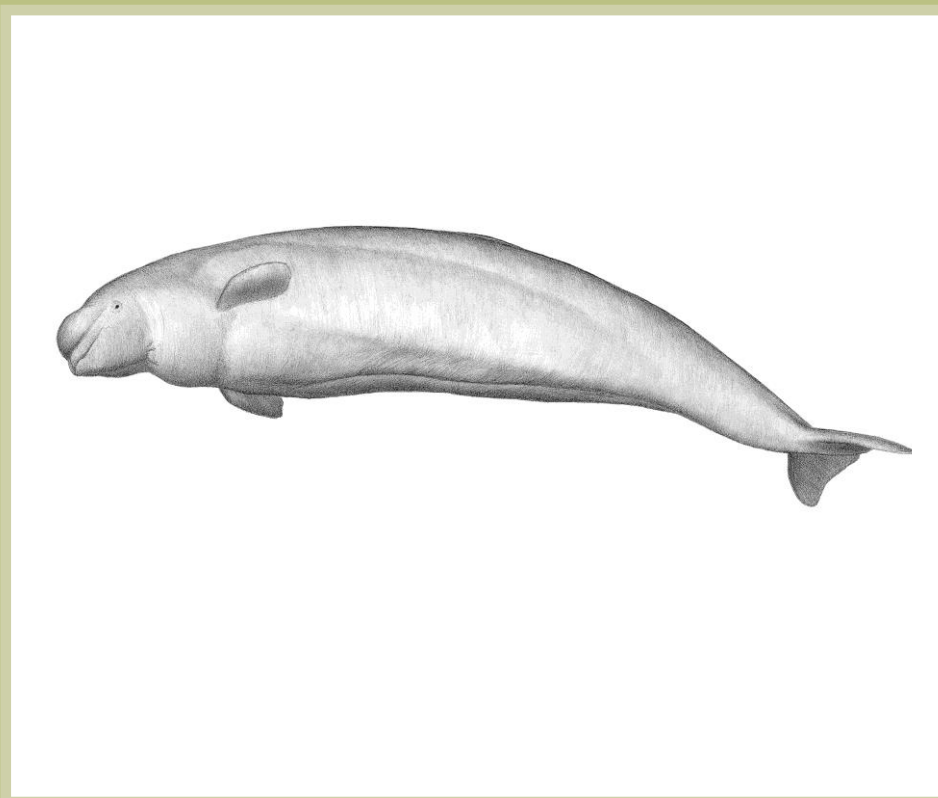


Recovery Strategy for the Beluga Whale (*Delphinapterus leucas*), Cumberland Sound population, in Canada

Beluga Whale



2024

Recommended citation:

Fisheries and Oceans Canada. 2024. Recovery Strategy for the Beluga Whale (*Delphinapterus leucas*), Cumberland Sound population, in Canada [Proposed]. *Species at Risk Act Recovery Strategy Series*. Fisheries and Oceans Canada, Ottawa. vii + 51 pp.

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](#).

Cover illustration: © Gerald Kuehl

Également disponible en français sous le titre
« Programme de rétablissement du béluga (*Delphinapterus leucas*), population de la baie Cumberland, au Canada »

© His Majesty the King in Right of Canada, represented by the Minister of Fisheries and Oceans, 2024. All rights reserved.

ISBN ISBN to be included by SARA Responsible Agency

Catalogue no. Catalogue no. to be included by SARA Responsible Agency

Content (excluding the illustrations) may be used without permission, with appropriate credit to the source.

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 the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for species listed as extirpated, endangered, or threatened and are required to report on progress 5 years after the publication of the final document on the [Species at Risk Public Registry](#), and every subsequent 5 years, until the recovery strategy is no longer required under SARA or the species' recovery is no longer feasible.

The Minister of Fisheries and Oceans is the competent minister for the Cumberland Sound Beluga (*Delphinapterus leucas*) and has prepared this recovery strategy, as per section 37 of SARA. It has been prepared in cooperation with the Pangnirtung Hunters and Trappers Association (HTA), the Qikiqtaaluk Wildlife Board (QWB), and the Nunavut Wildlife Management Board (NWMB), as per subsection 39(1) of SARA.

As stated in the preamble to SARA, success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Fisheries and Oceans Canada (DFO), or any other jurisdiction alone. The cost of conserving species at risk is shared amongst different constituencies. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Cumberland Sound Beluga, and Canadian society as a whole.

This recovery strategy will be followed by 1 or more action plans that will provide information on recovery measures to be taken by DFO and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this recovery strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

Acknowledgments

This document was prepared on behalf of the Cumberland Sound Beluga Recovery Team by S.A. Stephenson (DFO, Species at Risk Program, Ontario and Prairie Region).

Members of the Team acknowledge the support of their organizations during the preparation of the strategy: the Pangnirtung Hunters and Trapper Association, Qikiqtaaluk Wildlife Board, Nunavut Wildlife Management Board, Nunavut Tunngavik Incorporated (NTI), and DFO.

The following participants of the Regional Advisory Process and of the Recovery Planning Workshop held in Pangnirtung in March 2002 are thanked for their contribution of knowledge and experiences, and for helping to make a start on drafting the recovery strategy: Jaypetee Angmarlik, Susan Cosens, Karen Ditz, Josée Galipeau, Patt Hall, Lazarusee Ishulutaq, Abraham Kaunak, Mosesie Keenainak, Livee Kulluarlik, Mathewsie Maniapik, Laimee Nakashuk, Joeelee Papatsie, and Pierre Richard.

Recovery Team members have included: Leopa Akpialluk (Pangnirtung HTA), Tracy Allison (DFO), Tara Bortoluzzi (DFO), Holly Cleator (DFO), Karen Ditz (DFO), Winston Fillatre (DFO), Josée Galipeau (NWMB), Patt Hall (DFO), Joannie Ikkidluak (QWB), Paul Irgaut (NTI), Lazarusee Ishulutaq (Pangnirtung HTA), Abraham Kaunak (QWB), Daisy Keenainak (Pangnirtung HTA), Stephan Kilabuk (NTI), Livee Kulluarlik (Pangnirtung HTA), Chris Lewis (DFO), Jeff MacDonald (DFO), Noah Mosese (Pangnirtung HTA), Laimee Nakashuk (Pangnirtung HTA), Mosese Nuvaqiq (Pangnirtung HTA), Keith Pelley (DFO), Peterosie Qappik (Pangnirtung HTA), Pierre Richard (DFO), Adam Schneidmiller (NWMB), and Sam Stephenson (DFO).

The Recovery Team is thankful for the administrative support of Moe Keenainak and Leona Nakashuk (Pangnirtung HTA), and Solomon Awa and Tom Demcheson (QWB). Louisa Angmarlik (Pangnirtung HTA), Martine Giangioppi (DFO), and Patt Hall (DFO), provided assistance with recording, taking notes, and facilitating the workshop/meetings. Jonah Kilabuk provided Inuktitut translation and interpretive services at various times throughout the process. Innirvik Support Services, Andrew Diallya, and Naimee Kilabuk Bourassa also provided translation services when needed.

Numerous other individuals from Pangnirtung HTA, QWB, NWMB, NTI, and DFO have participated in meetings and reviewed drafts of the recovery strategy over the years. These individuals are thanked for their contributions to the development of the strategy.

Executive summary

The Cumberland Sound population of Beluga Whale (*Delphinapterus leucas*) (hereafter abbreviated as CSB) was listed as threatened under the *Species at Risk Act* (SARA) in April 2017. In 2020, during the drafting of the recovery strategy, COSEWIC reassessed CSB as endangered. Consequently, this recovery strategy may be amended at a future date if the listed SARA status under Schedule 1 changes. This recovery strategy is part of a series of documents for this species that are linked and should be taken into consideration together; including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Report (COSEWIC 2004), a recovery potential assessment (DFO 2005a), and 1 or more actions plans (to come). Recovery of CSB has been determined to be biologically and technically feasible, but will take a considerable length of time; possibly in excess of 100 years.

The Beluga Whale is a toothed whale characterised by a blunt head, slight beak, fat, stocky body, and lack of a dorsal fin. Newborn calves range from light to dark mottled grey in colour. Juveniles gradually lighten in colour as they age until they become almost pure white at, or shortly after, the age of sexual maturity of approximately 10 to 14 years of age. CSB was identified as a unique population in 2004 due to genetics, contaminant and movement data (COSEWIC 2004).

The primary current threat to CSB is the Inuit subsistence harvest. The latest population estimates and modelling data strongly suggest that a reduced harvest level will be required to achieve population recovery. Other potential threats, and activities that may impede CSB recovery include: noise and disturbance, pollution, and commercial fisheries that may compete for beluga prey. Killer Whale (*Orcinus orca*) predation, ice and tidal entrapment, disease/parasites, and environmental changes are among the natural limiting factors which may delay recovery or cause a decline in the population.

The population and distribution objective (section 6) for CSB is to protect, maintain and recover the population to levels that are self-sustaining such that the population is increasing to a stable size that is large enough to resist stochastic events and persist over the next 2 generations (that is, long-term ≥ 30 years).

To meet the population and distribution objective, the recovery strategy takes into consideration the uncertainty associated with current knowledge of CSB and its environment. The strategic approaches proposed to meet the population and distribution objective are to:

- manage the harvest for the recovery of CSB
- increase knowledge of the biology, seasonal distribution, abundance, and habitat requirements of CSB
- identify and protect all CSB critical habitat as soon as possible
- increase knowledge of how threats affect CSB survival so that these threats can be prioritized and avoided, eliminated, or mitigated to the extent possible

A description of the broad strategies to address threats to the species' survival and recovery, as well as research and management approaches needed to meet the population and distribution objective, are included in section 7. These will help inform the development of specific recovery measures in 1 or more action plans. An action plan relating to this recovery strategy will be produced within 5 years of this final recovery strategy being posted on the SARA Public Registry.

Using available data, critical habitat has been identified to the extent possible (section 8). The schedule of studies outlines the research required to further identify critical habitat to help achieve the population and distribution objective.

The recovery strategy provides the exemption that the summer and winter Greenland Halibut fishery may use long-lines, and their use will continue to be authorized under section 7 of the *Fisheries Act*.

Recovery feasibility summary

Recovery of CSB is believed to be biologically and technically feasible. The following feasibility criteria have been met for the species:

1. Are individuals of the wildlife species that are capable of reproduction available now or in the foreseeable future to sustain the population or improve its abundance?

Yes. There are currently a sufficient number of individuals capable of reproduction to sustain the population or improve its abundance (DFO 2005a). Local¹ and scientific knowledge suggests that CSB are capable of reproducing at a level that will permit recovery. Hunters report seeing, on a regular basis, cows with young calves. Calves were seen in aerial photographs taken in Clearwater Fiord in 2017. A recent study ([DFO 2022](#)) has identified 2 genetically distinct populations of Beluga in Cumberland Sound. However, further study is needed to determine whether the two populations correspond to 2 visually distinguishable stocks² described by local hunters. Beluga from the 2 populations cannot be distinguished visually during aerial abundance surveys. Spatial or temporal characteristics associated with the populations that could allow selective harvesting of the 2 populations in Cumberland Sound have also not yet been identified (DFO 2022). Based on information currently available, these 2 populations can only be assessed as a single stock.

2. Is sufficient suitable habitat available to support the species or could it be made available through habitat management or restoration?

Yes. Degradation or loss of habitat in Cumberland Sound is not considered to be a threat to the species. Local knowledge suggests that CSB habitat has changed little since pre-whaling times, therefore it is currently understood that sufficient suitable habitat is available now and in the foreseeable future to accommodate an increase in the CSB population to recovery levels.

3. Can significant threats to the species or its habitat be avoided or mitigated?

Yes. The subsistence harvest is under quota of 41 whales per year and a Fisheries Management (FM) management plan is being developed by the Cumberland Sound Beluga Working Group using co-management methods required in Nunavut and using the most recent scientific information and local knowledge. The subsistence harvest under the current quota is considered a high risk threat to CSB (DFO 2016; DFO 2019). According to DFO's population estimate based on the most recent surveys, a model estimated that a quota of 0, 14, or 20 whales per year would result in a 0%, 25%, and 50% probability of decline, respectively, for CSB within 10 years (DFO 2019). A sustainable subsistence harvest would not pose a threat to species' recovery.

Predation by Killer Whales (*Orcinus orca*), and possible threats from climate change and contaminants, are difficult to control or mitigate, and the degree to which they affect species' recovery is unknown, although presumably low. Other possible threats such as

¹ Local knowledge in this recovery strategy is geographically distinct to Cumberland Sound, and represents Inuit knowledge and the perspectives of hunters and trappers of the Pangnirtung community.

² A stock refers to a management unit defined geographically and temporally that may include more than one population if they overlap during the management or harvest season (DFO 2022).

noise, disturbance and pollution can be mitigated to a large extent at the local level and are also considered a low level of concern. Conflicts with commercial fisheries are minimal and should be monitored locally and, if required, measures should be taken to prevent the reduction of food resources for CSB.

4. Do recovery techniques exist to achieve the population and distribution objective or can they be developed within a reasonable timeframe?

Yes. Recovery techniques already exist including harvest management, “no hunting and harassment” zones, and population monitoring. There are techniques available to address human impacts (for example, overharvest, noise disturbance, pollution) that will allow the population to recover.

Table of contents

Preface.....	i
Acknowledgments.....	ii
Executive summary.....	iii
Recovery feasibility summary.....	v
1. Introduction.....	1
2. COSEWIC species assessment information.....	2
3. Species status information.....	3
4. Species information.....	4
4.1 Species description.....	4
4.2 Population abundance and distribution.....	5
4.3 Needs of the species.....	10
4.3.1 Physiographic features that characterize Beluga habitat use.....	10
4.3.2 Biological features that characterize Beluga habitat use.....	10
4.3.3 Sea ice features that characterize Beluga habitat use.....	11
4.3.4 Limiting factors of habitat.....	11
5. Threats and limiting factors.....	12
5.1 Threat assessment.....	12
5.2 Description of threats.....	12
5.3 Limiting factors assessment.....	15
5.4 Description of limiting factors.....	16
6. Population and distribution objective.....	17
7. Broad strategies and general approaches to meet the objective.....	18
7.1 Actions already completed or currently underway.....	19
7.2 Strategic direction for recovery.....	20
7.3 Narrative to support the recovery planning table.....	23
7.3.1 Additional information needed about the species.....	24
8. Critical habitat.....	25
8.1 Identification of the species' critical habitat.....	25
8.1.1 General description of the species' critical habitat.....	26
8.1.2 Information and methods used to identify critical habitat.....	27
8.1.3 Identification of critical habitat: geographic and biophysical information.....	27
8.2 Schedule of studies to identify critical habitat.....	32
8.3 Examples of activities likely to result in the destruction of critical habitat.....	33
9. Measuring progress.....	38
10. Activities permitted by the recovery strategy.....	38
11. Statement on action plans.....	38
References.....	40
Appendix A: effects on the environment and other species.....	46
Appendix B: record of cooperation and consultation.....	47
Appendix C: threat assessment categories.....	48
Appendix D: monthly home range of Cumberland Sound Beluga: September 2008 to May 2009	50

1. Introduction

The Cumberland Sound Beluga Whale (*Delphinapterus leucas*) (hereafter abbreviated as CSB) was listed as threatened under the *Species at Risk Act* (SARA) in May 2017. In 2020, during the drafting of the recovery strategy, COSEWIC reassessed CSB as endangered. Consequently, this recovery strategy may be amended at a future date if the listed SARA status under Schedule 1 changes.

This recovery strategy is part of a series of documents regarding CSB that should be taken into consideration together, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Report ([COSEWIC 2004](#)), [COSEWIC 2020 reassessment](#)³ and the Science Advisory Report from the Recovery Potential Assessment (RPA) ([Fisheries and Oceans Canada \[DFO\] 2005a](#)), and the subsequent action plan(s), to be prepared within 5 years of this final recovery strategy being posted on the SARA Public Registry. A recovery strategy is a planning document that identifies what needs to be done to arrest or reverse the decline of a species. It sets objectives and identifies the main areas of activities to be undertaken for the species. Detailed planning is done at the subsequent action plan stage.

The RPA is a process undertaken by DFO Science to provide the information and scientific advice required to implement SARA, relying on the best available scientific information, data analyses and modeling, and expert opinions. For more detailed information beyond what is presented in this recovery strategy, refer to the COSEWIC status report, COSEWIC 2020 reassessment, and the RPA science advisory report.

³ The 2020 COSEWIC assessment considers beluga in Cumberland Sound as 1 population.

2. COSEWIC species assessment information⁴

Date of assessment: November 2020

Common name (population): Beluga Whale (Cumberland Sound population)

Scientific name: *Delphinapterus leucas*

COSEWIC status: Endangered

Reason for designation: This is a small population with a restricted range, heavily reduced by commercial whaling in the past. While whales from this population continue to be harvested for subsistence, recent models suggest that reported removals are not sustainable. There are also concerns related to fishery removals of Greenland Halibut, a prey item for this population of belugas.

Canadian occurrence: Nunavut, Arctic Ocean

Status history: The Southeast Baffin Island-Cumberland Sound population was designated endangered in April 1990. In May 2004, the structure of the population was redefined: the Southeast Baffin Island animals (formerly part of the Southeast Baffin Island-Cumberland Sound population) were included as part of the "Western Hudson Bay population, 2004 designation". The newly defined "Cumberland Sound population" was designated threatened in May 2004. Status re-examined and designated endangered in November 2020.

⁴ The species' current classification on Schedule 1 of the *Species at Risk Act* is based on the 2004 assessment.

