

Polar bears in Baffin Bay are affected by climate changes

(Article based on the summary of the report "A reassessment of the polar bears in Baffin Bay and Kane Basin " (2011-2014).

Scientists have now proved that the polar bear population in Baffin Bay in West Greenland is affected by the climate changes. On the other hand, the polar bear population further north in Kane Basin is thriving.

These results appear in the latest report regarding studies of Greenland and Canada's joint polar bear populations in Baffin Bay (West Greenland) and in Kane Basin (at Qaanaaq), which the Greenland Institute of Natural Resources in collaboration with research scientists from Canada/Nunavut, Norway, USA, polar bear hunters and local populations in Greenland and Canada performed in the years 2011-2014.

The report describes one of the most extensive studies of marine mammals that the Greenland Institute of Natural Resources have been involved in to date. The studies were performed on the basis of a wish from the *Canada-Greenland Joint Commission on Polar Bear* for new information on the situation of the polar bear populations in Baffin Bay and Kane Basin.

There are 20 years between the two big studies of the polar bear populations in Baffin Bay and Kane Basin. The first study was performed in the middle of the 1990s.

The Commission's Scientific Working Group submitted the report of the extensive study in July 2016. First, the Commission had to relate to the content of the report, and since then the report has been subject to a long translation process to Greenlandic. Not until 9 February this year did the Commission make the report public.



Photo1: Polar bear scientists; Kristin Laidre (right) and Erik Born (left) from the Greenland Institute of Natural Resources, and Øystein Wiig from Norway's Natural History Museum (in the middle).
Photo: Fernando Ugarte.

Baffin Bay polar bear population affected the most

The data show that polar bears in Baffin Bay now live under difficult conditions. Since 1979 their most important habitat – the sea ice – has declined and, especially the years after the 1990s, changed significantly. The open water season has extended with 12 days per 10 years, and the concentration of sea ice has decreased in the period June-October. The sea ice has started to break up in the spring three-four weeks earlier than in the 1990s.

The range of the polar bears in Baffin Bay has contracted with circa one third. In the months of March in the 1990s, the population had an approx. 853,000-km² area of sea ice at their disposal, which today has contracted to approx. 581,000 km². Moreover, during the summer in Baffin Bay, there is generally no longer any sea ice from which the polar bears can hunt.

However, the melting sea ice in the southern part of Baffin Bay also means that the polar bear population has moved further north and has become more isolated, since the polar bears no longer are so inclined to cross the surrounding populations borders.

In the beginning of the millennium, the migration speed of adult females fell significantly during the summer months, after the ice in Baffin Bay started to disappear completely in the summer. The polar bears simply no longer have the possibility of moving between sea ice and land in the summer as they did in the 1990s. Both in winter and spring the polar bears are now in areas with notably lower concentration of sea ice and have become more inclined to stay along the shores.

