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The Fifth National Report Greenland

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Executive Summary

Greenland, located in the Arctic close to the North Pole and with a population of 56,370 people, is dependent on nature's resources, especially those from the sea.

Fishery is the primary industry and it is expected that it will remain dominant for many years even though other industries will be of increasing importance.

Greenlanders are traditionally hunters and fishermen and have subsisted on the resources provided by our environment for thousands of years.

One very special component in Greenland's marine environment are Polynyas. The most important and significant on a global scale being "The North Water" polynya. The shear zone found along the west coast (with open cracks and leads) between the land fast ice and the drift ice are also very important to marine mammals and seabirds, particularly in the spring migration northwards.

Over the past decade considerable effort has been invested in identifying marine areas and coastlines vulnerable to oil spills, key habitats, natural resources, migration routes, and the population size and ecology of sensitive species.

The fifth national report contains three examples on changes in status and trends for pelagic fish, seabird and marine mammals. These examples show how population sizes have responded differently to management measures taken to stop the decline in the populations. They also demonstrated how ecosystem drivers may influence not just single species dynamics but also ecosystem structure.

In 2013 the Arctic Council working group CAFF (Conservation of Arctic Flora and Fauna) released the *Arctic Biodiversity Assessment (ABA)*. The most important messages from the report are that climate change is the most serious underlying driver of overall change in biodiversity in the Arctic. At the same time the report argues for the necessity of taking an ecosystem based approach to management and the importance of mainstreaming biodiversity by making it integral to other policy fields (CAFF, 2013).

The ABA report concludes that until the second half of the 20th century, overexploitation was the primary threat to a number of Arctic mammals, birds and fish. A wide variety of conservation and management actions have helped alleviate this pressure in many areas to such an extent that many populations are recovering, although pressures on others persist (CAFF, 2013). In a Greenlandic context this picture is very much the same where the number of eiders has been increasing while the Brünnich's guillemot population has still not recovered even though restrictions were introduced in 2001.

In line with the Convention of Biological Diversity, Greenland has undertaken different actions to secure the implementation of the Convention. As reflected in the fourth National Report, Greenland in 2003 adopted the Nature Protection Act (Greenland Home Rule Government Act no 29 on Protection of Nature). This Act implements a number of obligations that are derived from the Convention of Biological Diversity.

In the fourth National report Greenland reported that a Strategy and Action plan for biodiversity in Greenland would be adopted in 2009. A framework has been developed outlining the actions and priorities needed to facilitate the implementation of the Convention of Biological Diversity and other related international conventions and agreements.

However, even though Greenland has not adopted a specific National Biodiversity and Action Plans a range of activities have been carried out both nationally and in regional fora since with close links to the targets and goals which would be required in an NBSAP. In this regard Greenland has initiated a national project to analyze existing biodiversity hotspots. This will be published in 2014 and will be a platform for an administrative and political process to develop a strategy for protected areas as well as national legislation for specific areas. Included in the strategy is a framework for management planning and monitoring plans for protected areas. This strategy will be developed in 2014 and 2015 and implemented thereafter. It will also act as the framework for national conservation priorities.

Background and Information

The Ministry of Environment and Nature, Government of Greenland has prepared The Fifth National Report. The National Report contains three examples on changes in status and trends for pelagic fish, seabird and marine mammals prepared by The Institute of Natural Resources, Greenland.

The report is part of the Kingdom of Denmark reporting that consists of the National Report from Denmark and the National report from Greenland.

The Kingdom of Denmark is the signatory part to the Convention of Biological Diversity. The Danish Kingdom consists of Denmark and the self-governing areas of Greenland and the Faeroe Islands. The Government of Greenland has the legislative and administrative responsibility over several sectors including the right of self-determination over biodiversity and living resources while aspects such as foreign affairs, defence, and the judicial system are shared with Denmark. The ruling authority in Greenland is the Government with its parliament. On the National Day June 21, 2009, Greenland established self-government.

Update on biodiversity status, trends, and threats and implications for human well-being

Importance of biodiversity

Greenland – with its population of 56,370 people in the Arctic and as a neighbour to the North Pole – has always been dependent on nature's living resources, especially from the sea.

Fishery is the primary industry of the country. On a national level, more than one fifth of the workforce is employed in fisheries and related industries. The export of shrimp, Greenland halibut, cod and crab makes a significant contribution to the Greenlandic economy.

In total, Greenland's export of fish products amounts to approximately 2,4 billion DKK. This represents 57% of total exports of 4.2 billion. DKK, making the industry the most exporting industry in Greenland in 2011. Falling shrimp prices have put fisheries under pressure in recent years. At the same time, declining stocks of shrimp in Greenlandic waters have led to a reduction of the shrimp quota by 25% from 2012 to 2013. On the other hand, sudden increases of pelagic species such as mackerel hold potential for the development of new fisheries.

Different factors – for example the geographical remoteness and isolation of Greenland far away from other markets – make a differentiated economic development in Greenland a challenging task. It is expected that the modern Greenlandic fishing industry will continue to be dominant for many years even though other industries may be of increasing importance.[1]

Greenlanders are traditionally hunters and fishermen and have subsisted on the living resources for thousands of years. Hunting and fishing has been the way to survive in an environment with very short summers and unpredictable weather. For many generations hunting and fishing traditions have been passed on to the next generation and today many young people know how to shoot seals, caribou, birds or how to fish.

The most important marine mammals in terms of hunting are: polar bear, harp seal, walrus, ringed seal, minke whale, fin whale, narwhale, beluga, harbour porpoise and others. Among terrestrial mammals caribou, musk ox and arctic hare are important.

Greenland has a long tradition for seabird harvest dating back thousands of years. Today seabirds still play a key role in subsistence hunting and the growth of the human population, better guns and faster boats have increased the harvest of several species. Exploitation of bird species is limited to around 20 species, of which the most important are Brünnich's Guillemot, eider, king eider, little auk, Black Guillemot and kittiwake.

[1] *The mineral resources in the Greenland underground can be a future and potential economic development factor. Currently Greenland has no mines in operation. However. there are more mining projects under development. These projects include two exploitation projects for rubies and iron as well as prospecting projects aiming for exploitation of Rare Earth Elements. zinc and anorthosite. The potential for extraction of other natural resources such as oil and gas are being explored these years with optimistic economic perspectives.*

Exceptional biodiversity and/or ecosystems - examples

Within the borders of Greenland and the Greenlandic/Danish Arctic Marine part (within the EEZ), a number of areas containing exceptional biodiversity and/or ecosystems should be mentioned.

One very special physical component in the marine Arctic, and also Greenland, are polynyas. Polynyas are open waters surrounded by sea ice. They are predictable in time and space, and are of a high ecological significance. Some remain open throughout winter while others open or increase in extent in late winter. Polynyas play important ecological roles and are associated with earlier and higher levels of plankton production, which attracts plankton-feeding fish and other predators, including marine mammals and seabirds. The most important polynya in Greenland (and significant on a global scale) is the North Water (fig 1., box.1 and see below).

This has during the International North Water Polynya Study in 1997-1999 shown to be the most productive area in the Arctic (Deming et al. 2002). But also other smaller polynyas are found at several sites along the west coast of Greenland. Moreover, a shear zone occurs along the west coast (with open cracks and leads – fig. 1) between the land fast ice and the drift ice (Boertmann, D., Mosbech, A., Schiedek, D. & Dünweber, M. (Eds.) 2013). This is also very important to marine mammals and seabirds, particularly in the spring when populations are migrating northwards. In this shear zone, open water gradually extends northwards during the spring. On the east coast of Greenland the two most significant polynyas are the North East Water, the Wollaston Forland and the Mouth of Scoresbysund (Boertmann & Mosbech, (Eds). 2011).

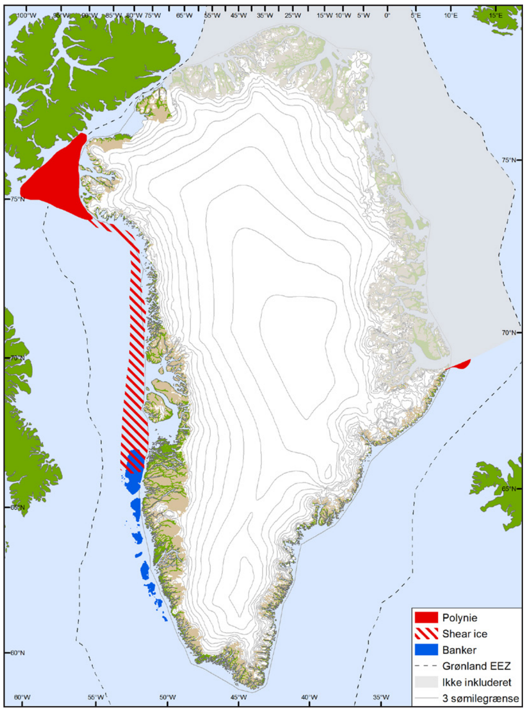


Figure 1. The North Water (red), the sheer zone, dashed red, and the banks in South West Greenland (Christensen et.al. in prep.)

Also several of the shallow banks along the west coast of Greenland (fig 1.), where light reaches the bottom and where complex topography in some places deflect the coastal currents and generate instabilities in the current with upwellings, are documented to play a special role for the rich ecosystems and biodiversity. Often a high production is found on the banks that benefit many species.

In this regard Store Hellefiskebanke (Box 2) should be mentioned as a site with documented high species diversity and rich production, and parts of the bank can be regarded as a biodiversity hot spot with many high arctic species present (Box 2 & Boertmann, D., Mosbech, A., Schiedek, D. & Dünweber, M. (Eds.) 2013).

In relation to the marine environment it should be mentioned that over the past decade considerable effort has been invested in identifying marine areas and coastlines vulnerable to oil spills as well as key habitats, migration routes, and the population size and ecology of sensitive species and resources in Greenland, resulting in a number of strategic environmental impact assessments (SEIAs) for hydrocarbon exploration and exploitation activities.

The SEIA's are conducted for the Greenland Bureau of Minerals and Petroleum by scientific environmental institutions (Danish Center for Environment and Energy, Aarhus University (formerly the Danish National Environmental Research Institute, NERI) and the Greenland Institute of Natural Resources). The SEIAs build on peer-reviewed scientific literature and supplementary scientific studies. Each SEIA states the sources to primary literature.

Through recent years these SEIA´s have been used as a platform for different initiatives to identify valuable ecosystems and biodiversity areas. An ongoing project that is based on SEIA data is a study that based on certain national and internationally accepted criteria, including the EBSA criteria, will indentify biodiversity hotspots (See later, Christensen et. al. in prep).

