Species at Risk Act
Recovery Strategy Report Series

Report on the Progress of Recovery Strategy Implementation for Blue, Fin and Sei Whales (*Balaenoptera musculus, B. physalus* and *B. borealis*) in Pacific Canadian Waters for the Period 2006 – 2011

Blue, Fin and Sei Whales

2013

Canada

Report on the Progress of Recovery Strategy Implementation for Blue, Fin and Sei Whales (*Balaenoptera musculus, B. physalus* and *B. borealis*) in Pacific Canadian Waters for the Period 2006-2011

2013

Recommended Citation

DFO. 2013. Report on the Progress of Recovery Strategy Implementation for Blue, Fin and Sei Whales (*Balaenoptera musculus, B. physalus* and *B. borealis*) in Pacific Canadian Waters for the Period 2006-2011. *Species at Risk Act* Recovery Strategy Report Series. Fisheries and Oceans Canada, Ottawa. v + 10 pp.

For copies of the progress report, or for additional information on species at risk, including COSEWIC Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the SAR Public Registry.

Cover illustrations: From top to bottom: Blue, Fin and Sei Whales. A. Denbigh, Fisheries and Oceans Canada.

Également disponible en français sous le titre : Rapport sur les progrès de la mise en œuvre du programme de rétablissement du rorqual bleu, du rorqual commun et du rorqual boréal (*Balaenoptera musculus, B. physalus et B. borealis*) dans les eaux canadiennes du Pacifique pendant la période 2006 - 2011

ISBN 978-1-100-22731-3
Catalogue no. En3-4/1-1-2013E-PDF

Authors

This document was prepared by Jonathan Thar on behalf of Fisheries and Oceans Canada (DFO).

Acknowledgements

Fisheries and Oceans Canada would like to thank John Ford, Linda Nichol, Lisa Spaven (DFO) and Patrick O'Hara (Environment Canada) for their significant contributions to the development of this progress report.

Preface

Section 46 of the *Species at Risk Act* (SARA) requires the competent Minister to report 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.

Reporting on the progress of recovery strategy implementation requires reporting on the collective efforts of the competent Minister, provincial organizations and all other parties involved in conducting activities that contribute towards the species' recovery.

Executive Summary

Blue, Fin and Sei Whale (*Balaenoptera musculus, B. physalus* and *B. borealis*) populations in Pacific Canadian waters were respectively listed under the *Species at Risk Act* (SARA) as: Endangered (2005), Threatened (2006) and Endangered (2005).

Present threats to Blue, Fin and Sei Whales, as identified in the Recovery Strategy for Blue, Fin, and Sei Whales in Pacific Canadian Waters (Gregr *et al*. 2006), include: vessel strikes; anthropogenic noise; entanglement in fishing gear and debris; pollution; habitat displacement by changes in ocean climate or trophic structure; and acoustic disturbance and possible physical injury due to vessel presence.

This report documents the progress of recovery strategy implementation for Pacific Canadian populations of Blue, Fin and Sei Whales, for the period 2006 - 2011. It summarizes progress that Fisheries and Oceans Canada (DFO), and the broader scientific community, have made towards achieving the goals and objectives set out in the Recovery Strategy. Progress to date includes:

- advancing specific studies meant to help identify potential, realized and critical habitat, as well as further research not prescribed in the Recovery Strategy's Schedule of Studies to Identify Critical Habitat;
- executing management activities and mitigation standards that help Canadians better understand the threats to and reduce impacts on Blue, Fin and Sei Whales; and
- expanding the body of knowledge on the current population identities, distributions and abundances of Blue, Fin and Sei Whales, so as to be able to address the performance measures outlined in the Recovery Strategy.

DFO collaborates with First Nations, United States National Oceanographic and Atmospheric Administration (NOAA) researchers, independent research organizations, and academia in both Canada and the United States, to advance efforts to expand knowledge and identify critical habitat. Limited observations and understanding of the current distribution of Blue, Fin and Sei Whales does not yet allow for the definition of their critical habitat in Pacific Canadian waters.

While there has been measurable progress towards meeting the goals, objectives and performance measures presented in the Recovery Strategy, further work is required to ensure the continued growth of knowledge around and eventual recovery of Blue, Fin and Sei Whales.