Date of assessment: May 2004

Common name (population): Beluga Whale (Cumberland Sound population)

Scientific name: *Delphinapterus leucas*

COSEWIC status: Threatened

Reason for designation: Numbers of Belugas using Cumberland Sound have declined by about 1,500 individuals between the 1920s and present. The population decline is believed to have been caused by hunting by the Hudson Bay Company into the 1940s and by the Inuit until 1979. Hunting has been regulated since the 1980s. Current quotas (41 in 2003) appear to be sustainable. Concerns have been raised about increased vessel traffic and the associated noise of outboard motors, as well as fishery removals of Greenland Halibut, a food source of Belugas.

Canadian occurrence: Cumberland Sound, Nunavut

Status history: The Southeast Baffin Island, Cumberland Sound population was designated endangered in April 1990. In May 2004, the structure of the population was redefined and named “Cumberland Sound population”, and the Southeast Baffin Island animals were included as part of the Western Hudson Bay population. Status re-examined and designated as threatened in May 2004. Last assessment based on an updated status report.

3. Species status information

Global status: The Beluga is globally secure, although some populations are clearly depleted and require further conservation measures (Jefferson et al. 2010). Beluga are listed under other programs such as the International Union for Conservation of Nature (IUCN) Red List which listed the entire species as near threatened in 2008. There is no individual IUCN status ranking for the CSB population.

Canadian status: CSB has not yet been ranked by NatureServe Canada. The entire population occurs within Canada in Nunavut in the area of Cumberland Sound. It was classified as threatened by COSEWIC in 2004 and listed as threatened under SARA in May 2017. In November 2020, COSEWIC reassessed the CSB population as endangered.

Upon listing as a threatened species in 2017, CSB became protected wherever it is found by section 32 of SARA:

“No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species.”
[subsection 32(1)]

“No person shall possess, collect, buy, sell or trade an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species, or any part or derivative of such an individual.” [subsection 32(2)]

Subsection 83(3) of SARA provides that the general prohibitions of SARA do not apply to a person who is engaging in activities in accordance with conservation measures for wildlife species under a land claims agreement.

Under sections 73 and 74 of SARA, the competent minister may enter into an agreement or issue a permit authorizing a person to engage in an activity affecting a listed wildlife species, any part of its critical habitat, or its residences.

4. Species information

4.1 Species description

Belugas are toothed whales (*Odontocete*) characterised by a blunt head, slight beak, fat, stocky body, and lack of a dorsal fin (figure 1). Newborn calves range from light to dark mottled grey in colour. Juveniles gradually lighten in colour as they age until they become almost pure white at, or shortly after, the age of sexual maturity (Sergeant 1973; Heide-Jørgensen and Teilmann 1994). Belugas are most commonly found in Arctic waters, but they also occur in sub-Arctic waters. In Cumberland Sound, adult females and males reach mean lengths of 362 cm (11.9 ft) and 428 cm (14 ft), respectively (Brodie 1971) and weigh from 800 to 1,000 kg (1,750 to 2,200 lbs). Females typically reach sexual maturity between 8 to 14 years, and males somewhat older at 12 to 14 years (Brodie 1971; Doidge 1990; Heide-Jørgensen and Teilmann 1994; Stewart 1994a; Stewart 1994b). Stewart et al. (2006) have shown that Beluga tooth growth layer groups form annually, not biannually as was previously thought, and therefore, the ages given herein for sexual maturity have been adjusted accordingly.

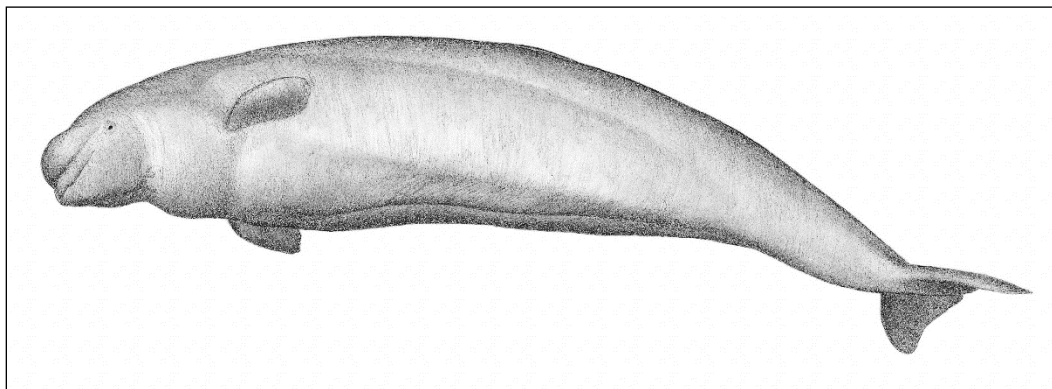


Figure 1. Beluga Whale (*Delphinapterus leucas*). © G. Kuehl.

Local knowledge regarding CSB suggests the peak in mating appears to occur in May, with calves being born in late July or early August (Kilabuk 1998). However, Béland et al. (1990) suggest that the peak calving time is not well established nor easily observed for Belugas, as it occurs offshore during the late spring migration. Calving in estuaries, in early summer, has been postulated (Sergeant 1973), but detailed studies in at least 2 Canadian estuaries have never recorded a calving event (Caron and Smith 1990; Smith et al. 1994). Nonetheless, hunters from Pangnirtung mention that in the past, females were sometimes seen calving in Shark Fiord (figure 2). While waiting on islands in the area, it was often possible for hunters to witness calving and then harvest the newborn immediately thereafter, if there was need for this resource. Females about to calve were observed to separate from the main pod and travel back

to the pod following calving. Calving was observed in July (Pangnirtung Hunters and Trappers Association [HTA] pers. comm. 2018).

The calving interval for beluga is estimated on average to be 1 calf born every 3 years (Brodie 1971; Matthews and Ferguson 2015) and calves may nurse for up to 3 years (Matthews and Ferguson 2015). The gestation period is about 14.5 months (Brodie 1971), although Pangnirtung hunters report that CSB females may give birth annually (Kilabuk 1998). An approximate maximum rate of increase of 4% per year was predicted for the population in the absence of hunting (Richard 2013). A population model using survey estimates from 1990 to 2017 and reporting annual harvests from 1960 to 2017 suggests a maximum growth rate of 3% per year (DFO 2019). Sources of natural mortality may include predation by Polar Bears (*Ursus maritimus*) (Smith 1985) and Killer Whales (*Orcinus orca*) (Byers and Roberts 1995; Sheldon et al. 2003), ice or tidal entrapments (Porsild 1918; Freeman 1968) and, possibly, disease (Nielsen pers. comm. 2018). Although Polar Bear predation has not been documented in Cumberland Sound, hunters report harvesting Belugas that exhibit scars from Polar Bear claws which point to failed attempts at predation (Pangnirtung HTA, pers. comm. 2018).

According to local knowledge (Kilabuk 1998; Stewart 2001), in the springtime, CSB are found at the floe edge, preying mainly on Arctic Cod (*Boreogadus saida*) and Greenland Halibut (*Reinhardtius hippoglossoides*) (also known as Turbot) (Kilabuk 1998). Some hunters also report that shrimp are eaten in the spring and early summer, as these are noted in the stomach contents of harvested whales (Pangnirtung HTA, pers. comm. 2018). Using stable isotopes, Marcoux et al. (2012) determined that from March to September, CSB primarily eat Arctic Cod and Capelin (*Mallotus villosus*). Fatty acid profiles of CSB blubber from 1980 to 2010 indicated there has been an increasing consumption of Capelin and a reduction in Arctic Cod in the summer months (Watt et al. 2016). Shallow, short dives in the summer seem to indicate foraging on Capelin, while deeper, longer dives in autumn and winter possibly indicate foraging on deeper prey such as Arctic Cod and Greenland Halibut, consumption of which would be important for amassing energy reserves (Watt et al. 2016).

4.2 Population abundance and distribution

A total of 7 Canadian Beluga populations have been identified based mainly on their summer distributions and genetic differences Beaufort Sea, St. Lawrence Estuary, Ungava Bay, eastern Hudson Bay, western Hudson Bay, High Arctic Baffin Bay, and Cumberland Sound (COSEWIC 2004).

Prior to the commencement of commercial harvesting in 1868, there were an estimated 8,500 CSB (Alvarez-Flores 2005). As a result of the commercial harvesting, the population declined substantially until 1966 when commercial harvesting ended after removing at least 14,079 whales (Stewart 2018). There is little doubt that these commercial harvests, and not subsistence harvests by the Inuit, were the primary cause of the decline of CSB (COSEWIC 2004, 2020). Aerial surveys conducted in the western end of Cumberland Sound (including Clearwater Fiord) in the autumn of 1979, and the summers of 1980, 1985 and 1986, produced surface index counts of about 400 to 600 Belugas (Brodie et al. 1981; Richard and Orr 1986). Since a surface index only counts those whales seen at, or near, the surface of the water and does not include animals diving below the surface that cannot be seen by aerial survey observers, it is not a means to accurately estimate population size.

Dive data obtained from Belugas tagged in other parts of Nunavut (Heide-Jørgensen unpubl. data) were used to estimate the number of diving animals during 1999 surveys (Richard 2013), resulting in a population estimate of 1,960 Belugas (90% confidence limits [CL]=1,594 to 2,409). A Bayesian model estimated the 2002 population size to be 2,018 individuals (95% CL=1,553 to 2,623), or 24% of its estimated historical population size (DFO 2005a).

An aerial survey planned for 2005 was not completed due to inclement weather conditions, while large confidence intervals made the 2009 abundance estimate unreliable (estimate of 788 [confidence interval (CI)=310 to 1,679]) (Richard 2013). A 2014 aerial survey using visual and photographic methods yielded a population estimate of 1,151 individuals (95% CI=761 to 1,744) (Marcoux et al. 2016). The 2014 survey was carried out over an 8 day period in August and included multiple surveys of Clearwater Fiord and the north and western portion of Cumberland Sound where most CSB are known to congregate at that time of year (DFO 2016). The survey also included the south and west side of the Sound to Kikiktaluk Island (figure 2). A 2 part aerial survey carried out from July 29 to August 3, 2017 and August 4 to August 12, 2017, included Clearwater Fiord and extended as far south as Moodie Island (figure 2); farther than the 2014 survey. The 2017 survey yielded a weighted average estimate of 1,381 whales (95% CI=1,270 to 1,502) (DFO 2019).

Based on the best information at the time, the CSB subsistence quota was set at 41 whales per year in 2005 (DFO 2005b). However, examination of the 4 aerial surveys of CSB (from 1990 to 2014) show sequential abundance estimates that cannot be explained by known dynamics of Beluga populations (Marcoux and Hammill 2016). The large increase in estimated population size observed between the 1990 and 1999 surveys is not biologically possible. The severe decline implied by the 1999 and 2009 population estimates is only possible if mortality was substantially larger (~180 CSB/year) than is presently reported by the Inuit harvest or there are other important sources of mortality that were not taken into account (Richard 2013). Therefore, the setting of a quota of 41 CSB per year in 2005 was meant to be sustainable, but several recent assessments have shown that those levels of harvest are not sustainable.

More recently, a population model was developed with an updated series of survey estimates from 1990 to 2017 and reported annual harvests from 1960 to 2017 to estimate current abundance and determine trends in population dynamics. The model estimated that a total allowable landed catch (TALC) of 0, 14, or 20 CSB per year would result in a 0%, 25%, and 50% probability of decline, respectively, in the CSB population in 10 years (DFO 2019). Local hunters speak of 2 types of Belugas that inhabit Cumberland Sound that they distinguish by size and behaviour (Kilabuk 1998). Groups of smaller sized Belugas are reported to first appear at the floe edge in April. They are later seen in Nettling and Kangillo fiords along with the regular Cumberland Sound whales. These whales are somewhat thinner and the adults are white. The texture of their blubber, or maktaq, is soft. A recent study ([DFO 2022](#)) has identified 2 genetically distinct populations of Beluga in Cumberland Sound. However, further study is necessary to see if the 2 genetic populations correspond to the 2 physically distinguishable stocks described by local hunters. Herds of larger Belugas arrive at the floe edge in late April and May and eventually move to the Clearwater Fiord area for the summer. In spring, their outer skin layer is yellow and just starting to shed.

In late June and early July, large groups of CSB migrate in ice leads along the southwestern coast of Cumberland Sound to their main summering area in and near Clearwater Fiord at the top of the Sound (figures 2 and 3). Some whales are found in bays along the southern side of the Sound until early fall. Early surveys suggested that from mid-July to mid-September, the major summer aggregation of CSB were limited to the Clearwater Fiord area where they

occupied the Ranger River estuary and adjacent bays where they reportedly fed infrequently on a variety of fish and invertebrates (COSEWIC 2004). There is some evidence that older CSB of both sexes either inhabit different areas or feed on more benthic species than younger CSB (Marcoux et al. 2012). CSB leave the Clearwater Fiord area in late August through September and move back along the southwest side of Cumberland Sound. Based on satellite tagging studies, CSB spend most of their time near the centre of the Sound in late autumn, diving to depths of 300 m or more, likely to feed on deep water species such as Greenland Halibut (Richard and Stewart 2008) (figure 4). In early winter, CSB move to the eastern end near the mouth of Cumberland Sound and remain in open water areas (polynyas) until the following spring.

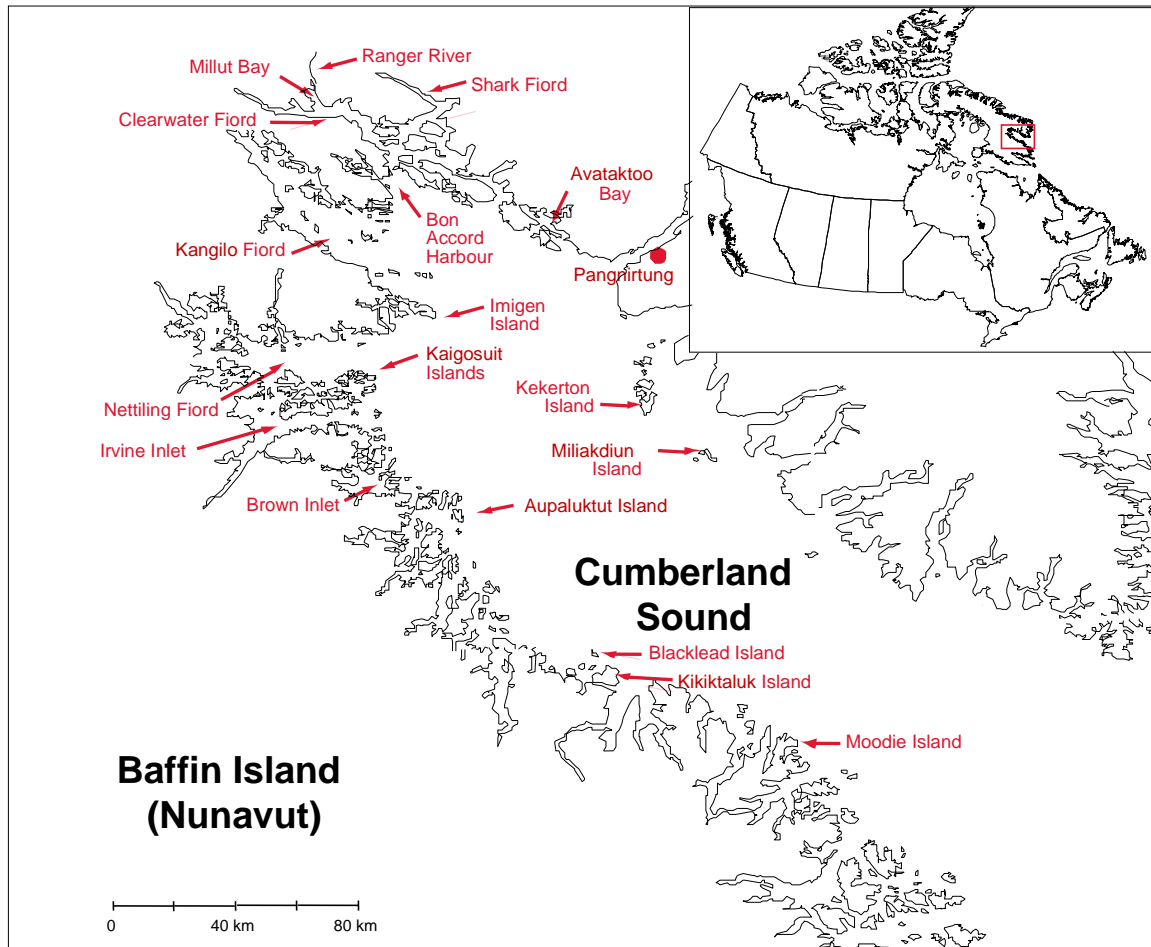


Figure 2. Locations of place names in Cumberland Sound mentioned in the text.