Another recent study that builds on the SEIA´s in relation to identifying ecologically valuable and sensitive marine areas around Greenland was based on IMO´s Criteria for Particularly Sensitive Sea Areas (PSSA) (Christensen et al., 2012). A comparison of the various sets of criteria shows that IMO´s PSSA criteria and CBD´s EBSA Criteria are broadly the same (Skjolddal et. al, 2013).

Box 1. North Water; example of a site with exceptional biodiversity and ecosystems in Greenland

(builds on: Boertmann & Mosbech (Eds) 2011, AMAP/ CAFF/ SDWG 2012 & Christensen et. al 2012, where primary references can be found).

The North Water Polynya is the most productive polynya in the Arctic and globally unique.

Especially in the eastern parts along Greenland, upwelling of nutrient-rich waters and the associated high biological production provides favorable foraging conditions for seabirds and mammals, mostly in the summer, but even some marine mammal populations winter here.

- More than 80% of the world population of little auk is dependent on the North Water Polynya from May to September, when about 30 million pairs are estimated to nest along the Greenland coast.
- Over half of Greenland's breeding population of Brünnich's Guillemot are nesting in five colonies with a total of about 200 000 breeding pairs (Boertmann et al., 1996). They are dependent on the northeastern parts of the area from mid-May to late August, and during the autumn migration in August–September also on the western (Canadian) side.
- The endangered ivory gull (Near Threatened globally) occurs scattered throughout the North Water Polynya in summer and breeds on adjacent Ellesmere Island.
- Seaduck molting areas, especially for king eider, occur along the Greenland coast.
- The North Water Polynya is critical habitat for beluga: an estimated 14 000 animals migrate from Lancaster Sound in Canada to the North Water Polynya and adjacent waters, a large proportion of them winter in mainly the western parts of the polynya.
- The northernmost parts of the North Water Polynya and Inglefield Bredning are important summer areas for discrete summer populations of narwhal. An estimated population of 8368 individuals exploits Inglefield Bredning. Melville Bay is the only other summer range in West Greenland.
- Bowhead whales utilize the southern parts of the North Water Polynya in spring, and an unknown number winter here.

The northern parts of the North Water Polynya – Kane Basin – hold a population of a couple of hundred polar bear; they are linked to larger sub-populations in Baffin Bay (about 1600 animals) and Lancaster Sound (2500 bears). The ice edges anywhere in the North Water Polynya and around Cape York in the southern part of the area are particularly important for wintering polar bear.

- The North Water Polynya is also an important wintering area for young ringed seal (an important prey for polar bear) benefitting from the relatively thinner ice in the eastern (Greenland) parts.
- At least 1500 walrus summer in the North Water Polynya, mainly in the western parts along Ellesmere, and winter mainly in the eastern parts. The entire Baffin Bay population was estimated at 2100 animals in 2009.

Box 2. Disko Bay and Store Hellefiskebanke; example of a site with exceptional biodiversity and ecosystems in Greenland

(builds on: Boertmann & Mosbech (Eds) 2011, AMAP/CAFF/SDWG 2012 & Christensen et. al 2012, where primary references can be found).

The Disko Bay and Store Hellefiskebanke area has complex oceanographic and bathymetric conditions where a tide induced upwelling forms the basis for high biological spring production, although with large inter-year variation. The production provides favorable foraging and breeding conditions for seabirds and mammals and a range of species are dependent on the resources on the banks on the shelf, in particular on Store Hellefiskebanke. Capelin and sandlance (*Ammodytes* spp.) are most important prey for seabirds and mammals.

- The entire area, but especially Store Hellefiskebanke is critical habitat for the walrus that winter in West Greenland, estimated at 3240 animals in 2008. In late winter (February–May) they rely on foraging areas within the 100 m isobath; satellite-tagged individuals utilized a fairly limited area of the northern part of the bank.
- The entire area is part of the beluga winter range (December) in West Greenland, where about 7000 animals rely entirely on the ice edge and marginal ice zone;
- In summer and autumn this area (like the more southern areas) serves as foraging grounds for harbor porpoise (Phocoena phocoena) and a range of baleen whales (blue, sei, minke, fin, and humpback). Evidence suggests that in particular the western part of the area – off the shelf break – is important to the baleen whales.
- The bowhead whale has its main spring (March to June) staging area in and just west of Disko Bay, which is used by perhaps about 1000 whales of the Baffin Bay population. Apparently, the Disko Bay area serves as a foraging and staging area primarily for female bowhead whales without calves.
- The Benthic fauna is very diverse and the bank can be regarded as a benthic biodiversity hotspot.
- Seaducks – mostly king eider, but also common eider, harlequin duck (*Histrionicus histrionicus*) and red-breasted merganser – have important molting areas (July–September) in coastal areas and fjords; during wing molt, the birds are flightless and extremely shy.
- Narwhal are abundant in the deeper basins of the area during November through May. Narwhal winter in the dense pack ice west of Disko as well as in the coastal areas close to the southern entrance to Disko Bay.
- Beluga are abundant on the banks of the area from November through May. They arrive from the Canadian summer grounds in November and stay until May.
- Store Hellefiskebanke – specifically within the 50 m isobaths – is critical staging and wintering habitat for 500.000 king eider, which is a major proportion of the flyway population.
- Store Hellefiskebanke is also a significant winter/spring area – including whelping grounds – for bearded seal.
- Kitsissunnguit / Grønne Ejland in Disko Bay holds the largest Arctic tern colony in Greenland (about 21 800 pairs in 2006); a number of other colonies in the bay are home to up to 5800 pairs – with large inter-year fluctuations.
- Disko Bay has a high diversity of seabirds including Brünnich's Guillemot (one colony), black-legged kittiwake (several colonies), cormorants (several colonies), common eider (several colonies), fulmar (one of Greenland's largest colonies) and small populations of Atlantic puffin and little auk. Finally, the rare Ross's gull occasionally nests here.
- The high productivity is also reflected in the rich commercial fisheries in the area, including Greenland halibut, snow crab, shrimp and scallops.
- Capelin spawning areas occur in the tidal zone several places along the coastline.

The outcome of that assessment is shown in Table 1. In addition, Table 1 also lists areas proposed as Ecologically and Biologically Significant Areas (EBSA) or "Super EBSA" by IUCN/NRDC in their interpretation of UN Convention on Biodiversity (CBD) designation (Speer & Laughlin, 2011).

Generally speaking, most of the coastal and offshore waters around Greenland host sensitive marine resources at least part of the year (Fig. 2).

Subsequently, the 12 areas have been ranked in four priority categories (Fig. 2 and Table 1). Half of the areas meet all 11 PSSA criteria, but two areas, the North Water Polynya and Disko Bay and Store Hellefiskebanke – stand out, and are ranked Priority 1 (see box text for illustrating why these two areas are considered high priority).

As mentioned an ongoing project that is based on SEIA data is expected to be published later this year (2014) (Christensen et. al. in prep). Included in this study is a more thorough analysis of the distribution of single species (including redlisted species) nature types, areas with high diversity of certain groups etc. and where and when these species are occasionally concentrated and/ or can be sensitive to human impact. The abovementioned descriptions of important marine areas are included in this report and the most important parts are described in a finer scale. Also important terrestrial sites are described. Examples are given in figure 3.

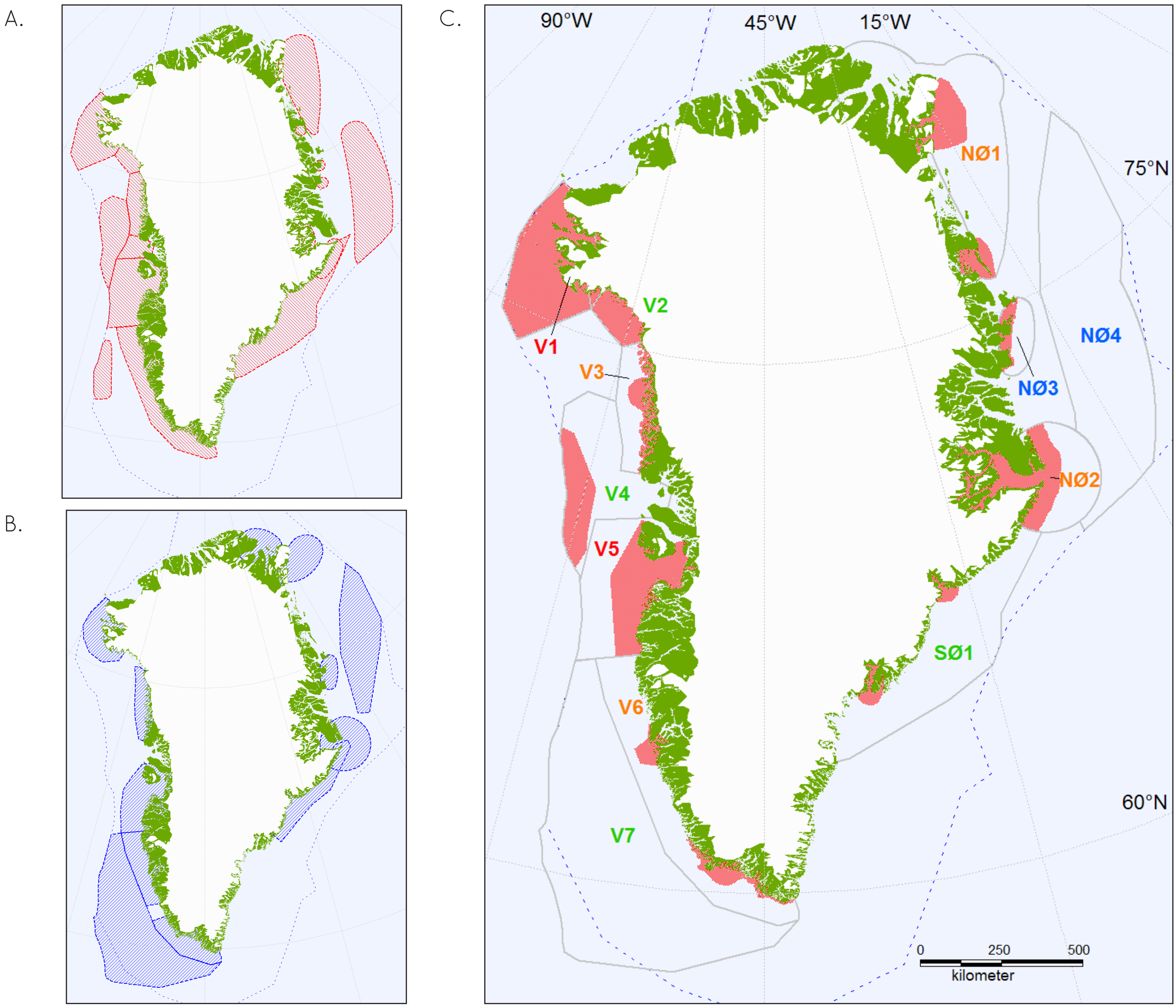


Figure 2. A) Important areas for sea mammals; B) important areas for seabirds; the delineations are based on the general information on distribution and habitat use as exemplified by the maps from different sources reproduced in this report; and C) proposed designation of vulnerable sea areas (see number and names in table 1 below). Within the general areas, especially important 'core areas' are marked by red toning; however, in areas V7 and NØ4 the critical resources (whelping seals and foraging seabirds and whale etc.) are associated with the marginal ice zone, which is highly dynamic within and between years, and increasingly so due to climate change impacts, and identification of core areas would have to be equally dynamic - and therefore no core areas are suggested here. Area V7 includes international waters. Numbers refer to Table 1, where the 12 areas are prioritized in four categories: Priority 1: red; Priority 2: orange; Priority 3: blue; Priority 4: green (From Christensen et. al 2012).

