CANADIAN MANAGEMENT PLAN

for the

IVORY GULL
(*Pagophila eburnea*)

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Disclaimer

This management plan was written when the species was assessed as special concern by COSEWIC. This document is considered by Environment Canada as a technical document that would support the drafting of a recovery strategy should the species be updated on the List of Wildlife Species at Risk by the federal government. Consultations with Wildlife Management Boards have not yet taken place.

This management plan does not necessarily represent either the official positions of agencies or the views of individuals that were involved in its preparation. The recovery goal and objectives are based on the best existing data and are subject to modification resulting from new information. The working group recognizes that the implementation of the plan, and recovery activities in general, will be subject to the priorities and budgetary constraints of the participating jurisdictions and organizations.

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Species Information

Common name: Ivory Gull

Scientific name: *Pagophila eburnea*

Current status: Special Concern

Date of assessment: November 2001

Reason for designation: Relatively rare species with few breeding colonies, potential threats from human disturbance and oil spills.

Occurrence: YT, NT, NU, NL

Status history: Designated a species of Special Concern in 1979 (MacDonald & Cooper 1979). Status re-examined and confirmed in April 1996, and again in November 2001, based on an updated status report (Alvo & MacDonald 1995).

Executive Summary

The Ivory Gull (*Pagophila eburnea*) is a medium-sized gull that breeds in the High Arctic, and is the sole representative of its genus. It is pelagic for much of the year, wintering in cold northern waters, and is associated with pack ice year round. It is currently listed as a species of *Special Concern* under the federal Species at Risk Act (SARA). However, recent breeding colony surveys suggest that Ivory Gulls have declined by up to 85 % in Canada since the 1980s.

While little is known about the anthropogenic activities that may affect Ivory Gulls in Canada, potential threats that may be contributing to mortality include hunting, disturbance, habitat degradation, and oiling. However, identifying and addressing potential threats is extremely difficult, due to the lack of information on the species' breeding biology, winter ecology, life history and behaviour, as well as a lack of information on the extent of the threats themselves.

The management plan outlines specific measures that can be taken to increase knowledge and promote the recovery of Ivory Gulls in Canada. The long-term recovery goal is to restore "*the Canadian breeding population to historic levels and to expand the breeding range to historically occupied areas*". The objectives aim to:

1) maintain Ivory gull colonies currently in existence and prevent further loss,
2) identify and understand the threats to Ivory Gulls in Canada, with a focus on anthropogenic activities,
3) acquire further knowledge to understand the life history characteristics of the species,
4) identify and protect critical habitat,
5) educate stakeholders and the general public on ways to support recovery, and
6) work collaboratively at an international level to further recovery.

A major challenge in the recovery of Ivory Gulls is the scarcity of information regarding the species' general ecology. As additional information is collected, however, the goals and objectives of the plan will be adapted and improved, and the potential to achieve the recovery of the species in Canada will be increasingly enhanced.

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I. BACKGROUND

1. Description

Phylogeny

The Ivory Gull (*Pagophila eburnea*) is considered phylogenetically distinct, and is the only representative of its genus. Recent phylogenetic analysis based on mitochondrial DNA, has provided strong evidence that the Ivory Gull is a sister taxa to the Sabine's Gull (*Xema sabini*: Crochet *et al*. 2000). These species are estimated to have diverged early, some 2 million years ago, compared with most other gull groupings, which are estimated to have diverged in the last million years (Crochet *et al*. 2000). Differentiation between the Ivory Gull and Sabine's Gull is thought to have taken place within the Arctic, rather than these species independently colonizing the far north (Crochet *et al*. 2000).

Physical Description

The Ivory Gull is a medium-sized gull, approximately 10% larger and longer-winged than the Black-legged Kittiwake (*Rissa tridactyla*; (Cramp & Simmons 1983). It is distinctive at all ages, but is particularly striking in its pure white adult plumage. Immature birds have a dusky face, and black spots on the breast and flanks, tips of the primaries, and tail and outer wing coverts (Grant 1986), although the extent of speckling is highly variable among individuals. The eye is dark, giving the bird a gentle expression (Cramp & Simmons 1983). It exhibits a short period of immaturity for a gull of its size, acquiring adult plumage in its second winter. In adults, the bill is generally slate blue at the base, becoming pale yellow and tipped with red, but is darker in juveniles. The Ivory Gull has relatively short legs, which are black at all ages. Its round chest, short legs, and rolling gait give it a pigeon-like appearance when on the ground. However, although it is a stocky built bird, in the air it has a graceful and agile flight. Overall, the sexes are similar in appearance, and, once they reach maturity, there is little or no seasonal variation in characteristics.

Distribution

The Ivory Gull has a circumpolar but patchy breeding distribution across the High Arctic, with small, scattered colonies in North America, Greenland, Spitzbergen, and the northern islands and archipelagos of Russia (Fig. 1).

In Canada, it breeds exclusively in Nunavut, concentrated around the Jones and Lancaster sounds, with colonies on southeastern Ellesmere Island, eastern Devon Island, and the Brodeur Peninsula of northern Baffin Island. One outlying colony exists further west on Seymour Island, off the northern coast of Bathurst Island. This species winters among the pack ice of the Davis Strait, Labrador Sea, Strait of Belle Isle, and northern Gulf of St. Lawrence. It is occasionally seen

ashore along east coast of Newfoundland and Labrador, particularly the Northern Peninsula of Newfoundland, and on the Lower North Shore of Québec.

