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Report on the Progress of Management Plan Implementation for the Eastern Pacific Grey Whale (*Eschrichtius robustus*) in Canada for the Period 2011-2015

Eastern Pacific Grey Whale

2019

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 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 ministers 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 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 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 Agency are the competent ministers under SARA for the Eastern Pacific Grey Whale 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, the Parks Canada Agency, 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 Eastern Pacific Grey Whale for the benefit of the species and Canadian society as a whole.

Acknowledgments

This progress report was prepared by Wendy Szaniszlo with input from Fisheries and Oceans Canada (DFO) Marine Mammal Program, Science, and Fisheries Management; as well as the U.S. National Oceanographic and Atmospheric Administration; the Province of British Columbia; Parks Canada Agency; Cascadia Research Collective; University of Victoria; Pacific WildLife Foundation; Nuu-chah-nulth Tribal Council; and Makah Tribe. Fisheries and Oceans Canada would like to express its appreciation to all individuals and organizations who have contributed to the conservation of the Eastern Pacific Grey Whale.

Executive summary

The Eastern Pacific Grey Whale (*Eschrichtius robustus*) was listed as a species of special concern under the Species at Risk Act (SARA) in 2005. The Management Plan for the Eastern Pacific Grey Whale (*Eschrichtius robustus*) in Canada (DFO 2011a) was finalized and published on the Species at Risk Public Registry in 2011.

The main threats identified for the Eastern Pacific Grey Whale include: increased human activity in Mexican breeding lagoons, environmental variability, disruption or destruction of benthic feeding habitat, acute noise and toxic spills.

The management goal for the Eastern Pacific Grey Whale is: “to maintain the migration route and foraging habitat in British Columbia (B.C.) for Eastern Pacific Grey Whales, in order to contribute to the maintenance of a self-sustaining population.”

In order to achieve this goal, the management plan identified the following distribution objective: “to maintain the current known distribution, and migration route of Grey Whales in Pacific Canadian waters.”

There are an additional five research and monitoring objectives and five management objectives in the Eastern Pacific Grey Whale management plan.

This report documents the progress of management plan implementation for the Eastern Pacific Grey Whale in Canada for the period 2011-2015. It summarizes progress made towards achieving the goal and objectives set out in the management plan, including:

- satellite-tracking animals to understand the migration route of northward migrating Eastern Pacific Grey Whales
- research on Eastern Pacific Grey Whale fine-scale foraging ecology and habitat use along the west coast of Vancouver Island
- increased understanding of Eastern Pacific Grey Whale abundance and distribution along the west coast of Vancouver Island through collaborative photo-identification programs with the United States
- undertaking acoustic monitoring of Eastern Pacific Grey Whales in conjunction with vessel noise
- training First Nations in oil spill response

While progress has been made toward meeting the management goal and objectives presented in the management plan, ongoing work is required to better understand the threats to Eastern Pacific Grey Whales and their habitat, particularly to the Pacific Coast Feeding Aggregation, and to support the conservation of the population.

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1. Introduction

This document reports the progress towards meeting the goal and objectives listed in the Management Plan for the Eastern Pacific Grey Whale (*Eschrichtius robustus*) in Canada (DFO 2011a) from 2011 through 2015, and should be considered as one of a linked series of documents for this species, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status report (COSEWIC 2004) and the management plan.

Section 2 of the progress report summarizes key information on the threats to the species, the management goal and objectives, and actions and approaches for meeting these objectives. For more details, readers should refer to the Management Plan for the Eastern Pacific Grey Whale (*Eschrichtius robustus*) in Canada (DFO 2011a).

Section 3 reports on the progress of activities, identified in the management plan, to support achieving the management goal and objectives.

Although outside the period of consideration for this progress report, it should be noted that the Eastern Pacific Grey Whale population was re-examined by COSEWIC in November 2017 and has been assessed as three designatable units (DUs): the Pacific Coast Feeding Group population (endangered), the Western Pacific population (endangered), and the Northern Pacific Migratory population (not at risk). These DUs are currently under consideration for listing under the Species at Risk Act (SARA). As this COSEWIC assessment occurred after the period of consideration of this report, all references to “Grey Whales” herein refer to the Eastern Pacific Grey Whale population. Similarly, references to the Pacific Coast Feeding Aggregation (PCFA) in this report refer to the small part of the Eastern Pacific Grey Whale population that does not undertake the full migration to Arctic feeding areas, and instead spends the summer feeding in temperate waters between northern California and southeastern Alaska.

2. Background

2.1 COSEWIC assessment summary

The SARA listing of the Eastern Pacific Grey Whale in 2005 as special concern, which led to the development and publication of the management plan in 2011, was based on the information provided in the COSEWIC status report (COSEWIC 2004). This information is also included in section 1.1 of the management plan.