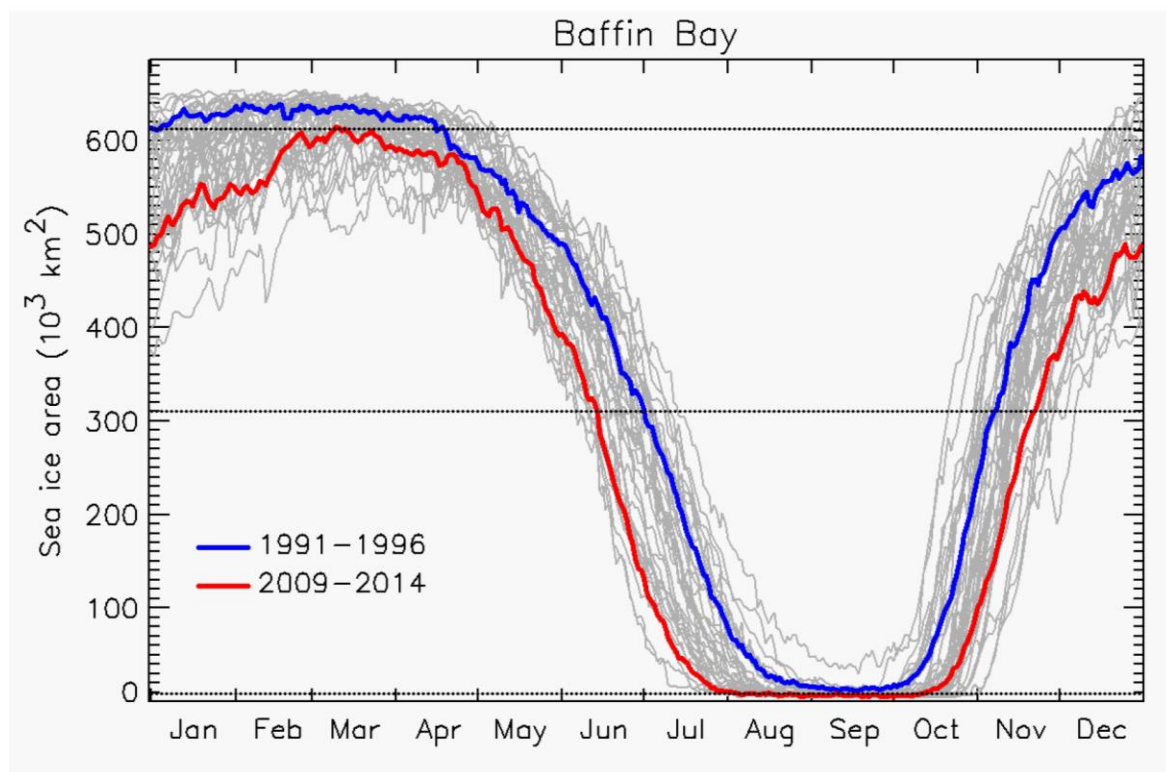


Figure 1: The annual cycle of the sea ice in Baffin Bay over the years 1979-2014 (grey curves) shown in 1000 x km² sea ice distribution. Average curves for the periods 1991-1996 (blue) and 2009-2014 (red) show that the shrinking sea ice in Baffin Bay breaks up earlier and settles later. The horizontal line in the middle indicates the date of the definition of spring break-up and autumn sea ice.

Polar bears must swim further than before

The early break-up of the sea ice in the spring also means that more polar bears have started to swim very far – often up to 100 km – to reach the coasts of Baffin Island (Canada). They arrive at the shore approx. one month earlier and stay longer than they did in the 1990s.

Some of the Baffin Bay polar bears spend the summer in Melville Bay – a long, uninhabited stretch of coast between Upernavik and Qaanaaq in North-West Greenland – and some choose to stay all year. In contrast to the 1990s, it therefore appears that the polar bears to a greater extent stay in the Melville Bay nature reserve.

Also the gestating females go ashore earlier and in average hibernate one month later than was the case in the 1990s. However, there is no difference in the time they leave their breeding hibernation dens in March with a new litter of cubs. Potential consequences of the females' shorter stay in hibernation are unknown.

The warmer climate has also affected the location of the dens, which in comparison with the 1990s now are situated higher up the fell, which probably is due to less and less snow cover.

