WRITTEN TESTIMONY OF
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HEARING ON
WILDLIFE AND OCEANS IN A CHANGING CLIMATE

BEFORE THE
COMMITTEE ON NATURAL RESOURCES
SUBCOMMITTEE ON FISHERIES, WILDLIFE AND OCEANS
U.S. HOUSE OF REPRESENTATIVES

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Good morning. I am Monica Medina, the Acting Director of the U.S. office of the International Fund for Animal Welfare (IFAW). IFAW is a non-profit organization with offices in fifteen countries around the world. We work to improve the welfare of wild and domestic animals throughout the world by reducing the commercial exploitation of animals, protecting wildlife habitats, and assisting animals in distress. Thank you for the opportunity to testify before you today on the devastating impacts that the changing climate is having on marine mammals in Alaska.

The testimony I give today is based on a report that IFAW will publish soon entitled "On Thin Ice: The Precarious State of Arctic Marine Mammals in the U.S. Due to Global Warming." The report is based on a 2006 white paper written by Stacey Marz of The Ocean Foundation. Her research was originally funded by the Alaska Oceans Program of the Alaska Conservation Foundation and the George H. and Jane A. Mifflin Memorial Fund. IFAW agreed to assist in the editing of the white paper into a condensed report for public release. Stacey and I collaborated to create the report from the original white paper. Its publication is jointly funded by The Ocean Foundation, the Wallace Global Fund and IFAW. I want to acknowledge all their contributions to assembling the information I will provide the subcommittee.

The purpose of the report is to survey what is currently known about the impacts of global warming on ice-dependent marine mammal species in the U.S., including four species of ice seals (*Erignathus barbatus* - bearded, *Phoca fasciata* - ribbon, *Pusa hispida* - ringed and *Phoca largha* - spotted seals), two stocks of polar bears (*Ursus maritimus* - the Southern Beaufort Sea stock, Chukchi/Bering Seas stock), Pacific walruses (*Odobenus rosmarus*), and western Arctic bowhead whales (*Balaena mysticetus* - also known as the Bering/Chukchi/Beaufort Seas stock). The report also provides an overview of each of these marine mammal species, its habitat, and the relevant federal statutes, agreements and management entities that govern it. Finally, the report explains the serious threat global warming poses to these animals, and the sobering impacts that they are already experiencing as observed by biologists and Alaska Native subsistence hunters.

Most importantly, the report addresses these issues and provides tangible recommendations that policy makers can immediately do to help improve the prospects for long term survival of these animals in the Arctic. The government must aggressively employ all of its legal authorities, international agreements and management bodies to create systemic protections for ice dependent marine mammals. Specifically, the government must avail itself of all the tools it has at its disposal under the Marine Mammal Protection Act and the Endangered Species Act, and through these various management bodies, to begin to take actions that will conserve these animals and their habitat.

Immediate actions are needed – we cannot wait until a comprehensive legal and regulatory structure to reduce greenhouse gas emissions is enacted by Congress. Congress can act in the short run to increase funding for research and stock assessments of ice dependent marine mammals, and to close the loophole in the Marine Mammal Protection Act that permits the importation of polar bear trophies hunted in Canada. Taking these steps will set the stage for providing relief to ice dependent marine mammals in the United States. However, it is also clear that in the long run, unless greenhouse gas emissions are radically reduced, we can expect mass extinction of these amazing animals within this century. Such a tragic loss of species and biodiversity will have far reaching effects on the entire vast Arctic ecosystem, and the subsistence and cultural uses of these animals by Alaska Native peoples.

Background

In Alaska, ice seals, walruses, polar bears and bowhead whales rely on sea-ice as habitat in the Bering, Chukchi and Beaufort Seas. Much of these seas are covered by sea-ice for three quarters of the year from roughly October until June. Sea-ice has a large seasonal cycle, reaching a maximum extent in March and a minimum in September. There are three major forms of sea-ice in the Arctic: (1) shorefast or landfast ice that is attached to the shore and relatively immobile, extending to variable distances offshore; (2) stamukhi ice that consists of thick ridges that become grounded during the winter and attach to the ocean bottom; and (3) pack ice that includes first-year and multiyear ice and moves under the influence of winds and currents. Leads and open water areas form within the pack ice zone.