The eastern Canadian Arctic represents 100 % of the North American breeding range, and approximately 25 % of the global breeding range and unknown but possibly a very high (up to 100%) proportion of the global wintering range (Orr and Parsons 1982).

The North American distribution appears to have been shrinking since late 1800s (Haney & MacDonald 1995). The Canadian breeding range has certainly contracted since the 1980s. Only one active colony now exists north of Makinson Inlet on Ellesmere Island. Considerably fewer colonies now exist on the western side of the Brodeur Peninsula, Baffin Island, with none in the area of Jackson Inlet, which supported three known colonies in the past (Gilchrist & Mallory 2004).

Abundance

The global population of Ivory Gulls has been estimated at around 14,000 breeding pairs (Volkov & de Korte 1996). However, this figure incorrectly included 2,400 *pairs* estimated to be breeding in Canada in the 1980s, when the original estimate was in fact 2,400 *individuals* (1,200 pairs; Thomas & MacDonald 1987). This global estimate also admittedly included a likely over-optimistic estimate for the Russian population (~10,000 pairs; Volkov & de Korte 1996).

The global population trend is unknown. Long-term declines have been suggested for various parts of the breeding range (Bateson & Plowright 1959, Cramp & Simmons 1983, Glutz von Blotzheim & Bauer 1982, Haney 1993), but only well documented in Spitzbergen (Bateson & Plowright 1959, Birkenmajer 1969).

The Canadian Arctic was thought to support 20-30% of the entire global breeding population, and to represent colonies of continental and global importance (Gaston 1991). However, aerial surveys carried out in 2002 and 2003 indicate that the Canadian breeding population has declined by 80-85% since the early 1980s (Gilchrist & Mallory 2004), one of the greatest population declines detected for a bird species in North America.

Ivory Gulls are also known to winter in Canadian waters, although the percentage of the global population to do so is unknown. A single study in the late 1970s, based on aerial transects in the Davis Strait and Labrador Sea in March 1978, estimated approximately 35,000 individuals in that region (Orr & Parsons 1982). If that estimate is accurate, it suggests that Canada is responsible for a large proportion of the global population throughout the year.

Biologically limiting factors

Ivory Gulls have a relatively low adult survival rate compared with other gulls (0.86; Stenhouse *et al*. 2004), and are likely to experience high post-fledging mortality (Haney & MacDonald 1995).

Like most seabird species, Ivory Gulls display a delayed maturity, and presumably do not breed until they are 2-3 years old, although there is little to no data available (Haney & MacDonald 1995). They also show a relatively low productivity rate, with a clutch size of 1 or 2, compared with the more usual 3-egg clutch seen in most other gulls. Mean clutch sizes are also known to be lower during years when there is less pack ice near colonies (Dalgety 1932).

Breeding success is limited, due to the extreme and variable nature of their breeding environment. In some years, Ivory Gull colonies fail to produce any young, and in years when conditions are completely unsuitable they may be forced to forego breeding altogether (MacDonald 1976).

Socio-economic considerations

The Ivory Gull was traditionally hunted for food in both breeding and wintering areas. However, due to their relatively small numbers and unpredictable presence, harvest of this species was probably always rather opportunistic in nature and it is unlikely that they ever provided a major food source for subsistence hunters.

The existence of the Ivory Gull in Canada has no monetary value, and its worth is principally derived from an aesthetic standpoint and in its contribution to biodiversity. The Inuit regard this species with great affection, and appear to consider its decline in Canada as an ominous indicator of a greater systemic ill in the northern environment.

Legal Protection

The Ivory Gull is a non-game species, and as such is protected in Canada under the Migratory Birds Convention Act (1994) and Regulations.

It has been protected in West Greenland since 1977 under the Local government order of 21st December on bird hunting in West Greenland (Landsraadsvedtaegt af 21. december 1977 om jagt paa fugle i Vestgroeland). In 1988, hunting regulations were revised and applied to all of Greenland, under the Greenland Home Rule order of 5th May 1988 on protection of birds in Greenland (Hjemmestyrets bekendtgoerelse af 5. maj 1988 om fredning af fugle i Groenland; D. Boertmann, pers. comm.).

The Ivory Gull is on the Norwegian Red List, in the category DM, which stands for 'declining, monitoring' (Directorate for Nature Management 1999). In Svalbard, it has been protected since 1978, under the Svalbard Environmental Protection Act (H Strøm, pers. comm.).

In Russia, it is registered as a Category 3 (Rare) species in the Red Data Book of the former USSR (Haney 1993).

The provincial government of Newfoundland and Labrador adopted the COSEWIC designation of *Vulnerable* in August 2002, so Ivory Gulls are also protected under their provincial *Endangered Species Act*. The territorial government of Nunavut has listed the Ivory Gull as *May Be At Risk* (Department of Sustainable Development 2001).

2. Threats

Currently, the hunting of birds on migration is negatively affecting survival and possibly population viability (Stenhouse *et al*. 2004). Human disturbance at breeding colonies may have a considerable effect. In addition to reducing reproductive success, via disturbance, human activities in the vicinity of a colony may play a significant role in habitat degradation. Resource extraction in the extreme climate and topography of Ivory Gull breeding areas requires considerable flying time and use of ATVs, which introduces noise and pollution. The presence of semi-permanent drilling camps may attract predators to otherwise remote areas.

However, there are several other possible factors influencing the potential for recovery in Ivory Gulls, for which there is no current data, including: 1) ecological perturbation, such as changes in the extent of ice cover causing degradation of winter habitat, 2) exposure to toxic pollutants in the marine environment, and 3) vulnerability to oiling.