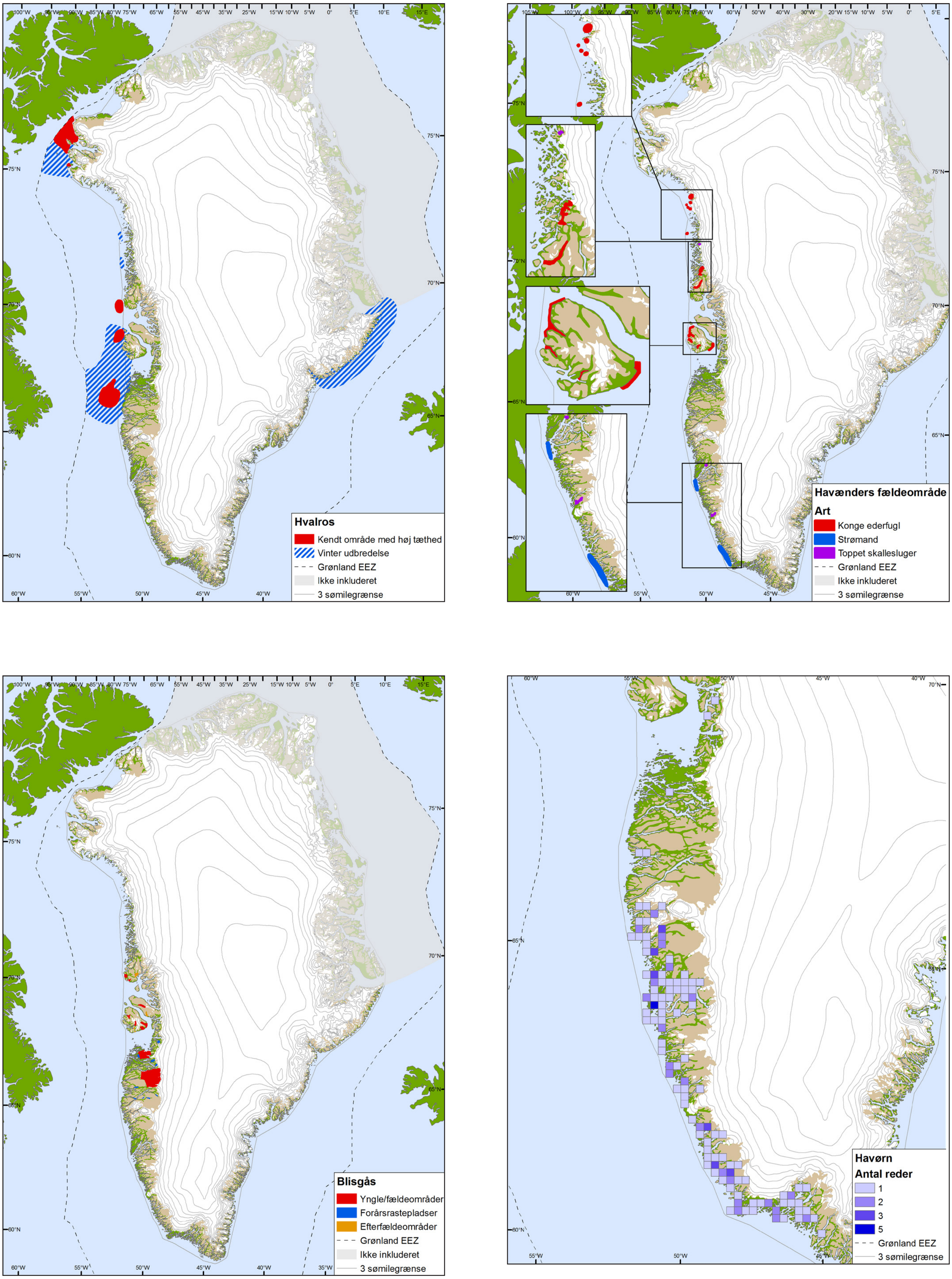


Fig. 3 Examples on marine and terrestrial areas that have importance for different species from Christensen et. al. (in prep) expected to be published in spring 2014 . A) Known areas with high densities of walrus (red; October - May) and general winter distribution dashed blue; B) Important areas for moulting seaducks from July to September. King eiders (red), harlequin ducks (blue) red-breasted merganser (purple); C) Breeding areas (red), spring feeding grounds (blue) and post breeding areas (yellow) for the Greenland white fronted goose. D) Number of sea eagle nests (1- 5) in grids along the south west coast of Greenland.

Table 1. Overview of sensitive marine areas in Greenlandic waters with an overall 'Priority' (in four categories, right column) based on an assessment of which criteria for proposing Particularly Sensitive Sea Areas in line with IMO guidelines[2]; for each criteria it is indicated whether the area meets the criteria 'unequivocally' (XXX), 'substantively' (XX) or 'in part' (X). The blue column specifies if the area is also proposed as Ecologically and Biologically Significant Areas (EBSA) or "Super EBSA" by IUCN/ NRDC in their interpretation of UN Convention on Biodiversity (CBD) identification[3] (based on Christensen et al. 2012).

Area		PSSA criteria											EBSA	
Number See map, Fig. 2	Name / description	Uniqueness / rarity	Critical habitat	Dependency	Representativeness	Diversity	Productivity	Spawning / breeding grounds	Naturalness	Integrity	Fragility	Bio-geographic importance	EBSA/Super EBSA	
V1	North Water Polynya area	XXX	XXX	XXX	XXX	XX	XXX	XXX	XXX	XXX	XXX	XXX	S	1
V2	Melville Bay	XX	XX	XX				X	XXX		XX	X	E	3
V3	Northwest Greenland shelf and ice shear zone	X	XXX	XXX	XX	XX	X	XX	XX	X	XX	XX	E	2
V4	Central Baffin Bay drift ice and head of Uummaannaq Fiord		XXX	XXX					XX					4
V5	Disko Bay and Store Hellefiskebanke	XX	XXX	XXX	XX	XXX	XXX	XX	X	XX	X	XX	S	1
V6	Southwest Greenland shelf area	X	XXX	XX	XX	XXX	XXX	XX	X	XX	X	X	E	2
V7	Labrador Sea drift ice and marginal ice zone		XX	XX				XX	X				E	4
SØ1	Southeast Greenland – Denmark strait		X	X				X	X				(E)*	4
NØ1	Northeast Water polynya and NE Greenland	XX	XX	XX	XX	X	XX	XX	XXX	XXX	X	XX	E	2
NØ2	Scoresby Sund and surrounding waters	XX	XXX	XX	XX	XX	XX	XXX	XXX	XX	X	X	E	2
NØ3	Sirius Water Polynya /Young Sund (Wollaston Forland, Clavering Ø)	X	X	X	X	XX	X	XX	XXX	X	XX		E	3
NØ4	Southwestern Greenland Sea and drift ice		XX	XXX		X	XX	XXX	XXX		XX		E	3

2 International Maritime Organisation (IMO) criteria - see 'Revised Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas - A 24/ Res.982; 6 February 2006'. According to the guidelines (section 1.2) "a PSSA is an area that needs special protection through action by IMO because of its significance for recognized ecological, socio-economic, or scientific attributes where such attributes may be vulnerable to damage by international shipping activities"

3 IUCN/ NRDC (2010)

Major changes in the status and trends of biodiversity in Greenland

Since the last national report some changes in status and trends of biodiversity have occurred / been reported. The Fifth National Report contains three examples on trends in biodiversity in pelagic fish, seabirds and marine mammals. The examples show that the population size of different species has responded differently to the management measures that have been taken to stop the decline in the populations and how ecosystem drivers may influence single species dynamics but also ecosystem structure.

An example – pelagic fishes in Greenland waters

The Greenland ecosystem is to a large extent a benthic community similar to other arctic regions (Grebmeier et al. 2006), which is also evidenced by the largely benthic fish community. There has historically been a few trial fisheries targeting capelin and sand lance, but neither proved profitable. However, increasing temperatures in especially east Greenland as well as a decline in sea ice extent (Fig. 4) suggests that conditions may be changing, becoming more favourable of a pelagic community including both mammals and fishes (Piepenburg, 2005; Hansen, 2010).

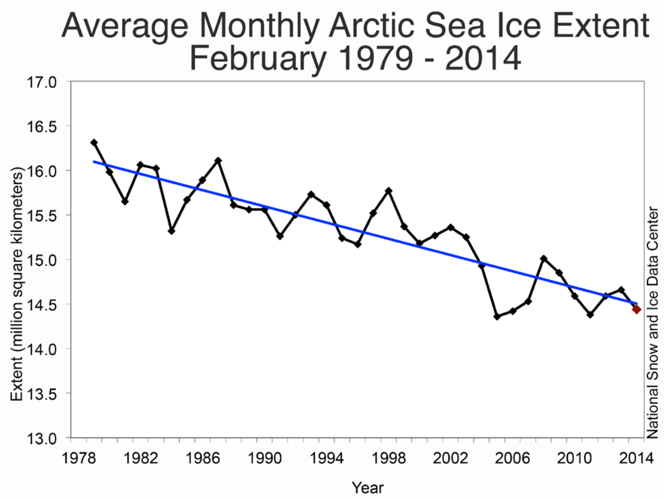


Figure 4. Extent of sea in the arctic in September (www.DMI.dk)

In the surveys of Greenland waters conducted by the Greenland Institute of Natural Resources pelagic species are occasionally caught in surveys targeting groundfish. This includes blue whiting along the Greenland east coast. Concurrently with increasing temperatures blue whiting catches have steadily increased since 2007 and the distribution area has expanded to include all of the surveyed area (Figs. 5 and 6).

