The importance of Southwest Greenland for wintering seabirds

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ABSTRACT The coastal and offshore waters of Southwest Greenland are internationally important winter quarters for seabirds. Estimates of the total number of wintering seabirds are in the region of 3.5–5.5 million individuals (not including an unknown but probably extremely large number of Little Auks Alle alle). These seabirds originate mainly from Arctic Canada, Greenland and Svalbard, but also, to a lesser extent, from Alaska, Iceland, mainland Norway and Russia. The most numerous species are Common Eider Somateria mollissima, King Eider S. spectabilis, Brünnich’s Guillemot Uria lomvia and Little Auk. Some key areas have been designated as Important Bird Areas (IBAs) by BirdLife International, and recent data indicate that more areas qualify as IBAs. The most immediate threat to the seabirds in Southwest Greenland is hunting, and current harvest levels of the Greenland breeding populations of Brünnich’s Guillemot and Common Eider are considered unsustainable. Bird hunting is prohibited in spring and summer; however, there are no sanctuary areas in Southwest Greenland, and a degree of spatial regulation of winter hunting is urgently required.
It is well known that the coastal and offshore waters of Southwest Greenland are biologically highly productive, and support a great quantity and diversity of marine life, including seabirds, during the summer (Born & Böcher 2001). It is much less well known that these Arctic waters are also extremely important habitats for wintering seabirds (e.g. Salomonsen 1950), and only within the past ten years has it been possible to assess the abundance and distribution of the different seabird species that occur in winter. The lack of quantitative data explains why the conservation importance of this region has not been recognised more widely, but it is now possible to identify potential new Important Bird Areas. Here, we present the background for these new insights and review the present knowledge.

The background

There are two reasons for the recent focus on seabirds in West Greenland. The first is that the seabed has high potential for petroleum development and, since the late 1980s, the Greenland political system has strongly promoted exploration for oil and gas. This has resulted in extensive surveys of the seabed geology. So far, only a single drilling has been carried out, in the Davis Strait west of Nuuk, in 2000. That well was dry, and so far no petroleum reserves have been discovered, but exploration continues and more drillings are expected in the near future. Good-quality biological and ecological data are essential for assessing the potential environmental impact of the oil industry and, in 1992, the available biological data were assembled and analysed to highlight the most important gaps. This data gab analysis made it clear that seabirds were an extremely important component of the environment but also that the information on seabirds was inadequate (Mosbech et al. 1996, 2000). Consequently, a programme of seabird studies was launched, including breeding colony surveys, establishment of a seabird colony database, mapping of seabird abundance and distribution along the coasts and in offshore areas, and also the analysis of old and unpublished seabird surveys (Boertmann et al. 1996, 2004; Boertmann & Mosbech 1997, 1998, 2002; Mosbech & Boertmann 1999).

The second reason is that some of the important breeding seabird populations in West Greenland – mainly Brünnich’s Guillemots *Uria lomvia* and Common Eiders *Somateria mollissima* – have declined markedly over recent decades, and these decreases are linked mainly to the intensive hunting there (Kampp et al. 1994; Meltofte 2001; Merkel 2004). Biological information on these populations has, there-
fore, been in demand as the basis for management of the seabird populations and regulation of the hunt.

The key organisations in these seabird studies are two applied science institutions, the Danish National Environmental Research Institute and the Greenland Institute of Natural Resources, often in close co-operation.

The study region
This comprises the shelf and nearshore waters off West Greenland, between Nanortalik at about 60°N and Disko Bay at 69°N, and hereafter termed ‘Southwest Greenland’ (fig. 1). In the northern part of this region, the shelf (from the coast to the steep gradient, usually outside the 200-m isobath) is about 150 km wide but narrows gradually to the south, being about 50 km wide at 62°N. Southwest Greenland is situated within the Arctic region, i.e. mean July temperatures are below 10°C. In terms of wintering seabirds, the most significant feature is that large areas are ice-free during the winter. In particular, only scattered ice floes usually occur in the waters between 63°N and 65°N. This is due primarily to the northbound Irminger Current, carrying relatively warm Atlantic water, but the prevailing easterly and southerly winds also help to keep coastal waters ice-free. South of 63°N, multi-year drift ice from the East Greenland Current (originating from the Arctic Ocean) often enters from the south in late winter, spring or even early summer (Valeur et al. 1997), while north of 65°N, drift ice usually covers the sea from January to May. Drift ice is highly dynamic; it is rarely completely solid, and usually has leads and cracks with open water. A significant phenomenon north of 65°N is a lead system between the drift ice and the outer coast (the ‘shear zone’) where open water is almost always present. This is created by wind and tidal currents, sometimes as far north as Disko Island and Uummannaq Fjord (Valeur et al. 1997). In winter 2005/06, this shear zone has been wide (>50 km) and almost ice-free, something which has become more common in recent years. In some of the fjord mouths, strong tidal currents ensure that the water is always ice-free. Within the fjords themselves, solid and stable ice anchored to the coast (‘fast ice’) forms during the winter. In the southern part of the study area, this forms only in the innermost parts of the fjords, while in the north of the study area, similar stable ice also forms in the archipelagos and as a rim along the coasts (although nowadays only during exceptionally cold spells). A polynya is an area within the sea ice where recurrent open water occurs. The open water off Southwest Greenland is not a true polynya, because the area is usually open to the south, but it has similar properties as far as seabirds are concerned, serving as a feeding and staging ground in winter and during spring migration.

