

COMMENTS

ON DRAFT STATUS ASSESSMENT IN RESPONSE TO A PETITION TO LIST POLAR BEARS AS A THREATENED SPECIES UNDER THE U.S. ENDANGERED SPECIES ACT

The document submitted for comments, titled "DRAFT STATUS ASSESSMENT IN RESPONSE TO A PETITION TO LIST POLAR BEARS AS A THREATENED SPECIES UNDER THE U.S. ENDANGERED SPECIES ACT," is actually a detailed analytical review of the status of Arctic polar bear populations, including Alaska coastal polar bear populations. The document focuses on a description of the most important aspects of the ecology, biology and behavior of the polar bear, as well as its habitat and the effects of natural and anthropogenic factors on populations. The document also gives a brief overview of international legal documents and legislation in the U.S. and other Arctic nations pertaining to conservation and use of the polar bear and/or its habitat. The document is based on published scientific research from various Arctic countries as well as traditional knowledge of Arctic indigenous peoples.

In the overview particular attention is paid to work citing data on the impact of climate change on the polar bear and its major prey, ringed seals. Numerous examples are given in the document to prove the effects on polar bears of global warming, which is most strongly felt in the earth's polar regions. According to some predictive models the current continuing climate warming in the Arctic may result in a sharp decrease, particularly in summer, of the area, thickness and compactness of the ice cover, which is a key element of polar bear habitat. Climate warming may also bring about changes in species composition and the structure and functioning of marine ecosystems, whose components include polar bears and their prey.

The draft status assessment also surveys a significant number of published works on the current and potential impact on polar bears and their prey of various anthropogenic factors, such as exploration and development of oil and gas resources, intensive use of Northern shipping channels, intensive fishing, and environmental pollution. The document shows that these as well as other anthropogenic factors are a real or potential threat to a number of polar bear populations inhabiting circumpolar regions and, in particular, to populations inhabiting the seas bordering Alaska, i.e., the Alaska-Chukotka population and southern Beaufort Sea population.

In general, the materials included in the draft status assessment justify the inclusion of polar bears inhabiting Alaska coastal areas in the list of threatened species under the U.S. Endangered Species Act.

Certain inaccuracies and repetitions found in the draft are minor and easily eliminated. On the whole the draft deserves a positive evaluation. Its scientific data and conclusions are valid and well-founded.

> Date: 07/06/2006 09:46AM

> Subject: Peer review

>
> Dear Kurt and Scott: I have completed my review of the Polar Bear Status
> Assessment. The cover letter I received doesn't make it clear where I
> should send the review, so I'm sending it to the two of you in the hopes
> that one or the other of you is the right person or, if not, that you'll
> know where it should go and will either forward it or send me the correct
> address. Thanks very much. The review is in two parts, the text provided
> below, plus, more importantly, the explicit suggested changes, which are
> provided in an annotated version of the Word file of the draft document.

> [http://www.usfws.gov/.../polarbear/.../polarbear_status_assessment.doc](#), and let me know whether you were successful in doing the
> download. Thanks very much. The file will automatically be removed from
> the website after 15 days.

> With best wishes,

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> Review of "Status Assessment in Response to a Petition to List Polar Bears
> as a Threatened Species Under the U.S. Endangered Species Act".

>
> This document is very well written and very informative. I have annotated
> the Word document with my suggested revisions, which are on pp. 11, 14,
> 20, 21, 23-32, 39-42, 52, 58, 62-70, 73-79, 82-85, 89, 92-94, 97-101, 104,
> 106-107, 115, 122-123, 125-126, 129-131, 133-136, 138, 142, 144-145,
> 148, 159, 162-164, 167-168, 174, 177-180, 187, 192, 201, 208, 211, 217,
> 226, and 228 of the annotated version. The changes include some trivial
> editorial changes as well as more substantive revisions. Almost all are