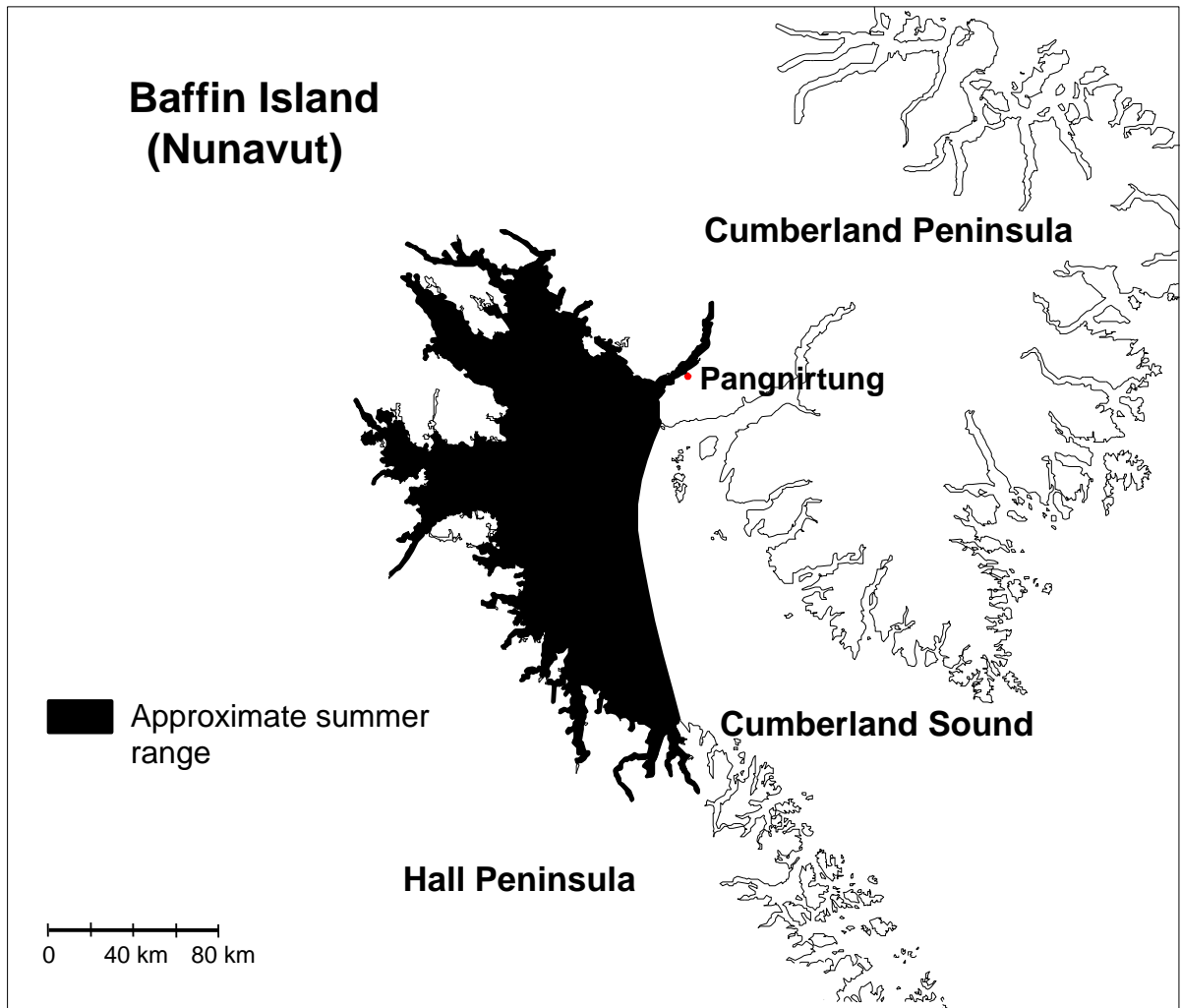


Figure 3. Distribution of Cumberland Sound Beluga during summer.

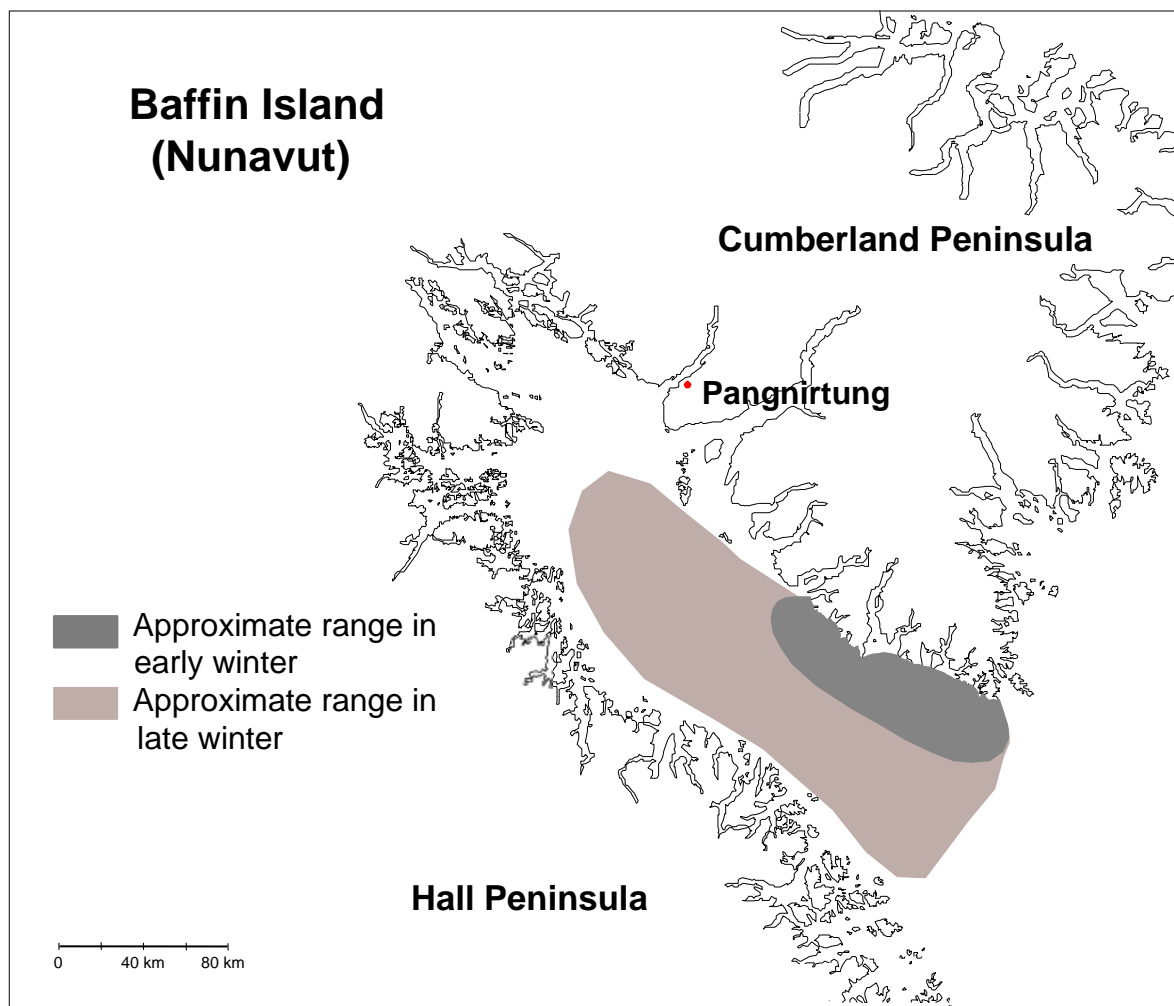


Figure 4. Distribution of Cumberland Sound Beluga during early and late winter.

During the summer, Pangnirtung hunters also report Belugas being present in Nettling Fiord and southward in the bays and coastal waters of the southwestern side of Cumberland Sound (figure 3). Like the early floe edge whales, some of these Belugas are smaller in size and thinner than the Clearwater Fiord whales. It is unclear whether these whales are the same animals as the small whales seen at the floe edge in April, but their maktaq reportedly tastes the same (Kilabuk 1998). There are reportedly far fewer of the smaller whales than the larger ones. The appropriateness of using morphology to distinguish or differentiate Beluga populations has been questioned (for example, Luque and Ferguson 2010; Harwood et al. 2014), and therefore, these whales may all belong to the same population. However, it is possible that these smaller whales are from another population, such as Hudson Bay, and overwinter near the mouth of Cumberland Sound and are simply slow in leaving the area after ice breakup. Pangnirtung hunters suggest that most of these whales leave Cumberland Sound by the end of July and, therefore, would only be seen if aerial surveys were flown near the mouth of the Sound earlier in the year. As previously mentioned, genetic analysis of CSB has revealed 2 distinct genetic populations, but further research is necessary to see if these 2 stocks correspond to the 2 different physically distinct stocks. Comparison of genetic samples taken from the larger versus smaller sized Belugas may help determine whether these 2 types of Belugas represent different stocks and their degree of relatedness, if any.

4.3 Needs of the species

The CSB uses different habitat depending on the season. Habitat use by CSB can be described physiographically, biologically, and by sea ice features that characterize use. A residence, as defined under SARA, is not applicable to CSB because it does not have any known dwelling place similar to a den or nest that is occupied or habitually occupied by 1 or more individuals during all or part of its life cycle.

4.3.1 Physiographic features that characterize Beluga habitat use

Cumberland Sound is a large, wide inlet with maximum depths in excess of 1,000 m, with large fiords on the northeast and eastern side which are in excess of 100 m in depth, while southern and western areas are much shallower, have a wider shelf (IBCAO 2012) and a more complex shoreline. Throughout the year, CSB can be found in areas of variable depths. In the summer (July to August), CSB predominantly occupy Clearwater Fiord centering on Millut Bay, or “Midlurialik” as it is called locally (Richard and Stewart 2008) (figure 2). It has been suggested that estuaries serve as beach rubbing or moulting sites for Belugas, or that they provide shelter from predators. The water discharged from the Ranger River into Millut Bay is colder than sea water, and may possess some benefits for the moulting process. Clearwater Fiord is the only calving place in Cumberland Sound known to hunters (Kilabuk 1998) and is the only location of its kind on the southeast Baffin coast. CSB occupy the fiord for several weeks every summer. In late summer or early fall (late August to early September), they leave Clearwater Fiord for deeper waters, migrating to feeding areas along the southwestern shore. CSB used to leave Clearwater Fiord later in the year, sometimes October, when there were more Killer Whales present (Kilabuk 1998). With Killer Whale numbers recently increasing, CSB may again begin leaving the area later to avoid these predators. Changing temperatures may also be delaying CSB movement from Clearwater Fiord.

The west end of Cumberland Sound and a large portion of the southern part of the Sound have a wide shelf and gentle slope that reaches a depth of approximately 400 m (Richard and Stewart 2008). The bays located there are relatively shallow when compared to depths in most of the Sound. These areas contain small numbers of Belugas seasonally and some animals have been known to become trapped, typically in the fall, in bays that have a shallow sill at their entrance. They remain trapped in these bays until high tides provide a chance to exit. Occasionally, a humane harvest occurs when animals seem unable to leave independently or ice makes escape impossible (Stewart 2018).

Research suggests that CSB have a preference for certain water depths and that this preference varies seasonally (Richard and Stewart 2008). Data for an entire year is not available, although preliminary tagging data in 1998 to 1999 and from September to November 2008 revealed that in September, CSB preferred to use waters between 100 m and 300 m deep whereas in October and November, CSB preferred deeper waters ranging in depths of between 200 m and 500 m (Richard and Stewart 2008).

4.3.2 Biological features that characterize Beluga habitat use

In Cumberland Sound, Belugas have access to a variety of prey at differing depths. The most common marine fishes in the area are Arctic Cod and Greenland Halibut. Other species present include Capelin, Greenland Cod (*Gadus ogac*), Snail fish (*Liparis* spp.), Arctic Alligatorfish

(*Ulcinia olrikii*) and several species of Sculpins (*Gymnocanthus* spp. and *Myoxocephalus* spp.). A variety of benthic invertebrate prey are also available.

It is unknown if CSB are targeting particular prey species or are feeding opportunistically, although there is some evidence for targeted feeding (Marcoux et al. 2012). Capelin seems to be increasing in both abundance in the Sound (Marcoux et al. 2012), and proportionally in the diet of CSB (Watt et al. 2016). During the summer when they are found within Clearwater Fiord, belugas rarely feed. Brodie (1970 and 1971) reported that stomachs at this time of year were often empty, but the few that did contain contents mainly had consumed a variety of benthic organisms. Belugas have been seen feeding in the Sound and near the mouth of Kangilo Fiord in the fall (Kilabuk 1998).

4.3.3 Sea ice features that characterize beluga habitat use

During winter months, ice covers much of Cumberland Sound. At that time of year, CSB are vulnerable to the risk of losing access to open water, so they seek out areas where the ice conditions are more dynamic and large areas remain open. The coastal shelf of Cumberland Sound is covered with landfast ice (ice attached to the shoreline) throughout the winter, with heavy pack ice (large pieces of shifting, floating ice packed together) covering most of the remainder of the Sound. CSB survive the winter in ice leads and polynyas where open water provides access to air.

The largest polynya is located near the mouth of Cumberland Sound, close to the Cumberland Peninsula. Several smaller polynyas that are kept open by tidal currents occur at the mouths of several bays and fiords around the Sound. In months when winter ice is forming rapidly, the northeast polynya along the Cumberland Peninsula provides the least risk of ice entrapment. Belugas trapped in ice are susceptible to predation by Polar Bears, starvation, and suffocation if the ice does not break open to release the whales. Large ice entrapment events are, however, thought to be infrequent in the Sound (Richard and Stewart 2008). Elders of Pangnirtung speak of an ice entrapment of approximately 100 CSB in 1956 on the west side of the Sound and another entrapment of more than 35 CSB in Irvine Inlet (no date given) (Richard and Stewart 2008) (figure 2).

An ice lead also forms along the northern margin of fast ice when northwest winds displace pack ice (Richard and Stewart 2008). The size of the lead varies, but can also narrow or close completely with strong winds. CSB do not appear to use it in the winter, but hunters report that this lead is occupied by CSB in early spring (Kilabuk 1998).

4.3.4 Limiting factors of habitat

Like most toothed whales, it is believed that Belugas have a slow reproductive rate which leads to a slow potential population growth rate. Many CSB, especially females and their calves, return to the same nursery areas annually. This summer site fidelity could be a limiting factor if these sites were subject to disturbance. In 1985, the Pangnirtung HTA recognized the importance of Clearwater Fiord and nearby Shark Fiord (figure 2) to CSB in summer by banning harvesting in those areas (Richard and Pike 1993), thereby protecting them from disturbance.

5. Threats and limiting factors

5.1 Threat assessment

Apart from subsistence harvesting pressures, there are no other significant anthropogenic threats to this population (COSEWIC 2004; DFO 2005a; DFO 2005b). Table 1 lists the threats known or suspected of having a negative effect on CSB, and the level at which they occur. Appendix C describes the threat assessment categories used in the table. Known and suspected threats were ranked with respect to likelihood and impact and were combined to produce an overall risk of the threat. A certainty level was also assigned to the overall threat level, which reflected the lowest level of certainty associated with either the threat likelihood or threat impact.

Table 1. Population level threat assessment for the Cumberland Sound Beluga. See appendix C for a detailed definition of descriptions used in this table.

Threats	Overall risk of threat	Occurrence	Frequency	Extent
Subsistence harvesting	High	Current	Continuous	Narrow
Acoustic disturbance	Low	Current	Recurrent	Broad
Commercial fisheries	Low	Current	Recurrent	Extensive
Pollution	Low	Anticipatory	Recurrent	Narrow

5.2 Description of threats

Subsistence harvest

The subsistence harvest is the only human activity which is known to remove whales from the CSB population. Under the current quota, the subsistence harvest is considered a high risk threat to CSB (DFO 2016; DFO 2019). As such, a well managed harvest which provides information on the number of whales struck and lost during the harvest, as well as samples collected from harvested whales (for example, length, sex, genetic, and contaminant samples) can contribute valuable knowledge essential in managing this population. Ongoing accurate knowledge on the number of CSB, their habitat use, and life history is important to properly manage a continuing harvest. Pangnirtung hunters believe there are virtually no whales struck and lost in the hunt, as CSB are only harvested early in the summer when they are very fat and hunters have never seen a fat whale sink. When whales first arrive and are harvested, they are very fat, but become thinner later in the year (Pangnirtung HTA pers. comm. 2018). DFO's population model (2019) estimated a struck and lost and non-reporting rate of 36%.

Some hunters believe that an increased harvest would not pose a threat to recovery of CSB as local knowledge suggests the population is continuing to recover. After 20 years of a quota and no increase in the number of CSB available to harvest, many Inuit feel that they should be

allowed to manage the Cumberland Sound stock for a similar length of time using traditional methods of wildlife management. Additionally, some Elders of Pangnirtung believe that while they were willing to respect the DFO quota, a growing population of younger hunters may not be so willing to accept the quota and push for a greater role in management as outlined in the *Nunavut Lands Claim Agreement* (1993). DFO continues to collect data on the population from aerial surveys and samples collected by hunters during the harvest. Based on analysis of this data, the subsistence harvest under the current quota is considered a high risk threat to CSB (DFO 2016; DFO 2019). Ongoing, accurate knowledge on the number of CSB, their habitat use, and life history is important to properly manage a continuing harvest while still allowing for recovery.

Wildlife in Nunavut is co-managed with local, regional, territorial and federal partners. Quotas are first approved by the Nunavut Wildlife Management Board and then reviewed by the Minister of Fisheries and Oceans Canada. At the recommendation of the Southeast Baffin Beluga planning committee a quota of 35 CSB was established for the 1991 to 1992 season and was increased to 41 for the 2002 to 2003 season (DFO 2002). The quota has been maintained at 41 CSB using DFO Variation Orders and is monitored by the Pangnirtung HTA. The quota was established using the best available information at the time (DFO 2005b) and is controlled by Pangnirtung HTA hunting rules and bylaws.

