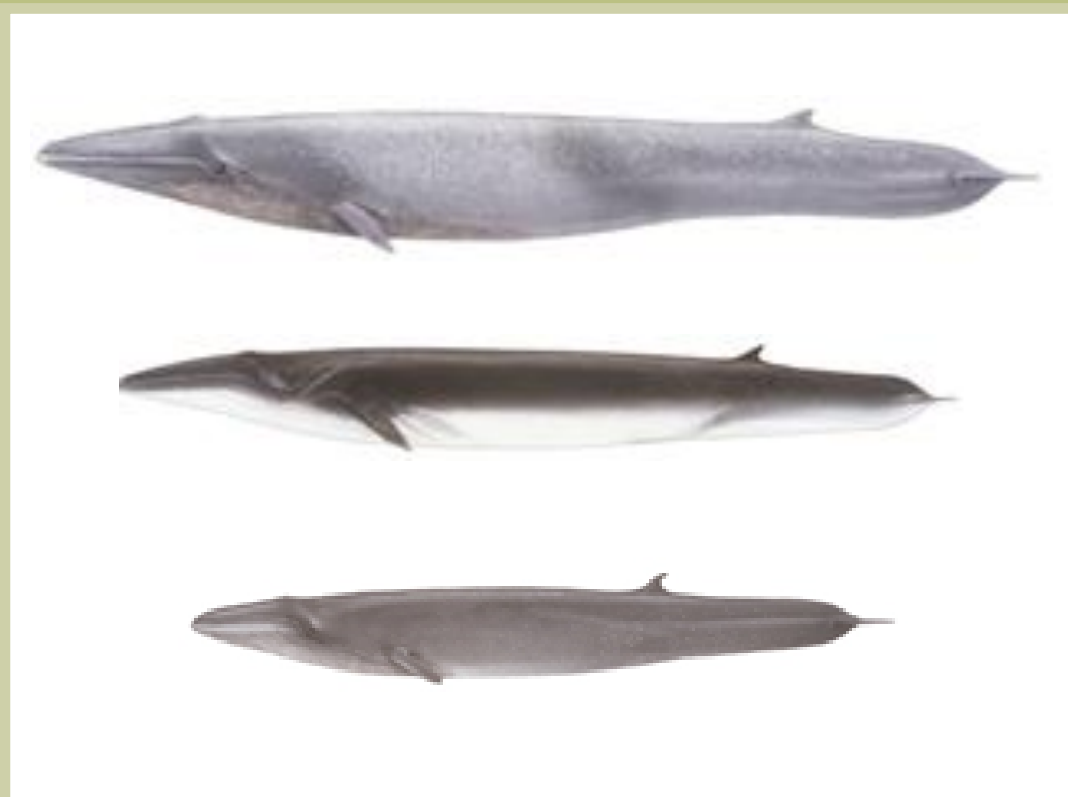


Report on the Progress of Recovery Strategy Implementation for the Blue, Fin, and Sei Whales (*Balaenoptera musculus*, *B. physalus* and *B. borealis*) in Canadian Pacific Waters for the Period 2012 to 2017

Blue, Fin, and Sei Whales



2022

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For copies of the progress report, or for additional information on species at risk, including Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status reports, recovery strategies, residence descriptions, action plans, and other related recovery documents, please visit the [Species at Risk Public Registry](#).

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Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#) agreed to establish complementary legislation and programs that provide for the protection of species at risk throughout Canada. Under section 46 of the *Species at Risk Act* (S.C. 2002, c.29) (SARA), competent ministers are responsible for reporting on the implementation of the recovery strategy for a species at risk, and on the progress towards meeting its objectives within five years of the date when the recovery strategy was placed on the Species at Risk Public Registry and in every subsequent five-year period, until its objectives have been achieved or the species' recovery is no longer feasible.

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

The Minister of Fisheries and Oceans (DFO), and the Minister responsible for the Parks Canada Agency (PCA) are the competent ministers under SARA for the Blue, Fin, and Sei Whales and have prepared this progress report.

As stated in the preamble to SARA, success in the recovery of species at risk depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in the recovery strategy and will not be achieved by DFO and the Minister responsible for PCA, or any other jurisdiction alone. The cost of conserving species at risk is shared amongst different constituencies. All Canadians are invited to join in supporting and implementing the Recovery Strategy for the Blue, Fin, and Sei Whales in Canadian Pacific waters for the benefit of the species and Canadian society as a whole.

Acknowledgments

This progress report was prepared by Christie McMillan and Tatiana Lee (DFO). To the extent possible, this progress report has been prepared with inputs from staff at DFO Science, Marine Mammal, and Fisheries Management Programs. DFO greatly appreciates all individuals and organizations that contribute to the recovery of Blue, Fin, and Sei Whales in Canada and abroad.

Executive summary

Blue, Fin, and Sei Whale (*Balaenoptera musculus*, *B. physalus* and *B. borealis*) populations in Canadian Pacific waters were listed under the *Species at Risk Act* (SARA) as: endangered (2005), threatened (2006), and endangered (2005), respectively. The [Recovery Strategy for Blue, Fin, and Sei Whales \(*Balaenoptera musculus*, *B. physalus* and *B. borealis*\) in Pacific Canadian Waters](#) (Gregr et al. 2006) was finalized and published on the Species at Risk Public Registry in 2006.

Present threats to Blue, Fin, and Sei Whales, as identified in the recovery strategy (Gregr et al. 2006), include: vessel strikes; anthropogenic noise; entanglement in fishing gear and debris; pollution; and habitat displacement due to changes in ocean climate or trophic structure.

The recovery objectives for Blue, Fin, and Sei Whales are:

1. by 2011, determine the identity of the population of Blue, Fin, and Sei Whales that occur in Canadian Pacific waters
2. maintain or increase the relative proportions of Blue, Fin, and Sei Whales in Canadian Pacific waters compared to the whole population through to 2016
3. by 2011, confirm the presence of Sei Whale(s) in Canadian Pacific waters. If confirmed, maintain or increase the relative proportion of Sei Whales that occur in Canadian Pacific waters compared to the whole population through to 2016
4. see that the threats as they are identified do not significantly reduce the potential habitat or distribution in Canadian Pacific waters for Blue, Fin, and Sei Whales through to 2016 (by comparison to when identified as a threat)

This report summarizes progress Fisheries and Oceans Canada (DFO), and the broader conservation community have made towards achieving the goals and objectives set out in the recovery strategy.

Examples of progress from 2012 through 2017 include:

- updated information on Fin Whale distribution and habitat use in Canadian Pacific waters (Nichol et al. 2018; Pilkington et al. 2018)
- science advice on habitats of special importance to Fin Whales in Canadian Pacific waters (DFO 2017b)
- improved understanding of population structure (Koot 2015), seasonality and relative distribution (Pilkington et al. 2018) of Fin Whales through acoustic monitoring
- vessel strike risk analyses for Fin Whales off the west coast of Vancouver Island, British Columbia (B.C.) (Nichol et al. 2017a; Nichol et al. 2017b)
- annual offshore ship-based surveys conducted
- presence of Sei Whales in offshore Canadian waters confirmed based on two sightings (COSEWIC 2013)
- new hydrophones installed, in offshore and coastal waters, to expand acoustic detections of large whales
- audience of over 70 million engaged through large whale conservation outreach efforts
- fourteen B.C. based projects focussing on Blue, Fin, and Sei Whale research and/or education and outreach funded

DFO collaborates with Indigenous groups, United States' National Oceanographic and Atmospheric Administration researchers, independent research organizations, and academia in both Canada and the United States, to advance efforts to expand knowledge and identify

occupied and critical habitats for large whales. Limited observations and understanding of the current distribution of Blue and Sei Whales does not yet allow for the identification of their critical habitat in Canadian Pacific waters.