> self-explanatory. Here are some comments regarding changes that are not
> self-explanatory:
>
> p.23 - The Cavalieri et al. (1997) article was a 3-page preliminary
> article giving a preview of results that came out in full in Parkinson et
> al. (1999; 20 pages, on the Arctic) and Zwally et al. (2002; 21 pages, on
> the Antarctic). Now that the full articles are out, they're the ones that
> should be referenced, not the preliminary Cavalieri et al. article. (All
> three articles are by the same set of five authors.)
>
> p.24 - The first full paragraph on this page needed substantial revision
> to reflect properly the climate impacts of sea ice and to make several
> corrections (e.g., eliminating the erroneous outdated implication that the
> circulation in the Canada Basin is consistently clockwise and the
> erroneous suggestion that all the ice entering Baffin Bay from the
> Canadian Archipelago ends up reaching Newfoundland).
>
> p.27 - The description of recurring polynyas needed to be corrected.
>
> p.27, first sentence of the second paragraph - From the discussion in the
> subsequent two sentences, it seems that "greater than" should be "less
> than", although I'm not a polar bear expert and so just raise the issue of
> consistency among the three sentences.
>
> p.29 - If the year 1989 is to be retained in the sentence on decadal-scale
> fluctuations, then a reference should be given that explains the
> importance of that year. I've instead redone the sentence in the annotated
> version, including removal of 1989. I think the revised sentence, without
> a specific year highlighted, is more justifiable.
>
> p. 63 - The Rothrock et al. (1999) study was updated (by the same authors)
> in Yu et al. (2004) after they had a chance to incorporate more of the
> submarine record.
>
> p.70 - Many recent studies indicate that the Greenland ice sheet is
> decaying.
>
> p.94 - Saying that most female polar bears will be unable to reproduce
> somewhere between 2012 and 2104 seems like an excessively wide range
> (i.e., 6-98 years from now). It seems the range should be narrowed or at
> least a comment should be made about how broad a range it is, perhaps
> reflecting extreme uncertainty.
>
> p.99 - The deleted sentence near the bottom of the page is because the
> same quote appears in the previous paragraph.
>
> p.115 - The Kane Basin rate of harvesting (10 per year, from a population
> of approximately 165 polar bears) seems particularly sad (way too high).
> The quota of 3 bears set for M'Clintock Channel's population of 284 bears
> seems far more reasonable.
>
> p.123 - The sentence "Cannibalism has also been documented in polar bears"
> seems out of place, as it seems the previous paragraph was also discussing
> cannibalism by polar bears.
>
> p.131 - The 3-generation calculation was very unclear as written; I've
> tried a rewrite that I hope is better.
>
> p.148 - It seems that experimental studies like the St. Aubin (1990) study
> should be banned. The sentence that I added to this effect could probably
> be worded better, but in a document concerned with polar bears and

> appropriate regulations regarding them, it seems that something along the
> lines of what I wrote should be included.
>
> p.162 - I changed "A majority of the climate models" to "Data analyses"
> because the references listed seem to be observational studies rather than
> modeling studies. It would be okay to keep the original wording if the
> list of references were to be changed appropriately.
> p.177 - I deleted the sentence on 40% reduction of sea ice thickness
> because of its being unnecessary and outdated (see comments above
> regarding p.63).
>
> pp.187, 192, 201, 208, 211, 217, and 226 - I've filled in some of the
> references and added the ones that I added to the text.
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>

July 26, 2006

Mr. Scott Schliebe
Marine Mammals Management Office
U.S. Fish and Wildlife Service
1011 E. Tudor Road
Anchorage, AK 99503-6199

Dear Mr. Schliebe:

Thank you for the opportunity to peer review the U.S. Fish and Wildlife Services (USFWS) draft status assessment of the polar bear.

Comments have been submitted using the reviewer/comment function, as requested. We did have a few general comments that are provided below.