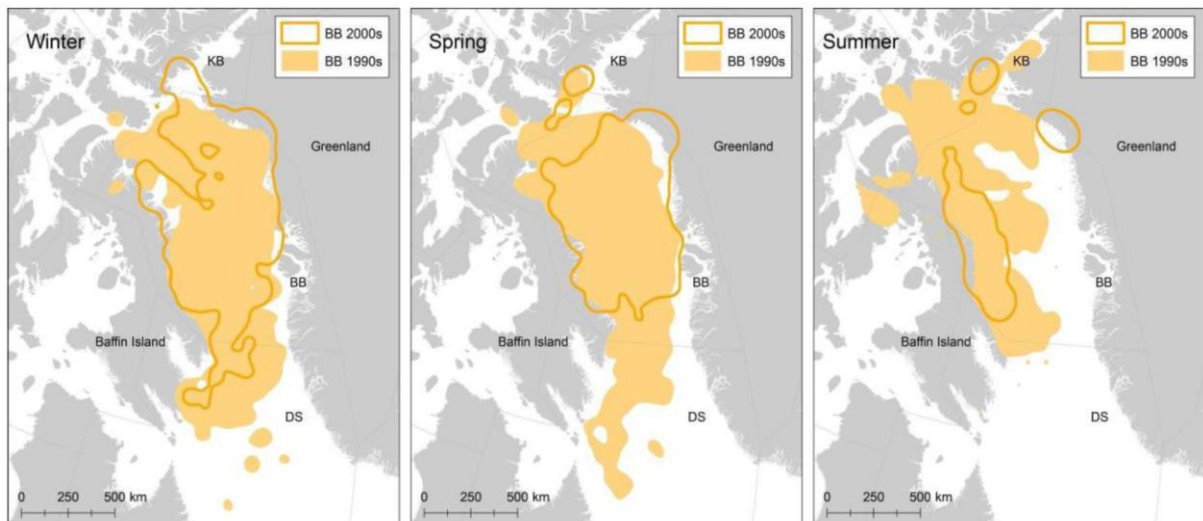


Figure 2: The distribution of the Baffin Bay polar bears through three seasons (winter, spring and summer/autumn = open water season) in the 1990s (orange area) and the 2000s (orange line) based on bears tracked with satellite transmitters. It is clear that the population is less distributed due to the declination in sea ice.



Photo 2: In the 1990s the polar bear dens were situated at an altitude of approx. 350 meters, while they now in average are situated at approx. 700 meters – and even up to 1300 meters. Furthermore, the females show an increased tendency to make dens on steeper slopes than in the 1990s. Photo: Øystein Wiig

The polar bears are thinner than previously

The scientists also found signs of a decline in the Baffin Bay polar bears body condition/feeding status. This means that the polar bears have become thinner because they have less time for hunting seals on the sea ice.

A comparison with the data from the 1990s and the recent studies in 2011-2014 shows that there is also a correlation between the polar bears' production of cubs and the sea ice conditions. Between 1993 and 2011 the increase of new cubs in the Baffin Bay population dropped concurrently with an earlier break-up of sea ice in the spring.

However, the scientists assess that the Baffin Bay population, despite signs of decline in both feeding status and production of new cubs, will get cubs enough to sustain a viable population.



Photo 3: A polar bear on a fell side in Innaanganeq/Kap York. Photo: Kristin Laidre.

Has the number of Baffin Bay polar bears increased?

The result of the count of the polar bear population shows that there in 2012-2013 were approx. 2,800 polar bears in Baffin Bay. For different reasons there is always some uncertainty attached to counting big and largely widespread animal population, but we can say that there with 95 % certainty exist between 2,100 and 3,600 polar bears in Baffin Bay.

Because of different circumstances it is difficult to compare the estimated population sizes from the two studies made in the middle of the 1990s and after 2011. It is therefore not possible to draw a clear conclusion regarding the development of the Baffin Bay population. Both studies exploited the fact that the polar bears in Baffin Bay must stay on land during the open water season. The counts were therefore performed by marking and recapturing as many polar bears as possible through a period of several years, while they were concentrated at land. And since the majority of the Baffin Bay population stays on land in Baffin Island, the main effort was put there.

The scientists, disposing of only one helicopter for the counts in 1990, disposed of as many as three helicopters for the counts made between 2011-2014. In the 1990s there was still some sea ice left in Baffin Bay, while the counts were performed on land. An unknown number of polar bears have therefore stayed far out among the drift ice, where it was dangerous to look for them, but now the area is ice-free during the summer, so all the polar bears are forced to stay on land and in the fjords in the study area. A new analysis of data from the 1990s also showed that the studies back then did not cover the inner parts of the fjords at Baffin Island, where adult female bears have a tendency to stay during the summer.

Despite some uncertainty about the development of the Baffin Bay population since the 1990s, there are many conditions that suggest that the population is undergoing changes and is under pressure due to the decline in sea ice. If the sea ice continues to shrink, which all projections show,

a decrease in the Baffin Bay population is to be expected. This will demand more attention to surveying and managing the population.