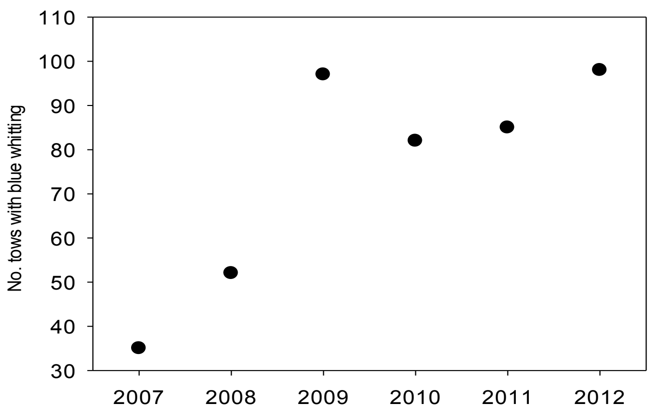


Fig. 5: No. of tows containing blue whitting in the East Greenland survey (Greenland Institute of Natural Resources)

In addition to already present pelagic species in East Greenland waters, a single mackerel was first observed in 2011 in the East Greenland surveys. In 2013, it was observed in high abundances and as far south as 62°N (Fig. 7). This occurrence was so profound that a fishery quickly developed, and mackerel was a fished intensely in especially 2013, and the fishery went from no catches in 2010, to more than 53.000t in 2013 (Fig. 7). Although investigations are ongoing, all evidence suggests that the arrival of mackerel and pelagics in general are linked to increases in temperature and shifts in ocean current patterns. The ecological importance of an increased occurrence of pelagics in such high numbers in Greenland waters is unknown, but given the integrated consumed biomass and the nature of mackerel feeding (highly predatory), they could have a very large impact on ecosystem structure, energy flow and recruitment to commercial fish stocks.

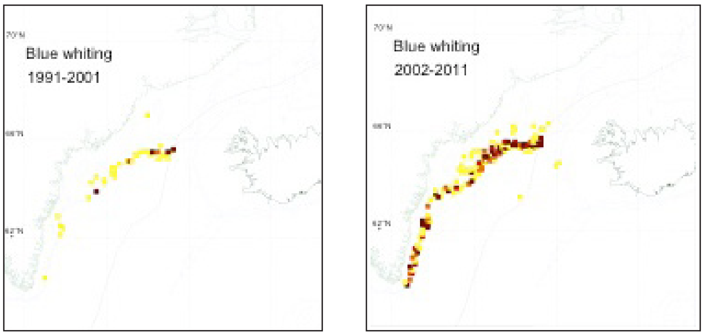


Figure 6 Occurrence of blue whitting in East Greenland waters in the periods 1991-2001 and 2002-2011. Colour intensity indicate number of fish (Greenland Institute of Natural Resources)

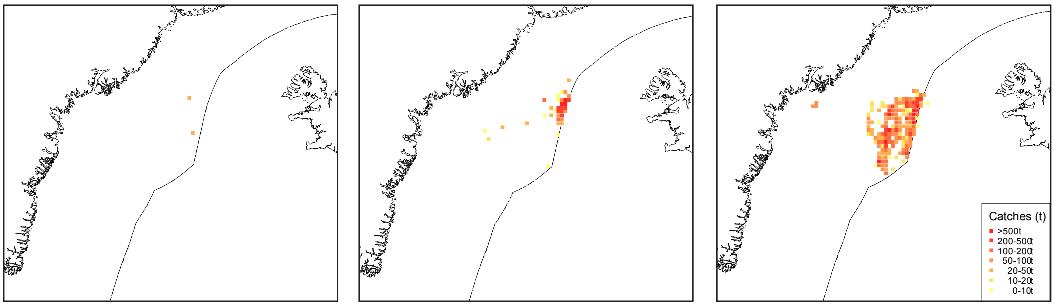


Figure 7. The development in the mackerel fishery in Greenland from 2011 (left) to 2013 (right). The rod dot in 2013 marks the observed southern limit of mackerel distribution.

An example - seabirds

Only a few seabird species are monitored on a regular basis in Greenland and these are mainly among the harvested species. Two important species that are highly valued among the living resources in Greenland are the common eider (*Somateria mollissima*) and Brünnich's guillemot (*Uria lomvia*), for which a brief population status is presented here.

The common eider experienced a severe population decline in Greenland over the period 1960 – 2000 and this was probably related to unsustainable harvest practices (Merkel 2004; Gilliland et al. 2009). However, concurrent with the introduction of more restrictive hunting regulations in 2001, a quick population recovery has since occurred (Merkel 2010; Burnham et al. 2012). In Northwest Greenland the recovery has been documented in details by means of a community-based monitoring program that was initiated in 2001. This program includes approximately 60 eider colonies distributed over six areas in Northwest Greenland, some of which are surveyed annually by six teams of local observers and others every fifth year jointly by the locals and biologists (Fig. 8).

Similar to the common eider the Brünnich's guillemot experienced a large decline in the past (1930s - 1980s, Kampp et al. 1994) and since then the hunting season was shortened several times (most significantly in 2001) to compensate for this development. However, for the Brünnich's guillemot the changes in the management have not had the desired effect. A recent status of the monitoring program shows that previously declining colonies are still declining. On a national scale the breeding population has declined by 15% since the mid/late 1980s, but in several regions the decline has been as much as 62 - 74 % (Table 2). Despite a large reduction in harvest levels, it appears that illegal hunting and disturbances still constitute a problem in some breeding areas (Merkel et al. submitted). However, a potential deterioration of some of the wintering areas, related to large-scale changes in the marine environment, may also have contributed to the recent decline. Such a relationship has been documented for the breeding population on Svalbard (Descamps et al. 2013)

Among other seabird species and based on a more sporadic monitoring effort, species like the black-legged kittiwake (*Rissa tridactyla*), common guillemot (*Uria aalge*) and Atlantic puffin (*Fratercula arctica*) are also categorized as declining in Greenland. In contrast, great cormorant (*Phalacrocorax carbo*), great black-backed gull (*Larus marinus*) and lesser black-backed gull (*Larus fuscus*) are currently increasing in Greenland. For a number of species there is no obvious trend or the status is unknown, such as little auk (*Alle alle*) and Arctic tern (*Sterna paradisaea*). For more information see (Boertmann 2007, 2008; Frederiksen 2010; Labansen et al. 2010; Egevang and Boertmann 2012).

Table 2. Past and recent population development, including annual growth rates (AGR), for Brünnich's guillemot in Greenland (GL) and the current breeding population size (2006-2011) (Merkel et al. submitted). For details about past population change (1930s - 1980s) see Kampp et al. (1994).

Region/district	Population change			Population size (2006-2011)		
	1930s - 1980s	1980s - 2000s	AGR	Colonies	No of birds	GL prop.
Northwest						
Qaanaaq (Thule)	< -10%	+8%	0.4%	5	308,000	68%
Upernavik N	-30%	-28%	-1.4%	2	115,000	25%
Upernavik S	-80-90%	-74%	-5.9%	2	3,000	1%
Midwest						
Uummannaq	-100%			0	0	
Disko Bay	-90%	-62%	-3.6%	1	1,700	0%
Southwest						
Maniitsoq	-40-50%	-38%	-2.2%	4	14,300	3%
Nuuk	?	+8%	0.0%	1	1,000	0%
Paamiut	-50-60%	-65%	-4.5%	1	800	0%
Qaqortoq	?	-65%	-4.2%	1	2,700	1%
East						
Ittoqqortoormiit	< -10%	-62%*	-6.3%*	2	6,500	1%
Total				20	453,000	100%

* Represents change since 1995 (no data available from the 1980s)

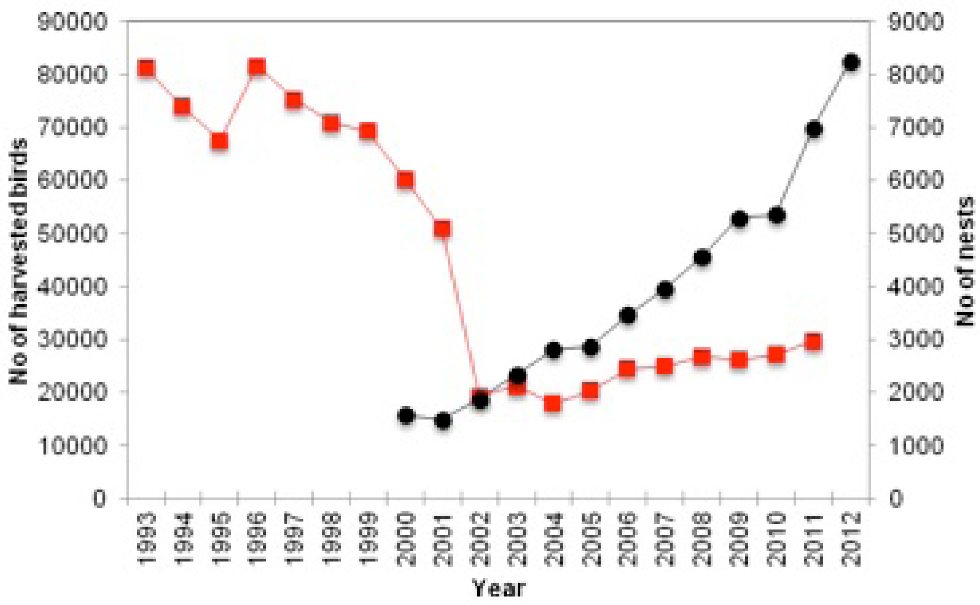


Fig. 8. Common eider population trend in West Greenland (69°N -74°N) in 2000-2012 (black circles) based on annual colony surveys in 32 eider colonies and the number of eiders reported shot in West Greenland in 1993-2011 (red squares). Harvest statistics obtained from the Greenland Ministry of Fishery, Hunting and Agriculture.

An example – marine mammals

Twenty-two species of marine mammals occur permanently or seasonally in Greenlandic waters and population census information is available for about half the species (Table 3). Census data are inadequate for some species because only a fraction of the population, i.e. the fraction that occur in Greenland, has been surveyed and their major occurrence outside of Greenland remains to be surveyed. Neighbouring countries that host the main part of their seasonal distribution assess two of the seal species and some of the population estimates for the arctic species are derived jointly with Canada. Several species of small cetaceans and seals including walrus have discrete population units in Greenland that need to be assessed separately and surveys targeting specific stock units are therefore required. Stock units are surveyed at intervals ranging from 1 to 10 years (or even up 20 years for polar bears) dependent on the conservation status and the risks the stock units are subject to.