An action plan for these species was published ([DFO 2017a](#)) and a progress report on the recovery strategy for 2006 to 2011 was completed ([DFO 2013](#)). Measurable progress has been made towards meeting the goals, objectives and performance measures presented in the recovery strategy. Continuing to build the overall body of knowledge on these species' habitat use and distribution will aid in threat mitigation to support recovery of Blue, Fin, and Sei Whales in Canada.

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1 Introduction

This report outlines the progress made towards meeting the objectives listed in the recovery strategy for Blue, Fin, and Sei Whales in Canadian Pacific waters from 2012 through 2017. This report should be considered as part of a series of documents for these species that are linked and should be taken into consideration together. These are: the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status reports for Blue, Fin, and Sei Whales (COSEWIC 2005; 2012; 2013), the recovery strategy (Gregr et al. 2006), the progress report on activities between 2006 and 2011 (DFO 2013), and an action plan (DFO 2017a).

Section 2 of this progress report reproduces or summarizes key information on the threats to the species, recovery objectives, approaches to meeting the recovery objectives, and performance measures to measure the progress of recovery. For more details, readers should refer back to the “[Recovery Strategy for Blue, Fin and Sei Whales \(*Balaenoptera musculus*, *B. physalus* and *B. borealis*\) in Pacific Canadian Waters](#)” (Gregr et al. 2006). Section 3 of this report outlines progress made from 2012 through 2017 in implementing activities described in the recovery strategy that support achieving the recovery objectives. Section 4 summarizes the progress toward achieving the recovery objectives for Blue, Fin, and Sei Whales.

2 Background

2.1 COSEWIC assessment summary

The *Species at Risk Act* (SARA) listing of the Blue, Fin, and Sei Whales (2005, 2006, and 2005 respectively) led to the development and publication of the recovery strategy (Gregr et al. 2006). The recovery strategy was based on the information provided in COSEWIC status reports for each of the three species (COSEWIC 2002; 2003; 2005). This COSEWIC information is included in sections 2.1, 3.1, and 4.1 of the recovery strategy. A decade later, COSEWIC re-examined and confirmed the status of Blue and Sei Whales as endangered (COSEWIC 2012; 2013). The summary of COSEWIC’s most recent assessments for each species is provided below.

Common name:	Blue Whale (Pacific population)
Scientific name:	<i>Balaenoptera musculus</i>
Legal listing (SARA):	January 2005 (endangered)
COSEWIC status:	Endangered
Assessment summary:	May 2012
Reason for designation:	Individuals off the coast of British Columbia are likely part of a northeastern Pacific population that was depleted by whaling. The infrequency of observations (visual and acoustic) suggests their numbers are currently very low (significantly less than 250 mature individuals). Threats to this species along the coast of British Columbia are poorly known, but may include ship strikes, anthropogenic noise, entanglement in fishing gear, and long-term

	changes in climate (which could affect the abundance of their zooplankton prey).
Occurrence in Canada:	Pacific Ocean
Status history:	The species was considered a single unit and designated special concern in April 1983, but was split into two populations in May 2002. The Pacific population was designated endangered in May 2002, and its status was re-examined and confirmed in May 2012.

Common name:	Fin Whale (Pacific population)
Scientific name:	<i>Balaenoptera physalus</i>
Legal listing (SARA):	September 2006 (threatened)
COSEWIC status:	Special concern
Assessment summary:	May 2019
Reason for designation:	The abundance of this large whale appears to be recovering from depletion due to industrial whaling, which ended in the mid-1970s. Current abundance estimates are less than 1000 mature individuals, but this excludes individuals in Canadian waters beyond the continental shelf where substantial numbers were sighted in a 2018 survey. Additionally, populations in neighbouring United States waters are increasing and could augment the Canadian population. Individuals continue to be at risk mainly from vessel strikes and underwater noise from shipping.
Occurrence in Canada:	Pacific Ocean
Status history:	The species was considered a single unit and designated special concern in April 1987. Then, it was split into two populations (Atlantic and Pacific) in May 2005. The Pacific population was designated threatened in May 2005, and its status was re-examined and designated special concern in May 2019.

Common name:	Sei Whale (Pacific population)
Scientific name:	<i>Balaenoptera borealis</i>
Legal listing (SARA):	January 2005 (endangered)
COSEWIC status:	Endangered
Assessment summary:	May 2013

Reason for designation:	Individuals off the coast of British Columbia are likely part of a northeastern Pacific population that was depleted by whaling. The infrequency of observations (visual and acoustic) suggests that numbers in Canada are currently very low (well below 250 mature individuals) and reports of this species are similarly rare in adjacent United States waters to the north (Alaska) and south (Washington, Oregon, California). Threats to this species along the coast of British Columbia are poorly known, but may include ship strikes, anthropogenic noise, and long-term changes in climate (which would affect the abundance of their zooplankton prey).
Occurrence in Canada:	Pacific Ocean
Status history:	The species was designated as endangered in May 2003. Its status was re-examined and confirmed in May 2013.

2.2 Threats

This section summarizes the information, detailed in the recovery strategy, on threats to survival and recovery of the Blue, Fin, and Sei Whale and habitat-related threats.

2.2.1 Threats to the Blue, Fin, and Sei Whale

The following are current threats to the Blue, Fin, and Sei Whale in Canadian Pacific waters. Please refer to section 5 of the recovery strategy for more information on these threats:

- vessel strikes and physical disturbance due to vessel presence
- acute and chronic anthropogenic noise causing disturbance and/or physical injury
- entanglement in fishing gear and debris
- pollution
- changes in foraging habitat due to changes in ocean climate or trophic structure

2.2.2 Threats to critical habitat

Critical habitat for Blue, Fin, or Sei Whales has not been formally identified. Section 9.4.1 of the recovery strategy (Gregar et al. 2006) includes a schedule of studies that outlines the research required to identify critical habitat to achieve the species' recovery objectives. Habitat of 'special importance' to Fin Whales in inshore Canadian Pacific waters was identified in a Canadian Science Advisory Secretariat (CSAS) science advisory report (DFO 2017b), following the National Marine Mammal Peer Review Committee meeting, and in greater scientific detail in a CSAS research document (Nichol and Ford 2018). However, important Canadian Pacific habitat for Blue and Sei Whales has not been determined. Further progress in undertaking the schedule of studies is reported in section 3.2 of this document.

Habitat-related threats identified in the recovery strategy (Gregar et al. 2006), the action plan (DFO 2017a) and in Nichol and Ford (2018) include: acoustic disturbance, contaminants, and physical disturbance. These threats could impact important qualities of habitat for large whales in Canadian Pacific waters such as those supporting feeding or foraging, mating or courtship and rearing of young.

2.3 Recovery

Blue, Fin, and Sei Whales are long-lived species with life spans between 50 and 100 years. Long-term goals must span several generations, and therefore have a horizon of 150 to 300 years.

The recovery goals for these species are:

1. to attain a long-term viable population of Blue Whales that use Canadian Pacific waters
2. to attain a long-term viable population of Fin Whales that use Canadian Pacific waters
3. to attain a long-term viable population of Sei Whales that occasionally use Canadian Pacific waters

The section below summarizes the information found in the recovery strategy (Gregar et al. 2006) on the recovery objectives that are necessary for the recovery of the Blue, Fin, and Sei Whale and on performance measures that provide a way to define and measure progress toward achieving the recovery objectives.

2.3.1 Recovery objectives

Section 9.3 of the recovery strategy (Gregar et al. 2006) identified the objectives necessary for the recovery of the species. Recovery objectives are outlined in table 1 below. The objectives below refer only to the portion of these populations that occur in Canadian Pacific waters and provide a short-term measure of progress towards reaching the recovery goals.

