



# VANISHING KINGDOM

The Melting Realm of the Polar Bear



Photo: Georg Bangjord

The Polar Bear – *Ursus maritimus* – Bear of the Sea. King of the seemingly pristine arctic realm - but subject to the ravages of global warming.

## THE KINGDOM...

Photo: Wim van Passel



The physical environment of the Arctic is harsh. Winters are long, dark, windy and biting cold. Summers are short and often wet, with continuous sunlight day and night. The ground is frozen, and is mostly covered by permanent ice and snow except for a thin layer that thaws in some lowland areas during summer. Few species have adapted to these harsh conditions. But among those few, some have flourished.

This is particularly true for the relatively shallow shelf seas that surround the deep basin of the Arctic Ocean. The Arctic is in fact mostly sea, covered by a thick layer of ice year round. During winter the sea ice expands southward; in the spring and summer it melts and retreats north. This melting, combined with the continuous sunlight, seeds a bloom of algae and phytoplankton along the ice edge. Zooplankton and small crustaceans, such as krill, feed on this bloom. These in turn, serve as food for an abundance of fish, seals, and seabirds.

*Circumpolar distribution of polar bear populations (courtesy IUCN Polar Bear Specialist Group).*



## RULER OF THE ICE

Photo: Georg Bangjord



At the top of the arctic marine food web reigns the polar bear. These largest of the land carnivores are spread throughout the Arctic in 20 relatively distinct populations that vary in size from a few hundred to a few thousand individuals. There are at least 22,000 polar bears in the wild, with about 60 per cent of these occurring in Canada.

The sea ice is where polar bears spend most of their lives. Here they hunt their primary prey: ringed and bearded seals. Bears also prey upon harp seals, as well as young walrus and beluga whale, narwhal, fish, and seabirds and their eggs.

During summer, the sea ice melts in all or part of the range of some polar bear populations. These bears are forced to spend several months on land waiting for freeze-up in the fall. Otherwise, polar bears are usually only on land when moving between feeding areas, when in search of a mate, when resting, or when having cubs.





Photo: Georg Bangjord



Photo: Wim van Passel

Pregnant females dig dens in deep snow-drifts on land in the late fall, while other bears remain active through the winter. Cubs, usually two, are born in the den in November-December. Each weighs around 600 grams and is about the size of a guinea pig. The cubs are nursed until they are large enough to venture out onto the sea ice, usually in March or April.

A polar bear eats most of its food out on the sea ice between late April and mid-July. Plentiful access to food in this period is critical, particularly for pregnant females. When food is unavailable, e.g. when bears are stranded on land during the ice-free season, they fast for long periods. Fasting can last three to four months, and up to eight months for pregnant females in some populations. Fasting for extended periods is demanding and can reduce a bear's body condition dramatically.

Due to its position at the top of the arctic marine food web, the polar bear is an ideal species through which to monitor the effects of human-caused impacts in this ecosystem, for example climate change.

Photo: Wim van Passel



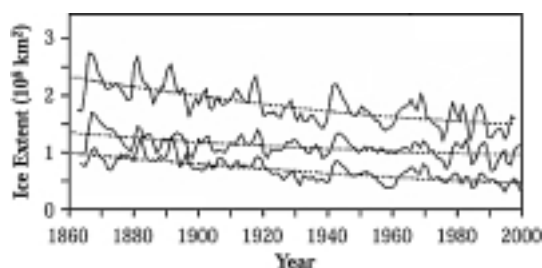
## MELTING REALM...

The Intergovernmental Panel on Climate Change has confirmed that human-induced climate change is a reality. It can no longer be dismissed as a theoretical, academic concept nor a politically motivated doomsday prophecy. The Arctic is one of the regions on earth where climate change will be seen early, and where the impacts are dramatic. Arctic indigenous communities are already noticing some of these changes: warmer winters, early spring breakup, and thinner than usual ice. This traditional knowledge echoes the scientific evidence:

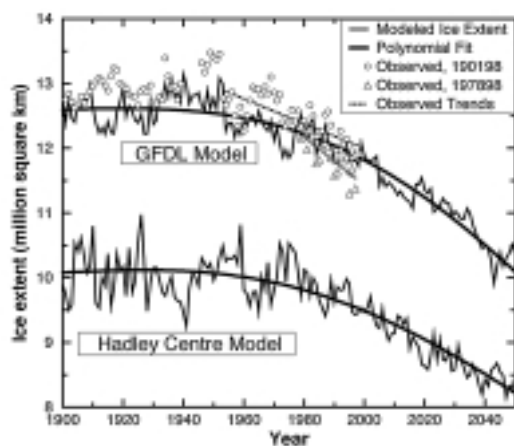
- Air temperatures in the Arctic have on average increased by about 5°C over the last 100 years.
- Arctic sea ice extent decreased by approximately 3 per cent per decade between 1978 and 1996.
- The summer minimum thickness of arctic sea ice has decreased by 40 per cent over the last 30 years.



