22 October 2007

Rosa Meehan, Ph.D.
Supervisor, Marine Mammals Management
U.S. Fish and Wildlife Service
1011 East Tudor Road
Anchorage, AK 99503

Dear Dr. Meehan:

On 20 September 2007 the U.S. Fish and Wildlife Service published a notice in the *Federal Register* announcing the availability of, and seeking comment on, nine U.S. Geological Survey (USGS) reports. The reports contain new information pertinent to the 9 January 2007 proposed rule to list the polar bear (*Ursus maritimus*) as a threatened species under the Endangered Species Act (ESA). The Marine Mammal Commission initially commented in support of the proposed listing by letter of 9 April 2007. The Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the new reports and provides the following recommendations and supplemental comments on the proposed listing.

RECOMMENDATIONS

<u>The Marine Mammal Commission recommends</u> that the Fish and Wildlife Service—

- list under the ESA all populations of polar bears as threatened throughout their range in the foreseeable future (45 years), with the exception of those populations that inhabit the divergent ice and seasonal ice ecoregions; and
- list those populations of polar bears that inhabit the divergent ice (southern Beaufort Sea, Chukchi Sea, Laptev Sea, Kara Sea, and Barents Sea populations) and seasonal ice ecoregions (western Hudson Bay and southern Hudson Bay populations) as endangered under the ESA.

RATIONALE

We offer the following explanation and rationale for our recommendations.

Listing standards

The ESA defines a threatened species as one "which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." In turn, the Act defines an endangered species as one "which is in danger of extinction throughout all or a significant portion of its range." Section 4(b) of the ESA specifies that listing determinations are to be made "solely on the basis of the best scientific and commercial data available…." It is against this statutory framework that our recommendations and comments have been developed.

Although the Act requires the Service to use the best scientific and commercial information available in determining whether a species warrants listing under the Act, it does not require that the information make an incontrovertible case that, absent human intervention, a species will in fact decline to extinction (in the case of an endangered species) or decline in the foreseeable future to the point where it is in danger of extinction (in the case of a threatened species). Rather, to warrant listing as endangered, the Act only requires that there be a reasonable basis for believing that a species is in danger of extinction. To warrant a threatened listing, decisionmakers need only a rational basis for concluding that it is reasonably likely that the threats facing a species will pose a risk of extinction in the foreseeable future. The Commission believes that the papers made available by the Service make a compelling case that polar bears as a circumpolar species face threats that are likely to reduce their numbers in the foreseeable future to the point where the risk of extinction is significant and, based on the projections in those reports, that some populations already are in danger of extinction unless the declining trends in sea ice coverage observed in recent years are somehow reversed. There is no present reason to expect such a reversal.

Polar bear natural history

The availability of sufficient sea ice is critical to maintaining the health and reproductive potential of individual polar bears and, as such, sea ice is key to maintaining the health and stability of polar bear populations. Polar bears use and depend on sea ice as a platform to hunt their primary prey, ringed seals and, to a lesser degree, bearded seals. As the amount of sea ice recedes, the bears' feeding season is likely to be shortened or they may be displaced to areas with persisting ice (e.g., farther offshore) where seals may be less abundant. Young ringed seals are the most important component of the prey available to polar bears, and their survival also is likely to be affected by earlier ice breakup, warmer temperatures, and early-season rain. In addition, sea ice is important to bears for facilitating seasonal movements, providing a platform where most mating occurs and, in some areas, particularly in northern Alaska, providing maternity denning habitat. It therefore is reasonable to expect that declines in the coverage and quality (e.g., thickness) of sea ice will negatively affect the health of polar bears, their survival, their reproductive potential, and, ultimately, the status of polar bear populations.