The annual quota of 41 whales was previously believed to be sustainable and not a threat to recovery, provided the harvest remained properly controlled (for example, not over-harvested, few if any struck and lost animals) and no additional unknown mortality occurred (DFO 2002). Between 1992 and 2001, Pangnirtung hunters landed an average of 36.5 Belugas annually, although this number does not include any struck and lost whales, nor those that were harvested opportunistically and for humane reasons when becoming entrapped by ice (DFO 2002). Stewart (2018) suggested that from 2002 to 2016 the quota of 41 whales was met or exceeded in all years except 2015, where the presence of summer ice limited the harvest to only 18 whales. There were 2 aerial surveys to estimate CSB abundance in 2017; to estimate current abundance and determine trends in population dynamics, a population model was developed using the series of survey estimates from 1990 to 2017 and reported annual harvests from 1960 to 2017. The model estimated that a Total Allowable Landed Catch (TALC) of 0, 14, or 20 CSB per year would result in a 0%, 25%, and 50% probability of decline, respectively, in the CSB population in 10 years (DFO 2019). Under the current quota, the model estimated a 96% probability of population decline in ten years.

The principles of conservation set out in the *Nunavut Lands Claim Agreement* (1993) guide harvest management and are consistent with requirements of the *Marine Mammal Regulations* and SARA. A Fisheries Management (FM) management plan will be developed with the Cumberland Sound Beluga Working Group, including the community of Pangnirtung to guide the conservation and sustainable use of the fishery and to ensure the harvest is conducted safely and effectively. The FM management plan is not a SARA legal instrument but will assist with achieving recovery goals.

Acoustic disturbance

Belugas rely on sound production and reception to navigate, communicate, locate breathing holes, and hunt in dark or murky waters. Loud external noise could result in hearing damage, avoidance of preferred areas during foraging or travel, and, possibly, deterrence of some activities. Excessive noise can prevent Belugas from carrying out vital functions and would,

therefore, constitute the destruction of critical habitat. Although the threshold level of acoustic disturbance that would destroy CSB critical habitat is currently unknown, scientific literature from the United States National Marine Fisheries Services (NMFS 2003) has established the threshold level of disturbance for marine mammals at 120 dB from continuous sources and 160 dB from pulse sources. The threshold for physical damage to hearing is set at 180 dB. These thresholds are given as an indication only, and can vary according to factors such as sound frequency or oceanographic conditions.

Local knowledge suggests that noise from motorized boats was considered to be the main factor causing a decline in numbers of whales seen at outpost camps and in all of Cumberland Sound (Kilabuk 1998). Kilabuk (1998) suggested that noise disturbances were causing whales to expend energy in avoiding boats, resulting in a decline in the oiliness of their blubber. More recently, hunters report that Belugas normally lose fat during the summer as a result of eating less, not only as a response to noise, although it should be noted that noise may also be driving Belugas from preferred feeding sites.

Tourism boats are increasing in many, but not all, parts of the Arctic during the summer months (for example, Lasserre and Têtu 2015). Some Inuit are concerned about the unregulated operation of an increasing number of large tour ships and associated smaller boats attempting to approach whales closely. The presence of tour boats could potentially have an adverse effect on CSB feeding or in calving and nursery areas such as Clearwater Fiord, although there are currently none operating in the area. The *Marine Mammal Regulations* under the *Fisheries Act* define and prohibit disturbance of marine mammals and describe the legal approach distances from marine mammals. The recent *Marine Mammal Regulations* amendments governing human activities affecting marine mammals were published in the *Canada Gazette, Part II* on July 11, 2018.

In 2013 and 2017, Turbot allocations in the Nunavut waters of the Northwest Atlantic Fisheries Organization divisions 0A and 0B increased significantly (Nunatsiaq News 2017). The development of these fisheries in Baffin Bay and Davis Strait has resulted in increased vessel traffic in Cumberland Sound. Ship traffic may remain at its current level, but could also increase as the harbour at Pangnirtung undergoes further development and the fish plant expands. Currently, fishing by large vessels (that is, greater than 19.8 m) in Cumberland Sound is prohibited. Belugas can react to the noise of large ships at distances of up to 20 km or 30 km (12 to 18 miles) (Cosens and Dueck 1993).

In addition to boat noise, hunters report that CSB also react to a variety of noises including low flying aircraft and footsteps or snowmobiles at the floe edge (Kilabuk 1998). Hunters have also reported increased submarine traffic in Cumberland Sound and local changes in CSB distribution in response to these vessels (Kilabuk 1998).

Overall, the threat posed to the recovery of CSB due to noise is currently considered low (DFO 2005b).

Commercial fisheries

Development of an inshore Turbot fishery in summer has begun in Cumberland Sound. Although the use of gill nets in the Greenland Halibut fishery seems unlikely due to DFO's ongoing commitment to not authorize the use of gill nets in Cumberland Sound, the potential for entanglement of Belugas (and other whales) should be carefully considered if gill nets are to be allowed (DFO 2009). DFO currently authorises only using long-lines (DFO 2008a). There is a

potential for competition over prey species (for example, Turbot and shrimp) possibly eaten by Belugas, but this competition is speculative and unproven at this time (DFO 2005b). While the current fishery for Turbot in Cumberland Sound does not pose any concern for CSB, the amount of Turbot and other species required by CSB is unknown. However, as the CSB population is currently much smaller than it was historically, any reduction in prey availability would probably have to be significant to affect this population.

Pollution and contaminants

Pangnirtung residents have reported that dumping at sea appears to be widespread in the waters between Greenland and Baffin Island and may be increasing. Localized pollution from a sewage outfall in the waters near Pangnirtung had been a source of local concern. A sewage treatment plant went into operation in April 2004 and was improved and expanded in 2014. Threats from pollution are considered low (DFO 2005b).

Arctic marine predators such as Beluga, which are near the top of the Arctic marine food chain, can accumulate relatively high levels of persistent halogenated organic contaminants and heavy metals. Belugas that reside in the waters of southeast Baffin Island have some of the highest levels of organochlorines of any reported to date in the Canadian Arctic, although the levels in Cumberland Sound samples are lower than those from Kimmirut and Iqaluit (Stern et al. 2005). Since the early 1980s, concentrations of some of the major persistent organic pollutants in the environment have stabilised or declined, while concentrations of other contaminants currently in use are low but have increased (Law et al. 2003). Mercury and other heavy metals have been found in Beluga samples from Cumberland Sound (Wagemann et al. 1996; Lockhart et al. 2005). More studies are needed to assess the potential effects of all contaminants and their synergistic effects on the health of Belugas, the Inuit that consume them, and the fish (as well as other species) that both utilize for food.

5.3 Limiting factors assessment

Limiting factors are potential ecological impacts which may take place during the recovery process and could slow the speed or success of recovery. These can be predicted as possible impacts/events, but cannot be controlled. Table 2 lists the limiting factors known or suspected of having a negative effect on CSB and their recovery.

Like the threats above, known and suspected limiting factors were ranked with respect to their likelihood of occurrence and impact. The likelihood and impact categories were then combined to produce an overall risk level. A certainty level was also assigned to the overall threat level, which reflected the lowest level of certainty associated with either the likelihood or impact.

Table 2. Population level limiting factors assessment of the Cumberland Sound Beluga. See appendix C for a detailed definition of descriptions used in this table.

Limiting factor	Overall risk of limiting factor	Occurrence	Frequency	Extent
Predation by Killer Whales	Low	Current	Recurrent	Restricted
Entrapment and stranding	Low	Current	Recurrent	Restricted

Disease and parasites	Unknown	Current	Recurrent	Narrow
-----------------------	---------	---------	-----------	--------

5.4 Description of limiting factors

Among limiting factors, both scientific and local knowledge indicate that the environment in the eastern Arctic is changing; it is no longer as cold for as long as it used to be and rare weather events may occur at unpredictable times. Therefore, climate change has a great potential to have a cumulative effect on most, if not all, of the limiting factors identified, by allowing them to occur for longer periods of time or in novel areas. Positive effects of climate change might include a temporary period of greater prey availability or quality, as primary productivity increases with warmer temperatures, while negative effects might include a greater risk of predation from Killer Whales due to reduced periods of sea ice (DFO 2009). Continued monitoring is required in order to better understand the effects of climate change on CSB.

Predation by Killer Whales

Hunters from Pangnirtung have noticed an increasing number of Killer Whales in Cumberland Sound over the past 35 years. Beginning in 2019, hunters from Pangnirtung observed a greater number of Killer Whales than usual and observed them more often, sometimes in areas such as Clearwater Fiord, where they had previously been rarely, if ever, observed. The concern of an increasing number of Killer Whales accessing Belugas in non-typical areas, probably for an extended period of time due to a longer ice-free season, suggests to the Pangnirtung HTA that actions may need to be taken to lower Killer Whale numbers in Cumberland Sound.

Predation by Killer Whales is perhaps the single most limiting natural factor capable of having a negative effect on the size of the CSB population. More Killer Whales could result in higher mortality of CSB (table 1). Many years ago, hunters saw evidence of Killer Whale attacks on Belugas such as pieces of Beluga maktaq and viscera floating in the water (Ferguson et al. 2012). Killer Whales, which are almost twice the size of Belugas and travel and hunt in pods, are able to successfully kill adult Belugas. Historically, when there were more Killer Whales present in Cumberland Sound than until perhaps recently, CSB used to leave Clearwater Fiord late in the year, sometimes in October, presumably to avoid contact with the Killer Whales (Kilabuk 1998). However, with Killer Whale numbers increasing to historic levels, as well as a longer ice free period allowing Killer Whales to remain in Cumberland Sound for a longer period, CSB may again be leaving Clearwater Fiord later in the year in an attempt to avoid these predators. Warming temperatures could also be delaying the departure of CSB from Clearwater Fiord.

The exact number of Belugas taken annually by Killer Whales in Cumberland Sound is unknown (DFO 2005b). Killer Whales are known to be present in Cumberland Sound only during the open water season when sea ice no longer presents a danger to their prominent dorsal fin. There is a concern that due to a warming climate, less ice cover will make it easier for Killer Whales to prey on CSB for a longer period of time each year. Distribution, movement, and population size of the Northwest Atlantic/Eastern Arctic population of Killer Whales is largely unknown, but may number only 250 individuals (COSEWIC 2008), with only a small number of these entering Cumberland Sound in any given year.

Entrapment and stranding

Local hunters report that CSB occasionally become trapped by ice or receding tides for varying lengths of time (Kilabuk 1998). For example, in the late 1950s many whales became entrapped in the ice southeast of Aupaluktut Island (Pangnirtung HTA pers. comm. 2008) (figure 2). In September 2001, 3 whales became stranded in a bay at Avataktoo and were unable to free themselves during the following extreme high tides. Of these 3 whales, 2 were killed and landed, while 1 was killed and lost (Stewart 2018). The HTA also herded approximately ten whales out of the Tajagiaq Bay area in early October 2005, to prevent them from being completely entrapped (Stewart 2018).

When Beluga Whales become trapped in shallow water during tidal occurrences or by ice in fall or early winter in an area far from other openings in the ice, they have little or no chance of escape and usually die from predation, suffocation, or starvation. How often this occurs and the possible effect of climate change on the frequency of these events is unknown. Large ice entrapment events are thought to be infrequent in the Sound (Richard and Stewart 2008). However, elders of Pangnirtung speak of an ice entrapment of approximately 100 CSB in 1956 on the west side of the Sound and another entrapment of more than 35 CSB in Irvine Inlet (no date given) (Richard and Stewart 2008) (figure 2). An “Action Plan for Trapped Whales” was developed by DFO and the Pangnirtung HTA in 2001 to guide monitoring of trapped whales and possible humane harvests. This plan was used to respond to entrapment reports in 2005, 2006, 2007, 2009, and 2010. However, details on the number of whales trapped, harvested, or rescued are largely missing and some ice or tidal entrapments and harvests may not have been reported to DFO. The number of trapped animals that perish annually may have a large impact on success of recovery approaches.

Disease and parasites

Serological surveys of Belugas looking for the presence of viruses and bacteria have revealed that sporadic infections of influenza A have occurred in Canadian populations, although whales from Cumberland Sound were found to be unaffected (Nielsen et al. 2001a). No distemper antibodies were detected in any Canadian Belugas tested (Nielsen pers. comm. 2018). Canadian Belugas, including CSB, are infected by a form of *Brucella* that is specific to marine mammals. All species of *Brucella* are known to cause reproductive failure in infected animals, although the full extent of its effect on Canadian belugas, and specifically, CSB, has not yet been determined (Nielsen et al. 2001b).

While these results suggest that CSB are not currently threatened by disease, infectious diseases can cause mortality or affect reproduction over the longer term (Young 1994; Nielsen et al. 2001c). For this reason, monitoring should continue (that is, through blubber sample collection) to assist in detecting the onset of an infection that could be harmful to CSB, and any sick whales should be reported to DFO.

6. Population and distribution objective

Population and distribution objectives establish, to the extent possible, the number of individuals and the geographic distribution that is necessary for the recovery of the species. The long-term population and distribution objective for CSB is:

- to protect, maintain and recover the population of CSB Whales to levels that are self-sustaining such that the population is increasing to a stable size that is large

enough to resist stochastic events and persist over the next 2 generations (that is, ≥ 30 years)

To meet the objective of this recovery strategy, harvest sustainability must be addressed as harvest is the primary current threat to the species. In addition, the self-sustaining levels described in the recovery objective may support a sustainable Inuit harvest. Consideration should also be given to new information received through local knowledge and science advice/expertise, as well as the uncertainty associated with current knowledge of the CSB with regards to biology, abundance, seasonal distribution, and habitat requirements.

The size of the CSB population prior to commercial whaling is estimated to have been 8,465 whales (DFO 2005a). Early in the recovery planning process (2002), the Recovery Team chose a recovery target of 5,000 whales, which represents approximately 70% of the population based on the historical population size. A population of 5,000 belugas could sustain a harvest of 100 whales per year, which would meet the projected future needs of the local community. The median time period over which the population was estimated to be able to reach 5,000 whales was 80 years (DFO 2005a), assuming a starting population greater than 2,000 whales. However, it is now understood that reaching a population size of 5,000 cannot be achieved at current harvest levels based on the most recent population estimates (DFO 2019).

The latest population model (DFO 2019), created using survey estimates from 1990 to 2017 and reported harvests from 1960 to 2017, estimated a population of 2,884 whales in 1960 (95% CI=1,849 to 3,725) which has declined to an estimated population of 1,090 in 2018 (95% CI=617 to 1,864). Using this model, there is a 96% probability that the current harvest quota of 41 CSB will result in a continued population decline over 10 years (DFO 2019). A harvest of 0, 14, or 20 CSB per year is predicted to result in a 0%, 25%, or 50% probability of decline in the Cumberland Sound population over the next ten years (DFO 2019).

A recent study (DFO 2022) has identified 2 genetically distinct populations of Beluga in Cumberland Sound. However, further study is necessary to see if the 2 genetic populations correspond to the 2 physically distinguishable stocks described by local hunters. Beluga from the 2 populations cannot be distinguished visually during aerial abundance surveys. Spatial or temporal characteristics associated with the populations that could allow selective harvesting of the 2 populations in Cumberland Sound have also not yet been identified (DFO 2022). Based on information currently available, these 2 populations can only be assessed as a single stock.

It is recognized that an increase in CSB deaths due to other factors including Killer Whale predation, contaminants, disease, ice and tidal entrapment, net entanglement, and bycatch is possible and could change the time required to achieve a self-sustaining population, although the immediacy and severity of these threats or limiting factors, while presumed to be low, are still not fully understood (DFO 2005a).

7. Broad strategies and general approaches to meet the objective

Cumberland Sound has been identified as one of several areas of high biological importance and productivity in the Arctic, based on the presence of several species and species groups (for example, birds, fishes, seals) (Stephenson and Hartwig 2010). Bowhead Whale (*Balaena mysticetus*), which is identified as “special concern” on Schedule 1 of SARA, as well as the Narwhal (*Monodon monoceros*), Killer Whale, and Atlantic Walrus (*Odobenus rosmarus*) that

have all been assessed by COSEWIC as “special concern” are found in Cumberland Sound. In contrast to CSB, however, Bowhead Whale, Narwhal and Killer Whale overwinter in areas outside the Sound. Narwhal overwinter in coral areas in central Davis Strait, while Killer Whale migrate south each fall, away from ice covered areas. Bowhead feed on zooplankton, unlike Belugas which feed on fish and large invertebrates. Atlantic Walrus are different in that they can leave the water and may also migrate great distances in the winter. These and other differences highlight the diverse management requirements and dissimilar habitat requirements that these 4 mammal species have when compared to Belugas. For these reasons, a single species approach to recovery is most suitable for CSB. Appendix A outlines the possible effects of an increased CSB population on the environment and on species common to Cumberland Sound.

7.1 Actions already completed or currently underway

- The Pangnirtung HTA and hunters have maintained a “no hunting and harassment” zone in Clearwater Fiord and Shark Fiord (figure 2) since the mid-1980s
- A co-management plan was developed for Southeast Baffin Belugas⁵ by representative local Inuit organizations and DFO in May 1994 (Planning Committee for Co-Management of Southeast Baffin Beluga, 1994). The plan contained recommendations related to harvesting practices and quotas, the integration of Inuit and scientific information and concerns, filling knowledge gaps, establishing zoning systems to guide land - and water -use activities, and promoting education and public awareness. It was recommended that a special standing committee be created to oversee implementation of the plan. A local knowledge study of Southeast Baffin Belugas was published in 1998 (Kilabuk 1998). This report included local knowledge provided by Pangnirtung hunters on seasonal changes in distribution, movements, and behaviour of Belugas
- Genetic analyses of Beluga Whale populations in Nunavut showed that Pangnirtung samples differed from Kimmirut using both haplotypes and microsatellites, while Iqaluit samples had intermediate genetic characteristics between Pangnirtung and Kimmirut (de March et al. 2002)
- Genetic and contaminants profiles and satellite tracking data collected since the late 1980s have shown that most Belugas hunted in Cumberland Sound are distinct from those hunted near Iqaluit and Kimmirut (de March et al. 2002; Richard 2010). Consequently, in 2004 the Southeast Baffin Beluga population was separated into the CSB population in Cumberland Sound, and the remaining whales in Iqaluit and Kimmirut were added to the Western Hudson’s Bay population
- Twenty Belugas were tagged with satellite-linked time-depth recorders/transmitters from 1998 to 1999 and from 2007 to 2008 to track their movements, habitat use, and diving habits. Transmitters gave their positions from late August or early September until November to May, depending on the tag. All of the whales remained in Cumberland Sound during their period of transmission suggesting that they all winter in Cumberland Sound. Unfortunately, due to tag failure, no year round movements were obtained for any tagged Belugas and confirmation of annual habitation within Cumberland Sound was not verified (Richard and Stewart 2008; Richard 2010)
- A 2014 survey showed a lower number of CSB (1,151) than previous surveys (Marcoux et al. 2016). An aerial survey conducted in the summer of 2017 resulted in an estimate of 1,381 Belugas (DFO 2019)

⁵ The Southeast Baffin Belugas included CSB before the reassessment into 2 designatable units in 2004.

