



ARCTIC FACT SHEET

Climate Change and Arctic Wildlife

Adam Markham, Clean Air-Cool Planet

Global warming appears to be causing greater and more rapid environmental changes in the Arctic than in almost any other region of the world and its impacts are beginning to be felt in ecosystems throughout the region.

The Arctic is home to an extraordinary array of wildlife including caribou, musk oxen, polar bear, belugas and bowhead whales. Species that live all or part of their time in the Arctic are well adapted to an extreme and surprisingly variable environment, but many are now under serious threat from climate change. At greatest risk are those species that are most restricted to the high Arctic and are in some way dependent on the ice for their survival. Among these, the polar bear, ringed and bearded seals, walrus, narwhal and ivory gull may be most vulnerable.

The most obvious indicators of the Arctic warming trend are loss of permafrost, more rapidly receding glaciers, ocean warming and loss of sea-ice. In addition, scientists have observed alterations in tundra ecosystems and changes in freshwater ponds and lakes. Evidence suggests that many of these impacts are occurring faster, sometimes much faster, than was predicted just a few years ago.

The Sea Ice Food Web

Ice is of paramount importance for many Arctic species; multi-year sea-ice especially supports complex and specialized communities of organisms that live in close association with it. At the edge of the ice and underneath it, the beginning of the spring melt season triggers a remarkable explosion of biological activity. Light penetrating the ice provides the energy for the growth of algae called phytoplankton. These tiny plants provide food for small undersea animals including single-celled protozoans, shrimps, and worms that are collectively known as zooplankton, and which in turn provide the main food for many Arctic fish and diving birds as well as bowhead whales. One of the most important consumers of zooplankton is the Arctic cod, a small fish found throughout the Arctic. The most northerly of all marine fishes adapted only to cold polar waters, the Arctic cod thrives even in waters below 0°C because of natural antifreeze proteins in its blood. With its fat-rich flesh, it is an important food source for many



Polar bear on sea ice. Photo by Adam Markham.

species especially narwhal, beluga, ringed seal and seabirds such as murre and guillemots. Warming waters and loss of ice directly threaten populations of Arctic cod – one of the vital links in the Arctic food web.

Polar Bears and Seals



Polar bear and cubs. Photo by Adam Markham.

The largest terrestrial carnivores on the planet and ranging throughout the Arctic, polar bears are superbly adapted to their frigid home. Their complete dependence on ice for feeding, breeding and traveling makes them extremely vulnerable to global warming. On average, polar bears need to eat about 45 seals a year to survive. Their most important prey are ringed seals and bearded seals.

Ringed seals give birth and raise their pups in snow lairs on both pack and land-fast sea ice and can inhabit the fast ice even in the winter because of their ability to scratch open and maintain breathing holes with the heavy claws on their flippers. Their greatest vulnerability apart from the loss of ice is likely to be to increased spring rainfall which can lead to the collapse of snow dens and the death of pups. Bearded seals are found in shallower waters and pup mainly on floating pack ice. Reductions in the amount and stability of pack ice, as well as its earlier break up in the year, will affect all the ice-associated seals including ribbon and spotted seals, but may be particularly negative for harp and hooded seals, as their pups need a longer period of stable ice on which to rest and learn to hunt.

While significant reductions in numbers of seals will certainly be bad for polar bears, of even greater consequence is the early break up of floating ice. Sea ice is most important as a platform for seal hunting. In the more northerly areas, some bears spend all year on sea-ice of one sort or another. In southern Arctic areas, such as Hudson Bay, bears have to spend weeks or months on land fasting between the time all the ice melts and the fall freeze. Warming in the Western Hudson Bay has already resulted in sea ice break-up three weeks earlier than in the 1970s. Thus polar bears in this region are now unable to get out on the ice and hunt at the most critical time of year – the late spring, when seal pups are most abundant and easy to catch. Scientists have shown that female polar bear body weights in this area are progressively declining, and that fewer cubs are surviving. The ultimate consequence of this will be reduced numbers of adult bears. What is already happening in Hudson Bay does not auger well for the rest of the Arctic's 20,000-25,000 polar bears.



Bearded seal. Photo by Ralph Lee Hopkins, Courtesy Lindblad Expeditions.

In 2007, the US Geological Survey analyzed all the available scientific data on polar bears and climate change and came to the conclusion that “projected changes in future sea ice conditions, if realized, will result in loss of two thirds of the world’s current polar bear population by the mid 21st century.”