2.3.2 Performance measures

Section 10 of the recovery strategy (Gregar et al. 2006) includes objective-based evaluation criteria that act as performance measures to assess the effectiveness of the objectives and to determine whether recovery remains feasible. Seven performance measures are outlined against recovery objectives in table 1 below.

Table 1. Recovery objectives and corresponding performance measures for the Blue, Fin, and Sei Whale as found in the recovery strategy (Gregar et al. 2006).

Recovery objective	Performance measures
1. By 2011, determine the identity of the population of Blue and Fin Whales that occur in Canadian Pacific waters	Were the population identities of Blue and Fin Whales that occur in Canadian Pacific waters determined?
2. Maintain or increase the relative proportions of Blue and Fin Whales in Canadian Pacific waters compared to the whole population through to 2016	Was the relative proportion of Blue Whales in Canadian Pacific waters compared to the whole population maintained, or increased?
3. By 2011, confirm the presence of Sei Whale(s) in Canadian Pacific waters. If confirmed, maintain or	Was the presence of Sei Whale(s) confirmed in Canadian Pacific waters? If so, has the relative proportion of Sei Whales

Recovery objective	Performance measures
increase the relative proportion of Sei Whales that occur in Canadian Pacific waters compared to the whole population through to 2016	that occur in Canadian Pacific waters compared to the whole population been maintained, or increased?
4. See that the threats as they are identified do not significantly reduce the potential habitat or distribution in Canadian Pacific waters for Blue, Fin, and Sei Whales through to 2016 (by comparison to when identified as a threat)	<p>Did the identified threat(s) significantly reduce the potential habitat or distribution in Canadian Pacific waters for Blue, Fin, and Sei Whales?</p> <p>Were threats better identified? Were threats reduced or mitigated?</p>

The following two additional approach-based performance measures were not tied to specific objectives.

- Were studies undertaken to identify critical habitat for these large whales?
- Was research conducted and/or surveys carried out to better define the species' abundance and distribution?

Some performance measures may not be measurable within the timeframe covered in this progress report. In such cases, the implementation of the recovery measures and critical habitat studies will help report on the progress towards achievement of the performance measures. Refer to section 3 of this document.

3 Progress towards recovery

Section 9.4 of the recovery strategy for Blue, Fin, and Sei Whales in Canadian Pacific Waters (Gregr et al. 2006) divides the recovery effort into three broad strategies; 1) schedule of studies to identify critical habitat, 2) species abundance and distribution, and 3) threat mitigation. Progress in carrying out these broad strategies is reported in sections 3.1 and 3.2 below. Section 3.3 reports on the progress of meeting the performance measures and other commitments identified in the recovery strategy (for example, identification of critical habitat(s)) and information obtained through implementing the recovery strategy.

3.1 Activities supporting recovery

Broad strategy 1: schedule of studies to identify critical habitat¹

- Approach 1-1: identify potential habitat²
- Approach 1-2: identify realized habitat³
- Approach 1-3: define critical habitat

¹ Progress on activities supporting the identification of critical habitat are reported on in section 3.2 of this document.

² Potential habitat represents areas where suitable habitat exist (Gregr et al. 2006).

³ Realized habitat describes where species actually occur (Gregr et al. 2006).

Broad strategy 2: species abundance and distribution

- Approach 2-1: estimate the number of Blue and Fin Whales using Canadian Pacific waters
- Approach 2-2: establish presence of Sei Whales in Canadian Pacific waters
- Approach 2-3: determine the extent of migrations and identify the populations to which Blue, Fin, and Sei Whales using Canadian Pacific waters belong
- Approach 2-4: determine relative seasonal distribution in Canadian Pacific waters of Blue, Fin, and Sei Whales through surveys, photo-identification, and/or acoustic detection
- Approach 2-5: establish collaborations and data sharing with researchers in other jurisdictions to develop estimates of abundance and range-wide distribution and habitat use

Broad strategy 3: threat mitigation

- Approach 3-1: determine the spatial distribution of commercial shipping traffic and relate to the critical habitat of Blue, Fin, and Sei Whales
- Approach 3-2: determine likely locations of seismic surveys and low frequency sonar use and relate to critical habitat of Blue, Fin, and Sei Whales
- Approach 3-3: determine source locations and background noise levels from industrial activities and other anthropogenic sources and relate to critical habitat use of Blue, Fin, and Sei Whales
- Approach 3-4: with the information gathered in approaches 3-1, 3-2, and 3-3, develop options to protect critical habitat and implement as necessary
- Approach 3-5: investigate methods to obtain information on frequency of ship strikes and fishing gear entanglements and, if necessary, develop options to reduce their occurrence
- Approach 3-6: include the presence of balaenopterids in oil spill response plan(s) to prevent individuals from being oiled in the event of an oil spill
- Approach 3-7: confirm that there is little threat to balaenopterids in Canadian Pacific waters from chronic and acute sources of pollution
- Approach 3-8: confirm that seismic mitigation strategies and low frequency sonar use policies protect individuals from injury or mortality and, if necessary, develop options to improve protection
- Approach 3-9: promote marine mammal viewing guidelines and enforce compliance with regulations against disturbance

Each approach in Table 2 has been assigned a status:

- 1) completed: the 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

Table 2. Details of activities supporting the recovery of Blue, Fin, and Sei Whales from 2012 through 2017.

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
Estimate the number of Blue and Fin Whales using Canadian Pacific waters	2-1	In progress	<p>Mark-recapture methods were used to estimate the abundance of Fin Whales in Hecate Strait, Queen Charlotte Sound and Greater Caamano Sound. The estimated total number of Fin Whales present in the area at any time during the period between 2009 and 2014 was 405 individuals (DFO 2017b).</p> <p>Fin Whale abundance for the same areas was estimated using line-transect methods. These methods produced an estimate of 329 individuals (95% Confidence Interval: 274 to 395) present in the area at any time during the survey years (2004 to 2008) (Best et al. 2015).</p> <p>An analysis to estimate Fin Whale abundance for the west coast of Vancouver Island and offshore British Columbia (B.C.) waters was not completed during the period of this progress report. Additional ship based line transect data, and/or photo-identification data are still needed (Nichol pers. comm. 2018; Abernethy pers. comm. 2018).</p> <p>The number of Blue Whales using Canadian Pacific waters has not been estimated; however, data collection is underway including ship-based surveys, and collection of identification photographs (Nichol pers. comm. 2017).</p>	All	<p>Fisheries and Oceans Canada (DFO); Academia; Environmental non-governmental organizations (ENGOs)</p>
Establish presence of Sei Whales in Canadian Pacific waters	2-2	Completed	<p>In August 2012, there were two confirmed sightings of a possible total of four Sei Whales in the outer portion of Canada’s Economic Exclusion Zone. These sightings occurred during a joint International Whaling Commission, Japan cetacean survey of the eastern North Pacific (COSEWIC 2013; Matsuoka et al. 2013).</p>	All	<p>DFO; Independent researchers (IR); United States’ National Oceanographic</p>