Fig. 1. Southwest Greenland, with the most important site names shown. Black dots are towns, the dotted line is the 200-m isobath, delimiting the shelf. Important winter bird areas are shown in red, and associated numbers refer to the description in the text (pp. 291–293).
Another important factor for the seabirds in the area is the bathymetry, particularly for species feeding on the seabed, such as Common Eiders, which rarely dive deeper than 50 m (Bustnes & Lønne 1997). Such relatively shallow waters are found mainly along the coasts, but also offshore at some particular areas of the shelf.

The feeding conditions for wintering seabirds are clearly favourable. The basis for this is the high primary productivity in the waters; in summer, the gross primary production has been measured to be as high as 900 mg C/m²/day, which is comparable with or higher than that of many temperate seas. The spring bloom is intense, and in many areas is sustained through the summer by upwelling events and other hydrodynamical discontinuities. Marine mammals and seabirds feed on schooling fish species such as Capelin Mallotus villosus and sandeels Ammodytes spp., crustaceans (e.g. euphausiids and gammarids), and benthic-feeding molluscs, crustaceans and echinoderms (e.g. Falk & Durinck 1993, Pedersen & Smidt 2000). The high biological production in the sea is also reflected in the Greenland economy, as the main export revenue (more than 50%) is now from Deep-sea Shrimp Pandalus borealis products. Until about 1970, the area supported one of the largest Atlantic Cod Gadus morhua fisheries in the world, but this had declined and virtually disappeared by 1980, probably owing to a combination of oceanographic changes and overfishing.

Material and methods
The 1992 assessment revealed that winter was the most sensitive period for the seabirds in Southwest Greenland, and that seabird data from this season was seriously lacking (Mosbech et al. 1998). Consequently, some recent but unpublished seabird observations from both airborne and ship-based surveys (aimed chiefly at marine mammals and carried out in February and March 1981–93) were analysed (Durinck & Falk 1996; Mosbech & Johnson 1999). As these surveys had different spatial coverage, it soon became clear that an aerial survey covering as much as possible of the entire Southwest Greenland region, and carried out within a limited time period, was needed. This survey was launched in March 1999 (when light conditions were favourable) and covered the coastal parts of the entire region between Disko Bay in the north and the southern tip of Greenland (Merkel et al. 2002; Boertmann et al. 2004). Line-transect methodology (Buckland et al. 1993) was applied in the coastal region, while total counts were used inside the fjords (fig. 2).

Birds
The most numerous seabirds wintering in Southwest Greenland are Brünnich’s Guillemots and Common Eiders (table 1). Both species
breed in the area, but in relatively low numbers, estimated at 25,000 individuals and 2,500 pairs, respectively (Boertmann et al. 1996). In winter, however, huge numbers of these two species arrive from breeding areas elsewhere. Ring recoveries reveal a rather complicated migration pattern for Brünnich’s Guillemots (Kampp 1988; Lyngs 2003; Bakken & Mehlum 2005). Part of the local breeding population in West Greenland move to the waters off Newfoundland and Labrador, while others remain in the open waters off Southwest Greenland, where they mix with birds from right across the North Atlantic, as far away even as Russia (table 1). The total numbers wintering in the region are estimated at 1.5–3.5 million birds (Boertmann et al. 2004, unpubl. data). Brünnich’s Guillemots arrive in September and October and typically remain far from the shore during the early autumn. Later in the year, in late October and November, many move closer to the coast, and this is reflected by an increase in the shooting bag (Falk & Durinck 1992). Recurrent guillemot concentration areas in winter are difficult to designate, as they tend to vary in time and space according to the distribution of their pelagic prey, which again is governed by oceanographic features. However, there are a few particular areas where Brünnich’s Guillemots concentrate regularly, often at upwelling sites or fjord mouths with strong tidal movements, and a good example is the mouth of Godthåb Fjord (see below).

