

Recovery Strategy for the Atlantic Walrus (*Odobenus rosmarus rosmarus*), Northwest Atlantic Population in Canada

Atlantic Walrus



November 2007



About the Species at Risk Act Recovery Strategy Series

What is the *Species at Risk Act* (SARA)?

SARA is the Act developed by the federal government as a key contribution to the common national effort to protect and conserve species at risk in Canada. SARA came into force in 2003 and one of its purposes is “*to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity.*”

What is recovery?

In the context of species at risk conservation, **recovery** is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of the species’ persistence in the wild. A species will be considered **recovered** when its long-term persistence in the wild has been secured.

What is a recovery strategy?

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 goals and objectives and identifies the main areas of activities to be undertaken. Detailed planning is done at the action plan stage.

Recovery strategy development is a commitment of all provinces and territories and of three federal agencies — Environment Canada, Parks Canada Agency, and Fisheries and Oceans Canada — under the Accord for the Protection of Species at Risk. Sections 37–46 of SARA (http://www.sararegistry.gc.ca/the_act/default_e.cfm) outline both the required content and the process for developing recovery strategies published in this series.

Depending on the status of the species and when it was assessed, a recovery strategy has to be developed within one to two years after the species is added to the List of Wildlife Species at Risk. Three to four years is allowed for those species that were automatically listed when SARA came into force.

What’s next?

In most cases, one or more action plans will be developed to define and guide implementation of the recovery strategy. However, in the case of an extirpated species for which recovery is deemed not feasible, no further action is anticipated.

The series

This series presents the recovery strategies prepared or adopted by the federal government under SARA. New documents will be added regularly as species get listed and as strategies are updated.

To learn more

To learn more about the Species at Risk Act and recovery initiatives, please consult the SARA Public Registry (<http://www.sararegistry.gc.ca/>) and the web site of the Recovery Secretariat (http://www.speciesatrisk.gc.ca/recovery/default_e.cfm).

**Recovery Strategy for the Atlantic walrus (*Odobenus rosmarus rosmarus*),
Northwest Atlantic Population, in Canada [Proposed]**

November 2007

Recovery of this species is considered not technically or biologically feasible at this time

Recommended citation:

Department of Fisheries and Oceans. 2007. Recovery Strategy for the Atlantic walrus (*Odobenus rosmarus rosmarus*), Northwest Atlantic population, in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Department of Fisheries and Oceans. Ottawa. x + 11 pp.

Additional copies:

You can download additional copies from the SARA Public Registry (<http://www.sararegistry.gc.ca/>)

Cover illustration: J.Domm for Fisheries and Oceans Canada

Également disponible en français sous le titre

« Programme de rétablissement du morse de l'Antique (*Odobenus rosmarus rosmarus*) population de l'Atlantique Nord-Ouest au Canada »

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ISBN ISBN to be included by SARA Responsible Agency

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

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DECLARATION (RECOVERY NOT FEASIBLE)

This proposed recovery strategy for the Atlantic walrus (Northwest Atlantic population) has been prepared in cooperation with the jurisdictions responsible for the species, as described in the Preface. The Department of Fisheries and Oceans (DFO) has reviewed and accepts this document as its recovery strategy for the Atlantic walrus (Northwest Atlantic population) as required by the *Species at Risk Act*.

The recovery of the Atlantic walrus (Northwest Atlantic population) in Canada is neither technically nor biologically feasible at this time by human assisted means. The population has been extirpated and therefore no longer exists in the wild in Canada but occasional individuals, probably migrants from adjoining populations, are still observed in its historical distribution. These individuals are potential re-colonizers. Accordingly, recovery efforts targeted towards other species in the same geographic area or experiencing similar threats, and general conservation programs in the same geographic area, would help provide the conditions for recovery through natural processes.

The feasibility determination will be re-evaluated as warranted in response to changing conditions and/or knowledge, in particular every five years as part of the mandatory report on implementation of the recovery strategy.

RESPONSIBLE JURISDICTIONS

Under the Species at Risk Act, Fisheries and Oceans Canada is the responsible jurisdiction for the Atlantic walrus.

AUTHORS

This document was prepared by Howard Powles (University of Ottawa) and has benefited from reviews by federal and provincial government officials.

