

Testimony submitted to  
Senate Committee on Environment and Public Works

Hearing on  
Examining Threats and Protections for the Polar Bear

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### **Observed reductions of Arctic sea ice**

For over thirty years, I have studied the marine mammals that populate the Gulf of Alaska as well as the Bering, Chukchi, and Beaufort seas. During those three decades, I



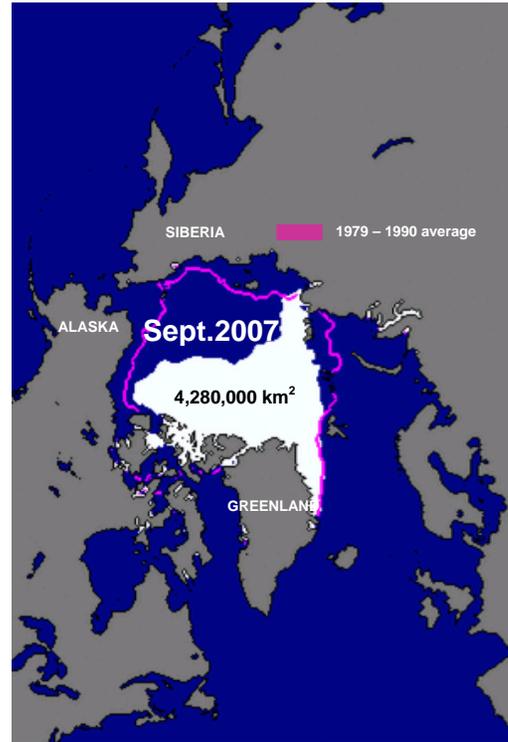
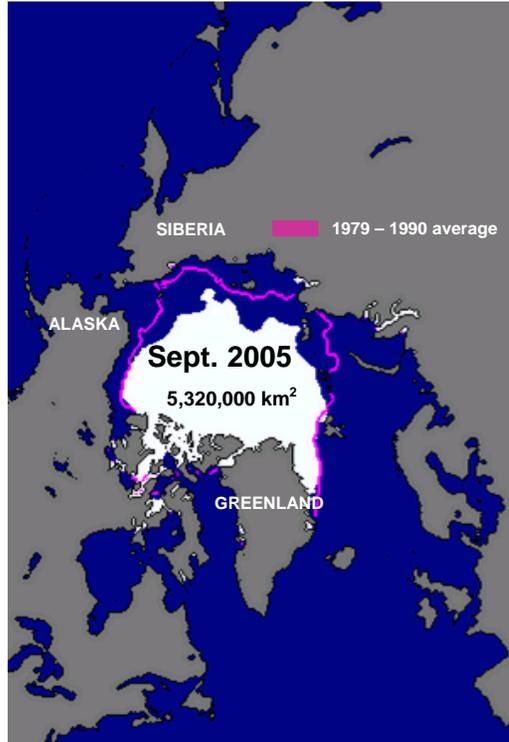
have witnessed dramatic changes in the sea ice that provides essential habitat to 7 species of seals, walruses, and polar bears. Eleven of the 12 warmest years since 1850 were recorded between 1994 and 2006, and one result has been that the seasonal duration and extent of the ice decreased substantially. As seen in the figure on the next page, the summer sea ice extent has been reduced by almost one half. The Intergovernmental Panel

on Climate Change, the American Geophysical Union, and the vast majority of sea ice physicists predict that there will be no summer sea ice in the Arctic Ocean before the current century is over, perhaps within the next 30 years.

### **Polar bears are specialists, adapted to hunting on sea ice**

The loss of over 8,000,000 km<sup>2</sup> of summer sea ice will endanger many species of plants and animals adapted to that once extensive habitat. Polar bears especially will be negatively impacted as they are adapted to a narrow niche, namely hunting seals from the sea ice.

The narrow niche occupied by polar bears can be contrasted to that of brown bears who occupy a greater range of habitats and whose diet is much broader. Genetic data indicate that polar bears began to separate from a brown bear population (probably in southern Alaska) 150,000 to 250,000 years ago. Molecular biology does not tell us when that new line of bears began to specialize in hunting Arctic seals, but the oldest fossils showing the



National Snow and Ice Data Center

specialized meat-eating teeth that distinguish today's polar bears from brown bears are as recent as 20,000 years old.

Specialization to preying on ice-inhabiting seals was not without its costs, and the polar bear's feeding success is strongly related to ice conditions; when stable ice is over productive shelf waters, polar bears can feed throughout the year on their primary prey, ringed seals. When the ice is absent, however, the bears lack a platform from which to capture surfacing seals.