Table of Contents

1. Background

1.1 COSEWIC Assessment Summaries

Common name:	Blue Whale (Pacific population)
Scientific name:	*Balaenoptera musculus*
Legal listing (*SARA*):	January 2005 (Endangered)
COSEWIC status:	Endangered
Assessment summary:	May 2012[1]
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. Split into two populations in May 2002. The Pacific population was designated Endangered in May 2002. Status re-examined and confirmed in May 2012.

[1] Assessment updated from that presented in the 2006 Recovery Strategy. COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2012. COSEWIC Wildlife Species Assessments (detailed version), May 2012. Web site: http://www.cosewic.gc.ca/rpts/Detailed_Species_Assessments_e.html [accessed August 2012].

Common name:	Fin Whale (Pacific population)
Scientific name:	*Balaenoptera physalus*
Legal listing (*SARA*):	September 2006 (Threatened)
Assessment summary:	May 2005
COSEWIC status:	Threatened
Reason for designation:	Currently sighted only infrequently on former whaling grounds off British Columbia. Coastal whaling took at least 7,600 animals from the population between 1905 and 1967, and thousands of additional animals were taken by pelagic whalers through the 1970s. Catch rates from coastal whaling stations declined precipitously off British Columbia in the 1960s. Based on the severe depletion and lack of sufficient time for recovery, it is inferred that present population is below 50% of its level, 60-90 years ago. Individuals continue to be at risk from ship strikes and entanglement in fishing gear.
Occurrence in Canada:	Pacific Ocean
Status history:	This species was considered a single unit and designated Special Concern in April 1987. Split into two populations (Atlantic and Pacific) in May 2005. The Pacific population was designated Threatened in May 2005. Last assessment based on an updated status report.

Common name:	Sei Whale (Pacific population)
Scientific name:	*Balaenoptera borealis*
Legal listing (*SARA*):	January 2005 (Endangered)
Assessment summary:	May 2003
COSEWIC status:	Endangered
Reason for designation:	This was one of the most abundant species sought by whalers off the British Columbia coast (with over 4,000 individuals killed) and was also commonly taken in other areas of the eastern North Pacific. Sei Whales have not been reported in British Columbia since whaling ended and may now be gone. There are a few, if any, mature individuals remaining in British Columbia waters, and there is clear evidence of a dramatic decline caused by whaling and no sign of recovery.
Occurrence in Canada:	Pacific Ocean
Status history:	Designated Endangered in May 2003. Assessment based on a new status report.

1.2 Threats

1.2.1 Threats to the Species at Risk

Present threats to Blue, Fin and Sei Whales, as identified in the Recovery Strategy for Blue, Fin, and Sei Whales (*Balaenoptera musculus, B. physalus,* and *B. borealis*) in Pacific Canadian Waters (Gregr *et al*. 2006), include: vessel strikes; anthropogenic noise; entanglement in fishing gear and debris; pollution; habitat displacement by changes in ocean climate or trophic structure; and acoustic disturbance and possible physical injury due to vessel presence.

1.2.2 Activities Likely to Destroy Critical Habitat

Critical habitat for these species was not identified in the Recovery Strategy, so activities likely to destroy critical habitat cannot be defined here.

Considering departmental priorities and budgetary constraints, Fisheries and Oceans Canada (DFO, or "the Department") and its partners committed in the Recovery Strategy to undertake the following efforts to identify critical habitat:

- Identify potential habitat by:
    - relating historic distributions of balaenopterids to long-term oceanographic conditions to predict potential habitats; and
    - developing and testing methods to predict the distribution of prey species.
- Identify realized habitat by:
    - determining relative seasonal distribution of eastern North Pacific balaenopterids in Pacific Canadian waters;
    - identifying factors (e.g., prey, ocean currents, upwellings) contributing to species' distributions; and
    - relating the identified factors to the seasonal distributions and predicting how species may occupy potential habitats (not all potential habitats will be occupied).
- Define critical habitat by:
    - establishing collaborations with researchers in other jurisdictions to identify frequently used habitat and prioritize areas for critical habitat selection; and
    - defining critical habitat for Blue, Fin and Sei Whales based on the amount of potential habitat needed for survival and recovery.