STRATEGIC ENVIRONMENTAL ASSESSMENT STATEMENT

In accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*, 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.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The recovery planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts on non-target species or habitats. The environmental considerations for this strategy are summarized as follows:

Because the Atlantic walrus (Northwest Atlantic population) is extirpated and recovery is not considered to be feasible, no further recovery action is considered appropriate at this time. Accordingly, this recovery strategy will have no effect on the environment.

RESIDENCE

SARA defines residence as: “*a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating*” [SARA S2(1)].

Residence protection is a SARA requirement that is separate from recovery strategy development as it relates to the general prohibitions under the Act (Section 33). To facilitate protection, residence descriptions, or the rationale for why the residence concept does not apply to a given species, are posted on the SARA public registry: http://www.sararegistry.gc.ca/plans/residence_e.cfm.

In the case of an extirpated species for which the recovery strategy does not recommend its reintroduction into the wild in Canada, the prohibition pertaining to the damage or destruction of residence does not apply [SARA S33].

PREFACE

The Atlantic walrus in Canada was originally treated by COSEWIC (in both April 1987 and May 2000) as two separate populations: Eastern Arctic population (Not at Risk) and Northwest Atlantic population (Extirpated). Recently (April 2006) COSEWIC reassessed the species over its entire range as a single designatable unit with a Special Concern status, however, the Northwest Atlantic population is the population which is on the federal List of Wildlife Species at Risk (i.e., Schedule 1 of SARA) and therefore a recovery strategy is required for that population.

Fisheries and Oceans Canada has led the development of this recovery strategy for the extirpated Atlantic walrus (Northwest Atlantic population). The development of the recovery strategy has

involved: (i) the preparation of a draft addressing SARA requirements for recovery strategies for extirpated species; (ii) the circulation of this draft for review and comment by other jurisdictions of Québec, New Brunswick, Nova Scotia, and Newfoundland & Labrador; (iii) public consultations on the draft strategy via the SARA public registry; and (iv) the production of the final version.

The determination that recovery is not feasible, including the justification, was reviewed as part of the review and consultation process for the recovery strategy. The final decision and wording of the determination were the responsibility of DFO and took account of the comments received.

EXECUTIVE SUMMARY

Walrus are large, gregarious marine mammals which can be distinguished from all other species of marine mammals by their tusks, which are long upper canine teeth, and the moustache of quill-like whiskers. Males grow to about 315 cm and 1100 kg, females to about 280 cm and 800 kg. Females mature at age 5-10 years, males at age 7-13 years. Maximum age in walrus may be greater than 35 years.

Walrus feed mostly on bottom-dwelling organisms such as clams and sea urchins, but are known to occasionally also eat fish, squid and even ringed and bearded seals. Their preferred habitat is shallow water (80 m or less) with bottom substrates that support a productive mollusc community, the reliable presence of open water over the feeding areas, and suitable ice or land nearby on which to haul out, sometimes in large herds.

Historically, Atlantic walrus ranged from the central Canadian Arctic in the west to the Kara Sea (Russia) in the east, north to Svalbard and south to Nova Scotia. Within Canada the extant eastern Arctic population (currently subdivided by the Department of Fisheries and Oceans (DFO) into four populations for management purposes (COSEWIC 2006) of Atlantic walrus ranges from Bathurst and Prince of Wales islands in the west to Davis Strait in the east, and from James Bay in the south to Kane Basin in the north. A fifth Northwest Atlantic population ranged south along the Labrador coast to the Gulf of St. Lawrence, Newfoundland, and Nova Scotia. This recovery strategy follows the original COSEWIC (in press) population separation which identified two Canadian populations for designation: an extant eastern Arctic population, and an extirpated Northwest Atlantic population. It is this Northwest Atlantic population which is on the federal List of Wildlife Species at Risk (i.e., SARA Schedule 1) and for which the development of this recovery strategy is required.

Originally thought to number in the tens of thousands, this Northwest Atlantic population was heavily harvested for at least a hundred years in the 17th and 18th centuries and hunted to extirpation by the late 18th century. The principal threat to existing Atlantic walrus populations is hunting for Aboriginal subsistence. Noise and disturbance from shipping, aircraft, and human activities including oil and gas exploration; contamination from oil spills; entanglement in fishing gear; and disturbance or harvesting of prey populations are potential threats to a re-established walrus population in southeastern Canada. Hunting would be an unlikely threat to a re-established Northwest Atlantic population.