The available data on sea ice are consistent with the widely held view that, by the middle of the 21st century, the reduction and, in many places, the disappearance of sea ice will put certain populations of polar bears at an increased risk of extinction. The analyses of the southern Beaufort Sea polar bear population prepared by USGS indicate that the condition of bears, the recruitment of cubs to the population, and the demographic trends of the population are all declining as the duration of the open-water period increases. In addition, scientists in Alaska are observing a shift toward land-based denning, abandonment of areas with high rates of ice degradation, and starved and cannibalized polar bears, all of which are signs of a population under stress. Opponents of the Service's listing proposal will no doubt argue that these results are preliminary, the correlations equivocal, polar bears will simply adapt, and thus the basis for listing is equivocal. The Marine Mammal Commission disagrees with such arguments. First, the statute requires that the Service use the best available information in making a listing decision, not that it wait until the data are extensive

enough to provide absolute certainty that the observed trends are going to continue. We believe that the papers and analyses circulated by the Service for public comment constitute the best scientific information currently available and provide a strong basis for evaluating the risk of extinction faced by this species. Second, although quantitative predictions of sea ice retreat and associated declines in polar bear populations include varying degrees of uncertainty, the existing evidence is more than sufficient to support the view that sea ice, particularly in certain areas used by polar bears, is changing in ways that are detrimental to the persistence of polar bear populations. The patterns of environmental change that will likely occur are not identical throughout the Arctic. In some areas, sea ice is breaking up earlier so that bears have less time to feed and acquire the fat needed to survive their seasonal fasting period in good enough condition to support reproduction. As already observed in the western Hudson Bay area, ice is breaking up earlier and freezing up later, resulting in a longer fasting period with greater energetic demands on the bears during the summer-fall fasting season. In other areas, the period during which summer sea ice remains over the productive waters of the continental shelf is declining, and bears are being forced to spend the summer in relatively unproductive areas over the deep waters of the polar basin. Third, the linkages between sea ice retreat and adverse effects on polar bears established empirically in the USGS papers are consistent with current scientific understanding of polar bear natural history and population dynamics.

Model selection and validation

Because of the causal link between the availability of sea ice, particularly annual ice over the continental shelf, and the status of polar bear populations, a crucial question is whether the reductions in total amounts of sea ice predicted in the USGS papers are reasonably likely to occur. The Commission believes that the models used were chosen with objectivity and rigor and that the projections made constitute the best available scientific information. The USGS examined the range of available models, compared their predictions with data from the recent past, and then used the set of models giving results most consistent with observed ice trends as quantified from satellite sensor records. This approach ensures that the best available information is used to hone predictions of sea ice reduction that, in the absence of a model selection procedure, would otherwise be much more wide-ranging and less reliable. The approach used by the USGS is state-of-the-art scientific and statistical practice for selecting and validating predictive models, and such procedures are commonly used to identify the best scientific information available.

Although a number of the models used in the USGS projections indicate a rapid decline of sea ice, they do not yet take into account sea ice observations from 2007. Minimum sea ice coverage in 2007 declined to a new historical low of slightly more than 4 million square kilometers. This is about 1 million square kilometers less than the previous minimum coverage, observed in 2005, and reflects a nearly 40 percent reduction in ice coverage compared to the average for 1979 through 2000. Importantly, this reduction included not just seasonal ice but multi-year ice as well. If data from 2007 had been used in the USGS modeling, projected ice coverage in future years would likely be lower and impacts to polar bears greater than are reflected in the current analyses. In addition, certain other factors that are likely to increase warming in Arctic areas and lead to further reductions in the extent and quality of ice are not accounted for in the Intergovernmental Panel on Climate Change (IPCC) models used in the USGS analyses. These include projected increases in the release

of greenhouse gases from the thawing of permafrost and the albedo effect that will increase thermal absorption as ice coverage diminishes. Finally, it should be noted that projections of change in Arctic conditions related to climate warming have repeatedly underestimated the rate of those changes, and it is not yet clear that all the pertinent factors are understood and accounted for. For example, there are new hints in the data of an accelerating loss of winter sea ice. Thus, the models used by USGS to assess the threats to polar bears may well prove to be overly conservative.