2. Recovery

2.1 Recovery Goals and Objectives

Recovery Goals and Objectives, as stated in the Recovery Strategy, are as follows:

Recovery Goals

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 150-300 years. The recovery goals for these species are:

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

Recovery Objectives

These objectives refer only to the portion of these populations that occur in Canadian waters and provide a short-term measure of progress towards reaching the recovery goals.

1. By 2011, determine the identity of the population of Blue and Fin Whales that occur in Pacific Canadian waters.
2. Maintain or increase the relative proportions of Blue and Fin Whales in Pacific Canadian waters compared to the whole population through to 2016.
3. By 2011, confirm the presence of Sei Whale(s) in Pacific Canadian waters. If confirmed, maintain or increase the relative proportion of Sei Whales that occur in Pacific Canadian 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 Pacific Canadian waters for Blue, Fin, and Sei Whales through to 2016 (by comparison to when identified as a threat).

2.2 Performance Measures

Performance Measures outlined in the Recovery Strategy are as follows:

Objective-based evaluation criteria include:

1. Were the population identities of Blue and Fin Whales that occur in Pacific Canadian waters determined?
2. Was the relative proportion of Blue Whales in Pacific Canadian waters compared to the whole population maintained, or increased?
3. Was the presence of Sei Whale(s) confirmed in Pacific Canadian waters? If so, has the relative proportion of Sei Whales that occur in Pacific Canadian waters compared to the whole population been maintained, or increased?
4. Did the identified threat(s) significantly reduce the potential habitat or distribution in Pacific Canadian waters for Blue, Fin, and Sei Whales?

Approach-based evaluation criteria include:

5. Were studies undertaken to identify critical habitat for these large whales?
6. Was research conducted and/or surveys carried out to better define the species' abundance and distribution?
7. Were threats better identified? Were threats reduced or mitigated?

3. Progress towards Recovery

Progress towards achieving the goals and objectives set out in the Recovery Strategy is largely detailed in Nichol and Ford 2011 and Ford *et al*. 2010. This section summarizes those achievements, as well as items not captured in those reference documents, to the year 2011.

3.1 Research and Monitoring Activities

The Recovery Strategy's Schedule of Studies to Identify Critical Habitat identified three broad areas of focus: identifying potential habitat, identifying realized habitat, and defining critical habitat. This section summarizes achievements by DFO and the scientific community towards completing those studies, as well as further research not prescribed in the Schedule of Studies to Identify Critical Habitat.

Identifying potential habitat

The Department has worked with a doctoral student to predict potential whale habitat over historic whaling grounds, which are areas well offshore and that have not yet seen much ship-based visual survey effort. DFO has also started examining the physical and biological oceanographic features that may be important to whales, and that could potentially be used as habitat predictors. That knowledge helps to focus ship-based visual survey efforts, but is not yet far enough advanced to be able to estimate the amount of potential habitat. Minimal sightings and acoustic recordings of Blue and Sei Whales hamper our ability to validate modeling efforts to identify potential habitat.

Identifying realized habitat

Most of DFO's current research effort on Blue, Fin and Sei Whales concentrates on identifying realized habitat. Results on realized habitat are needed to evaluate models of potential and critical habitat. Present understanding of distribution, abundance and seasonal occurrence of these whales is primarily based on ship-based visual surveys, photo-identification studies, and remote acoustic monitoring performed by DFO's Cetacean Research Program (CRP). The CRP's efforts are complemented by: data from DFO's British Columbia (B.C.) historic whaling database; incidental sightings from DFO, the Vancouver Aquarium's B.C. Cetacean Sightings Network and the United States' National Oceanographic and Atmospheric Administration's (NOAA) Platforms of Opportunity Program; collaborators' acoustic monitoring devices and networks; and published literature.

The CRP completed over 2,000 hours of dedicated ship-based surveys, covering almost 40,000 km of line transects from 2002-2010. Data collected in 2011 has not yet been summarized. Surveys often focused on species likely to be encountered inshore and on the continental shelf, rather than being targeted offshore to study large oceanic baleen whale species. Roughly 10% of survey effort has been beyond the shelf edge, where Blue, Fin and Sei Whales should be found in the highest densities.

Whales encountered during ship-based visual surveys are photographed and the photos used to identify individuals, allowing for tracking between and within years and seasons.