Recovery of the extirpated Northwest Atlantic population is not considered biologically or technically feasible at this time. Individuals are occasionally observed in the area of historical distribution, probably migrants from the eastern Arctic population to the north, but these strays have not supported natural recovery to date. With respect to re-introducing individuals from elsewhere to establish a viable population, suitable habitat may be available but interactions with humans would have to be minimized by site selection or management. Threats could probably be mitigated. It is uncertain that sufficient numbers of mature individuals could be made available from extant populations to support re-establishment, and the challenges of humanely transporting live animals from the remote northern areas where they are found to remote areas in southern Canada are such as to make recovery technically not feasible. Captive breeding is unlikely to be a viable option for contributing to re-establishment.

Although recovery has not occurred based on migrants from the adjoining eastern Arctic population, there is a slight possibility of recovery based on natural migration. Conservation efforts to ensure healthy marine environments in southeastern Canada, along with the prohibitions on killing or harming individuals of this population which is listed as “extirpated” under the *Species at Risk Act*, would contribute to increasing the possibility of natural recovery. The feasibility determination will be re-evaluated as warranted in response to changing conditions and/or knowledge, in particular every five years as part of the mandatory report on implementation of the recovery strategy.

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1. BACKGROUND¹

1.1 Species Assessment Information from COSEWIC

Date of Assessment: May 2000

Common Name (population):

Atlantic walrus – Northwest Atlantic population

Scientific Name:

Odobenus rosmarus rosmarus

COSEWIC Status:

Extirpated

Reason for designation:

Extirpated by exploitation

Canadian Occurrence:

Québec, New Brunswick, Nova Scotia, Newfoundland and Labrador, Atlantic Ocean

COSEWIC Status History:

Extirpated around 1850. Designated Extirpated in April 1987. Status re-examined and confirmed in May 2000. Last assessment based on an existing status report.

1.2 Description

Walruses are large, gregarious marine mammals with front and hind limbs that have developed into flippers. Although related to the seals and sea lions, the walrus can be distinguished from all other species of marine mammals by its tusks, which are long upper canine teeth, and by its moustache of quill-like whiskers. Adult males are larger than females and have longer, broader tusks. The skin, covered sparsely with hair, is cinnamon brown but can appear pink on a warm day or almost white after a long, cold dive. At birth Atlantic walruses are about 120 cm long and weigh about 55 kg; males grow to about 315 cm and 1100 kg, females to about 280 cm and 800 kg. The walrus can support itself upright with its front flippers, like sea lions.

Walruses are polygynous (each male has several mates) and males compete for females at breeding time. Mating occurs in the water from February through April. Most young are born the following year in May-June and suckle for 25-27 months. Maternal care is very well-

¹ Unless otherwise stated, material in this section is drawn from COSEWIC (in press) and COSEWIC (2006).

developed and walrus herds are protective of young, which may lead to high juvenile survival rates. Females give birth about every 3 years.

Maximum age in walruses may be greater than 35 years. Females mature at age 5-10 years, males at age 7-13 years. Because of the low rate of production of young (annual gross production of about 10%) walruses are susceptible to mortality caused by humans, including hunting.

Walruses “haul out” (i.e., come ashore for a period of time) on ice and land, sometimes in large herds. Walruses haul out to rest, for social interactions, and to give birth and rear pups. Ice is preferred for hauling out. It has been hypothesized that one of the benefits of hauling out on land is that it provides a stable temperature in the skin and appendages, which promotes regeneration of the skin and healing of wounds. Little is known of the physiological requirements of walrus or their ability to adapt to changes in food availability or environmental conditions.

1.3 Populations and Distribution

The walrus has a discontinuous circumpolar distribution in the Arctic and sub-Arctic, with distinct Atlantic (*Odobenus rosmarus rosmarus*) and Pacific (*O. r. divergens*) subspecies. The historical distribution of Atlantic walruses ranged from the central Canadian Arctic in the west to the Kara Sea (Russia) in the east, north to Svalbard (archipelago in the Barents Sea north of Norway) and south to Nova Scotia. Within this range there are two well separated populations, one to the east of Greenland and the other to the west, to which all Canadian individuals belong. The western population can be further subdivided and includes the Canadian populations described below.

Within Canada the Atlantic walrus currently ranges from Bathurst and Prince of Wales islands in the west to Davis Strait in the east, and from James Bay in the south to Kane Basin in the north. Historically, at the time non-aboriginal people first made contact with the species, the Atlantic walrus ranged south along the Labrador coast to the Gulf of St. Lawrence, Newfoundland and Nova Scotia (Figure 1). During the ice ages, walrus may have ranged as far south as the Carolinas and Georgia.

