may increase (Gerber and VanBlaricom 1998). Another example is

the increased risk of oil spills that may come with an increase in tanker traffic stemming from several energy related projects. Risk of oil spills is the greatest threat to Sea Otters.

It is important to recognize that growth trends vary geographically across the Sea Otter population, which has implications for conservation and management of this species. Threats may affect different areas in different ways, and their effects may be mediated by small scale differences in population dynamics (DFO 2020). Keeping the varying population trends across the species' range in mind, continuing to regularly monitor Sea Otter population change, range expansion and range use will assist in determining if the management objective has been achieved for this population within Canada. It will also aid in understanding influences and interactions of Sea Otter with other species at risk.

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1. Introduction

The “Report on the Progress of Management Plan Implementation for the Sea Otter (*Enhydra lutris*) in Canada for the Period 2014 to 2020” (progress report) outlines the progress made towards meeting the objective listed in the “Management Plan for the Sea Otter (*Enhydra lutris*) in Canada” (management plan) (Fisheries and Oceans Canada [DFO] 2014) during the indicated time period. The reporting period covers 6 years of management plan implementation in order to reflect the most up to date information. The progress report is considered as 1 in a series of documents for this species that are linked and should be taken into consideration together with the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status reports (COSEWIC 2000; 2007), and the management plan (DFO 2014).

Section 2 of the progress report summarizes key information on the threats to the species, the management objective, and conservation measures and approaches for meeting this objective. For more details, readers should refer to the management plan (DFO 2014). For more information on the status of the Sea Otter population in Canada, see section 3, which reports on the progress of conservation measures identified in the management plan in support of achieving the management objective. Section 4 summarizes the progress toward achieving the management objective.

2. Background

2.1 COSEWIC assessment summary

The listing of the Sea Otter as threatened under the *Species at Risk Act* (S.C. 2002, c.29) (SARA) in 2003 led to the development and publication of the Recovery Strategy for the Sea Otter (*Enhydra lutris*) in Canada in 2007 (Sea Otter Recovery Team 2007). The recovery strategy is consistent with the information provided in the 2000 COSEWIC status report (COSEWIC 2000).

In 2007, COSEWIC re-examined and changed the status of the Sea Otter from threatened to special concern (COSEWIC 2007). Subsequently, the SARA status of the Sea Otter was changed to special concern in 2009, which led to the development and publication of the management plan in 2014 (DFO 2014). The management plan is consistent with the information provided in the 2007 COSEWIC status report (COSEWIC 2007). This information is included in section 1 of the management plan.

Section 4.1 of the management plan provides information on the threats to the species’ survival and conservation.

2.2 Conservation

This section summarizes the information found in the management plan (DFO 2014) on the management objective and associated approaches necessary for the conservation of the Sea Otter and on performance measures that provide a way to define and measure progress toward achieving the management objective. Table 2 in this report outlines the progress made in implementing the 16 conservation measures identified in the management plan to support this objective.

Section 5 of the management plan (DFO 2014) identified the following management objective:

> To conserve abundance and distribution in Canada as observed in 2008, and promote the continued population growth and expansion into formerly occupied regions such as Haida Gwaii, Barkley Sound, and north mainland British Columbia coast.

The Sea Otter management plan (DFO 2014) recommended an approach to conservation that:

> Recognizes that Sea Otter populations have the potential to recover from depletion, but also that threats could limit or even reverse the current population trend if not addressed. Therefore, the conservation approach focuses on identifying and reducing threats that may negatively affect abundance and distribution of Sea Otters.

The Sea Otter management plan also noted that Sea Otter distribution and abundance are inter-related (DFO 2014):

> Unoccupied habitat is sequentially occupied as the number of Sea Otters in an area approaches carrying capacity. Given the relationship between range size and population abundance, coupled with the localized movements of individuals, it follows that increasing the geographic range to reduce the risk from human induced mortality will also result in an increased abundance of Sea Otters. The expansion of the geographic range of Sea Otters in coastal British Columbia will reduce population level vulnerability to catastrophic events such as oil spills.