Listing by ecoregion

Model projections of sea ice coverage over the next several decades indicate that changes will vary across the range of polar bears. The Commission believes that the Service has responded appropriately to these differences by identifying four separate "ecoregions" and completing a separate analysis for each of them. Based on the similarity within those regions and the types and scales of the threats faced by the polar bear populations that inhabit them, the Commission concurs that the four ecoregions constitute appropriate subunits on which to assess extinction risks for polar bears.

The modeling and other analyses completed by the USGS indicate that polar bears inhabiting the seasonal sea ice ecoregion and the divergent ice ecoregion face the greatest and most immediate risk of extinction. Three of the nine new papers assess the likely impact of sea ice loss and related changes on the southern Beaufort Sea population, which is the polar bear population occurring in the divergent ice ecoregion for which the best data are available. The authors of those papers predict that, if the ice conditions that have been observed since 1979 persist into the future, the population can be expected to decline by about 1 percent per year and to be at a level between 1 and 10 percent of its current number by the end of the century. If, on the other hand, ice conditions remain similar to those observed during 2004 and 2005, "the population would decline precipitously within 45 years." Using a variety of forecasts of sea ice conditions, the USGS projected that this population could be extirpated within the next 100 years and more likely within the next 50 years. Based on these projections, the Commission believes that the southern Beaufort Sea polar bear population should, at a minimum, be listed as threatened. However, these projections also indicate that, barring some intervening factor to reverse the projected trends in sea ice loss, this population is already at the point where it should be considered sufficiently in danger of extinction to warrant listing as endangered. Based on similarities between the southern Beaufort Sea and the four other areas categorized as belonging to the divergent ice ecoregion, the Chukchi Sea, Laptev Sea, Kara Sea, and Barents Sea polar bear populations all face threats of similar magnitude and also merit a listing status of endangered.

Projections of future trends for polar bear populations that use the seasonal ice zone also are dire. Recent studies have shown declines in body condition and a significant decline in numbers (minus 22 percent) for the western Hudson Bay population between 1987 and 2004. In the adjacent southern Hudson Bay area, polar bears have shown significant declines in body condition since the mid-1980s. Although it is reasonable to assume that such changes will influence cub production and survival, a decline in abundance has yet to be measured. This difference may be attributable to the longer persistence of sea ice in the southern and eastern portions of Hudson Bay, which has not yet

changed as drastically as in the western portion of the bay or, conceivably, could be a function of "measurement error" related to the timing and resolution of surveys. In either case, a measurable decline can be expected in what already appears to be a nutritionally stressed southern Hudson Bay polar bear population if sea ice patterns continue to change as predicted. Using a Bayesian modeling approach, the USGS forecast that the Hudson Bay populations and others that inhabit seasonal ice habitats are likely to be extirpated by the middle of this century. Therefore, these populations, like those in the divergent ice ecoregion, merit a listing as endangered at this time.

Based on the USGS modeling and analyses, the polar bear populations in the convergent ice ecoregion and the archipelago ecoregion have the best prospect of persisting into the next century. But even in those areas, the populations are at risk of extinction, primarily because of the projected loss of sea ice. The Bayesian modeling exercise predicted that polar bears in the convergent ecoregion will face a considerable risk of extirpation within 75 years. Even in the archipelago ecoregion, where some modeling scenarios suggest persistence of ice into the next century, the populations are likely to be reduced in both numbers and range by the end of this century. Therefore, these populations clearly qualify to be listed as threatened under the ESA.

Foreseeable future

What constitutes the "foreseeable future" for purposes of determining whether a species merits listing as a threatened species? This question has been discussed at length by those involved in the polar bear listing proposal. When it examined the status of polar bears, the Polar Bear Specialist Group of the IUCN–The World Conservation Union adopted a 45-year period based on guidelines that refer to a timescale of three generations (15 years is the calculated generation time in the case of the polar bear) for assessing population trends. Listing determinations for other marine mammal species have sometimes considered longer periods because recovery is a function not only of the generation time but, ultimately, of the potential growth rate of a population, the extent to which it is depleted, and the extent to which risk factors impeding recovery are successfully addressed. In at least some respects, our ability to foresee the future may well exceed 45 years. For example, the existing IPCC models have been used to project sea ice recession to the end of the 21st century, partly because of the considerable lag time between the generation of greenhouse gases and their absorption or modulation by the atmosphere and ocean.

