International Murre Conservation Strategy and Action Plan
About CAFF

The Program for the Conservation of Arctic Flora and Fauna (CAFF) was established to address the special needs of Arctic species and their habitats in the rapidly developing Arctic region. It forms one of four programs of The Arctic Environmental Protection Strategy (AEPS) which was adopted by Canada, Denmark/Greenland, Finland, Iceland, Norway, Russia, Sweden and the United States through Ministerial Declaration at Rovianemi, Finland in 1991. The other programs of the AEPS include the Arctic Monitoring and Assessment Program (AMAP) and the programs for Emergency Prevention, Preparedness and Response (EPPR) and Protection of the Arctic Marine Environment (PAME).

Since its inaugural meeting in Ottawa, Canada in 1992, the CAFF program has provided scientists, conservation managers and groups, and indigenous peoples of the north with a distinct forum in which to tackle a wide range of Arctic conservation issues at the circumpolar level.

CAFF’s main goals, which are achieved in keeping with the concepts of sustainable development and utilization, are:

- to conserve Arctic flora and fauna, their diversity and their habitats;
- to protect the Arctic ecosystems from threats;
- to improve conservation management laws, regulations and practices for the Arctic;
- to integrate Arctic interests into global conservation fora.

CAFF operates through a system of Designated Agencies and National Representatives responsible for CAFF in their respective countries. CAFF also has an International Working Group which meets at least annually to assess progress and to develop CAFF Work Plans. It is headed up by a chair and vice-chair which rotate among the Arctic countries and it is supported by an International Secretariat. When needed, CAFF also sets up Specialist and Experts Groups to handle program areas.

The majority of CAFF’s Work Plan activities are directed at species and habitat conservation and at integrating indigenous peoples and their knowledge into CAFF. Some examples are: work on rare, vulnerable and endangered plants and animals of the Arctic; developing circumpolar conservation strategies for certain species; work on Arctic vegetation, analyzing and making recommendations on threats to Arctic species and habitat; an Arctic strategy on biodiversity conservation; an indigenous peoples mapping project. Most of CAFF’s work is carried out through a system of Lead Countries as a means of sharing the workload. Some projects are also assigned to the CAFF Secretariat. Whenever possible, CAFF works in cooperation with other international organizations and associations to achieve common conservation goals in the Arctic.
For further information, or additional copies, please contact:

CAFF INTERNATIONAL SECRETARIAT
 c/o Canadian Wildlife Service
  Environment Canada
  Ottawa, Ontario
  Canada K1A 0H3

Telephone: (1-819) 953-4385
Facsimile: (1-819) 953-7177 or (1-819) 997-9012
E-mail: 74761.2771@compuserve.com

ISBN 0-969057-6-7
Preface

The Declaration on the Protection of the Arctic Environment was signed in June 1991, at Rovaniemi, Finland, by representatives of Canada, Finland, Greenland, Iceland, Norway, Russia, Sweden, and the United States. The Declaration included the adoption of the Arctic Environmental Protection Strategy, a component of which was the Conservation of Arctic Flora and Fauna or CAFF initiative.

At the inaugural meeting of CAFF in April 1992, at Ottawa, Canada, concern was expressed over the conservation of several circumpolar seabird species. Participants agreed to focus initial attention on two species, known as murrens in North America and guillemots in Europe and Asia: the Common Murre or Common Guillemot (Uria aalge) and the Thick-billed Murre or Brünnich’s Guillemot (Uria lomvia). These migratory species are vulnerable to the effects of many human activities, owing to characteristics of their ecology and their use as food in many circumpolar countries. Participants agreed that many murre conservation issues could be most effectively addressed through the exchange of information and expertise, and by joint initiatives of countries that share murre populations.

Circumpolar countries agreed to develop a common conservation strategy, with Canada playing a coordinating role. Canada initiated the process, in September 1992, by circulating an annotated outline of the Circumpolar Murre Conservation Strategy and Action Plan. Subsequent discussions at annual CAFF meetings in Fairbanks, Alaska (1993), Reykjavik, Iceland (1994) and Moscow, Russia (1995), and at Circumpolar Seabird Working Group meetings in Sacramento, USA (1994) and Oslo, Norway (1995), led to the completion of this document.

It is important to note that, although the initiatives agreed herein relate specifically to murrens, they will benefit other components of circumpolar marine ecosystems. While the strategy is specific to the signatory nations, it is hoped that it will influence the management of murrens and additional seabird species in other countries. As appropriate, this strategy and action plan will be used as a framework for more detailed national action plans.

Kenton Wohl
Chair, CAFF Circumpolar Seabird Working Group

Peter Nielsen
Chair, CAFF
# Table of contents

Executive summary ........................................ iv  

Map 1. The circumpolar distribution of Common and Thick-billed Murres .... v  

Chapter 1. Overview  
1.1 The murres ............................................. 1  
1.2 Common Murre .......................................... 1  
  1.2.1 Population status .................................... 1  
  1.2.2 Breeding habitat and feeding habits .................. 2  
  1.2.3 Migration patterns and shared populations ........... 2  
1.3 Thick-billed Murre ....................................... 3  
  1.3.1 Population status .................................... 3  
  1.3.2 Breeding habitat and feeding habits .................. 3  
  1.3.3 Migration patterns and shared populations ........... 4  
1.4 Factors affecting murre conservation ........................ 4  
  1.4.1 Threats to murre populations ........................ 4  
  1.4.1.1 Hunting and egg collecting ......................... 4  
  1.4.1.2 Oil pollution ...................................... 5  
  1.4.1.3 Incidental mortality of murres in commercial fisheries  
  1.4.1.4 Disturbance at breeding colonies .................... 5  
  1.4.1.5 Competition with fisheries ......................... 5  
  1.4.2 Biological and ecological considerations .............. 6  
  1.4.2.1 Behaviour and feeding ecology ...................... 6  
  1.4.2.2 Life-history ........................................ 6  
  1.4.2.3 Distribution, abundance and nesting habits ......... 6  