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			Acoustic monitoring during the reporting period resulted in several detections of possible Sei Whale vocalizations within Canadian Pacific waters (Doniol-Valcroze pers. comm. 2021).		and Atmospheric Administration (NOAA)
Determine the extent of migrations and identify the populations to which Blue, Fin, and Sei Whales using Canadian Pacific waters belong	2-3	In progress	<p>A total of 29 satellite tags were deployed on Fin Whales between 2012 and 2017. Sixteen of these tags were deployed in northern B.C. (greater Caamano Sound and Hecate Strait) and the remaining 13 were deployed off the west coast of Vancouver Island (Abernethy pers. comm. 2017). All tagged animals remained in Greater Caamano Sound or Hecate Strait for the duration of tag transmission which averaged 27 days (8 to 60 days); therefore, the data obtained from these tags was not well suited to inform an understanding of extent of migration (Nichol et al. 2018). It was anticipated that tag transmission would be longer, however Fin Whale speed and profile resulted in early tag-shedding.</p> <p>Satellite tags were deployed on two Blue Whales in offshore B.C. waters in 2013. These individuals remained in offshore B.C. waters for the short duration of their tag transmissions; therefore, the data obtained from these tags was not well suited to inform an understanding of extent of migration (Abernethy pers. comm. 2017). As with the Fin Whale tagging, the tag transmission period was intended to be longer. Tag data for both species did provide useful information at a finer temporal and spatial scale. For example, data were used to inform Fin Whale important habitats and ship strike risk modelling by both DFO and collaborators on the Central coast.</p>	All	DFO ; Academia; CRC; ENGOs; JASCO Applied Sciences

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			<p>Identification photographs of Blue Whales collected in B.C. are periodically shared with United States (U.S.) researchers from Cascadia Research Collective (CRC) and have been useful to inform extent of migration and population identities of these individuals. Between 2012 and 2017, two Blue Whales photographed in B.C. were matched to individuals photographed in California by Calambokidis et al. (2009).</p> <p>Seven genetic samples were collected from Blue Whales between 2012 and 2017. Five of these were biopsies from live Blue Whales, one was a fecal DNA sample, and one was a sample from a stranded individual. These samples may inform population structure of Blue Whales in Canadian Pacific waters (Abernethy pers. comm. 2017), analyses are pending.</p> <p>Analyses of acoustic data collected in B.C. waters using passive underwater acoustic recording devices suggest that there may be two populations of Fin Whales in these waters. Two song types (Type 1 and Type 2), possibly indicative of two populations of Fin Whales were recorded off the coast of B.C. Type 1 songs were only recorded in offshore waters, while Type 2 songs occurred throughout coastal B.C. (Koot 2015; Nichol and Ford 2018; Pilkington et al. 2018). More study is needed to determine level of population structure indicated by different song types, as well as potential geographic segregation.</p> <p>Photo-identification continues to provide insight into movements of Fin Whales in B.C. waters. An analysis of photo-identification data collected by DFO and collaborators does not indicate regular movement of</p>		

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			<p>Fin Whales between inshore and offshore areas (Nichol et al. 2018; Nichol and Ford 2018).</p> <p>A total of 105 biopsy samples were collected from Fin Whales in B.C. waters between 2012 and 2017. Stable isotope and fatty acid analyses of these samples are pending (Abernethy pers. comm. 2017).</p> <p>An analysis of 141 Fin Whale biopsy samples collected off Vancouver Island, B.C. was conducted by St. Mary's University and DFO to test for patterns of population structure. Results varied depending on the methods used, but the majority of analyses indicate no clear population structuring (Nichol pers. comm. 2017; Pilkington pers. comm. 2018).</p> <p>There are insufficient data on Sei Whales to assess migration or population structure.</p>		
<p>Determine relative seasonal distribution in Canadian Pacific waters of Blue, Fin, and Sei Whales through surveys, photo-identification, and/or acoustic detection</p>	<p>2-4</p>	<p>In progress</p>	<p>Data on the distribution for Blue and Fin Whales are collected on an ongoing basis during multi-species ship-based and aerial surveys conducted by DFO. For example, DFO completed 42 ship surveys from 2002 to 2014, and 34 aerial surveys from 2012 to 2015 (Nichol pers. comm. 2017).</p> <p>Annual ship-based and aerial surveys collect data on all cetacean species encountered; therefore, survey effort also applies to Sei Whales. However, due to the very limited number of Sei Whale sightings to date, sufficient data does not yet exist to determine relative seasonal distribution of Sei Whales.</p> <p>Acoustic data recorded between 2008 and 2015, and analyzed as part of a collaborative project conducted by DFO and the University of British Columbia,</p>	<p>All</p>	<p>DFO; Academia; JASCO Applied Sciences; PCA</p>

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			<p>provided information about relative seasonal distribution of Fin Whales in B.C. waters. These data indicated that Fin Whales are present year-round in the waters off B.C., and that there is potentially a seasonal movement of Fin Whales into Hecate Strait and Queen Charlotte Sound in late fall and winter, coinciding with the peak of the breeding season (Koot 2015; Pilkington et al. 2018). These efforts could not confirm nor exclude the possibility of seasonal migration to/from Canadian Pacific waters. These studies also highlighted geographic gaps in acoustic data collection for Fin Whales in B.C. Ongoing collection of Blue, Fin, and Sei Whale acoustic data is underway by DFO and PCA, using underwater acoustic recording devices (Pilkington pers. comm. 2017; Lee pers. comm. 2021).</p>		
<p>Establish collaborations and data sharing with researchers in other jurisdictions to develop estimates of abundance and range-wide distribution and habitat use</p>	<p>2-5</p>	<p>Completed (ongoing)</p>	<p>DFO has had long-term scientific collaborations and data sharing with internationally based organizations. Examples are U.S. NOAA and CRC. Research collaborations have resulted in publications such as: Calambokidis et al. (2009) and Keen et al. (2018).</p> <p>The B.C. Cetacean Sightings Network (BCCSN) is a partnership between DFO and the Coastal Ocean Research Institute that solicits sightings of cetaceans in B.C. waters from the public. Data collected inform habitat use and distribution of cetacean species. The BCCSN collected a total of 180 confirmed Fin Whale sightings and 5 confirmed Blue Whale sightings between 2012 and 2017 (Torode pers. comm. 2018). From 2012 through 2017, BCCSN had at least 24 requests to share sightings data with other researchers.</p>	<p>All</p>	<p>DFO; ENGOS Indigenous groups (IG); IR; PCA</p>

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			<p>DFO has collaborated with Parks Canada Agency (PCA) and the Council of the Haida Nation to deploy hydrophones in 2016 and 2017 in Gwaii Haanas, Haida Gwaii, to monitor underwater noise levels and cetacean activity (Shepherd pers. comm. 2018).</p> <p>Conservation work conducted through federal funding avenues (for example, Habitat Stewardship Program [HSP], Aboriginal Fund for Species at Risk [AFSAR]) allow for expanded stewardship, collaboration, and data collection opportunities in remote areas. From 2012 through 2017, 14 HSP and AFSAR funded projects included surveys and data collection on cetaceans including, Blue, Fin, and Sei Whales.</p> <p>Since the establishment of the Gwaii Haanas marine monitoring program in 2016, PCA field staff in Gwaii Haanas report cetacean sightings to BCCSN (Shepherd comm. 2018).</p>		
Determine the spatial distribution of commercial shipping traffic and relate to the critical habitat of Blue, Fin, and Sei Whales	3-1	In progress	<p>Nichol et al. (2017a) provided analyses of vessel strike risk off west coast Vancouver Island for Fin Whales. Sightings of Blue Whales were logged during aerial surveys for this effort; however, there were insufficient data to include Blue Whales in the analyses. While these data do not overlap with the habitats of special importance described for Fin Whales (Nichol and Ford 2018), they provide important insight into vessel strike risk for large whales in B.C.</p> <p>Critical habitat for Blue and Sei Whales in Canadian Pacific waters cannot yet be identified, due to limited data and understanding of the distribution of these species. Additionally, although a habitat of special importance has been identified for Fin Whales,</p>	4	DFO; Environment and Climate Change Canada (ECCC)