Table 3. List of marine mammals that occur in Greenland and the availability of information of population census data from each species. Some species are covered by collaborative efforts by neighbouring countries (international effort), whereas other species only have census information on the fraction of the population that seasonally occur in Greenland (partial coverage) that for some species are supplemented with census data from Canada (partly with Canada).

Species	Latin name	Census information
Ringed seal	*Pusa hispida*	None
Harp seal	*Pagophilus groenlandicus*	Yes, from international efforts
Hooded seal	*Cystophora cristata*	Yes, from international efforts
Bearded seal	*Erignathus barbatus*	None
Harbour seal	*Phoca vitulina*	Yes
Walrus	*Odobenus rosmarus*	Yes, partly with Canada
Polar bear	*Ursus maritimus*	Yes, partly with Canada
Minke whale	*Balaenoptera acutorostrata*	Yes
Fin whale	*Balaenoptera physalus*	Yes
Blue whale	*Balaenoptera musculus*	None
Sei whale	*Balaenoptera borealis*	Inadequate due to partial coverage of distribution
Humpback whale	*Megaptera novaeangliae*	Yes, incl. trend
Bowhead whale	*Balaena mysticetus*	Yes, incl. trend
Harbour porpoise	*Phocoena phocoena*	Inadequate
Beluga	*Delphinapterus leucas*	Yes, incl. trend data and partly with Canada
Narwhal	*Monodon monoceros*	Yes, partly with Canada
Pilot whale	*Globicephala melas*	Inadequate due to partial coverage of distribution
Whitebeaked dolphin	*Lagenorhynchus albirostris*	Inadequate due to partial coverage of distribution
Whitesided dolphin	*Lagenorhynchus acutus*	Inadequate due to partial coverage of distribution
Sperm whale	*Physeter catodon*	None
Killer whale	*Orcinus orca*	None
Bottlenose whale	*Hyperoodon ampullatus*	None

Range wide population census is at present considered technically and logistically unfeasible for some of the species. Other species are given high priority due to their vulnerable status caused by exploitation, disturbances or habitat changes. It has for a number of species been necessary to develop methods that are specific for Greenland for developing population estimates based on surveys.

Most population censuses are conducted by large-scale visual aerial surveys that include correction factors for animals missed by the observer or animals submerged during the passage of the aircraft. Some population censuses are conducted by markrecapture methods either based on genetic samples or photo identification of whales. Total counts are possible for harbour seals and walruses when they are present at their terrestrial haul-outs. A few species have census histories long enough for detecting trends. Dating back to 1981 the longest time series involves belugas on their wintering ground in West Greenland (Fig. 9).

A decline in beluga abundance was observed in the 1990s and this led to various regulations of the hunting of belugas that culminated with the instalment of quotas in 2006. Reduced availability of belugas caused by both overexploitation and reduced sea ice, that allowed the whales to move further offshore, assisted in reducing the catches. Following the decline in mortality the population showed signs of recovery in in recent surveys (Heide-Jørgensen et al. 2009, GINR unpublished data from a survey in 2012).

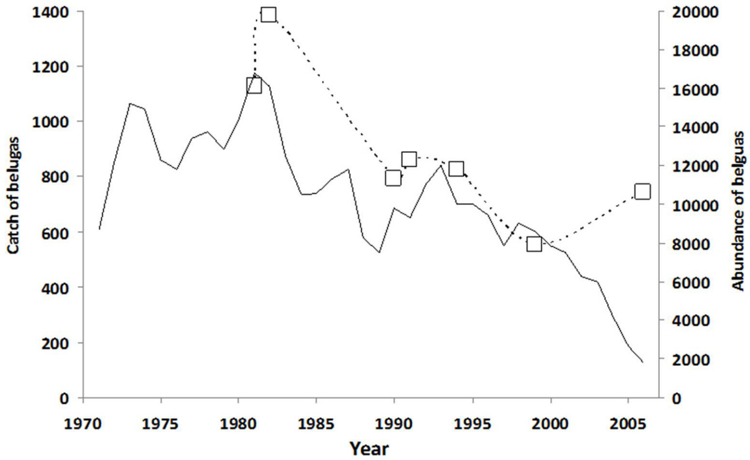


Figure 9. Trends in catches and abundance of belugas in West Greenland from 1970 to 2006. Catches are shown with a solid line as a two- year sliding average, and abundance is shown as a dotted line, with squares indicating years where abundance estimates can be derived (Heide-Jørgensen et al. 2009)

Other species subject to little or no exploitation show a more unidirectional trend over time. With an international protection since 1932 the bowhead whale has the longest protection history of any wildlife. After almost a century where they have virtually been absent from their former wintering area in West Greenland they were considered at risk of being extinct. After 1999 there was a sudden increase in the number of sightings of bowhead whales in West Greenland that continued through 2006 where the abundance was assessed to 1229 whales (95% CI 495-2939). More recent survey data suggest that the rate of increase of bowhead whales in West Greenland has stopped at an abundance of 1538 whales (95% CI 827-2249) in 2012 (Rekdal et al. in press). The relation between bowhead whales in West Greenland and those in other parts of the Arctic and especially in northern Canada, remains unresolved and it is likely that connection between different stocks influences the abundance and changes over time in West Greenland (Heide-Jørgensen et al. 2011).

Humpback whales in West Greenland are also connected to a wider population range in the Atlantic but their occurrence in Greenland shows a steady increase since 1982 (Fig. 10)

Humpback whales have been protected from hunting since 1985 and in all areas of their occurrence in the North Atlantic are there indications of increasing abundance. In West Greenland the increase from 1982 to 2007 was estimated at 9% per year, which is not different from increases in the other areas of the North Atlantic (Heide-Jørgensen et al. 2012).

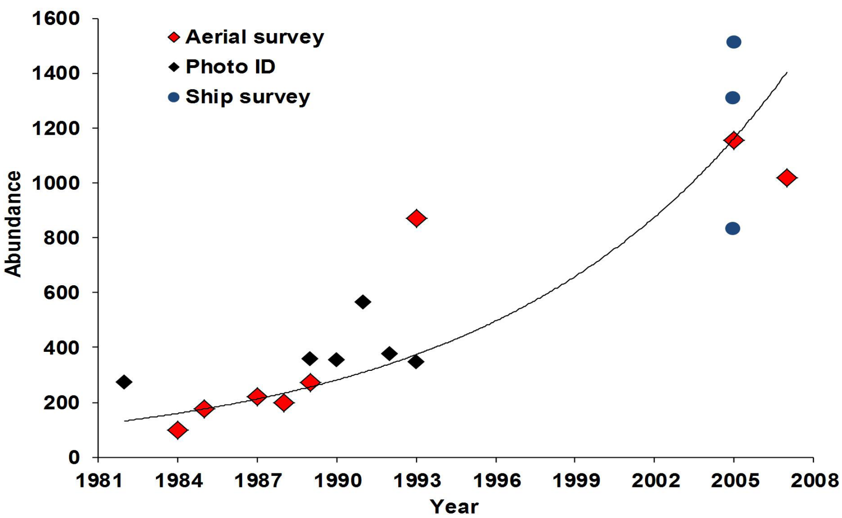


Figure 10. Trends in relative abundance of humpback whales in West Greenland 1982-2007 with different survey methods; aerial surveys, ship-based surveys and mark-recapture estimates based on photo-identification (Heide-Jørgensen et al. 2012). The exponential growth model is fitted to the estimates from the aerial surveys. Details of the three abundance options from the ship-based survey in 2005 are given in Heide-Jørgensen et al. (2007).

One of the most difficult marine mammals to survey is the walrus. They occur in clumps that are hard to detect with seasonal sex and age segregation. They are at the same time considered to be at risk for over-exploitation in some areas, which emphasizes the need for repeated population monitoring. The stock in East Greenland seems after >100yrs to have recovered from over-exploitation, although walrus are rare now in areas outside the national park where they were previously abundant. Stocks in North and West Greenland have been exposed to long-term exploitation with periods with unsustainable harvest. Hunting has eliminated the use of terrestrial haul-outs for walruses in West Greenland and they have for >50 years only been present in West Greenland in winter months where they haul out on sea ice. The current population estimates for Northwest Greenland in 2010 and in West Greenland in 2012 were 1,759 (95%CI 1,008-3,070) and 1,408 (95%CI 922-2,150), respectively (Heide-Jørgensen et al. 2013a,b), which allow for a small number of catches from each of the stocks (100/yr). Opposite humpback and bowhead whales walruses are believed to occur in discrete stock units in Greenland and are therefore more susceptible to overexploitation. Given the low abundance estimates and the uncertain exchange with Canadian walrus groups it is necessary to maintain a continued monitoring of the population changes in Greenland walrus stocks.

Continued monitoring of stock sizes of selected marine mammals in Greenland will allow not just adjustment of catches to ensure sustainability of exploitation but also to evaluate effects of anthropogenic activities such as fishery, seismic exploration and shipping, but also of habitat changes caused by continued warming of the waters around Greenland.

The main threats to biodiversity

Impacts of climate change

In 2013 the Arctic Council working group CAFF (Conservation of Arctic Flora and Fauna) released the Arctic Biodiversity Assessment (ABA). The most important messages from the report are that climate change is the most serious underlying driver of overall change in biodiversity in the Arctic. At the same time the report argues for the necessity of taking an ecosystem based approach to management and the importance of mainstreaming biodiversity by making it integral to other policy fields (CAFF, 2013).

The ABA report concludes that until the second half of the 20th century, overexploitation was the primary threat to a number of Arctic mammals, birds and fish. A wide variety of conservation and management actions have helped alleviate this pressure in many areas to such an extent that many populations are recovering, although pressures on others persist (CAFF, 2013). In a Greenlandic context this picture is very much the same as reflected in the seabird example where the number of eiders has been increasing while the Brünnich's guillemot population still has not recovered even though restrictions were introduced in 2001.

Global climate change is expected to have the most extensive impact in the High Arctic. Consequenses of climate change include more open coastal waters and following increased human activities such as increasing tourism and mineral exploitation, which all may contribute to increased threats towards biodiversity, habitats, and ecosystems.