Photo 4: In Kane Basin in the spring a Canadian Bell-206 Long Ranger helicopter was used for operations along Baffin Island, while two of the same type were used in the autumn. During subsequent autumn counts an Air Greenland AS350 Ecureuill helicopter was used. Photo: Peter Hegelund.

The Kane Basin polar bears are doing better than the Baffin Bay polar bears

In comparison with the Baffin Bay polar bear population, the Kane Basin population lives in a much smaller area in the northernmost West Greenland. The population is distributed in the Qaanaaq area and in Kane Basin between Ellesmere Island in Canada and Humboldt Glacier in North-West Greenland; an area of approx. 150,000 km².

The polar bear population in Kane Basin is therefore much smaller than the Baffin Bay population. The most recent marking-recapture studies from 2012-2014 resulted in a population size estimated to be approx. 357 polar bears with an uncertainty ranging between 221-493 animals. Thus the population appears to have increased since the 1990s where it was estimated to be approx. 200 polar bears.

The sea ice in Kane Basin has also changed. Previously, there was sea ice practically most of the year, whereas now, in Baffin Bay, it is starting to be ice-free during the summer. The open water period has increased with 12 days per 10 years since 1979. This means that the time of year where there is less than 50 % sea ice has increased with almost two months since 1970. The changed

conditions in the sea ice have made the polar bears change their movement patterns and choice of habitat. As a result of the fact that the drift ice in Kane Basin has become more movable, the polar bear population in Kane Basin is now distributed to a *greater* total extent, in contrast to the polar bears in Baffin Bay.