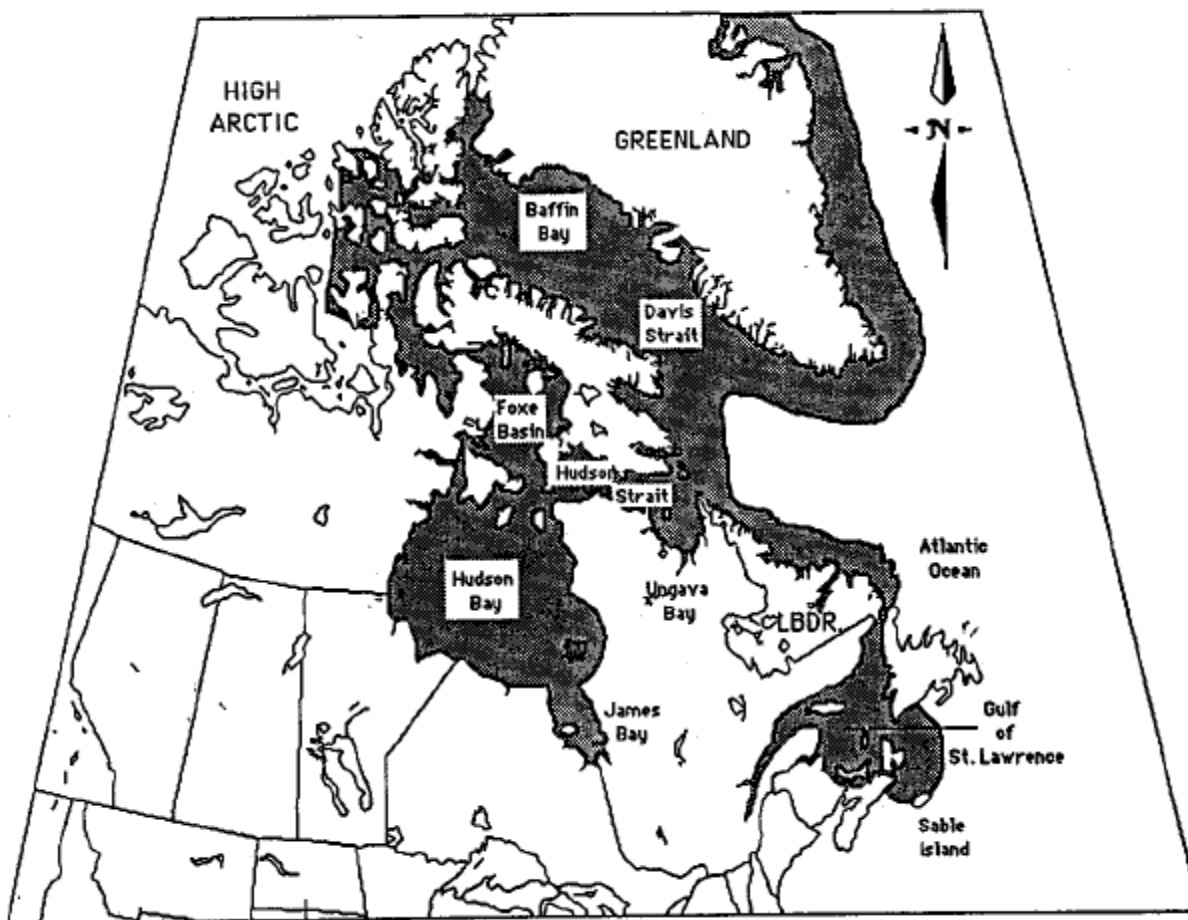


Figure 1. Approximate historical distribution of Atlantic walrus in Canada. (Source: COSEWIC in press.)

Five populations of Atlantic walrus, ranging from Nova Scotia to the high Arctic, have been recognized in Canada. Four extant populations are currently recognized by DFO for management purposes based on geographical distribution, changes in abundance, contaminants and lead isotope ratios and signatures: 1) south and east Hudson Bay; 2) northern Hudson Bay-Davis Strait; 3) Foxe Basin and 4) Baffin Bay (High Arctic) (COSEWIC 2006). The degree of genetic isolation between these four extant populations is not known, and each may consist of sub-units that mix little or not at all.

