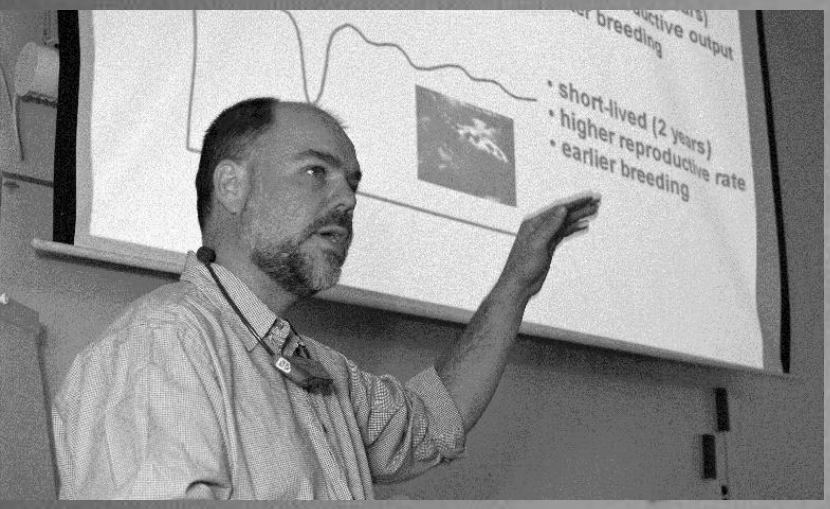
The Northern Common Eider: Report of a Workshop



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The Northern Common Eider: Status, Problems, Solutions

Report of an International Workshop held at the Greenland Institute of Natural Resources, Nuuk 15–17 February 2005

edited by

Michael C.S. Kingsley

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Contents

Summary:

The Northern Common Eider is a subspecies of the Common Eider breeding in West and north-western Greenland and throughout the eastern Canadian Arctic as far south as Hudson Strait and northern Hudson Bay and as far west as Lancaster Sound and Jones Sound. It winters in West Greenland and in eastern Canada off Newfoundland and in the St Lawrence. The status of the population has long given cause for concern: it is exploited in all parts of its range, in some areas heavily; numbers in some breeding areas are much reduced from former times and in other areas are little known; studies of the dynamics of the species indicate that it can tolerate only limited removals.

An international workshop to discuss not only the status of the population, but also threats, management actions, and research priorities, was held at the Greenland Institute of Natural Resources in Nuuk in February 2005, with the participation of scientists, hunters, and managers from both Canada and Greenland, and support from the Danish Environmental Management Agency, the Danish Environmental Research Institutes, the Canadian Wildlife Service, Department of the Environment, and the Greenland Institute. Scientists presented their knowledge of the biology of the species and the status of this population, managers described their actions to ensure sustainable use, and hunters related their practices and their knowledge. All participants contributed their observations and opinions about threats to the stock, priorities for research, and suggestions for management actions.

Records of migrations across Davis Strait confirm that this is a shared stock. While some breeding stocks are and remain depleted, wintering numbers appear stable. Measures to control exploitation on the summering grounds and to regulate winter hunting appear from present data to be effective, but concerns were expressed about by-catch in near-shore gillnets and about collisions on winter nights between flocks of flying birds and ships' searchlights. Both cause significant mortality, but are poorly studied, and little is known about their severity and spatial distribution or what can be done to mitigate them. Other concerns included predation on the nesting grounds.

Research priorities identified included exploration to find and survey breeding colonies, both in Canada and in Greenland—many areas of possible breeding habitat are unsurveyed, while known wintering numbers appear inconsistent with present knowledge of breeding

areas. Continuation and extension of marking studies, and finding out how the Greenland catch is split between Canadian and Greenland breeders, were also recommended.

Greenland hunters expressed concern that present season limits completely protect eiders when they are present in northern West Greenland and north-western Greenland, so preventing people there from any use of the resource, and argued for locally adapted regulations. Other recommendations for management were to set definite management objectives for the population, and to do so cooperatively between the two jurisdictions. Recommendations were also made for improved cooperation between hunters and scientists and for better information on research and management issues.

Imaqarniliaq:

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misissuinerit aqutsinerillu pillugit pitsaanerusumik paasissutissiisoqartarnissaa ilanngullugu kissaatigineqarpoq.

Introduction:

The Northern Common Eider is the *borealis* subspecies of the Common Eider *Somateria mollissima*, summering and breeding in the eastern Canadian Arctic, including the eastern high Arctic, and on the coast of West Greenland, and wintering in open-water areas on the West Greenland coast and, in Canada, around Newfoundland and in the lower St Lawrence. It is known that there are international migrations, and while it is not known with certainty what proportion of the population migrates across the international border, it appears that a large proportion of Greenland-wintering birds may be Canadian breeders.

The population is exposed to exploitation throughout its entire range, at most seasons, and in all phases of its yearly cycle. It is hunted in fall, winter and spring and eggs and down are collected in the breeding season. Knowledge of its biology corresponds in general to what is known of the biology of the species, but there is little precise knowledge, at the population level, of the population dynamics, survival, migration routes or timing, food availability, and so on.

The geographical boundaries between this population and its neighbouring conspecifics are fairly well defined, but numbers of birds in the population are not accurately known, and the level of exploitation is such as to give rise to concern over the population trend. In particular, breeding colonies in northern parts of West Greenland, notably in Upernavik kommune, are described as being seriously depleted in comparison with historical numbers[1], and there is—at least from time to time—more or less concern over the scale of winter harvest in West Greenland and Newfoundland. The species is a valued resource, and there is strong interest in ensuring that management is satisfactory and exploitation sustainable.

An action plan for the recovery of the population has been discussed for some time, including components of research, management, education and public information. A central assumption of the construction of this action plan was that population numbers are on a continuing downward trend, and that a top priority is first to reverse the trend and then to re-establish a population at more nearly its historic size. However, it was considered appropriate to hold a workshop to update knowledge of population parameters and to review the present state of regulation and management measures. The purpose of this workshop was to bring together scientists, management decision-makers and hunters (Appendix II) to arrive at common understandings of the status and trend of the population, and what are the most significant factors affecting it. We also hoped to priorise the actions needed to further the recovery of the populations and to inform and educate users and other members of the public.

[1] Merkel, F.R. 2004. Evidence of population decline in Common Eiders breeding in Western Greenland. Arctic 57: 27–36.

The Danish Programme for Cooperation on the Arctic Environment of the Danish Environmental Management Agency furnished funding for scientists from Denmark and for hunters from Arctic Canada to travel to Nuuk to contribute to the workshop, and the Canadian Department of the Environment agreed to fund travel for scientists from the Canadian Wildlife Service. We thank these organisations for their contributions.

It was planned that the workshop should be held in at the Greenland Institute of Natural Resources in Nuuk, on 15–17 February 2005 (Appendix III). Bad weather delayed the arrival of some participants, and so the workshop did not start until the afternoon of 15 Feb. The programme was revised *ad hoc* to cover as much of the originally planned material as possible (Appendix IV). I thank Dr Jens Nyeland for his help in setting up the workshop, and Tanja Christiansen and other members of the Administration Division of the Greenland Institute of Natural Resources for help with logistic and other arrangements.

The sections of this report present summaries of the presentations given at the workshop, of the contributions from the Greenland hunters' organisations, and of the discussions—organised by topic, rather than by chronology, since the discussions moved irregularly between topics. It also includes the participants' suggestions of priority subjects for study and for actions that should be taken to improve the outlook for and secure the future of the Northern Common Eider, with our rough-and-ready scheme for indicating which ones the participants felt to be most important.

An action plan was drafted from the priorised list and forms the first Appendix, while reviews of recent and current research in Greenland and Canada form Appendix V.

Summaries of Scientific Presentations:

Savard, J.-P. L.[1] and G. Gilchrist[2].

CONSERVATION OF THE NORTHERN COMMON EIDER DUCK: AN INTERNATIONAL ECONOMIC, SOCIAL AND ECOLOGICAL CHALLENGE.

[1]Canadian Wildlife Service, Quebec Region, Quebec; [2]Canadian Wildlife Service, Western and Northern Region, Yellowknife.
Presented by Jean-Pierre L. Savard.

The Northern Common Eider, *Somateria mollissima borealis*, presents a management challenge. Little is known about the size of the population, and its breeding, moulting and wintering ecology are also poorly known. But it is intensively exploited by diverse users. In the summer, Inuit in Nunavut and Nunavik collected on feather down, eggs and meat on the breeding colonies. In winter, eiders are hunted for meat in Greenland as well as by Innu in Labrador and non-aboriginal hunters in eastern Canada and St Pierre and Miquelon. During moult and fall migration, eiders are hunted by Inuit in Nunavut and Nunavik, Greenlanders, and Innu in both Quebec and Labrador. On the breeding areas in Nunavut the impact of down harvesting, egg collection and adult harvest are poorly known, owing partly to the large size and isolated location of the breeding area. Down harvesting provides a sustainable way of using eiders to generate local economic gains and has been part of traditional use in northern Canada. However, the transition from a sustainable traditional harvest to an intensive commercial use needs to be closely monitored. Indeed, conflicts between Nunavut and Nunavik Inuit over down harvesting within shared land claim settlement areas are increasing. In West Greenland, hunted birds are sold commercially and that wintering population is likely over-harvested. Winter and spring harvests, both legal and illegal, in eastern North America are poorly quantified. Tensions between aboriginal and non-aboriginal hunters (especially on the Lower North Shore of the St Lawrence), and ongoing negotiations with the Innu in Labrador further complicate this issue. Finally, climate change may influence both the ecology of the Northern Eider and the exploitation pressure by modifying the access to colonies for both human exploiters and non-human predators, as well as altering the eiders' access to shallow feeding areas because of variable sea ice conditions. The management of the Northern Common Eider must be tackled at several levels simultaneously (local, regional, provincial, national and international), and monitoring and research efforts must be increased. One crucial step is the education of all users about the resource they share and their potential impacts on the Northern Eider population and on other users.

Heinrich, Nikolaj.
IMPORTANCE OF EIDERS TO NORTHERN RESIDENTS IN GREENLAND.
Kalaallit Nunaanni Aalisartut Piniartullu Kattuffiat, Nuuk.

Eiders and eider hunting have always been important in Greenland as a subsistence food needed to sustain human welfare. In those days, survival could depend on the eider hunt. Egg collection is not practised any more, in fact hasn't been legal since the 1920s, and this ban has generally been observed by most people. However, now there is more imported meat and food than there used to be, and so there is less need to rely on eider hunting. And also, we used to use the skins for clothing, but we don't do that any more.

But there are still some who like eider meat and want to eat it.

There is by-catch, we know that and we have more information about that.

The hunting season in West Greenland does not start until 15 October, and eiders are already gone from the northern areas by then, so that for example Upernavik could not get eiders last hunting season because of the restrictive hunting season. It would be good if the hunting regulations could be altered to allow hunting on flocks of moulting birds in summer.

Merkel, F.R.[1], A. Mosbech[2], C. Sonne[2] and G. Gilchrist[3].
STATUS OF THE NORTHERN COMMON EIDER IN WEST GREENLAND: SUMMER AND WINTER.
[1]Greenland Institute of Natural Resources, Nuuk; [2]Danish National Environmental Research Institute, Roskilde; [3]Canadian Wildlife Service, National Wildlife Research Centre, Ottawa.
Presented by: Flemming Ravn Merkel.

There is a long tradition for harvesting eiders or eider products in Greenland. However, the social tendencies of recent decades--growth of the human population, better guns and faster boats--have generated a growing concern for the status of breeding population in West Greenland.

Recent surveys in western Greenland confirmed the general impression that there has been a large decline in the breeding population of the Common Eider. During 1998–2001 ground surveys were conducted systematically along the west coast of Greenland, covering the districts of Ilulissat, Uummannaq, and Upernavik (69° 15′ N–74° 05′ N). At 15 colonies where comparable and well-documented surveys were conducted about 40 years earlier and had counted 3 361 nests in 1960–65, only 662 nests were found in 1998–2001. This corresponds to an overall decline of 80% or an annual population decline of about 4%. The

study revealed a considerable year-to-year variation within colonies, but not one large enough to explain the overall decline. A similar population trend (73–83% decline) has been documented at breeding grounds further south in West Greenland (Kangaatsiaq, 68° 20′ N) over a period of 43 years. Among recently surveyed breeding areas only colonies in Northwest Greenland (Qaanaaq) seem to be stable.