Fewer than 15,000 pairs of Common Eiders breed in the entire West Greenland region (Merkel 2004), which confirms that the bulk of the c. 500,000 wintering Common Eiders in Southwest Greenland must originate from breeding areas outside West Greenland, mainly in Arctic Canada. This has been confirmed recently by ring recoveries and satellite telemetry (Mosbech et al. submitted). Recoveries of Common Eiders ringed in Greenland show that birds from Northwest Greenland winter mainly in the northern part of Southwest Greenland, indicating that almost all Common Eiders wintering in the southern part are from Canada (Boertmann et al. 2004). Common Eiders from Southeast Greenland may also occur in winter, but the size and migration routes of this population are unknown (although recent observations suggest that considerable numbers may breed there; Boertmann 2004). Common Eiders are concentrated much more predictably than the Brünnich’s Guillemots, owing to the distribution and accessibility of their benthic prey. Again, the mouth of Godthåb Fjord, with its numerous sheltered and shallow bays and inlets, is an example of an area where large numbers of Common Eiders occur each winter (Merkel 2006).

The King Eider S. spectabilis winter population is currently estimated at a minimum of 300,000 individuals, although recent unpub-
lished data indicate an even higher figure; ring recoveries confirm that almost all originate from breeding sites in Arctic Canada (table 1). One of the most surprising discoveries during the winter surveys was that of some important King Eider habitats up to about 70 km offshore on the northern part of Store Hellefiskebanke (Mosbech & Johnson 1999). These habitats are characterised by relatively shallow water (about 50-m depth), where King Eiders can dive to the bottom and feed on high-density mussel (Mytilidae) banks – also exploited by wintering

Table 1. Overview of the different flyway populations of seabirds wintering in Southwest Greenland and the conservation status of the species. For more information see Boertmann et al. (2004), but note that some of the figures (e.g. for Great Cormorant Phalacrocorax carbo and Brünnich’s Guillemot Uria lomvia) have been adjusted according to new information. SPEC = Species of European Conservation Concern (see BirdLife International 2004).

<table>
<thead>
<tr>
<th>Species</th>
<th>Supposed numbers in winter</th>
<th>European conservation status (BirdLife International 2004)</th>
<th>Flyway populations and percentage wintering in Southwest Greenland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Fulmar Fulmarus glacialis</td>
<td>&lt;100,000</td>
<td>Secure (Non-SPEC)</td>
<td>Probably Baffin Bay area (i)</td>
</tr>
<tr>
<td>Great Cormorant* Phalacrocorax carbo</td>
<td>20,000²</td>
<td>Secure (Non-SPEC)</td>
<td>W Greenland (100%)</td>
</tr>
<tr>
<td>Mallard* Anas platyrhynchos</td>
<td>&lt;50,000³</td>
<td>Secure (Non-SPEC)</td>
<td>W and SE Greenland (≥95%)</td>
</tr>
<tr>
<td>Common Eider Somateria mollissima</td>
<td>≥500,000¹</td>
<td>Secure (Non-SPEC)</td>
<td>N and W Greenland (100%), NE Canada (80%), SE Greenland?</td>
</tr>
<tr>
<td>King Eider Somateria spectabilis</td>
<td>≥300,000¹</td>
<td>Secure (Non-SPEC)</td>
<td>NE Canada (75%), N Greenland (x)</td>
</tr>
<tr>
<td>Harlequin Duck* Histrionicus histrionicus</td>
<td>5,000–10,000²</td>
<td>Rare (SPEC 3)</td>
<td>W Greenland (100%), E Canada (≥50%)</td>
</tr>
<tr>
<td>Long-tailed Duck Clangula hyemalis</td>
<td>≥100,000¹</td>
<td>Secure (Non-SPEC)</td>
<td>Greenland (x), Iceland (x), Canada?</td>
</tr>
<tr>
<td>Red-breasted Merganser* Mergus serrator</td>
<td>&lt;20,000³</td>
<td>Secure (Non-SPEC)</td>
<td>W Greenland (100%)</td>
</tr>
<tr>
<td>White-tailed Eagle* Haliaeetus albicilla</td>
<td>150–200</td>
<td>Rare (SPEC 1)</td>
<td>W Greenland (100%)</td>
</tr>
<tr>
<td>Iceland Gull Larus glauoides</td>
<td>≥300,000³</td>
<td>Secure (Non-SPEC)</td>
<td>Greenland (≥90%), NE Canada (i)</td>
</tr>
<tr>
<td>Glaucous Gull Larus hyperboreus</td>
<td>≥300,000³</td>
<td>Secure (Non-SPEC)</td>
<td>Greenland (≥75%), Svalbard (i), NE Canada?</td>
</tr>
<tr>
<td>Great Black-backed Gull Larus marinus</td>
<td>22,000³</td>
<td>Secure (Non-SPEC)</td>
<td>W Greenland (100%), NW Europe (i)</td>
</tr>
<tr>
<td>Kittiwake Rissa tridactyla</td>
<td>few³</td>
<td>Secure (Non-SPEC)</td>
<td>North Atlantic (i)</td>
</tr>
<tr>
<td>Ivory Gull Pagophila eburnea</td>
<td>few³</td>
<td>Rare (SPEC 3)</td>
<td>NE Greenland (i), NE Canada?, Svalbard?</td>
</tr>
<tr>
<td>Common Guillemot Uria aalge</td>
<td>few³</td>
<td>Secure (Non-SPEC)</td>
<td>W Greenland (x), E Canada?</td>
</tr>
<tr>
<td>Brünnich’s Guillemot Uria lomvia</td>
<td>1.5–3.5 mill.²</td>
<td>Vulnerable (SPEC 3)</td>
<td>W, N Greenland (50%), Svalbard (75%), NE Canada (50%), Iceland (x), Russia (x)</td>
</tr>
<tr>
<td>Razorbill Alca torda</td>
<td>few³</td>
<td>Secure (Non-SPEC)</td>
<td>Greenland (x), Russia (i), NW Europe (i)</td>
</tr>
<tr>
<td>Black Guillemot Cepphus grylle</td>
<td>≥250,000³</td>
<td>Depleted (SPEC 2)</td>
<td>W, N Greenland (≥75%), Iceland (i), Canada?</td>
</tr>
<tr>
<td>Little Auk Alle alle</td>
<td>unknown</td>
<td>Secure (Non-SPEC)</td>
<td>Svalbard (x), N Greenland?</td>
</tr>
<tr>
<td>Puffin Fratercula arctica</td>
<td>few³</td>
<td>Depleted (SPEC 2)</td>
<td>Greenland (x), Iceland (x), NW Europe (i)</td>
</tr>
</tbody>
</table>