A fifth population, the Northwest Atlantic population, was formerly found at Sable Island, the eastern coast of Nova Scotia, and in the Gulf of St. Lawrence. Originally thought to number in the tens of thousands, this Northwest Atlantic population was heavily harvested for at least a hundred years in the 17th and 18th centuries and extirpated by the late-18th century.

All Canadian populations may once have been continuously distributed. Walrus are able to move long distances, by swimming or by drift on ice, but overall movements are little known.

Although five populations of Atlantic walrus are currently recognized in Canada (COSEWIC 2006), this recovery strategy follows COSEWIC (in press) which identified two Canadian populations for designation: an extant eastern Arctic population, and an extirpated Northwest Atlantic population. It is this Northwest Atlantic population which is on the federal List of Wildlife Species at Risk (i.e., SARA Schedule 1) and for which this recovery strategy is written.

1.4 Life History Requirements

All information on the habitat and biological requirements of the Northwest Atlantic population of Atlantic walrus is based on what is known about the extant Atlantic walrus population in the eastern Arctic.

1.4.1 Habitat and biological needs

Atlantic walruses require large areas of relatively shallow water (80 m or less), with bottom substrates that support a productive bivalve community, open water over the feeding areas, and suitable ice or land nearby on which to haul out. In the north they are associated with moving pack ice for much of the year but when ice is lacking in summer and fall, they congregate and haul out on land in a few predictable locations. Suitable land habitat is on low, rocky shores with steep or shelving subtidal zones where animals have easy access to the water.

Atlantic walruses feed mostly on benthic (bottom-living) prey at depths of 10m to 80m. Dives can last up to 24 minutes. They identify suitable prey using their sensitive whiskers, and bottom sediment patterns suggest that prey are identified by rooting with the snout and then excavated using jets of water from the mouth.

Although bivalve molluscs are the preferred prey, gastropod molluscs, sea cucumbers and sea urchins, polychaete worms, amphipod and isopod crustacea, brachiopods and priapulids have also been found in stomach contents. Over a 97-hr period a 1200 kg male Atlantic walrus dove 412 times and consumed an average of 53 bivalves per dive, equivalent to an intake of 57 kg wet weight of bivalve biomass per day. Walruses are also known to eat ringed and bearded seals, fishes and squids, and seabirds.

1.4.2 Ecological role

Atlantic walrus are an important predator of bottom invertebrates, particularly bivalve molluscs. The closely related Pacific subspecies, which is currently much more abundant than the Atlantic walrus (ca 200,000 individuals in the Bering Sea and adjacent areas), is considered to have a major role in the marine ecosystem, strongly influencing productivity and ecological function through predation on benthic invertebrates, disturbance to bottom sediments and facilitating flow of nutrients from the bottom to the water column (Ray et al. 2006). Nutrient flow from water in bottom sediments to the water column is estimated to be increased by two orders of magnitude by Pacific walruses.

It is not known whether competition for resources with other animals was a significant ecological factor historically.

1.4.3 Limiting factors

The low intrinsic capacity of the population to increase, mainly due to infrequent production of young (every three years), means that Atlantic walrus are particularly susceptible to additional mortality from human activities.

1.5 Threats

1.5.1 Description of potential threats

The principal threat to existing Atlantic walrus is human hunting. Hunting in the 17th and 18th centuries (for meat, oil and hides) was the cause of extirpation of the Northwest Atlantic population. However, this might not be an important potential threat to a re-established walrus population in southeastern Canada. Commercial harvesting of Atlantic walrus has been forbidden in Canada since 1928, and there was apparently no documented Aboriginal harvest in the past in southeastern Canada (COSEWIC 2006), although given the long time period since the population was extirpated, evidence may have been lost or not collected.

Human disturbances (noise from ship traffic and aircraft, oil and gas exploration, human settlements, and other human activities) could be potential threats to a re-established walrus population in southeastern Canada. Disturbances that cause walrus to leave their haul-outs may impact populations by causing stampedes (with associated juvenile mortality), interfering with feeding, increasing energy expenditures, masking communications, impairing thermoregulation and increasing stress levels. Oil spills would be a significant potential threat to walrus herds given their need for habitat near the water's edge.