Although uncertainties exist for breeding areas in Southwest Greenland, the total breeding population on the west coast is not likely to count more than 15 000 breeding pairs at the present time. However, based on historical information on the quantity of eider down purchased at trading stations, the breeding population has been estimated to number at least 110 000 nests 150 years ago.

From recent aerial surveys of Southwest Greenland (1999) it is estimated that the coastal zone and the adjoining fjords of Southwest Greenland support a winter population of 462 794 (95% CL: 341 573–627 036). The breeding population in western Greenland can contribute only little to this winter population, and therefore most Common Eiders wintering in Southwest Greenland must originate from Canadian breeding grounds.

Common Eiders have been tracked by satellite telemetry between 2000 and 2003 from various locations in Greenland and Canada: from breeding grounds in Upernavik in West Greenland, and on Southhampton Island in eastern Arctic Canada, from a moulting area at Disko in West Greenland, and from wintering areas in Southwest Greenland. Two main wintering areas were identified and three major migration flyways. Eiders tracked from the breeding colony in Upernavik migrated south to winter and north to breed, following the western coast of Greenland. Some of the eiders tracked from the colony in Arctic Canada similarly migrated south to winter and north to breed following the eastern Canadian coast. However, 15 of 24 eiders (63%) marked in Arctic Canada, and 5 of 6 eiders marked in winter in West Greenland, followed an east-west flyway. They migrated across Davis Strait to winter in Southwest Greenland and back to breed in Canada, thus linking the other two flyways.

Gilchrist, G.[1], M. Robertson[2], and M. Mallory[3].

POPULATION STATUS OF NORTHERN COMMON EIDERS IN THE EASTERN CANADIAN ARCTIC.

[1]Canadian Wildlife Service, National Wildlife Research Centre, Ottawa;
[2]Canadian Wildlife Service, Western and Northern Region, Yellowknife;
[3]Canadian Wildlife Service, Western and Northern Region, Iqaluit.
Presented by: Mark Mallory.

The Northern Common Eider (*Somateria mollissima borealis*) nests in the eastern Canadian Arctic and Southwest Greenland, with the majority of the population nesting along coasts of

Hudson Strait and southeast Baffin Island. The population winters in Atlantic Canada and Southwest Greenland. Recent data from band recoveries and satellite telemetry has shown that a significant proportion of the Canadian nesting population winters in Greenland. Roughly 2 out of every 3 eiders banded at East Bay on Southampton Island in Nunavut are shot and reported from Greenland, a few are harvested locally in Nunavut and about one quarter are harvested in Atlantic Canada. These estimates agree with information provided by satellite tracking of birds from this colony. The satellite tracking has also identified important staging or moulting locations along Hudson Strait and in eastern Frobisher Bay.

Estimates of breeding numbers in Canada are poor, because colonies are widely dispersed along thousands of kilometres of shoreline around the Canadian Arctic archipelago, and many areas of good breeding habitat have never been surveyed. Surveys carried out to date in Canadian breeding areas can only account for approximately 200 000 eiders, but based on numbers in wintering areas more than 400 000 eiders should be breeding in Arctic Canada. There are undoubtedly many small colonies scattered along the coasts that have not yet been found.

The best recent information on Northern Common Eiders in Canada comes from long-term research at the East Bay colony, Southampton Island, Nunavut. This colony alone supports about 4 500 breeding pairs of eiders and is the largest known in Arctic Canada.

Adult females at the East Bay colony have only a 73% chance of survival each year, which is much lower than eiders elsewhere. Research priorities for the Northern Eider include determining better population and harvest estimates, and generating additional survival estimates for birds after Greenland restricted its hunting regulations.

Nyeland, Jens.

EIDER HARVEST IN GREENLAND 1993-2002 AND THE EFFECT OF A NEW HUNTING LEGISLATION.

Greenland Institute of Natural Resources, Nuuk.

For thousands of years eider ducks have been an important food resource for the indigenous peoples of Greenland, and although European foods become ever more important, ducks and other seabird species continue to play a major role. Furthermore, bird hunting is an important recreational activity in many parts of the country. Between 1993 and 2001 the then-existing bird hunting legislation remained unchanged. In 2002, however, owing to increasing concern about declining seabird populations, new regulations came into force, which were particularly intended to reduce spring harvests. The present talk reports on the harvest of Common Eiders (*Somateria mollissima*) by commercial and sport hunters on a national as well as on a regional scale between 1993 and 2002. It assesses the effect of the new hunting legislation on the Common Eider harvest and analyses trends and causes.

In 1993 an obligatory harvest reporting system—Piniarneq—was introduced in Greenland, which provided the information reported here; however, as there are indications of under-reporting, these statistics are considered as index values. From 1993 to 2001 the reported national harvest declined gradually by 37% from 83 000 to 52 000 birds. The decline was associated with, and most probably largely due to, a 33% reduction in the number of commercial hunters, from 4 000 in 1993 to 2 700 in 2002. However, other causes, such as a decline of the breeding population, cannot be excluded. In 2002 only 20 000 birds were reported taken, which was a clear and additional drop from the gradual decline between 1993 and 2001. The 2002 harvest corresponds to a 62–68% reduction since 2000–2001 or a 76% reduction since 1993. Based on the official hunting statistics, it is concluded that the 2002 bird legislation has had the intended effect on the Common Eider harvest level in Greenland. In 2004 the 2002 legislation was revised and the open season was extended by the last two weeks in February. As relatively few birds are shot at this time of the year, this is not expected to have a major impact on the annual harvest.

Gilliland, Scott G.

RECENT TRENDS IN THE CONSERVATION OF COMMON EIDERS IN NEWFOUNDLAND.

Canadian Wildlife Service, Atlantic Region, St John's, Newfoundland.

Eiders first breed at 2–5 years of age, and have a life expectancy of 20 years. They lay about 4 eggs/pair/year on average, but fledge only about 0.5 young. These dynamics make their populations slow to recover. In Newfoundland and Labrador, recent trends in breeding numbers have been generally positive. In the eastern Canadian Arctic, counts in Baffin Island have shown ca. 25 000 breeding pairs, and stable or increasing numbers in Ungava Bay and northern Hudson Bay. However, wintering numbers in Newfoundland waters have decreased in recent decades—possibly owing to harvests up to 20 000/year in the 1980s—reaching values as low as 30 000 counted on aerial survey in 1996. A shortened season and lower daily bag limit has reduced the harvest to current levels near 7–8 000/yr, considered sustainable. Current wintering estimates are of the order of 460 000 birds in the ice-free waters of West Greenland, and about 205 000 wintering in Newfoundland waters and the lower St Lawrence, where a wintering stock of, overall, about 250 000 might be a reasonable objective.

Eiders are not highly productive, and while an annual harvest near 7% allows some population growth, a harvest of 10% might produce a near-stationary situation and harvests of 12% would probably cause a decline. The winter of 2004–05 was exceptional for recent

years, with continued heavy sea ice that concentrated eiders in restricted open-water areas where hunters could get at them. The harvest was much larger than normal and may have inflicted lasting damage on the resource. Additional management measures are therefore under consideration, including tags or season limits on individual catches, early closures, emergency ice closures, or additional protected areas for eider management.

There appear to be few other serious threats at present on the Canadian wintering grounds. Although several marine species are farmed, aquaculture has not so far presented serious problems, and bilge-water oil fouling, more serious for the more pelagic seabird species, is not currently impacting eiders. Larger oil spills, especially in near-shore waters, do, however, present a threat, as evidenced by recent oiling events in both Quebec and Newfoundland waters in each of which a few thousand eiders died.

Bédard, J.[1], Bernard Murdoch[2], Richard Murdoch[2], and J.-P. L. Savard[3].
EIDERDOWN HARVESTING: A TOOL FOR MANAGEMENT AND RESEARCH.
[1]La Société Duvetnor Ltée, Rivière-du-Loup; [2]Fédération des Coopératives du Nouveau-Québec, Montreal; [3]Canadian Wildlife Service, Quebec Region, Quebec.
Presented by: Jean-Pierre L. Savard.

Eiderdown has been harvested for centuries for use in clothing and has become a luxury item in some parts of Europe, thus providing an additional source of revenue for some northern communities. Permits for collecting down from eider nests in the St Lawrence estuary are issued by the Canadian Minister of the Environment under Regulations made pursuant to the Migratory Birds Convention Act. Two such permits are issued to non-profit organisations, which annually collect some 1 000 kg of raw down from about 25 000 nests. The yield—150–200 kg of cleaned down—is sold in Europe as a luxury product. The income is essentially returned to the colonies in the form of habitat improvement, predator control and protection from disturbance. Trained down harvesters also monitor eider populations as they go, recording population numbers, incidence of disease, condition of nesting habitat, etc., and this has generated a unique and scientifically sound database. This activity has provided a strong incentive for protecting the resource.

Communities in northern Canada are rapidly moving from a traditional to a commercial use of this resource and could benefit by learning from the experience gained in the St. Lawrence. Down is collected in Nunavik from (probably) 75 000 to 125 000 nests on an untold number of islands, mostly along the south coast of Hudson Strait and the west coast of Ungava Bay. The (raw) amount collected averaged 3 300 kg over 1998–2004, but reached 5 000 kg in 2004. However, in Nunavik there are a number of not-yet-resolved conflicts related to harvesting rights, ranging from territorial jurisdiction over coastal islands—historically *de jure* Nunavut territory, although close to the coastline of, and *de facto* used by residents of, Nunavik—to the allocation of harvesting privileges within local communities

and even to conflicts between different modes of exploitation: down harvesters, egg collectors, and meat hunters.

Merkel, Flemming R.

IMPACT OF HUNTING AND GILLNET FISHERY ON WINTERING EIDERS IN NUUK, SOUTHWEST GREENLAND.

Greenland Institute of Natural Resources, Nuuk.

Commercial harvest of the Common Eider (*Somateria mollissima)* and King Eider *(S. spectabilis)* was studied at the local market in Nuuk (Southwest Greenland) during the hunting season (October–May) in 2000 and 2001. The goal was to quantify composition (by species, sex and age), sources (hunting or bycatch), and spatial and temporal distribution of the harvest. Hunting within 30 km of the city was the source of 98% of all eider kills from October until March. In contrast, bycatch in gillnets accounted for 52% of the eiders brought to the market in March and April (2000 and 2001 combined). In April, most bycatch was from remote fjord habitats, which seem to hold a high proportion of adult Common Eiders. As measured by the removal of potential reproductive eiders, spring harvest (April and May) was highly critical for the Common Eider, while the impact of harvest was highest during midwinter (January and February) for the King Eider. Sympatric distributions within hunting areas complicate adaptive management of both species. Spring hunting and gillnet bycatch are of high management concern.

Falk, K.[1], F. Merkel[1], K. Kampp[1] and S. E. Jamieson[2].

EFFECTS OF HUNTING WITH LEAD SHOT ON COMMON EIDERS IN GREENLAND.

[1]Greenland Institute of Natural Resources, Nuuk; [2]Atlantic Cooperative Wildlife Ecology Research Network, University of New Brunswick, Fredericton.
Presented by: Flemming Ravn Merkel.

The large numbers of Common and King Eiders wintering in Southwest Greenland are subject to intensive hunting, and in addition to direct harvest an unknown number of birds are wounded and become carriers of embedded lead shot. We conducted the first assessment of the magnitude of this undesirable side-effect of hunting in Greenland by X-raying 879 Common and 114 King Eiders collected during 3 winters (2000–2002) by local fishermen and hunters. On average, 22% of all Common Eiders carried embedded shot, but proportions were strongly age-dependent. Of first winter (1W) birds 13.2%, 16.4% of immatures (IM), and 29.1% of adults (AD) had been hit. For King Eiders the proportions were similar: 11.3, 10 and 20% had been hit. Adult Common Eiders collected in fjord areas were significantly less burdened (24.5 %) than birds collected in the more heavily hunted coastal areas (35.0 %). 1W birds contained more pellets (mean 2.2) than AD (mean 1.7), despite the adults' longer time to accumulate pellets from repeated occurrences, suggesting

that the hardest hit juveniles die before entering the older age class. From the proportion of wounded 1W birds (13.2%) we estimated the wounding rates (proportion of age class wounded for the first time each year) for older birds (IM+AD) to be at least 1.8–3%, assuming annual survival of adult eiders falls in the range 0.8–0.9. Assuming that roughly 35% of the 463 000 Common Eiders estimated to winter in Southwest Greenland are juveniles, 13% are immature, and 52% adults (4th winter and older), then each winter up to 30 000 eiders would become new carriers of embedded shot (21 000 juveniles, 1 200–1 800 immatures and 4 800–7 300 adults). Since crippled birds may suffer higher winter mortality and also may also have reduced reproductive output, these crippling losses have implications for the demographic models used to assess sustainable eider harvest levels. There is a need for follow-up studies of regional variation in crippling, and to identify ways to possibly reduce hunters' unintended impacts on game populations.