Assessment summary – **May 2004**

Common name Grey Whale (Eastern North Pacific population)

Scientific name *Eschrichtius robustus*

Status
special concern

Reason for designation
Grey Whales migrate each year from their winter calving grounds in Mexico to their summer

feeding areas in northern Alaska, Russia and Canada. Most of the population passes along the B.C. coastline, and some individuals repeatedly spend the entire summer feeding in B.C. (about 80). The population increased by 2.5% per year following the cessation of whaling, and peaked, within the range of pre-exploitation estimates, at about 27,000 animals in 1998. The extent of recovery of the summer resident group is unknown. However, over one-third of the population died from 1998 to 2002 (possibly due to a lack of food in Alaska). Birth rates, survival rates and other indicators suggest that the decline has ceased and that the population is stable or increasing since 2002. The whales are susceptible to human activities in their 4 breeding lagoons in Mexico, as well as to entanglement in fishing gear and collisions with boats throughout their range. Underwater noise associated with proposed oil development in B.C. could alter migration patterns. The small group of summer-resident whales could also be threatened by subsistence whaling in the USA.

Occurrence
Pacific Ocean, Arctic Ocean

Status history
Designated not at risk in April 1987. Status re-examined and designated as special concern in May 2004. Last assessment based on an update status report.

2.2 Threats

This section summarizes the information found in the management plan (DFO 2011a) on threats to the Eastern Pacific Grey Whale.

2.2.1 Threats to the Eastern Pacific Grey Whale

Table 1 summarizes the population-level anthropogenic threats to the Eastern Pacific Grey Whale. Refer to section 1.5 of the management plan for more information on these threats.

Table 1. Summary of the population-level threats identified for the Grey Whale, based on the management plan.

Threat	Level of concern[1]	Description
Increased human activity in Mexican breeding lagoons	Moderate/ potentially high	The primary threat to the population is increased human activity in the breeding lagoons. While measures are in place to restrict vessels and activities within most lagoons, any natural or anthropogenic catastrophic event in the area could put the population at risk if reproductive success or calf survival were affected.
Environmental variability	Potentially high	Environmental variability, including persistent changes in ice cover at the Arctic feeding grounds, ecosystem regime shifts, and global climate change can severely impact the population through limiting food as a result of changes to prey recruitment, and limiting access to Arctic feeding grounds. While natural regime shifts and environmental variability cannot be managed, measures to mitigate climate change may assist in reducing effects of anthropogenic changes to Arctic and

[1] Level of concern indicates whether, at the time the management plan was written, managing the threat is an overall high, medium, or low level of concern for conservation of the species, taking into account the likelihood of occurrence and severity of the specific threat.

Threat	Level of concern[1]	Description
		temperate feeding grounds.
Disruption or destruction of benthic feeding habitat	Potentially high for Arctic feeding areas, low on migration route	Disruption or destruction of the benthic habitat within Arctic or Pacific Coast Feeding Aggregation (PCFA) feeding areas could result in negative effects to the population. Grey Whales are predominantly benthic feeders in many areas. Disruption of coastal benthic habitats may impact the availability or quality of benthic prey and affect foraging success, resulting in nutritional stress or displacement. Habitat degradation within British Columbia (B.C.) will likely only affect the PCFA.
Acute noise	Medium	Acute noise refers to impulsive sounds produced in the mid to low frequency range (such as those produced during military tactical sonar use and seismic surveying). These impulsive sounds are capable of traveling long distances through open ocean areas and therefore, both migrating and PCFA Grey Whales may be exposed to acute noise effects. Seismic surveys have been demonstrated to affect Grey Whales in both the eastern and western populations, resulting in behavioural modification and displacement (Malme and Miles 1985).
Toxic spills	Low to medium	Grey Whales are vulnerable to the effects of environmental contaminants either through direct exposure via a toxic spill (such as an oil spill), or through the consumption of contaminated prey and sediment. A spill near a feeding aggregation has the potential to impact numerous individuals and the feeding habitat simultaneously. Chronic or residual effects to sediments following a spill have the potential to impact feeding sites and contaminate whales, particularly the PCFA in B.C.
Whaling	Low	Commercial whaling for Grey Whales ended in 1937 and there has been little subsistence harvest in the U.S.; however, some Canadian First Nations have indicated past interest in having subsistence whaling included as a treaty right. As the PCFA depends on long-term use of coastal habitats in B.C., they may be more vulnerable to hunting activity due to proximity to potential subsistence hunters if this activity were to occur in Canadian waters.
Chronic noise	Low	Continuous exposure to increased sound levels may lead to avoidance behaviour by Grey Whales, as well as disruption of north or southward migrations and impacts to feeding. Disturbance from chronic low-frequency noise sources (e.g. vessel traffic) may also affect navigation along migration routes, social communication, or detection of prey or predators.
Physical disturbance	Low	Chronic pressure from whale watching has the potential to disrupt feeding behaviour, or displace animals from habitat. Disturbance at breeding lagoons may potentially pose risks during years of low food abundance or through other synergistic effects of stresses.
Fossil fuel exploration and extraction	Low (potentially high for Arctic feeding grounds)	Oil and gas exploration, and the associated anthropogenic noise and potential of spills can cause loss of habitat on Arctic and temperate feeding grounds. Offshore mining and dredging could also lead to removal or covering of feeding substrate, which could impact food supply. A moratorium on offshore oil and gas exploration in B.C. remains in place; therefore, current impacts on the PCFA are negligible.
Prey reduction/ competition	Low (unknown for PCFA)	Some known prey species of Grey Whales are also targeted by fisheries in Canadian and U.S. waters. As Grey Whales are generalist predators, they are not likely to be food limited if one prey source