Ivory Gulls

This pure white, strongly ice-associated gull is found only in the Arctic and has been experiencing such precipitous declines in some parts of its range that it has recently been listed as endangered in Canada. The ivory gull has a varied diet but is usually found at the ice edge where it feeds on crustaceans and small fish such as polar cod as well as scavenging the remains of polar bear kills. Reasons for the decline of the ivory gull in Canada, Svalbard and the Russian Arctic remain unknown, but scientists have suggested that the concentration of pollutants such as mercury in the food chain, and the recent rapid loss of sea ice due to global warming could both be to blame.

Whales

There is considerable uncertainty as to how Arctic cetaceans will fare in a changing climate. Several species of whale occur in the Arctic, but only three are found there all year round – beluga, narwhal and bowhead. Of these, the narwhal is the most restricted in distribution and habitat and is likely to be the most vulnerable to global warming. Found only in the Atlantic sector and preferring deep or offshore waters, they over-winter in areas of dense pack ice. Both belugas and narwhals are toothed whales and feed mainly on Arctic and polar cod as well as other fish, including Greenland halibut and squid.

Bowheads, on the other hand, are filter feeders that subsist mainly on zooplankton and it is at least a possibility that reductions in sea ice will be advantageous as more sea area becomes accessible. Bowheads were hunted almost to extinction starting in the 16th Century. Although they have been increasing in the Western Arctic for the last 30 years, it is not yet possible to tell if this is due to a rebound from hunting pressures, a response to ice retreat, or some combination of factors. Those whales that visit the Arctic seasonally, including blue, gray, fin, humpback, minke and killer may be able to take advantage of warming by ranging further north in search of food. Gray whales are among the most flexible and adaptable visitors to the Arctic and as such can be expected to cope well with changes as can killer whales, which are being much more frequently observed in sub-Arctic and Arctic waters. Any increase in killer whales could negatively impact populations of other marine mammals on which they prey, including bowheads, belugas, seals and walruses.



Atlantic walrus. Photo by Stewart Cohen, Courtesy Lindblad Expeditions.

Walruses

There are three subspecies of walrus (the Atlantic, Laptev and Pacific) distributed around the Arctic. They are specialized feeders whose preferred prey is generally clams but who will eat a variety of foods including most invertebrates found in shallow waters as well as occasionally squid, seals and seabirds. Walruses need ice floes or land close to their feeding areas to haul out on to rest and to breed. In years when there is less ice and the ice edge retreats beyond the continental shelf

the water is too deep for walruses to feed and they must find alternative feeding sites. Reduced ice can also increase the number of walrus pups that get separated from their mothers, reducing their chance of survival. Scientists in Alaska and Russia have observed that reductions in suitable sea ice is causing more walruses to shift their haul-outs to land, where they may be at more risk of polar bear predation or disturbance by humans.

Caribou and Tundra Ecosystems

While the most direct climate threats are to the ice-dependent species of the Arctic, global warming is already having a major impact on tundra ecosystems. Permafrost (continuously frozen ground) is being lost throughout the southern regions of the Arctic, causing dry habitats to convert to bogs. Other major changes in vegetation are being recorded, too. The tree line that marks the boundary of the Arctic has already moved 10 km northwards, the southern edges of the tundra are becoming shrubbier, spring is arriving earlier and the growing season is longer. Pests and diseases are likely to increase with warming. Alaska has experienced massive outbreaks of spruce bark beetle that have killed millions of trees, and spruce budworm is moving north, too.



Svalbard reindeer grazing. Photo by Adam Markham.

In the winter, caribou dig through snow to find lichens to eat. When there is freezing rain instead of snow (as predicted to occur more frequently under global warming scenarios) there can be large scale caribou die-offs. In the spring, caribou switch to eating the fresh growth of tundra plants such as sedges and willows and follow the natural cue of increasing day length to start their migrations to the calving grounds. But now that spring is coming earlier in the year, some caribou herds are reaching their breeding areas too late to take advantage of the best new plant growth, which is triggered by increasing temperature, not day length. There is recent evidence from West Greenland that fewer caribou calves are being born and fewer are surviving because the pregnant females are arriving at the breeding areas too late in the spring.

There are fears that similar mismatches of migration timing and peak food availability as well as loss of suitable tundra habitat could also negatively affect some of the many species of shorebird that breed in the Arctic, for example the sanderling, red knot, curlew sandpiper and golden plover.

For more information visit www.arcticwarming.net or contact Adam Markham directly at amarkham@cleanair-coolplanet.org

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