Total 3.5–5.5 mill.

(i) = insignificant part, (x) = unknown part, (%) = part guessed, ¹ reasonable estimate, ² crude estimate, ³ educated guess, * discrete population in Greenland.
Walruses *Odobenus rosmarus* (Born et al. 1994). These shallow parts are within the waters covered by drift ice in winter, but usually there are leads and cracks allowing the King Eiders to remain throughout the winter. During extremely cold spells, the open waters may freeze completely, and large numbers of King Eiders are then found in similar waters further south, at Fyllas Banke. Many King Eiders also winter among the Common Eiders throughout the coastal parts of the region. Recent satellite-tracking projects have shown that King Eiders arrive at the winter habitats of Store Hellefiskebanke as early as October, soon after they have finished their moult in fjords further north in West Greenland (Mosbech et al. 2004, in press).

Wintering Harlequin Ducks *Histrionicus histrionicus* are found along the exposed rocky coasts in the southern half of the region. Two flyway populations occur, the local Greenland breeders but also – a recent discovery – birds from eastern Canada (Brodeur et al. 2002). The numbers of wintering Harlequins are unknown, but a survey of moulting males in July 1999 produced an estimate of 5,000–10,000 birds. If all these stay for the winter, and are accompanied by females and juveniles, substantial numbers may actually winter in Southwest Greenland (Boertmann & Mosbech 2002; Boertmann 2003). Harlequin Duck is a species with an unfavourable conservation status in Europe (BirdLife International 2004), although not concentrated there (SPEC 3).

Long-tailed Ducks *Clangula hyemalis* winter in relatively high numbers in Southwest Greenland, estimated at 95,000 birds in March 1999 (Merkel et al. 2002); ring recoveries show that birds breeding in Greenland, Iceland and, probably, Canada winter in Southwest Greenland (table 1).

Black Guillemots *Cepphus grylle* are also numerous in Southwest Greenland, scattered throughout the region, including the ice-covered waters, where they are found in cracks and leads, even far from shore and in deep water. In such habitats, they survive by feeding on crustaceans (mainly amphipods) and Polar Cod *Boreogadus saida* associated with the ice floes and icebergs. An estimated 250,000 birds occur in the region in winter (Boertmann et al. 2004, unpubl. data).

Among the species occurring in low numbers, compared with eiders and Brünnich’s Guillemots, several are important in a conservation context because they constitute discrete Greenland populations, for example Great Cormorant *Phalacrocorax carbo*, Mallard *Anas platyrhynchos conboschas* – an endemic sub-
species – and Red-breasted Merganser *Mergus serrator*. Also, the White-tailed Eagle *Haliaeetus albicilla* population must be included here, even though this is not a seabird in the strict sense, because the population is completely dependent on the open waters of Southwest Greenland in winter. This constitutes an isolated population, occasionally even considered as a separate subspecies, and numbers only 150–200 pairs (Kampp & Wille 1990).

Three species of large gulls – Glacous *Larus hyperboreus*, Iceland *L. glaucoides* and Great Black-backed Gulls *L. marinus* – are numerous in Southwest Greenland in winter. All are from local populations, except for a few Kumlien’s Gulls *L. glaucoides kumlieni* from Baffin Island (Boertmann 2001). Glacous Gulls from Canada probably also occur, but this has not been confirmed. Even though the sea is ice-covered, very few Ivory Gulls *Pagophila eburnea* winter in the region; they occur mainly as a rather rare visitor in the fishing ports, particularly when drift ice is close to the coast. The main wintering grounds are presumed to be outside Greenland waters, in the marginal ice zone of the southern Davis Strait and Labrador Sea (Orr & Parsons 1982).