Mark-recapture analyses also allow the estimation of population abundance, and studying of movement patterns and site fidelity. A catalogue has been compiled for Blue, Fin and Sei Whales identified in British Columbia. Due to the relative number of observations, photo-identification databases for Blue, Fin and Sei Whales are small compared to that for more frequently sighted Humpback Whales. The databases are, however, actively shared with organizations conducting similar research along the west coast of the United States.

Since 2005, the CRP has deployed passive acoustic recorders at nine locations in Pacific Canadian waters (see Fig. 2 in Nichol and Ford 2011). Each recorder detects the distinct vocalizations of cetaceans for up to one year, allowing the monitoring of broad areas for extended periods, and in times when ship-based visual surveys are not possible. Recorders are retrieved annually, and can be redeployed for an additional year of sampling. DFO's network is complemented by a continuous, cabled acoustic recorder at NEPTUNE Canada's Barkley Canyon node, and other collaborators' acoustic monitoring devices and networks.

Additionally, the Department has attempted to deploy satellite tags on individual whales encountered during ship-based surveys. The tags track the movements and site fidelity of these animals over relatively short periods of time. Three satellite tags were successfully deployed on Fin Whales in 2011.

An emphasis has also been placed on collecting hydroacoustic data and prey samples during ship-based surveys, to determine the quality of habitat based on prey preferences and density. Recent observations of Blue Whales in British Columbia waters demonstrate the occurrence of foraging behaviour through concurrently observed prey layers (Calambokidis *et al*. 2009). Balaenopterid distribution has recently been associated in different ocean regions with areas of strong upwelling (Irvine 2007) and sea surface temperature gradients or "fronts" (Doniol-Valcroze *et al.* 2007), helping to concentrate prey. However, Gregr and Coyle (2009) argue that zooplankton life histories, and availability of their food, confound the predictability of dynamic zooplankton patches.

Where possible during ship-based visual surveys, biopsy sampling has also been a focus, allowing the collection of genetic data to determine stock identity by comparison with samples from other regions, and to discover migration patterns through capture-recapture analyses. Data acquired will be used to refine what is currently known about these species' habitat use in Pacific Canadian waters.

As Blue and Sei Whales have been encountered rarely, and only over a few number of years, it is not yet possible to identify realized habitat for either species. A handful of photo-identified Blue Whales in British Columbia and the Gulf of Alaska indicate the potential re-establishment of historic feeding grounds (Calambokidis *et al.* 2009). What is believed to be Blue Whale foraging behaviour has primarily been observed in late summer and fall in Washington and British Columbia waters (Irvine 2007; Bailey *et al.* 2009; Calambokidis *et al*. 2009). That seasonal presence is consistent with recently recorded acoustic data, but direct observations from ship-based visual surveys and historic records show their occurrence in Pacific Canadian waters from late spring through late summer. A relationship between the timing of cool phase Pacific Decadal Oscillation and Blue Whale occurrence has also been suggested (Calambokidis *et al.* 2009).

Sei Whales have been sighted only twice in Pacific Canadian waters since commercial whaling in Canada ceased; once in 2004, and once in 2008. Possible Sei Whale calls were detected by passive acoustic recorders at Union Seamount in 2006, and La Perouse Bank in 2007. The paucity of Sei Whale observations does not yet allow for hypotheses or conclusions on their realized habitat.

Fin Whales were the third most frequently observed species on spring, summer and winter ship-based surveys between 2002 and 2010. Their calls have also been recorded at passive acoustic stations between February and September, from 2005 to 2010, suggesting a protracted or possibly even year-round occurrence in Pacific Canadian waters. Fin Whales have been observed widely over the continental shelf west of Vancouver Island and Haida Gwaii, and in Queen Charlotte Sound, southern Hecate Strait and Dixon Entrance. They have also been observed in the confined waters of Caamano Sound and Squally Channel. Through a systematic line transect survey performed in 2010 over Moresby Trough (extending west from Caamano Sound, across Hecate Strait and Queen Charlotte Sound), the CRP (unpubl. data) has estimated a density of 0.035 Fin Whales per km^2, corresponding to an abundance of 176 Fin Whales in Moresby Trough at the time of the survey. Williams and Thomas (2007) calculated an abundance estimate of 496 Fin Whales in Dixon Entrance, Hecate Strait and Queen Charlotte Sound, in 2004 and 2005. Due to the presence of Fin Whales in Davis Strait (eastern Canada) during their period of peak conception (November and December), it has been suggested that Fin Whales may also be breeding in northern latitudes (Simon *et al.* 2010).