The draft status assessment provides substantial information on the five listing factors (i.e., threats), but this information is presented in a general manner without an evaluation of the relative impact of how these factors may influence the persistence of polar bear in the foreseeable future. For example, the threat of climate change will have a relatively high impact on persistence, whereas intraspecific predation will have a relatively low impact. Such an evaluation of the five listing factors would, in part, provide a basis to determine if the petitioned action is either warranted or not. If such an evaluation had been included in the draft and made available for peer review, important information could have been provided by reviewers to the USFWS to assist in their decision whether or not to list polar bears. In the required upcoming 12-month finding, we request that the USFWS provide sufficient detail on how the five listing factors were evaluated in the listing decision. This will allow people to provide more thorough comments during the public review.

Other important points to consider:

- 1) It is important to make a clear distinction between the survival strategy used by Hudson Bay polar bears and the much different strategy used by the other populations of polar bears. Differences are noted in some sections but in other sections studies from Hudson Bay are presented without clarifying how results might be different in other populations.
- 2) Polar bears have the ability to enter into an energy conservation mode that allows them to survive long periods of fasting. This is a well known fact regarding Hudson Bay bears, but is also evident for other populations. This ability could give polar bears an advantage for dealing with predicted changes in their environment that would not require adaptation at an evolutionary time scale.

- 3) The summary of changes in ice and models for the Arctic do not include a discussion of a recent change in the Arctic Oscillation that some oceanographers believe (Dr. Mark Johnson at UAF, for example) will help retain old ice in the Arctic Ocean over summer and allow ice to build again in winter. It would be useful to include an evaluation of our most recent winter 05/06, which was a heavy ice year and a late spring in Alaska. Does this fit within the models that are being used to make ice predictions for the future? We suggest the final status evaluation present a more critical and broader review of the literature that predicts ice conditions in the future.

- 4) The harvest of polar bears is given significant emphasis, but few jurisdictions allow a harvest, and jurisdictions where a harvest is allowed have excellent management programs and over harvest is not a concern. Illegal taking in parts of Russia is a potential concern, but the recent bilateral agreement between the U.S. and Russia should provide a mechanism to curtail illegal harvest in Russia.

I hope our comments are useful.

12

Sincerely yours.

Scott L. Schliebe
Polar Bear Project Leader
U.S. Fish and Wildlife Service/MMM
1011 E. Tudor Road
Anchorage, AK 99503

July 11, 2006

Dear Mr. Schliebe,

As requested, I have completed my review of "Draft Status assessment in response to a petition to list polar bears as a threatened species under the U.S. Endangered Species Act" prepared June 23, 2006 by Scott Schliebe, Thomas Evans, Kurt Johnson, Michael Roy, Susanne Miller, Charles Hamilton, Rosa Meehan, and Sonja Jahrsdoerfer. I reviewed the whole document although my knowledge varies with the different components of the document.

In general, I found the document very well written and a thorough coverage of the issues as they pertain to the ecology of polar bears and the conservation and management of the species throughout their range. I found no instances of incorrect interpretation of the literature and I believe the document addresses the issues covered to the extent of the knowledge present in both the primary literature and in the grey literature.

The structure of the document is logical and presents a thorough overview of the ecology of polar bears, their management, and the threats. The use of the literature is broad in most instances but where I thought the literature could be expanded, or alternate references used, I have included them. The literature is current and makes logical use of older and recent references. I believe there is no bias in interpretation within the document and it makes a balanced presentation on the state of our knowledge of the situation.

One area that was absent in the document was a synthesis of the interactions of the various threats. These interactions came up periodically but there was no cumulative impact assessment that might allow greater insight into the interactions between various components. Given the depth that each section was given, it is not a major issue and in all likelihood, would have been a speculative undertaking without major quantification and modelling of the issues.

Should you require any further information on my comments or suggestions, please feel free to contact me and I will endeavour to assist as best I can.

I have used the track changes function in Word to note issues that I have with the document.