- A new model using population estimates from 1990 to 2017 and reporting annual harvests from 1960 to 2017 estimated a population of 2,884 whales in 1960 (95% CI=1,849 to 3,725) which declined to 1,090 whales in 2018 (95% CI=617 to 1,864) (DFO 2019);
- A photographic field program in Clearwater Fiord to identify individual whales as well as census the number of females with calves was completed using drones in the summer of 2019
- Since the Pangnirtung HTA approved the 2002 NWMB/DFO quota of 41 CSB, co-management partners have continued work toward community-based management of a sustainable harvest. A Cumberland Sound Beluga Working Group was re-convened in 2019 to advance the development of a FM management plan to achieve a sustainable Beluga harvest that is compatible with the recovery of the species. The Working Group is comprised of co-management partners, including the Pangnirtung HTA and elders, Qikiqtaaluk Wildlife Board (QWB), Nunavut Tunngavik Incorporation (NTI) and Nunavut Wildlife Management Board (NWMB), and DFO representatives
- DFO has implemented the NWMB decision to not allow the use of gillnets in the commercial Turbot fishery in Cumberland Sound, to minimize the risk of entanglement of non-directed species, including CSB

7.2 Strategic direction for recovery

Strategic approaches proposed to address the identified threats and to guide appropriate research and management activities to meet the population and distribution objective are discussed under the broad headings of:

1. management activities
2. research
3. monitoring and assessment
4. stewardship and outreach

Specifically, these 4 approaches will:

- manage the subsistence harvest on a sustainable basis and establish guidelines for these activities as needed
- conduct research on the CSB population by studying its biology, ecology, and environment
- continue to identify, monitor, assess, and protect CSB habitat in Cumberland Sound and monitor human activities to assess ongoing and newly emerging threats, and communicate the need for and the content of this recovery strategy to promote understanding and support within the community, Nunavut, and elsewhere (table 3)

Each strategy has been designed to address information deficiencies that might otherwise inhibit species conservation; to assess, mitigate or eliminate specific threats to the species; or to contribute to species' recovery. These strategies are summarized by approach in table 3, which lists them in order of priority, and will be further described and developed in a species at risk action plan.

Table 3. Recovery planning table for the Cumberland Sound Beluga (CSB).

Activity	Broad strategy	Threat or knowledge gap addressed	Priority ⁶	General description of research and management approaches
1	Management activities	Subsistence harvest	High	<ul style="list-style-type: none"> • Develop a Fisheries Management (FM) management plan to manage the harvest on a sustainable basis and establish guidelines for these activities • The Cumberland Sound Beluga Working Group (CSB-WG) comprising co-management partners meets at least 3 times a year to develop a FM management plan for the recovery and management of CSB. The FM management plan will be based on local knowledge and science • The CSB-WG will establish goals, principles and objectives for the FM management plan, as well as review and enhance the present harvest-based monitoring program, and identify harvest monitoring indicators (that is, number of Beluga struck and landed, and struck and lost, during hunts) • Increase awareness and education on safe hunting techniques via support for community-led harvest training initiatives
2	Research	Refine population abundance estimates	High	<ul style="list-style-type: none"> • Update and improve estimation of population size using standardized survey techniques • Investigate the use of new methods to estimate population abundance • Continue population modeling and risk analysis. • Document hunter observations • Continue research on genetic diversity and stock discrimination, including continued research on the 2 genetic populations identified and whether they correspond to the 2 visually distinct populations identified by local harvesters
3	Research	Incomplete biological knowledge	High	<ul style="list-style-type: none"> • Conduct studies on foraging dynamics • Conduct satellite tagging • Collect tissue samples from hunters and analyse to determine key life history parameters • Document hunter observations and use hunter collected samples

⁶ High, medium, and low are equivalent to urgent, necessary and beneficial (respectively).

4	Monitoring and assessment	Habitat use	High	<ul style="list-style-type: none"> Identify and refine the location of important winter and spring habitats Develop an understanding of why certain areas are important for CSB, and establish appropriate protective measures for each area of the sound as required
5	Monitoring and assessment	Environmental/natural threats	Medium	<ul style="list-style-type: none"> Continue to monitor and assess all potential environmental threats (for example, effects of climate change, Killer Whales)
6	Monitoring and assessment	Human induced threats	Low	<ul style="list-style-type: none"> Continue to investigate and assess all potential threats resulting from human activities (for example, noise) and implement guidelines as appropriate Continue research on effects of heavy metals and halogenated organic contaminants on CSB health Mitigate potential threats from local pollution as needed Assess and mitigate potential threats from exploratory and commercial fisheries (for example, fishing gear entanglements)
7	Stewardship and outreach	Public understanding of recovery strategy	High	<ul style="list-style-type: none"> Produce communication, education and outreach materials about the recovery strategy and CSB Develop and implement communication programs by the community of Pangnirtung and Fisheries and Oceans Canada Continue ongoing communication with local hunters through the CSB-WG, development of the FM management plan, and maintain subsequent updates through a communications plan

7.3 Narrative to support the recovery planning table

Management activities (activity 1): New or revised management actions are necessary to protect CSB and their habitat, and support their recovery. Such actions will assist in reducing or eliminating identified threats.

In 2019, co-management partners met in Pangnirtung to review the 2019 Science Advisory Report (DFO 2019). Hearing the results of the 2017 survey which showed a declining population, it was agreed upon by all participants that CSB are a priority and that the Cumberland Sound Beluga Working Group would be re-convened to address the management of CSB in relation to conservation, recovery and sustainable harvest. The working group has met 8 times from 2019 to March 2021 in a mixture of in-person meetings and conference calls due to the COVID-19 pandemic. The next step of recovery planning will be the development of an action plan which should include the development and implementation of a FM management plan, including any changes to harvesting methods or levels (quota). The action plan and FM management plan will be developed collaboratively with co-management partners. Engagement and support from the community are required for successful development and implementation of the FM management plan.

The existing quota was established in 2002 and the no harvesting zone was established by the Hunters and Trappers Association (HTA) for Clearwater and Shark fiords in 1985 in their bylaws. Increased education of hunters on the importance of reporting numbers of struck and lost whales, as well as the total number harvested, is required as this information assists in calculating accurate harvest mortality, population estimates and to understand population trends. Population modeling and risk analysis have been undertaken, but these are needed on an ongoing basis to estimate the probability of and rate of recovery of the population at various harvest levels. Monitoring of CSB health can, in part, be attained through the ongoing development of and participation in a community monitoring plan to collect tissue samples from annual harvests and share genetic analysis results with the community. Tissue samples are useful in providing the genetic material required to help resolve the issue of whether or not there is more than 1 stock of Belugas in Cumberland Sound.

Research (activity 2 to 3): Knowledge must form the basis of any recovery efforts for CSB. Currently, some information on CSB is speculative and relies on limited or inferred information from other populations. Information gaps exist regarding basic life history, population structure, abundance, genetic diversity, seasonal distribution, and habitat requirements. These questions need to be addressed to refine the recovery strategy and ensure that the population is adequately protected.

Monitoring and assessment (activity 3 to 6): Once baseline information has been collected, regular monitoring will be necessary to determine changes in CSB distribution and abundance, as well as to describe the availability of critical habitat once completely identified. Ongoing monitoring of population size and status using both science and local methods is needed to measure the rate of population recovery over time, to update population models, and to ensure that appropriate harvest management and conservation strategies are in place. Aerial surveys provide a quantitative measure of population trend, while Inuit observations provide a more qualitative measure of population size, growth, and CSB demographics. Continued use of both scientific and hunter collected information will be needed to refine knowledge of Beluga biology and general life history in Cumberland Sound. The Pangnirtung HTA has indicated a need for

additional tracking studies, not limited to, but especially during the winter months, to aid in the identification of important habitats and movement of Belugas, possibly out of Cumberland Sound to other areas, at various times of the year.

Identification of all important and critical habitat for CSB is a necessary component of recovery planning. While some critical habitat has been identified, most habitat identified so far provides only seasonal use. Why CSB return to specific areas annually has not yet been determined except in the broadest sense (for example, ice free area in winter, freshwater input). More research is needed on habitat use and foraging behaviour and at times of year when, and in areas where, it is often difficult to observe Belugas. Overall, habitat does not appear to be limiting for CSB.

Some limiting factors that may affect the recovery of CSB are environmental and/or more globally based (for example, climate change and disease) and, therefore largely cannot be directly controlled. However, changes observed in the environment can be noted and reported and may help with the recovery planning and monitoring of CSB. Potential threats are the result of human activities and many can be monitored and managed (for example, noise and disturbance, commercial fisheries, and subsistence harvest).

The collection of local observations and knowledge can identify human activities and environmental changes that are taking place in the waters of Cumberland Sound. These observations will aid in developing a better understanding of the probable results of those changes on CSB and to the ecosystem in which they live. Licensing of new exploratory, open water marine fisheries in Cumberland Sound should be assessed in light of CSB recovery. Spills and dumping of garbage and ballast/bilge water and oil can be dealt with under existing legislation. Consideration of new tourism activities which could intrude on important CSB habitat during certain times of the year also need to be carefully assessed prior to approval.

Stewardship and outreach (activity 7): Public education is essential through stewardship and outreach to gain acceptance of, and compliance with, the overall objective of the recovery strategy. Public support can be gained through increased awareness of this recovery strategy and involvement in stewardship programs.

The success of recovery and management actions depends on the continued involvement and support of Pangnirtung residents which, in turn, depends on their understanding of the threats to the recovery of the CSB, as well as the actions being taken to help the population recover. The Recovery Team recognizes the need for a communications program that will help to educate and inform the residents of Pangnirtung about the biology of CSB, the need to monitor potential threats and environmental conditions, and the need to support and participate in specific recovery and management actions intended to aid recovery, as well as communicating all progress made towards CSB recovery. The Cumberland Sound Beluga Working Group will also develop and implement a communications plan to ensure the community is informed on issues and plan development related to recovery, sustainable use, and management of CSB and their habitat.

7.3.1 Additional information needed about the species

Additional information is needed on CSB to accurately identify recovery objectives and activities for this population. This information includes:

- their population growth rate (for example, senescence, longevity, survival of age classes) and trends

- their reproductive growth rate (age of first reproduction, inter-birth interval, nursing duration) and trends
- their seasonal cycle of feeding activities and relationship to lifetime body growth rate and reproduction
- the level of threat that Killer Whales pose to this population
- how often ice or tidal entrapments occur in Cumberland Sound and the possible effect of climate change on the frequency of these events
- overall health trends over time: if, how, and to what extent contaminants, pollution, disease, noise and disturbance, and commercial fisheries affect the population

The preamble to SARA includes the statement that “The Traditional Knowledge of the Aboriginal peoples of Canada should be considered in the assessment of which species may be at risk and in developing and implementing recovery measures.” To help in achieving success of recovery goals and plans, efforts to include Inuit Qaujimagatuqangit should continue and should be drawn from the Pangnirtung HTA through supported and meaningful engagement and consultation throughout the recovery process. The Pangnirtung HTA has recently stated that much of the local knowledge available, for example, Kilabuk (1998), is now very outdated due to changes in the climate and predators like Killer Whale, which in turn affect how Beluga now behave and move within Cumberland Sound. It will be up to the HTA to collect this information and ensure the knowledge learned can provide useful guidance in all elements of the recovery process. The HTA is encouraged to utilize programs such as the SARA managed Aboriginal Fund for Species at Risk program and similar funding sources to help collect and apply this information.

8. Critical habitat

8.1 Identification of the species’ critical habitat

Critical habitat is defined in SARA as:

“...the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species’ critical habitat in a recovery strategy or in an action plan for the species.” [subsection 2(1)]

SARA defines habitat for aquatic species at risk as:

“... spawning grounds and nursery, rearing, food supply, migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced.” [subsection 2(1)]

Under SARA, critical habitat must be legally protected within 180 days after the recovery strategy or action plan that identified the critical habitat is included in the Species at Risk Public Registry. It is anticipated that the critical habitat identified in this recovery strategy will be protected by a Critical Habitat Order made by the Minister of Fisheries and Oceans, which will trigger the prohibition in section 58(1) against the destruction of any part of the critical habitat. For CSB, critical habitat is identified to the extent possible using the best available information. It is believed that the areas identified as critical habitat provide the functions, features, and attributes necessary to support the species’ life cycle processes and to achieve the species’ population and distribution objective.

The entire area inhabited by the CSB is relatively small (9,000 km²) (COSEWIC 2004). However, because CSB numbers are considered to have once been much larger than the present numbers and because few physical changes or marine industrial developments have taken place within the Sound, it is unlikely that habitat availability would, in the short term, limit recovery. No scientific information is available to demonstrate a reduction in range (DFO 2005b) or habitat loss (Richard 1991) and, based on local knowledge, the range of the population does not appear to have changed from its recent historical range, at least since the 1950s (DFO 2005b). The schedule of studies in section 8.2 outlines the activities required to further refine the identification of the critical habitat that is necessary to achieve the population and distribution objective.

CSB do not have a known dwelling place similar to a den or nest that is occupied or habitually occupied by 1 or more individuals during all or part of their life cycles; hence, the concept of “residence” as defined in SARA does not apply.

8.1.1 General description of the species’ critical habitat

Based on available information, 3 areas of critical habitat are identifiable at this time; all are used by CSB only seasonally. Clearwater Fiord is the only known calving area for this population (Kilabuk 1998). The area is used for beach rubbing/moulting, primarily near the mouth of the Ranger River. More work needs to be done to identify the physical traits of beaches used for rubbing and whether or not some areas are preferred over others. Almost all members of the population can be found within Clearwater Fiord in July and August. This area also serves as a predator refugia and a probable resting and socializing area.

A large area of varied habitats with complex shorelines exists on the western side of the Sound and is used by CSB as the population migrates between Clearwater Fiord and the polynya area near the mouth of the Sound. The access to deeper water and the varied coastline should provide habitats for, and access to, suitable prey sources. The complex coastline of islands and bays on the western shore may also serve as a possible refuge from Killer Whales. That CSB sometimes are trapped by ice or low tide in the bays of this area illustrates how much even the nearshore areas are used. The only certainty is that belugas use this area every year, so there are some features here that attract them and keep them in this area even when other open water areas are available.

The polynya/pack ice area near the mouth of Cumberland Sound is used every winter by all members of the population, as it provides the only area of open water throughout the winter. Local knowledge suggests that this is the mating area of CSB (Kilabuk 1998). It may also be the primary feeding and foraging area for the population. Belugas spend more time in this single area than elsewhere and it is known that Belugas are fatter in the spring than in the fall (Stewart et al. 1995), although this may, in part, be due to a lack of long distance movement during this time. Therefore, while difficult to determine with existing data, it appears that the polynya is a critical habitat, not only for overwintering, but also for feeding.

There are 2 other areas near the north end of Cumberland Sound that harbour aggregations of CSB for short periods of time (approximately June to July) seem to act primarily as staging areas prior to movement to regularly used habitat, may be critical habitats (DFO 2009), but at this time the areas are poorly defined. Not enough information is known about their features, functions, or attributes to identify them as critical habitat, and it may be that CSB spend time in these areas simply because they are waiting for ice to melt prior to entering preferred areas.

Further research is required to improve understanding of the temporal and spatial use of these areas to more clearly establish their importance for this Beluga population.

8.1.2 Information and methods used to identify critical habitat

Critical habitat has been identified based on a high level of occurrence of the species within the boundaries identified in section 8.1.3. The identified areas contain the biophysical features and attributes, as well as the functions they support, described in table 4, that are necessary for the species' survival and recovery. There is currently insufficient information to quantify the levels of many of the attributes listed in table 4 that are required to support the features and functions of critical habitat. For example, the density, quantity, quality, and kind of forage needed to support CSB is unknown. The descriptions of the attributes in table 4 will be refined in the future, as additional information becomes available.

Critical habitat was identified using local Inuit observations about locations of congregations of CSB and timing of movements (for example, Kilabuk 1998) and the results of scientific studies, including satellite linked tracking and aerial surveys (for example, DFO 2009). With exceptions, Inuit observations are often opportunistic and are limited to only a few specific areas, and usually only during the same season of each year. Similarly, aerial surveys have typically been restricted to July and August, even if over a large portion of the Sound. Satellite tracking has been based on a small number of tagged whales over only a short period, therefore making the identification of critical habitat difficult. Identification of critical habitat was also facilitated by identifying processes, features, and attributes that CSB are known to seek out to carry out their life processes (for example, sufficient quality and quantity of forage fish species and invertebrates which comprise CSB diet). These habitats can shift and are seasonal so that CSB must move around to take advantage of them.