Each ice-dependant marine mammal species is precisely adapted to this harsh environment. Each species prefers different types of ice and uses it in different ways that are suited to its biological characteristics. These animals rely on this ice environment as a platform for resting and foraging, breeding, traveling, protection, pupping, nursing and mating. They largely follow the movement of the ice in their migration patterns.

There are several serious issues of general concern that affect all ice-dependent marine mammals. The issues range from simply not having adequate background information about the different species' populations to the sobering projection that their ice habitat is disappearing due to climate change and will be gone within this century.

Related to climate change and the loss of sea-ice, there are additional concerns about what emerging human uses will be made possible by more open water in the northern seas and Arctic Ocean. These uses include increased oil and gas activities, the development of new commercial fisheries, new and emerging shipping routes, and increased disturbance and pollution in the ecosystem due to the newly possible human activities. There is also concern about bioaccumulation of contaminants in Arctic marine mammals.

There is a surprising shortage of background information about almost all ice-dependent marine mammals. This can be attributed to the difficulty of studying animals in a very remote and extreme environment, and the expense of both physically accessing the animals and using the appropriate technology to survey them. With the exception of bowhead whales and the Southern Beaufort Sea polar bears, there are no reliable abundance estimates for any of the four ice seal species, the Pacific walrus or the Chukchi/Bering Seas polar bear stock. Also, there is no information about population trends for these animals and no potential biological removal rate. As such, it is virtually impossible to discern the overall health of these marine mammal species, and how much loss of individual animals the stocks can sustain.

Considering the threats ice dependent species currently face and are likely to face in the future, it is troubling to have so little background information. It is critical that research is undertaken as soon as possible to collect reliable background abundance information, to monitor population trends, to identify sustainable take levels and to evaluate if and how human-caused and natural events are affecting the populations. In addition, as human activities increase in the Arctic it will become more important to monitor those activities for possible impacts on ice dependent marine mammals, their prey and their habitat, in order to detect harmful changes as early as possible. Moreover, research is needed to understand the cumulative effects of all issues of concern – climate change, oil and gas activities, and contaminants - on these animals to inform management actions and to mitigate against adverse impacts within our control. The current level of financial support for research limits informed decision-making about the status of Arctic marine mammals, now and in the future. Adequate funding is critical to support efforts by management agencies, their research collaborators and academic institutions to comprehensively survey and study the ice dependent marine mammals.

With that background, I will now discuss what is known about the impacts of global warming on each of the four marine mammal species in Alaska. In addition, I will make recommendations about actions the government can take in the near term to begin to mitigate and address the issues they face due to the loss of polar ice habitat.

Ice Seals

Ice seals spend the majority of time on the ice, and use ice as a platform from which to feed, to birth their pups and to rest. They migrate northward with the ice during the warmer months. Their reliance on sea-ice means that they will be severely impacted as the sea-ice diminishes due to climate change. Each of the four seal species found in

arctic Alaska will be affected by the loss of sea-ice in different ways based on their specific habitat preferences and their unique biological characteristics.

For example, ribbon and spotted seals that currently live at the southern edge of the polar bears' range could expand their range northward. This could greatly affect ribbon seal populations if their habitat shifts north into polar bear territory as the ice shrinks, because polar bears may prey heavily upon ribbon seals which do not have the wariness of seals that currently live near polar bears. Moreover, the absence of ice in southern pupping areas or the relocation of pupping to more northern areas could affect seal reproduction. In addition, crowding in birthing areas because of a reduction in the quality of the ice may also increase the risks of disease transmission.

Ringed seals prefer stable, shore-fast ice for construction of birth lairs. Adequate snow drift accumulation is necessary to protect pups in lairs with thick roofs. Access to birth lairs for thermoregulation is considered critical to the survival of nursing pups when air temperatures fall below freezing. For the past six years, ringed seals have abandoned lairs increasingly early as spring temperature and snow melts have advanced. The transition from lair use to basking on the surface was especially early and abrupt in 2002, and by mid-May all the seals had abandoned their lairs. Many pups in their natal coats were resting on the ice in the open instead of in lairs as is usual in mid-May. The early snow melts that researchers have observed are consistent with a general pattern observed in the Beaufort Sea. Premature lair abandonment by ringed seals, associated with early snow melts, likely will increase juvenile mortality rates due to exposure to freeze-thaw conditions and predation. When lack of snow cover forced birthing to occur in the open, nearly 100% of the pups died from predation.