Section 7 of the Sea Otter management plan (DFO 2014) outlined 3 objective based performance measures to be used to monitor progress:

- did the geographic range of Sea Otters continue to expand naturally beyond the 2008 continuous range?
- did the number of Sea Otters increase (compared to the 2008 estimate) to correspond to the range expansion?
- were threats better identified or clarified? Were threats to Sea Otters and their habitat mitigated to provide for continued conservation?

The questions outlined in the performance measures are answered in table 2 of this report.

3. Progress towards conservation

The management plan for the Sea Otter divides the conservation effort into 3 broad strategies: 1) management, 2) research and monitoring, and 3) outreach and communication. Conservation measures that support the management objective are detailed in the management plan. Progress in carrying out these broad strategies is reported below in section 3.1 (table 1) and progress in meeting performance measures of the management plan is listed in section 3.2 (table 2).

3.1 Measures supporting conservation

Table 1 provides information on the implementation of conservation measures undertaken to address the broad strategies and approaches identified in the management plan. The timelines

indicated are based on the implementation schedule (table 3) in the management plan. Each conservation measure has been assigned 1 of 4 statuses:

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

Table 1. Details of conservation measures supporting the management objective outlined in the management plan for the Sea Otter, from 2014 to 2020.

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
Broad strategy 1, approach 1	Support the Pacific Marine Mammal Response Program to monitor Sea Otter health and causes of mortality.	Ongoing	In progress	The Fisheries and Oceans Canada (DFO) led Marine Mammal Response Program (MMRP) continued to respond to reports of any incidents involving Sea Otter. When feasible, field staff investigates, assesses the animal(s), collects samples for analyses and/or conducts necropsies as appropriate. The feasibility of the investigations refers to logistics such as location, weather conditions and the state of decomposition given that the vast number of incidents are dead animals (Cottrell pers. comm. 2022). From January 01, 2014 through December 31, 2020, 54 incidents involving Sea Otter were reported to the MMRP. An increase in the number of dead Sea Otters was noted in 2020 and this is consistent with observations in Washington State. Necropsy results have not found a common cause to explain the increase in deaths (Cottrell pers. comm. 2022).	**DFO,** Environmental Non-governmental Organizations (ENGOs), Indigenous groups (IG), Parks Canada (PC)
Broad strategy 1, approach 2	Support the enforcement of the *Fisheries Act, Marine Mammal Regulations*, *Aboriginal Communal Fishing*	Ongoing	In progress	DFO and PC have supported the enforcement of federal legislation relating to Sea Otter on an ongoing basis through the operational work of DFO and PC staff. Enforcement of provincial regulations is the	**BC, DFO, IG, PC**

[1] When more than one participant is associated with a conservation measure, they are listed in alphabetical order. Lead participant(s) is/are listed on top and in bold.

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
	Licences Regulations, Oceans Act, Canada National Parks Act, National Marine Conservation Areas Act, and British Columbia provincial *Wildlife Act*			purview of British Columbia (BC) conservation officers. To support priority resource access, DFO reviews all Indigenous harvest interests that are identified to DFO, including any for Sea Otter. At time of writing, Food, Social or Ceremonial (FSC) access to Sea Otters has not been permitted by DFO.	
Broad strategy 1, approach 3	Develop Sea Otter specific measures for inclusion into catastrophic spill response programs	2018	In progress	As part of the Government of Canada's national Ocean Protection Plan (OPP) launched in November 2016 and the Planning for Integrated Environmental Response (PIER) Program, 8 Area Response Plans covering the entire BC coast have either been published or are under development. Published plans can be found in the Government of Canada's Science Catalogue. In the event of a spill, members of the PIER Program represent DFO in the Environmental Unit and engage subject matter experts within DFO for the implementation of species specific response measures when needed. The DFO Marine Mammal Plan for spill response, which includes Sea Otter specific	**Canadian Coast Guard (CCG), DFO, PC,** IG