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			assessment of their habitat was limited to inshore waters due to data deficiencies (DFO 2017b).		
Determine likely locations of seismic surveys and low frequency sonar use and relate to critical habitat of Blue, Fin, and Sei Whales	3-2	Not started	<p>Mapping locations of sonar use and potential seismic surveying in relation to critical habitat has not started.</p> <p>Nichol and Ford (2018) describe important Fin Whale habitats, and analyses of existing acoustic data may provide a useful tool to advance this effort.</p>	4	TBD
Determine source locations and background noise levels from industrial activities and other anthropogenic sources and relate to critical habitat use of Blue, Fin, and Sei Whales	3-3	In progress	<p>A model was developed that included the propagation of underwater noise from ships (a dominant source of anthropogenic sound in B.C.) and density maps and audiograms of marine mammals, including Fin Whales, to predict areas where ship noise is expected to have an above average impact on species specific habitat. Hotspots for ship noise levels and Fin Whale density included waters off Prince Rupert and into Hecate Strait (Erbe et al. 2014).</p> <p>DFO has not conducted analyses of background noise levels in offshore B.C. waters; however, calibrated data are being collected that could be used for soundscape analysis (Pilkington pers. comm. 2017).</p> <p>One region has been identified as habitat of special importance for Fin Whales and described in Nichol and Ford (2018); there is insufficient information to describe or identify important habitat for Blue and Sei Whales in Canadian Pacific waters.</p>	4	DFO; Academia; ENGOs; PCA

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			<p>Since 2014, North Coast Cetacean Society (NCCS) has monitored a network of four hydrophones in Squally Channel, capable of detecting large whale vocalizations.</p>		
<p>With the information gathered in approaches 3-1, 3-2, and 3-3, develop options to protect critical habitat and implement as necessary</p>	3-4	In progress	<p>Critical habitat has not yet been identified for Blue or Sei Whales. When sufficient information is available, critical habitat for these species will be described.</p> <p>Habitat of 'special importance' for Fin Whales in Canadian Pacific waters has been partially described, for inshore waters only, as a result of data availability (DFO 2017b; Nichol and Ford 2018). The process to formally identify and protect this important habitat as critical habitat under SARA is in progress.</p>	4	DFO
<p>Investigate methods to obtain information on frequency of ship strikes and fishing gear entanglements and, if necessary, develop options to reduce their occurrence</p>	3-5	In progress	<p>Nichol et al. (2017a) provides information on areas of increased ship strike risk to Fin Whales off the west coast of Vancouver Island and describes potential areas to focus ship strike mitigation effort.</p> <p>Work led by the Vancouver Fraser Port Authority's Enhancing Cetacean Habitat and Observation Program (ECHO) to model cetacean ship strike risks for outside waters off southwestern Vancouver Island is underway. In 2016, DFO deployed several satellite tags on large whales off Vancouver Island. Once analyzed, these data may support the ECHO effort (Abernethy pers. comm. 2018).</p> <p>Opportunistic photographs of injured whales are taken during DFO annual marine mammal ship and aerial surveys.</p> <p>DFO's Marine Mammal Response Program (MMRP) works with partners to respond to reports of dead and</p>	4	DFO ; ENGOs; Industry; Ocean Wise (formerly Vancouver Aquarium); PCA

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			<p>distressed marine mammals, and conducts disentanglements and necropsies, as well as documenting evidence of entanglement and vessel strike. From 2012 to 2017, the MMRP identified seven Fin Whales (six dead, one alive), and one dead Blue Whale. No Sei Whales were identified (Cottrell pers. comm. 2021).</p> <p>Many of HSP and AFSAR funded outreach efforts during this reporting period included messaging to encourage increase in reporting of vessel strikes and entanglements by the public, and industry partners such as fishing guides and whale watch industry.</p> <p>DFO publishes annual Integrated Fishery Management Plans for marine fisheries which include hotline contact information to report and resolve any incidents.</p> <p>Marine Mammal Regulations (MMR) under the <i>Fisheries Act</i> continue to be actively enforced by DFO Conservation and Protection Branch (C&P). During the time period for this progress report, proposed amendments to the MMR included recommendations for mandatory reporting of any accidental contact between a vessel or fishing gear and a marine mammal, recommended legal minimum approach distances between vessels and marine mammals, and proposed definitions of disturbance. Final amendments to the MMR will be described in the next reporting period.</p> <p>During the course of this reporting period, BCCSN developed the Whale Report Alert System (WRAS) designed to report observations of whales to</p>		

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			commercial ships in real-time to mitigate potential whale-vessel interactions. This system is intended for commercial ship pilots, shipmasters and operations centre staff. ⁴		
Include the presence of balaenopterids in oil spill response plan(s) to prevent individuals from being oiled in the event of an oil spill	3-6	In progress	<p>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 in plan development and Indigenous and coastal community consultations will be held on the draft plans, once developed.</p> <p>The Gwaii Haanas Public Safety Plan requires that a marine spill response kit (for small spills) be maintained and a field crew receives oil spill response training (Bartier pers. comm. 2018). In 2015, Gwaii Haanas began participating in a Transport Canada (TC) led initiative to create a Port of Refuge Contingency Plan for Haida Gwaii. The plan was finalized in 2017.⁵ PCA field units are engaged in oil spill response planning (Shepherd pers. comm. 2018).</p> <p>A marine mammal-specific operational manual will be developed for the southern B.C. pilot site in 2019 to 2020 (Herborg pers. comm. 2018).</p> <p>NOAA has developed guidelines to direct and inform response activities for marine mammals during oil spills. These guidelines allow for communication</p>	4	CCG; DFO; NOAA; Ocean Wise; PCA; Province of B.C.; TC

⁴ WRAS was implemented for B.C. coastal waters in late 2018.

⁵ The final plan was released in November 2017 (Bartier pers. comm. 2018).

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			<p>between agencies and maintain readiness for response to oiled wildlife at a national level in the U.S. (Ziccardi et al. 2015).</p> <p>In 2016 the Government of Canada launched the Oceans Protection Plan, a multi-agency effort including TC, ECCC, and DFO. As part of the Oceans Protection Plan and Planning for Integrated Environmental Response, the Government of Canada in collaboration with partners is developing stronger regional emergency response plans. Four Area Response Plans for southern B.C. are completed, with an annual update cycle. A draft marine mammal-specific operational manual for B.C. waters is under internal review (Herborg pers. comm. 2021).</p> <p>Intra- and inter-agency communications regarding emergencies (such as for oil spills) are outlined in existing federal and provincial response plans and include a formalized incident command structure. The agreements recognize that environmental emergencies are not limited to one jurisdiction and require cooperative responses.⁶</p> <p>The Marine Spills Contingency Plan, National Chapter outlines the process, including communications that CCG follows when responding to a marine emergency (DFO 2018). The Canada-United States Joint Marine Pollution Contingency Plan outlines the steps needed, including communications, to coordinate international</p>		

⁶ Canadian Coast Guard (CCG) command systems are being strengthened under Canada’s national [Oceans Protection Plan](#), launched in 2016. TC, DFO, ECCC and their partners (for example, Ocean Wise, Focus Wildlife and other contractors) are also reviewing and improving their communications to ensure readiness in the event of a spill.