In addition, increased rain on snow during the late winter damages or eliminates snow lairs, which increases pup exposure to hypothermia and predation. Researchers believe that if early season rain becomes regular and widespread in the future, ringed seal pup mortality will increase especially in the more southerly parts of their range. Consequently those local populations may be significantly reduced.

Researchers have reported that an early spring breakup negatively impacted the growth, condition and probably the survival of un-weaned ringed seal pups. Early breakup likely interrupted lactation in mother seals which negatively affected the condition and growth of pups. Earlier ice breakups are predicted to happen more frequently and result in decreased ringed seal productivity and abundance. Moreover, in addition to loss of habitat, the seals may also have to contend with the related loss of their major food sources. Arctic cod is one of the ringed seals' primary prey species. It is strongly associated with sea-ice throughout its range and uses the underside of the ice to escape from predators. It is likely that a decrease in seasonal ice cover could have adverse effects on Arctic cod and consequently affect its availability to ringed seals as food.

Recommendations for Ice Seal Conservation

Federal funding for the study of ice seals must be increased so that further research can be undertaken. It has been decades since there has been any comprehensive study on population numbers and distribution of ice seals. Without this critical information, it is impossible to know how rapidly the seal populations are declining,

much less to make intelligent management decisions regarding subsistence hunts. At the very least, the government should conduct assessments of these stocks to determine whether they are depleted and develop conservation plans as required under the Marine Mammal Protection Act. Further, in order to ensure that these seal species do not reach the brink of extinction without us even knowing it, we recommend that the government consider whether to propose listing these seal species under the Endangered Species Act. The challenges faced by these seal species are not appreciably different than those faced by polar bears, which the government recently proposed for listing.

Polar Bears

Polar bears are the largest of all land predators, with males weighing up to 1,700 pounds and standing 2-3.5 meters tall. They are a potentially threatened species living in the circumpolar north in Alaska, Canada, Russia, Greenland and Norway. In Alaska there are two populations: (1)the Southern Beaufort Sea population, which occurs along the North Slope of Alaska and ranges into western Canada; and (2) the Chukchi/Bering seas population, which occurs off western Alaska with its range extending to Wrangel Island and eastern Siberia. This is a shared stock with Russia. Only the Southern Beaufort Sea population can be reliably estimated with certainty. The Polar Bear Specialist Group of IUCN, the pre-eminent international scientific body for research and management relating to polar bears, estimated the population at 1,800 bears. The Chukchi Bering Sea population is estimated at 2,000, but that number is unreliable due to widespread poaching in Russia.

Polar bears are superbly adapted for Arctic survival, with physical characteristics that make them especially suited to live in the extremely cold ice environment. The polar bears' water-repellant white coat helps it blend into the snow and ice and they have dense under fur. Their bodies are entirely fur covered except for their nose, and they have a thick layer of insulating fat (up to 4.5 inches thick) that keeps their body temperature and metabolic rate stable at -34 degrees F. Their claws are suited to walking on ice and grasping prey along with "suction cups" on the underside of their feet for increased ice traction. Also, their enormous, oar-like feet make them expert swimmers and spread their weight on the ice. Polar bear are specialized for a carnivorous diet because they have an acute sense of smell for finding seals in snow caves.

Polar bears have received much media attention in recent years due to their high profile connection to their shrinking sea-ice habitat. In June 2005, 40 members of the IUCN Polar Bear Specialist Group/Species Survival Commission of the World Conservation Union concluded that polar bears should be classified as a "vulnerable" species based on a likely 30% decline in their worldwide population over the next 35 to 50 years caused principally by climatic warming and its consequent negative affects.