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
				measures, is in preparation and is anticipated to be published in 2023.[2] Additionally, DFO has provided funding to the Vancouver Aquarium in support of the Marine Mammal Rescue Centre. This funding focuses on increasing training and equipment capacity to improve overall preparedness for Sea Otter oil spill response. Since 2015, the Nuu-chah-nulth Tribal Council has been collecting marine traditional knowledge for all Nuu-chah-nulth Nations for the purpose of identifying important areas and species to protect in the event of an oil spill. Western Canada Marine Response Corporation held a Shoreline Cleanup Assessment Training course in 2016 for Uu-a-thluk staff and members from Nuu-chah-nulth Nations.	
Broad strategy 1, approach 4	Support oversight and monitoring of any future First Nation harvest of Sea Otters	To be determined (TBD)	Not started	Permit requests for activities impacting any marine mammals are reviewed by DFO, and other agencies as appropriate. As indicated in broad strategy 1, approach 2, FSC permits for access to Sea Otter hunting have not been issued by DFO at time of writing, and as such, there is currently no monitoring of First Nations harvest of Sea	**DFO, IG, PC**

[2] Response for oiled marine mammal training has taken place in 2021-2022 and is planned for 2023 for federal staff, First Nations and non-governmental organizations.

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
				Otters. Should First Nations harvest of Sea Otters be permitted in the future, a management regime, including oversight and monitoring by DFO would be established through existing regulatory authorities for authorizing and managing FSC fishing activities, including the *Fisheries Act*, *Marine Mammal Regulations*, and Communal Licenses pursuant to the *Aboriginal Communal Fishing Licences Regulations*.	
Broad strategy 1, approach 5	Support the development of Sea Otter viewing guidelines	2018	Not started	Sea Otter viewing guidelines have not been developed by DFO. It is illegal to disturb a marine mammal under the *Marine Mammal Regulations* of the *Fisheries Act*. Recent amendments provide clarity giving examples of what 'disturbing' marine mammals entail and identify approach distances tailored to particular circumstances. However, approach distances were not established for Sea Otters and as such the general minimum 100 m approach distance is applied. In 2020, British Columbia Cetacean Sightings Network (BCCSN), an Ocean Wise initiative with support from DFO, developed an Otter Identification Guide for British Columbia that includes best practices for viewing and reporting dead or distressed Sea Otters. These best practices provide interim suggestions, but are not considered viewing	**DFO,** Ocean Wise, PC

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
				guidelines. As such this conservation measure is considered not started.	
Broad strategy 1, approach 6	Examine and support mitigation options, such as spatial/temporal closures, in areas where fisheries interactions are known to occur.	Ongoing	Not started	No spatial or temporal fisheries closures have been considered to mitigate Sea Otter fisheries interactions. During the period of this progress report, 1 incident was reported where a Sea Otter was entangled in what appeared to be a fishing line that did not result in a mortality event (Galbraith pers. comm. 2021). In addition, as part of meeting the requirements under the *United States Marine Mammal Protection Act* Import Provision regulations, DFO, in collaboration with the Canadian commercial wild capture and aquaculture fishing industry, submitted Comparability Finding Applications for 323 Canadian fisheries (including aquaculture) that export products to the United States (US). These applications consolidated marine mammal fishery interactions and bycatch information from all sources[3] related to wild capture commercial fisheries and aquaculture operations for the past 5 fishing seasons (2015 to 2019). Based on reports submitted, there were no incidents of interactions between wild capture and	**DFO**, fishing industry

[3] Sources include fisher-dependent reporting, records from DFO's Marine Mammal Response Program, and fisher-independent sources for some fisheries.