3. Critical Habitat

Although there is no provision under the Species at Risk Act for the protection of critical habitat for Species of Special Concern, the precipitous decrease in North American Ivory Gull populations suggests that strong efforts should be made to identify and protect habitat necessary for the conservation and recovery of this species. At this time, there is a great need for information that will allow the identification of critical habitat. Although it may be possible to assess habitat characteristics remotely, via satellite imagery, confirmation of the details will require preliminary mapping and on-the-ground survey work.

Ivory Gulls have been found to nest in only four well-defined regions of the Canadian Arctic: 1) cliffs on south east Ellesmere Island, 2) cliffs on east Devon

Island, 3) flat ground on Cornwallis Island and the Brodeur Peninsula of Baffin Island and, 4) on Seymour Island, a small offshore island. The currently known Canadian breeding colonies of Ivory Gulls are listed in Tables 1 and 2 and should be designated critical habitat (see also Figure 1). Areas of similar geomorphology that are proximate to open water should be searched for breeding Ivory Gulls and possible inclusion as critical habitat (such as the eastern region of Somerset Island, west Devon Island, the southeastern interior of Cornwallis Island which have geologies similar to the Brodeur Peninsula and the nunataks between Talbot Inlet and Alexander Fiord on Ellesmere Island which shows a similar geology to the rest of southeastern Ellesmere Island).

The general wintering habitat used by Ivory Gulls along the ice edges of Davis Strait and the Labrador Sea is broadly know, but specific habitat requirements during the non-breeding season are not known. As such, more work on wintering habitat requirements and selection would be needed before critical habitat designation could be made for non-breeding habitat.

II. RECOVERY

4. Recovery Feasibility

As outlined throughout this document, detailed information on the Ivory Gull is scarce. However, the recovery goals and objectives, and the strategies for achieving them, laid out in the Canadian Ivory Gull Management Plan are based on all information currently available. As such, this document takes advantage of new information and provides an update to the 2001 COSEWIC Status Report for the Ivory Gull.

The management plan sets goals and objectives that are expected to contribute to the recovery of the Ivory Gull population in Canada and fulfills the legislative requirements outlined in the Species at Risk Act (SARA) for the development of Management Plans for Species of Special Concern (Sections 65-72). Currently, however, there is too little information on population growth rates available to know if this is achievable within the timeframe recommended, and this should be considered a preliminary assessment to be reviewed and revised as necessary.

The main challenges to the recovery process are:

1) the current lack of information on demographic parameters and life-history traits,

2) the expense of initiating research on these topics, and the time required to gain this information,

3) conflict between industrial development (i.e. mining) and the need to protect colonies from disturbance, particularly on the Brodeur Peninsula, and

4) the ethical and public relations challenges of predator control, should that be deemed necessary.

5. Recovery Goal, Objectives and Corresponding Activities

a) Recovery Goal

The primary objective of the Ivory Gull Management plan is the recovery of the Canadian breeding population to historic levels, and to expand the breeding range to historically occupied areas.

The specific goal of the plan is the recovery of the Canadian breeding population to ~1,000 breeding pairs in at least 4 regional breeding areas distributed across the known historic range in Canada (Ellesmere Island, Devon Island, Seymour Island, and the Brodeur Peninsula on Baffin Island) by 2014.

b) Recovery Objectives

By 2009, the objectives are to:

- **Objective 1:** Prevent further loss. *Maintain Ivory Gull colonies and numbers currently in existence in Canada*.

- **Objective 2:** Understand threats. *Identify and understand anthropogenic threats to Ivory Gulls in Canada*.

- **Objective 3:** Understand life history. *Initiate research and monitoring aimed at filling knowledge gaps concerning Ivory Gulls in Canada*.

- **Objective 4:** Protect habitat. *Identify characteristics of critical habitat and protect habitat from alteration and disturbance*.

- **Objective 5:** Initiate public outreach. *Develop and implement activities that support Ivory Gull recovery in Canada*.

- **Objective 6:** Encourage international cooperation. *Develop and facilitate international initiatives contributing to the recovery of Ivory Gulls*.

c) Broad Strategy to be Taken

Objective 1: Prevent further loss. *Maintain colonies and numbers currently in existence*.

Rationale: If the current decline in the Canadian Breeding population (85% since the 1980s) is allowed to continue, the Ivory Gull may be extirpated in Canada

before recovery can be achieved. The existing colonies, particularly Seymour Island, must be maintained in order to provide recovery source.

Strategies:

a) minimize risk of further decline by providing legislative protection for main breeding areas.

b) enforce legal protection in Canada and promote increased awareness in Greenland to eliminate mortality due to hunting, particularly for birds passing through northwest Greenland.

c) introduce predator control at Seymour Island, if deemed necessary.

d) monitor Canadian breeding population size, distribution and movements, by continuing breeding colony surveys and initiating banding programme(s).

Objective 2: Understand threats. *Identify and understand anthropogenic threats to Ivory Gulls in Canada*.

Rationale: currently little or no information exists on anthropogenic threats to breeding sites, migration routes or wintering areas. This information is urgently required to design and implement mitigative measures and population recovery.

Strategies:

a) identify potential threats and, based on any existing data, evaluate their impacts on survival and recovery.

b) quantify threat posed to Canadian population by hunting, particularly in northwest Greenland, through banding studies.

c) quantify threat(s) posed by pollution by measuring toxin loads in Canadian breeding population.

d) quantify anthropogenic sources of disturbance at Canadian breeding colonies.