In Alaska, there is evidence of decreased body condition, death from drowning, cannibalism and starvation. In three of the past four years, there have been record low ice packs in Alaska's Beaufort Sea region, pushing more and more polar bears onto land for protracted periods, with bears congregating around whale carcass sites, village dumps

and other settled areas where they may increasingly come into conflict with people. Observed and predicted changes in sea-ice cover and the timing of freeze-up and break-up have profound effects on polar bears. The Polar Bear Specialist Group of IUCN reports the following expected effects from climate change:

- Changes that alter the period of ice coverage could affect polar bear distribution and impact their condition:
    - With ice pack shrinkage, bears may spend greater amounts of time on land
    - Bears will likely more extensively use terrestrial areas, ultimately affecting their physical condition from relying on fat stores for energy
    - Bears with decreased physical condition could effect production and survival
    - Bears using deteriorating pack ice may experience increased exertion associated with movements and swimming
- Climate changes on prey species will have a negative effect on polar bears:
    - decreased snow or increased seasonal rain patterns could effect ringed seal pupping by not having adequate snow for construction of birth lairs or increased rain fall can collapse birth lairs and reduce seal productivity
    - increased snow can result in reduced success in entering ringed seal birth lairs
    - prey reductions could effect polar bear condition and ultimately cub production and survival
- Denning could be impacted by unusual warm spells:
    - access to high quality denning areas may be limited or restricted
    - use of less desirable denning habitat could have impacts on reproduction and survival
    - rain or warming could directly cause snow dens to collapse or be opened to ambient conditions
    - loss of thermal insulative properties in opened dens could effect cub survival

The best information on the effect of global warming on polar bears comes from the western coast of Hudson Bay in the Canadian province of Manitoba. Sea-ice has been breaking up there three weeks earlier than it did decades ago. Bears must spend an extra month on shore fasting, waiting for ice to re-form in the fall. As a result, the western Hudson Bay population has plunged 22% from 1,194 in 1987 to 934 in 2004. Canadian scientists have observed that today's polar bears are smaller in stature, weigh less, and have fewer cubs. Scientists estimate that for every week of delay in freeze-up, polar bears lose at least 22 pounds of critical fat reserves. Pregnant females are losing so much weight that they fail to produce enough milk for their cubs, which then suffer increased mortality. Once females fail to attain a minimum weight they will not give birth at all, and scientists can already document a 15% drop in birth rates. As polar bears are spending more time on land, there has been an increase in people killing curious and aggressive bears in self defense.

In addition, polar bears are expending more energy because of reduced ice thickness and extent. Arctic sea-ice circulation is clockwise and polar bears tend to walk against this movement to maintain a position near preferred habitat within large geographical home ranges. Ice thickness is diminishing and there is increased transport of multi-year ice from the polar region. This increased rate and extent of ice movements requires polar bears to work harder to maintain their position near preferred habitat. As sea-ice moves more quickly or becomes more fragmented, polar bears will likely use more energy to maintain contact with consolidated ice. During summer periods the remaining ice in much of the central Arctic is now positioned away from more productive continental shelf waters and over much deeper, less productive waters in the Beaufort and Chukchi Seas. As the open water enlarges, bears will spend more time and energy swimming in transit. In 2004, scientists documented for the first time four polar bear drownings in open water off Alaska and extrapolate that 27 bears may have drowned during that event after trying to swim between shore and distant ice.

Researchers suggest that as habitat patch sizes decrease, available food resources will also decline, resulting in reduced polar bear residency time and increased movement in search of food. As discussed earlier, the polar bear's primary prey – ringed seals are projected to decline from reduced sea ice habitat, and decreased snowfall that prevents adequate birth lairs to protect ringed seal pups from freezing air. Polar bears cannot offset energy losses from decreased seal consumption by using terrestrial habitat because food such as berries, snow geese and caribou do not represent significant energy sources and nutritional stress will result. The consequences of increased energetic costs to polar bears are reduced weight and condition and corresponding reduction in survival and recruitment rates.

Declines in fat reserves during critical times in the polar bear life cycle are likely to lead to an array of impacts. These include: delay in the age of first reproduction, fewer females with adequate fat reserves to complete successful denning, decline in litter sizes with more single cub litters and fewer cubs overall, lower cub body weights and lower survival rates. When mother bears and their cubs leave the den, their body masses are correlated; heavier females produce heavier cubs and lighter females produce lighter cubs. Researchers are seeing decreased body condition of southern Beaufort Sea polar bears. Cub survival rates declined significantly when comparing rates from 1967 to 1989 and 1990 to 2006. The lower cub survival rate coincided with warming temperatures and altered atmospheric circulation starting in the winter of 1989-1990 that caused an abrupt change in sea-ice conditions in the Arctic basin. In addition, broken and fragmented ice conditions may cause cubs to be in the water longer, increasing the chance of hypothermia or death because they cannot survive more than 10 minutes in icy water. In the Western Hudson Bay, declines in cub survival and physical size were seen for several years before a statistically significant decline in the population size was confirmed. Polar bear experts believe that if the trends in sea-ice loss continue, the southern Beaufort Sea population will significantly decline within the next 45 years.