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
				aquaculture commercial fisheries and Sea Otters during this period. Only 1 fisheries interaction with Sea Otters has been recorded during the period of this progress report, and as a result mitigation options have not been examined or deemed necessary. As such this conservation measure is considered not started. Should Sea Otter fisheries interactions occur in future, it would then become necessary to examine, implement and support mitigation options.	
Broad strategy 2, approach 1	Undertake annual surveys of the Sea Otter population in index areas, areas of range expansion, and other portions of their range as needed, as well as a total population survey every 5 years, to monitor population trends and distribution.	Ongoing	In progress	DFO has led regular rangewide surveys every 5 years for Sea Otters in coastal British Columbia since 2001. Nichol et al. (2015) provides analyses of abundance estimates and extent of range expansion based on the 2013 range wide survey. Results from the most recent survey, conducted in 2017, indicate that the total Sea Otter population in BC has increased from 4,712 in 2008 to 8,110 in 2017. DFO (2020) evaluated trends in the growth of Sea Otter population in BC from 1977 to 2017, and results indicate that overall, the Sea Otter population in Canada is growing and expanding. With respect to evaluation of range expansion, surveyed areas with at	**DFO,** Academia, Haida Nation, Hakai, PC

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
				least 1 raft of Sea Otters were considered occupied; however, newly surveyed areas where occasional single Sea Otters were encountered were not considered occupied and not included in the population count. Annual rates of increase and growth trends vary geographically, with long occupied areas nearing carrying capacity and exponential growth observed in more recently occupied areas. These subregional patterns reflect the expected pattern of density dependent growth for this species (DFO 2020). In addition to range wide surveys, DFO supports annual index site surveys off the west coast of Vancouver Island and undertakes annual surveys of portions of the range near the range expansion front. Research from several other groups contributes to the implementation of this conservation measure. From 2014 through 2017, Hakai Institute conducted winter surveys each year for Sea Otters at sites on BC's central coast. The survey data was not published at time of writing (Rechsteiner pers. comm. 2021). In 2019, the first population survey in Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site (Gwaii Haanas) was	

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
				completed by PC in collaboration with DFO and the Haida Nation. Results of the survey suggest that early population establishment is occurring in these areas. Subsequent Gwaii Haanas population surveys will be completed at least every 5 years (Nichol pers. comm. 2021).	
Broad strategy 2, approach 2	Support development and use of alternative population survey methods to better quantify uncertainty in population estimates.	2018	In progress	Nichol et al. 2015 provided a summary of survey methods used to date to assess the Sea Otter population in Canada. These have primarily been combinations of small boat, fixed wing aircraft, and/or shore based surveys. New or alternative survey methods have not been fully tested or implemented within the timeframe of this report. Testing the use of unmanned aerial vehicle (drone) technology as a complement to boat surveys is underway (Nichol pers. comm. 2021).	**DFO**
Broad strategy 2, approach 3	Assess the vulnerability of the Sea Otter population to oil spills by modelling spatial and temporal risk.	2018	In progress	Several studies were completed from 2014 to 2020 assessing the vulnerability of Sea Otters to oil spills. These studies considered a range of criteria including species distribution, behaviour, and biology as well as effects observed in historic spills. While extensive modelling and assessment of risk has been completed with respect to this measure, this measure is considered 'in progress' as conditions are constantly changing and projections should be updated	**Alaska Department of Fish and Game, DFO**

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
				as new data becomes available. Thornborough et al. (2017) developed an assessment framework to identify vulnerable biological components in order to inform oil spill response plans and contribute towards DFO's commitment to ensuring sustainable aquatic ecosystems. Vulnerability was assessed using a suite of criteria designed to be applicable in different Canadian aquatic environments. Based on this framework, Hannah et al. (2017) assessed species' vulnerabilities, ranking Sea Otter as "highly vulnerable" due to their restricted home ranges, dependence on fur for thermoregulation and the extensive mortalities of Sea Otters following the Exxon Valdez spill in Alaska. Jarvela-Rosenberger et al. (2017) developed a conceptual framework to evaluate impacts of potential oil exposure on marine mammals and applied it to 21 species in BC including Sea Otters. Vulnerability to oil spill was determined by assessing both the likelihood of species specific (individual) exposure and the potential for population level effects. In BC, Sea Otter vulnerability to oil spills was ranked highest (along with Northern and Southern Resident Killer Whales) due to their time spent at the ocean surface, dense fur and bottom foraging behaviour (Jarvela-	