Threat	Level of concern[1]	Description
with fisheries		declines; however, Grey Whale distribution in B.C. may be altered by changes in prey abundance. This threat is considered poorly understood for the PCFA due to uncertainties in prey habitat requirements and seasonal dietary requirements of this population.
Pollution	Unknown	The nearshore distribution and benthic or epi-benthic feeding mode of Grey Whales make them potentially susceptible to environmental toxins. Localized areas of nutrient loading from sewage or agricultural runoff may degrade or contaminate coastal feeding areas for Grey Whales. Persistent chemicals (e.g. DDT) and emerging toxins with similar properties (e.g. PBDEs) may accumulate in prey species or areas used by Grey Whales during breeding, feeding, and migration. There is a high degree of uncertainty regarding the severity of effects of such contamination.
Entanglement	Unknown	Entanglement in fishing gear and marine debris is a source of mortality for Grey Whales, but the occurrence, severity, and extent of this threat is poorly understood. Gillnets, longlines, and crab pots have been found on entangled whales, and entrapment or entanglement in aquaculture net pens, anchor chains, and other anthropogenic devices may also pose a risk to individual whales.
Boat collisions	Unknown	Concentrated vessel traffic around urban centres and in shipping lanes that overlap with migration routes or feeding aggregations may result in collisions with Grey Whales. There is additional concern that Grey Whales that are habituated to close approaches by vessels in the breeding grounds may approach vessels in B.C. The current rate of collisions and extent to which vessel strikes affect eastern Pacific Grey Whales at the population level is poorly understood.

2.3 Conservation

This section summarizes the information, found in the management plan (DFO 2011a), on the management goal and objectives that are necessary for the conservation of the Eastern Pacific Grey Whale.

2.3.1 Management goal and objectives

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

Management goal:

> To maintain the migration route and foraging habitat in B.C. for Eastern Pacific Grey Whales, in order to contribute to the maintenance of a self-sustaining population.

Distribution objective:

D1. Maintain the current known distribution and migration route of Grey Whales in Pacific Canadian waters

Research and monitoring objectives:

R1. Monitor abundance and distribution in B.C. on an ongoing basis

R2. Contribute to, or foster, the understanding of the habitat use and feeding ecology of Grey Whales in Pacific Canadian waters

R3. Contribute to, or foster, the understanding of the migration route of Grey Whales through Pacific Canadian waters

R4. Support, foster and contribute to research addressing uncertainties surrounding degradation of benthic habitat, competition with fisheries, toxins, and effects of other identified and non-identified threats to this population

R5. Assess available methods, and estimate levels of annual human-caused mortality that the population can sustain while achieving the distribution objective

Management objectives:

M1. Reduce the risk of catastrophic spills impacting Grey Whales or their habitat in Canada

M2. Protect benthic feeding habitat from degradation, such that it does not displace PCFA whales from known feeding habitat in Canada

M3. Minimize the exposure of Grey Whales to acute sound levels (in excess of those considered to cause behavioural or physical harm in cetaceans), and prevent disturbance such that it does not displace Grey Whales from known migration routes or feeding habitat in Canada

M4. Protect the population from commercial whaling in Canada, and reduce the likelihood of negative impacts to the PCFA from subsistence whaling activity

M5. Promote international collaboration, independent research, education and outreach on management and conservation initiatives

2.3.2 Performance measures

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

3. Progress towards conservation

The management plan for the Eastern Pacific Grey Whale divides the conservation effort into six broad strategies: 1) protection; 2) management; 3) research on Grey Whale biology; 4) research to clarify identified threats; 5) monitoring and assessment; 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 toward undertaking these actions and approaches.

3.1 Activities supporting conservation

Table 2 provides information on the implementation of activities undertaken to address the broad strategies, actions, and approaches identified in the management plan. The timelines indicated are based on the implementation schedule (Table 3) of the management plan. 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 a list of acronyms used throughout the report.

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

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
1	1. Protect from acute acoustic disturbance to mitigate negative effects	a) Apply Fisheries and Oceans Canada (DFO) standards for mitigation of seismic noise, regional implementation protocols	Ongoing	In progress	The Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment is currently being applied for mitigation of seismic noise to Grey Whales in Canada. The Statement of Practice specifies the mitigation requirements that must be met during the planning and conduct of marine seismic surveys in order to minimize impacts on life in the oceans. These requirements are set out as minimum standards and are reviewed on an annual basis and revised as new science, technological or mitigation information becomes available (DFO	D1; M3	**DFO**[2], Environment and Climate Change Canada (ECCC), National Energy Board (NEB), Natural Resources Canada (NRCan)