Johansen, P.[1], Henning S. Petersen[2], G. Asmund[1], F. F. Riget[1].

LEAD SHOT FROM HUNTING AS A SOURCE OF LEAD IN HUMAN BLOOD.

[1]Danish National Environmental Research Institute, Roskilde; [2]Dronning Ingrid's Hospital, Nuuk

Presented by: Helene Nyegaard.

Lead residues in shot game birds are a source of lead contamination to humans. Not necessarily through the consumption of whole shot or large pieces, but also from invisible trace remains of lead along the shot track. Breast muscle of eiders and murres bought at the market in Nuuk was analysed for lead content. Even with whole shot and visible fragments removed, breast meat from eiders averaged 6.1 ppm, much higher than breast meat from murres at about 0.73 ppm. By-caught eiders averaged only 0.14 ppm. The difference between eiders and murres may be due to the difference in size, or to the fact that murres are more often shot on the water, where the breast is protected from being hit.

Ingestion of 1 500 µg of lead per week is a level that is of medical concern; overall average ingestion rates in Greenland are only 15 µg/week. But a 200-gm meal of eider meat brings on average 1 220 µg. A study of 50 people in Nuuk during the seabird hunting season registered 1 300 meals of seabirds: 61% were of murres and 29% eiders. Lead levels in the blood varied with how often people ate birds, from 15 µg/l among those who ate no birds to an average of 128 µg/l among those who ate more than 30 'bird units'/month; the highest value of all was 221 µg/l. Even those who ate birds as little as 5 times a month or less had average levels of 62 µg/l. Although it takes about 850 µg/l to produce overt signs of lead poisoning, the U.S. has established a 'level of concern' at 100 µg/l, and developmental effects on foetuses and infants can be detected at about 60 µg/l.

Christiansen, Thomas Kjær.

HUNTING OF EIDER DUCKS IN DENMARK.

Danish National Environmental Research Institute, Kalø.

Common Eiders of the Baltic–Wadden-Sea flyway population occur in internationally important numbers in Danish waters in the non-breeding seasons. From October through February the eider is a common quarry, the annual bag presently numbering c. 75 000. From the Danish Bag Record, annual bag increased from c. 100 000 in the late 1950s to about 150 000 during the 1970s and 1980s, but then decreased by about 5%/yr through the 1990s to its present level. During the period of decrease, estimates of wintering numbers declined correspondingly at about 7%/yr. Analyses for 1980–1999 have shown that variation in the bag is mainly related to the number of hunters that report shooting eiders; this explains 71.3% of the variance. The proportion of juveniles in the October bag also contributed significantly to bag size, although the contribution of juveniles only accounted for 6.1% of the variation. The length of the hunting season was constant, and the number of days suitable for hunting at sea did not significantly affect the bag. Thus the decline in hunter numbers from c. 14 000 in 1980 to c. 7 300 in 1999 is probably the main reason for the decline in harvest. Assessed from trends in numbers taken per hunter, there is no indication that hunter numbers have declined because of a decline in the eider population; it seems more likely that the number of hunters has declined in response to legislative changes in the conditions for hunting that have taken place over the last twenty years.

Mosbech, A.

EIDERS AND ENVIRONMENTAL PROTECTION.

Danish National Environmental Research Institute, Roskilde.
Presented by: Helene Nyegaard.

Given the historical size of the West Greenland breeding population of eiders, there is room for a considerable increase. However, limiting factors should be assessed, and regulation considered. Hunting and egg-collecting have now been regulated to a sustainable level, and contaminants are not a problem.

Nearly 25 % of eiders have lead pellets in tissue, and some will have reduced survival or lower productivity, but it is difficult to assess the population impact. By reducing shooting ranges, wounding could be reduced: goose hunters in Denmark have achieved this following a campaign by their association.

There is significant bycatch of eiders in fishing nets, totalling several thousand per year. It is largely localised in time and space and could be eliminated with local restrictions in the lumpsucker fishery. However, the fishermen's cooperation is needed for mapping important conflict areas, assessing local mortality and identifying alternative fishing areas.

Eiders are attracted to ships' searchlights and flocks collide fatally with ships; large mortalities result. Every Greenland shipmaster knows of such incidents. Some turn searchlights off when an eider flock is seen approaching on the radar, to protect not only the birds but also the ship's equipment. We have no data to assess the population impacts of searchlight collisions in Greenland—probably a few thousand per year. A pilot investigation showed that numbers were variable from year to year and from area to area. It is not clear what could be done to reduce this problem, as shipping safety must be preserved. However, if local coastal areas in certain periods could be identified as the main locus, the regulation of shipping routes could be considered.

Oil spills are not now a problem, but may be an increasing threat as exploration activity increases and if production ensues. A large oil spill in a winter concentration area could kill tens of thousands of eiders. Strict safety and environmental regulation, oil spill contingency planning and inclusion of important eider areas in sensitivity mapping are measures that could reduce the risk to the birds. A large and productive eider population, with good recovery potential, would safeguard against long-term effects.

Human disturbance in breeding colonies can lower productivity. Historically, most disturbance has been related to hunting and to egg- and down-collecting, so levels should now be lower. Disturbance in hunting season in foraging areas can disrupt time and energy budgets. Protected areas in good foraging areas can attract birds, providing secure feeding areas and stable energy budgets.

Gilliland, Scott G.

REGULATIONS AND PROTECTION IN CANADA AND NEWFOUNDLAND.

Canadian Wildlife Service, Atlantic Region, St John's, Newfoundland.

Migratory birds in Canada are protected under Canadian federal legislation passed to implement the Migratory Birds Convention agreed between Great Britain (for Canada) and the United States in 1916. Among its important provision was the forbidding of market hunting—migratory game birds could no longer be sold—and the protection of migratory birds before and during the breeding season. However, Newfoundland was not at that time a member of the Canadian federation, and eiders were not protected by this legislation until 1949.

Current regulations for (the island of) Newfoundland, that affect the wintering populations of the Northern Common Eider, are a season between the fourth Saturday of November and the last day of February, and a daily bag limit of 6 sea-ducks—oldsquaws *Clangula hyemalis*, scoters *Melanitta* spp. and eiders combined—with a possession limit of 12. After the first

Monday of February, these limits are halved. In Quebec waters of the lower St Lawrence, the season is earlier, from 1 November until 14 February.

A recent hard winter with very heavy ice cover concentrated eiders in restricted ice-free areas where hunters could get at them and led to very large harvests. While the existing regulations might well be better enforced in key locations, the regulations themselves could also perhaps be improved, for example with possibilities for emergency ice closures, protected areas, or individual limits on the total bag for the season.

Thaulow, I.

MANAGEMENT MEASURES IN GREENLAND AND STATUS OF THE NEW HUNTING REGULATIONS: A NEW ERA OF BIRDS PROTECTION IN GREENLAND.

The Directorate for Environment and Nature, Greenland Home Rule Government, Nuuk.

In February 2004 a new revised version of the executive order on protection of birds came into force in Greenland. The new legislation was the result of a long and intensive debate that had been going on since 2001, when the former executive order was adopted.

The executive order of 2001 was introduced on the basis of data showing that especially the spring hunt in Greenland on murres, Common Eiders and King Eiders was not sustainable. A complete ban on spring hunting was introduced.

In Greenland there is a long history of seabird harvest, dating back thousands of years. Therefore these more restrictive regulations triggered intense discussions and the hunters' association (KNAPK) exerted huge pressure on the politicians to withdraw the new regulations.

To establish a regulation that was more acceptable to the public the Home Rule Government decided to grant an exemption in 2003 especially regarding the spring hunt. Among others the exemption implied that hunt on eiders and murres for private consumption was allowed until 30 April in the south of Greenland and 15 June in the north.

The exemption was granted during an unstable political period in Greenland and was followed by a growing international pressure from birders' associations and other non-governmental organisations. Furthermore, the new Greenlandic nature conservation NGO, Uppik, and the Greenlandic birders' association, Timmiaq, expressed concerns about the exemption.

The Home Rule Government insists on the importance of sustainable development of the society in general and in the utilisation of the living resources. After consultation with

researchers and hunters' associations a revised executive order for protection of birds was introduced, which came into force on 15 February 2004. The autumn and winter hunting of eiders and murres is now allowed until 28/29 February[2], which is a minor extension in the hunting period compared with the 2001 legislation. To compensate for this small extension in the open season, the rules for hunting during fall and winter has been tightened even more, with smaller daily limits. Furthermore birds taken as bycatch in fisheries may not be sold[3]. It is hoped that this will secure the right balance for sustainable hunting in order to maintain the living resources for future generations.

The Ministry of Environment and Nature has followed up on this new legislation by producing water-resistant information booklets that can be brought on hunting trips. Different booklets for different regions and different game seasons have been printed and distributed.

Merkel, Flemming R.

RECENT RESEARCH ON THE COMMON EIDER IN GREENLAND.

Greenland Institute of Natural Resources, Nuuk.

Recent research on Common Eiders in Greenland has mostly studied population status and population biology. There are scarce historical records of breeding numbers for West Greenland spanning the 20th Cent., and some even earlier historical records of trade in down, that indicate numbers of active nests. More intensive ground surveys were carried out in 1995–2002 and an aerial survey of wintering birds in West Greenland was carried out in winter 1999–2000. Trends in breeding numbers are currently being monitored by local people in some areas—a programme that should be extended. Nesting success and losses to predation were studied in Upernavik in 2002.

Population structure was studied by banding in the second and third quarters of the 20th century, and satellite studies in 2001–2003 have allowed migration routes and timing to be followed. Genetic studies on eggs collected in Canada and Greenland will contribute to understanding of population structure.

Winter ecology studies in Nuuk in 2000–02 covered diet, activity budgets, body condition, and parasite loads, as well as the effect of disturbance on activities.

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[2] in the Local Authority of Ittoqqortoormiit the birds mentioned may be hunted until 31 May and in the Local Authority of Qaanaaq until 15 June, but only for private consumption and with bag limits.
[3] true when the presentation was given; since altered by dispensation from the provisions of the Executive Order.

Harvests have been monitored through the harvest-statistics system 'Piniarneq' since 1993, and the composition of the harvest has been studied in Nuuk in the mid- and late 1990s, and in Maniitsoq and Sisimiut in 2002–03. Crippling, crippling rates, and the effect of crippling on the body condition of survivors, has been studied in Nuuk.

Bycatch, essentially in the lumpsucker fishery, was studied locally in Nuuk in 1999–2001 with some success, but a more extensive study in 2002–03 further south in West Greenland was unsuccessful.

Mallory, M.[1], G. Gilchrist[2] and M. Robertson[3].

RECENT RESEARCH ON NORTHERN COMMON EIDERS IN THE EASTERN CANADIAN ARCTIC.

[1]Canadian Wildlife Service, Western and Northern Region, Iqaluit; [2]Canadian Wildlife Service, National Wildlife Research Centre; [3]Canadian Wildlife Service, Western and Northern Region, Yellowknife.
Presented by: Mark Mallory.

The Northern Common Eider (*Somateria mollissima borealis*) has been the subject of several survey and research projects over the past 30 years in the eastern Canadian Arctic, although the majority of intensive work has only been undertaken since the mid-1990s. In collaboration with biologists from Greenland and Denmark satellite transmitters have been implanted in eider females to monitor their movements through the breeding season, during migration, and to the wintering grounds. This has yielded new information on the location of moulting and staging areas, and has confirmed some of the beliefs that had been based on interpreting band returns.

Studies are under way at East Bay, Southampton Island, Nunavut, to examine the influence of body condition, parasites, contaminants and local food supplies on the timing of breeding and the acquisition and use of energetic resources by breeding females.