Photo: Wim van Passel



The time series of April sea ice extent in the Nordic Sea (1864-1998) shows a 33% reduction in sea ice extent for the entire region (top curve) and its eastern (middle) and western (bottom) areas (after Vinje 2001).



Observed and modelled variation of annual averages of arctic sea ice extent. Reprinted with permission from Vinnikov et al 1999. Copyright 1999 American Association for the Advancement of Science.

The results of computer modeling of future climate vary in detail, but all show a clear trend towards an overall warming in the Arctic, and a resulting melting of the sea ice. The models suggest that by 2080, arctic sea ice will completely disappear during the summer months.

These are dramatic and rapid changes in an ecosystem that is defined by being frozen. A slight shift in temperature, bringing averages above freezing, will completely alter the character of this region, from one of ice covering the seas and permafrost stabilizing the ground, to one of open water and large tracts of land simply melted away. The consequences for all species adapted to the current Arctic ecosystem, including polar bears, will be severe.



Photo: Georg Bangjord





Photo: Zefa / Beneluxpress

## A LOST BATTLE...?

In the southern range of polar bears, for example the Hudson and James Bays of Canada, sea ice is now melting earlier in the spring and forming later in the autumn. The time bears have on the ice, storing up energy for the summer and autumn when there is little available food, is becoming shorter. As the periods without food are extended, the overall body condition of these bears declines. This is particularly serious for pregnant or nursing females, and young cubs. In Hudson Bay, scientists have found the main cause of death for cubs to be either an absence of food or lack of fat on nursing mothers.

*"New information indicates the greatest future challenges to the conservation of polar bears may be ecological change in the Arctic as a result of climate change..."*

(Polar Bear Specialist Group, 2001).

*"For every week earlier that break-up occurs in the Hudson Bay, bears will come ashore roughly 10kg lighter and thus in poorer condition. With reproductive success tied closely to body condition, if temperatures continue to rise in response to increases in greenhouse gas emissions and the sea ice melts for longer periods, polar bear numbers will be reduced in the southern portions of their range and may even become locally extinct."*

Dr. Ian Stirling, Polar Bear Scientist

The situation currently observed in western Hudson Bay is indicative of what is expected in other parts of the Arctic in the near future. In addition to less sea ice, climate change in the Arctic is expected to bring increased precipitation. Ringed seals, the polar bears' primary prey, keep their pups in snow lairs on the sea ice. Spring rains destroy such lairs, and expose the pups to the elements and to predators. Where climate change leads to increased spring rains, ringed seal populations will be devastated. This means a substantial loss of food for polar bears, most likely leading to local extinction.



Photo: Georg Bangjord

Late winter rains can have a more direct effect on polar bear survival, by causing polar bear maternity dens to collapse. Warm spring temperatures can also thaw out a den, exposing its occupants to the elements and to predators.

The trend toward stronger winds and increasing ice drift observed in parts of the Arctic over the last five decades will also likely increase energy expenditures and stress for polar bears that spend most of their time on the drifting sea ice.

Large carnivores are sensitive indicators of ecosystem health and can be used to define the minimum area necessary to preserve intact ecosystems. WWF has identified the polar bear as a unique symbol of the complexities and inter-dependencies of the arctic marine ecosystem as it works toward its goal of preserving biodiversity for future generations.

### *WWF Climate Change Program*

Global warming and climate change pose serious threats to the survival of many species and to the well-being of people around the world.

WWF's campaign has three main aims:

- to ensure that industrialised nations make substantial reductions in their domestic emissions of carbon dioxide - the main global warming gas - by 2010
- to promote the use of clean renewable energy in the developing world
- to reduce the vulnerability of nature and economies to the impacts of climate change



WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by:

- conserving the world's biological diversity
- ensuring that the use of renewable natural resources is sustainable
- promoting the reduction of pollution and wasteful consumption.

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