8.1.3 Identification of critical habitat: geographic and biophysical information

Geographic information

There are 3 critical habitat areas have been identified (figure 5) and are geographically delineated below. Depending on annual variations in climate, there is some variation in the length and extent of use of these areas. Specifically, these areas are:

1) Clearwater Fiord from, typically, late July to September is a nursery and moulting area on rubbing beaches and possible calving area. This is the only known freshwater estuary used by CSB on the entire southeast Baffin coast and, therefore, it exhibits very distinctive features such as substrates suitable for beach rubbing/moulting and a large freshwater input (Ranger River). CSB are generally thinner when they leave Clearwater Bay, as opposed to when they enter (Kilabuk 1998), strongly suggesting that this is not an important feeding area. Clearwater Fiord can be demarcated as that area north of a line extending from 67°15'33"W to 66°29'18"N east to 67°09'44"W to 66°29'12"N

2) The west side of Cumberland Sound is occupied from late September to November and again in May through June. This large area is used primarily for feeding and a migration route for travelling between Clearwater Fiord and the wintering areas of the polynya, but may also be an important refuge from possible Killer Whale predation due to the irregular shoreline and numerous islands. Therefore, while this area is identified as critical habitat, it requires more refinement to properly describe its features and function. It is defined by a line running from

67°15'52"W to 65°38'40"N, east to 66°44'W to 65°38'40"N, south east to 65°31'23"W to 64°53'40"N, and then west to the mainland at 65°54'53"W to 64°53'40"N

3) The polynya surrounded by pack ice areas that occurs off the southeastern tip of the Cumberland Peninsula is used by CSB from November to April (overwintering area). This polynya occurs annually in the same general area, but its location and size is not static depending on winds, ocean currents, and winter severity. CSB utilize this area only during the winter months and leave this area with more body fat than when they enter, suggesting the high quality and abundance of forage in this area. This area can be roughly defined as beginning at a point at 64°54'28"W to 65°20'30"N, running west to 65°40'00"W to 65°20'30"N, southeast to 64°15'00"W to 64°40'00"N, east to 63°20'00"W to 64°40'00"N and then north to 63°28'38"W to 64°58'52"N

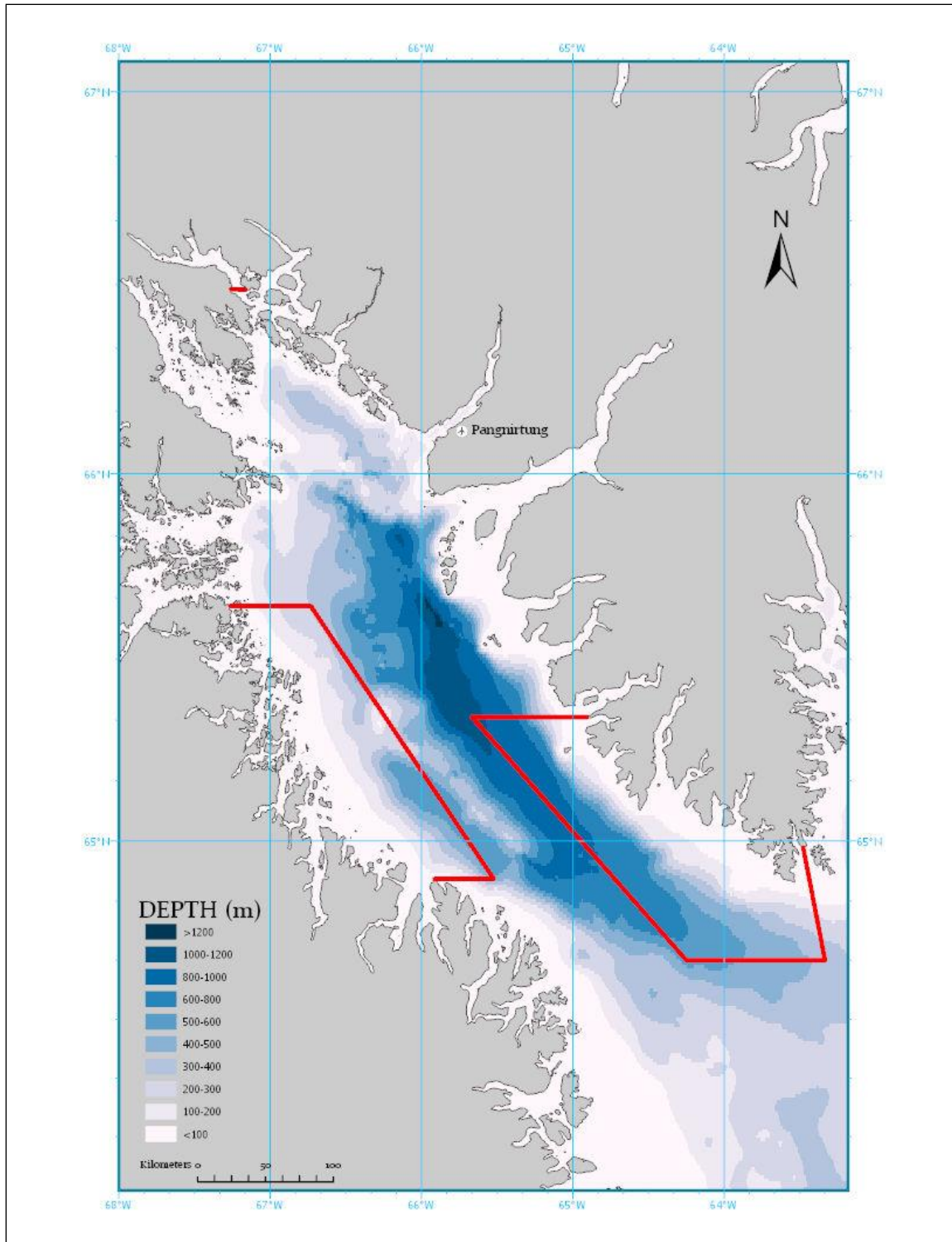


Figure 5. Critical habitat identified for Beluga Whales within Cumberland Sound. See text for description of areas. Bathymetric data from International Bathymetric Chart of the Arctic Ocean (IBCAO) (2012).

Biophysical functions, features and attributes

The areas identified as critical habitat (figure 5) are those that the Recovery Team and DFO consider to be of high quality or potential high quality for the species, and constitute the habitat requirements deemed necessary for species' survival and recovery. These areas are used for calving, nursing, beach rubbing, moulting, feeding and foraging, socializing, reproduction, resting, predator refugia, migration, and over-wintering, and all areas are used only seasonally.

Seasonal distribution and movement patterns of CSB seem to be strongly associated with the availability of their preferred prey, primarily Arctic Cod, but also Greenland Halibut and Capelin. Habitats that are important for the survival or recovery of CSB appear to be those that provide for profitable foraging on these key prey species, including the acoustic and physical space required to successfully pursue and capture prey. This is probably important in the polynya area, where some believe that the selection of overwintering areas has as much to do with bathymetric features that attract prey and forage as the extent of ice cover (Hauser et al. 2018). Hunters state that CSB leave the polynya area fatter than they are at any other time of the year, which seems to attest to the abundance of forage in the area (Kilabuk 1998).

An activity that is strictly associated with a particular geographic location is beach rubbing which is associated with moulting by CSB, which only takes place within Clearwater Fiord. Whether or not the sites where rubbing takes place are specific in nature, such as in the confluence of the Ranger River, or whether CSB can use all areas of the fiord for beach rubbing is currently unknown. Further study is required to observe CSB during this period and document where this activity is taking place, and to further refine the description of attributes of these beaches.

Table 4 summarizes the best available knowledge of the functions, features, and attributes for each life stage within the 3 areas identified above and in figure 5 (refer to section 4.3 "Needs of the species" for further details). Note that not all attributes in table 4 must be present in order for a feature to be identified as critical habitat. If a single feature as described in table 4 is present and capable of supporting the associated function(s), that feature is considered critical habitat for the species. The descriptions of the attributes in table 4 will be refined in the future as additional information becomes available.

There is currently insufficient information to quantify the levels of many of the attributes listed in table 4 that support the features and functions of critical habitat. For example, the size range of substrates and exact locations of rubbing beaches in Clearwater Fiord are unknown. Additionally, although it is assumed that either Arctic Cod or Greenland Halibut remain the primary prey species of CSB, the majority of CSB stomach samples have been collected during spring or summer when the Inuit harvest occurs; therefore, their year round diet is not well understood. Thus, it is possible that other, perhaps seasonally important, prey species may be identified in the future. Broad studies on identifying additional habitats that are important to CSB and to better understand threats to critical habitat are included in section 8.2.

Appendix D illustrates monthly home range locations from September 2008 to May 2009 of CSB, as obtained from studies of 20 CSB tagged between 1998 to 1999 and 2007 to 2008 (P. Richard, DFO, unpub. data) and shows the seasonal use of these areas. These results remain preliminary, as some monthly maps are based on only 1 tagged CSB and the time/location intervals plotted vary.

Table 4. Summary of the biophysical functions, features, and attributes of critical habitat necessary for the survival or recovery of all life stages of Cumberland Sound Beluga (CSB).

Function ⁷	Feature(s) ⁸	Attribute(s) ⁹
Feeding and foraging Calving, nursing Overwintering Predator refugia	Availability of sufficient forage species Physical space Acoustic environment Water quality	Sufficient quality and quantity of all fish species and invertebrates, including Arctic Cod, Greenland Halibut and Capelin, to provide for profitable foraging that comprise part of CSB diet. Unimpeded physical space and natural conditions surrounding individual whales which allow for normal behaviours. As an indication only: avoid activities that bring vessels closer than 100 m to Beluga Whales as per <i>Marine Mammal Regulations</i> (schedule VI, item 1). Anthropogenic noise levels that are sufficiently low so as to not result in loss of habitat availability by interfering with social signalling, communication, ability to detect predators or ability to echolocate prey. As an indication only: <120 dB continuous sound <160 dB pulse sound. Water quality of a sufficient level so as not to result in loss of function. As an indication only: water quality of sufficient level to support those fish species that are part of CSB diet.
Reproduction Socializing Resting Migration	Physical space Acoustic environment	Unimpeded physical space and natural conditions surrounding individual whales which allow for normal behaviours. As an indication only: avoid activity that brings vessels closer than 100 m to Beluga Whales as per <i>Marine Mammal Regulations</i> (schedule VI, item 1). Anthropogenic noise levels that are sufficiently low so as to not result in loss of habitat availability by interfering with social signalling, communication, ability to detect predators or ability to echolocate prey. As an indication only: <120 dB continuous sound <160 dB pulse sound.

⁷ Function: A life cycle process of the listed species taking place in critical habitat (for example, spawning, nursery, rearing, feeding, and migration).

⁸ Feature: Features describe the essential structural component that provide the requisite function(s) to meet the species' needs. Features may change over time and are usually composed of more than 1 part, or attribute. A change or disruption to the feature or any of its attributes may affect the function and its ability to meet the biological needs of the species.

⁹ Attribute: Attributes are measurable properties or characteristics of a feature. Attributes describe how the identified features support the identified functions necessary for the species' life processes.

Function ⁷	Feature(s) ⁸	Attribute(s) ⁹
Beach rubbing/ moulting	Rubbing beach	Physical habitat of proper size with rocks/gravel substrate for rubbing.
Socializing	Acoustic environment	Anthropogenic noise levels that are sufficiently low so as to not result in loss of habitat availability by interfering with social signalling, communication, ability to detect predators or ability to echolocate prey. As an indication only: <120 dB continuous sound <160 dB pulse sound.

8.2 Schedule of studies to identify critical habitat

To clearly establish the biological functions, features, and attributes of the habitats used seasonally by CSB would require considerable research investment in several areas (table 5). Such studies would likely require a decade or more to complete (Richard and Stewart 2008) and require significant community collaboration for identifying suitable scientific methods to address these questions.

Table 5. Schedule of Studies to further define critical habitat for the Cumberland Sound Beluga (CSB).

Description of activity	Rationale	Timeline
Study feeding ecology, including body condition, stable isotopes and fatty acid analysis of CSB and their prey, with biopsy samples and stomach analysis at different places and times of the year	Determines seasonal feeding patterns and periods when greatest energy (fat) storage occurs	Ongoing
Use satellite telemetry to delineate foraging activity, overwintering locations, track migratory movements and overall areas of high seasonal occurrence	Determines seasonal feeding patterns by location and depth to understand types and accessibility to prey to refine identification of feeding and overwintering location(s) as well as important migratory corridors and timing of use	2021 to 2030
Undertake extensive fish and macro-invertebrate studies of Cumberland Sound	Determines seasonal and spatial distribution of key CSB prey which may suggest why specific areas are being used seasonally, and identify areas of possible competition with existing or developing commercial fisheries	2021 to 2030
Undertake studies to identify rubbing beach locations and describe substrates and freshwater input in area	Determines critical habitat of rubbing beaches as well as distribution of these locations in Clearwater Fiord	2021 to 2030
Document ice and tidal entrapment events and correlate them to environmental predictors	Determines late autumn use of some areas and provides data for recovery models	Ongoing

8.3 Examples of activities likely to result in the destruction of critical habitat

Under SARA, critical habitat must be legally protected within 180 days of being identified in a final recovery strategy or action plan. For CSB critical habitat, it is anticipated that this will be accomplished through a SARA Critical Habitat Order made under subsections 58(4) and (5), which will invoke the prohibition in subsection 58(1) against the destruction of any part of the identified critical habitat.

Environment and Climate Change Canada (2016) describes destruction of critical habitat in the following manner:

Destruction of critical habitat would result if any part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from single or multiple activities at 1 point in time or from cumulative effects of 1 or more activities over time.

The list of activities is neither exhaustive nor exclusive and has been guided by the threats described in section 5 of this recovery strategy based on known human activities likely to occur in and around critical habitat of the species. The absence of a specific human activity at this time does not preclude or restrict the Department's ability to regulate that activity under SARA. Furthermore, the inclusion of an activity does not result in its automatic prohibition and does not mean the activity will inevitably result in destruction of critical habitat. Every proposed activity must be assessed on a case by case basis and site specific mitigation will be applied where it is reliable and available. Where information is available, thresholds or limits have been identified for critical habitat attributes to better inform management and regulatory decision making. In many cases, knowledge of the population and the thresholds of tolerance of its critical habitat to disturbance from human activities is lacking and must be acquired. In the case of physical space, as an example, the 100 m buffer identified in the *Marine Mammal Regulations* (schedule VI, item 1) for any unspecified whale, dolphin, or porpoise should be used as an interim minimum vessel approach distance for fishers and tourists which may still allow for the continuation of normal Beluga behaviour without disturbance. The approach distances in the *Marine Mammal Regulations* do not affect Inuit hunting and fishing rights, so this guideline does not affect the harvesting of CSB.

There are activities that could affect the use or function of areas of critical habitat (table 6). Some activities may impact critical habitat, whether or not whales are present in the area while some activities may impact critical habitat only when CSB are present. Activities affecting critical habitat have been identified as the following:

- vessel approach, anchoring in vicinity of rubbing beaches, activities that prevent approach of whales to rubbing beaches, that displace or disrupt rubbing behaviour or activities that displace whales from over-wintering area, short-term disturbances resulting from noise and the physical presence of boats (fishing or tourist) can disrupt or prevent whales from completing essential life processes by masking echolocation and communication (Lien 2001) and physically keep CSB out of preferred areas. Possible future increased commercial fishing or unregulated tourism activity, as opposed to the current infrequent, local boater, in part made possible by improved harbour facilities at Pangnirtung, could increase the amount of boat traffic in Cumberland Sound. An increase in both the amount and seasonal duration of the level of noise and physical disturbance, can affect the use of critical habitat by CSB
- digging, drilling, or earth removal in Clearwater Fiord or other shore based activities could alter freshwater input or change the nearshore habitats and substrates enough to cause CSB to move their beach rubbing activities elsewhere or be unable to complete them. Such activities could introduce silt into the water and restrict visibility, and cover or remove important areas which might directly affect CSB (for example, rubbing beaches) or prey. This could be particularly harmful in Clearwater Fiord, especially in the area of the Ranger River, where freshwater input may assist the moulting process

- while seismic activities are not a primary issue at this time, any seismic surveys, primarily due to their duration in an area and the volumes generated (for example, Richardson et al. 1995), could keep CSB away from their critical habitat and possibly cause hearing damage. Even proposed seismic surveys outside Cumberland Sound could potentially affect CSB activities, depending on duration and timing
- sewage treatment plant activities, dumping at sea of deleterious substances and contaminants pose a threat to CSB as discussed in section 5.1. While pollution from residential sources is minimal due to a small population, industrial and long range deposition of contaminants are a much greater concern. As high trophic level, long lived animals, with a very limited area of occupancy, CSB are particularly vulnerable to persistent bio-accumulating toxins that settle in their fatty tissues as they feed on contaminated prey. The introduction of additional contaminants is, therefore, a threat to CSB critical habitat
- the threat of an oil spill or introduction of other toxic material (from drilling activities or ocean dumping, possibly through accidents) within the areas of critical habitat pose a risk to the health of CSB and also have the potential to make their critical habitat uninhabitable for an extended period of time

It is important to note that the possibility of any particular activity (or cumulative effects from any activities) resulting in the permanent or temporary degradation of critical habitat depends on the nature of the activity, geographic extent, seasonal timing, duration, intensity, and adequacy of appropriate mitigation measures. As an example, it is believed that some activities, such as a seismic program, could take place in the polynya region of the northeastern Sound during the summer months without affecting CSB or their use of this area during the winter. There are mitigation measures and best management practices that can often be used in association with some of the activities described above, which, if implemented properly, would allow for activities to occur without destroying or preventing CSB from using critical habitat.