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			<p>responses to discharges of pollutants in the contiguous waters of Canada and the U.S.</p> <p>B.C.'s Marine Oil Spill Response Plan outlines incident command and communication frameworks (B.C. Ministry of Environment 2013). Other agencies and local governments fit into the response network and are included as required.</p>		
<p>Confirm that there is little threat to balaenopterids in Canadian Pacific waters from chronic and acute sources of pollution</p>	<p>3-7</p>	<p>Not started</p>	<p>Confirmation that chronic and acute pollution sources are not threats to large whales in Canada has not been determined. Research towards better understanding of pollutant threats to marine mammals is underway.</p> <p>Hannah et al. (2017) conducted a vulnerability assessment to determine the suitability of a framework to assess “marine biological components” in the Pacific Region and to ensure consideration of all taxa, including marine mammals in oil spill response planning information considered included:</p> <ul style="list-style-type: none"> • “marine mammals with feedings structures vulnerable to clogging” (for example, baleen whales) • “subgroups containing species with reduced population levels as indicated by conservation status” • “species with low reproductive capacity” <p>Assessment of Blue, Fin, and Sei Whales resulted in a moderate vulnerability score (Hannah et al. 2017).</p> <p>The National Pollutant Release Inventory is a publicly available data source to which facilities are required to</p>	<p>4</p>	<p>Council of the Haida Nation; DFO; ECCC; ENGOs; King County Department of Natural Resources and Parks; Ocean Wise; PCA; U.S. Environmental Protection Agency; Washington State Department of Ecology</p>

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			<p>report pollutant releases to air, water, or land. This resource allows for identification of pollution prevention priorities and aids development of targeted regulations for reducing release of toxins (ECCC 2018).</p> <p>Based on declining concentrations of polychlorinated biphenyls, polychlorinated diphenylethers (polychlorinated diphenyl ethers (PBDEs), and polychlorinated naphthalenes in a sentinel marine mammal species (Harbour Seals) in the Strait of Georgia, regulations and source controls have been effective in significantly reducing inputs of these contaminants into southern B.C. waters (Ross et al. 2013).</p> <p>In 2015, Ocean Wise initiated “Pollution Tracker” a monitoring framework with 51 stations along the coast of B.C. to provide coast-wide information about contaminant levels, types of contaminants, and response to regulations. Contaminant data are collected from sediment and mussels and will be analyzed and reported on every three years (Ross pers. comm. 2017). PCA and Council of the Haida Nation are partners in Pollution Tracker for samples collected in Gwaii Haanas and Haida Gwaii (Lee pers. comm. 2021). In 2016, DFO contributed \$399,000, through the Partnership Fund, to support the development of Pollution Tracker. Pollution Tracker will generate powerful insight into the state of coastal environments by identifying priority pollutants (Dubetz pers. comm. 2018).</p> <p>A review of research documenting some of the sources and properties, as well as the persistence</p>		

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			<p>and toxicity of PBDEs was published in 2009; this report contributed to the decision to ban deca-PBDEs in Canada (Ross et al. 2009). An action plan for PBDEs in the U.S. was finalized in December 2009 (EPA 2009).</p> <p>Jarvela Rosenberger et al. (2017) developed a conceptual framework to assess potential impact of oil spill exposure on 21 marine mammal species in B.C., including Blue, Fin, and Sei Whales. These three species ranked moderate in overall risk to oil spills.</p>		
<p>Confirm that seismic mitigation strategies and low frequency sonar use policies protect individuals from injury or mortality and, if necessary, develop options to improve protection</p>	<p>3-8</p>	<p>In progress</p>	<p>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; McMillan pers. comm. 2019).</p> <p>The Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment is applied for mitigation of seismic noise to cetaceans in Canada. The Statement of Practice specifies the mitigation requirements that must be met during the planning and conducting of marine seismic surveys in order to minimize impacts on marine life. These requirements are set out as minimum standards and are reviewed on an annual basis, revised as new science, technology or mitigation options become available.</p> <p>In 2016, U.S. NOAA developed the Technical Guidance for Assessing the Effects of Anthropogenic</p>	<p>4</p>	<p>DFO; DND; National Energy Board; NOAA</p>

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			<p>Sound on Marine Mammal Hearing (revised 2018) (NFMS 2018).</p> <p>The 2010 to 2016 Southern California Behavioural Response Study aimed to address questions surrounding risks and effects of mid-frequency military sonar on marine mammals. As part of that study, Goldbogen et al. (2013) determined that controlled exposure to mid-frequency sonar significantly affected Blue Whales' feeding behaviour in the Southern California Bight area. This information may be useful when reviewing effectiveness of policies and programs for seismic and sonar mitigation.</p>		
<p>Promote marine mammal viewing guidelines and enforce compliance with regulations against disturbance</p>	<p>3-9</p>	<p>In progress</p>	<p>DFO C&P enforces the <i>Fisheries Act</i>, Marine Mammal Regulations and promotes regional guidelines for marine mammal viewing. C&P's mandate includes investigating reports of disturbance and violations (Cottrell pers. comm. 2016).</p> <p>ENGOS, including BCCSN, Cetus, Marine Education and Research Society, and NCCS and others, promote MMR, marine mammal viewing guidelines "Be Whale Wise" and responsible vessel operation around marine mammals through presentations, signage, and other outreach materials.</p> <p>Twenty-two HSP AFSAR projects included education and outreach on Be Whale Wise Guidelines (BWW) and marine mammals in the form of presentations, print material (for example, brochures and posters), media broadcasts, and social media posts. In total, these efforts reached an estimated 70,767,011 people over this five year reporting period.</p>	<p>4</p>	<p>DFO; ENGOS; Indigenous groups; PCA</p>

Activity	Broad strategy and approach	Status	Descriptions and results	Recovery objectives	Participants*
			<p>Indigenous groups (for example, Gitga'at First Nation, Haida Gwaii Marine Stewardship Group [HGMSG], Namgis First Nation) inform fishing lodges and vessel operators from the North Coast of B.C., Haida Gwaii, and Vancouver Island of appropriate marine mammal viewing protocols.</p> <p>The Mariner's Guide, developed by the Coastal Ocean Research Institute provides information about how mariners can minimize disturbance to cetaceans, including relevant information from BWW (CORI 2016).</p> <p>PCA promotes compliance with marine mammal viewing guidelines through mandatory visitor orientation and business licensing (PCA 2016).</p> <p>PCA and HGMSG, led by Council of the Haida Nation, conduct joint outreach and education in Haida Gwaii about marine mammal viewing guidelines and threats to marine mammals (Shepherd pers. comm. 2018).</p>		

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

3.2 Activities supporting the identification of critical habitat

Table 3 reports on the implementation of the studies outlined in the schedule of studies to identify critical habitat as described in section 9.4.1 of the recovery strategy (Gregr et al. 2006). Each study has been assigned one of four statuses:

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

Table 3. Status and details on the implementation of the schedule of studies to identify critical habitat, as outlined in the recovery strategy (Gregr et al. 2006).

Study	Approach	Timeline	Status	Descriptions and results	Recovery objectives	Participants*
Relate historic distributions of balaenopterids to long-term oceanographic conditions to predict potential habitats	1-1	2006 to 2008	Cancelled (Fin Whales) Not started (Blue Whales) Not started (Sei Whales)	The intent of this proposed activity was to determine a way to predict the distribution of these species in the absence of survey data (that is, sightings and effort). Since this activity was developed for the 2017 action plan, acoustic, ship survey, aerial survey, and photo-identification data have been collected for Fin Whales, such that this approach is unlikely to be completed as it is described in the action plan schedule of studies (Nichol pers. comm. 2018). For example, recent analyses using acoustic data, ship-based and aerial survey data and data from satellite tags were used to predict and understand habitat use for Fin Whales in Hecate Strait and Queen Charlotte Sound (Nichol et al. 2018; Pilkington et al. 2018). Similar analyses for Blue and Sei Whales are limited by available data (Nichol pers. comm. 2017). Data from acoustic monitoring and ship based surveys are still so limited due to the rarity of this species, that a methodological approach to predict habitat for Sei Whales is still needed.	2, 3, 4	Fisheries and Oceans Canada (DFO) ; Academia; Environmental non-governmental organizations (ENGOS); JASCO Applied Sciences
Develop and test methods to	1-1	2006 to 2008	Cancelled (Blue	The intent of this proposed activity was to determine a way to predict the distribution of these whales in the	2, 3, 4	DFO