Finally, there is a joker in the pack when it comes to calculating the total number of seabirds wintering in the study region – the Little Auk *Alle alle*. Surprisingly few were observed during the aerial surveys but, owing to their small size, they may very well have been overlooked. Anecdotal information suggests that large numbers are present in winter, at least on occasion, and huge numbers must pass through the region if the birds winter elsewhere. The breeding populations potentially wintering in Southwest Greenland number at least 33 million pairs from Northwest Greenland (Egevang et al. 2003), 3.5 million pairs from East Greenland (Kampp et al. 1987) and at least one million pairs (almost certainly a substantial underestimate) from Svalbard (Anker-Nilssen et al. 2000). Ring recoveries show that Svalbard birds occur in Southwest Greenland, but also that some migrate to Newfoundland; the few ring recoveries of Greenland breeding birds are also from the sea off Newfoundland (Anker-Nilssen et al. 2000; Lyngs 2003).

Besides the White-tailed Eagle, three other landbirds are more or less dependent on the open waters of Southwest Greenland: Gyr Falcon *Falco rusticolus*, Snowy Owl *Bubo scandiacus* and Common Raven *Corvus corax*. In particular, Gyr Falcons and Snowy Owls may be encountered far offshore in Davis Strait and Baffin Bay, where they feed on seabirds and rest
on icebergs and floes.

None of the species occurring in Southwest Greenland in winter is globally threatened (BirdLife International 2005), although several came close to this designation. White-tailed Eagle was recently downgraded from ‘Near threatened’ (NT) to ‘Least Concern’ (LC), while Ivory Gull was upgraded to ‘Near threatened’ (BirdLife International 2005), the latter mainly as a consequence of a predicted reduction in the polar sea ice. A national ‘Red List’ for Greenland is being prepared, and at least the discrete population of White-tailed Eagle will be categorised as ‘Vulnerable’ (VU). Species of European Conservation Concern are listed in table 1 (BirdLife International 2004).

We estimate that the total number of birds wintering in Southwest Greenland is within the range of 3.5–5.5 million birds. This is a crude estimate since, for some species, the figures are nothing more than educated guesswork. The real numbers may be significantly higher, particularly because the estimate does not include Little Auks, as we simply have no idea of their abundance in winter, but there could well be several million Little Auks wintering in Southwest Greenland. It is not possible to calculate population trends from the winter survey results obtained so far. However, there is anecdotal evidence to suggest a serious decline in the eider populations since the early 1900s (e.g. Oldenow 1933). Surveys in the breeding areas of populations that winter in Southwest Greenland have also shown declines: Brünnich’s Guillemots in Greenland (Kampp et al. 1994) and Iceland (Petersen 2000); King Eiders in Canada (Gratto-Travor et al. 1998); and Common Eiders in Greenland (Boertmann et al. 1996; Merkel 2002). Numbers of moulting King Eiders in West Greenland have also decreased (Mosbech & Boertmann 1999), at least at some specific localities. Only resident breeding Great Cormorants and Great Black-backed Gulls appear to have increased (Boertmann 1994, 2006; Boertmann et al. 1996).

**Marine mammals**

Marine mammals are another important component of the marine environment of Southwest Greenland, both in winter and in summer, and show a marked difference in species composition between the seasons. In winter, Narwhals *Monodon monoceros* and Belugas (White Whales) *Delphinapterus leucas* occur in the northern part of the Southwest Greenland waters (Heide-Jørgensen & Acquarone 2002). Narwhals occur mainly within the drift ice, but also in the Disko Bay area; Belugas typically frequent open waters between the coast and the drift ice. Bowhead Whales *Balaena mysticetus*
occur in the marginal zone of the drift ice in December–May and congregate in the mouth of Disko Bay in April–May, before they move to their summer grounds in Arctic Canada (Heide-Jørgensen et al. 2006). Among the seals, Ringed Seal *Phoca hispida* is common in ice-covered waters, while a few Harp Seals *P. groenlandicus* occur in open waters, the latter being much more abundant in summer. Walruses and Bearded Seals *Erignathus barbatus* also occur within the drift ice. The number of Walruses (which spend the summer on the coasts of Baffin Island) is currently estimated at 1,000 individuals, a declining population owing to unsustainable hunting pressure. The top predator of the Arctic marine ecosystem, the Polar Bear *Ursus maritimus*, is an occasional winter visitor to Southwest Greenland. The bears usually arrive with advancing drift ice, most frequently in the north, where the drift ice is most extensive, but also in the south, with drift ice carried by the East Greenland Current around the southern tip of Greenland.