Habitat characteristics can influence nest location and reproductive success. In Nunavut, we have studied the influence on reproductive success of habitat use near the colony during and after incubation, nest-site characteristics (including artificial shelters), and male attendance on females at the nest.

Eider females rely on stored reserves not only to produce the clutch of eggs, but also for sustenance during incubation. The role that energy reserves play in eider reproduction has been studied, particularly by examining where females gather these resources.

Predation is probably the factor that determines whether a female eider successfully rears young in a given year. Avian predators at most Canadian Arctic colonies include Herring (*Larus argentatus*) or Glaucous gulls (*L. hyperboreus*), or both, and skuas (*Stercorarius* spp.); while a single Arctic fox (*Alopex lagopus*) or polar bear (*Ursus maritimus*) can wipe out a year's production at a colony. Predation is being studied in both the low and high Canadian Arctic.

Canadian eider management also needs a better understanding of harvest, particularly the levels of subsistence harvest near some communities, as well as sport hunting in Atlantic Canada and in Greenland. More banding efforts would also further refine our knowledge of movements. Finally, increased survey effort is required to locate and assess unsurveyed eider colonies in Canada so as to complete our knowledge of population size of the Northern Common Eider.

Contributions by the Representatives of the Hunters' Associations[4] in Greenland.

Nikolaj Heinrich, Nuuk; on behalf of KNAPK

The significance of eider duck for the people of Greenland
The eider duck has been of great importance to the Greenlandic people in many generations. One might even say that eider has constituted one of the means of existence for the continuous population in Greenland.

However, the significance of eider might also be seen as having changed over the years; not only as a contribution to the supply of household meat, but also for the fabrication of clothes from its skin. But during and after the modernisation of Greenlandic daily life, the bird has become less important as a means of existence, as Greenlanders learned to consume meat from other countries on a daily basis, and, likewise, the use of eider skin for clothing disappeared. However, one cannot say that the bird is of no interest at all any longer, as its tasty meat is still much in demand among the Greenlanders.

On the population, breeding, migration and wintering of eider duck
When weighing and assessing the eider population of Greenland, one must look into the past and remember the tales of one's ancestors as far back as the beginning of the 20th century when conditions were different.

At the beginning of the 20th century, when travels along the coasts of Greenland took place by kayak and umiak, it was much easier to get an impression of the eider population than today, and judging by the accounts, the populations were so large that the smell was extremely rank when one approached the outermost islands were the birds live.

In addition, owing to the gradual changes in sailing activity, changes have taken place in the eider breeding grounds, and it is particularly striking that the islands close to the sailing routes, where eider used to breed, no longer attract the birds.

If we return to present-day conditions, we know how the traffic during summer has developed, especially with regard to the breeding season. The amount of traffic today and the number of boats sailing along most of our extensive coastline is unbelievable. Thus, it is

[4] as far as eiders, other game birds, and many other resources are concerned, hunters in Greenland hold licences either as 'erhvervsfangere' (roughly, business hunters) or as 'fritidsfangere' (spare-time hunters). The former group is more economically dependent on hunting as a livelihood, has in some respects more liberal regulations, and is represented by the **Kalaallit Nunaanni Aalisartut Piniartullu Kattuffiat** (KNAPK); the latter group is represented by the **Tapertaralugu Piniartartut Aalisartartullu Kattuffiat** (TPAK).

becoming increasingly difficult for the eider duck to find the necessary peace during the breeding season, and it is not surprising that the breeding population in West Greenland has declined markedly in recent years. Not because the population has decreased in number, but because the birds move to other areas of Greenland, where traffic is less heavy, for instance to the Kap Farvel area, to the coasts of East Greenland and to northern Greenland.

Although we know less about the breeding population than earlier, we confirm, again and again, that at least no reduction has taken place, when the birds return in great numbers to their wintering areas, and this is proof that the size of the population has been constant in recent years.

Hunt of eider duck in West Greenland

As mentioned previously, the hunt of eider in West Greenland is of great importance. In the early 1920s hunting regulations were introduced, and hunting was prohibited from the approach of the breeding season in summer and until the young were able to fend for themselves. The close season at that time was from 1 July to 15 September.

Today, the close season has been extended for various birds throughout Greenland, and the hunt of eider is now allowed only from 15 October to 15 February. Thus, license is given to kill a maximum of 30 eider ducks per day. Since hunting of eider and guillemot came to be allowed within the same time period, the catch of eider has declined markedly. In the last 6 years, the catch of the long-billed eider (Common Eider) has been reduced 8-fold, while the catch of the (short-billed) King Eider has been reduced to a lesser extent, so that, last year, the catch only amounted to about 2500 individuals.

Bycatch of eider duck

One cannot say that bycatch of eider in Greenland, due to the volume of present-day fishing instruments, is large. The fishing areas along the coast of Greenland are so deep that claims of possible bycatch of eider are unwarranted. However a minor bycatch of eider takes place in spring when netting of lumpfish and seal begins. The bycatch is too insignificant to pose a threat to the population.

Potential threats to the eider population of West Greenland

A threat that is not just a potential one, but also an actual threat, is ships sailing day and night and being moored at the quay with floodlights shining brightly all the time.

We must divide the eider population of West Greenland into two species: the Common (long-billed) Eider and the King Eider (short-billed). The Common Eider, which winters mostly in coastal areas and in fjords, is not especially endangered, as few ships and ordinary boats sail among inshore areas and in fjords in winter. In contrast, the King Eider, which forages for food in offshore areas and on shoals, has been an endangered species for many years now.

We, who live in this country and follow and observe all species of animal in Greenland, must clearly state that the King Eider has declined markedly.

Because the King Eider lives mostly at sea, it is not a significant prey for the Greenlandic hunter, and the hunt of this species is not sufficient as a cause of the declining population. On the contrary, the culprits are the ships and other vessels sailing night and day with their floodlights constantly on. If the use of constantly shining floodlights is continued recklessly, the King Eider is in great danger of becoming extinct within a short period of time.

Wounding and climate change
It is unnecessary to discuss wounding of eider by hunters, as no investigations are available on this issue.

The same applies to climate change, and climate change does not seem to be of any importance to the eider population, as the population is the same in all years as far as the Common Eider is concerned.

Kale Mølgaard, Qeqertarsuaq; on behalf of KNAPK

Numbers of eider ducks
Regarding the size of the eider population it is impossible for me to confirm any reduction. The eider ducks have moved further away, however, and anyone with sufficient imagination can determine the reason for this, namely the high level of noise and the constant traffic during recent years. Nevertheless, eider ducks are found almost all year in certain parts of Greenland—ice cover being the main controlling factor.

One good example of this is the fact that they stay in the Disko area as long as just a little water remains open, although the male is most seen in summer while the female does not roam far during the breeding season.

Hunt of eider
I will list some things concerning the hunt. Firstly, in connection with the hunting regulations it is tempting to say, being a hunter myself, who wishes to adhere to declarations and suchlike of all kinds, that it is desirable that everyone stick to the rules laid down by decrees and declarations.

It is only too obvious that all sorts of birds are hunted in places where control is absent; at times almost throughout the year. Regarding hunting in northern parts of Greenland, it is certainly necessary to prohibit hunting of birds when spring approaches. After all, we never see eider ducks seeking mates in February (I believe that only the raven does that).

Significance for the people
Because different prey animals are available at different times of the year, the hunt of eider has been important since the old days alongside other animals. We know that some prey animals in Greenland move to other places and return to their favorite grounds. This also applies to the eider, as all kinds of living animals follow their food source. Traditionally, every hunter hunts different prey animals at different times. Some prey animals become sparser, and others take over, i.e. the eider is significant just like all the others.

The population size
I do not think that the eider population has declined. Based on experiences from my childhood, I cannot see whether a reduction of the population has taken place.

Jakob Petersen, Nanortalik; on behalf of KNAPK

First of all, I will try to describe my own observations regarding the eider population in South Greenland during my 30 years as a hunter. The eider population in the South Greenland wintering areas has not changed markedly. According to my knowledge and my observations as a hunter in the past years, I do not believe that there are grounds for the current claim that the eider population is receding, or for the assessment that there is a risk of extinction.

On the contrary, the eider population in the wintering areas seems to be increasing, as South Greenland encompasses many and deep fjords, where they winter in great numbers. During the last few years, the population has been particularly large.

Furthermore, the hunt of eider in South Greenland is negligible, and takes place only to a small degree and during short periods of time. The hunt on them does not set in until the meat becomes tasty in spring.

Breeding grounds
There are many breeding grounds located in South Greenland, which, unfortunately, are unknown to the local populace, or rather; there are breeding grounds that have not been registered officially. The breeding grounds in South Greenland cannot be regarded as endangered, as the laws of nature seem to guard them. That is, during the breeding season large quantities of *storis*[5] occur, which makes sailing impossible, and the breeding grounds are located on the outermost islands, which are very difficult to reach, and where the *storis* surrounding them isolates them from the rest of the world.

[5] 'storis' (literally, 'big ice') consists of large floes of multi-year sea ice from the Arctic Ocean that, after drifting south down the east coast of Greenland, round Cape Farewell on the west-flowing coastal current. It hinders navigation, sometimes seriously, in near-shore waters of southern West Greenland in summer.

On this basis, as mentioned above, the breeding grounds cannot be regarded as endangered.

The only risks of disruption of the breeding grounds are posed by the rapidly increasing populations of polar fox and sea gull. These species eat many eggs and young, and they are the ones threatening the eider population, not humans as such.

More descriptions will follow when we meet in the future.

Ole Petersen, Upernavik; on behalf of KNAPK

According to my knowledge of the eider duck areas in the Upernavik district, those areas still exist. In the old days, we only rowed there. Today, we travel by speedboat.

The eider duck occurs in large areas around Upernavik—from the outermost islands to the near-shore glaciers. Earlier, vessels had certain sailing routes (lines), and today there are none. Because sailing is permitted everywhere, the bird populations move to other places. According to what I have heard, some populations have moved to the Qaanaaq area.

It is plain to see that the population is in no danger today. They come to Upernavik when hunting is prohibited and leave when hunting is allowed, and, therefore, they are not hunted generally. In this case I mean the Common Eider.

The King Eider comes here, not to breed, but to moult. At times there are so many that sealing is no longer possible because of the many ripples on the sea surface.

We North Greenlanders eat eider occasionally, when we catch any. Because of the hunting regulations we cannot hunt them, and our descendants are no longer accustomed to them.

Breeding eider ducks have been seen in recent years in North Greenland. They have become more abundant, and now we see some of them in winter here because of absence of ice cover, which takes long in forming. When they dive near new ice, they drown; and not only hunters kill them, nature takes its toll as well.

I have nothing against observing the regulations, but suggestions from the hunters are not heard (they are not taken into account when rules are made), for instance as regards applications for quota.

It would be desirable to allow a quota on non-breeding populations in future so that our descendants may learn to eat them also. We would like to be permitted to hunt young birds

before they migrate, as our elders are accustomed to them and miss them as a source of food.

When we cannot have birds on a daily basis, it would be desirable that hunt of King Eider be permitted, as they do not breed here in North Greenland, but come here to moult. Just as non-breeding guillemots are hunted in South Greenland, and we do not get those in North Greenland.

Jokum Schmidt, Paamiut; on behalf of TPAK

15 February

Re 1: Based on current knowledge and my own experience from sailing trips, I have noticed that the number of birds present in the breeding season is increasing and that the number of birds is increasing rather than decreasing. Furthermore, it is noticeable during the migration season that the populations flying south, especially in autumn, are becoming larger and larger. Finally, the wintering populations have also become noticeably larger, so that there may not be sufficient food for all of them. One might also say that in recent years the birds have become bolder, or tamer, than before.

2: Regarding TPAK for all of Greenland and the Birds Order, I find that the quota for bird hunting is set too low; as the birds in recent years have increased several fold in number compared with earlier (especially eider, as well as other birds) as judged from a single sailing trip. Regarding the hunt in West Greenland, we find that it is important to amend the Order, i.e. that the size of the quota as well as the length of the hunting season be increased without affecting the sustainable exploitation of natural resources. We find, therefore, that the Birds Order should be reconsidered, even though it has only been in force a short while, as we find that the grounds for its implementation are deficient, particularly regarding the announcement of spring-season quota.