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
				Rosenberger et al. 2017).	
Broad strategy 2, approach 4	Improve estimation of all sources and magnitude of human-induced mortality.	2018	Not started	Where possible, the MMRP collects information on dead or distressed animals. Analyses on sources and magnitude of human induced mortality have not been started. As stated in DFO (2020), Potential Biological Removal[4] (PBR) for the entire population is estimated to be 534 animals. The report noted that recognition of the subregional spatial scale at which the population is structured has implications for conservation and management of this species. For example, the population wide PBR may need to be reassessed to take patterns of habitat use into account (DFO 2020).	**DFO**
Broad strategy 2, approach 5	Monitor and assess Sea Otter health through indicators such as body condition, disease exposure and contaminant burdens.	Ongoing	Not started	Although necropsies are conducted on recovered carcasses and biological samples are collected for analyses (see broad strategy 1, approach 1 for more information on this process), data analyses have not been started and as such this conservation measure is considered not started in Canada. Recent studies on Sea Otters in the US have analyzed contaminant burdens, risk of	**DFO, Independent Researcher (IR), Ocean Wise**

[4] Potential biological removal is an estimate of the maximum number of animals, excluding natural mortality, that may be removed per year while still allowing the population to reach or sustain to its optimum sustainable population (DFO 2020).

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
				exposure and effects. For example, the primary cause of death was infectious disease for over half of Sea Otters examined in the US, and trauma was the second most common cause of death (White et al 2018). Burgess et al. (2018) determined that analyses of contaminant exposure risk should take into account spatial scale when determining individual versus population level risks. Research on Sea Otter diet and metals contamination in Southeast Alaska demonstrated contaminants are distributed and concentrated in tissues of higher trophic consumers such as Sea Otters (Brown 2020). Moriarty et al. (2021) found that domoic acid, a toxin produced by algal blooms that bioaccumulates in the food web, increases the risk of fatal cardiac disease in Southern Sea Otters. Furthermore, exposure to domoic acid particularly increased cardiomyopathy hazard among prime age (4 to 10 years old) adults. These results are particularly important considering the increase in frequency of toxic algal blooms.	
Broad strategy 2, approach 6	Assess the potential impacts of fisheries including competition for prey resources, bycatch	TBD	In progress	No assessment specific to fisheries competition for prey resources was conducted for Sea Otters in Canada. However, related studies were conducted	**Academia, ENGOs, Hakai, IG, IR,**

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
	and entanglement in fishing gear, and illegal mortality.			during the period of this progress report. Lee et al. (2016) examined species interactions between Sea Otter and one of their prey, Northern Abalone (*Haliotis kamtschatkana*, an endangered species for which there is no active fishery). They found that, although Northern Abalone are present in areas where Sea Otter numbers have increased, they typically exist in lower densities of smaller more cryptic individuals. Hansen et al. (2020) identified variables to standardize the DFO Northern Abalone Index Site Survey data (1978 to 2018) to estimate trends in Northern Abalone densities in BC. Sea Otter occupancy (presence/absence) at Northern Abalone index sites was found to be an important environmental factor/proxy for estimating Northern Abalone density in survey regions in Southern BC. Further studies are being completed by other groups to broaden analyses of Sea Otter and invertebrate interactions on the central coast. These will inform how long term local presence of Sea Otters may influence local prey populations and thus the breadth of the Sea Otter diet (Rechsteiner et al. 2019). During this reporting period, multiple Northern Abalone projects funded through	DFO

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
				the Aboriginal Fund for Species at Risk (AFSAR) have included activities that involve monitoring for Sea Otters during Northern Abalone surveys and interviews with fishers to obtain information on presence/absence of Sea Otters. Gregr et al. (2020) published a report on the cascading social-ecological costs and benefits triggered by a recovering keystone predator focussing on the recovery of Sea Otters in the eastern North Pacific. Their study found that Sea Otter presence yields 37% more total ecosystem biomass annually across several industries. This indicates that not only does the recovery of keystone predators restore ecosystems, it can lead to a range of social, economic, and ecological benefits for associated communities. No assessments of fisheries interactions related to gear interactions (that is, bycatch or entanglement) or illegal mortality were conducted during the period of this progress report. As stated in broad strategy 1) – approach 6, 1 fisheries interaction with Sea Otters was recorded from 2014 to 2020.	
Broad strategy 2, approach 7	Assess the potential impacts of human disturbance such as wildlife viewing and other	TBD	Not started	At the time of writing this report, no assessment of impacts of human disturbance on Sea Otters in Canada has been	TBD