Entanglement in fishing gear, particularly gillnets, would be a potential threat to a re-established walrus population in southeastern Canada. Fishing for prey species preferred by walrus, or disturbance to habitat of prey species from fishing, might also be potential threats. These would probably be of limited importance however, since there are currently no fisheries for molluscs (clams and scallops) which live within benthic sediments in subtidal areas at depths where walrus forage in Atlantic Canada at present. Of greater potential concern however may be the perception of walrus as competitors for fisheries and the circulation of nuisance seal permits.

Predation from polar bears and killer whales are known to occur on walrus in the north, probably mainly on young; however predation is probably limited given the protective behaviour of herds to their young and the large size of adults. Killer whale predation on individuals of the Northwest Atlantic population may have occurred historically, but the importance of this is unknown. Predation would probably not be a limiting factor for a re-established Northwest Atlantic population at present because killer whales are rarely observed in the Gulf of St Lawrence. However, killer whales are reported off Newfoundland and given possible climate related shifts in whale distribution, future abundance levels, and uncertainties with regards to the

numbers necessary to induce an important predation pressure on a walrus stock, the potential importance of killer whale predation on walrus cannot be dispelled.

The potential effects of climate change on walruses or the distribution of ice floes are likely limited. The impacts of warming or cooling temperatures on a re-established walrus population in southeastern Canada are difficult to predict, but could involve direct effects such as behavioural and physiological responses as well as indirect effects such as increased vulnerability to hunting and predation. Extreme summer temperatures could potentially become a limiting factor for haul-out occupancy in southern waters. That being said, the extirpated Northwest Atlantic population of walrus presumably was able to survive in the absence of ice for much of the year, since ice cover in its area of distribution was only present in winter.

2. RECOVERY FEASIBILITY

A self-sustaining population of Atlantic walrus exists in the eastern Arctic, adjacent to the historic range of the extirpated Northwest Atlantic population. Occasionally individuals, probably strays from the north, are observed in the historic range of the Northwest Atlantic population, but there has been no natural recovery of the southern population to date despite the cessation of the key threat (hunting) for over 200 years (COSEWIC 2006).

Accordingly, any attempts at recovery in the shorter term of this extirpated population would require the re-introduction of individuals from another area to establish a viable population.

The recovery of the extirpated Northwest Atlantic population of Atlantic walrus is not considered feasible at this time. Based on definition of the ‘extirpated’ designation of COSEWIC, this population is no longer found in the wild in Canada and consequently, any recovery would require the introduction of non-native individuals and an examination of the assessment criteria for considering these introduced individuals. Notwithstanding this administrative issue, an fulsome examination of feasibility consideration are presented in the following sections.

2.1 Availability of Individuals for Re-establishment

Recovery would require that individuals be available to support re-establishment of a viable population. Atlantic walrus populations in Canada were recently assessed in a single designable unit as “Special Concern” by the Committee on Status of Endangered Wildlife in Canada (COSEWIC 2006). Estimates of current abundance are imprecise, but available information suggests a total walrus population in northern Canada of the order of 10,000 individuals (COSEWIC 2006). Its ability to sustain current removals is questionable however and current harvest levels are poorly known. Recent average harvests may have been of the order of 560 individuals per year, levels which may not be sustainable in some areas or throughout the range (COSEWIC 2006).

If the criteria for subsequent assessment are considered, populations of less than 250 mature individuals are considered “endangered” under the risk assessment criteria used by COSEWIC

(COSEWIC 2004). Therefore, hypothetically, an introduction of well over 100 mature individuals, perhaps a minimum of 250, would be necessary to lay the basis for re-establishment of a population of Atlantic walrus in the Northwest Atlantic below the endangered risk threshold. Re-establishment over a period of time of the order of 5 years would allow individuals to build social interactions and perhaps establish a viable population. Under these assumptions, 20-50 individuals per year would have to be captured and transported to support a reintroduced population. While this level of removal in itself would not likely pose a conservation concern, addition of these removals to existing harvests would increase risk to the existing northern populations. Therefore it is uncertain that removals of individuals from the extant population for a re-introduction program would not jeopardize its status even if well managed. Furthermore, captures for re-establishment of a Northwest Atlantic population would have to be managed in concert with Aboriginal subsistence harvest. The species is important for Aboriginal subsistence and there are significant removals for that purpose. Aboriginal harvesting rights are assured by Canada's Constitution and by the Nunavut Land Claims Agreement, but conservation requirements take priority over Aboriginal harvesting rights.