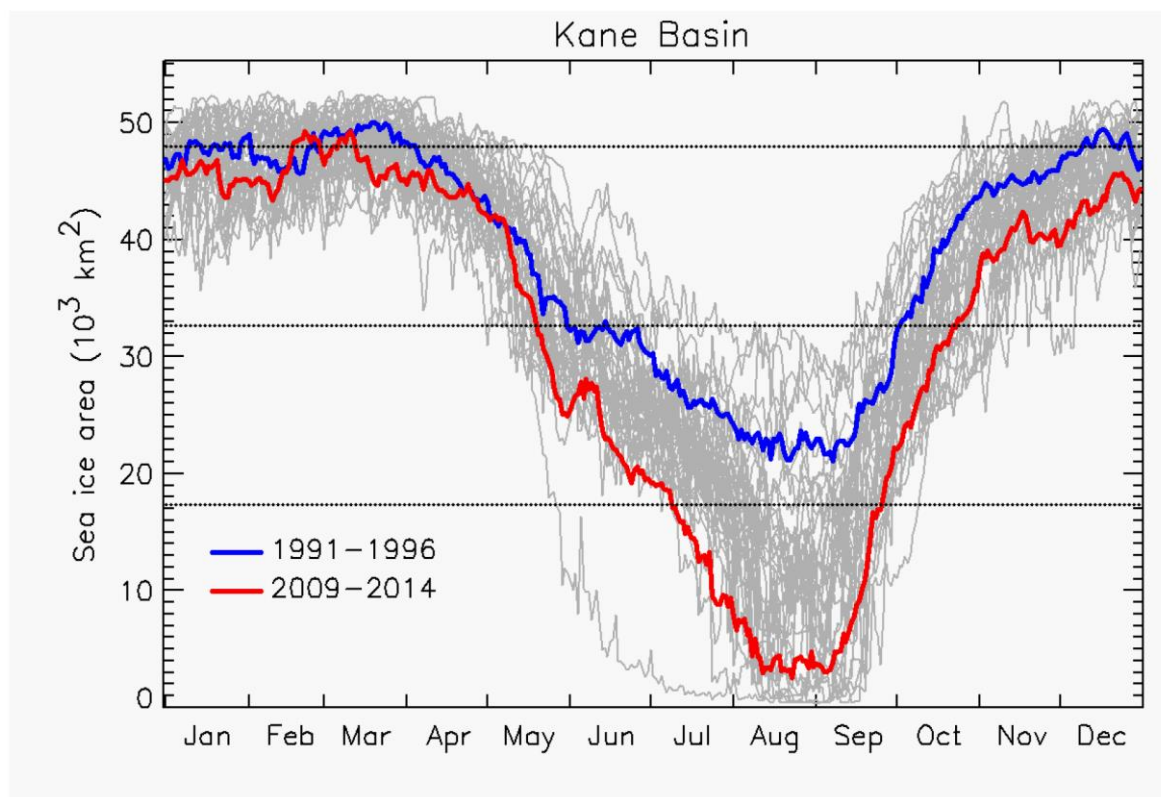


Figure 3: The annual cycle of the sea ice in Kane Basin through the years 1979-2014 (grey curves) shown in 1000 x km² sea ice distribution. Average curves for the periods 1991-1996 (blue) and 2009-2014 (red) are also shown. The figure shows an almost ice-free in Kane Basin. The horizontal line in the middle indicates the date of spring break-up and autumn sea ice.

Kane Basin polar bears have increased

The scientists assess that several conditions have contributed to the fact that the population in Kane Basin has increased since the 1990s. During the spring counts in 2012-2014 there were observed more polar bears in the eastern, i.e. Greenlandic, parts of Kane Basin off Humboldt Glacier. It appears that a reduced pressure from hunting in the eastern parts of the sea has provided a condition for the population to grow. It is probably due to the enforcement of quotas on the Greenlandic catch in 2006 but also the past several years of changed and difficult conditions making it problematic for the Greenlandic hunters to reach all the way up to the polar bears at Humboldt Glacier.

Observations did not show changes in Kane Basin females' den stays between the 1990s and 2000s, nevertheless, data were scarce.

The feeding status of young polar bears and adult females with 1-year-old cubs has improved compared to the 1990s. The improved body condition of the polar bears may be a result of the fact that they stay out on the sea ice longer time than the Baffin Bay polar bears. The scientists are

wondering whether easy ice conditions in Kane Basin has contributed to an increased production in the sea to the benefit of seals and polar bears. During the counts there were observed relatively many seals and polar bears in the north-eastern parts of Kane Basin – off Humboldt Glacier, which indicates good living conditions for the polar bears in the area.

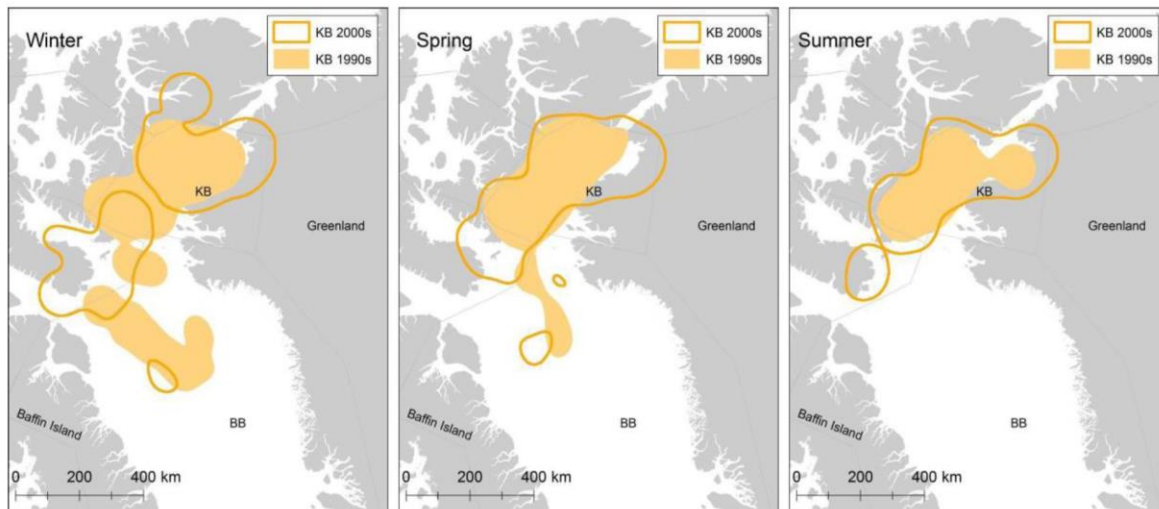


Figure 4: The distribution of the Kane Basin polar bear population in the 1990s (orange area) and the 2000s (orange line). The distribution shown in three seasons (winter, spring and summer/autumn = open water season) is based on bears tracked with satellite transmitters.