Objective 3: Understand life history. *Initiate research and monitoring aimed at filling knowledge gaps concerning Ivory Gulls in Canada*.

Rationale: The current level of knowledge regarding the reproductive biology and ecology of Ivory Gulls throughout their range is very poor, and limits effective recovery efforts in Canada.

Strategies:

a) synthesize existing information from previous research and monitoring undertaken in Canada, and throughout the range of the Ivory Gull.

b) assess population status and reproductive success through demographic studies at colonies in Canada, likely most feasible at Seymour Island and the Brodeur peninsula.

c) build a population model, based on current life history information from the Canadian breeding population.

d) clarify links between Canadian and Greenlandic populations and identify management units through banding and population genetics study.

Objective 4: Protect habitat. *Identify characteristics of critical habitat and protect habitat from disturbance*.

Rationale: At present, little information exists on the breeding and wintering habitats of Ivory Gulls, and this lack of information limits the ability to protect critical habitat.

Strategies:

a) undertake research to identify the characteristics of habitat(s) used by Ivory Gulls during breeding and at-sea/wintering in Canada.

b) assess the extent of critical habitat in Canada.

Objective 5: Initiate public outreach. *Develop and implement activities that support Ivory Gull recovery in Canada*.

Rationale: Education of general public and communication with stakeholders could help to further recovery efforts, and may improve the health of the marine environment in general.

Strategies:

a) document aboriginal and traditional ecological knowledge of Ivory Gulls in Canada.

b) identify target groups and develop resources (e.g. pamphlets, posters, etc.) to educate stakeholders about their role in Ivory Gull conservation.

c) engage Greenlandic government to develop similar resources.

Objective 6: Encourage international cooperation. *Develop and facilitate international initiatives contributing to the recovery of Ivory Gulls*.

Rationale: Canada has the opportunity to play a leading role in the conservation of the Ivory Gull throughout its range. Canadian agencies should encourage recovery and education activities in other countries, especially Greenland.

Strategies:

a) alert other nations to the decline in Ivory Gulls in Canada.

b) encourage international cooperation in the conservation of Ivory Gulls throughout their range.

c) collaborate with researchers in other countries to obtain information on the status and demography of Ivory Gulls in their jurisdictions.

d) Research and Management Activities Needed to Meet Objectives

Monitor Population Size, Distribution, and Movement

Ivory Gulls are notoriously difficult to census, as colonies are known to move around from year to year, and birds may forego breeding in some years due to extreme environmental conditions (Haney & MacDonald 1995). Until recently, no population trend information existed for this species in Canada. Since 2002, however, comprehensive aerial surveys have been carried out in and around previously known breeding areas. The results suggest a drastic decline in the Canadian breeding population of up to 85% since the early 1980s (Gilchrist & Mallory 2004). However, annual aerial surveys of breeding colonies must be continued, at least for the foreseeable future, in order to accurately assess the Canadian breeding population and to evaluate the effect of recovery measures.

A standardized protocol for dedicated Ivory Gull aerial surveys should be formalized, such that it can be distributed and used across the species global range. Aerial surveys initiated in Canada in 2002, must be continued annually for the foreseeable future to fully assess the extent of the population decline.

A banding programme should be initiated for the Canadian breeding population, to band adults and young. This could only be carried out at the most accessible colony sites, particularly Seymour Island and the Brodeur Peninsula on Baffin Island. A number of birds were banded at these sites in the 1970s and early 1980s, and repeating this work could provide valuable information on long-term changes in the population.

In the past, wintering and migrating Ivory Gulls were also banded at community refuse dumps in the Canadian High Arctic, but few birds are now seen at these sites (Mallory *et al*. 2003, Stenhouse *et al*. 2004). However, wintering birds could be surveyed and banded at the ice front between Canada and Greenland in conjunction with other government agencies. For example, the Department of Fisheries and Oceans carries out surveys of marine mammals (particularly seals) in the same region of the northwest Atlantic in which a large proportion of the global population of Ivory Gulls is thought to winter.

Demographic Parameters

There is an urgent need to quantify demographic parameters, without which it is extremely difficult to assess the potential for recovery in this species. Long-term colony studies must be carried out to quantify nest numbers, clutch sizes, fledging success, and the extent of annual variation in these. In addition, it will be important to estimate the extent of philopatry exhibited, age at first breeding, intervals between breeding attempts, and lifetime reproductive success.

A recent capture-mark-recapture analysis, based on recoveries of birds banded in Nunavut, mainly in the 1970s and early 1980s, provides an initial adult survival rate (0.86; Stenhouse *et al*. 2004). However, it is recognized that this study is based on a sparse data set, and as such provides only a preliminary estimate, which should be increasingly refined as further information becomes available.

Illegal Hunting

Recent analysis of banding recoveries shows that Ivory Gulls are still at risk of mortality due to hunting. Of over 1500 birds banded in Nunavut in the 1970s and early 80s, 26 have been recovered (Stenhouse *et al*. 2004). Most of those recovered were shot in northwest Greenland (n = 17) and a few were shot in Canada (n = 5), despite being legally protected in both these countries (Stenhouse *et al*. 2004). (Note that Inuit currently have the right to harvest these birds in Nunavut pursuant to harvest rights guaranteed in the Nunavut Land Claim Agreement, but these gulls are taken incidentally and not actively pursued).

Given the small size of the Canadian breeding population of Ivory Gulls, and the recently documented decline in that population (Gilchrist & Mallory 2004), it is critical that both the Greenland and the Canadian governments take steps to eliminate mortality due to hunting. If this proves to be significant, the Canadian federal government and the Greenland government should take steps to target appropriate hunting and law enforcement groups for stewardship and education.