Table 6. Examples of activities likely to result in the destruction of critical habitat of the Cumberland Sound Beluga (CSB).

Threat	Activity	Effect pathway	Function ¹⁰ affected	Feature ¹¹ affected	Attribute ¹² affected
Acoustic and physical disturbance	Vessel traffic (for example, from fishing or tourism activity)	Noise resulting in masking of communication and echolocation	Feeding and foraging	Acoustic environment	Anthropogenic noise levels that are sufficiently low so as not to result in loss of habitat availability by interfering with social signaling, communication, ability to detect predators or ability to echolocate prey (As an indication only: <120 dB continuous sound <160 dB pulse sound) Physical habitat of proper size and within freshwater influence to allow for beach rubbing behaviour
	Seismic surveys		Beach rubbing, calving, nursing	Rubbing beach	
	Shore based activities that could alter freshwater input or nearshore habitat and substrates such as by digging, drilling, or earth removal	Noise or physical disturbance resulting in disruption of behaviour or displacement from preferred habitat (for example, foraging areas, overwintering habitat)	Overwintering	Physical space	
	Activities that result in alteration of rubbing beaches through siltation		Predator refugia		
	Vessel approach distance (< 100 m)		Moulting		
	Vessel anchoring in vicinity of or landing on rubbing beaches	Geophysical disturbance resulting in loss of function	Reproduction, socializing, resting		
	Activities that prevent approach of whales to rubbing beaches, that displace or disrupt rubbing behaviour or activities that displace whales from overwintering areas		Migration		

¹⁰ Function: A life-cycle process of the listed species taking place in critical habitat (for example, spawning, nursery, rearing, feeding and migration).

¹¹ Feature: A feature describes the essential structural component that provides the requisite function(s) to meet the species' needs. Features may change over time and are usually comprised of more than 1 part, or attribute. A change or disruption to the feature or any of its attributes may affect the function and its ability to meet the biological needs of the species. Not all features will have the proper attributes to function as habitat.

¹² Attribute: Attributes are measurable properties or characteristics of a feature. Attributes describe how the identified features support the identified functions necessary for the species' life processes.

Threat	Activity	Effect pathway	Function ¹⁰ affected	Feature ¹¹ affected	Attribute ¹² affected
					Unimpeded physical space and natural conditions surrounding individual whales which allow for normal behaviours (that is, ≥ 100 m as required by the <i>Marine Mammal Regulations</i> (schedule VI, item 1) under the <i>Fisheries Act</i>)
Pollution and contaminants	Point and non-point source pollution (noise pollution, sewage treatment plant activities and dumping at sea) Release of deleterious substances	Loss of water quality Loss of, or reduction in, forage/prey quality or quantity	Feeding and foraging Reproduction, socializing, resting	Water quality Availability of sufficient forage species	Water of sufficient quality to support forage or prey which comprise CSB diet

9. Measuring progress

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objective. Specific progress towards implementing the recovery strategy will be measured against actions outlined in subsequent action plans.

Every 5 years, the success of the recovery strategy implementation will be measured against the following performance indicators:

- increase in the number of CSB
- increase in the identification, description, location, and protection of critical habitat (until such time as it is believed that all critical habitat has been identified)
- assessment of biological characteristics indicating good overall health of CSB (for example, body growth, reproductive health, lack of disease)
- a sustainable subsistence harvest which provides data for managing and monitoring stock recovery (for example, number of whales landed, number of whales struck and lost, biological samples or data on the harvest, observations of ice or tidal entrapments)
- all existing, new, or emerging human threats and natural, limiting factors identified during the 5 year period are monitored, their overall effects on the population are determined and, where possible, mitigated to lessen their effect on CSB

10. Activities permitted by the recovery strategy

Subsection 83(4) of SARA allows for certain activities to be exempt from the general prohibitions of SARA, provided the activities are permitted in recovery strategies, action plans or management plans and the person is also authorised under an Act of Parliament to engage in that activity. Subsection 83(4) can be used as an exemption, to allow activities which have been determined to not jeopardize the survival or recovery of the species.

An ongoing winter commercial fishery for Greenland Halibut using long-lines has taken place in Cumberland Sound since 1986 (usually January to May) when the ice is safe for travel (DFO 2008b). In some years, the harvest in the winter fishery has declined due to poor ice conditions and reduced fishing effort (DFO 2008a). An open water summer fishery (July to September) for Greenland Halibut, primarily to attempt to take the balance of the winter quota, takes place only infrequently using long-lines (DFO 2008a).

Long-line gear poses a low risk of entanglement or bycatch for Beluga (DFO 2008a) and the summer and winter Greenland Halibut fishery using long-lines is permitted by this recovery strategy and will continue to be authorized under section 7 of the *Fisheries Act*. Gill nets, which pose a greater risk of entanglement to Beluga, are not permitted by this recovery strategy and will not be authorized under the *Fisheries Act* (DFO 2008a).

11. Statement on action plans

SARA's approach to recovery planning is a 2 part approach, the first part being the recovery strategy and the second part being the action plan. An action plan contains specific recovery measures or activities required to meet the objective outlined in this recovery strategy.

An action plan relating to this recovery strategy will be produced within 5 years of the final recovery strategy being posted on the SARA Public Registry.

References

- Alvarez-Flores, C. M. 2005. Risk assessment of the hunt of belugas, *Delphinapterus leucas*, in Cumberland Sound. A report submitted to the Arctic Research Division of Fisheries and Oceans Canada contract F2402-040175. 24 p.
- Béland P., A. Faucher and P. Corbeil. 1990. [Observations on the birth of a beluga whale \(*Delphinapterus leucas*\) in the St. Lawrence estuary, Quebec, Canada](#). Can. J. Zool. 68: 1327-1329.
- Brodie, P.F. 1970. Life history of the white whale, *Delphinapterus leucas* (Pallas), in the waters of Baffin Island, Canada. Ph.D. Thesis, Dalhousie University, Halifax, N.S. vii + 127 p.
- Brodie, P.F. 1971. A reconsideration of aspects of growth, reproduction, and behaviour of the white whale (*Delphinapterus leucas*), with reference to the Cumberland Sound, Baffin Island, population. Journal of the Fisheries Research Board of Canada 28:1309-1318.
- Brodie, P.F., J.L. Parsons and D.E. Sergeant. 1981. Present status of the white whale (*Delphinapterus leucas*) in Cumberland Sound, Baffin Island. Reports of the International Whaling Commission 31:579-582.
- Byers, T., and L.W. Roberts. 1995. Harpoons and ulus: collective wisdom and traditions of Inuvialuit regarding the beluga (*qilalugaq*) in the Mackenzie River estuary. Unpubl. report to the Department of Indian and Northern Affairs (Arctic Environmental Strategy) and the Fisheries Joint Management Committee, Inuvik. 76 p.
- Caron, L., and T.G. Smith. 1990. Philopatry and site tenacity of belugas, *Delphinapterus leucas*, hunted by the Inuit at the Nastapoka estuary, eastern Hudson Bay. Can. Bull. Fish. Aquat. Sci. 224: 69-79.
- Cosens, S.E., and L.P. Dueck. 1993. Icebreaker noise in Lancaster Sound, N.W.T., Canada: implications for marine mammal behaviour. Marine Mammal Science 9: 285-300.
- COSEWIC 2004. [COSEWIC assessment and update status report on the beluga whale *Delphinapterus leucas* in Canada](#). Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 70 pp.
- COSEWIC. 2008. [COSEWIC assessment and update status report on the Killer Whale *Orcinus orca*, Southern Resident population, Northern Resident population, West Coast Transient population, Offshore population and Northwest Atlantic / Eastern Arctic population, in Canada](#). Committee on the Status of Endangered Wildlife in Canada. Ottawa. viii + 65 pp.
- de March, B.G.E., Maiers, L. D., and Friesen, M.K. 2002. [An overview of genetic relationships of Canadian and adjacent populations of belugas \(*Delphinapterus leucas*\) with emphasis on Baffin Bay and Canadian eastern Arctic populations](#). NAMMCO Scientific Publications, 4, 17-38.
- DFO. 2002. [Cumberland Sound Beluga](#). Science Stock Status Report E5-32.

- DFO. 2005a. [Recovery Potential Assessment of Cumberland Sound, Ungava Bay, Eastern Hudson Bay and St. Lawrence beluga populations \(*Delphinapterus leucas*\)](#). DFO Can. Sci. Advis. Sec., Sci. Advis. Rep. 2005/036.
- DFO. 2005b. [Proceedings of the meeting on recovery potential assessment of Cumberland Sound, Ungava Bay, Eastern Hudson Bay and St. Lawrence beluga populations \(*Delphinapterus leucas*\); April 5-7, 2005](#). DFO Can. Sci. Advis. Sec. Proceed. Ser. 2005/011.
- DFO. 2008a. [Fixed gear recommendations for the Cumberland Sound Greenland Halibut fishery](#). DFO Can. Sci. Advis. Sec. Sci. Resp. 2008/011.
- DFO. 2008b. [Cumberland Sound Greenland Halibut \(Turbot\) Inshore Fishery](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2008/040.
- DFO. 2009. [Advice relevant to the identification of critical habitat for Cumberland Sound Belugas](#). DFO Can. Sci. Advis. Sec., Sci. Advis. Rep. 2008/056.
- DFO. 2016. [Status of beluga \(*Delphinapterus leucas*\) in Cumberland Sound, Nunavut](#). DFO Can. Sci. Advis. Sec., Sci. Advis. Rep. 2016/37.
- DFO. 2019. [Sustainable harvest advice for Cumberland Sound beluga based on the 2017 aerial survey and modelled abundance estimates](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2019/024.
- DFO. 2022. [Genetic assessment for discrimination of beluga whales in Cumberland Sound](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2022/nnn.
- Doidge, D.W. 1990. Age-length and length-weight comparisons in the beluga, *Delphinapterus leucas*. In: Smith, T.G., D.J. St. Aubin, and J.R. Geraci. Eds. Advances in research on the beluga whale, *Delphinapterus leucas*. Canadian Bulletin of Fisheries and Aquatic Sciences 224. p. 59-68.
- Environment and Climate Change Canada. 2016. [Species at Risk Act Implementation Guidance for Recovery Practitioners - Critical habitat identification toolbox](#). Developed by Environment and Climate Change Canada, Canadian Wildlife Service and Critical Habitat Community of Practice, version 2.3, updated February 2016
- Ferguson, S.H., J.W. Higdon, and K.H. Westdal. 2012. Prey items and predation behavior of killer whales (*Orcinus orca*) in Nunavut, Canada based on Inuit hunter interviews. Aquatic Biosystems 8: 3.
- Freeman, M.R. 1968. Winter observations on beluga (*Delphinapterus leucas*) in Jones Sound, N.W.T. Canadian Field-Naturalist 82(4): 276-286.
- Harwood, L.A., M.C.S. Kingsley and T.G. Smith. 2010. [An Emerging Pattern of Declining Growth Rates in Belugas of the Beaufort Sea: 1989 – 2008](#). Arctic 67(4): 483–492.
- Hauser, D.D.W., K.L. Laidre, H.L. Stern, R.S. Suydam, and P.R. Richard. 2018. Indirect effects of sea ice loss on summer-fall habitat and behaviour for sympatric populations of an Arctic marine predator. Divers Distrib. 24: 791–799.

- Heide-Jørgensen, M.P., and J. Teilmann. 1994. Growth, reproduction, age structure and feeding habits of white whales (*Delphinapterus leucas*) in West Greenland waters. *Meddelelser om Grønland, Bioscience* 39: 195-212.
- IBCAO. 2012. International Bathymetric Chart of the Arctic Ocean.
- Jefferson, T.A., L. Karczmarski, K. Laidre, G. O’Corry-Crowe, R.R. Reeves, L. Rojas-Bracho, E.R. Secchi, E. Slooten, B.D. Smith, J.Y. Wang, and K. Zhou. 2010. *Delphinapterus leucas*. In: IUCN 2010. [IUCN Red List of Threatened Species](#). Version 2010.1. (Accessed: May 3, 2010).
- Kilabuk, P. 1998. Final report on a study of Inuit knowledge of the southeast Baffin beluga. Report prepared for the Southeast Baffin Beluga Management Committee. Nunavut Wildlife Management Board, P.O. Box 1379, Iqaluit, Nunavut. 74 p.
- Lasserre, F., and P. Têtu. 2015. The cruise tourism industry in the Canadian Arctic: analysis of activities and perceptions of cruise ship operators. *Polar Record* 51 (256): 24–38.
- Law, R.J., M. A. Alae, C.R. Allchin, J.P. Boon, M. Lebeuf, P. Lepom and G.A. Stern. 2003. Levels and trends of polybrominated diphenylethers and other brominated flame retardants in wildlife. *Environment International* 29(6): 757-770.
- Lien, J. 2001. The Conservation Basis for the Regulation of Whale Watching in Canada by the Department of Fisheries and Oceans: A Precautionary Approach. *Can. Tech. Rep. Fish. Aquat. Sci.* 2363: vi + 38 p.
- Lockhart, W.L., G.A. Stern, R. Wagemann, R.V. Hunt, D.A. Metner, J. DeLaronde, B. Dunn, R.E.A. Stewart, C.K. Hyatt, L. Harwood and K. Mount. 2005. Concentrations of mercury in tissues of beluga whales (*Delphinapterus leucas*) from several communities in the Canadian Arctic from 1981 to 2002. *Science of the Total Environment*. 351-352:391-412.
- Luque, S.P., and S.H. Ferguson. 2010. Age structure, growth, mortality and density of belugas (*Delphinapterus leucas*) in the Canadian Arctic: Responses to environment? *Polar Biology* 33(2): 163 – 178.
- Marcoux M., B.C. McMeans, A.T. Fisk, and S.H. Ferguson. 2012. [Composition and temporal variation in the diet of beluga whales, derived from stable isotopes](#). *Mar. Ecol. Prog. Ser.* 471: 283-291
- Marcoux, M., and M.O. Hammill. 2016. [Model estimates of Cumberland Sound beluga \(*Delphinapterus leucas*\) population size and total allowable removals](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2016/077. iv + 35 p.
- Marcoux, M., B.G. Young, N.C. Asselin, C.A. Watt, J.B. Dunn, and S.H. Ferguson. 2016. [Estimate of Cumberland Sound beluga \(*Delphinapterus leucas*\) population size from the 2014 visual and photographic aerial survey](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2016/037. iv + 19 p.
- Matthews, C.J.D., and S.H. Ferguson. 2015. [Weaning age variation in beluga whales \(*Delphinapterus leucas*\)](#). *Journal of Mammalogy*. 96: 425-437.

- National Marine Fisheries Service. 2008. Conservation Plan for the Cook Inlet beluga whale (*Delphinapterus leucas*). National Marine Fisheries Service, Juneau, Alaska.
- NatureServe. 2017. [NatureServe Explorer](#): An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. (Accessed: July 19, 2017).
- Nielsen, O., A. Clavijo and J.A. Boughen. 2001a. Serologic evidence of Influenza A infection in marine mammals of Arctic Canada. *Journal of Wildlife Diseases* 4: 820-825.
- Nielsen, O., R.E.A. Stewart, K. Nielsen, L. Measures and P. Duignan. 2001b. Serological survey of *Brucella spp.* antibodies in some marine mammals of North America. *Journal of Wildlife Diseases* 37: 89-100.
- Nielsen, O., pers. comm. 2018. Fisheries and Oceans Canada, Winnipeg, MB
- NMFS. 2003. Taking marine mammals incidental to conducting oil and gas exploration activities in the Gulf of Mexico. *Federal register*. 68(41): 9991-9996.
- Nunatsiaq News. [Nunavut fish quota increase helps correct historic wrongs](#). 2017. February 3, 2017.
- Nunavut Land Claims Agreement. 1993. [Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada](#). Indian Affairs and Northern Development, Ottawa. xi + 282 p.
- Pangnirtung Hunters and Trappers Association. pers. comm. 2008 and 2018. Pangnirtung, NU.
- Planning Committee for Co-Management of Southeast Baffin Beluga. 1994. Co-Management plan for Southeast Baffin beluga. Unpublished report for the Minister of Fisheries and Oceans. Nunavut Wildlife Management Board, P.O. Box 1379, Iqaluit, Nunavut. 80 p.
- Porsild, M.O., 1918. On "savsatts" a crowding of Arctic mammals at holes in the sea ice. *Geographic Review* 6: 215-228.
- Richard, P.R., and J.R. Orr. 1986. [A review of the status and harvest of white whales \(*Delphinapterus leucas*\) in the Cumberland Sound area, Baffin Island](#). *Can. Tech. Rep. Fish. Aquat. Sci.* 1447: iv+25 p.
- Richard, P.R. 1991. Status of the belugas, *Delphinapterus leucas*, of Southeast Baffin Island, Northwest Territories. *Can. Field-Nat.* 105(2): 206-214.
- Richard, P.R. 2010. Stock definition of belugas and narwhals in Nunavut. *DFO Can. Sci. Advis. Sec. Res. Doc.* 2010/022. iv + 14 p.
- Richard, P.R. 2013. Size and trend of the Cumberland Sound beluga whale population, 1990 to 2009. *DFO Can. Sci. Advis. Sec. Res. Doc.* 2012/159. iii + 28 p.
- Richard, P.R., and D.G. Pike. 1993. Small whale co-management in the eastern Canadian arctic: a case history analysis. *Arctic* 46: 138-143.