Study	Approach	Timeline	Status	Descriptions and results	Recovery objectives	Participants*
predict the distribution of prey species			Whale); other methods to predict distribution likely available Cancelled (Fin Whale); other methods to predict distribution likely available Not started (Sei Whales); this method may still be useful	absence of survey data (that is, sightings and effort). For rare species where there is almost no data, one approach is to explore the distribution of prey species as a proxy for the distribution of the cetacean species. Sufficient data have since been collected for Fin Whales through acoustic, ship survey, aerial survey, and photo-identification methods and therefore the original approach is unlikely to be completed as described in the action plan schedule of studies (Nichol pers. comm. 2018). For example, recent analysis using ship-based survey data and another analysis using aerial survey data were used along with habitat variables to describe Fin Whale distribution (Nichol et al. 2017a; Nichol et al. 2018). Incorporating prey data into such models may be a useful next step (Nichol pers. comm. 2018). Due to increased data collection, other methods are also likely to be used to predict Blue Whale distribution. No analyses have been started for Blue or Sei Whales.		
Determine relative seasonal distribution of eastern North Pacific balaenopterids in Canadian Pacific waters	1-2	2006 to 2010	In progress	Data collection and analysis to inform relative seasonal distribution of Fin Whales is underway through several methods. Fin Whale sighting and distribution data is collected by DFO during multi-species ship-based and aerial surveys. Ship surveys are conducted regularly (usually three per year) and 34 aerial surveys occurred between 2012 and 2015. (Nichol pers. comm. 2017; Nichol et al. 2018). Koot (2015) analysed acoustic data from 2010 to 2012, demonstrating Fin Whales to be present year-round in marine waters off British Columbia (B.C.). Pilkington et al. (2018) analysed acoustic data from 2008 to 2015.	1, 2, 3	DFO; Academia; JASCO Applied Sciences; PCA

Study	Approach	Timeline	Status	Descriptions and results	Recovery objectives	Participants*
				<p>Results confirm year-round presence and suggest a seasonal movement of Fin Whales into Hecate Strait and Queen Charlotte Sound in late fall and winter that coincides with the peak of the reported breeding season. This work was not able to confirm or disclude a seasonal migration out of Canadian Pacific waters (Pilkington et al. 2018).</p> <p>Data collection on Blue Whale distribution is underway via ship-based surveys, aerial surveys, and passive acoustic recording devices. Ship-based surveys show Blue Whales can be found annually in offshore waters. Surveys are generally limited to summer months and season specific data for other times of year is limited. Acoustic data is collected year round (Nichol pers. comm. 2017; Pilkington pers. comm. 2017).</p> <p>Parks Canada Agency (PCA) has a hydrophone off the west coast of Gwaii Haanas (installed at Gowgaia Bay in 2017) which will contribute to knowledge on seasonal distribution via collection of passive acoustic data (Lee pers. comm. 2019).</p> <p>Within this reporting period, planning for the Pacific Region International Survey of Marine Megafauna began. This extensive inshore and offshore survey aimed to provide further information on distribution of marine mammals off B.C.'s coast. This survey was carried out in summer 2018. Results have been analyzed and peer-reviewed and are in stages of final publication.</p>		
Identify factors (for example, prey, ocean currents, upwellings) contributing to	1-2	2006 to 2010	In progress (Fin Whales) Not started (Blue, Sei Whales)	Nichol et al. (2018) undertook habitat modeling for Fin Whales in Hecate Strait, Queen Charlotte Sound and Greater Caamano Sound. The analyses were based on sightings and effort from ship-based surveys between 2002 and 2014. Results indicate an association between Fin Whales and Moresby Trough,	4	DFO; University of California San Diego

Study	Approach	Timeline	Status	Descriptions and results	Recovery objectives	Participants*
species' distributions				<p>a deep-water gully, and the heads of submarine canyons (near the 1000 m contour) between Cape Scott and Cape St. James (Nichol et al. 2018). Extending this kind of analysis to the remainder of the B.C. coast is pending.</p> <p>Dive profiles from tagged Fin Whales during periods of area-restricted movement showed a significant diurnal pattern, with longer, deeper dives during daylight hours. These results suggest Greater Caamano Sound is an important feeding area, and that Fin Whales may be targeting aggregations of vertically migrating zooplankton (Nichol et al. 2018).</p> <p>From 2013 to 2016, a large systematic study to describe oceanographic and prey-related conditions (in relation to large whales) was conducted in greater Caamano Sound (Keen et al. 2018; Keen and Qualls 2018). Results of this study may assist in determining prey influences on localized Fin Whale distribution.</p> <p>Within the period of this progress report, habitat modeling for Blue or Sei Whales in B.C. was not started (Nichol pers. comm. 2017).</p>		
Relate the identified factors to the seasonal distributions and predict how species may occupy potential habitats (not all potential habitats will be occupied)	1-2	2006 to 2010	In progress (ongoing)	<p>Nichol et al. (2018) undertook habitat modeling for Fin Whales in Hecate Strait, Queen Charlotte Sound and Greater Caamano Sound. This approach used ship survey data and effort in a generalized additive model incorporating static environmental covariates to predict the distribution of Fin Whales in the Hecate Strait and Queen Charlotte Sound region. A similar approach can be applied in future to predict habitat of Blue whales and perhaps Sei whales. Habitat modelling using acoustic data is also possible.</p> <p>From 2013 to 2016, a large systematic study to describe oceanographic and prey-related conditions (in</p>	1-4	DFO

Study	Approach	Timeline	Status	Descriptions and results	Recovery objectives	Participants*
				<p>relation to large whales) was conducted in greater Caamano Sound (Keen et al. 2018; Keen and Qualls 2018). Results of this study may assist in determining prey influences on localized Fin Whale distribution.</p>		
<p>Establish collaborations with researchers in other jurisdictions to identify frequently used habitat and prioritize areas for critical habitat selection</p>	<p>1-3</p>	<p>2006 to 2010</p>	<p>Completed (ongoing)</p>	<p>Given the potentially vast area in which these large whales may be found, and the difficult nature of offshore marine research, most of the research and outreach work detailed in tables 2 and 3 are a result of collaborations between researchers and conservationists from a variety of institutions.</p> <p>In 2012, the International Whaling Commission and Japan conducted a survey of cetaceans in the eastern North Pacific. The survey recorded two Sei Whale sightings in Canadian waters 250 km off the coast of Haida Gwaii (COSEWIC 2013; Matsuoka et al. 2013). These data were shared with Canadian researchers.</p> <p>DFO and Environment and Climate Change Canada collaborate with several Indigenous groups through Habitat Stewardship Program and Aboriginal Fund for Species at Risk to conduct surveys and collect sightings of cetaceans in B.C., including Fin Whales. These data help to inform Fin Whale habitat use and distribution.</p> <p>Since 2016, PCA staff report cetacean sightings to the British Columbia Cetacean Sightings Network as part of the PCA marine monitoring program in Gwaii Haanas National Marine Conservation Area Reserve (Shepherd pers. comm. 2017).</p> <p>PCA is also involved in the deployment of hydrophones to the east and west of Gwaii Haanas to monitor underwater noise and marine mammal presence.</p>	<p>1-4</p>	<p>DFO; Indigenous groups; PCA; U.S. National Oceanic and Atmospheric Administration</p>