Defining critical habitat

DFO collaborates with First Nations, NOAA researchers working on the same populations, and independent research organizations, university faculty and graduate students in both Canada and the United States, to advance efforts to define critical habitat. Limited observations and understanding of Blue, Fin and Sei Whales' current distribution does not yet allow for the definition of their critical habitat in Pacific Canadian waters. Though more data exists for Fin than Blue or Sei Whales, the body of knowledge is not yet sufficient to model Fin Whale habitat associations or identify areas of their persistent occurrence (Nichol and Ford 2011).

3.2 Management Activities

Two mitigation standards have been put in place to reduce the threat of noise to Blue, Fin and Sei Whales: 1) the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (DFO 2007); and 2) the Maritime Commanding Order: Marine Mammal Mitigation Procedures (DND 2008), intended to minimize impacts of tactical sonar noise on marine mammals. Reviewing and improving the effectiveness of the Department of National Defense's Maritime Commanding Order has been identified as an action in the Implementation Schedule of DFO's *Management Plan for the Offshore Killer Whale (*Orcinus orca) *in Canada* (DFO 2009).

Departmental science and fisheries management staff regularly review development and research proposals for the potential effects of noise and pollution on Blue, Fin and Sei

Whales, making specific mitigation requirements or recommendations in the context of risk to the animals from proposed activities.

Further refining our knowledge on threats to these species has proven challenging, as few incidents involving Blue, Fin and Sei Whales have been reported to the Pacific Marine Mammal Response Program (one dead Blue Whale and 10 dead Fin Whales). The relative lack of reported incidents may be because carcasses sink before they are found, or come to rest in very remote locations. Only two of the reported incidents have resulted in confirmed causes of death or injury; both were attributed to vessel strikes. It is difficult to confirm the cause of death for these large animals, because of decomposition after their often late discovery in remote locations, and the inability to perform x-rays and other scans on large animals. Examination of cleaned bones sometimes reveals information that tissue analysis does not or cannot yield.

3.3 Summary of Progress towards Recovery

The recovery of Blue, Fin and Sei Whales depends on first understanding their current population identities, distributions and abundances, realized habitat, and then on the ability to define potential and critical habitat. The performance measures listed in Section 2.2 above are addressed below.

1. Were the population identities of Blue and Fin Whales that occur in Pacific Canadian waters determined?

Three of 10 individual Blue Whales photographed in British Columbia waters have been identified by comparing the photographs with those of known individuals in American waters. Population identification has not yet been possible for Fin Whales.

2. Was the relative proportion of Blue Whales in Pacific Canadian waters compared to the whole population maintained, or increased?

The relative proportion of Blue Whales is yet unknown because of the limited number of observations gathered since commercial whaling ceased.

3. Was the presence of Sei Whale(s) confirmed in Pacific Canadian waters? If so, has the relative proportion of Sei Whales that occur in Pacific Canadian waters compared to the whole population been maintained, or increased?

The presence of Sei Whales was confirmed. Given the very few visual and acoustic observations in Pacific Canadian waters and elsewhere in the northeast Pacific, there is currently no information on Sei Whale population trends.

4. Did the identified threat(s) significantly reduce the potential habitat or distribution in Pacific Canadian waters for Blue, Fin, and Sei Whales?

Data is not yet sufficient to determine if threats are significantly reducing potential habitat or distribution of Blue, Fin and Sei Whales in Pacific Canadian waters.

5. Were studies undertaken to identify critical habitat for these large whales?

Research as outlined in Section 3.1 above has been performed to contribute to the eventual identification of realized and potential habitat. Adequate knowledge of realized

and potential habitat will provide the information necessary for the subsequent identification of critical habitat.

6. Was research conducted and/or surveys carried out to better define the species' abundance and distribution?

Ship-based visual surveys and the deployment of acoustic recorders, and subsequent data analysis, occurred in an effort to better define the abundance and distribution of Blue, Fin and Sei Whales.

7. Were threats better identified? Were threats reduced or mitigated?

As set out in Section 3.2 above, better identifying threats has proven challenging due to the paucity of data and difficulty determining the cause of death for those deceased animals that are encountered.