New advice on polar bears is on its way

After counts and new numbers for the Baffin Bay and Kane Basin populations, this summer (2017) the Scientific Working Group of the Commission submits a new advice on future sustainable catch of polar bears in Baffin Bay and Kane Basin. This time the Working Group will consider the climate changes and the decrease of the sea ice. The Scientific Working Group is implementing a new model of calculation, which will make possible the calculation of catch in situations where the polar bear population is under pressure from climate changes.

The report on population studies of polar bears can be downloaded on:

<http://www.natur.gl/biologisk-raadgivning/havpattedyr/>

Fact box 1: Innovative research

Counts of polar bears between 2011-2014 were performed using a method – genetic marking-recapture – which involves that the scientists shoot with small darts at as many as possible free-roaming and non-sedated polar bears. The darts take very small tissue samples (biopsies) of the polar bear without disturbing it further.

The tissue samples are used for determining every individual's identity from its genetic profile. Never before has genetic marking-recapture been utilised in so large areas nor for polar bears other places at the beginning of the study. The advantage of this method is that it is much less time consuming than the so-called – physical marking – where the biologists first must sedate the polar bear before they tattoo and earmark them. Tissue samples from the Greenlandic and Nunavut hunters' polar bear catches were analysed together with the biologists' own tissue samples and directly contributed to the study.

Fact box 2: Information on population size from the 1990s was obsolete

In May 2010 the Scientific Working Group prepared a report on the condition of the Baffin Bay and Kane Basin polar bears based on data from studies performed in the middle of the 1990s. The Scientific Working Group concluded that the collected information on the size and productivity of the population was outdated and therefore unreliable, as the welfare of the polar bears might have changed significantly – not least due to the decrease in sea ice – since the latest studies. Therefore it was the recommendation of the Working Group to procure new information on size, distribution, state of health and production of the population.

Polar bear scientists from Greenland and Canada started an extensive research project. In the years 2011-2014, together with scientists from Canada/Nunavut, Norway and USA – and in collaboration with polar bear hunters and local populations in Greenland and Nunavut – the Greenland Institute of Natural Resources completed an extensive research program to map the condition of the polar bear populations in Baffin Bay and Kane Basin. A significant part of the studies is financed by the Danish Environmental Protection Agency. In July 2016 the Scientific Working Group submitted the more than 600-page long report to the Canada-Greenland Joint Commission on Polar Bear. The 9 February 2017 the report was made public.

Fact box 3: The management of polar bear

In 2010, in acknowledgement of that the joint polar bear populations are hunted and that Canada and Greenland therefore has a joint management responsibility, the two countries founded the Canada-Greenland Joint Commission on Polar Bear to ensure a sustainable management of the polar bear populations in Baffin Bay and Kane Basin.

The Commission was established by the signing of a "Memorandum of Understanding" between the government in Canada, the government in Nunavut and Naalakkersuisut in Greenland in October 2009, where the most important goals concern:

- 1. Management of polar bears inside the management areas in Kane Basin and Baffin Bay to ensure their protection and conservation and a sustainable management in the future.*
- 2. To establish an effective administration system that abides by the principles for protection.*

On the basis of this, the Canada-Greenland Joint Commission on Polar Bear established a Scientific Working Group to provide scientific advice and recommendations on the polar bear populations in Baffin Bay and Kane Basin. The most important task of the working group is to:

- 1. Propose levels for highest allowed catch of polar bears in Baffin Bay and Kane Basin and submit recommendation reports*
- 2. Scientific advice on monitoring/surveillance of the effects of climate changes on polar bear populations and their habitats.*