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

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					2016).		
1		b) Review of Department of National Defence (DND) protocol, request updates on revisions	As required	In progress	The current Department of National Defense (DND) policy on marine mammal mitigation is contained in the Maritime Command Order 'Marine Mammal Mitigation Procedures for Active Sonar Use' (MARCORD 46-13). DFO and DND meet periodically to discuss marine mammal measures, and revisions if required (Cottrell pers. comm. 2016). In 2013, NOAA updated the acoustic threshold levels for avoiding temporary and permanent hearing threshold shifts for marine mammals (National Marine Fisheries Service 2016).	D1; M3	**DFO**, DND, National Oceanic and Atmospheric Administration (NOAA)
1	2.Protect from disturbance (physical and acoustic)	a) Complete amendment of Marine Mammal Regulations (MMR)*	Underway.	In progress (during the reporting period of 2011-2015) *amendments completed and came into force on July 11, 2018	Amendments to the Canadian MMR were drafted and a public comment period for the proposed amendments occurred in 2012. The amendments aim to reduce the risk of disturbance, displacement from habitat, collisions with vessels, entanglement in fishing gear, and the effects of acoustic disturbance to marine mammals, including Grey Whales.[3]	D1	**DFO**
1		b) Continue enforcement of MMR, promote	Ongoing	In progress	DFO Conservation and Protection (C&P) enforces the MMR and promotes regional guidelines for	D1	**DFO**, Canadian Coast Guard Services (CCGS),

[3] Regulations amending the Marine Mammal Regulations came into force on July 11, 2018.

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
		regional guidelines			marine mammal viewing: “Be Whale Wise” (BWW). C&P’s mandate includes investigating reports of disturbance and violations (Cottrell pers. comm. 2016). Parks Canada (PCA) requires licensed marine mammal viewing operators to maintain a minimum distance of 100 m from Grey Whales within the boundaries of Pacific Rim National Park Reserve. This requirement is per Parks Canada’s Business Regulations, and is monitored by Park Wardens on an on-going basis (Yakimishyn pers. comm. 2016).		PCA
2	3.Review project proposals, provide advice for mitigation or avoidance		Ongoing, enhance involvement where necessary	In progress	Activities that may impact Grey Whales require review and approval from DFO. All activities are subject to a thorough review process by DFO Marine Mammal Science (Cottrell pers. comm. 2016). Approvals or permits contain terms and conditions necessary for protecting the species, minimizing the impact of the authorized activity on the species, and/or providing for its recovery.	D1; M2; M3	**DFO**, DND, industry, NEB, NRCan
2	4.Develop comprehensive toxic spill response to mitigate impacts	a) Develop emergency response plan to include marine mammal expertise into spill response initiatives	1 year	Not started (during reporting period)	Stronger regional emergency response plans are under development in collaboration with partners as part of the Government of Canada’s national Ocean Protection Plan launched in November 2016. Four pilot studies have been launched across Canada, including one site in southern B.C. Marine mammal experts are engaged	D1; M1; M2	**CCG DFO, Ocean Wise (formerly Vancouver Aquarium), NTC, Province of B.C., TC,** PCA

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					in plan development and indigenous and coastal community consultations will be held on the draft plans, once developed.[4] 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 (TC)-led initiative to create a Port of Refuge Contingency Plan for Haida Gwaii.[5] Since 2015, the Nuu-chah-nulth Tribal Council (NTC) 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. This includes Herring spawning areas (Picco pers. comm. 2016), which are known to be a feeding habitat for Grey Whales.[6]		
2		b) Marine mammal-specific operational	1 year	Not started during reporting	A marine mammal-specific operational manual will be developed for the southern B.C. pilot site in 2019-2020.[4]	D1; M1; M2	**NOAA**

[4] 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.
[5] The final plan was released in November 2017 (Bartier pers. comm. 2018).
[6] The NTC is receiving oil spill response training by Western Canada Marine Response Corporation (WCMRC; Picco pers. comm. 2016). WCMRC also held a Shoreline Cleanup Assessment Training course in 2016 for Uu-a-thluk staff and members from Nuu-chah-nulth Nations.

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
		manual		period (Canada) Completed (U.S.)	NOAA has developed cetacean oil spill response guidelines. These guidelines outline the coordination and communication between local, state and federal oil spill response agencies, stranding networks and scientists, and highlight the procedures specific to oil spill response for whales (Ziccardi et al. 2015).		
2	5.Permitting of non-DFO research, monitoring and assessments		Ongoing	In progress	From 2011 through 2015, DFO issued 14 permits to undertake research on Eastern Pacific Grey Whales in Canada. In order to authorize an activity that is otherwise prohibited under the Species at Risk Act (SARA) and/or MMRs, several conditions must be met (DFO 2016). PCA requires a research permit to conduct research on Grey Whales 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).	R1 through R5; M1 through M5	**DFO**, Environmental Non-governmental Organizations (ENGOs), NOAA, PCA, universities, TBD
2	6. Proactively mitigate for threats indicated to have high mitigation potential	a) Continue development of fisheries observer reporting standards and guidelines; species identification, data collection	5 years	Completed (Ongoing effort)	Standards for fisheries observer reporting are managed through the ongoing development of reporting and monitoring standards, individual Integrated Fisheries Management Plans, and license conditions (Cottrell pers. comm. 2016). The Pacific Integrated Commercial Fisheries Initiative includes measures	D1; R4	**DFO**, aquaculture industry, fishing industry