- Richard, P.R., and D.B. Stewart. 2008. [Information relevant to the identification of critical habitat for Cumberland Sound belugas \(*Delphinapterus leucas*\)](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2008/085: iv + 24 p.
- Richardson, W. J., C. R. Greene, C. R. Malme and D. H. Thompson. 1995. *Marine mammals and noise*. Academic Press. San Diego. 576 p.
- Sergeant, D.E. 1973. Biology of white whales (*Delphinapterus leucas*) in Western Hudson Bay. Journal of the Fisheries Research Board of Canada, Arctic Unit, Montreal, Quebec, Circular No. 8:13 pp.
- Sheldon, K.E.W., D.J. Rugh, B.A. Mahoney, and M.E. Dahlheim. 2003. Killer whale predation on belugas in Cook Inlet, Alaska: Implications for a depleted population. *Marine Mammal Science* 19: 529–544.
- Smith, T.G. 1985. Polar bears, *Ursus maritimus*, as predators of belugas, *Delphinapterus leucas*. *Canadian Field-Nat.* 99: 71-75.
- Smith, T. G., M. O. Hammill, and A. R. Martin. 1994. Herd composition and behaviour of belugas, *Delphinapterus leucas*, in two Canadian Arctic estuaries. *Meddelelser om Grønland Bioscience.* 39: 175-184.
- Stephenson, S.A., and L. Hartwig. 2010. [The Arctic Marine Workshop: Freshwater Institute Winnipeg, Manitoba, February 16-17, 2010](#). Can. Manuscript Rep. Fish. Aquat. Sci. 2934: vi + 67 p.
- Stern, G.A., C.R. Macdonald, B. Dunn, C. Fuchs, L. Harwood, B. Rosenberg, D.C.G. Muir and D. Armstrong. 2005. Spatial trends and factors affecting variation of organochlorine contaminants levels in Canadian Arctic beluga (*Delphinapterus leucas*). *Science of the Total Environment.* 351-352:344-68.
- Stewart, D.B. 2001. Inuit knowledge of belugas and narwhals in the Canadian eastern Arctic. Prepared by Arctic Biological Consultants, Winnipeg, MB for Canada Department of Fisheries and Oceans, Iqaluit, Nunavut. iv + 32 p.
- Stewart, D.B. 2018. [Commercial and subsistence catches of beluga whales \(*Delphinapterus leucas*\) from Cumberland Sound, Nunavut, 1840-2016](#). Can. Tech. Rep. Fish. Aquat. Sci. 3250: viii + 89 p.
- Stewart, D.B, A. Akeeagok, R. Amarualik, S. Panipakutsuk and A. Taqtu. 1995. [Local knowledge of beluga and narwhal from four communities in the Arctic](#). Can. Tech. Rep. Fish. Aquat. Sci. 2065: viii + 48 p.
- Stewart, R.E.A. 1994a. Size-at-age relationships as discriminators of white whale (*Delphinapterus leucas*) stocks in the eastern Canadian Arctic. *Meddelelser om Grønland, Bioscience* 39: 217-225.
- Stewart, R.E.A. 1994b. Progesterone levels and reproductive status of white whales (*Delphinapterus leucas*) from the Canadian Arctic. *Meddelelser om Grønland, Bioscience* 39: 239-243.

- Stewart, R.E.A., S.E. Campana, C.M. Jones, and B.E. Stewart. 2006. Bomb radiocarbon dating calibrates beluga (*Delphinapterus leucas*) age estimates. *Canadian Journal of Zoology*. 84: 1840–1852.
- Wagemann, R., S. Innes and P.R. Richard. 1996. Overview and regional and temporal differences of heavy metals in Arctic whales and ringed seals in the Canadian Arctic. *Science of the Total Environment*. 186: 41-66.
- Watt, C.A., J. Orr and S.H. Ferguson. 2016. A shift in foraging behaviour of beluga whales *Delphinapterus leucas* from the threatened Cumberland Sound population may reflect a changing Arctic food web. *Endangered Species Research*. 31: 259-270.
- Young, T.P. 1994. Natural die-offs of large mammals: implications for conservation. *Conservation Biology* 8: 410-418.

Appendix A: effects on the environment and other species

In accordance with the [Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals](#) (2010), *Species at Risk Act* (SARA) recovery planning documents incorporate strategic environmental assessment (SEA) considerations throughout the document. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or achievement of any of the [Federal Sustainable Development Strategy](#)'s goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies and critical habitat identified may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself (see recovery planning table under section 7.2), but are also summarized below in this statement.

Cumberland Sound Beluga (CSB) were estimated to number close to 8,500 animals prior to 1920, so it is anticipated the ecosystem could accommodate a large increase from current numbers without suffering any detrimental effects. As the CSB prey base once supported substantially more whales than are present today, it is expected that the prey base can support a larger Beluga population although other consumers (for example, Seals, Narwhal, Killer Whales and the Inuit people) may now also have increased their take of the same prey species. Increased numbers of CSB will benefit the Inuit of Pangnirtung by allowing a larger harvest to satisfy their needs. An increase in the number of CSB might also result in increased availability of prey for Killer Whales or Polar Bears.

Appendix B: record of cooperation and consultation

To aid in the recovery of this population and in anticipation of possible *Species at Risk Act* (SARA) listing, the Cumberland Sound Beluga Recovery Team was formed in September 2002. Representatives from the Pangnirtung Hunters and Trappers Association (HTA), the Nunavut Wildlife Management Board (NWMB), the Qikiqtaaluk Wildlife Board, Nunavut Tunngavik Incorporated, and Fisheries and Oceans Canada (DFO) participated on the Team during the process. Recovery Team meetings were ongoing during 2002 to 2005 and an initial strategy was presented to the NWMB in 2005. The Pangnirtung HTA requested revisions to the strategy which were made in 2008. Meetings to discuss a revised strategy occurred in February 2010 and again in February 2011 with Pangnirtung HTA executives and members of the Recovery Team. A penultimate revision of the recovery strategy was prepared after the 2017 SARA listing of the population and sent to the Pangnirtung HTA for comment in February 2018. Other interested Nunavut organizations were also sent the draft recovery strategy for comment. A meeting was held with Pangnirtung HTA executives in June of 2018 when further revisions were made to this strategy. A final meeting to review this recovery strategy prior to posting on the SARA Public Registry was held via teleconference with Pangnirtung HTA executives in April 2022.

Residents of Pangnirtung, including members of the HTA, were first consulted on a possible SARA listing of the Cumberland Sound Beluga (CSB) in November 2004. The NWMB was informed of the results of these consultations in early 2005.

The Governor in Council decided not to make a decision on possible listing of CSB under schedule 1 of SARA in August 2006 to allow further engagement with the NWMB to ensure that future listing decisions were made in full consideration of the views of Inuit. By mid-2008, “A Memorandum of Understanding to harmonize the designation of rare, threatened and endangered species under the Nunavut Land Claims Agreement and the listing of wildlife species at risk under the *Species at Risk Act*” was completed between the Minister of Environment, the Minister of Fisheries and Oceans, and the NWMB, and consultations on the recovery strategy began again.

In June 2008, DFO sent a second consultation letter to the Pangnirtung HTA explaining why there had been a delay in the listing process, describing what new science information was available, and asking whether they supported listing of CSB. The Ministers of Environment and Fisheries and Oceans, taking into account the local knowledge and scientific advice available on the status of the population, and the position of the NWMB, made the recommendation to the Governor in Council that the population should be listed.

The proposed listing decision was made public in the *Canada Gazette, Part I* in August 2016 . CSB was listed as Threatened on May 3, 2017.

Additional Indigenous, stakeholder, and public input will be sought through the publication of the proposed document on the Species at Risk Public Registry for a 60-day public comment period. Comments received will inform the final document.

Appendix C: threat assessment categories

Likelihood of Occurrence	Definition
Known or very likely to occur	There is a 91% to 100% chance that this threat is or will be occurring.
Likely to occur	There is a 51 to 90% chance that this threat is or will be occurring.
Unlikely	There is a 11 to 50% chance that this threat is or will be occurring.
Remote	There is a 10% or less chance that this threat is or will be occurring.
Unknown	There are no data or prior knowledge of this threat occurring now or in the future.

Level of Impact	Definition
Extreme	Severe population decline (for example, 71 to 100%) with the potential for extirpation.
High	Substantial loss of population (31 to 70%) or threat would likely jeopardize the survival or recovery of the population.
Medium	Moderate loss of population (11 to 30%) or threat may jeopardize the survival or recovery of the population.
Low	Little change in population (1 to 10%) or threat is unlikely to jeopardize the survival or recovery of the population.
Unknown	No prior knowledge, literature, or data to guide the assessment of threat severity on population.

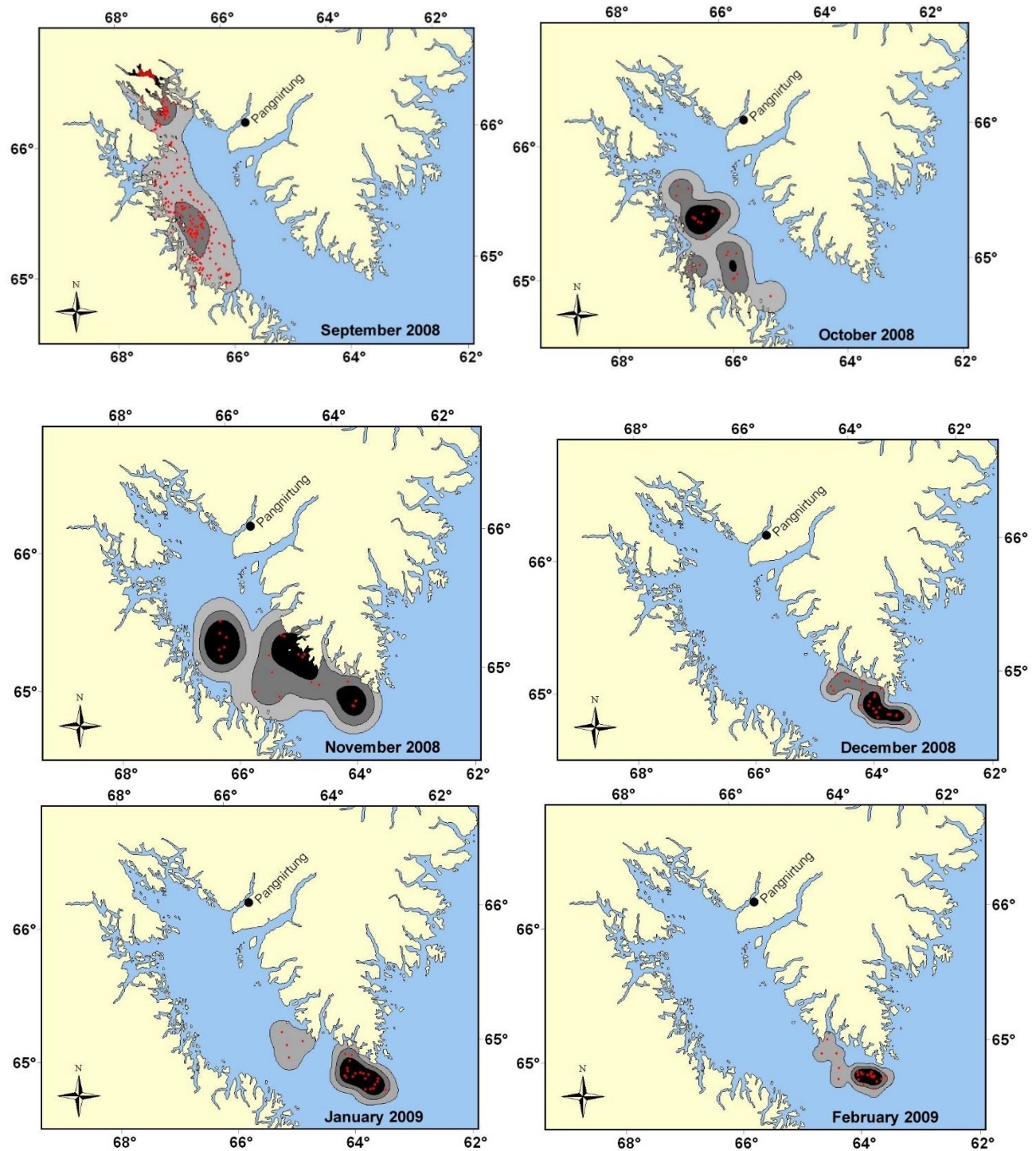
Causal Certainty	Definition
Very high	Very strong evidence that threat is occurring and the magnitude of the impact to the population can be quantified. Population decline or jeopardy to survival or recovery is anticipated.
High	Substantial evidence of a causal link between threat and population decline or jeopardy to survival or recovery.
Medium	There is some evidence linking the threat to population decline or jeopardy to survival or recovery.
Low	There is a plausible link with limited evidence that threat is leading to a population decline or jeopardy to survival or recovery.
Very low	There is a theoretical link with no evidence that the threat is leading to a population decline or jeopardy to survival or recovery.

Threat Occurrence	Definition
Historical	A threat that is known to have occurred in the past and negatively impacted the population.
Current	A threat that is ongoing, and is currently negatively impacting the population.
Anticipatory	A threat that is anticipated to occur in the future, and will negatively impact the population.

Threat frequency	Definition
Single	The threat occurs once.
Recurrent	The threat occurs periodically, or repeatedly.
Continuous	The threat occurs without interruption.

Threat extent	Definition
Extensive	71 to 100% of the population is affected by the threat.
Broad	31 to 70% of the population is affected by the threat.
Narrow	11 to 30% of the population is affected by the threat.
Restricted	Less than 10% of the population is affected by the threat.

Appendix D: monthly home range of Cumberland Sound Beluga: September 2008 to May 2009



Appendix D: continued.

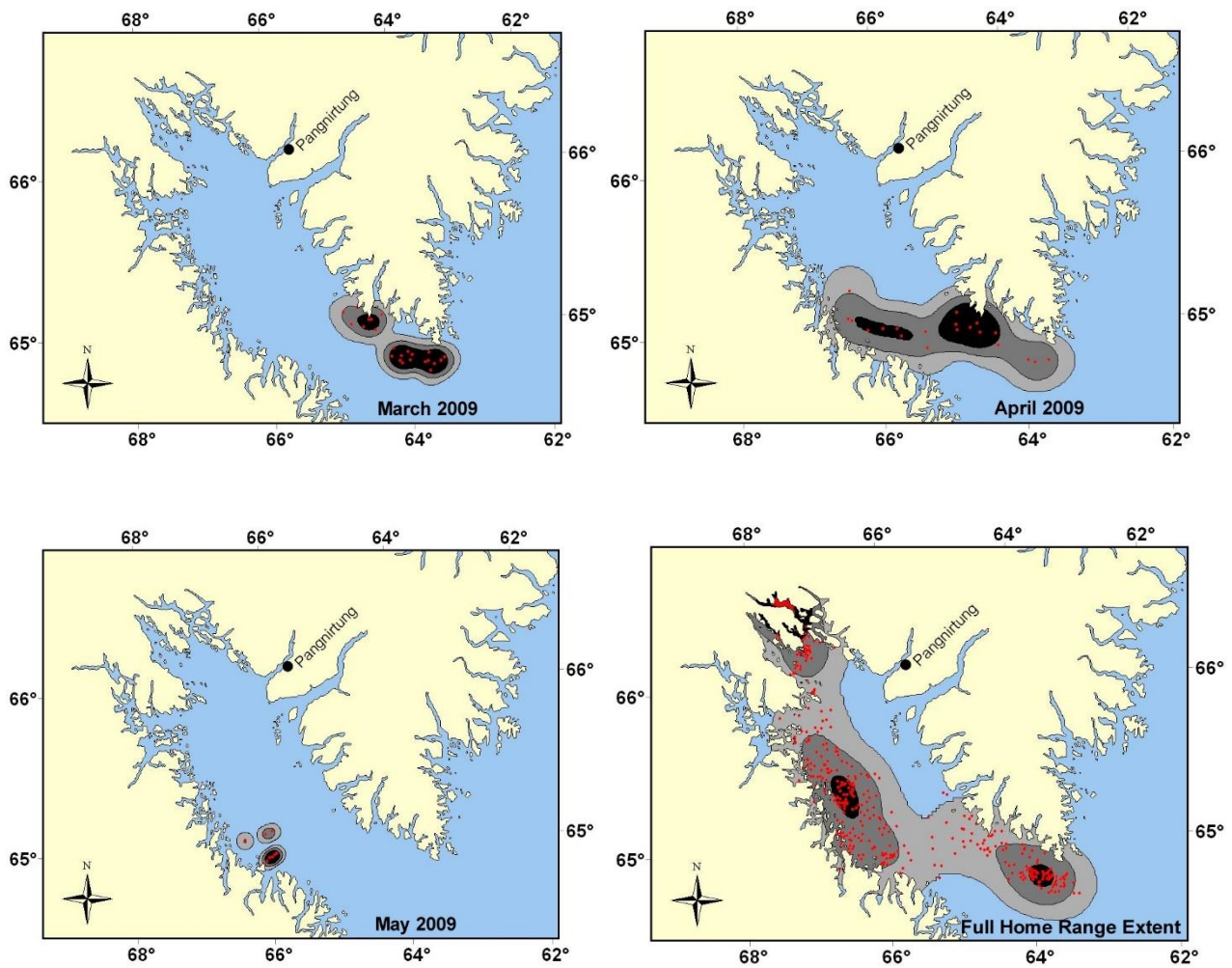


Figure 6. Monthly home range of Cumberland Sound Beluga from September 2008 to May 2009. Red dots represent the estimated locations of individual whales. The darker the shading, the more likely whales were to be in the area.