3: We also have forebodings concerning birds that are killed because of the use of floodlights on ships at night, and why no count is kept of the birds killed as they hit the hull, bridge or cabin of ships, because the birds fly towards light, and speaking of safety at sea, radar and other instruments are used as well, but even these are not enough, regarding safety precautions. Therefore, I find that this issue should be taken up with the maritime authorities, if such cooperation does not exist already, as they, too, must have some experience in such cases. Furthermore, I believe that these concerns must also be of interest to Canada.

In addition, we find, although it has not been documented, that during netting of lumpfish, birds may be caught as well, which is not reported either. In addition, climate change may also have an effect, for instance, the weather has been very warm just before Christmas of

2004, which is why birds have not been close to the shore. Only when the weather grew colder did the eider ducks reach the shore. When we consider the preceding years, the population of scallops has also affected the birds. For instance, when scallops are being caught in the Nuuk area, a marked reduction in number of eider ducks is observed. The reason for this is the fact that the eider lives on scallop, and when these are caught by fishermen, not much food is left over for the eider. We find, therefore, that when giving out fishing licenses, one does not take into account the effect on the food chain, which is also a thing to consider.

If we further consider health conditions in connection with the use of lead shot, it is said to be dangerous when we eat birds with lead shot in them. We do not find that anything can be done about the legislative aspect at this point, because, if we change the legislation, this will entail financial expenses for the hunters, who will have to purchase new hunting instruments, and we know that the human aspect cannot be measured in terms of financial assessments.

16 February

If we look at the guidelines, there are some holes and some could be cleared up. Regarding the Birds Order, leisure hunters have no influence whatsoever on the reduction in number of birds, as only 5 birds may be shot in a single sailing trip, and due to the need for working on weekdays and sometimes being unable to sail out because of the weather, which means that it is only possible to sail out on the weekends and only when the weather allows it, especially this year. Therefore, we find that the Order should be amended so that we are allowed to shoot more birds, especially eider; for we must consider that they, too, need to be able to find food, otherwise they will just die of natural causes when they experience shortage of food.

1: In connection with inadvertent killing of birds by ships, one should cooperate with the maritime authorities so that some arrangement can be made concerning the problem without jeopardising safety at sea.

2: One should take a closer look at guidelines, rules and declarations concerning lumpfish netting, as birds may also be caught in the nets. The legislation on lumpfish netting should be investigated, and each net should bear the name of its owner, as the law requires, but the rules are just not followed.

3: In connection with anti-pollution measures, all parties concerned with this issue must be more organised than at present, so that pollution can be removed as fast as possible.

4: For instance: If the Canadians say that our eider ducks are being eradicated by Greenlanders (we hear them whisper or shout about it) where is the proof of this claim? For centuries, our living conditions have been changing because of climate change. This has also

been clear in recent years, when the birds have become more and more. This is the way living conditions are for us Greenlanders. Greenlanders have always lived the way living conditions allowed and have always adjusted accordingly. Such are the living conditions. To mention a piece of good news, I am pleased to say that, of old, we have always adjusted our living conditions according to what we can get: In 1916–17, Kangaamiut (the settlement's) council decided that in connection with sealing one should not shoot birds certain months of the year in a certain area outside the settlement. So you see—we have always guarded our living resources here in Greenland.

17 February:
When we consider the migrating populations of birds and the wintering populations, I have noticed, or experienced, as I have mentioned previously, that eider ducks live on scallop, which is why the eider population is declining—because of the ruthless exploitation of scallops by the fishermen, but because the eider ducks have found new food items, the size of the population is now considerable again. When we think of the years 2004 and 2005, the cold winters have caused the eider ducks to increase in number and, therefore, when reconsidering the Birds Order, one must take this into account. We just cannot see why the birds should die from lack of food, and it is important, therefore, to keep this realistic consideration in view.

13:30: More work is needed on information campaigns, and the users should be drawn into this work. More information should be disseminated in schools, educational institutions, the media and other organisations. In addition, I think that the work of the project "Tulugaq" should be continued and that the authority of the Hunting Council should be strengthened.

Furthermore, I find that it is important that the authority of the Greenlandic municipalities be strengthened, as they know the living conditions of the local populace better than anyone else. At the same time, I would like the Greenland Home Rule and people in authority to cooperate more and have the Greenlanders carry out information campaigns targeted at the rest of the world, in order that others may understand the living conditions in Greenland. Thus, talks might be given and other technical aids applied to let others see how we live. For instance, the day before yesterday, a French actor attempted to create a disturbance without knowing the Greenlandic way of life.

Summaries of Discussions

On Numbers, Population Status, Population Trends:

We agreed that there are large numbers of breeding birds in eastern Arctic Canada, although the numbers are not perfectly known. There was discussion and some disagreement about the breeding numbers in Greenland, and their status in comparison with formerly; some views were advanced that eiders have moved to other places. It was agreed that there are in any case large numbers *wintering* in West Greenland, but no good knowledge on the trend of those numbers. Hunters observed that there are some flocks to be found in winter in ice-free areas as far north as Disko Bay, for example, and biologists agreed, and said that they had knowledge of these northerly wintering groups. An estimate of 250 000 was mentioned as a carrying capacity and also as a management objective for the wintering flocks in Newfoundland waters. This generated some discussion, as it was not clear what the basis was for proposing that number.

Although trend in wintering numbers in West Greenland is not known, it was proposed that a more serious lack of precise knowledge was a stock-taking of breeding numbers in some of the areas of Greenland that have not been surveyed. It was also noted that knowledge of breeding numbers over the breeding range of this population in eastern Arctic Canada was incomplete, and that further surveys there would be informative.

On Hunting, Egg- and Down-Collecting and other Exploitation:

A presentation on down collecting was heard with interest, but there was little discussion of this subject. The industry appears to be under development in Arctic Canada, and in Greenland, the perceived present need to rebuild the breeding populations will not conduce to developing such an industry, even though the disturbance to breeding birds may be slight. Down collecting in Greenland used to be permitted, but only after the birds had left the nest, and then the down is soon spoilt or blown away. Present practice in Canada is to collect down while the nest is active, but to collect only a part of the down from each nest.

There were some observations on egg collecting in Canada, which is a traditional practice. Canadian hunters described their practice of only taking perhaps 4 of 6 eggs in a nest.

Hunting practices and bags in Arctic Canada seem poorly known and reported, although it was pointed out that there are no commercial or recreational hunters in Arctic Canada, only subsistence hunters. There was heated discussion of the present regulations in Greenland. The spring and summer closure of seabird hunting was seen as directed against the northern communities, from which eiders have disappeared before the hunting season opens, and in

which they do not reappear until after it has closed again. There were voluble arguments against the present regulations. It was asserted that in northern West Greenland there are few other resources than seabirds, and that therefore it was important to adjust the bird-hunting regulations so that these areas could have some better access to migratory sea-birds.

On Hazards and Mortalities:

Crippling and subsequent moribundity:
Discussion on crippling and the proportion of birds carrying shot was largely directed toward the methods used in the study, but there was also some discussion of whether an introduction of steel shot in Greenland—where lead shot is still being used—would increase crippling losses in the seabird hunt. Opinions were mixed. Crippling loss can be reduced by restrained shooting and careful hunting, and it was suggested that there would be a learning experience for hunters after a switch to non-toxic shot—crippling loss might increase at first, but as hunters learnt about the new shot and changed their hunting practices, it could be brought down again. It was said from Canada that many hunters there are still in this learning phase, although lead shot has been forbidden for migratory bird hunting since 1999.

Bycatch:
There was a lot of discussion on bycatch, without necessarily much agreement. Data, as well as some anecdotal information, was brought forward showing that total bycatch can be large. One study in Nuuk found a total of 1 800 bycaught eiders on sale over 83 days, and in another study in an area further south about 2000 bycaught eiders were found in one month of checking nets. It was also reported that about 50% of eiders, and 73% of adult eiders, on sale in the Nuuk open market were bycaught birds, indicating that, at least at certain times of year, bycatch is about as big as the take by hunting, and more damaging to the population because of the large proportion of adults. It appears that Common Eiders are more liable to bycatch than King Eiders, because they feed closer to shore and in areas where there are fisheries.

There is no agreed estimate of what the total bycatch might be, and studies on bycatch have proved difficult to carry out. A restricted study in areas near Nuuk was fairly successful, but a larger study in areas further south in West Greenland did not succeed. Although some fishermen and hunters are quite ready to declare that there is bycatch, it is large, and it should be reduced, it seems that others are sensitive to the possibility of restrictions on the lucrative fishery for lumpsucker roe. There is a requirement to record and report bycatch numbers in the harvest statistic system *Piniarneq*, but it is recognised that bycatch is incompletely reported. There was no discussion of the effects or usefulness of the present

ban on selling bycaught eiders[6], which was imposed to reduce any incentive to allow bycatch to occur. It was observed that bycatch damages nets and is to that extent undesirable for the fisherman.

Bycatch is agreed to be mostly in lumpsucker gillnets, in March and April, and in relatively shallow water in coastal areas. It was also stated that much of the bycatch occurs at night. However, all these properties are properties of the lumpsucker fishery itself, and there was little optimism that seasonal or time-of-day restrictions on the fishery would be usable or useful. However, it was maintained that closures—possibly short-term—in restricted areas as a response to local high bycatch might be effective in reducing the total, or at least that the problem should be studied to find out whether this is a realistic possibility. For example, by finding out how localised high-bycatch areas are, and also whether there can be good lumpsucker catches in areas without high bycatch.

There was also some discussion of modifying nets so that they scare eiders away—by sound or by making the nets visible—or in other ways avoid catching them, and whether this could be done without harming the fishery, but no suggestions for this kind of gear modification were made at the workshop that were recognised by the fishermen as likely to be helpful. However, further investigations should probably be made, at least by enquiring in other fisheries that have problems with bycatch of eiders or other birds.

There was some discussion of bycatch by abandoned nets or nets that are left out too long, and also whether, or to what degree, fishermen can themselves act to reduce bycatch of eiders without losing fish. There was some acrimony over questions of whether some classes of fishermen are better or worse than others at knowing how to catch lumpsuckers without catching eiders. It was impossible to draw any conclusions from this discussion, but it seems that if some way could be found to study the ability of the most competent fishermen to control bycatch, lessons might be learnt that would make it easier to protect the eider-duck resource.

The indications from Nuuk itself were that most catch of eiders in the fjords was by-catch—few hunters go far from the town to shoot—and that since the birds wintering in the fjords are mostly adults, the bycatch is the more damaging to the population.

Ships' lights and collisions:

There was much agreement on this problem. It was recognised as having a serious effect on the resource: kills in the thousands from single incidents were mentioned, and it seemed that kills in the hundreds were common. The description of the problem was agreed: almost any ship sailing at night in winter, in an area where eiders have gathered, with a searchlight to detect and avoid ice—a common practice in West Greenland—is liable to attract flocks of

[6] this ban was removed by dispensation from the Executive Order in late May 2005.

flying eiders to serious, or fatal, collision. The damage to the ship's equipment may be significant, but large numbers of birds are often killed. It was not reported that this is a major source of winter mortality in Canada.

However, there has been no survey, and no attempt to date to measure the scale of the problem or estimate the total damage to the eider resource. There is neither an estimate of the number of collisions that occur every year, nor of the number of birds in an average collision. There is also no information on what factors determine whether a collision will occur, or (apart from the size of the flock) how serious it will be if one does occur.

There was universal agreement that this is a priority for study, starting for example with surveys of ships of different classes to find out how often collisions occur, and whether higher-risk areas can be identified. However, not much hope was expressed that solutions to this problem would be easy to find. It was recognised that marine safety would tend to be a priority, and that there were few, or no, easy solutions in sight. It was noted that some captains turn off searchlights when approaching eider flocks are seen on the radar, partly to avoid collision damage to equipment, but there was no suggestion that this practice could be applied in all cases, or even a significant proportion. It was mentioned that collisions with ships in harbour might be reduced if searchlights were required to be extinguished there.

Predation:
Predation was discussed in connection with reproductive success. Large gulls and ravens are constant and consistent predators on breeding grounds; it was mentioned in connection with the St Lawrence eider-down industry that nest covers can be effective in reducing this avian predation. Access by an Arctic fox or a polar bear can wipe out a year's production at an Arctic colony. Hunters were insistent on the significance of predation by foxes, and they observed that fox predation in West Greenland has increased since egg-collecting was forbidden, the implication being that egg-collectors deter or deflect foxes. A similar observation from Canada was that predation has increased since people moved into (larger) settlements, again with the implication that while people were living on the land they helped to protect the breeding colonies from foxes.