Polar bears in the Southern Beaufort Sea may be turning to cannibalism because longer seasons without ice keep them from getting to their prey -- ringed seals. From

January to April 2004, in the region north of Alaska and western Canada, researchers found three instances of polar bears preying on each other, including the first-ever reported killing of a female in a den shortly after it gave birth. Adult males are believed to have actively stalked or hunted the bears before attacking and eating them.

Recommendations for Polar Bear Conservation

The effort underway by the government to list the polar bear as a threatened species under the Endangered Species Act is an important first step in polar bear conservation. This process, which can be quite lengthy, should be undertaken as quickly as possible. The government should not allow the process to be bogged down by opponents of the listing. In the meantime, the government should take other steps to conserve polar bears out of an abundance of caution. For example, the Congress should close the loophole in the Marine Mammal Protection Act that permits Americans to hunt polar bears in Canada and return home with their bear trophies. Each year approximately 200 bears are killed by American hunters. It is illegal to hunt these bears in the U.S. The Marine Mammal Protection Act should be amended to prohibit these trophies from entering our borders.

Pacific Walrus

Walruses are the largest pinnipeds in the Arctic and sub-Arctic seas, with a geographic range that completely encircles the polar basin. The Pacific walrus, which accounts for 80 percent of the world's walrus population, is one of two geographically isolated subspecies of walrus. The Pacific walrus is found in the North Pacific Ocean's Bering Sea and in Arctic waters from the East Siberian Sea to the western Beaufort Sea, as well as in the Laptev Sea.

They are most commonly found in relatively shallow water areas, close to ice or land. Walruses spend about half their time in the water and half their time on beaches or ice floes where they gather in large herds. They forage from ice above the continental shelf for bottom-dwelling invertebrates. The mouth of the walrus is uniquely adapted to allow them to eat buried clams and invertebrates. The walrus squirts high-power jets of water out of their mouths like a water drill to unearth clams mired in the mud at the bottom. Scientists believe that they then use strong suction to remove the fleshy parts of the prey away from the shell and then discard the shell. This intensive tilling of the sea bottom releases nutrients into the water column, provides food for scavengers such as starfish, and increases the patchiness of the bottom, which likely plays an important community structuring function for benthic and pelagic animals.

Walruses may already be feeling the impacts of climate change in Alaska. They use ice as a platform for resting and from which to forage. They can only dive to depths of approximately 90 meters; when the ice recedes north of the continental shelf, they are unable to dive as deep as their bottom dwelling prey is found. In addition, walrus calves, which have been observed swimming in open water alone, are believed to have been abandoned by their mothers who were searching for food in ice-free waters, leaving no place for the dependent calves to rest.

Pacific walruses are showing the effects of global warming associated with the changing distribution and extent of pack ice in the Bering and Chukchi Seas. Currently, there are no data upon which to make reliable predictions of the net impacts that changing climate conditions would have on the status and trend of the Pacific walrus population. However, disturbing observations have been made in recent years about climate change impacts on walruses.

As described earlier in this section, the process walruses use to eat involves bioturbation, which is the disturbance of sediment layers by biological activity. Bioturbation releases an extraordinary amount of nutrients, including nitrogen, into the water, which is a massive effect compared to natural release in the absence of walrus feeding. Researchers believe that walruses return to the same drifting ice floes from which they left to forage in the water. The loss of sea-ice due to climate change will result in diminished extent and configuration of ice platforms from which walruses will feed and bioturbate the benthic environment.

As noted above, walruses are distributed only over continental shelves because they feed on benthic invertebrates and cannot effectively feed at depths beyond 90-100 meters. After breeding on the winter ice in the Bering Sea, the males retreat to coastal areas while the females and young (up to age three) retreat with the ice into the Chukchi Sea. There they feed intensively in between periods of resting and nursing their young on the ice.