Study	Approach	Timeline	Status	Descriptions and results	Recovery objectives	Participants*
<p>Define critical habitat for Blue, Fin, and Sei Whales based on the amount of potential habitat needed for survival and recovery</p>	<p>1-3</p>	<p>2008 to 2011</p>	<p>In progress</p>	<p>Important habitat for Fin Whales in B.C. has been described (DFO 2017b).</p> <p>Studies to define and identify critical habitat for Blue Whales and additional critical habitat for Fin Whales are underway through ship-based and aerial surveys, acoustic data collection, satellite tagging, and photo identification studies. Areas of special importance will continue to be identified as sufficient information becomes available (Nichol pers. comm. 2017).</p> <p>Effort has been made to collect data on the distribution of Sei Whales through multi-species ship-based and aerial surveys, and passive underwater acoustic recording devices. However, there were only two confirmed sightings of Sei Whales during the period of this progress report and there have been no confirmed acoustic detections of Sei Whales; therefore, sufficient information does not yet exist to define critical habitat for this species (Nichol pers. comm. 2017).</p> <p>PCA has a hydrophone off the west coast of Gwaii Haanas (installed at Gowgaia Bay in 2017) which will contribute to knowledge on seasonal distribution via collection of passive acoustic data (Lee pers. comm. 2019).</p>	<p>2, 3, 4</p>	<p>DFO; PCA</p>

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

3.3 Summary of progress towards recovery

3.3.1 Status of performance measures

Table 4 provides a summary of the progress made toward meeting the performance measures outlined in table 1. Each measure has been assigned one of four statuses:

1. not met: the performance measure has not been met, and little to no progress has been made
2. not met, underway: moderate to significant progress has been made toward meeting one of 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 (that is, the measure will be reported against in the next five-year progress report)

Table 4. Progress and details of the progress made toward meeting the performance measures outlined in the recovery strategy.

Performance measure	Status	Details
Were the population identities of Blue and Fin Whales that occur in Canadian Pacific waters determined?	Not met, underway	Progress has been made toward identifying the population structures of Fin and Blue Whales through photo-identification, genetic, and acoustic studies. Acoustic analyses suggest that there may potentially be more than one population of Fin Whales using Canadian Pacific waters (Koot 2015); a coastal and an offshore population. Further work is required to confirm this initial finding.
Was the relative proportion of Blue Whales in Canadian Pacific waters compared to the whole population, maintained or increased?	Not met, underway	Collection of photo-identification, genetic, and tag data from Blue Whales continues. At present, there is insufficient data to determine relative proportion of Blue Whales in Canadian Pacific waters compared to the whole Pacific population.
Was the presence of Sei Whale(s) confirmed in Canadian Pacific waters?	Met, ongoing	Presence of Sei Whales is confirmed in Canadian Pacific waters through two validated sightings (COSEWIC 2013; Matsuoka et al. 2013). Multi-species cetacean monitoring surveys continue to include Sei Whales to expand on sightings information.

Performance measure	Status	Details
If so, has the relative proportion of Sei Whales that occur in Canadian Pacific waters compared to the whole population been maintained, or increased?	Not met	Based on the very few confirmed sightings of Sei Whales (two sightings of a total of four individuals), the relative proportion of Sei Whales that occur in Canadian Pacific waters cannot yet be determined.
Did the identified threat(s) significantly reduce the potential habitat or distribution in Canadian Pacific waters for Blue, Fin, and Sei Whales?	Not met, underway	Although progress has been made towards a better understanding of the threats to Blue, Fin, and Sei Whales, data is not yet sufficient to determine whether these threats are reducing the potential habitat or distribution of these species in Canadian Pacific waters.
Were studies undertaken to identify critical habitat for these large whales?	Met, ongoing for Fin Whales Not met, underway for Blue and Sei Whales	<p>Yes, studies to identify critical habitat for these species are underway, including ship-based, acoustic and aerial surveys</p> <p>DFO (2017b) described habitat of special importance to Fin Whales in British Columbia (B.C.) coastal waters. Identification of this important habitat was based on results of ship-based surveys, acoustic detections, photo-identification and satellite tag data, as well as habitat modeling detailed in table 3.</p> <p>Calambokidis et al. (2015) published information on nine biologically important areas for Blue Whales off the west coast of the United States (U.S). While these areas are not formal critical habitat, they do represent current understanding of important feeding habitats for these whales. No U.S. biologically important areas for Fin Whales were identified due to poor understanding of offshore distribution, population structure and data discrepancies.</p> <p>There is insufficient data to determine Canadian Pacific critical habitat descriptions for Blue and Sei Whales. Efforts to close data gaps are underway.</p>
Was research conducted and/or surveys carried out to better define the species' abundance and distribution?	Met, ongoing	Yes. Annual surveys are carried out within Canadian Pacific waters to collect data to support analyses of abundance and distribution for all marine mammals, including Blue, Fin, and Sei Whales

Performance measure	Status	Details
Were threats better identified?	Met, ongoing	Yes, threats were better identified. For example: <ul style="list-style-type: none"> • Hannah et al. (2017) assessed vulnerability to toxic spills • Nichol et al. (2017a) analysed ship strike risks in B.C. • Erbe et al. (2014) identified hotspots off Prince Rupert and in Hecate Strait where acoustic impacts overlap with increased Fin Whale densities • Goldbogen et al. (2013) documented mid-frequency sonar impacts on Blue Whales • Jarvela Rosenberger et al. (2017) modelled impact risks for oil spills on 21 marine mammal species
Were threats reduced or mitigated?	Not met	While some threats were mitigated and reduced, further work is needed on threat mitigation for these large whales.

3.3.2 Completion of action plan

The [Action Plan for Blue, Fin, Sei and North Pacific Right Whales in Canadian Pacific Waters](#) was published in 2017. It is a multi-species action plan that addresses research needs and threat mitigation common to Blue, Fin, Sei and North Pacific Right Whales.

3.3.3 Critical habitat identification and protection

Habitat of ‘special importance’ for the survival or recovery of Fin Whales has been partially described for inshore Canadian Pacific waters and the analyses peer-reviewed (DFO 2017b; Nichol and Ford 2018). However, in 2019, COSEWIC reassessed Fin Whale as special concern (COSEWIC 2019), which triggered the Government of Canada to undertake a process to consider whether or not to reclassify Fin Whale as special concern under Schedule 1 of SARA. While Fisheries and Oceans Canada Science is still conducting research to support the identification of Fin Whale critical habitat, future steps will depend on the outcome of the listing process. Information will be made available on the Species at Risk Public Registry. Critical habitat for Blue and Sei Whales is not identified due to lack of data. Research to clarify aspects of habitat use will inform future efforts to identify critical habitat for these species in Canadian Pacific waters.

3.3.4 Recovery feasibility

Recovery of the Blue and Fin Whale populations that use Canadian Pacific waters is considered feasible. The recovery of Sei Whales that use Canadian Pacific waters should also be considered feasible, until it is shown to be otherwise. Details on the determination of recovery feasibility for these species are outlined in section 9.1 of the recovery strategy.

4 Concluding statement

Sightings and news stories of large cetaceans such as Blue, Fin, and Sei Whales continue to draw interest from the public and provide an opportunity for engagement in species conservation. Researchers, Indigenous groups, conservationists and resource managers remain committed to working with stakeholders and interested parties to better understand these iconic whales and find solutions to support their recovery.

Progress has been made on many of the measures outlined in the recovery strategy. Partial habitat required for the survival or recovery of Fin Whales in Canadian Pacific waters has been described (DFO 2017b); however, the continuation of work towards the identification of critical habitat for Fin Whale will depend on the outcome of the SARA listing process to either retain the Fin Whale status or reclassify it as special concern. Several threat assessments were completed and mitigation measures to address disturbances, ship strikes, and contaminants have either been completed or are in development. The presence of Sei Whales in Canadian Pacific waters has been confirmed, creating an opportunity to formally include this species in future multi-species management measures for large whales.

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