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
	boating activities.			conducted.	
Broad strategy 2, approach 8	Improve our understanding of the degree of interchange with adjacent populations to assess potential for rescue effect.	TBD	Not started	At the time of writing this report, interchange between the Canadian population and Sea Otter populations in adjacent US waters to the north and south has not been investigated.	**DFO**
Broad strategy 3, approach 1	Establish and maintain communication with First Nations, stakeholders, coastal communities, and the public about Sea Otter conservation and research; promote community involvement in stewardship and research	Ongoing	In progress	Collaborations on Sea Otter research and conservation between DFO and independent researchers continue (for example, Nichol et al. 2015, Rechsteiner et al. 2018, 2019 Davis et al. 2019). Over the period of this progress report, a total of 13 AFSAR and Habitat Stewardship Program for Aquatic Species at Risk stewardship projects, funded through the Government of Canada have included Sea Otter outreach and education and/or dedicated Sea Otter surveys in local areas. This includes the 5 projects referenced in, broad strategy 1, approach 2, the 8 projects referenced in broad strategy 2, approach 1, and the Haida Gwaii Marine Stewardship Group. These efforts have increased awareness of species at risk recovery and Sea Otter conservation, as well as contributed information towards	**DFO,** Academia, ENGOs, Haida Nation, IG, IR, PC

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
				understanding Sea Otter range expansion and other ecological interactions (Nichol et al. 2015, Lee pers. Comm. 2022). PC Gwaii Haanas worked with Dr. Tim Tinker, DFO Sea Otter biologist Linda Nichol, and others to develop a Gwaii Haanas Sea Otter Spatial Habitat-based Population Model, later expanded to Haida Gwaii (Lee pers. comm. 2021). This effort expanded into a 3 year interdisciplinary and multi-interest collaborative Sea Otter conservation and restoration project co-led by PC and the Council of the Haida Nation, called X̲aayda Gwaay.yaay K̲uugaay Gwii Sdiihltl'lx̲a (The Sea Otters Return to Haida Gwaii), starting in 2020. The aim of the project is to work with a diverse project team and Haida Gwaii communities to re-learn how we can live together with K̲u | K̲uu (Sea Otter) by drawing on knowledge, perspectives and values related to Sea Otters and the coastal ecosystems that we depend on. This project includes co-development of a Sea Otter ecosystem model including cultural, social and ecological components that incorporate community values and needs, to inform management decision making (Lee pers. Comm. 2022). In 2020, the BCCSN (Ocean Wise), with support from DFO, developed an Otter Identification Guide for British Columbia that	

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
				includes best practices for viewing and reporting dead or distressed Sea Otters.	
Broad strategy 3, approach 2	Promote Sea Otter viewing guidelines for commercial and recreational wildlife viewing.	2018	Not started	As stated in broad strategy 1, approach 5, Sea Otter viewing guidelines have not been developed by DFO. It is illegal to disturb a marine mammal under the *Fisheries Act*, *Marine Mammal Regulations*. Recent amendments provide clarity giving examples of what 'disturbing' marine mammals entail and provide alternative approach distances tailored to particular circumstances. However, alternative approach distances were not established for Sea Otters and as such the general minimum 100 m approach distance is applied. DFO provides information on watching marine wildlife and approach distances are enforced by DFO. Outreach and education on safe marine mammal viewing practices also occurs through other non governmental programs (for example, Indigenous led CoastWatch programs and ENGOs). PC requires holders of business licenses to adhere to *Marine Mammal Regulations* requirements while in park reserve waters. Pacific Rim National Park Reserve staff also promote safe marine mammal viewing guidelines outlined in the *Marine Mammal Regulations* to park visitors and through	**DFO, IG, PC,** ENGOs, Ocean Wise