The determination of what constitutes the foreseeable future also should take into account our ability to identify, characterize, and effectively address the processes that result in conservation problems for marine mammals, including their root causes. Realistically, human action to address such processes often requires decades, if not longer, even for threats that appear to be far more tractable (e.g., ship strikes, entanglement in debris). In the present case, the underlying threat to the persistence of polar bears has temporal characteristics that allow one to project that actions will need to be taken well into the future. For all these reasons, the Commission believes that 45 years is the minimum foreseeable time frame for taking into account pertinent biological, ecological, and management considerations.

Secondary risk factors

Each of the new analyses prepared by the USGS underscores ongoing and projected reduction in sea ice habitat as the primary threat to polar bears. This threat fits squarely within the first listing factor enumerated under section 4(a)(1) of the ESA—the present or threatened destruction, modification, or curtailment of a species' habitat or range.

Secondary factors, such as reduced prey abundance, disease, and even predation by adult male polar bears, also may take on added importance as available sea ice habitat shrinks and the number of bears dwindles, although trends in these responses have not been demonstrated at this point. In addition, sea ice is a major physical determinant of ecosystem productivity in the Arctic region, and changes in its seasonal occurrence and distribution may fundamentally change the structure of the Arctic ecosystem through effects on productivity and the entire Arctic food chain, including species such as Arctic cod and ringed seals. The multiple possible mechanisms of ecosystem alteration mean that conditions could change rapidly and in ways not easily predicted by an extrapolation based only on a single physical parameter, i.e., extent of sea ice.

In addition, declining sea ice is likely to lead to increasing indirect effects on polar bears as human activities such as shipping, commercial fishing, oil and gas development, tourism, and coastal development expand in the Arctic. The Bayesian network model developed by the USGS illustrates the many changes that may occur and the multiple factors that pose risks to polar bear populations. Although we believe the predicted loss of sea ice by itself constitutes a threat sufficient to warrant ESA listing, it will ultimately be the cumulative effect of all such risk factors that determines the fate of polar bear populations.

Efficacy of existing conservation efforts

In making a listing determination, the Service also is required to consider efforts being taken by states and foreign nations to protect the species. Several ongoing conservation programs are designed to protect polar bears both domestically and internationally, including the multilateral Agreement on the Conservation of Polar Bears, the recently concluded bilateral agreement between the United States and Russia concerning the shared Chukchi/Bering Sea stock of polar bears, and the Native-to-Native agreement governing the hunting of polar bears from the southern Beaufort Sea stock shared by the United States and Canada. Although efforts under these agreements, as well as ongoing domestic actions, are laudable and important, none of them adequately mitigates the primary threat faced by polar bears today, loss of sea ice habitat. The Commission therefore concludes that the conservation tools provided by the ESA are essential to preventing polar bear populations that are now threatened from becoming endangered and those that are now endangered from becoming extinct.

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The Commission commends the Service and the USGS for their efforts to develop new models and analyses related to polar bears and their sea ice habitat for use in a listing determination.

The agencies have responded well to a call for additional analyses by producing, within a short period of time, nine peer-reviewed papers that are informative, insightful, and directly relevant to the critical issues at hand. As reflected in our comments, we believe that these papers represent the best scientific information available on several of the key points. When taken as a whole, they present a bleak picture of the survival prospects of most populations of polar bears, absent rigorous management of the underlying factors driving climate change. The new information and analyses by the USGS make a convincing case that listing is warranted, and the ESA provides tools essential for conservation in the face of such a challenge.

Please contact me if you have any questions about these recommendations and comments.

Sincerely,

Timothy J. Ragen, Ph.D.
Executive Director

cc: The Honorable Dale Hall
        The Honorable Dirk Kempthorne
        Mr. Tom Melius
        Mr. Todd Willens