Predation

Arctic foxes (*Alopex lagopus*) are well-known nest predators, and can wipe out entire Ivory Gull breeding colonies in some years (Zubakin 1984). Polar bears (*Ursus maritimus*) will take eggs and young on occasion (Haney & MacDonald 1995). Therefore, quantifying predation and the extent of variation between years is a research priority. If predation is shown to be extensive, careful predator control may be deemed necessary at specific colony locations.

Feeding Ecology

Like most gulls, the Ivory Gull is an opportunistic feeder. At sea, it is a surface-feeder, foraging primarily on small fish, such as lantern-fish (*Myctophidae*) and juvenile Arctic cod (*Boreogadus saida*), and macro-zooplankton, such as amphipods and euphausiids (Haney & MacDonald 1995). Pellets found near nests and containing small bones and hair, suggest that, at least during breeding, they catch small mammals (Bent 1921).

Ivory Gulls are also keen scavengers at times, especially of marine mammals killed by large predators, and are strongly attracted to blood on the ice. They are also reported to forage on marine mammal faeces and placentae (Haney & MacDonald 1995), and, in doing so, are potentially subject to high toxin loading. However, their interest in scavenging may be influenced by a temporary lack of available open water in which to feed (Stishov *et al*. 1991).

Monitoring food provisioning rates and identifying prey items fed to chicks may help to establish whether there has been a change in the availability or abundance of prey during breeding, which may be associated with changes in ice distribution.

Colony Disturbance

Remoteness and inaccessibility of breeding locations limits the number of direct risks from human disturbance. However, there is evidence that Ivory Gull colonies are easily disturbed, particularly by low flying aircraft, ground traffic, or careless human activity in or near the colony (MacDonald & Cooper 1979). Disturbances of this nature may cause abandonment of breeding in a given year or even abandonment of the colony altogether (Haney & MacDonald 1995).

In recent years, much of the Canadian Arctic has become more and more accessible and the potential for disturbance at colonies has no doubt increased. Thus, it is extremely important to identify potential sources of disturbance at colonies, and to quantify their effects on breeding success. This is particularly relevant on the Brodeur Peninsula, where mining exploration has increased dramatically.

Habitat Mapping

Like other seabirds breeding in the Arctic, Ivory Gulls have simple but critical habitat requirements. Specifically, they require breeding sites that are safe from terrestrial predators, but within close proximity to open water early in the breeding season. These limitations restrict the possible range of breeders in the Canadian Arctic, much more so than was perhaps originally thought (Gilchrist & Stenhouse, *in prep*).

In order to protect nesting habitat, both current and potential nesting habitat must first be determined. Foraging habitat and wintering areas are only loosely known and must also be clearly identified. This could employ aerial or satellite images and ground-truthing at colony locations.

Habitat Protection

The cliff colonies of Ellesmere and Devon Islands probably remain fairly protected due to their extreme inaccessibility; however, the Brodeur Peninsula on Northern Baffin Island is under increasing pressure. This is due to an increase in mineral exploration and mining activities in that region, but uncontrolled tourism may also cause unintentional disturbance at some breeding locations.

At present, Seymour Island is the only colony with any legislative protection and was designated as a Migratory Bird Sanctuary in 1975, based solely on the existence of a large Ivory Gull colony (MacDonald & Cooper 1979). Habitat protection should be explored for other areas under threat, particularly the Brodeur Peninsula, where construction (including buildings, gravel pads, roads, and airstrips) and related activities (including low level flying, and use of ATVs) should not be permitted near Ivory Gull colonies (i.e. within 10 km). In order to achieve such protection, all stakeholders must be identified, made aware of the situation, and involved in the development of mitigative measures; relevant mechanisms available through provincial/territorial legislations to protect these areas should be explored.

Public Outreach

In order to reduce mortality and prevent colony abandonment, it is critical to raise the public profile of this species and highlight the impacts of hunting and disturbance. An education outreach programme should be initiated to improve understanding of the situation among relevant stakeholders and the general public.

The development of a pamphlet and poster aimed initially at Canadian and Greenlandic hunters should be a priority. This would be specifically designed to draw attention to the population decline and reiterate legislative regulations in both countries. As a matter of course, this would require discussion and consultation with the Greenland government.

Education materials should be written in Inuktitut and Danish, as well as the usual English and French, in the first instance. However, these materials could be expanded to reach other regions through collaboration with members of the CAFF Circumpolar Seabird Group. This has been done for education materials on the Thick-billed Murre and Common Eider, where a basic poster design was provided to each political unit, which then translated the text into the appropriate language to reach the relevant audience(s) in their region.

Genetics

Ivory Gulls from the Canadian Arctic and Greenland, and perhaps much further afield, are known to winter at the ice front in the Davis Strait and Labrador Sea (Orr & Parsons 1982, Renaud & MacLaren 1982). Thus, a large percentage of the global population may be wintering in Canadian waters, and a single catastrophic event or ecological change in this region could seriously affect the entire world population. Consequently, it is necessary to identify the breeding colony source(s) of birds wintering in Canada.

Blood samples from birds caught and banded in Canadian colonies and throughout their breeding range, along with tissue samples from museum skins, whose precise capture locations are known, would allow the first genetic analysis of population structure for this species and identification of management units. Furthermore, the development of molecular markers for particular breeding populations would also allow wintering birds to be 'sourced'.