Chapter 2. Goal and objectives  
2.1 Goal .................................................. 7  
2.2 Objectives ............................................ 7  

Chapter 3. Management issues and actions  
3.1 Consumptive use ...................................... 8  
3.2 Non-consumptive use ................................... 8  
3.3 Commercial activities and industries .................... 9  
3.4 Habitat protection and enhancement ........................ 9  
3.5 Communications and consultation ........................ 10  
3.6 Research and monitoring ................................ 11
Chapter 4. Implementation Guidelines

4.1 Setting priorities ............................................. 13
4.2 Collaboration and cooperation ............................... 13
4.3 Reporting ..................................................... 14

Tables

Table 1. Summary of murre management issues and action items ............... 15
Table 2. Summary of implementation guidelines ................................. 16
Executive summary

The two species of seabirds known as murres in North America, and guillemots in Europe and Asia, the Common Murre or Common Guillemot (*Uria aalge*) and the Thick-billed Murre or Brünnich's Guillemot (*Uria lomvia*), inhabit coastal and offshore marine regions of all northern circumpolar countries. The Common Murre frequents boreal and low arctic areas, and the Thick-billed Murre inhabits more northern arctic areas (see Map 1). They are among the most numerous and widespread of Arctic seabirds, and play important roles in the food webs of Arctic marine ecosystems and in the lives of people in coastal communities.

Murres are particularly vulnerable to the direct or indirect effects of a range of human activities, such as hunting, tourism, oil pollution, competition with fisheries and entrapment in fishing gear, due to characteristics of their behaviour and distribution, their ecological position in marine systems, and their traditional use for human food. These threats are common throughout most of their range, and they have resulted in significant population declines in several circumpolar countries during the present century. Many murre populations are shared by two or more circumpolar countries as a result of their migration and dispersal patterns, so both exploitation and conservation actions in one country can have significant effects in others. Effective conservation of these economically and ecologically important species therefore requires a coordinated international approach, as provided for through the framework of CAFF.

*The goal of this strategy and action plan is: To facilitate circumpolar implementation of initiatives to conserve, protect and restore murre populations in the Arctic.* To achieve this goal, thirty-one specific action items are set out in the context of the following objectives (see Table 1):

- to ensure that consumptive use of murres is managed to be sustainable,
- to ensure that non-consumptive use of murres is sustainable and takes place with due consideration for conservation requirements,
- to minimize the deleterious effects on murre populations and their habitats from commercial activities and industries in coastal and marine areas, such as shipping and commercial fishing,
- to ensure that murre habitat identification, protection and enhancement measures are undertaken to ensure that the quality and quantity of murre habitat is maintained or restored,
- to implement communications and education programs to ensure public support for protecting murre populations and their habitats, and
- to facilitate circumpolar coordination of murre research and monitoring programs, to provide the common knowledge base needed to conserve and manage murres and their habitats.

The guidelines for implementing the strategy ensure the necessary flexibility to account for differing legislative and resource opportunities and constraints in contributing countries, while ensuring that high priority is given to the most urgent initiatives (see Table 2). Many actions build on existing seabird conservation programs or the expertise of partner countries. Highest priority is given to those activities which address significant levels of murre mortality, or provide effective protection for important murre habitats. Countries will report annually on their progress in implementing the strategy, and will meet regularly to revise its objectives and actions on the basis of shared information.
Location of major breeding colonies and concentrations:

- Thick-billed Murres ■
- Common Murres ●
- Both species ▲

Map 1. The circumpolar distribution of Common and Thick-billed Murres
Chapter 1: OVERVIEW

1.1 The murres

There are two species of murres, the Common Murre or Common Guillemot (*Uria aalge*) and the Thick-billed Murre or Brünnich’s Guillemot (*Uria lomvia*). Both are found primarily in north-temperate and arctic regions, the Common Murre being the more southern species and the Thick-billed Murre more arctic. They are among the most numerous and widespread of Arctic seabirds, and play important roles in the food webs of Arctic marine ecosystems and in the lives of people in coastal communities. Murres are related to the other auk s, such as the razorbills, puffins, guillemots, dovecies (= little auks), murrelets and auks, traditionally grouped in the family Alcidae. Their next closest relatives are the gulls, jaegers (= skuas), and terns.

These black-and-white seabirds breed in coastal colonies on mainland or island sites, usually in the open on narrow ledges of steep cliffs, or occasionally on flat islands. Colonies are sometimes very large, containing hundreds of thousands of breeding pairs. Murres feed tens of kilometres from their colonies but have been seen as far away as 175 km. Murres usually overwinter to the south of their breeding colonies in coastal or offshore areas over continental shelves. They are medium-sized seabirds, weighing about 1 kg, and feed mainly on small fish and crustaceans which they pursue while diving underwater to depths of up to 150 metres. Like the penguins, murres spend much time on or under the surface of the water while at sea, although, in contrast, murres have retained the ability to fly. Murres share with many seabirds the pattern of incubating only a single egg per year and not breeding until they are several years old. Countering this low reproductive rate, murres are long-lived birds under natural conditions, with a high adult survival rate.