The Arctic Climate Impact Assessment (2004) forecast an increase in average temperatures by 2°C in the low arctic areas of South Greenland over the next century, while the average winter temperature is likely to increase by 6 - 10°C in North Greenland. Dramatic changes in the average summer temperature are not expected. According to the ACIA report Greenland will see an increase in rain- and snowfall by 10 to 50 per cent (ACIA, 2005).

In Greenland, one of the challenges will be the climate belts' movement north where the high Arctic species may lose their habitats which lead to loss of high arctic ecosystems and biodiversity. There is a risk that most of the high-Arctic zone will disappear together with the unique fauna and flora that are adapted to precisely this zone. In Northeast Greenland, large areas are completely without vegetation. There are few species of Arctic flora and fauna, and those present have adapted to the extreme climate conditions. Many plants and mammals depend on a stable snow cover to protect them against the cold. Other species are dependent on early melting of the snow - or that the snow is blown away throughout the winter. The distribution, duration, and thickness of the snow cover are therefore just as important factors as the temperature for the general conditions of life for many plants and animals in Greenland. In high-Arctic Greenland, more ample precipitation would presumably mean more extensive plant cover, and large parts of this zone would possibly change character to become more like low-Arctic areas. The potential earlier melting of the snow, higher temperatures and along with an increase in rainfall the lengthened growing season is likely to lead to an increase in plant cover. Immigration of species from the south can be envisaged, but would be impeded by barriers in the form of open seawater and competition from already established species.

The Greenlandic marine ecosystems are, as part of the Arctic Oceans, subjected to the threats mentioned in the Arctic Climate Impact Assessment for the region. The consequences can be comprehensive for the biodiversity, as well as for the people depending on the ocean for their living. Changes in stocks call for a reorientation of the industry as northern shrimp Pandalus borealis has started to disappear from the waters off South Greenland, while stocks of Atlantic cod Gadus morhua are reappearing and new pelagic species, such as mackerel are moving in.

CAFF released in 2013 the report *"Life linked to Ice: a guide to sea-ice-associated biodiversity in this time of rapid change"*. The report concludes that sea ice loss is affecting life in the Arctic Ocean with changes resonating throughout the entire food web, and affecting everything from algae to birds, fish, marine mammals and human communities that rely on sea ice for travel and food or economic opportunities (Eamer et. Al., 2013).

The most productive polynya in the world, the North Water polynya between Canada and Greenland, shows signs of breaking down because of ice conditions. Analysis of the annual formation and break-up of this polynya over the period from 1968 to 2011 shows a trend to earlier break-up and suggests that a slightly warmer Arctic winter could lead to its disappearance (Eamer et al., 2013).

Effects of changes in sea ice on most fish stocks remain uncertain. Northern bottom-dwelling species, including Greenland halibut, appear to be sensitive to environmental changes related to climate, but the role of sea ice is not clear (Eamer et al., 2013).

Other stressors to biodiversity

Arctic biodiversity is under pressure from a number of other stressors as well, including overharvesting, environmental contaminants, habitat fragmentation, invasive species, increased shipping and regional development. However, except for climate change effects on habitats, almost no habitats in Greenland have been threatened by habitat deterioration during the last decades. The main part of the ice-free area of Greenland (99,8 %) is undisturbed by human activities, without modern infrastructure and devoid of human activity apart from an impact from traditional hunting and fishery. These activities do not influence habitats, but have had some impact on some exploited species (see seabirds and marine mammals section).

Many chemicals in commercial use today have the potential to transport to and accumulate in the Arctic. Many of these compounds transport over long distances and accumulate in Arctic food webs. New knowledge highlights the potential importance of ocean transport pathways. In contrast to atmospheric pathways ocean currents are slow. This may delay the environmental response to regulations (AMAP, 2009). Many studies show that the Greenlandic marine ecosystems are affected by human-induced pollution. Studies under the Arctic Monitoring and Assessment Programme (AMAP) of the Arctic Council prove that levels of certain heavy metals and POPs are relatively high in a number of marine mammals living in Greenland waters, i.e., ringed seal *Phoca hispida*, harp seal *Pagophilus groenlandicus*, minke whale *Balaenoptera acutorostrata*, beluga whale *Delphinapterus leucas* and narwhal *Monodon monoceros*. The National Environmental Research Institute and the Greenland Institute of Natural Resources (GINR) have studied the polar bears and have drawn special attention to the health of the East Greenland population, as the animals here have high levels of POPs.

Attention is further drawn to activities within the fishery and hunting sectors, mineral resources activities, the transportation of goods and passengers at sea, cruise tourism and finally non-commercial activities with an influence on the marine environment. In 2009 the Artic Council released the *Arctic Marine Shipping Assessment* (AMSA), which among other things summarized the environmental impacts of shipping. As a result of the climate change impact with longer periods of open waters during the summer it is likely that an increase in shipping will occur. The types of effects on the marine environment are pollution from discharges and emissions and disturbance from ships and shipping activity.
At the same time introduction of alien invasive species can be a problem that could lead to loss of native biodiversity (PAME, 2009). In Greenland environmental impacts on biodiversity have not yet been documented in large scale, studies have, however, been carried out to predict some of the effects.

Photo: Carsten Egevang/ARC-PIC.com

Impacts of the changes in biodiversity for ecosystem service and the socio-economic and cultural implications

As reflected in the section about seabirds and marine mammals some of the Greenlandic species did show a decline during the last decades among other factors due to unsustainable hunting, which has been explained as one of the major threats. However, during the past years efforts have been made to secure sustainable hunting by following the scientific biological recommendation on the game species with a successful response in some populations. The harvest of many marine mammal species is regulated in executive orders and follows biological advice on sustainable harvest. There is furthermore, a need to constantly monitor harvests of non-regulated species to assess whether management is needed.

The impact of climate change

Fisheries are, as mentioned above, of paramount importance to employment and export in Greenland. On a national level, more than one fifth of the workforce is employed in fisheries and related industries. The report "Opportunities for Climate Adaptation in the Fishing and Hunting Profession" from 2012 summarises some of those areas in which a changing climate is expected to impact fisheries in Greenland.

Climate change is likely to affect shrimp fisheries and to lead to a decline in the total amount of shrimp in Greenland waters. This is in part because of an increase in sea temperatures and in part because those same temperature increases are expected to boost the occurrence of cod, which feed on shrimp. Hence, a main concern, not just for fisheries, but for the Greenlandic national economy in general, is how climate change will affect the relationship between shrimp and cod in the future.

The anticipated effects of climate change vary significantly depending on the species of shellfish or fish. While cod populations and other species of fish are expected to grow as a consequence of increasing sea temperatures, the occurrence of currently present shrimp, krill and other smaller crustaceans will be negatively affected by the expected sea temperature rise of 1-4° C. The relative occurrence of different species is interdependent and consequently small variations in sea temperatures will cause great change in fish and shellfish populations.

The report from 2012 lists a number of possibilities for the future development of fisheries in Greenland. It is mentioned that a transformation of the industry might be necessary in response to the expected effects of climate change. Possible changes are characterised by significant uncertainty. Hence, the report highlights the need to make fisheries more resilient to the changes that an altered climate may present. Here, ability to adapt will be of the utmost importance. Special attention has been placed on expanding the information available for fishermen and fishery managers with regard to the climatic conditions and processes that affect the ecosystems in the Greenlandic waters. This will facilitate flexible and continuous adaptation to fluctuations in species' populations and ensure a sustainable harvest in the future.

Hunting plays an important role in Greenlandic society. The input to the formal economy from hunting has decreased over the years, but nevertheless remains a valuable contribution to the economy of many households. The hunted species, many of which are already regulated by quotas, are affected more by management decisions than by climate change, even though the prevalence and distribution of these populations are expected to change as a consequence of climate change. Caribou is of special significance to many hunters and is considered likely to be affected by changes in temperature and precipitation. In the same manner, the polar bear is affected by a changing climate. The retreating sea ice can limit its opportunities for finding food, and a decreasing population has already resulted in significantly reduced hunting quotas. For seals, whose life cycle is closely related to the sea ice, the retreat of sea ice may result in a decline of the population, which necessitate further hunting regulations and restrictions. Some species of whale, such as fin whale and humpback whale, stay in the Arctic until the sea ice forms. These species are expected to prolong their stay in the region and move towards more northern areas as the extent of sea ice is reduced. Changes in the occurrence of prey species resulting from increasing sea temperatures are anticipated to have an impact on all top – predators, including fish, marine mammals and seabirds. For most species, predictions of future changes in populations are bound by significant uncertainty and are furthermore dependent on how management is executed and enforced.

Finally, a changing climate and thinner sea ice coverage can increase isolation of some settlements, as the sea ice traditionally has constituted the main route of connection to larger populated areas.

In the climate adaptation report from 2012, it is noted that this can lead to increasing depopulation of villages and settlements – a trend that is already recognised, but which is affected by many other factors than just a changing climate (Grønlands Selvstyre, 2012).

Altogether, climate change combined with a multiplicity of other variables, is expected to have considerable impact on future conditions and prospects for the hunting profession in Greenland. Hunting as a primary occupation will most likely decrease even further, while conditions for leisure hunters will change. The report on climate adaptation points to the importance of initiating adaptation initiatives aimed at supporting the capacity of professional hunters, enhancing their resilience and preparing them for a future characterised by unpredictability and change.

Part II.

NBSAP (its implementation and mainstreaming of biodiversity)

The National biodiversity strategy and action plan (NBSAP), its implementation, and the mainstreaming of biodiversity

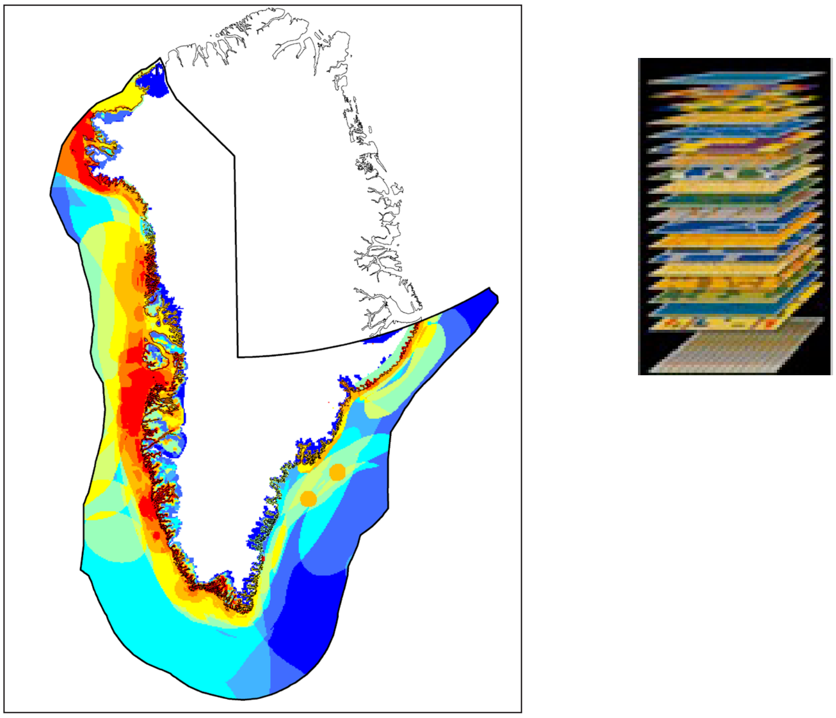
Biodiversity targets, status on NBSAP and actions taken to implement the convention

In line with the Biodiversity Convention, Greenland pays attention to different actions to secure the implementation of the Convention. As reflected in the fourth National Report, Greenland in 2003 adopted the Nature Protection Act (Greenland Home Rule Government Act no 29 of 18 December 2003 on Protection of Nature). The Act implements a number of obligations that is derived from the Biodiversity Convention.