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					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). The DFO Policy for Managing Bycatch was completed in 2013 and applies to all 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. Between 2011 and 2015, the B.C. Cetacean Sightings Network (BCCSN) provided 11 training workshops to employees of Archipelago Marine Research to familiarize fisheries observers with marine mammal species identification (Danelesko pers. comm. 2016).		
2		b) Promote development of alternative gear types (fishing, aquaculture)		Not started	Use of alternative fishing gear to reduce entanglement risk to Grey Whales has not been implemented in B.C. waters; implementation will depend on additional information, including reliable scientific studies that		

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					show that measures are effective and feasible (Cottrell, pers. comm. 2016).[7]		
2		c) Develop co-management strategies for traditional whaling, in support of treaty negotiated rights	3 years	In progress	The Maa-nulth Treaty Nations have committed to not pursuing a Grey Whale hunt for 25 years (Maa-nulth First Nations and Canada 2006), and the NTC has not shown interest in renewing traditional whaling activities (Picco pers. comm. 2016). In the U.S., the Makah Tribe has requested NOAA authorization to hunt Eastern Pacific Grey Whales. The right to whale is secured by the 1855 Treaty of Neah Bay (NOAA Fisheries-West Coast Region 2016). NOAA is evaluating the Tribe's waiver request under the U.S. Marine Mammal Protection Act. Any hunt occurring in Canadian waters would require discussion and permitting from DFO.	D1; R4	**DFO**, First Nations (FN)
2		d) Continue implementation of the Marine Mammal Response Network (MMRN)		In progress	The MMRN is a collaborative network of federal government, ENGOs and other experts. DFO coordinates and authorizes responses, such as collection of photographs, measurements and tissue samples. In 2015, the MMRN created an Advisory Team and joined the Canada Marine Animal Response Alliance	R4; M5	**MMRN**, DFO, PCA

[7] DFO is working with industry to rid anchoring systems of tag lines as a means to reduce entanglement risk (Cottrell pers. comm. 2016).

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					(CMARA), an association of Canada's regional response networks. These changes enhanced the communication between MMRN members and increased cohesion of the network.		
3	7. Priority Research	a) Undertake satellite-tracking of animals during migration	Initiated in 2009	Completed	Satellite tracked individuals and shore-based surveys have provided evidence that northbound migrating Grey Whales travel through Hecate Strait and Dixon Entrance to the east and north of Haida Gwaii (Ford et al. 2013).	R1; R2;R3	**DFO,** TBD
3		b) Studies to identify Pacific Coast Feeding Aggregation (PCFA) occurrence north of Cape Caution	3 years	Not started	There has been no dedicated effort to identify PCFA occurrence north of Cape Caution. DFO opportunistically photographs Grey Whales while undertaking research efforts along B.C.'s north coast (Ford pers. comm. 2016). In 2015, NOAA's Collaborative Large Whale Survey included surveying for Grey Whales from California to Alaska, including Canadian waters (NOAA 2015).	R1; R2	DFO, NOAA, TBD, universities
3		c) Contribute and collaborate, when feasible, to studies addressing general habitat use in B.C.	4 years	Completed (Ongoing effort)	Since 1998 there has been ongoing collaboration between groups, facilitated by Cascadia Research Collective (CRC), to examine habitat use and residency periods of the PFCA between feeding areas (Calambokidis et al. 2009; Calambokidis et al. 2012) with long-term regular surveys of summer foraging sites (e.g. Burnham and Duffus, In press).	D1;R2	**Universities**, CRC, ENGOs, independent researchers (IR), NOAA, National Marine Mammal Lab (NMML), TBD

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					Results from acoustic studies will also help address the presence of Grey Whales on the west coast of Vancouver Island and their habitat use over space and time (Burnham pers. comm. 2016). This includes an acoustic study investigating the occurrence of Grey Whales in B.C. waters during their southbound migration, which will provide new information about southerly migration timing, the location of this corridor and habitats that may be important during this phase of the migration (Ford pers. comm. 2017). Clare (2015) characterized fine-scale habitat use by examining site fidelity of Grey Whales over different time scales at one foraging site within the PCFA's foraging range.		
3		d) Contribute to, support, and foster research on Grey Whale prey needs	3 years	Completed (Ongoing effort)	Several studies addressing fine-scale foraging and prey switching by the PCFA in Clayoquot Sound, as well as the role of Grey Whales as an apex predator, have been undertaken (e.g. Feyrer and Duffus 2011; Duffus et al. 2013; Feyrer and Duffus 2014; Clare 2015; and Burnham and Duffus 2016). In 2015, CRC expanded dedicated surveys, photo-identification effort and initial tag deployments to examine feeding behaviour and document feeding locations in Puget Sound, Washington (Cascadia Research	P1; D1; R2	CRC, ENGOs, NOAA, universities, TBD