1.2 Common Murre

1.2.1 Population status

The world population of Common Murres is roughly 12-15 million breeding birds. To arrive at an estimate of the total population, this figure should be doubled to account for the non-breeding (young) segment of the population. Recent estimates suggest an Atlantic population of 6-9 million breeding birds, of which 38% are in Iceland, 19% British Isles, 18% Bear Island (Norway), 14% eastern Canada, 7% Faeroes, 3% in the rest of Norway, and <1% in France and Spain (Map 1). In the Pacific subarctic, many large colonies of mixed Common and Thick-billed Murres have not been differentiated to species. A recent estimate put the total Common Murres at 3.3 million breeding birds and the total unidentified murres at about 5 million. If we apportion the unidentified murres according to the ratio of the two species in each region, we estimate an additional 2.7 million Common Murres, giving a total of about 6 million breeders for the Pacific. Of the Pacific birds, about 34% breed in the Alaskan Bering Sea, 24% on the Alaska Peninsula, 13% from Washington to California, 10% in the Sea of Okhotsk, 9% on Russian shores of the Bering Sea and about 5% in the Kuril Islands.

Common Murre populations are currently much reduced in comparison to estimates of historical numbers in the 1800s. Since the advent of legislation protecting murres on both sides of the Atlantic, populations there have generally increased through most of the 20th century. The Newfoundland population has increased by a factor of ten since the early 1900s, with the Funk Island colony going
from very few in the late 19th century to 800,000 by 1950. Some local declines may have occurred in Newfoundland due to entrapment of breeding adults in fishing gear. In the British Isles the population increased from 110,000 in 1969-70 to 2,400,000 in 1985-87. Iceland populations have been quite stable, with a possible slight increase in numbers, for the last several decades. In Norway, where harvesting continued to be legal until 1979, the population declined until the 1970s. In northern Norway, a further decline occurred until 1985, caused by drowning in gill nets. After 1985 a very sharp decline occurred in the Barents Sea colonies, including those on Bear Island, coincident with a massive reduction in the Barents Sea capelin stock.

Little is known of population trends in Common Murres in the north Pacific, except in California where the historically large Farallon Islands population was severely reduced by over-harvesting in the 19th century. The colony at Tyulenii Island, in the Sea of Okhotsk, declined from 650,000 to 140,000 between the late 1940s and 1960. Numbers at the large colony at Bluff on the Chukchi Sea have declined continuously over the past 20 years for unknown reasons. This is the most northerly colony in the north Pacific to be dominated by Common Murres, and changes in sea-surface temperature and reduced populations of forage fish have been implicated in the decline. At least one large colony was eliminated in the Pribilof Islands by introduced Arctic foxes. Otherwise, Arctic and sub-Arctic populations in the Pacific have shown variable and relatively small amounts of population change.

1.2.2 Breeding habitat and feeding habits

Breeding habitat of Common Murres is rocky cliffs, usually with broad ledges, and on flat-topped islands. They may nest together with Thick-billed Murres on narrower ledges in shared colonies. In summer, they forage mainly in continental shelf waters ranging in surface temperature from 6° to 16° C. Density of birds decreases with distance from the breeding colony, with some birds commuting up to 200 km to and from feeding sites. Most are found within a few tens of kilometres from the colony.

Individuals dive to maximum depths of more than 100 m, although normal feeding depth is probably 20-50 m. The diet suggests that prey is taken mostly in the mid-water column, rather than on the bottom. The most important foods of Common Murres are mid-water schooling fishes such as sand lance, capelin, tomcod, herring, sprat, juvenile rockfishes, and walleye pollock. Squid and crustaceans such as euphausiids and amphipods are also taken. Common Murres have generally been found to take more fish and less crustaceans than do Thick-billed Murres.

1.2.3 Migration patterns and shared populations

Common Murres do not migrate or disperse as far as Thick-billed Murres, with no evidence of trans-Atlantic migration. In general, Common Murres disperse from colonies to more offshore areas after the breeding season. Newfoundland birds move south ahead of advancing winter ice, and some remain in ice-free areas. Many northern British and Faeroese birds move east to western Norway and the North Sea, and others move west towards Iceland and Greenland. Icelandic murres seem to remain primarily in Icelandic waters year-round. Barents Sea and north Norwegian birds move south along the Norwegian coast. Baltic Sea birds are resident or move small distances southwest ahead of the winter ice.

Pacific North American birds migrate south from Alaska and north from Oregon and California, and many overwinter off the coasts of southern Alaska and British Columbia.
1.3 Thick-billed Murre

1.3.1 Population status

The world breeding population of Thick-billed Murres is estimated to be about 14 million birds. This figure should be doubled to arrive at an estimate of the total population. There are approximately 10 million breeding birds in the north Atlantic and 4 million in the north Pacific (Map 1). The largest colonies in the Atlantic are in Hudson Strait, the eastern Canadian high Arctic, west Greenland, Iceland, Spitzbergen and Novaya Zemlya, and in the north Pacific on the islands and coasts of the Bering and Chukchi Seas, and the Sea of Okhotsk. The total world population is distributed approximately as follows: Bering and Chukchi seas 27%, eastern Canadian Arctic 20%, Spitzbergen 12%, Novaya Zemlya 12%, Bear Island 10%, Iceland 8%, Greenland 7%, Sea of Okhotsk 2%.