The overall objective of the law is to conserve biological diversity, including genes, habitats, species and ecosystems and to ensure sustainable exploitation of natural resources. The main objective is to support the Government of Greenland in its implementation of the Biodiversity Convention and other closely related international agreements and to conserve the biodiversity in Greenland. The act is furthermore the framework for the development of executive orders to protected species and ecosystems – among others executive orders on specific protected areas.

In the fourth National report Greenland reported that a Strategy and Action plan for biodiversity in Greenland would be adopted in 2009. A working document has been the framework for the actions and priorities with the aim of facilitating the implementation of the Biodiversity Convention and other closely related international conventions and agreements.

Figure 11. From Christensen et al. in prep. mage on right illustrates the process analysing the app. 60 layers of important areas for species, nature types, groups of species and more (see text for more information). The map (left) shows the result of the analysis. Red colours symbolise that many species or themes are repesented with important areas (breeding, moulting, feeding grounds, hotspots etc), whereas blue indicate that only few species are represented.



However, even though Greenland has not adopted a specific NBSAP, a range of activities has been carried out both nationally and in regional fora since the last reporting with close links to targets and goals in a NBSAP and the national implementation.

Greenland has initiated a national project analysing existing biodiversity hotspots with financial support from DANCEA (The programme of Danish Cooperation for Environment in the Arctic). The project is divided into two phases. First phase is to compile a report (Christensen et al. in prep) that identifies biodiversity hotspots based on available species and ecosystem data.

The marine part of the analysis is based on the assessments (SEIAs – see above) related to oil exploration and ongoing work within the Arctic Council (and related IUCN processes) with focus on Ecological and Biologically Significant Areas. Included in this study is a thorough analysis of the distribution of species (including redlisted species), nature types, and areas with high biological diversity. The study coveres where and when these species are concentrated in specific areas and/or can be sensitive to human impact. Each of the identified areas is maped in GIS. The study also includes a ranking of the different layers, based on internationally accepted criterias (such as the EBSA criteria, KBA criteria, Ramsar Criteria, areas with redlisted species etc.) and nationally formulated criteria (such as importance of ecosystem services etc.). Based on this, an analysis of the different layers has been made (overlay analysis) to reveal where in Greenland biological hotspots are found (Fig. 11).

The report will be published in 2014 and will be a platform for an administrative and political process to develop a *strategy for protected areas* as well as national legislation for specific areas. Included in the strategy is a framework for management planning and monitoring plans for protected areas. The strategy will be developed in 2014 and 2015 and will be implemented thereafter. The report will also be the framework for national conservation priorities.

It is of critical importance to recognise the biodiversity challenges and to respond to these challenges in cooperation and Greenland is dealing with biodiversity on both national level and on a regional and global level.

On regional level, Greenland represents the Kingdom of Denmark in the CAFF (Conservation of Arctic Flora and Fauna) working group of the Arctic Council. As already mentioned CAFF released the Arctic Biodiversity Assessment (ABA) in 2013. The future work continuing the ABA will be linked closely to the Aichi Biodiversity Targets. CAFF has signed a Memorandum of Cooperation with CBD and functions as the CBD arctic biodiversity group. This role ensures that information on arctic biodiversity is fed into all relevant CBD processes e.g. the Aichi Targets. The ABA implementation plan will be completed in 2014 and is focused on impacting ground actions with Greenland playing a key role in developing this plan.

Greenland/Denmark from 2013 has become the co-chair (together with the US) of the Circumpolar Biodiversity monitoring programme[4] (CBMP/ www.cbmp.is). The programme was launched in 2006 and is the cornerstone biodiversity monitoring programme of the Arctic Council.

4 The CBMP is an international network of scientists, governments, indigenous organizations and conservation groups working to harmonize and integrate efforts to monitor the Arctic's living resources (www.CBMP.is).

Since the last CBD reporting the CBMP programme has begun implementation of marine, terrestrial and freshwater biodiversity monitoring plans. Community-based monitoring tools are integrated in the plans. In 2013 a CBMP four-year strategy plan (2013-2017) has been approved with focus on implementing the developed strategies for building and maintaining a comprehensive and cost-effective pan-Arctic monitoring program. Efforts are made to establish and maintain steering groups and to develop the monitoring plans and coordinated monitoring across the Arctic. In 2015-2017 the first *State of Arctic Biodiversity* reports will be produced and the ABA will be used as the baseline.

Greenland finds it of great importance to link this work to the CBD targets and the CBMP strategy plan has a close link to the CBD 2020 targets and the Millennium Development Goals.

The major obstacles to the implementation of the Convention are lack of resources and manpower. This is of major concern in relation to the implementation of international agreements, development and implementation of comprehensive monitoring programmes for protected areas and resources etc.

Denmark has since 1994 provided environmental support to the Arctic including funding for initatives to initiate and secure implementation of conventions and international agreements. The scheme is called DANCEA (Danish Cooperation for Environment in the Arctic) and it helps ensure that the commonwealth meets its obligations in the Arctic Council and other relevant international fora. Part of the aid is implemented in close cooperation with the Government of Greenland. One of the focus areas is biodiversity and sustainable use of living resources. In addition, a smaller portion of the funds ensures the indigenous Arctic people's participation in environmental cooperation - including funding for the Indigenous Peoples' Secretariat (IPS), activities related to regional cooperation on the protection of the Arctic environment and horizontal dissemination efforts. On the other hand, governmetn savings have reduced the amount of funding available for research in Greenland, as shown by the closing of KVUG stipends in 2012 and the uncertain future of the Greenland Climate Research Centre.

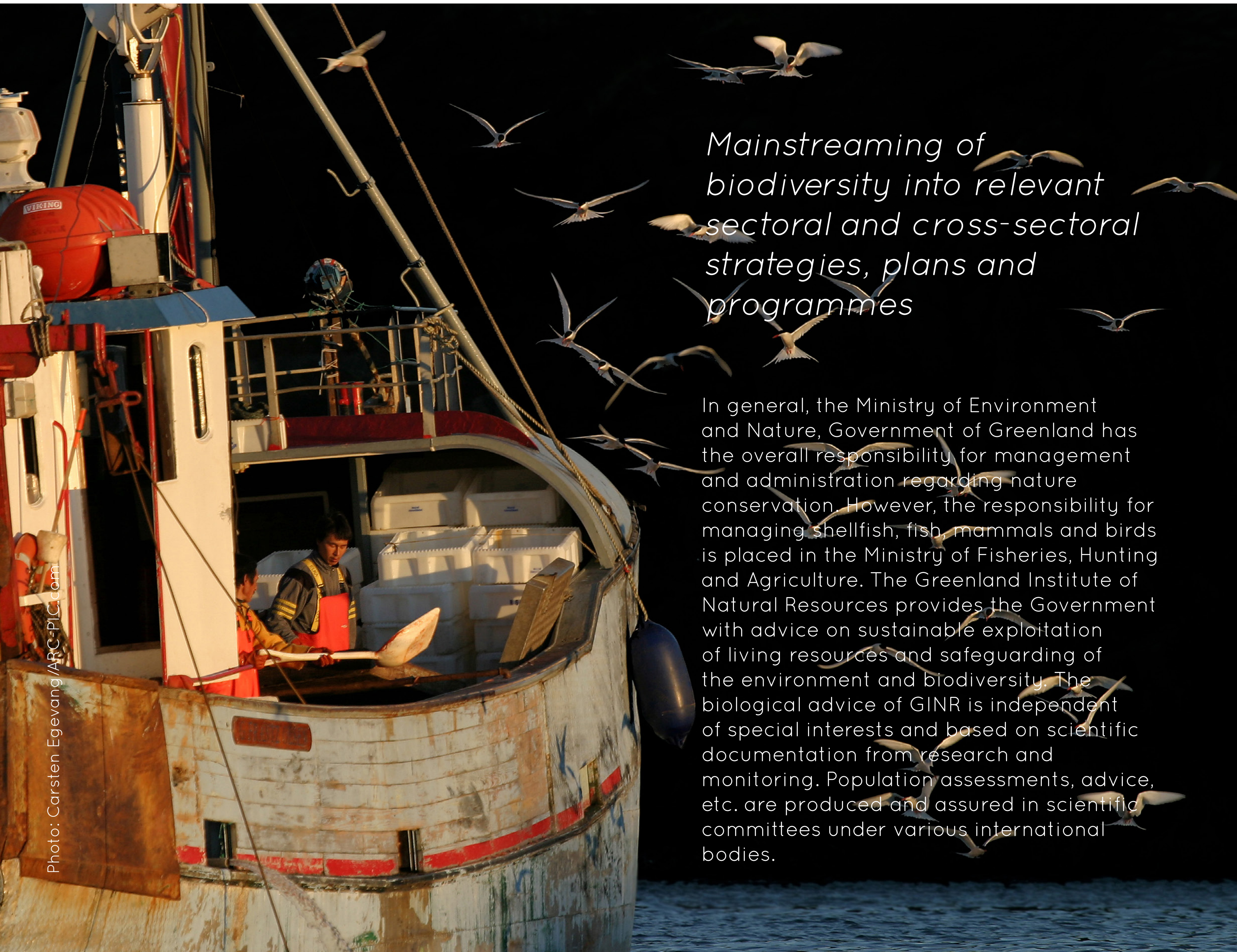


Photo: Carsten Egevang/ARC-PIC.com

Mainstreaming of biodiversity into relevant sectoral and cross-sectoral strategies, plans and programmes

In general, the Ministry of Environment and Nature, Government of Greenland has the overall responsibility for management and administration regarding nature conservation. However, the responsibility for managing shellfish, fish, mammals and birds is placed in the Ministry of Fisheries, Hunting and Agriculture. The Greenland Institute of Natural Resources provides the Government with advice on sustainable exploitation of living resources and safeguarding of the environment and biodiversity. The biological advice of GINR is independent of special interests and based on scientific documentation from research and monitoring. Population assessments, advice, etc. are produced and assured in scientific committees under various international bodies.