This will involve partnering with a genetics laboratory with experience in wildlife population studies. There are several laboratories in Canada and worldwide that already have considerable experience of working on the genetic relationships within seabird families (see Friesen *et al*. 1996, Crochet *et al*. 2000) and in the population structuring within specific seabird species (see Birt-Friesen *et al*. 1992).

Contaminants

The bioaccumulation of toxins is known to affect surface-feeding birds and other Arctic species, particularly animals at the top of the food web, such as fish-eating birds and marine mammals (Braune *et al*. 1999, Muir *et al*. 1999, Fisk *et al*. 2003, Buckman *et al*. 2004). High levels of toxic compounds, such as PCBs, DDE, dioxins, and mercury, can cause abnormal behaviour in adult birds, deformities and reduced growth in young birds, and/or embryo toxicity in eggs (Hoffman *et al*. 2003).

As yet, it is unclear if contaminants have played a part in the recent breeding population decline in Canada. However, given the potential for bioaccumulation in Ivory Gulls, it is necessary to determine the extent to which heavy metals and organic compounds may be influencing the Canadian breeding population.

Blood and feather samples could be easily collected whenever birds are handled for banding. Eggs which fail to hatch should also be collected whenever possible. The Canadian Wildlife Service's Wildlife Toxicology Division at the National Wildlife Research Centre, Ottawa, is willing to carry out appropriate chemical analyses and to archive tissue samples in their specimen bank.

e) Effects on Non-Target Species

There are likely few, if any, potential impacts of recovery on other species, as Ivory Gulls do not strongly associate with any other species.

Should it be deemed necessary, some form of predator control, such as the discouragement or removal of Arctic foxes early in the breeding season, may be necessary to enhance reproductive success at some colony locations. However, given their abundance and wide distribution, this is unlikely to affect Arctic fox populations to any measurable degree.

f) Evaluation

Meaningful performance indicators are expected to develop with the acquisition of critical information on Ivory Gull ecology and demography. However, it is important to 'build in' performance indicators of recovery from the outset i.e. to match each recovery objective with a specific performance indicator or indicators.

Initially, population surveys in breeding and wintering areas will be critical to the assessment of recovery measures. Without an accurate picture of the number of Ivory Gulls in Canada, and their population trend, the success or failure of specific recovery measures will be completely unknown.

An important measure of overall performance is the publication of new information in peer-reviewed scientific journals. Not only does this give the entire species recovery process a scientific legitimacy, and provide evidence of the advancement of knowledge, it also shows a willingness to share new information with researchers around the world and fosters cooperation between individuals and nations.

6. Knowledge Gaps

The current knowledge of Ivory Gull ecology in Canada, and worldwide, is sadly lacking, and acutely insufficient to accurately define recovery objectives and approaches. Information is required on almost all aspects of their breeding and wintering ecology, especially details of breeding productivity, identification of critical habitat and potential threats.

7. Timeline for Action Plans

An aerial survey of Ivory Gull colonies was initiated in Canada in 2002. This must be continued annually, at least for the foreseeable future, to assess the full extent and progress of the current population trend.

A study of local ecological knowledge, carried out in Nunavut, provided important information on Ivory Gull populations (Mallory *et al*. 2003). A comparative study is currently underway in Newfoundland and Labrador (P. Ryan, pers. comm.). A similar study should be carried out along the Lower North Shore of Québec, to assess potential changes in numbers across a broader area.

Consultations with other jurisdictions, particularly provincial and territorial government agencies, but also international governments, on the subject of Ivory Gulls were initiated in 2002 and 2003. This effort must be continued to establish a strong collaborative approach to species recovery.

Collaborative decision-making and planning will be essential to an efficient and successful recovery programme. Given the opportunities for collaborative efforts, lines of communication with other governmental departments, particularly the Department of Fisheries and Oceans, need to be kept open and the existing links strengthened.

A dedicated and collaborative field research programme will provide critical information on mortality, productivity, and movements, as well as the opportunity to band birds and sample blood and feathers. This should be initiated at the earliest possible date, which would be the breeding season (July-August) of 2004.

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Table 1. Number of Ivory Gulls present at historically known colonies (data from Gilchrist and Mallory 2004).

General Location	Latitude	Longitude	# colonies considered	Year of Historical survey	Previous # Birds	2002 # Birds	2003 # Birds	Historical data source
ELLESMERE ISLAND								
Sydkap Glacier	76º 23'	84º 58'	1	1982	275-300	0	0	Thomas and MacDonald 1987
Mansen Ice Field	76º 56.135'	80º 31.002'	1	1977	60	0	0	Frisch and Morgan 1979
Mansen Ice Field	76º 55'	79º 58'	1	1977	15	0	.	Frisch and Morgan 1979
Smith Bay	77º 9.5'	79º 20'	1	1977	50	0	5	Frisch and Morgan 1979
Matkinson Inlet	77º 27'	79º 14'	1	1977	50	0	0	Frisch and Morgan 1979
Talbot Inlet north	78º 50'	78º 11'	1	1977	30	0	0	Frisch and Morgan 1979
Mansen Ice Field	77º 1.463'	80º 34.482'	1	1990	24	0	0	France and Sharp 1992
Mansen Ice Field	76º 48'	79º 55'	1	1990	28	0	0	France and Sharp 1992
Mansen Ice Field	76º 51.79'	79º 44.837'	1	1990	20	5	0	France and Sharp 1992
Mansen Ice Field	76º 46.117'	79º 53.242'	1	1990	28	0	0	France and Sharp 1992
Mansen Ice Field	76º 47.5'	80º 25'	1	1990	70	0	0	France and Sharp 1992
Mansen Ice Field	76º 48.223'	80º 15.645'	1	1990	90	6	0	France and Sharp 1992
Mansen Ice Field	76º 42.57'	80º 7.75'	1	1990	70	10	0	France and Sharp 1992
Makinson Inlet and Smith Bay	.	.	14	1981-83	730-830	.	.	Thomas and MacDonald 1987
BAFFIN ISLAND								
Brodeur Peninsula, south of Cape York	.	.	10	1982-83	560-580	0	0	Thomas and MacDonald 1987
DEVON ISLAND								
Belcher Glacier	75º 28.120'	81º 22.103'	1	1981	25	0	0	Frisch 1983
Raper Point	75º 20.447'	80º 44.663'	1	1981	30	6	0	Frisch 1983
Bethune Inlet	74º 57.185'	81º 0.043'	1	1981	30	0	0	Frisch 1983
Bethune Inlet	74º 46.300'	80º 42'	1	1981	6	.	.	Frisch 1983
SEYMOUR ISLAND								
Seymour Island	76º 48'	101 º16'	1	1974	340	0	200	MacDonald 1976