In most of their north Pacific range, and in Iceland and Bear Island, Thick-billed Murres share colonies with large numbers of Common Murres. Elsewhere colonies are predominantly of one species.

Northwest Atlantic populations of Thick-billed Murres have declined since the 1950s, with numbers in Greenland reduced by more than 50% and some large colonies entirely extirpated. Declines were a result of hunting, egging and drowning in salmon gill nets. Population trends in Canadian colonies are less clear with no change or increases at some, and possible declines at others. Populations of Thick-billed Murres in Iceland are apparently stable, although the more accurate recent estimates have the population at about half of former estimates.

In the Bering Sea there has been a decline at the Pribilof Islands and at some other colonies. A major decline occurred at Guba Bezmyannaya, Novaya Zemlya where there were 1.6 million murres in 1933-34, but only 290 000 in 1948. In both cases the cause was commercial hunting and egging, and there have been increases at both these colonies following the cessation of commercial exploitation, although neither has reached its former size.

1.3.2 Breeding habitat and feeding habits

Most Thick-billed Murres nest on steep rocky cliffs, often on ledges only a few cm wide. They forage in continental shelf waters ranging in surface temperature from 0° to 10° C. Thick-billed Murres feed over a wide range of distances from the colony and distance varies considerably between colonies. Early in the season they have been seen as far away as 175 km, feeding at ice edges. Later in the season they typically feed tens of km from the colony.

Throughout the year, Thick-billed Murres generally occupy areas with floating ice that sometimes covers up to 90% of the water surface. In spring and early summer they concentrate at the seaward edge of land-fast ice, where this occurs over deep water. In Newfoundland, they frequent large bays in winter, often in water more than 50 m deep.

Thick-billed Murres dive to maximum depths of more than 100 m, but the normal feeding depth is 20-60 m. Diet studies suggest that prey is mostly taken in the mid-water column, rather than near the bottom. Fish and crustacea form the most important components of the diet of Thick-billed Murres throughout the year, with the single most important organism in the northwest Atlantic being a small crustacean. In winter off Newfoundland, where a large portion of the Atlantic population spends the
non-breeding season, capelin were apparently important components of the diet in the 1950s. This is no longer the case, as arctic cod and other fish now form the main prey in November and December, and euphausiids dominate from January to March. Off Greenland, the wintering population feeds mainly on capelin and euphausiids, with fish being especially predominant in the early part of the winter. In the western Pacific, winter diet is mainly squid and euphausiids, with smaller quantities of fin-fish, especially lanternfish.

1.3.3 Migration patterns and shared populations

The northern parts of the Thick-billed Murre’s breeding range are ice-covered and deserted in winter, and in some areas murres migrate long distances to escape dense pack ice. Most eastern Canadian birds, and significant numbers from west Greenland, winter off eastern Newfoundland. Most birds from Spitzbergen and the western Russian Arctic winter off southwest Greenland, although a few from there and Iceland migrate as far as Newfoundland. The large flights seen passing Jan Mayen in October may consist of birds on passage from the European Arctic to southwest Greenland.

Pacific populations winter in the southern Bering Sea, Sea of Okhotsk, and the northern Pacific south to northern Honshu, Japan, in the west, and northern British Columbia in the east. Some persist as far north as Cape Thompson, Alaska, throughout the winter.

1.4 Factors affecting murre conservation

1.4.1 Threats to murre populations

A number of human activities directly or indirectly reduce the survival or breeding success of murre populations. Factors vary in importance among regions but many commonalities exist due to man’s pervasive effects on the Arctic environment. Some activities may have minor effects or their own but in combination with others can cause serious impacts. The following briefly describes the most important of these on a circumpolar scale.

1.4.1.1 Hunting and egg collecting

Murres are hunted and their eggs are taken to some degree in most areas of their breeding range. Most notable are the large winter hunts of birds occurring off the coasts of west Greenland, and off Newfoundland and Labrador in eastern Canada. Recent estimates place the annual harvest in these two areas combined at about 1 million birds, out of populations totalling 8-10 million birds. The majority of birds hunted are Thick-billed Murres, and about half the harvest is of first-year birds. It has been estimated that this harvest accounts for over 75% of the mortality of murres that over-winter in Newfoundland waters. Many of these birds are illegally sold in Canada, and about 50,000 are legally marketed in Greenland annually. The small numbers of murres and their eggs taken in Alaska by indigenous people are unlikely to affect the local populations. About 80,000 auks are harvested annually in Iceland, the great majority of which are murres, and their eggs are also legally taken there. It is not legal to hunt murres in the Nordic countries, and in all of Russia except the Magadan area in the east. Egging still occurs in some Russian colonies.
1.4.1.2 Oil pollution

Oil pollution is a common occurrence in the world's oceans. The many sources of oil at sea include shipping activity, offshore oil and gas exploration and development, land-based run-off, and natural seepage. The potential for oil pollution in an area is related to the degree of industrial development, but few areas escape its effects. Many thousands of murres die every year after encountering oil in the marine environment. Oil kills seabirds by reducing the waterproofing capabilities of their feathers, and through internal toxic effects, and it can also reduce breeding success when transferred to eggs. The most important threats from oil to seabirds are the two types of ship-source oil pollution. The chronic variety where small amounts of oil are discharged as a result of routine ship operations is responsible for over 75% of oil released at sea, whereas the catastrophic variety in which large amounts of oil are spilled following an accident is a less frequent but locally important threat. Both Common and Thick-billed Murres are impacted by oil pollution. Oil pollution events close to a colony or aggregations at sea can have major consequences at the population level. About 11 million gallons of crude oil spilled by the Exxon Valdez in Prince William Sound, Alaska, resulted directly in the deaths of an estimated 250,000 seabirds, of which about 150,000 were murres, and the spill indirectly reduced breeding productivity in nearby colonies.