In 1998, the sea-ice in the Chukchi and Beaufort Seas retreated unusually far to the north and by September it covered 25% less of the Arctic Ocean than during the minimum for the previous 35 years. Vessel-based researchers surveying walruses found that substantial portions of the ice edge had receded north of the continental shelf where the water was too deep for walruses to feed. Continued warming and reduction in ice over the continental shelf in summer and fall will likely reduce the amount of forage available to lactating walruses. The result may be a reduced survival of nursing calves if female walruses respond by concentrating on ice or shorelines near feeding areas. This will result in a corresponding increase in their risk of predation by polar bears. There have also been reports of mother walruses following the retreating ice and abandoning their calves in open water because the calves cannot keep up, which creates yet another possible method of mortality.

Moreover, the calves have been reportedly abandoned on the ice as well. In April 2006, the *Aquatic Mammals* journal stated that walrus calves had apparently been stranded far offshore by melting sea-ice in the Arctic Ocean. During a summer 2004 cruise in the Canada Basin to investigate the impact of global warming on the oceanic ecosystem over the continental shelf of Alaska, researchers aboard the U.S. Coast Guard icebreaker Healy found nine lone walrus calves swimming far from shore. The area was 53 to 134 miles from shore in water that was over 3000 meters deep. Ice was virtually absent throughout the area where the scientists saw the lone calves. Scientists had never before documented calves offshore without their mothers and had seen mothers and calves together only in water less than 100 meters deep and 20 miles from shore. The

calves, which swam around the ship, barked continuously and seemed distressed and according to the researchers. These calves likely drowned or starved.

The sightings of lone calves coincided with evidence of rapidly melting seasonal ice in the shallow continental shelf region where walruses feed on clams and crabs. Researchers measured an unusually warm mass of water moving onto parts of the continental shelf north of Alaska from the Bering Sea that caused seasonal sea-ice to rapidly melt. Sea temperatures there were more than six degrees warmer than those observed at the same time and location two years earlier. In areas where sea-ice remained, the sea floor was too deep, about 2836.5 meters, for adult walrus to feed. This development is significant because walruses use sea ice as a resting platform, especially for pups when their mothers dive for food. The calves, which are dependent on mothers' milk for up to two years, cannot forage for themselves. Researchers believe that the mothers had to swim farther and farther from shore to find ice for the calves to rest on and eventually had to abandon them in waters too deep for the mothers to reach food.

Recommendations for Walrus Conservation

The same course of action is recommended for walruses as for ice seals. Federal funding for the study of walruses must be increased so that further research can be undertaken. It has been decades since there has been any comprehensive study on population numbers and distribution of walruses in Alaska. Without this critical information, it is impossible to know how rapidly the walrus populations are declining, much less to make intelligent management decisions regarding subsistence hunts. At the very least, the government should conduct stock assessments of these stocks determine whether they are depleted, and develop conservation plans as required under the Marine Mammal Protection Act. Further, in order to ensure that this species of walrus does not reach the brink of extinction without us even knowing it, we recommend that the government consider whether to propose listing the Pacific walrus under the Endangered Species Act. The challenges faced by this walrus species is not appreciably different than those faced by polar bears, which the government recently proposed for listing.

Bowhead Whales

Bowhead whales are the only baleen whales that spend their entire lives in waters near sea-ice and do not migrate to temperate or tropical waters to calve. Bowheads are well adapted for living in Arctic and sub-Arctic waters. They have the thickest blubber of any marine mammal, up to .61 meters thick, which is used for insulation, food storage, and padding.

Bowhead whales are the most important subsistence animal for most northwestern and northern Alaska coastal Eskimos. The International Whaling Commission (IWC) manages the subsistence harvest, and has granted the Alaska Eskimo Whaling Commission a harvest quota. For 2002-2007, subsistence hunters received a block quota of 280 bowhead strikes allowed, of which 67 whales (plus up to 15 unharvested in the previous year) could be taken annually. This quota allows the Chukotka Natives in

Russia to take 5 whales. The next five-year quota is up for renewal in May of 2007 at the annual

As a result of heavy exploitation by commercial whalers, the western Arctic bowhead whale stock is currently listed as endangered under the Endangered Species Act and depleted under the Marine Mammal Protection Act. This stock of bowhead whales is the most studied of bowhead whales in the world and because of their importance to Alaska Natives for subsistence, the International Whaling Commission's regulation of bowheads, and the sub-sea location of oil and gas reserves below bowhead habitat. Research has included obtaining reliable population estimates and trends, information about the whale's overall health, migration and stock structure.