**Important Bird Areas**

The coastline of the study region covers more than 1,250 km in a straight line, and within this huge region only two areas were identified as IBAs (Important Bird Areas) for wintering birds at the most recent review by BirdLife International (Boertmann 2000). They were the two most important King Eider habitats, at the shallow parts of the shelf (Areas 2 and 4 in fig. 1, p. 284). However, a further six areas are also designated as IBAs, mainly because of their breeding birds. Since the last review, some other extremely important wintering seabird areas have been identified, of which several qualify as IBAs. These, and the designated IBAs, are described below (cf. fig. 1).

Area No. 1 is a potential IBA and is a coastal area with extensive archipelagos between the entrances of two narrow fjords, Arfersiorfik and Søndre Strømfjord. In both of these fjords there are strong tidal currents and, particularly in Arfersiorfik, these currents keep large areas ice-free during winter. The shores are generally rocky, the waters are shallow and there are numerous sheltered bays and inlets. In March 1999, more than 30,000 Common Eiders were counted here (representing 6% of the total Southwest Greenland winter population; IBA criteria A4i, A4iii, B1) and more than 200 Great Cormorants (at that time 1% of the total Southwest Greenland population). Large numbers of King Eiders occur occasionally, perhaps when the ice completely covers important habitats further offshore (see IBA 027 below), and species like Brünnich’s Guillemot, Long-tailed Duck and Red-breasted Merganser...
also utilise the area. The human population is relatively dense in this area, with one town and four settlements. These and several now-abandoned settlements indicate predictable and reliable hunting resources (mainly birds) in winter, before fisheries became the most important way of living (prior to 1950).

Area No. 2 (IBA 027) is an offshore area within the 50-m isobath of Store Hellefiskebanke. Up to 345,000 King Eiders were estimated here in March 1982 (Mosbech & Johnson 1999), which represents a very high proportion of the total flyway population (IBA criteria A4i, A4iii, B1). Total numbers were estimated more recently as at least 300,000 (Mosbech & Boertmann 1999). The largest flock ever recorded was of c. 25,000 birds. Unfortunately, this area was not covered by the 1999 survey, but satellite-tracking and an unpublished ship-based survey in November 2003 confirm that it still is extremely important for King Eiders (Mosbech et al. 2004, in press).

Area No. 3 (a potential IBA) is also an offshore area situated within the 50-m isobath, on the southern part of Store Hellefiskebanke. An estimate of the number of King Eiders present in March 1981 gave 180,000 birds (Mosbech & Johnson 1999), around half of the estimated total winter population at that time (IBA criteria A4i, A4iii, B1). However, King Eiders have not been recorded in this area as regularly as at IBA 027 (above). Perhaps it is utilised only when dense ice cover forces King Eiders away from the northern part of Store Hellefiskebanke (Mosbech & Johnson 1999).

Area No. 4 (IBA 037) is the last of the relatively shallow offshore areas, and this is situated on Fyllas Banke, west of Nuuk. In March 1982, a total of 24,000 King Eiders was estimated here, representing about 8% of the total population; and in February/March 1989 more than 280,000 were estimated from ship-based observations (Durinck & Falk 1996), fulfilling IBA criteria A4i and B1. As for Area No. 3, high numbers of King Eiders have not been recorded as regularly as at Area No. 2, and the area is probably most important when ice conditions are too harsh for the eiders further north.

Area No. 5 (this includes IBA 038, while the major part is a potential IBA) is located around the mouth of Godthåb Fjord, covering both the outer coastal areas and the exterior parts of the fjord. There are strong tidal currents in the fjord mouth, and winter ice occurs only rarely and only during extremely cold spells. The coasts are rocky, but there are also some areas with low sediment beaches and very shallow waters. In March 1999, 57,000 Common Eiders and

![Purple Sandpiper](https://arc-pic.com)

**147.** Large numbers of Purple Sandpipers *Calidris maritima* winter on the rocky shores of Southwest Greenland.
13,000 Long-tailed Ducks were estimated in this potential IBA, representing 11% and 13% of the total winter populations in Southwest Greenland respectively (meeting IBA criteria A4i, A4iii and B1) and these congregations undoubtedly occur each winter (Merkel et al. 2002; Merkel 2006). It is not possible to calculate the proportion of the flyway population of these two ducks because the contributions from different breeding populations are not fully understood (table 1, p. 287). The westernmost islands provide an important wintering site for Harlequin Ducks (Boertmann 2003), where possibly more than 10% of the winter population are found (IBA criterion B2). In July/August 1999, this part of the coast held 28% of the total population of moulting males. Brünnich’s Guillemots are often abundant among the islands and in the fjord entrance. The area is also important for the discrete Greenland populations of Red-breasted Merganser and Mallards, and large flocks of Purple Sandpipers *Calidris maritima* winter on the rocky shores. Several small settlements were previously situated in this area, testifying to predictable hunting resources in the winter. These are now utilised mainly by the many recreational hunters of the capital, Nuuk, situated in the centre of this area.