1.4.1.3 Incidental mortality of murres in commercial fisheries

Productive fishing grounds tend to be in the same areas selected by murres for foraging. Murres dive underwater to feed and as a consequence are at risk of being entrapped and drowned in fishing gear. Commercial fisheries using monofilament gill-nets are a particular problem. As a general rule, Common Murres are more vulnerable, as their temporal and spatial distribution coincides with gill-net fisheries in many areas. For example, gill-nets in Monterey Bay, California, may have reduced local Common Murre populations in the late 1970s and early 1980s. Many Thick-billed Murres were drowned in gill-nets set for Atlantic Salmon off the west coast of Greenland in the 1960s and 1970s, and recent changes in the fishery there may mean a resurgence of this problem. Sale of murres drowned in salmon gill-nets indicate that by-catch may currently amount to 70,000 murres a year in Iceland. Very high numbers of murres are also occasionally drowned in gill-net and long-line fisheries in the open sea and coastal waters of Norway. Small numbers of murres are regularly drowned in Alaskan gill-nets and, although not monitored, the levels of bycatch in Russian and Japanese fisheries in the North Pacific may be significant.

1.4.1.4 Disturbance at breeding colonies

Murres require nesting habitat which is undisturbed. Human activities such as colony visitation by tourists, researchers or the general public, boating, and industrial development can create unacceptable levels of disturbance at breeding colonies, resulting in reduced breeding success. By virtue of their more southerly distribution, Common Murres are perhaps more vulnerable than Thick-billed Murres. A relatively recent upsurge in tourism in the Arctic may present an increased threat to Thick-billed Murre colonies.

1.4.1.5 Competition with fisheries

Species of fish important in the diets of murres, such as capelin, sand lance, sprat and polar cod, are harvested by man in many areas. Management of these fish stocks has not yet seriously considered
competition from other predators such as seabirds, whales and seals. As a consequence, impacted fish stocks can decline below levels that can sustain seabird populations. Over-fishing has been implicated in the collapse of fisheries and resulting breeding failure of seabirds, as in the crash of over-harvested capelin stocks in the Barents Sea off Norway in the 1980s.

1.4.2 Biological and ecological considerations

By virtue of characteristics of their biology and ecology, such as deferred of age of first breeding, and a maximum annual productivity limited to one chick per pair, murre populations are particularly vulnerable to a variety of factors that directly or indirectly influence survival rates and breeding success.

1.4.2.1 Behaviour and feeding ecology

Murre spend much of their time swimming on the surface of the sea or diving in pursuit of small marine organisms such as fish and crustacea. By virtue of this aquatic lifestyle, murres are particularly vulnerable to direct mortality by oil pollution. The habit of pursuit-diving underwater puts murres at risk of being entrapped and drowned in fishing gear. Feeding on fish such as capelin or sand lance places murres in direct or indirect competition with human fisheries. This may reduce food availability and affect adult survival rates through effects on body condition, and breeding success may decline through effects on egg quality and chick feeding rates.

1.4.2.2 Life-history

Murre share with many other seabirds the pattern of low annual reproductive rate and delayed breeding. They lay only one egg a year, and each pair can therefore raise a maximum of one chick under ideal conditions. Actual breeding success figures are usually closer to 70-80%. Murres do not breed until they are about 4-5 years old and survival rates of immatures can be low due to high hunting pressure on young birds. These factors are offset by relatively high annual survival rates of adults. Thus the health of murre populations depends much more on adult survival rates than on breeding success, and factors that affect adult survival, such as hunting, oil pollution and net drowning, can have significant negative impacts on populations.

1.4.2.3 Distribution, abundance and nesting habitat

Murre usually nest on narrow ledges of steep cliffs, or on low isolated islands, in a relatively few large and isolated colonies in north-temperate and Arctic locations. Some colonies contain significant proportions of the population of a region. For example, over one quarter of Canadian Thick-Billed Murres breed at the two colonies on Akpatok Island, and over 90% of Icelandic birds breed in three colonies within a small area in the northwest of the country. As a result, disturbance near a colony has the potential to affect many individuals representing significant proportions of the population. Murres, and indeed most colonial seabirds, can suffer reduced breeding success as a result of disturbance at the colony site, such as may be caused by tourism and research activities. Disturbance in murre colonies can cause significant egg or chick loss because of their habit of nesting on narrow ledges.
Chapter 2: GOAL AND OBJECTIVES

2.1 Goal

The goal of this strategy is:

*To facilitate circumpolar implementation of initiatives to conserve, protect and restore murre populations in the Arctic.*

2.2 Objectives

Objectives which will contribute to the achievement of this goal are considered in detail in the following section, as follows:

- to ensure that consumptive use of murres is managed to be sustainable.
- to ensure that non-consumptive use of murres is sustainable and takes place with due consideration for conservation requirements.
- to minimize the deleterious effects on murre populations and their habitats from commercial activities and industries in coastal and marine areas, such as shipping and commercial fishing,
- to ensure that murre habitat identification, protection and enhancement measures are undertaken to ensure that the quality and quantity of murre habitat is maintained or restored.
- to implement communications and education programs to ensure public support for protecting murre populations and their habitats.
- to facilitate circumpolar coordination of murre research and monitoring programs to provide the common knowledge base needed to conserve and manage murres and their habitats.
Chapter 3: MANAGEMENT ISSUES AND ACTIONS

3.1 Consumptive use

Murres are hunted and, to a lesser extent, their eggs are taken in most places where they occur. Levels of consumption vary considerably among circumpolar countries, although the actual extent is often not monitored. Although some murres and their eggs are legally harvested in Iceland, only the large harvests that currently take place in Canada and Greenland are significant enough to affect northwest Atlantic population levels. In Canada, predominantly non-indigenous people in Newfoundland and Labrador legally hunt Thick-billed Murres and fewer Common Murres during fall and winter months for personal use. Some murre hunters shoot other seabirds, such as Razorbills whose numbers have already declined, and some murres are sold illegally. In Greenland, both indigenous and non-indigenous people legally hunt murres in winter for personal use and local sale. Harvest levels have been estimated in both countries, and in the recent past Canadian harvests appeared to be unsustainable. Harvest restrictions are now in place in both countries. Canadian restrictions are of an interim nature, but will soon be formalized with the implementation of recently-signed amendments to the Migratory Birds Convention between Canada and the United States. Because of the great potential for population impacts as a result of consumptive use of murres, there is a need to ensure that harvests are maintained at levels consistent with long-term sustainability and with adequate margins of safety.

Actions

1. Manage consumptive uses of murres to ensure that harvests are sustainable, and have no impact on other species.

2. Monitor harvest levels of murres in circumpolar countries, and conduct research and population modelling to assess the impacts of these uses on populations.

3. Wherever shared populations of murres are harvested, harmonize management and harvest regimes to ensure that undue pressure is not placed on shared populations by any country.

4. Involve local and indigenous people in the development of management approaches for consumptive uses.

3.2 Non-consumptive use

Some activities, such as eco-tourism and bird-watching, may have negative impacts on murre populations. However, the economic value of these activities can also be a potent conservation tool in that individuals profiting from the resource, as well as government agencies responsible for promoting and regulating the activity, are motivated to ensure sustainable use. Research activities at breeding colonies also may be considered a non-consumptive use of murres. Although most individuals engaged in the non-consumptive use of murres practice good conservation measures, some irresponsible actions, such as deliberately scaring breeding birds into flight, do occur. These must be addressed through consultation and communication, and backed by enforcement of appropriate regulations, if necessary. Managers of murre populations must not let their actions lag behind those of agencies or individuals with economic interests. Rather, a sustainable-use approach must be taken which recognizes that conservation measures are needed to ensure that long-term non-consumptive uses of murres can be sustained.
5. Manage and promote sustainable and environmentally sound non-consumptive uses of murres.

6. Develop and implement management plans for specific areas of current or potential eco-tourism activity.

7. Develop and publicize standard guidelines to minimize the impact of human activities such as tour-boat operations and research at murre colonies.

3.3 Commercial activities and industries

Commercial activities and industries conducted in coastal and marine areas have contributed to declines in murre populations in many circumpolar areas, although some, such as eco-tourism, have had relatively little impact on murres to date. In particular, shipping activities which result in oil pollution, and commercial fishing with its impacts of incidental bycatch of murres near colonies and at sea, and competition with seabirds for forage fish species, have shown the potential to dramatically affect murre populations and their habitats. Most impacts can only be addressed effectively by working closely with representatives of these industries and the agencies which regulate them, to ensure that they understand the impact of their activities on murres and the marine ecosystems in which they live, and to find ways to modify their activities to reduce impacts with minimum additional economic costs.

Actions

8. Identify, publicize and minimize the impacts of commercial activities and industries on murre breeding habitats, and important areas where murres concentrate offshore.

9. Implement multi-faceted programs to reduce oil pollution in areas used by murres, and use provisions under the MARPOL convention or IMO to establish "Special Areas" or "Areas to be avoided" in important pelagic habitat for murres.

10. Assess and reduce mortality of murres in commercial fishing gear, in cooperation with the fishing industries and national and international managers of fisheries resources.

11. Ensure that the management of commercial harvests of small fish species used by murres as food provides for their role in the diet of murres.

3.4 Habitat protection and enhancement

Impacts of these human activities on murre habitats can be minimized by drawing attention to their location and international importance, and by protecting or enhancing important sites, particularly when undertaken in conjunction with actions specified in section 3.3 to alter the ways in which specific activities are conducted. A combination of site-specific and broad-scale habitat enhancement or protection mechanisms is required. The murre habitats most critically in need of protection are islands which support breeding colonies, and surrounding waters which provide resting, socialising and foraging areas. Given the widespread distribution of murres at sea outside the breeding season, it is also
important to identify and protect large expanses of key marine habitat. In some cases, specific habitat restoration or re-introduction activities may be needed to assist affected populations. However, situations may be quite complex where several factors are involved. If, for example, food sources on which murres formerly depended are no longer available, any management attempts to re-build numbers may be unsuccessful. An ecosystem approach, considering changes in the environment as well as human impacts, must be used to identify factors which may limit the ability of populations to recover, before restoration is attempted. It is important to note that global warming or localized eutrophication may also affect the quality of some murre habitats, although immediate solutions are not obvious.