Atlantic walrus is also found in west and east Greenland and western Russia, but conservation status of these populations is such as to make removals for re-introduction in southern Canada unlikely. The west Greenland population is considered depleted and declining and is subject to subsistence harvesting, the east Greenland population may be subject to unsustainable levels of subsistence harvesting, and information on the western Russian population is very uncertain (NAMMCO 2005).

2.2 Habitat Availability

Sufficient habitat would have to be available to support re-establishment of the Northwest Atlantic walrus population, or would have to be made available through habitat management or restoration. Suitable habitats, combining relatively shallow water with productive bottom invertebrate communities, probably exist in the Northwest Atlantic area historically inhabited by Atlantic walrus, given that there are relatively large areas of relatively undisturbed habitat in this region. However, human settlements and human activities are widely distributed in these historically inhabited areas, and disturbance from these would be an important potential habitat limiting factor.

Selection of sites for re-establishment would have to be done with considerable care. Areas with minimal human settlements (to minimize disturbance), minimal human activities (fishing, shipping, recreational activities in coastal areas), minimal fisheries for bottom invertebrates, and relatively unpolluted water (to minimize contamination from and mortality in bottom invertebrates) would be required for reintroduction of this species. Consideration might be given to sites within coastal protected areas, and measures to restrict interactions between humans and walruses would have to be included in any re-introduction initiative.

2.3 Potential to Mitigate Threats to Individuals and Habitat

The potential for significant threats to the species or its habitat to be mitigated or avoided must also be considered in assessing recovery feasibility. The existing legal provisions prohibiting the

harming of a listed extirpated species under the *Species at Risk Act* might provide a good basis for reducing threats to a re-introduced population to a minimum.

Harvesting is unlikely to be a serious threat in southern Canada, since the only harvests permitted on the extant eastern Arctic population are for Aboriginal subsistence; although it is not certain that Aboriginal rights to harvest would not be asserted, there appears to be no documented evidence of Aboriginal harvesting in the south. Cree in eastern James and Hudson Bay occasionally harvest walrus for dog meat (COSEWIC 2006), and it is possible that such use was historically made in southern Canada where walrus were found. Entanglement in fishing gear, as with whales and seals, is a potential threat which would have to be managed within any area of reintroduction of this species. Human disturbance could probably be minimized by selecting areas far from human settlements, or within established protected areas, for re-establishment.

Interactions with other species might potentially affect recovery, but the impact is impossible to assess. Predation would probably not be an issue, since even in the north predation is apparently rare and impact is reduced by herd behavior. Adequate abundance and productivity of prey species would be a critical factor to choosing a site for re-introduction.

2.4. Existence of Effective Recovery Techniques

Recovery techniques which have been proven effective would be required if this population were to be re-established. Transport of walrus by air is feasible, as has been shown by shipments of individual walrus between zoos and aquariums (Brookfield Zoo, n.d.). However, it seems unlikely that humane transport of the large numbers of walrus needed to re-establish a viable population would be feasible in the near-term, in light of the remoteness of the source areas, the size of mature animals, the numbers required, the large distances to be covered, as well as the uncertainties with survival through any potential relocation. Walrus are only found in remote areas of the north, far from normal air transport facilities, and the logistics of transporting live animals from these areas would be very difficult. In recent years walrus have become less abundant near population centers and are mainly found at some distance from settlements (COSEWIC 2006), further increasing the difficulties of humane live transport. Given the need to resettle walrus in areas of minimal human disturbance, it would be necessary to move walrus to remote areas in the historical range, further increasing complexity and distance of transport.

As indicated above, transport of 20-50 individuals per year would be required over 5 years or more to lay the basis for a re-established population. Each individual trip would require (a) live capture of a mature adult walrus in a remote Arctic area (b) holding in captivity pending transport (c) transport, probably by boat, to a local airport (d) transport by small aircraft (Twin Otter) from a local airport to Iqaluit or another airport capable of taking large aircraft (e) transport south by jet (f) transport to a large airport in the area of release (g) transport by small aircraft, vehicle or boat to the site of release. Efficiency might be increased by capturing and transporting several animals per trip. However, the logistics of such operations would be such as to make feasibility of large-scale reintroduction highly questionable.