Table 2. Number of Ivory Gulls present at colonies discovered in 2001-2003 (data from Gilchrist and Mallory 2004).

Location	Latitude (ºN)	Longitude (ºW)	# Birds 2001	# Birds 2002	# Birds 2003	Colony Type
Ellesmere Island	77º 11.052'	79º 35.459'	.	4	0	Eroded Cliff
Ellesmere Island	76º 49.677'	79º 50.855'	.	19	3	Sheer Spire
Ellesmere Island	76º 49.3'	79º 50.250'	.	20	0	Sheer Spire
Ellesmere Island	76º 46.117'	79º 53.242'	.	1	0	Sheer Spire
Ellesmere Island	76º 43.79'	79º 53.969'	.	2	1	Sheer Spire
Ellesmere Island	76º 42.836'	80º 0.167'	.	2	0	Sheer Spire
Ellesmere Island	76º 41.547'	80º 3.560'	.	11	0	Sheer Spire
Ellesmere Island	77º 7.112'	79º 53.500'	.	1	0	Sheer Spire
Ellesmere Island	77º 1.414'	80º 35.658'	.	1	0	Sheer Spire
Ellesmere Island	77º 3.460'	79º 56.650'	.	.	2	.
Brodeur Peninsula	73º 19.410'	87º 54.400'	.	.	50-60	Flat ground
Brodeur Peninsula	73º 25.000'	86º 21.200'	.	.	26	Flat ground
Brodeur Peninsula	73º 25.200'	87º 32.900'	.	.	7	Flat ground
Brodeur Peninsula	73º 30.865'	86º 54.399'	35	.	0	Flat ground
Brodeur Peninsula	73º 38.801'	87º 18.100'	20	.	0	Flat ground