**Actions**

12. Identify important murre breeding colonies, and designate them under national and international systems of protected areas.

13. Identify important pelagic habitats for murres, and promote the establishment of marine protected areas where hunting, commercial fishing and other activities that affect murres are reduced or curtailed.

14. Contribute to BirdLife International’s "Important Bird Areas" system to highlight key areas of importance for murre populations.

15. Explore the establishment of an international network to identify and protect key breeding, foraging and over-wintering areas for murres, and the linking of protected areas used by the same population of murres in different countries.

16. Fully assess the importance of, and interactions among, human and environmental factors contributing to declines from an ecosystem perspective, before undertaking conservation actions.

17. Undertake specific habitat and population restoration activities to assist depressed populations to recover where limiting factors can be effectively addressed.

### 3.5 Communications and consultation

The resolution of all resource management issues relies heavily on sound consultation and communication outreach programs. Information and education programs are required if the understanding, good will, and cooperation of hunters, fisherpersons, ship operators, special-interest groups, and the public at large are to be maintained and enhanced. Communication with hunters concerning the impacts of their activities is an essential element in gaining their support for changes to harvest regimes. Additionally, the nature and effects of other factors impacting on murres, including oil pollution, eco-tourism and incidental mortality in fish nets are poorly understood, and need to be communicated both to those with an interest in murre management and those responsible for the competing activities. The impact of circumpolar scientific research and monitoring activities can be maximised by effectively and promptly communicating its results to other scientists and managers who deal with similar concerns. An assessment of messages to be communicated must be made initially, followed by a determination of the most effective means of getting those messages out to target groups.
Actions

18. Determine messages to be communicated, target groups, and the most effective media, and produce materials to deliver specific messages to the public and special-interest groups, including key elements of murre biology and management concerns.

19. Emphasize communication of murre conservation requirements and protection guidelines to those who operate ships that may discharge oil at sea, the fishing industry, and tour-boat operators.

20. Produce educational materials aimed specifically at children, recognizing the importance of getting conservation messages to younger generations.

21. Issue periodic joint scientific reports on the status of populations, research and other activities relating to murre conservation.

3.6 Research and monitoring

Murres can be properly protected only if there is an adequate background of scientific information against which to examine issues, and on which to base management actions. Much murre research and monitoring has been done to date although significant gaps exist, particularly in assessing population size, trends and demography, and in the development of specific conservation and management techniques. Monitoring programs, field methods, and data analysis procedures may benefit from more standardization to facilitate comparison of scientific data among counties that share murre populations. There is a need for comprehensive national and circumpolar computerized databases, both colonial and pelagic, to store, retrieve and visualize field data. Internationally coordinated banding efforts are required to enhance our knowledge of population structure, movements, and survival rates. Effective conservation of biodiversity of murre populations may require more knowledge of the genetic structure of populations.

Actions

22. Coordinate circumpolar murre population monitoring, designate monitoring sites in each signatory country, and report on selected key monitoring data stored in standardized or centralized circumpolar databases.

23. Conduct research on population demography at monitoring sites, emphasizing work on survival rates, breeding success and age of first breeding.

24. Develop a coordinated, circumpolar murre-banding program which prescribes regular banding of murre chicks and adults at colonies, and sharing of banding and recovery data.

25. Monitor murre feeding ecology and food availability, particularly where forage fish stocks are shared by two or more nations.

26. Monitor levels of murre mortality due to oil pollution, incidental entrapment in commercial fisheries, and hunting.
27. Conduct research to develop techniques to reduce entrapment in fishing nets without significantly reducing fish catches.

28. Develop specific management techniques to restore degraded habitats or depressed populations.

29. Consider the current or potential effects of global warming and local marine eutrophication on circumpolar murre populations.

30. Assess the need to conduct research into the genetic structure of murre populations.

31. Conduct research to define the temporal and spatial distribution and abundance of murres at sea, and factor affecting these.
Chapter 4: IMPLEMENTATION GUIDELINES

4.1 Setting priorities

Immediate implementation of all action items is not possible owing to resource constraints and differing domestic legislative restrictions and opportunities. It is therefore necessary to prioritize activities to be undertaken. Many of the actions have additional importance in that they may implement current obligations of some circumpolar nations under existing treaties and agreements. Many actions may already have been undertaken in some countries, or can be based on existing conservation programs and activities. Flexibility in approach, therefore, is required to ensure that highest priority issues are addressed.

Guidelines

1. Give highest priority to implementing those actions that directly address significant levels of murre mortality, including necessary consultation and enforcement.

2. Give second priority to implementing habitat protection measures, including effective protection of key breeding colonies and foraging areas.

3. Give additional priority to research and monitoring initiatives which directly address murre conservation issues.

4. Give additional priority to actions which support obligations of existing treaties and agreements.

4.2 Collaboration and cooperation

This international strategy is based on common conservation concerns facing murres in circumpolar countries, and the benefits to be gained by sharing relevant data and techniques, and undertaking joint projects to address common problems. Through the development of national conservation plans, each country can identify those areas where international cooperation will most effectively help to address its murre conservation priorities. Some actions can be undertaken directly by agencies with jurisdiction for murre management. However, others, such as the protection of marine habitats or reducing mortality in fishing nets, can only be implemented with the cooperation of agencies whose jurisdictions may relate only indirectly to the conservation of murres. Additionally, some actions can only be undertaken with the assistance and participation of the public or members of special-interest groups or industries.