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					Collective 2016). The project addresses a number of objectives related to Grey Whale consumption of, and reliance on, Ghost Shrimp in the northern Puget Sound region.		
3		e) Photo-identification for PCFA	5 years	In progress	Since the mid-1990s, there have been several ongoing photo-identification studies for the PCFA. NMML, NOAA and CRC have been studying Grey Whales along the southwest coast of Vancouver Island and along the northern Washington coast. These efforts involve multiple research groups and independent researchers, to examine the occurrence and abundance of PCFA (Calambokidis et al. 2012).	P1; D1; R1	**CRC**, **NOAA**, ENGOs, DFO, FN, IR, universities, TBD
3		f) Genetic studies for PCFA	5 years	Completed	Many agencies collaborated in a genetics study which assessed whether stock structure exists among feeding grounds used by Eastern Pacific Grey Whales. Results indicated that matrilineal fidelity played a role in creating structure among feeding grounds, but suggested that individuals from different feeding areas may interbreed (Lang et al. 2014). Frasier et al. (2011) found significant differences in haplotype frequencies between the PCFA and the more 'northern' feeding group, indicating that the maternal lineages of the southern feeding group represent a distinct seasonal subpopulation.	P1; D1; R1	**NOAA**, DFO, ENGOs, FN

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					D'Intino et al. (2013) suggest that there is one interbreeding Grey Whale population that is seasonally subdivided based on maternally-directed site fidelity to different feeding areas.		
3		g) Assess methods for determining sustainable human-caused levels of mortality for PCFA and population	2 years	Completed	The sustainable human-caused levels of mortality (or 'potential biological removal') for the PCFA and Eastern Pacific population have been calculated by the U.S. National Marine Fisheries Service (NMFS); Carretta et al. 2016). This is also applicable for Grey Whales in Canada (Nichol pers. comm. 2017).	R5; M1 through M4	**NOAA,** TBD
4	8. Contribute to, support and foster analysis of scarring rates of individuals (photographs)		5 years	In progress	DFO, MMRN and PCA take photos of scars when responding to dead stranded Grey Whales (Ford pers. comm. 2016; Spaven pers. comm. 2016). Photographs of live animals collected by independent researchers have been included in scar rate studies (e.g. Steiger et al. 2013). One of these studies used scars to assess human-caused mortality from ship strikes and entanglement in Canadian and U.S. waters (Scordino et al. 2014).	R4	**ENGOs**, DFO, IR, MMRN, PCA, TBD
4	9. Conduct assessments of vulnerability to identified threats	a) Collect data on incidents involving Grey Whales	Opportunistic	In progress	If dead stranded Grey Whales present in good condition and are accessible, a necropsy is conducted (Raverty pers. comm. 2016). Data collected include tissue and blood samples, photos and measurements (Spaven pers. comm.	R4	**DFO**, MMRN, PCA, Province of B.C., universities, TBD

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					2016). Evidence of human interaction is documented. PCA reports stranded Grey Whales to DFO's 1-800 reporting line and participates in data collection and necropsies within Pacific Rim National Park Reserve (Yakimishyn pers. comm. 2016). PCA also collaborates with DFO on monitoring underwater noise, and would participate in data collection and potentially necropsies of any dead Grey Whales, in Gwaii Haanas National Marine Conservation Area Reserve and Haida Heritage Site (Lee, pers.com 2017). The University of Victoria's Whales, Habitat, and Listening Experiment (WHaLE) project applies an acoustic monitoring system off the west coast of Vancouver Island to monitor Grey Whale calls during the northern spring migration and to investigate whale acoustics and vessel noise during the summer feeding season (Burnham pers. comm. 2016; Duffus pers. comm. 2016).		
4		b) Investigate increased risk associated with lifting of moratorium on offshore fossil fuel extraction	3 years	In progress	Moratorium remains in effect (Short pers. comm. 2016). There have been applications of strategic environmental assessments (SEA in the international offshore energy sector; however, SEA remains underdeveloped offshore (Nobel et al.	D1; R4; M1; M2; M3	DFO, ECCC, NEB, NRCan, Province of B.C.

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					2013). In the event a project is proposed, DFO conducts site-specific risk assessments. Although the severity of an oil spill is often measured by the number of marine birds and mammals killed, Williams et al. (2012) found that on an average only 2% of cetacean carcasses are recovered.		
4		c) Assess potential for fisheries interactions	3 years	In progress	Reports of interactions between marine mammals and fisheries are collected and managed by DFO. Information about fisheries interactions are obtained through mandatory reporting as a condition of fishing licenses, and voluntary reporting by members of the public through the DFO Incident Reporting Line (Cottrell pers. comm. 2017).	D1; R4	**DFO**, TBD
4		d) Tissue sample collection	Opportunistic	In progress	When possible, tissue samples are taken to test for pathogens, and fecal samples are collected to test for domoic acid and saxitoxin (Raverty pers. comm. 2016). Toxin loading is not tested in Grey Whales in B.C. (Raverty pers. comm. 2016).	R4	**DFO**, Province of B.C., TBD
5	10. Increase understanding of Grey Whale abundance and distribution in B.C.	a) Contribute, collaborate, when feasible to photo-identification programs	3 years	In progress	DFO supports coast-wide Grey Whale photo-identification programs by encouraging and permitting surveys undertaken by independent researchers (Ford pers. comm. 2016). Likewise, NOAA contributes to photo-identification programs and shares	R1	**CRC, ENGOs,** DFO, IR, NOAA, TBD, universities