Tools used to mainstream biodiversity - EIA/ SEA, Ecosystem Approach, spatial planning, etc.

The *Nature Protection Act - Greenland Home Rule Government Act No. 29* of 18 December 2003 on Protection of Nature contains a framework for Environmental Impact Assessments. The framework leaves wide opportunities for demanding the preparation of an EIA that match the scale of an anticipated project. In 2013, a new executive order on EIA was passed through. The executive order complies with international EIA standarts and applies to anyone planning to carry out large building and construction works or to establish business which may significantly change the character of the landscape or of fjord or sea areas or which may significantly affect nature, including the wild fauna and flora. The holder of the project must carry out an assessment of the impacts on the environment before the initiation of the project. The assessment shall describe the plans for the project and any implications that the project is believed to have on the areas of the fjords and the sea and on nature. If projects are assumed to cause substantial damage to the landscape or nature, the Government may decide that the project cannot be carried out. In connection with oil and mineral exploration EIAs must be carried out according to the EIA guidelines issued by the Bureau of Mineral and Petroleum.

On January 1st 2013, the Environment Agency for Mineral Resources Activities (EAMRA) was established under the Ministry of Environment and Nature, as the field of responsibility, previously under The Bureau of Minerals and Petroleum (BMP) was divided between the Ministry of Industry, BMP and EAMRA.

EAMRA is the authority in Greenland concerning assessments and considerations of all environmental aspects related to oil and mineral activities. EAMRA has a close cooperation with the affiliated scientific advisors, Danish Centre for Environment and Energy (DCE) and Greenland Institute of Natural Resources (GINR).

In connection with new licensing rounds and the opening of frontier areas with technologically challenging conditions DCE and GINR the carries out Strategic Environmental Impact Assessments (SEIA) on behalf of the EAMRA. A SEIA provides an overview of the environment in the potential license area and adjacent areas, which may be impacted by the hydrocarbon activities, and identifies major potential effects associated with future offshore hydrocarbon activities. Furthermore the SEIA identifies gaps in knowledge and data, highlights issues of concern, provides recommendations for mitigation and planning and identifies general restrictive or mitigation measures, as well as monitoring requirements that must be dealt with by the companies applying for hydrocarbon licenses.

An Environment Impact Assessment (EIA) is carried out for all extractive activities on mineral resources. The EIA for mineral resources activities must include the full lifecycle of activities: the exploration/exploitation area prior to exploration/ exploitation (baseline studies), the phase of exploration, field development, production, transport, decommissioning and post activity environmental monitoring. The EIA must be updated and further developed when needed, e.g. if there is a change in the plans presented in the EIA. The mineral resources authorities have developed guidelines for preparing EIAs for hydrocarbon activities, as well as for preparing EIA's for mining activities. In developing these guidelines, information on the requirements to EIAs related to hydrocarbon and mineral exploration, development, production, decommissioning and transport in other Arctic countries has been studied. The guidelines are based on Inter Alia the Arctic Offshore Oil & Gas Guidelines issued by the Arctic Council, and on the OSPAR Guidelines for Monitoring the Environmental Impacts of Offshore Oil and Gas Activities.

It is an important part of the protection of nature and environment that hydrocarbon and mining companies through the EIA process and public consultations demonstrate how their project can affect the natural biodiversity, together with suggestions of mitigation measures

Wildlife management today focuses on harvest management of individual species (the exception being shrimp and cod, where ecological interactions between the two species are considered in the models used for fisheries advice). This, however, does involve some aspects of ecosystems-based management through cross-sectoral involvement of relevant authorities and stakeholder consultation. Obtaining biological knowledge in the Arctic is generally difficult, expensive and dependent on long-term monitoring activities since many species are distributed over vast areas. In addition, extreme weather conditions, remote locations and expensive logistics and transportation may limit the biological knowledge about particular populations. Thus, lack of data leads to biological advice hat often creates controversy between the scientific community and the fishermen and hunters. Fishermen and hunters have accumulated traditional ecological knowledge for decades and therefore often find it difficult to understand and accept the notion of lack of data. Many efforts are made to ensure a sustainable utilisation of the fish and marine mammals and consequently, Greenland is involved in several institutional bodies and organizations delivering biological advice on the management of these species.

International Cooperation

As reflected in the fourth report, Greenland is represented in a number of international forums that deal with biodiversity and management of species:

International Council for Exploration of the Sea (ICES): Greenland, and other countries with surveys in the Atlantic, are members of several expert groups (e.g. NWWG, WGNEACS) that provide the scientific basis for advice to policy makers for several commercially exploited species including cod, Greenland halibut (east coast), redfish and capelin.

Northwest Atlantic Fisheries Organization (NAFO): The objective of NAFO is to provide advice that ensures optimum utilization, rational management and conservation of fishery resources. Greenland participates in yearly scientific meetings and provides advice for species such as shrimp and Greenland halibut in west Greenland.

North Atlantic Salmon Conservation Organization (NASCO): The objective of NASCO is to conserve, restore, enhance and manage Atlantic salmon through international cooperation taking account of the best available scientific information. Greenland participates in yearly meetings, and is a key player, as much of the North Atlantic salmon stock use Greenland waters as feeding grounds.

The International Whaling Commission (IWC): Greenland, together with the Faroe Islands, is represented in IWC via the Kingdom of Denmark. The aim of the IWC is to provide for the proper conservation of whale stocks by ensuring sustainable harvest levels and thus make possible the orderly development of the whaling industry. Scientific advice is provided by a scientific committee under the IWC

The North Atlantic Marine Mammal Commission (NAMMCO): Greenland, together with Norway, Iceland and the Faroe Islands, is a member of NAMMCO. NAMMCO works for regional protection, rational management and research on marine mammals in the North Atlantic. Scientific advice is provided by a scientific committee under NAMMCO, which in turn has established several working groups. Canada is not a member of NAMMCO, but NAMMCOs scientific committee has a joint working group working group with JCNB (see below) for scientific advice regarding narwhal and beluga.

The Joint Committee for Narwhal and Beluga between Canada and Greenland (JCNB): The JCNB provides biological and management advice for populations of narwhal (*Monodon monoceros*) and beluga whale (*Delphinapterus leucas*) shared between Greenland and Canada. Scientific advice is provided by a joint working group with experts from the NAMMCO scientific committee.

The Conservation of Arctic Flora and Fauna (CAFF): CAFF is one of the six permanent working groups within the Arctic Council. The aim of the working group is to address the conservation of Arctic biodiversity and to promote practices which ensure the sustainability of the Arctic's living resources. Greenland chaired CAFF from 2006 – 2009 and act as the Head of Delegation for the Kingdom of Denmark in the working group. Important long-term initiatives under CAFF are

Greenland finds it of great importance to link work arising from the Conservation of Arctic Flora and Fauna's Circumpolar Biodiversity Monitoring Program (CBMP) to the CBD targets . The CBMP strategic plan has a close link to the CBD 2020 targets and the Millennium Development Goals.

the Cbird group, where status, trends and advice for seabirds at a circumpolar level is discussed, and the Circumpolar Biodiversity Monitoring Program, which aims at coordinating monitoring among arctic nations.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): CITES was laid out by the Washington Convention in 1977, and Greenland participates in CITES. The CITES administration is managed by the Ministry of Environment and Nature of the Government of Greenland , and there is cooperation with the Nature Agency in Denmark. The CITES scientific authority of Greenland is the Greenland Institute of Natural Resources.

The International Union for Conservation of Nature (IUCN): Greenland participates in the IUCN. The International Union for the Conservation of Nature and Natural Resources harbours a number of specialist groups under its Species Survival Commission. One of those is the Polar Bear Specialist Group (PBSG), who meets every 3-4 years to evaluate the status of polar bear sub-populations. The PBSG has recently become the advisory organ of the Meeting of the Parties to the 1973 Agreement on the Conservation of Polar Bears (see below)

The Meeting of the Parties: Also known as Polar Bear Range States, the Meeting of the Parties to the 1973 Agreement on the Conservation of Polar Bears became active in 2007, after a long period of inactivity. Delegates from USA, Canada, Russia, Norway and Greenland are currently working on an action plan for management and conservation of polar bears across the Arctic.

JCPB: The Canada/Greenland Joint Commission on Polar Bears originated from a memorandum of understanding between the governments of Greenland, Nunavut and Canada. It has the mandate of advising the governments of Nunavut and Greenland for the sustainable harvest of the sub-populations of polar bears in Kane Basin and Baffin Bay. It receives biological advice from a scientific working group.

The Ramsar Convention: In line with the Convention, Greenland has in the recent years taken different actions to secure the implementation of the Convention. Several projects related to public awareness, education and ecotourism have been initiated and carried out. Among others, a Ramsar local implementation project in 2005 has been carried out, with financial support from the Danish Ministry of Environment, as a part of the Danish environmental support program cooperation for environment in the Arctic (DANCEA). The project focused on local implementation of the Ramsar Convention and the sustainable use of Ramsar sites in regard to eco-tourism, training, education and local involvement. Special attention was paid to the Ramsarsite 'Kitsissunnguit' where information material, ect. has been developed. Involvement of the local community was a key element in the project. As a follow-up to this work, financial resources have been allocated to ensure further implementation of the Ramsar Convention.

Greenland also takes an active part in the Ramsar Regional Initative NorBalWet and acted as the chair in 2013-2014.

Part III.

Progress towards the 2020 Aichi Biodiversity Targets and contributions to the relevant 2015 targets of the Millennium Development Goals

As already mentioned, a variety of initiatives have been carried out/are still on the way to secure the implementation of the Strategy plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets.

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Appendices I and II

Contact information and a brief introduction about the process of preparation of the report as well as further sources of information.

The Ministry of Environment and Nature, Government of Greenland have prepared The Fifth National report with input from the Institute of Natural Resources in Greenland and the Danish University of Aarhus. The report is part of the Kingdom of Denmark reporting that consists of the National report from Denmark and the National report from Greenland.

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