Data also appears to show that the threat of predation on the Greenlandic wintering grounds can influence birds' use of habitat, because sea-eagles can safely attack near to the shore but are at higher risk when attempting to take eiders in offshore waters.

Other hazards, including oil spills, contaminants, parasites and diseases:
There was little discussion on these issues. Avian cholera was mentioned in two presentations as a significant mortality factor on breeding grounds in the St Lawrence and in Denmark, but not (yet) in connection with the Northern Common Eider. Not only spills of oil, but also chronic low-level releases in bilge-water discharge can cause mortality or moribundity, but neither the one issue nor the other is yet registered as a current continuing

problem for this population. Other contaminants seem not to be an issue, and lead poisoning of ducks from ingesting shot on heavily hunted wintering grounds is not apparently so far a problem for these sea-ducks. Parasites, and their effect on production or mortality, were mentioned in connection with current research on the Canadian breeding grounds, and as a possible contributory cause of declines in Denmark, but were not described or discussed as a problem that can be, or needs to be, controlled.

Priorities for Study and Action:

Participants in the workshop were asked to name three things we should do to improve the management of the eider population and to improve the outlook for its future, and also three things we should study. Then we listed the different subjects and tallied up how many times each one had been recommended. The division between subjects for study and recommendations for action was not always clear-cut at the time, so the two lists have here been combined, and allocated *ad hoc* to 'Action' (A) or 'Study' (S). 'Improve reporting' has been considered a 'study' item. Some items that had similar intentions and only insignificantly different descriptions have been combined.

There was a clear distinction between important subjects that received a lot of attention and subjects that were only mentioned once or twice. The main preoccupations were clear: in terms of study, we should find out more about population numbers (20), about bycatch (15), and about collisions with ships (19). Among other data collection, improved reporting or other means of estimating hunting takes are also seen as a priority, and the migration routes connecting different breeding and wintering areas were also important (7).

Priority *actions* were less clear-cut. Improvements in the social framework for eider management received a total of 14 mentions, with education programmes and improving the communication and relations between users, managers and scientists at the top of the list. Having better (more clearly defined) management goals, common between the two countries, was seen as important (7), and Greenland hunters attached great importance to extending hunting seasons and adapting regulations to local conditions (7). Other priority action items were finding ways to reduce fox predation on the breeding-grounds (6), by-catch (5) and collisions with ships' searchlights (4). By-catch and collision were priority items for both study and action (43 in total), but it was not thought important to study predation (1).

Social Framework in General

A Education programmes---hunters, boaters, tourists, immigrants from outside Greenland, schools as well, media, and restart Tulugaq XXXXXX
A Better cooperation and trust, hunters and biologists, (and even managers!) user involvement in research, also spare-time hunters XXXX
A Increase the influence of the Fangstrådet, the users, and the municipalities (in management and research) XXX
A Improve the transfer of research results to the community X

Management in General

A Make better and common management goals XXXXXXX
A Extend the hunting season and have locally adapted regulations for Greenland hunting: XXXXXXX
S Improve the reporting of bag, by-catch and collisions; change attitudes XXXX
A Improve enforcement of regulations: XX
A Overhaul management methods, go away from a daily bag system, go away from having two classes of hunters X
S Find out how well the new regulations are working in Greenland X

Numbers, Population Status, Population Trends:

S Get better data on population sizes XXXXXXXX; e.g. more breeding areas XXXXXX, in Greenland XXX, specifically in East Greenland X, and also in Canada X
S Specifically wintering numbers: X
S Improve survey methods—remote sensing, observation satellites! X
A Improve reproductive success, by all appropriate means X

Other Population Biology:

S More widespread marking in colonies (also in Canada); study migrations and relations between breeding and moulting areas and wintering sites XXXXXXX
S Estimate how the Greenland catch splits between Canadian breeding birds and Greenland breeders? XXXX
S Estimate total mortality levels, not just hunting but including other mortalities XXX and including the Canadian subsistence harvest X
S Study movements between colonies and find new colonies XX

Hunting, Egg- and Down-collecting, Other Exploitation

S Find out about egg collection in Canada, e.g. its scale and its effect on production; X
S Study the effects on productivity of disturbance by down and egg collection X
A Ban egg-collecting—also in Canada: X

Other Hazards:

Bycatch:

S Get data, improve information on and reporting of bycatch (Piniarneq) XXXXXXXX
A Develop methods to reduce bycatch XXXXX

Ships' lights and collisions

S Introduce an enforceable regulation requiring reporting of searchlight collisions as an initial step to find out more about this problem: XXXXXXXXXXX
A Make regulations for turning searchlights off, find solutions to this problem, take some action: XXXX

Predation:

A Reduce fox and other predation, and reduce fox numbers, subject to local approval: XXXXXX

S Find out how much predation occurs in breeding areas: X

Oil spills, contaminants, parasites and diseases

A. Reduce or minimise disturbance, *inter alia* by improving traffic routing: XXX

Appendix I: Action Plan for the Northern Common Eider.

This action plan was not developed at the workshop, but was written later to address the priority concerns expressed at the workshop.

If there are problems with eider populations, they are probably either management problems—i.e. management action needs to be taken to restore populations, prevent their decline, or enable them to reach a level set by management authorities as desirable—or perception problems, in which differences of opinion about the present state of populations, or about predictions for their future, cause friction between management authorities and users. It follows that the lead agencies in the most important components of any Action Plan will necessarily be the authorities responsible for managing exploitation and ensuring the sustainable future for the populations. In Greenland this is the responsibility of the Directorate for Environment and Nature, with the participation—notably in the area of catch statistics—of the Directorate for Fishing and Hunting and the cooperation of the hunters' organisations. Where the Directorates are in need of scientific advice on the consequences of specific management decisions, the Greenland Institute of Natural Resources and the Danish National Environmental Research Institute play a leading but not exclusive role. In Canada, the Department of Environment is the management authority, and the Canadian Wildlife Service, which is a part of that Department, is the scientific adviser.

It appeared from the priorisation of topics at the workshop that hunter catch *per se*—i.e. legal catch by licensed hunters within authorised seasons, and under ordinary conditions during hunting season—was not high on the list of concerns or under strong suspicion of further reducing numbers. Data was presented that appeared to show that recent restrictions on hunting seasons and bag limits in Greenland have had effects in reducing the take, while hunter harvests in Canada are considered to be under adequate control, under ordinary conditions, through regulation of season length and daily limits. Extraordinary conditions—such as exceptionally hard winter weather—that greatly increase the vulnerability of eiders to hunters, and thereby increase takes, are, however, not well addressed by present regulatory powers, which may need to be strengthened.

However, the workshop identified a number of uncertainties, both as regards basic population parameters, including numbers and distribution, effects of predators, etc., and also pointed out some problems of human-caused non-hunting mortality about which not enough is known, but which are likely causes of significant losses to the populations.

In terms of management, there were also identified a range of problems, including deficient dialogues between different participants such as scientists, hunters and managers, and even between management authorities in different countries.

In this action plan, we have tried to identify groups who could take leading roles in implementing the suggested actions. The abbreviations we have used are, for user groups:

KNAPK: Kalaallit Nunaanni Aalisartut Piniartullu Kattuffiat, the Association of Commercial Hunters and Fishermen of Greenland;

TAPK: Tapertaralugu Piniartartut Aalisartartullu Kattuffiat, the Association of Free-time Hunters and Fishermen;

for agencies with management responsibility:

DMN: Direktoratet for Miljø og Natur: the Directorate for Environment and Nature of the Greenland Home Rule Government;

DFF: Direktoratet for Fiskeri og Fangst: the Directorate for Fishing and Hunting of the Greenland Home Rule Government;

DOE: the Department of the Environment, Government of Canada;

and for scientific advisory bodies:

GN: Grønlands Naturinstitut, the Greenland Institute of Natural Resources;

DMU: de Danske Miljøundersøgelser, the Danish National Environmental Research Institute;

CWS: the Canadian Wildlife Service;

Biology and Population Dynamics

1. Population surveys—nesting areas

a. Canada

Information: the majority of the population is thought to nest along coasts of Hudson St and southeastern Baffin I. However, estimates of breeding numbers are poor, colonies are widely distributed, and many areas of good breeding habitat are un-surveyed. From estimates of wintering numbers, only about half the Canadian breeders have been counted, and the distribution of the remainder is unknown.

Actions: **complete** an accurate review of the colonies and breeding areas now known to biologists. **Supplement** this with surveys of local knowledge (community visits) and with map analyses to delineate significant un-surveyed areas of potential breeding habitat. **Carry out** aerial surveys at appropriate seasons to identify important colonies and derive a basis for subsequent stratified surveys. **Carry out** stratified ground surveys to estimate numbers of breeding pairs.

Timing: Soon.

Leaders: CWS; Nunavut Wildlife; Nunavik Wildlife;

b. Greenland

Information: the offshore islands and islets in Upernavik and Qaanaaq kommunes accounted for a significant proportion of the pristine breeding numbers in West Greenland, but numbers in southern West Greenland are not, and have never been, well known. Monitoring programmes are in place in Upernavik, Uummannaq and Ilulissat, but not elsewhere in West Greenland.

Actions: **Survey and collect** local knowledge of breeding areas in W. Greenland, especially s. of Disko Bay, through community visits and meetings; **carry out** aerial surveys to identify and delineate colony areas and **carry out** stratified ground surveys to estimate numbers.

Timing; Soon;

Leaders: GN/DMU.

2. Predation studies, actions to reduce predation

Information: Fox predation (chiefly on eggs in breeding colonies) is episodic. It is considered a problem by users in Greenland; less so in northern Canada. When it happens, local effects are often serious—a large part of a colony's annual production may be lost. However, owing to its episodic occurrence, there are no good estimates of its mean incidence, and no clear ideas of how to control it.

Action: **estimate** frequency of fox incursions to islands or colonies. A possible starting point might be data from a monitoring programme in Upernavik, possibly supplemented by monitoring of some number of colonies elsewhere.

Action: consider or recommend methods to reduce predation. Methods usually take one of two forms: either 1) reduce the predator population (perhaps locally), or 2) find ways to keep the predator away from the resource (fences; scaring devices; aversive conditioning; not disturbing natural anti-predator screens, camouflage, or behaviour), or the resource away from the predator (relocation). It is not immediately obvious that any of these methods could be easily applied in Greenland: the density of foxes is not known, but reducing their numbers to any significant degree would probably be expensive. A small group might be formed to consider ways to keep foxes away from eider colonies in other ways, but I am not optimistic about their chances of success.

Comment: it could be a long-term project—several decades, perhaps—to estimate frequency, given that fox predation is not frequent in the first place. Protecting natural

resources from natural predation is often contentious; fox populations in most areas of West Greenland are not high, owing to the absence of small mammals.
Timing: not high priority

Leaders: studies: GN/DMU; KNAPK/TAPK; actions: DMN/DFF.

3. Marking in colonies; study migrations and connections between breeding and moulting areas

Information: eiders marked in n. Hudson B. have travelled both to Greenland and south down the Labrador to Newfoundland; eiders marked in winter in Greenland have been tracked to breeding areas in Canada. Satellite-tag studies have shown movements across Davis St. Recent work in Canada has been concentrated at East Bay on Southampton I.; it would be advantageous to extend banding studies more widely in the Canadian breeding areas.

Actions: **extend** satellite tagging and banding studies to other Canadian breeding areas; **tag or band** in other Greenland breeding areas, especially in Qaanaaq and in West Greenland south of Disko B., to extend knowledge of movements of birds from these areas.
Timing: in terms of return on expenditure, this represents an efficient method of updating knowledge and should have high priority.
Leaders: CWS/GN/DMU

4. Catch compositions

Information: Greenland winter harvest is made up of Canadian breeders and Greenland breeders, but the exact proportions are unknown. However, it is recognised that Canadian breeders compose most of the Greenland winter harvest. Better knowledge both of the proportion of Canadian breeders in the harvest and the regional variation of this proportion would be informative and helpful in management of the Greenland breeding populations. One primary source of information could be analysis of band returns from coordinated banding studies in both Greenland and Canada; an alternative might be analyses of DNA.
Actions: **relate** this to marking studies and the need to extend banding more generally in both Canadian and Greenlandic breeding areas; **assess** DNA from harvest samples as an indicator of the source of birds taken in Greenland in winter[7];
Leaders: GN; DMU; CWS.