Captive breeding is unlikely to be a viable option to support re-establishment. Although walrus can be kept in captivity; at present there are 25 individuals in 9 zoos in North America, births in

captivity are very rare (Indianapolis Zoo n.d.). Few young have been raised by their mothers in captivity, but hand-rearing by humans is possible using formulated feeds (COSEWIC 2006). Intrinsic rate of population increase for walrus in the wild would be around 5% per year based on estimates of sustainable harvesting rates and on information from species with similar reproductive characteristics (large whales). A rate of increase of 5% per year translates into a population doubling time of 14.4 years. Even beginning with a captive population of 10 individuals, 4 doublings (56 years) would be required to achieve numbers of the order needed to establish a viable population (160 individuals). Risks and uncertainties for this strategy would include questionable adaptability of captive bred individuals to wild conditions, the need for extensive facilities and personnel over a very long time period for keeping and rearing large numbers of captive individuals, and uncertainties about breeding success in captivity. The need to hand-rear young and to remove tusks in captivity would reduce adaptability to conditions in the wild, and rate of increase in captivity would probably be lower than that expected in the wild, increasing the time to produce the required numbers.

2.5 Recovery Feasibility Conclusion

Recovery of the extirpated Northwest Atlantic population of Atlantic walrus is considered neither biologically nor technically feasible at the present time. There are many uncertainties about whether a viable population would establish, even if (i) adequate numbers of individuals were available for re-introduction and (ii) interactions between walruses and humans could be managed in such a way as to ensure good habitat conditions for re-introduction. It is further uncertain as to how well individual walrus would adapt from northern conditions, where ice is available for much of the year, to an area where ice is only present in winter and only in part of the historical range. Choice of site(s) for re-establishment would be critical; although some characteristics of an ideal site can be identified (minimal human disturbance, abundant benthic mollusc populations at shallow depths, good coastal habitat for haul out), it would be impossible to guarantee success at any given site. Sea otters have been successfully re-introduced to areas from which they have been extirpated, but this is a species with a high intrinsic rate of increase, in contrast to walrus. Because of the low rate of increase of walrus, efforts to re-establish a Northwestern Atlantic population of Atlantic walrus would have to be continued over at least a decade, and determining whether re-establishment was successful might well require several decades.

The biological feasibility of recovery associated with the availability of the numbers of individuals needed to re-establish a population is not certain: extant populations are at low levels, and Aboriginal subsistence harvest is a high priority in managing these populations. Although re-introduction might be considered a conservation issue, the risks and uncertainties surrounding the potential success of re-introduction in the south might make it difficult to argue that capture for re-introduction was a higher priority than harvest for Aboriginal subsistence. Technical feasibility of transporting the large numbers of walruses needed to support re-establishment of a viable population is doubtful, given the many transport steps required between the remote northern areas from which mature live animals could be obtained and of the remote southern resettlement site. The potential cost and logistics associated with a large recovery effort combined with uncertainties regarding survival through any relocation as well as the success of any re-establishment support the conclusion that recovery is not feasible at this time.

3. CRITICAL HABITAT

3.1 Identification of the Species' Critical Habitat

The extirpation of this population and lack of information on historical ecology or habitat use of the Northwest Atlantic population of Atlantic walrus, makes it impossible to identify critical habitat for this population at this time.

4. CONSERVATION APPROACH

Although recovery is deemed not feasible at this time, there is a very slight possibility that natural recovery based on migrants from the extant eastern Arctic population could occur. Individuals observed in eastern Canadian waters, probably strays from the eastern Arctic population, have not supported natural recovery to date, and given the apparently reduced status of the eastern Arctic population adequate out-migration to support recovery of a southern population appears unlikely, but the possibility does exist. Effective conservation action for the eastern Arctic population would be critical to maximizing the potential for re-establishment of the Northwest Atlantic population from migrants.

Since the Northwest Atlantic population of Atlantic walrus is listed as “extirpated” on Schedule 1 of the *Species at Risk Act*, killing or harming individuals of this population is forbidden. These SARA prohibitions would support natural recovery of this population.

Conservation action to maintain health of coastal and marine environments in eastern Canada would help to provide conditions for recovery of Northwest Atlantic walrus, should natural migration be adequate to support this.

Whether this population does re-establish or not, it is still possible and important to educate Canadians about the species that we have lost, such as the Atlantic walrus (Northwest Atlantic population).

5. REFERENCES

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Note: information from the 2000 assessment (COSEWIC in press) is used with respect to the extirpation of the northwest Atlantic population. Information from that report and from COSEWIC 2006 is used regarding biology and population dynamics of the species. Where the two reports differ on biological matters, more weight has been given to COSEWIC (2006) which includes the most recent information on species biology.