Sincerely yours,

Original signed

Date: 24/07/2006

J.no.:

Letter no.:

Drs. Gary Edwards (acting Regional Director)
Scott Schliebe (Wildlife biologist)
US Fish and Wildlife Service
1011 E. Tudor Rd.
Anchorage, AK 99503-6199, USA

Dear Drs. Edwards and Schliebe:

In this letter I forward my comments to the status assessment of polar bears. My comments of a more substantial nature are given in this letter (below) whereas other comments have been written directly in the attached version of the electronic copy of the draft (hence, please scroll you my the text carefully to find my comments etc.).

Thank you for allowing me to review the draft. Hopefully my comments can be of some help in the further process.

Yours sincerely

to:

DRAFT - STATUS ASSESSMENT IN RESPONSE TO A PETITION TO LIST
POLAR BEARS AS A THREATENED SPECIES UNDER THE U.S. ENDANGERED
SPECIES ACT - Prepared and Edited By (Tentative list of contributors) Scott Schliebe, Thomas
Evans, Kurt Johnson, Michael Roy, Susanne Miller, Charles Hamilton, Rosa Meehan, Sonja
Jahrsdoerfer | U.S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, Alaska.

Generally, I find that the review is thorough and presents the relevant information on the situation of polar bears in relation to an evaluation of the potential effects of global warming and other man-induced impacts on the species.

Throughout the DRAFT, I have inserted specific comments (copy with my inserted suggested corrections/changes attached) but I have also these overall comments to the draft:

(1) A section is needed on the history of polar bears (and at least also the ringed seal to which polar bears have adapted as a predator) during glacial and inter-glacial stages. I a few places in

the text the fact that polar bears earlier have experienced periods of relative warming of the climate is noted. However, the fact that this species has survived at least one inter-glacial (i.e. the Eem Interglacial ca. 115 000 – ca. 140 000 before present) and the Holocene “climate optimum” (ca. 8 000 – 4 000 B.P.) during which period temperatures were elevated (see e.g. references at the bottom of this note), and higher than at present, calls for a more thorough treatment of the fate of polar bears during their evolutionary history. I realise that the information on the species during those early days is very scanty (and I must emphasize that I am not an expert in neither palaeontology nor past climate). However, some considerations on whether or not ice (“polar bear habitat”) and their main prey ringed seals were completely absent (or present in some parts of the range of the polar bears) during earlier warm periods must be presented. Apparently, some of the pre-historical shifts in overall climate were pretty rapid - although likely not as rapid as seen right now. Basically, I do not dispute that polar bears are facing grave problems with the warming of the Arctic as seen now but I miss “the long view back” to put the present and future situation in perspective.

Given the fact that polar bears have survived other warm periods I personally doubt that they will be come extinct “as a species” as suggested by some researcher. However, the rapid deterioration of their habitat that they experience now (and likely will in the foreseeable future) is likely a critical threat to the species in significant portions of their range.

Dansgaard, W., Johnsen, S.J., Clausen, H.B., Dahl-Jensen, D., Gundestrup, N.S., Hammer, C.U., Hvidbjerg, C.S., Steffensen, J.P., Sveinbjörnsdottir, A.E., Jouzel, J. & Bond, G. 1993. Evidence for general instability of past climate from a 250-kyr ice-core record. - *Nature* 364: 218-220.

Johnsen, S.J., D. Dahl-Jensen, W. Dansgaard & N. Gundestrup 1995: Greenland palaeotemperatures derived from GRIP bore hole temperature and ice core isotope profiles. *Tellus* 47B: 624-629.

Dahl-Jensen, D., K. Mosegaard, N. Gundestrup, C.D. Clow, S.J. Johnsen, A.W. Hansen & N. Balling 1998: Past temperatures directly from the Greenland Ice Sheet. *Science* 282: 268-271.)

(2) I lack a more in depth treatment of the fate of the other ice breeding seals (and polar bear food) such as for example harp and hooded seals or ribbon and spotted seals. If these are supposed to represent alternative food sources for polar bears in a situation where ringed seals decrease it is not unimportant what happens to these other ice breeders. There are for example studies showing that harp seals may also suffer due to lack of good breeding substrate.