[7] a study of DNA differences between sub-populations is under way as a post-graduate project (p. 47).

Human Influences

5. By-catch studies—get data, improve information and reporting; develop methods to reduce bycatch;

Information. Numbers of Common Eiders are drowned in gillnets. This bycatch typically occurs in the set-gillnet roe fishery for lumpsucker (*Cyclopterus lumpus*), which takes place in spring along rocky shores—places where eiders forage for benthic molluscs and other foods. It is suggested that eiders also forage on lumpsucker roe, making them doubly vulnerable. Other fisheries may also catch eiders, but no other has been as strongly implicated in the bycatch problem. This by-catch—its size, its distribution (in space and time)—is a sensitive subject and it transpired at the workshop that even discussing it is difficult.

There has been one successful study of bycatch in Nuuk[8], but subsequent studies ran into difficulties, the main reason for which was apparently that bycatch is such a sensitive issue that it was not possible to obtain full cooperation from the fishermen active in the fishery. The only control measure that has been applied so far is a ban on the sale of bycaught eiders in the open markets. However, enforcing such a regulation is not easy, as the source of ducks that are offered for sale is not necessarily evident.

Thus the present situation is that bycatch is like an iceberg on a dark night at sea—you know it's there, but you can only see a small part of it, and that indistinctly, and you have a feeling that there's much more of it than you know about.

It appears that before any action can be taken to solve—or even to reduce—this problem, it will have to be studied somehow or other. It is also obvious that it will be difficult—or more probably impossible—to study it without the cooperation of fishermen active in the lumpsucker fishery.

In the context of a cooperation agreement between KNAPK (the Greenland Association of Hunters and Fishermen) and the Greenland Institute of Natural Resources, KNAPK has requested a higher level of involvement in both the planning and the execution of biological studies. This agreement would be an appropriate platform for the design and execution of a *bona fide* study to quantify the distribution and extent of eider bycatch. The successful completion of such a study would be an excellent demonstration of the value of this kind of cooperation.

Actions: set up a small working group with ONE member from each of KNAPK, TAPK, GN/DMU, DMN, DFF, to specify how, where and when, and from what group of fishermen/hunters to collect data on the occurrence, frequency, and severity of bycatch;

[8] Merkel, F. R. 2004. Impact of hunting and gillnet fishery on wintering eiders in Nuuk, Southwest Greenland. Waterbirds 27(4):469–479.

propose study to the steering committees of GN, KNAPK and TAPK; execute the study and report its results; propose measures for regulating fisheries to reduce bycatch of eider ducks, including: requirements for short-term monitoring of by-catch, short-term and/or local-area closures, alterations in gear, &c;

Timing: immediately. This is a serious issue, and setting up a satisfactory study, getting it approved by the various interested parties, executing it and reviewing its results will be a lengthy process.

Leaders: GN/DMU, KNAPK/TAPK, DMN/DFF.

6. Collisions with ships—estimate size and study spatial incidence; regulations on reporting collisions;

Information: Ships sailing at night in winter in Greenland commonly use powerful steaming lights to see and avoid ice and other obstacles. Eider flocks flying in the dark, especially when fog or snow reduce visibility, are attracted to ships using lights and, dazzled, hit the ship's superstructure and rigging. Such occurrences usually result in fatal injury to large numbers of eiders. They can also cause expensive damage to some of the more delicate parts of the ship's superstructure, such as radar antennas. (Captains sometimes shut lights off if eider flocks are seen on radar, to avoid damage.)

Although there is plenty of anecdotal evidence that this happens, fairly often, every year, there is no quantitative data on the number of times it happens in an average year, still less on how many birds are involved in an average collision incident or how badly they are injured.

A preliminary study to estimate the scale of the problem, and find out how serious it is, would be appropriate, but difficult to carry out. Remedial action would be difficult and contentious, as the use of searchlights makes sailing at night in ice-infested waters in small and medium-sized boats significantly safer; for much of the winter, in many areas of Greenland, it would not be possible to navigate without them. However, if mortality from this cause is large, it behoves managers to investigate it.

Actions: a **sample survey** of boats could be carried out, with contact to the skipper every two weeks or every month to estimate the frequency of collision incidents through the winter. Estimating the mean losses per incident would be difficult, as the numbers probably vary widely. Initially, captains' estimates of the numbers of birds involved might be the best place to start. Analysis of the spatial and temporal patterns of occurrence would perhaps indicate how to proceed with further investigations.

Timing: This study, or planning for it, should proceed immediately. This is a concern about which there is little information on how seriously it should be taken.

Leaders: study: GN/DMU, KNAPK/TAPK; reporting regulations: DMN/DFF.

Management and Regulation

7. Management objectives, and management by objectives

Information: management measures have no specific goals; in general, the objective assumed is to avoid (further) declines in populations. However, no quantitative goals for wintering or breeding populations in Greenland have been established. So we can't find out whether management is being successful—achieving its desired objectives—nor can we plan management actions to reach a stated objective—none has been stated.

Possible management objectives might be to have a wintering population of a given size, to have populations that will support harvests of desired size, to maintain regional breeding populations at specified sizes, or to maintain a specified annual production. Any of these might be further specified by region and season, and they might be combined, e.g. by requiring both wintering populations of given sizes and also a certain distribution of the breeding birds.

Any suggestion to set management objectives would need to start with work specifically by management authorities, to consider what they would consider to be suitable types of objectives (e.g. numbers); perhaps advised by biologists as to what objectives could be monitored (e.g. number of nests can be monitored, production per nest is more difficult) and by hunters as to what objectives are important (e.g. allowable harvest might be seen as more important than numbers per se).

Although Greenland and Canada share stocks of migratory seabirds (not only eiders), there is no formal bilateral agreement between the two jurisdictions on management or management principles for migratory birds. Both are member of the Arctic Council, under which—through subsidiary levels—one eventually reaches the level of the Circumpolar Seabird Working Group. This is however principally a technical working group, and management authorities do not generally participate.

Actions: a suggested programme might include the following elements:

- **discussions** at the management level between the two jurisdictions with a view to putting in place a formal international agreement on the management of migratory birds, including eider ducks;

- a **correspondence working group** of management authorities (DMN, DOE)—with biological advice—to discuss and propose what *kinds* of management objective could be usable;
- **dialogue with users** (hunters and others) on what objectives they regard as desirable (e.g. regional distributions of harvest, harvest over longer periods of year);
- **biological input** on what *levels* of these objectives might be attainable in the medium or long term;
- a forum or **seminar** on what the implications (e.g. reductions in present harvests) might be if objectives are set at certain levels;
- a **decision to *set*** management objectives and to promulgate them;

Timing: Immediately; to show that management authorities take the management of this species seriously; also to show that the principle of management by objectives is accepted;

Leaders: DMN/DFF/DOE;

8. Locally adapted regulations

Information: Greenland hunters consider that their country has a large north-south extent and that it would be appropriate for bird hunting regulations to reflect latitudinal variation in climatic regimes. Eiders that breed in the northern part of West Greenland tend to leave the area soon after breeding, and do not return until near the start of the breeding season. For the main part of the 'recognised' hunting season, eiders are not present in these areas and are not available to people living there. The locally produced birds are not available to local people as a resource, but are seen as unfairly reserved for people living in the areas where birds spend the winter months. There is a persistent demand to have special seasons in these areas, especially to allow local people to hunt in spring near the start of the breeding season.

Biologists discountenance hunting in spring for several reasons: principally because hunting on breeding birds that have survived winter mortality is expensive for the breeding stock, but also because disturbance associated with pursuit and hunting is thought to hinder birds in building up the energy reserves they need for breeding. A limited hunt might be allowable, if a corresponding reduction could be made in the winter take in the main wintering areas. However, regulations to limit spring hunting have been contentious. Small daily limits are not worth going out for, and weekly limits have been derided as unenforceable.

While biologists are, in general, cautious about spring hunting, the ability to make *quantitative* assessments of its effects on the population or on the allowable winter harvest is limited. Data is lacking on the age distribution of birds taken in spring in the northern

breeding areas, and on the effect of hunting and associated disturbance on the building up of energy reserves.

Management authorities in Greenland have recently after some years of discussion introduced revised regulations for bird hunting, and look for a period of stability while the effect of the recent changes can be assessed. Revision of the regulations is not at this time a priority, so there is time to consider how data on the effects of possible spring hunting could be gathered.

Actions: design **studies** to collect information on effects of spring hunting on the breeding population and breeding success.

Timing: low priority, but study design could be initiated now, with a view to having a proposal readily available for submission when opportunity permits.

Leaders: GN/DMU; KNAPK/TAPK.

9. Improved reporting of all kinds of mortality—bag, by-catch, and collisions.

Information: monitoring mortality is a key element in wildlife management. Greenland operates a catch reporting system, operated by the Directorate for Fishing and Hunting, covering all hunters and all hunted species, with a daily diary, sent to hunters with their hunting licence, that the hunter is asked to summarise to monthly totals and submit annually; it has provisions for reporting by-catch of eiders (but not other seabirds) as a separate entry, but without no details on the fishery or gear that generated the bycatch. Hunters are responsible for species identification. Canada estimates catches by a mailed sample survey of holders of migratory bird licences, but has no system for reporting by-catches. In neither case is there any verification of the accuracy of the data collected, or a regular observer programme in fisheries that generate eider by-catch.

Neither jurisdiction has any system for regularly recording or reporting other mortalities where people are present (in Greenland, notably collisions with ships due to dazzling), while human-caused mortalities where people are absent (due for example to oil fouling) are recorded haphazardly if at all.

It is likely that higher priority needs to be given to addressing mortalities that are not recorded at all (in Greenland, collisions with ships; in Canada, perhaps by-catch) than to improving the monitoring systems that are already in place.

Actions: review the functioning of existing systems for reporting mortalities, especially with respect to evidence of gaps or errors in the collected information;

assess the significance of mortalities, or causes of mortality, that are missed by existing systems (for Greenland, see above under ship collisions and bycatch); decide whether they are significant enough to require mitigation, monitoring, or both.

if appropriate, institute **monitoring** systems, such as log-book entries or observer systems, to register and record mortality events.

Leaders: DMN/DFF/CWS;

Social Framework

10. Education, information, better trust between users and biologists;

Information: Education: in general requires closing the gap between an acceptance of the principle of sustainable utilisation of resources (which receives at least lip service universally) and an acceptance of its practical implications, which may include setting lower quotas or protecting animals at some seasons. With specific reference to the management of bird hunting, there needs to be a continuing effort to make all participants in management aware of the status of populations and the factors that affect them.

Relations between users and biologists. In Greenland in particular, a supposed lack of mutual comprehension and confidence between resource users and biologists is a continually recurring topic, in relation to the management not only of eider hunting, but to that of other resources as well. This perception is nurtured by the leaders of KNAPK, in their efforts to represent the interests of the members of their organisation. However, there is similarly, at the same time, a continuing effort at all levels to improve relations, mutual confidence, cooperation, and the exchange of information. It is probably not necessary to undertake a specific effort in the context of the management of eiders, although of course work on eiders should continue to be characterised by cooperation and communication between hunters and biologists.

The situation in Canada is different; bird hunters in general—including Arctic residents—have more confidence that biologically informed management is effective, and that regulations are appropriate and are needed to safeguard both population numbers and future exploitation.

Information: In Greenland, KNAPK, GN, DMN have to cooperate in two respects, one is agreeing on common views of the situation, the biology, the numbers, the other is putting out a common message. If the only message conveyed to the public is of discord and disagreement it is difficult for people to believe that hunting is being managed effectively. The Greenland Institute of Natural Resources has in recent years devoted two issues of its popular-science periodical Pitu to the status of game bird populations, one of them

specifically to eider ducks, and eiders were one of the species groups named as 'problem species' in the recent Greenland public dialogue programme 'Tulugaq'.

Actions: continue efforts by hunters' organisations and GN to improve communications, relations, contact between biologists and hunters and mutual confidence.

Leaders: GN/KNAPK/TAPK.

Timing: ongoing:

Actions: design and **implement continuing information** programmes on the status of bird populations, on hunting regulations, and on new programmes to reduce mortality and their success.

Leader: DMN/DFF/DOE.

Timing: now.