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					photos with DFO (Gearin pers. comm. 2016). DFO also supports Grey Whale photo-identification work through funding programs including the Habitat Stewardship Program and the Aboriginal Fund for Species at Risk. CRC has coordinated a collaborative Grey Whale photo-identification effort along the U.S. and Canadian west coast since 1998. This effort involves multiple research groups in Canada and examines the occurrence and abundance of Grey Whales. The research effort has produced abundance estimates, trends, and movements of PCFA animals and has tracked individuals migrating through to other feeding areas (Calambokidis et al. 2009; Calambokidis et al. 2012). Currently Pacific WildLife Foundation is analyzing a 40-year photo-identification dataset and genetic samples collected over the last 20 years in Clayoquot Sound. This work will make decades of information on Grey Whales in Pacific Canadian waters more widely accessible to researchers both in Canada and abroad (Darling pers. comm. 2016). Between 2011 and 2015, the BCCSN fulfilled three Grey Whale data requests for research, education, and		

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					marine traffic projects (Danelesko pers. comm. 2016).		
5		b) Annual population estimates during southward migration	Ongoing	In progress	Since 1967, systematic counts of Grey Whales migrating south along the coast of central California have been conducted annually by shore-based observers at Granite Canyon (Carretta et al. 2016). The sightings data are used to estimate the abundance of the Eastern Pacific Grey Whale population (NOAA 2016).	R1; R3	**NOAA**, TBD
5	11. Contribute, when feasible, to measuring body condition of animals (photographs)		3 years	Not started (Canada) In progress (U.S.)	DFO and the MMRN collect photographs and take measurements of dead stranded Grey Whales; however, photogrammetry of live Grey Whales is not being conducted in Canadian Pacific waters (Spaven pers. comm. 2016). As part of the Cetacean Health and Life History Program, NOAA began an annual monitoring program in 2015 to assess Grey Whale health using unmanned aircraft. This monitoring assesses the condition of females, the growth and condition of calves, and links calf production to feeding condition in the Arctic (Durban pers. comm. 2017).[8]	D1; R1; R4	**DFO**, **NOAA**, MMRN, PCA, TBD
5	12. Continue to support the		Ongoing	In progress	DFO contributes to the collection of sightings information through on-going	D1; R1	**DFO**, ENGOs, PCA

[8] NOAA is planning analyses of data on PCFA whales for comparison (Durban pers. comm. 2017).

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
	collection of sightings information				ship-based and aerial surveys (Ford pers. comm. 2016) and by partnering with the BCCSN (Spaven pers. comm. 2016). The BCCSN collects sightings of Grey Whales and uses the data to understand habitat use (BCCSN 2016). Between 2011 and 2015, the BCCSN received 1757 reports of Grey Whale sightings (Danelesko pers. comm. 2016). Pacific Rim National Park Reserve keeps a record of cetaceans reported along the West Coast Trail (Yakimishyn pers. comm. 2016). Parks Canada staff in Pacific Rim and Gwaii Haanas report Grey Whale and other cetacean sightings to the BCCSN (Lee pers. comm 2017). As part of its 2011 Barkley Sound survey and monitoring effort, Cetus forwarded sightings to DFO and the BCCSN. U.S. researchers in Alaska forward photos of Grey Whales to DFO (Gearin pers. comm. 2016).		
6	13. Foster communication networks	a) Develop emergency response communication networks	Immediate	In progress	Intra- and inter-agency communications regarding emergencies (such as for oil spills) are outlined in federal and provincial response plans (examples below) and	M1; M5	**CCG**, **DFO**, **ECCC**, **NOAA**, **Province of B.C.**, **TC**, ENGOs, FN, municipalities,

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					include a formalized incident command structure. The agreements recognize that environmental emergencies are not limited to one jurisdiction and require cooperative responses.[9] The Marine Spills Contingency Plan - National Chapter outlines the process, including communications that CCGS follows when responding to a marine emergency (DFO 2011b). The Canada-United States Joint Marine Pollution Contingency Plan outlines the steps needed, including communications, to coordinate international responses to discharges of pollutants in the contiguous waters of Canada and the United States. B.C.'s Marine Oil Spill Response Plan outlines incident command and communication frameworks (B.C. Ministry of the Environment 2013). Other agencies and local governments fit into the response network and are included as required (Yakimishyn pers. comm. 2016; Picco pers. comm. 2016).		PCA
6		b) Promotion of BWW guidelines	3 years	In progress	DFO staff promotes the BWW guidelines and MMR to industry, the		**DFO**, BCCSN, ENGOs, PCA,

[9] 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.