In order to coordinate and guide implementation of this plan, each country should establish a Murre Conservation Group made up of biologists and managers. The Circumpolar Seabird Working Group would act as a coordinator between national conservation groups and would report progress to CAFF.

Guidelines

5. Encourage and assist signatory countries to develop and implement national murre conservation plans.
6. Collaborate with, and assist, other circumpolar countries to undertake coordinated initiatives to address shared murre conservation issues.

7. Ensure that managers with jurisdiction for murre conservation use their best efforts to influence other jurisdictions and interest groups to implement this action plan effectively.

4.3 Reporting

The effectiveness of this strategy depends on the ability of circumpolar countries to focus their efforts on areas of greatest importance to murre conservation. Regular meetings of seabird scientists and managers in a circumpolar working group will facilitate the required sharing of information, and the development and progress of joint projects. Annual reporting of achievements is necessary to revise objectives and actions, identify areas where a more concerted approach may be necessary, and maintain the support of circumpolar governments for this initiative by demonstrating its effectiveness.

Guidelines

8. Meet regularly to revise objectives and actions, and undertake joint initiatives, on the basis of information shared among circumpolar countries.

9. Circumpolar Seabird Working Group to report annually to CAFF on each nation's progress in implementing this strategy's action items.
<table>
<thead>
<tr>
<th>Management Issue</th>
<th>Action Item</th>
</tr>
</thead>
</table>
| 3.1 Consumptive use                   | 1. Ensure that consumptive uses of murres are sustainable.  
                                          2. Monitor harvest levels and assess their impacts on populations.  
                                          3. Harmonize management and harvest regimes for shared populations.  
                                          4. Involve local and indigenous people in the management of consumptive uses.        |
| 3.2 Non-consumptive use               | 5. Ensure that non-consumptive uses of murres are sustainable.  
                                          6. Implement management plans for areas of eco-tourism activity.  
                                          7. Implement standard guidelines to minimize the impact of disturbance at murre colonies. |
| 3.3 Commercial activities and industries | 8. Identify, publicize and minimize impacts of commercial activities on murre breeding and foraging areas.  
                                          9. Implement programs to reduce oil pollution in areas used by murres.  
                                          10. Assess and reduce mortality of murres in commercial fishing gear.  
                                          11. Ensure that management of commercial harvests of small fish species provide for their role in murre diets. |
| 3.4 Habitat protection and enhancement | 12. Identify important murre colonies and designate them under national and international systems of protected areas.  
                                          13. Promote the establishment of marine protected areas in important pelagic habitats for murres.  
                                          14. Contribute to the "Important Bird Areas" system to highlight important areas for murres.  
                                          15. Explore the establishment of an international network to identify and protect key areas for murres.  
                                          16. Ensure that conservation action will benefit populations, by assessing causes of population declines from an ecosystem perspective.  
                                          17. Undertake specific restoration activities to assist depressed populations to recover. |
| 3.5 Communications and consultation   | 18. Determine appropriate communication approaches and produce materials to deliver specific messages.  
                                          19. Emphasize communication to operators of ships at sea, the fishing industry and tour boat operators.  
                                          20. Produce educational materials aimed specifically at children.  
                                          21. Issue joint scientific reports of activities relating to murre conservation. |
| 3.6 Research and monitoring           | 22. Coordinate circumpolar murre population monitoring and store data in standardized databases.  
                                          23. Conduct research on population demography at circumpolar monitoring sites.  
                                          24. Develop a coordinated circumpolar murre banding program.  
                                          25. Monitor murre feeding ecology and food availability.  
                                          26. Monitor murre mortality due to oil pollution, commercial fisheries, and hunting.  
                                          27. Conduct research to develop techniques to reduce entrapment in fishing nets.  
                                          28. Develop management techniques to restore habitats and populations.  
                                          29. Consider the effects of global warming and local eutrophication on murre populations.  
                                          30. Assess the need to conduct research into the genetics of murre populations. |

Table 1. Summary of Murre Management Issues and Action Items
<table>
<thead>
<tr>
<th>Implementation Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4.1 Priorities</strong></td>
</tr>
<tr>
<td>1. Give high priority to actions addressing significant levels of murre mortality.</td>
</tr>
<tr>
<td>2. Give high priority to habitat protection for key colonies and foraging areas.</td>
</tr>
<tr>
<td>3. Give additional priority to research and monitoring needed to address murre conservation issues.</td>
</tr>
<tr>
<td>4. Give additional priority to actions supporting obligations of treaties and agreements.</td>
</tr>
<tr>
<td><strong>4.2 Collaboration and cooperation</strong></td>
</tr>
<tr>
<td>5. Encourage and assist the development and implementation of national murre conservation plans.</td>
</tr>
<tr>
<td>6. Coordinate initiatives among circumpolar countries to address shared murre conservation issues.</td>
</tr>
<tr>
<td>7. Ensure the involvement of other jurisdictions and groups necessary to effectively implement this action plan.</td>
</tr>
<tr>
<td><strong>4.3 Reporting</strong></td>
</tr>
<tr>
<td>9. Meet regularly to revise objectives and actions on the basis of shared information.</td>
</tr>
<tr>
<td>8. Report annually to CAFF on each nation's progress in implementing this action plan.</td>
</tr>
</tbody>
</table>

*Table 2. Summary of Implementation Guidelines*