Appendix II: Participants

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Appendix III: Planned Programme

Tuesday 15.02

09:00	Welcome, housekeeping, etc.
09:10	Presentation: Workshop objectives and Programme:
09:30	Session Start: Setting the Scene: where we are now
09:30	Importance of eider ducks to northern residents in Canada: Can. hunters, CWS
09:50	Importance of eider ducks to residents in Greenland: KNAPK, TPAK
10:10	Population status in Greenland: nesting, migrating, wintering: GN, KNAPK
10:40	Population status in eastern Arctic Canada: nesting, migrating, wintering: CWS & Canadian hunters
11:10	Coffee
11:25	Hunting, bycatch, and other exploitation in West Greenland: numbers, regulations, seasonal incidence: DFF, KNAPK, GN
11:55	Hunting, bycatch, down collection and other exploitation in eastern Canada: numbers, regulations, seasonal incidence: CWS & Can. hunters
12:30	Lunch
13:30	Other threats in West Greenland: ships' searchlights, disturbance, crippling, climate change, etc.: DMN, DFF, DMU
14:00	Other threats in Canada: oil emissions, mariculture, disturbance, climate change, etc: CWS & ?
14:30	Lead shot and health effects; DMU, DIH
15:00	Coffee
15:15	Discussion, Collating, Priorising: Knowledge, what we know and what we don't Regulations and Protection: what's working and what isn't Hunting and other threats: which do we know about, which do we not know about; which ones are serious, which need study, etc. (This discussion will generate information to inform the discussions in the next 2 days.)
16:45	Ending first day, Summary

Wednesday 16.02

09:00	Thomas Kjær: Eider duck hunting in Denmark: history and consequences

09:30 Session Start: Management Measures (DMN, DFF, KNAPK, CWS)
(Discussion structured on the results of the previous day's discussions.)

09:30 Regulations in Canada: CWS and Canadian hunters—what do we know about regulations and their observance; what is not working, what is uselessly strict, what management changes can or should be considered? how well is contact with users working, are their inputs heeded? What threats are serious, in spite of regulations? Should regulations be altered? If so, how?

10:30 Coffee

10:45 Regulations in Greenland: DMN and Greenland hunters— what do we know about regulations and their observance; what is not working, what is uselessly strict, what management changes can or should be considered? How well is contact with users working, are their inputs heeded? What threats are serious, in spite of regulations? Should regulations be altered? If so, how?

12:30 Lunch

13:30 Environmental Protection: DMU, DMN: what measures can or should be taken to combat other threats (oil spills, searchlights)?
are there regulatory opportunities that are being missed?
are there opportunities for increased cooperation with users and other organisations?

14:30 Summary: recommended actions on management measures

15:00 Coffee

15:15 Session Start: Research Requirements and Priorities

15:15 Recent research and results, current programmes and proposals in Greenland: GN, DMU and Canada;

16:00 Recent research and results, current programmes and proposals in Canada: CWS

16:45 Summary: current research

Thursday 17.02

09:00 Research Requirements and Priorities:
this discussion will be structured on results of the priorised items from Day 1, in the light of discussion on management measures in Day 2

09:00 Eider population model: CWS

09:40 Discussion on needed, possible, and desirable research on:

- population size, numbers, trend, ecological parameters; population separations;
- migration routes, wintering areas;
- other threats: oil emissions, searchlights; bycatch;

Priorise all research requirements: managers' and users' priorities for research; estimate funding requirements and identify sources;

11:00 Coffee

11:15 Networking and cooperation between users, ships' crews, other involved parties, scientists, managers, & c. in carrying out research;
International neworking and cooperation in carrying out research;

12:30 Lunch

13:30 Session Start: Communication and Publicity:
what to publicise: present status, what is going right, what isn't, regulations, research, threats?
whom to publicise to: hunters, nature users, schools, decision-makers?
how to publicise: TV spots, leaflets, popular articles in newspapers?
how to fund publicity: funding sources

15:00 Coffee
Connection with other communication programmes:
–Tulugaq
–Naturvejledere
–Grønlands Naturinstitut as a knowledge centre
Summarise and Priorise: Communication, concrete proposals
Summarise and Priorise: Workshop.

Appendix IV: Actual Programme:

Owing to a Nuuk snowstorm, travel to the workshop was disrupted and the programme started late. Not all the people who had planned to attend were in the end able to travel, and some of the expected presentations differed in content from the plans or were withdrawn for one reason or another. This section is a brief overview of the course of the workshop as it happened.

Tuesday 15 February

Afternoon:

Jean-Pierre Savard: Review of the Northern Common Eider population and of its importance to northern residents in Canada.

Nikolaj Heinrich: The significance of the Eider as a resource for the people of Greenland.

Flemming R. Merkel: Status of Northern Common Eiders and their numbers in Greenland

Mark Mallory: Status of the Northern Common Eider in eastern Arctic Canada, with information on general biology and some information on movements and migrations.

Jens Nyeland: Hunting statistics for eiders in Greenland, with some estimate of the consequences of recent changes in regulations.

Scott Gilliland: The Northern Common Eider on its wintering grounds in eastern Canada: numbers, relationship to other subspecies, and observations on ship traffic on the wintering grounds, threats from oil spills and other habitat issues.

Jean-Pierre Savard: Eider down as a resource and the procedures for collecting it on the St Lawrence breeding grounds in eastern Canada.

Wednesday 16 February

Morning:

Flemming Merkel: Causes of mortality and morbidity in Greenland: crippling and non-fatal shooting, ships' searchlights, and the effect of disturbances on the wintering grounds.

Helene Nyegaard on behalf of **P. Johansen** and others: Lead contamination of eider meat by gunshot and the consequent intake of lead by consumers.

Thomas Kjær Christiansen: Eider duck hunting in Denmark and historical trends in takes

Helene Nyegaard on behalf of **Anders Mosbech**: Status of the Northern Common Eider in West Greenland, with a review of principal threats.

Afternoon:

Scott Gilliland: The regulation of duck hunting in Canada, with particular reference hunts on the Northen Common Eider and other sea-ducks in Newfoundland and Labrador and in Quebec.

Inge Thaulow: The regulation of sea-bird hunting in Greenland and recent changes.

Plenary: Discussions and priorising of research and study topics

Thursday 17 February

Morning:

Flemming Merkel: Review of recent research activities and results in Greenland;

Mark Mallory: Review of recent research activities and results in Canada;ecent programmes and research in Canada

Plenary: Discussion and priorising of research and study topics

Afternoon:

Plenary: Discussion and priorising of research and study topics; construction of priorised list of activities;

KNAPK: Comments on the current state of eider hunting regulations in Greenland with respect to the needs of the people and the perceived status of the population:

Appendix V Recent, Current, and Planned Research Studies and Management Initiatives

Greenland

	Previous studies	References	Present Proposals and Active Projects
Abundance and distribution			
Historical records	Scarce records, West Greenland, 1900–2000	1, 2	
Recent ground surveys	West Greenland, 1995–2002	3–6	Ground surveys in Southwest Greenland
Aerial surveys, winter	Southwest Greenland, 1999	7–10	
Population trends			
Historical	Down collection statistics	11	
Recent	Central West Greenland, 1960–2000	3, 5, 6	
Current	Inuk survey programme, central West Greenland	12	Inuk survey programme, southern West Greenland
Productivity and survival			
Clutch size	Old and recent information, West Greenland	3–6	
Nest success	Upernavik, 2002	13	
Nest & duckling predation	Upernavik, 2002	13	
Population delineation			
Ringing	West Greenland, mainly 1933–1972	14	
Sat. telemetry, winter	Nuuk 2000, 2001	15, 16	
Sat. telemetry, summer	East Bay 2001, 2003; Upernavik 2002	17	
Sat. telemetry, moulting	Disko Bay, 2003	17	
Genetics	Eggs collected: Greenland and Canada		Active M.Sc. project 2006
Winter ecology			
Diet	Nuuk, 2000–2002		

Activity budgets	Nuuk, 2002		
Body condition	Nuuk, 2000–2002	15,18-20	
Parasite loads	Nuuk, 2000–2002	21	
Harvest and other mortalities			
Harvest levels	Since 1993	22	Online access, DFF
Demography	Nuuk 1995–96; Sisimiut 1999–2001; Maniitsoq 2002–03	23, 24	Elsewhere in Southwest Greenland
Fraction of birds carrying lead shot, infliction rates, and effects of condition	Nuuk 2000–2002	19, 25	
Disturbance	Nuuk 2002		
Bycatch	Nuuk 1999–2001; (a further study in 6 towns in SW Greenland failed 2002–3);	23	Active project 2006–
Collisions with ships			Active project 2006–

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Canada

	Previous studies	References	Present Proposals and Active Projects
Abundance and distribution			
Historical records	Scarce records		
Recent ground surveys	S. coast Baffin I.; Ungava B. northern Quebec; Frobisher B., Baffin I.; islands in Hell Gate polynya; Labrador Coast.	14, 35, 37 40, 56, 58, 62	Island surveys along Labrador Coast, ongoing; ground surveys in Cumberland Sd, Foxe Basin, E. Baffin I. proposed.
Aerial surveys, winter (Atlantic Canada)	Gulf of St Lawrence (1981,1989,2003,2006) Newfoundland (2003, 2006),	41, 42, 43	Winter aerial surveys in eastern Canada ongoing; planned at 3 year intervals.
Aerial Surveys, Breeding	S. Baffin I. (1980–83, 1998); Ungava B. (1978); Labrador coast (1980,1994,2006); Hudson St. (1980–1983)	35–39	Labrador coast to be resurveyed in 2006
Population trends			
Historical	S. Baffin I.	61	
Recent	Ungava B. and Ivujuvik northern Quebec (2001); Hell Gate polynya (high Arctic, ongoing); northern Foxe Basin (1995); Penny Strait polynya (2002); Labrador Coast.	21, 27, 30, 40, 56, 57, 58, 37, 27	Hell Gate and Penny Strait polynya areas (high Arctic) surveys ongoing. Renewed island surveys S. Baffin I., proposed.
Productivity and survival			
Clutch size	S. Baffin I.; East B., Southampton I.; St Helena I.; Labrador Coast; Ungava B.	14, 21, 35, 40, 60, 62	East B., Southampton I. (low Arctic) and St Helena I. (high Arctic), ongoing; Ungava B. (proposed).

Nest success	S. Baffin I.; East B., Southampton I.; St Helena I.; Labrador Coast.	14, 21, 35, 40, 60, 62	East B., Southampton I. (low Arctic,), St. Helena I. (high Arctic), ongoing.
Nest & duckling predation	S. Baffin I.; East B., Southampton I.; St Helena I.	22, 28,	East B. Southampton I. (low Arctic), St Helena I. (high Arctic), ongoing
Endogenous reserve dynamics	Factors affecting reproduction and migration	9–12, 17, 20, 25	
Contaminants in eiders	Carcase analysis	19, 26, 29, 31, 33, 63	
Population delineation			
Ringing	S. Baffin I.; East B., Southampton I.; St Helena I.; Ungava.	6	East B., Southampton I. and St Helena I., (ongoing). S. Baffin I., Frobisher B., and Ungava B. proposed..
Satellite telemetry, summer	East B. 2001, 2003; Upernavik 2002	8	Ungava B. (planned for 2006)
Satellite telemetry, moulting	East B. 2001, 2003 (moulted in Hudson St.);	8	
Genetics	Eggs collected Greenland and Canada; genetic relatedness within a Canadian colony (East B., Southampton I.)	16	Active M.Sc. project 2006
Winter ecology			
Distribution in Atlantic Canada	Aerial surveys in winter	39, 41, 42, 43	Aerial surveys ongoing
Body condition, activity, and diet in winter	Gulf of St. Lawrence	50, 51, 52, 53, 54	Ongoing, Gul of St. Lawrence.
Parasite loads in winter	None		
Harvest and other mortalities			
Harvest levels	Nunavut Wildlife Harvest Study; Canadian National Harvest Survey	44, 45, 46, 47, 48	Ongoing, Atlantic Canada.

Demography			Southwest Greenland
Fraction of birds carrying lead shot, infliction rates, and effects of condition	East B., Southampton I.; Atlantic Canada	13, 49	
Disturbance	From humans at nesting colonies	34	
Oiling	Monitored in Newfoundland	55	Ongoing, opportunistic.
Bycatch	None		
Collisions with ships	None		

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