The impacts of global warming on bowhead whales are not clearly understood yet, but it is believed that the abundance of their food may decline as more open water occurs. Also, some are concerned that gray whales may be moving into bowhead whale habitat and may compete with bowheads for space.

Climate change and the associated changes in the distribution and extent of pack ice in the Bering, Beaufort and Chukchi Seas is a large concern for bowhead whales. Bowhead whales are likely sensitive to changes in Arctic weather, sea-surface temperatures, or ice extent and the associated effect of prey availability. There is insufficient data to make reliable predictions of the net impacts that changing climate conditions would have on bowhead whales. However, the IWC has listed bowhead whales in the Eastern Arctic and Okhotsk Sea as vulnerable due to a combination of climate change and other factors.

The bowhead whale's foraging efficiency is intricately linked to the Arctic ecosystem by changes in ice cover, in spring ice break-up, in algal blooms, and in the abundance of its prey species. Bowheads, which spend their entire lives in Arctic waters, may be strongly affected by changes in the distribution or abundance of their prey in these areas. If plankton species are affected by climate change, this could lead to cascading effects through the food chain. In addition, global warming and possible shifts in wind patterns could also affect the distribution of polynyas in the polar ice cap. Dark polynyas often contain significant blooms of phytoplankton. Cetacean species such as bowhead whales that rely on ice edges for phytoplankton foraging might be adversely affected by any decline in these habitat areas.

Researchers and subsistence hunters are concerned that bowhead whales may also be impacted by gray whales migrating further northward beyond their historical range, seeking colder waters. Large pods of gray whales typically travel to the Bering Sea's northern waters each spring from Baja, California, feasting on amphipods, tiny shrimp-like creatures that live in the muck at the bottom of the shallow sea. The gray whales feed voraciously all spring and summer in preparation for a three- to five-month fast during their 12,000-mile journey back to Baja. They make the return trip in the fall, having the longest total migration of any marine mammal.

However, now the gray whales are heading north into the Chukchi Sea, above the Arctic Circle, where the colder waters support amphipods. Some gray whales are foregoing their full fall migration, going no further south than Kodiak. It is unknown exactly what effect more gray whales in the northern seas year-round will have on bowhead whales. Both bowhead and gray whale populations are increasing at approximately 3% per year. Gray whales have a broader diet than bowheads, breed faster and generally seem more capable of colonizing new areas than bowhead whales. As the gray whales shift northward, they are moving closer to the territory of the bowhead whale, which feeds offshore on krill. Some Alaskan Natives bowhead hunters are concerned that the more aggressive gray whale may interfere with the quieter bowhead, competing for space.

It has also been predicted that reductions in Arctic sea-ice will lead to an increase in ice-free days annually. Several potential concerns arise from this. The presence of sea-ice also affects the timing, nature and possible locations of human activities such as shipping, research, barging, whale hunting, oil and gas activities (seismic surveys and drilling), commercial fishing, military activities and other activities to introduce noise and pollution into the marine environment. Seasonal changes in ice extent and human activity may restrict whale movements such that patterns of gene flow are altered. Further, bowhead whale migrations and selection of wintering and summering grounds may shift in a warmer Arctic.

Recommendations for Bowhead Whale Conservation

The federal government must continue to be a forceful advocate for whale conservation at the IWC. It must make clear that the limited scope of the subsistence hunt for bowheads stands in sharp contrast to the commercial hunts conducted by other nations under the guise of scientific research. Moreover, the Alaska Eskimo Whaling Commission should continue to collaborate with scientists to ensure there is adequate data collection and documentation of changes regarding the range and population densities of bowhead and gray whales in the Arctic in order to ensure that we have as much information as possible about the impacts of global warming on the whales. The fact that there are annual subsistence hunts provides an opportunity to collect data in a consistent and timely manner about the impacts of global warming on bowhead whales, on other whales, and on the Arctic ecosystem in general.

Conclusion

The information compiled in the report makes a powerful and persuasive case that the time is now to take action. The very existence of polar bears, walruses, ice seals, and bowhead whales for future generations to enjoy is at stake. Immediate actions are urgently needed. We cannot wait until a comprehensive legal and regulatory structure to reduce greenhouse gas emissions is enacted by Congress and our greenhouse gas emissions decrease, and the warming trend eventually slows. By then it will be much too late.