Areas Nos. 6 and 7 (both potential IBAs) are coastal areas in Julianehâb Bay with extensive archipelagos and shallow waters. Both outer coastal areas and parts of the fjords are included. These two areas are especially important for Common Eiders and 95,000 birds were estimated in March 1999, representing about 19% of the total winter population (IBA criteria A4i, A4iii, B1). The coasts of the northern area (No. 6) are also an important winter habitat for Harlequin Ducks (numbers unknown), and both Mallards and Red-breasted Mergansers occur in fair numbers.

**International significance**

The international significance of Southwest Greenland as a winter habitat for seabirds is underlined by the breeding origins of the seabirds (table 1). Birds ringed as far away as northern Alaska and Novaya Zemlya in Russia have been recovered there. However, the majority of the wintering birds are from breeding populations in the Baffin Bay region.
and Svalbard. Internationally, Southwest Greenland is of particular importance for Brünnich’s Guillemots breeding in Svalbard and Arctic Canada and for Common and King Eiders from Arctic Canada (table 1). The region is also extremely important for many discrete Greenland populations, such as Great Cormorant, Mallard (endemic subspecies), Harlequin Duck, Red-breasted Merganser and White-tailed Eagle.

It is clear why so many birds from the Baffin Bay region winter in Southwest Greenland – it is the nearest area of considerable size and extent which has reliable open water and abundant food resources. It is less obvious why so many birds from Svalbard also winter there. Perhaps there is less competitive interaction with other diving birds in Southwest Greenland than in the much closer Norwegian and Icelandic waters, where large numbers of diving seabirds from local populations (notably Common Guillemots *Uria aalge* and Puffins *Fratercula arctica*) winter (see Nygård et al. 1988, Petersen 1998, Barrett et al. 2001).

**Threats**
The present threats to the wintering seabirds of Southwest Greenland and their habitats are disturbance and direct mortality from fishing and hunting activities.

Hunting seabirds and marine mammals is important to Greenlanders, not only as an occupation but also culturally and as a recreational activity (Kapel & Petersen 1982; Pars et al. 2001). The importance of seabird hunting is underlined by the fact that only 38,000 people live in Southwest Greenland (Anon. 2000) and the number of professional hunters is around 2,000, yet, according to the official bag-record system, about a quarter of a million seabirds are taken each year. Most of these are killed in the winter months, by hunters sailing in small, fast dinghies. The highest numbers reported to the bag-record system during 1994–2003 were 255,000 Brünnich’s Guillemots (1996), 84,000 Common Eiders (1996), 64,000 Little Auks (1996), 58,000 Kittiwakes *Rissa tridactyla* (1995), 35,000 Black Guillemots (1994) and 5,500 King Eiders. These numbers include birds taken outside the Southwest Greenland region, but by far the majority are taken there. In recent years, the numbers reported killed have decreased significantly, perhaps because of a similar trend in the numbers of professional hunters. But under-reporting of bag-records and declining quarry populations may also be relevant.

Declines in breeding Canadian King Eider populations and Icelandic Brünnich’s Guillemots have been related to the winter hunt in Southwest Greenland (Gratto-Travor 1998; Petersen 2000). For the Greenland breeding populations of Brünnich’s Guillemots and Common Eiders, illegal hunting during the summer also plays a significant role, and the total harvest of these populations in Greenland is considered unsustainable (Kampp et al. 1994; Meltofte 2001; Merkel et al. 2002).

The disturbance
caused by hunting activity is also a serious threat, exacerbated by the fact that hunted bird populations are much more wary of non-threatening human activities such as sailing (Madsen et al. 1998). The winter hunt is not spatially regulated, and no coastline is more than a few hours away from towns and smaller settlements in a fast dinghy. Wintering seabird populations which are confined to coastal waters, such as Common Eiders and Long-tailed Ducks, therefore face the constant risk of being hunted or disturbed; others, like King Eiders, wintering well offshore and among the drift ice, are less accessible to hunters.

The most significant impact from fisheries is incidental bycatch in Lumpsucker Cyclopterus lumpus gill-nets (Merkel 2004). This fishery takes place in spring and in shallow coastal waters, often coinciding with concentrations of staging Common Eiders, and it has increased markedly since 1966 (Merkel 2004). The total bycatch of eiders and the impact on the population is still unknown, but a study from Nuuk shows that bycatch may have a significant impact. Here, bycatch accounted for a minimum of 52% of the total eider harvest, numbering about 12,000 birds per season (Merkel 2004). Previously (in the early 1970s), offshore and nearshore drift-net fisheries for Atlantic Salmon Salmo salar took huge numbers of Brünnich’s Guillemots off Southwest Greenland, mainly in late autumn (Tull et al. 1972; Christensen and Lear 1977). This bycatch problem has declined to insignificant levels, first because the salmon quota was reduced and the timing and location of the fishery were changed, later because the commercial salmon fishery was closed (Falk & Durinck 1991; Falk 1998).