Today, an estimated 20,000 to 25,000 polar bears live in 19 apparently discrete populations distributed around the circumpolar Arctic. Their overall distribution largely matches that of ringed seals, which inhabit all seasonally ice-covered seas in the Northern Hemisphere, an area extending in winter to approximately 15,000,000 km<sup>2</sup>. The broad distribution of their seal prey is reflected in the home ranges of polar bears which - averaging over 125,000 km<sup>2</sup> - are 200 times larger than the averages for brown bears. Most polar bear populations expand and contract their range seasonally with the distribution of sea ice, and they spend most of year on the ice. Most populations, however, retain their ancestral tie to the terrestrial environment for denning, although denning on the sea ice is common among the bears of the Beaufort and Chukchi seas. Dens on land and on ice are excavated in snow drifts, the stability and predictability of which are essential to cub survival.

### **Loss of sea ice too rapid for successful adaptation**

The rapid rates of warming in the Arctic observed in recent decades and projected for at least the next century are dramatically reducing the snow and ice covers that provide denning and foraging habitat for polar bears. These changes to their environment will exert new, strong selection pressures on polar bears. Adaptive traits reflect selection by past environments, and the time needed to adapt to new environments depends on genetic diversity in populations, the intensity of selection, and the pace of change. Genetic diversity among polar bears is evident in the 19 putative populations, suggesting some scope for adaptation within the species as a whole even if some populations will be at greater risk than others. On the other hand, the nature of the environmental change affecting critical features of polar bears' breeding and foraging habitats, and the rapid pace of change relative to the bears' long generation time (about 15 years) do not favor successful adaptation.

### **Threats from changes in breeding habitat**

The most obvious change to breeding habitats is the reduction in the snow cover on which successful denning depends. Female polar bears hibernate for four to five months per year in snow dens in which they give birth to cubs, typically twins, each weighing just over 1 lb. The small cubs depend on snow cover to insulate them from the cold.

## **Threats from changes in foraging habitat.....**

Changes in the foraging habitat that will entail new selection pressures include seasonal mismatches between the energetic demands of reproduction and prey availability; changes in prey abundance; changes in access to prey; and changes in community structure.

### **..... mismatches in timing**

Emergence of female and young polar bears from dens in the spring coincides with the ringed seal's birthing season, and the newly emerged bears depend on catching and consuming young seals to recover from months of fasting. The match in timing between bear emergence and the availability of young seals may be disrupted by changes in timing and duration of snow and ice cover. Such mismatches between reproductive cycles and food availability are increasingly recognized as a means by which a variety of animal populations are impacted by climate change.

### **..... reduced prey abundance**

Recognized as the most abundant of northern seals, ringed seal populations also are likely to decline as the sea ice habitat changes. Like polar bears, ringed seals depend on snow caves for rearing their young, and increasingly early snow melts have led to high rates of seal mortality due to hypothermia and predation. Walrus and bearded seals also are preyed upon by polar bears, and feeding and reproduction of those animals likewise is tightly coupled to the sea ice environment.

### **..... reduced access to prey**

The polar bear's ability to capture seals depends on the presence of ice. In that habitat, bears take advantage of the fact that seals must surface to breathe in limited openings in the ice cover. In the open ocean, however, bears lack a hunting platform, seals are not restricted in where they can surface, and successful predation is exceedingly rare. Only in ice-covered waters are bears regularly successful at hunting seals. When restricted to shorelines, bears feed little if at all, and terrestrial foods generally are of little significance to polar bears.

### **..... changes in biological community**

Seal and other prey populations also will be impacted by fundamental changes in the fate of primary production. For example, in the Bering and Chukchi seas, the reduction in sea ice cover alters the physical oceanography in ways that diminish nutrient flow to bottom-dwelling organisms and increases nutrient recycling closer to the ocean surface. The resultant shift in the composition of the biological community will impact all branches of the food web, including polar bears. The exact composition of future biological

communities in the Arctic Ocean is not known, nor is it known how effectively polar bears might exploit those communities.

### **Projected population reductions and possible extinctions**

The rapid rate at which snow and ice cover is declining, will work against successful adaptation by polar bears. Populations are likely to be reduced and extinction could result from mortality outpacing production and/or from hybridization with brown bears.

The U.S. Fish and Wildlife has made a careful analysis of the threats and prudently recommended listing polar bears as threatened. They accurately summarized the preponderance of evidence that the loss of sea ice will threaten polar bears. They have used the best available information to project likely changes in population levels. We cannot expect those projections to be precise in terms of actual numbers, but we have every reason to believe that population changes will be large and downward given the magnitude of sea ice loss.

The impacts of small changes in habitat can be difficult to predict, but the impacts of whole-sale loss of critical habitat are more obvious. If a lake shrinks, its fish population likely will be stressed but survival of the population is quite possible. If the lake dries up completely – even if only seasonally - the fish population will not survive. Sea ice is essential habitat to polar bears just as lake water is to fish, and the U. S. Fish and Wildlife Service’s proposal to list polar bears as threatened is appropriate and timely.