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					public, ENGOs and other government agencies, respond to media requests, and provide information on social media (Cottrell pers. comm. 2016). The BCCSN promotes the BWW guidelines through on-line resources, presentations, community events, brochures, signs, and other products. Between 2011 and 2015 the BCCSN gave 240 presentations which included Grey Whale information and wrote 16 Grey Whale related blogs for the www.wildwhales.org website (Danelesko pers. comm. 2016).[10] PCA promotes the BWW guidelines through on-going education programs and outreach events (Yakimishyn pers. comm. 2016; Lee pers. comm. 2017). Cetus's Straitwatch program promotes the BWW guidelines and distributes brochures during interpretive talks at beaches, docks, marinas, remote communities, community events and on the water. In 2011, Straitwatch provided whale watching monitoring and outreach in Grey Whale habitat on 28 days and		Straitwatch,

[10] A new Mariner's Guide was released in February 2017 targeted for large vessel mariners to inform them of threats associated with large vessels and how to minimize disturbance and ship strikes.

Broad strategy	Action	Approach	Timeline	Status	Description and results	Objectives	Participants
					distributed BWW media around Vancouver Island and the central B.C. coast, reaching an estimated 10,700 people.		
6		c) Trans-boundary, inter-jurisdictional collaboration	Immediate	In progress	There is ongoing inter-jurisdictional collaboration regarding Grey Whale research programs, including data sharing, assisting with biopsy work, and supporting research under DFO and NOAA research permits (Gearin pers. comm. 2016). Key publications resulting from this collaborative work include Calambokidis et al. (2012) and Lang et al. (2014).	R1; R2; R3; M5	**DFO**, **NOAA**, CRC, ENGOs, International Maritime Organization, TBD

3.2 Summary of progress towards conservation

3.2.1 Status of actions and approaches

Thirty-one actions and approaches from the management plan are identified in Table 2. Six actions have been completed for Eastern Pacific Grey Whales in Canadian waters (19%). Activities to meet another 20 (65%) actions and approaches are in progress. These activities may not have a specific endpoint. Activities in support of five approaches have not yet started (16%).

4. Concluding statement

While the majority of activities are still in progress, steps have been made toward meeting several of the actions outlined in the management plan. The following activities are examples of actions undertaken to understand the ecology of Grey Whales in B.C., threats to their habitat, and to develop mitigation measures to support conservation.

Satellite-tracking of Grey Whales has shown for the first time that northward migrating animals use a route to the east and north of Haida Gwaii. Continued research on Grey Whale foraging ecology and site fidelity along the west coast of Vancouver Island has demonstrated fine-scale spatial and temporal variability in Grey Whale distribution and habitat use. Ongoing collaborative photo-identification programs have increased the understanding of Grey Whale abundance and distribution along the west coast of Vancouver Island, including an improved understanding of the PCFA. Significant progress has also been made in understanding the stock structure of the PCFA. This research informed the recent re-assessment of Eastern Pacific Grey Whales by COSEWIC as three designatable units.

Addressing knowledge gaps related to known threats has advanced. Acoustic monitoring of Grey Whales and vessel noise are providing valuable information about the quality of the Grey Whale acoustic environment. This information can help to inform effective mitigation protocols for noise impacts. Remaining knowledge gaps include data on PCFA occurrence north of Cape Caution. Additionally, in Canadian Pacific waters, measurement of the body condition of live animals, including an analysis of scarring rates from entanglements and vessel strikes, remains a research gap. Ongoing work is therefore needed to provide further insight into Grey Whale habitat use and threats.

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Appendix A: acronyms

Acronym	Organization Name or Definition
BCCSN	British Columbia Cetacean Sightings Network
B.C.	British Columbia
Province of B.C.	British Columbia's Ministry of Agriculture and Lands
BWW	Be Whale Wise
C&P	DFO Conservation and Protection
CMARA	Canada Marine Animal Response Alliance
CCGS	Canadian Coast Guard Services
CRC	Cascadia Research Collective (U.S.)
Cetus	Cetus Research and Conservation Society
DDT	dichlorodiphenyl trichloroethane
DFO	Fisheries and Oceans Canada
DND	Department of National Defence
ECCC	Environment and Climate Change Canada
ENGOs	Environmental Non-governmental Organizations
FN	First Nations
IR	Independent researchers not affiliated with an organization
MMR	Marine Mammal Regulations under Canada's Fisheries Act
MMRN	Marine Mammal Response Network
NEB	National Energy Board
NMFS	U.S. National Marine Fisheries Service
NMML	National Marine Mammal Lab, U.S. National Oceanic and Atmospheric Administration
NOAA	U.S. National Oceanic and Atmospheric Administration
NRCan	Natural Resources Canada
NTC	Nuu-chah-nulth Tribal Council
OPP	Oceans Protection Plan
PBDEs	polychlorinated diphenylethers
PCA	Parks Canada Agency
PCFA	Pacific Coast Feeding Aggregation
SEA	Strategic environmental assessment
Straitwatch	Straitwatch on-water program run by Cetus
TBD	To be determined
TC	Transport Canada
WCMRC	Western Canada Marine Response Corporation
WHaLE project	Whales, Habitat, and Listening Experiment