Many eiders are inadvertently killed each winter by ships because on foggy and snowy nights eiders are attracted to the lights, particularly the powerful searchlights on board ships. The birds collide with superstructure and wires on the vessels and many incidents where hundreds of eiders have been killed by a single ship have been reported to us. Many ships pass through eider habitats even during the winter, but the population impact of this mortality remains unknown.

An important potential threat is the development of an offshore oil industry. The most promising areas (for oil) are found in deep waters beyond the shelf, but accidental oil spills from these sites or from tanker wrecks may drift to the coast and affect wintering seabirds and their habitats. The most vulnerable populations in this regard will be species with a slow population turnover and which occur in high recurrent concentrations, such as King Eiders and Harlequin Ducks. However, the most numerous and more dispersed populations – Common Eiders and Brünnich’s Guillemots – are also vulnerable, mainly because both species are declining and their ability to recover from an oil-spill incident will therefore be hampered.

Climate change models predict an increase in mean annual temperatures for Greenland, particularly in mid and high latitudes of West Greenland, while the frequency of extremely low temperatures is expected to decrease (Ras-
mussen & Aarø-Hansen 2003). At first sight, this might be expected to benefit many wintering seabirds (e.g. eiders) as the reduced extent and duration of winter ice would increase the availability of feeding areas. Species dependent on the sea ice, such as Ivory Gull and many marine mammals, will probably be negatively affected if the distribution and quality of the ice is reduced. However, indirect and more subtle effects are extremely difficult to predict and unexpected population changes resulting from climate change are likely. In fact, significant reductions in ice cover have been apparent during the past five winters in the northern part of the study region; for example, Disko Bay has not had stable ice cover in any of these winters.

**Conservation measures**

In recent years, the Greenland Government has taken several initiatives to reduce the bird harvest. The hunting season has been reduced, mainly in the vulnerable spring season (Merkel 2004). However, the pressure from local politicians and the hunting organisation for more liberal hunting regulations has been intense, and this explains why the regulations have been changed at least five times over the past 20 years. The most recent regulations were issued in 2004, and they ensure a closed season in spring and summer – in Southwest Greenland typically from 1st March to 30th August or 15th October. Some municipalities have employed wildlife rangers with the difficult task of enforcing hunting and fishing regulations.

While a closed season for hunting has existed since 1977, spatial regulation is absent in Southwest Greenland. Except in urban areas, bird hunting may take place anywhere, and there are no safe havens for wintering seabirds. Experience from Denmark, where a network of shooting-free reserves has been established recently, shows that both local and migratory waterbird numbers and the hunting in nearby areas benefit from these sanctuaries (Fox & Madsen 1997; Madsen 1998a,b; Madsen et al. 1998). A similar network of effective, hunting-free reserves in the coastal areas of Southwest Greenland would be extremely beneficial to the wintering seabirds, particularly the Common Eider population.

**Box 1. Visiting Southwest Greenland in winter**

Southwest Greenland is easily accessible from Copenhagen, with scheduled flights several times a week in winter, and there are hotels in the major towns. However, once in one of the towns, it is difficult to get access to the wintering seabirds. If you succeed in chartering a boat (as sailing is the only way of getting around), then another problem arises, as seabirds generally are extremely shy, owing to the high hunting pressure, and therefore difficult to observe at close range. One of the best sites to get an impression of the winter birds in Southwest Greenland is actually in the capital city, Nuuk. A walk along the rocky shores and in the large harbour area can, under the right conditions, be very rewarding. White-tailed Eagles are frequent, Gyr Falcons often rest on antennae and chase Little Auks and other seabirds over the sea, while Common Eiders, King Eiders and Long-tailed Ducks rest along the coasts and small flocks of Mallards often gather in shallow, ice-free pools where the intertidal areas become exposed at low tide. Brünnich’s Guillemots and Little Auks are also common. Purple Sandpipers assemble on some coasts, while large flocks of Glaucous, Iceland and Great Black-backed Gulls, usually with a few Kumlien’s Gulls, frequent sewage outlets. Ivory Gulls are rare and occur usually when the drift ice of Davis Strait is close to the Greenland coast. And, if you manage to charter a boat and the sea is calm, spectacular flocks of Harlequin Ducks can be found around the outermost and exposed islands to the west of the town.

**References**


Wintering seabirds in Southwest Greenland

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Eiders often commute daily between fjordlands and outer coastal areas; this flock contains both Common Somateria mollissima and King Eiders S. spectabilis.

Lars Witting/arc-pic.com