Section 11 of the Recovery Strategy for Blue, Fin, and Sei Whales in Pacific Canadian Waters (DFO 2006) stated that “an action plan will be developed within two years of approval of the Recovery Strategy.” A partial action plan has been drafted, gone through regional consultation, and development is ongoing. It is considered a partial action plan because current best available information is insufficient to identify critical habitat (DFO 2012). When sufficient information allows, critical habitat will be identified for one or more of the species in a later chapter of the action plan.

4. References

Bailey, H., B.R. Mate, D.M. Palacios, L. Irvine, S.J. Bograd, and D.P. Costa. 2009. Behavioural estimation of Blue Whale movements in the Northeast Pacific from state-space model analysis of satellite tracks. Endangered Species Research 10:93-106.

Calambokidis, J., J. Barlow, J.K.B. Ford, T.E. Chandler, and A.B. Douglas. 2009. Insights into the population structure of Blue Whales in the eastern North Pacific from recent sightings and photographic identification. Marine Mammal Science 25:816-832.

DFO (Fisheries and Oceans Canada). 2007. Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment. Web site: http://www.dfo-mpo.gc.ca/oceans-habitat/oceans/im-gi/seismic-sismique/pdf/statement-enonce_e.pdf [accessed August 2012].

DFO. 2009. Management Plan for the Offshore Killer Whale (*Orcinus orca*) in Canada. *Species at Risk Act* Management Plan Series. Fisheries and Oceans Canada, Nanaimo. v + 49pp.

DFO. 2012. Information relevant to the assessment of critical habitat for Blue, Fin, Sei and North Pacific Right Whales in British Columbia. Canadian Science Advisory Secretariat Science Advisory Report 2011/078. Ottawa, Fisheries and Oceans Canada. 12 pp.

DND (Department of National Defence). 2007. Maritime Command Order: Marine Mammal Mitigation Procedures [MARCORD]. Unpublished. 46-13 (3A). 10 pp.

Doniol-Valcroze, T., D. Berteaux, P. Larouche, and R. Sears. 2007. Influence of thermal fronts on habitat selection by four rorqual whale species in the Gulf of St. Lawrence. Marine Ecology Progress Series 335:207-216.

Ford, J.K.B., R.M. Abernethy, A.V. Phillips, J. Calambokidis, G.M. Ellis, and L.M. Nichol. 2010. Distribution and relative abundance of cetaceans in western Canadian waters from ship surveys, 2002-2008. Canadian Technical Report of Fisheries and Aquatic Sciences 2913: v + 51 pp.

Gregr, E.J., J. Calambokidis, L. Convey, J.K.B. Ford, R.I. Perry, L. Spaven, and M. Zacharias. 2006. Recovery Strategy for Blue, Fin, and Sei Whales (*Balaenoptera musculus*, *B. physalus*, and *B. borealis*) in Pacific Canadian Waters. *Species at Risk* Recovery Strategy Series. Fisheries and Oceans Canada, Vancouver. vii + 53 pp.

Gregr, E.J., and K.O. Coyle. 2009. The biogeography of the North Pacific Right Whale (*Eubalaena japonica*). Progress in Oceanography 80:188-198.

Irvine, L. 2007. Characterizing the habitat and diving behavior of satellite-tagged Blue Whales (*Balaenoptera musculus*) off California. M.Sc. Thesis, Oregon State University, Corvalis, Oregon, USA. 52pp.

Nichol, L.M., and J.K.B. Ford. 2011. Information relevant to the assessment of critical habitat for Blue, Fin, Sei and North Pacific Right Whales in British Columbia. Canadian Science Advisory Secretariat Science Research Document 2011/137. Ottawa, Fisheries and Oceans Canada. vi + 31 pp.

Simon, S., K.M. Stafford, K. Beedholm, C.M. Lee, and P.T. Madsen. 2010. Singing behaviour of Fin Whales in the Davis Strait with implications for mating, migration and foraging. Journal of the Acoustical Society of America 128(5):3200-3210.

Williams, R., and L. Thomas. 2007. Distribution and abundance of marine mammals in the coastal waters of British Columbia, Canada. Journal of Cetacean Research and Management 9(1):15-28.