Broad strategy and approach	Conservation measure	Timeline	Status	Description and results	Participants[1]
				outreach materials, such as social media (Yakimishyn pers. comm. 2021). PC also includes guidance and information in their mandatory visitor orientation at Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site (PC 2016). DFO and ENGO partners conduct presentations in coastal communities focused on how to report marine mammal disturbance. In 2020, BCCSN, (Ocean Wise) with support from DFO, developed an Otter Guide for British Columbia that includes best practices for viewing and reporting dead or distressed Sea Otters. These best practices are not considered viewing guidelines and as such this conservation measure is considered not started.	

3.2 Summary of progress towards conservation

3.2.1 Status of conservation measures and approaches

Table 1 identifies 16 conservation measures from the management plan. Of these, 8 conservation measures are in progress (50%) and 8 conservation measures have not been started during the period of this progress report (50%). No conservation measures were fully completed.

The 4 conservation measures that are currently 'in progress' have an ongoing timeline with no specific endpoint, and 1 has a timeline that is yet to be determined (broad strategy 2, approach 6). The remaining 3 conservation measures were meant to be 'complete' by 2018 (DFO 2014):

- Broad strategy 1, approach 3: develop Sea Otter specific measures for inclusion into catastrophic spill response programs
- Broad strategy 2, approach 2: support development and use of alternative population survey methods to better quantify uncertainty in population estimates
- Broad strategy 2, approach 3: assess the vulnerability of the Sea Otter population to oil spills by modelling spatial and temporal risk

In addition to continuing support for 'In progress' conservation measures with ongoing timelines, further work is needed to: finalize and publish the draft DFO Marine Mammal Plan for spill response; complete the testing of unmanned aerial vehicles (drones) and any other potential technology considered for population surveys; and conduct modelling of spatial and temporal risk of oil spills to the Sea Otter population in Canada to complete the assessment of vulnerability.

Of the 8 conservation measures that are 'not started', 3 have timelines that were yet to be determined (TBD) and 2 have ongoing timelines (DFO 2014). For 2 of these conservation measures, action is not currently required:

- Broad strategy 1, approach 4: support oversight and monitoring of any future food, social and ceremonial harvest of Sea Otters. The timeline for this conservation measure is TBD and work has not been started because currently there is no First Nation harvest of Sea Otters
- Broad strategy 1, approach 6: examine and support mitigation options, such as spatial/temporal closures, in areas where fisheries interactions are known to occur. The timeline for this conservation measure is ongoing; however, only one fisheries interactions with Sea Otters was recorded during the period of this progress report.

Of the 2 remaining conservation measures with timelines that are TBD (broad strategy 1, approach 4 is the third and is discussed above), these timelines need to be established and work needs to begin:

- Broad strategy 2, approach 7: assessing the potential impacts of human disturbance such as wildlife viewing and other boating activities;
- Broad strategy 2, approach 8: improving our understanding of the degree of interchange with adjacent populations to assess the potential for rescue effect.

For 3 of the conservation measures that have not been started, work was meant to be completed by 2018 (DFO 2014). Further work is needed in the following reporting period to begin and complete the following conservation measures:

- Broad strategy 1, approach 5: support the development of Sea Otter viewing guidelines

- Broad strategy 2, approach 4: improve estimation of all sources and magnitude of human-induced mortality
- Broad strategy 3, approach 2: promote Sea Otter use of viewing guidelines for commercial and recreational wildlife viewing

Table 2 provides a brief summary of the progress made toward meeting the performance measures outlined in section 2.2 above. Each measure has been assigned 1 of 4 statuses:

1) not met: the performance measure has not been met, and little to no progress has been made
2) partially met, underway: moderate to significant progress has been made toward meeting one or more elements of the performance measure, and further work is ongoing or planned
3) met: the performance measure has been met and no further action is required
4) met, ongoing: the performance measure has been met, but efforts will continue until such time the population is considered to be recovered

Table 2. Progress and details toward meeting the performance measures outlined in the management plan for the Sea Otter.