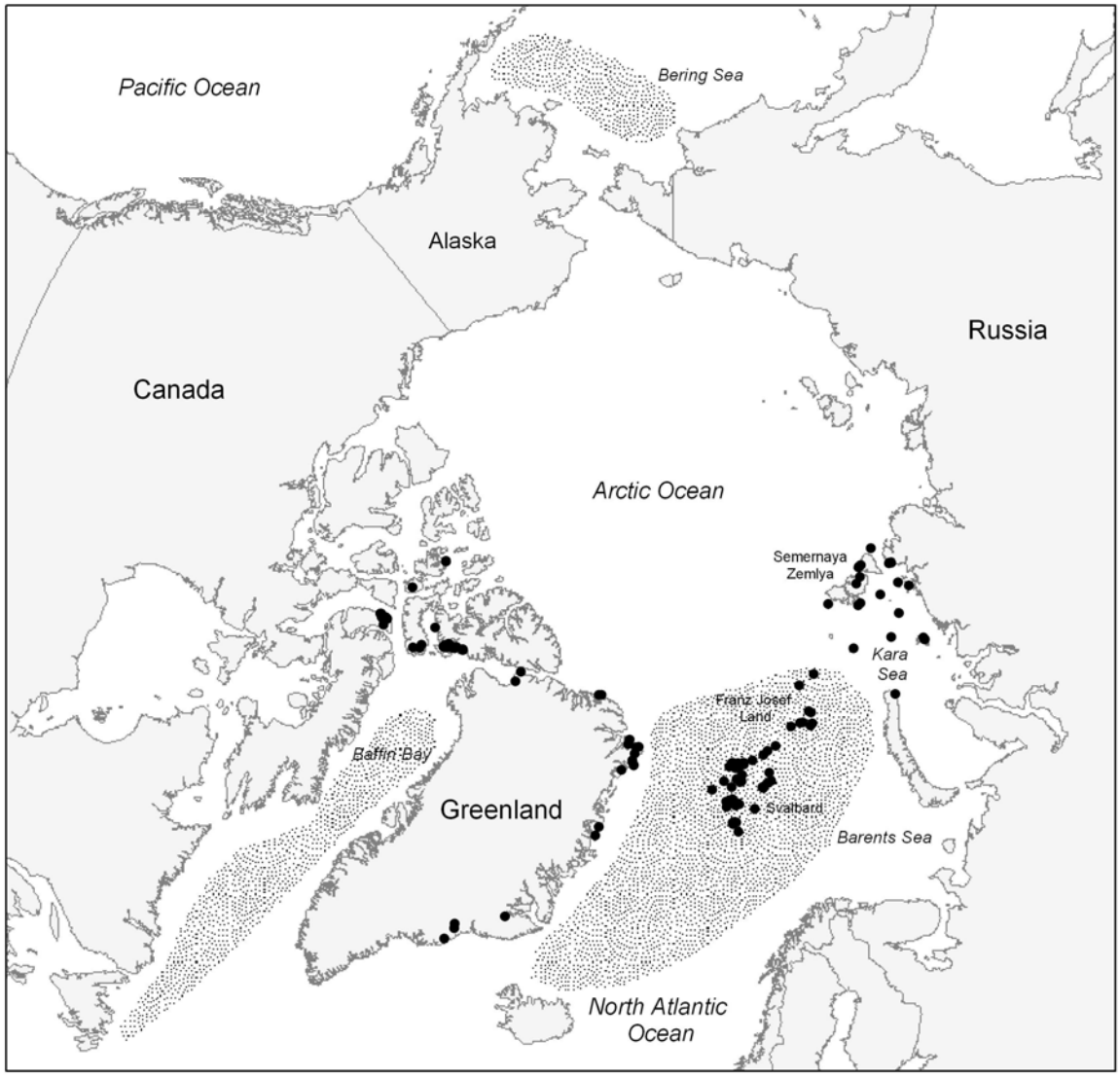

Fig. 1: The global breeding distribution of Ivory Gull (dots), and their wintering range (stipples).

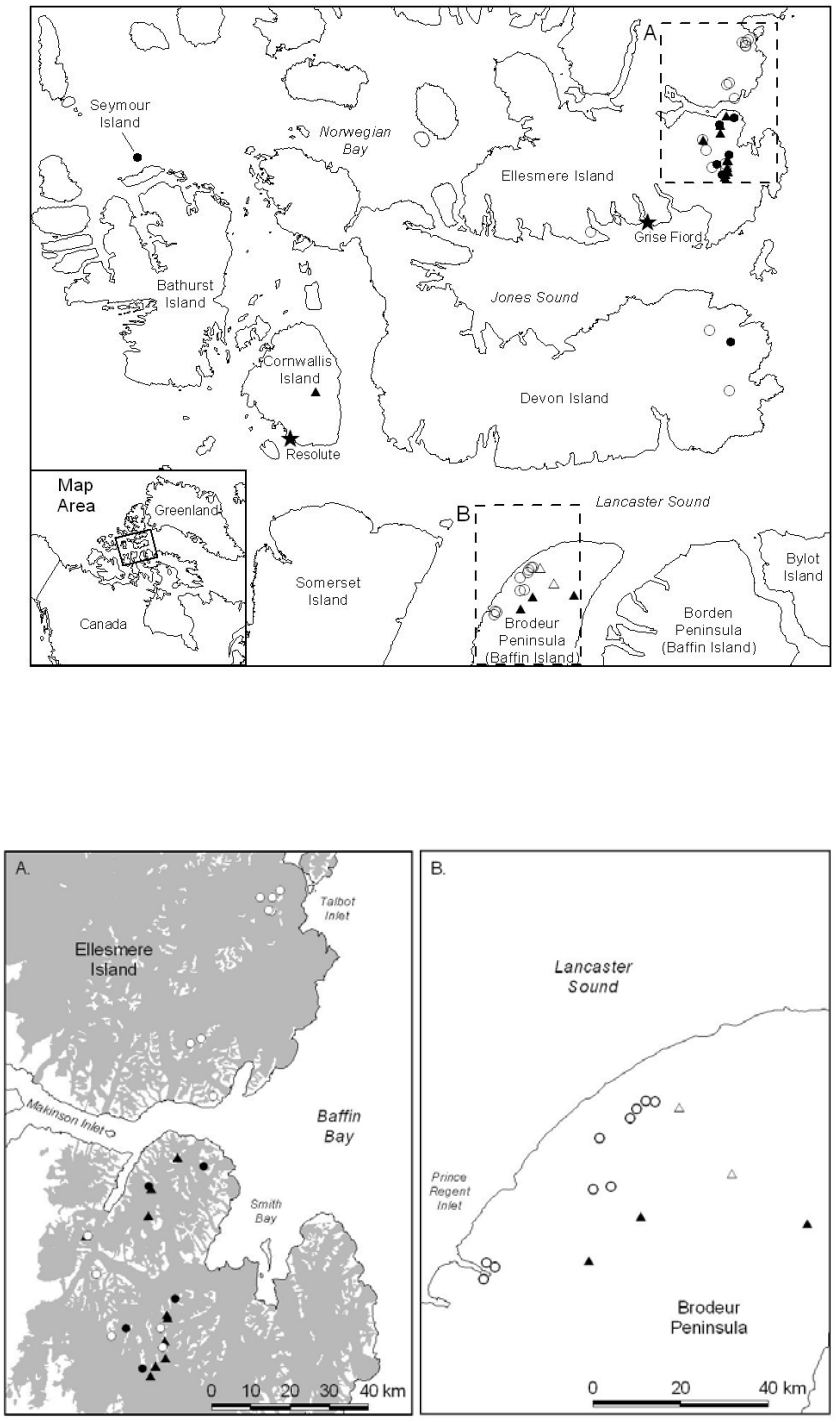

Fig. 2: Ivory Gull breeding colonies in Canada. Locations of former Ivory Gull colonies without birds (○) and with birds (●), new colonies with birds (▲) as found during the July 2002 and 2003 surveys, and colonies with birds in 2001 but not 2002 and 2003 (Δ).