Performance measure	Status	Details
Did the geographic range of Sea Otters continue to expand naturally beyond the 2008 continuous range?	Met, ongoing	Sea Otter expansion into 3 subregions of British Columbia (BC)'s central coast was documented within the period of this progress report. Nichol et al. (2015) indicated that these population growth and expansion patterns are typical among recovering Sea Otter populations. The 2017 range wide survey found no evidence of expansion north of the previously documented range limit. Within the range, there had been some infilling of gaps since the previous survey in 2013, as outlined in Fisheries and Oceans Canada (DFO) 2020. In 2019, the first population survey in Gwaii Haanas was completed by Parks Canada, in collaboration with DFO and the Haida Nation. Results of the survey suggest that early population establishment is occurring (Nichol pers. comm. 2021). See broad strategy 2, approach 1.
Did the number of Sea Otters increase (compared to the 2008 estimate) to correspond to the range expansion?	Met, ongoing	Nichol et al. (2009) estimated a minimum Canadian Sea Otter population of 4,712 in 2008, of which 87% and 13% occupied the Vancouver Island and the central BC mainland coast regions, respectively. The 2017 range wide survey recorded a total of 8,110 Sea Otters in BC. The annual rate of increase across BC was 6.4% per year from 2008 to 2012 and 5.2% per year from 2013 to 2017 (DFO 2020). For the period 2013 to 2017 annual rates of growth in long occupied areas were low (1.6% to 2.9% per year), suggesting these subregions were approaching carrying

Performance measure	Status	Details
		capacity. In more recently occupied areas, growth was exponential with several subregions exhibiting growth rates of 20.4% to 24.5% per year (DFO 2020).
Were threats better identified or clarified? Were threats to Sea Otters and their habitat mitigated to provide for continued conservation?	Not met, underway	Continued spill response planning has been aided by studies such as Hannah et al. (2017) and Sea Otter specific vulnerabilities were identified. Review and assessment of environmental contaminants has yet to be started in Canada; however, United States studies may provide some proxy for contaminant risks. Recent amendments of the *Marine Mammal Regulations* under the *Fisheries Act* will benefit Sea Otters with regard to clarifying human disturbance. Results from the 2017 range wide survey provide an index of abundance and a report on range expansion (DFO 2020). This updated information will assist discussions on threat mitigation. See the performance measure above.

4. Concluding statement

Growth in the Sea Otter population and expansion of range documented in surveys completed between 2013 to 2020 (DFO 2020) meet 2 of the 3 performance measures and part of the management objective outlined in the "Management Plan for the Sea Otter (*Enhydra lutris*) in Canada" (DFO 2014).

Steps have been taken toward completing several of the conservation measures supporting the management objective, including:

- research on ecological interactions (Lee et al. 2016; Rechsteiner et al. 2018, 2019; Gregr et al. 2020)
- population assessment based on 2013 survey data and documentation of range expansion (Nichol et al. 2015)
- assessment of trends in the growth of the Sea Otter population in British Columbia between 1977 to 2017 (DFO 2020)
- assessment of the vulnerability of the Sea Otter population to oil spills and the development of Sea Otter specific spill response measures and programs
- development of Sea Otter species identification guides, including educational material for viewing and reporting dead or distressed Sea Otters

While growth and expansion of the Sea Otter population in Canada is progress towards conservation of the species, continued monitoring of the population is necessary. Further work is needed to meet the third performance measure regarding the identification and clarification of current and future threats, and to address several of the conservation measures that are past their deadline or have not yet been started.

The Government of Canada remains committed to conserving the Sea Otter. The work started and completed to date has built a strong foundation for continued research and management of

this species over the next reporting period. Progress made to date would not have been achieved without the contributions from our partners. The Government of Canada looks forward to continuing these successful collaborations and welcomes the participation of additional partners.

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