For inspiration about this matter, an excerpt from Born 2005 are given here (Born, E.W. 2005: Robben and Eisbären in der Arktis: Auswirkung von Erderwärmung un Jagd (Arctic pinnipeds and polar bears: Effects of warming and exploitation), p. 152-159. In: J. L. Lozán, H. Grassl, H-W. Hubberten, P. Hupfer, L. Karbe and D. Piepenburg. Warnsignale as den Polarregionen (Warning signals from the Polar regions. Wissenschaftliche Auswertungen, Hamburg):

“Early ice break-up in years with “light” ice conditions may also influence other ice-breeding pinnipeds than ringed seals. Extremely small sized 1981 year-class of harp seals in eastern Canada and high juvenile mortality from starvation and cold stress was likely due to light ice conditions during 1981 (SERGEANT 1991) indicating that early ice breakup at the harp seal whelping patches may lead to increased mortality (JOHNSTON ET AL. 2005). One may speculate if early ice break-up may also negatively influence other ice breeding pinnipeds like the ribbon and spotted seals of the Bering Strait region.

Yearly variation in sea ice cover may have significant effects on harp and hooded seals. In light ice years the quantity of ice that is appropriate for whelping can be greatly reduced, and female seals may crowd into whelping areas and produce pups in high densities (JOHNSTON ET AL. 2005). It has been suggested that such crowding may increase the risks of disease transmissions and subsequently the risk of epizootics (FAY 1974) but the effects of crowding at

the harp and hooded seal whelping patches are largely unknown (JOHNSTON ET AL. 2005). Repeated years (1967, 1981, 2000, 2001 and 2002) with little or no ice in the Gulf of St. Lawrence resulted in years with almost zero production of harp seal pups, compared to hundreds of thousands in good ice years (ACIA 2004). Hooded seals may shift to heavier ice for whelping. Shifts to heavier ice for whelping in the more northerly whelping areas reportedly occur during periods of warmer climate and diminished ice (BURNS 2002A). In recent years the position of the hooded seal whelping patch near Jan Mayen has changed position likely as effect of a decrease in sea ice in East Greenland, and the number of seals there has decreases (T. HAUG, pers. comm. 2005)".

Fay, F.H. 1974. The role of ice in the ecology of marine mammals of the Bering Sea, pp. 383-399. *In*: D.W. Hood & E.J. Kelley (eds.). *Oceanography of the Bering Sea*. University of Alaska, Fairbanks.

Johnston, D.W., A.S. Friedlaender, L.G. Torres & D.M. Lavigne 2005. Variation in sea ice cover on the east coast of Canada from 1969 to 2002: climate variability and implications for harp and hooded seals. *Climate Research* 29: 209-222.

Sergeant, D.E. 1991. Harp seals, man and ice. *Canada Special Publications Fisheries and Aquatic Science* 114.

24 July 2006

Mr. Gary Edwards
Acting Regional Administrator
U.S. Fish and Wildlife Service
1011 East Tudor Road
Anchorage, Alaska 99503-6199

Dear Mr. Edwards:

Attached is an electronic copy of the Alaska Region's draft Status Assessment of Polar Bears, with comments primarily from

review the document because of his extensive experience and knowledge of marine mammals in Alaska, his editing skills, and his ability to review and organize large and complex analyses. I am confident that you will find his comments on the draft assessment insightful and constructive.

In its current form, the assessment provides extensive information, and such a comprehensive summary of information on a species always provides a useful reference. However, for your purpose here—determining whether the polar bear warrants listing under the Endangered Species Act—I believe a more directed, concise analysis of the pertinent considerations would be more appropriate; comments will help a great deal in this regard. In general, his edits—

- improve the readability of the assessment;
- help identify inconsistencies in the information presented;
- identify unnecessary and redundant information;
- identify areas where the analysis could be strengthened, such as by including citations; and
- help focus the analysis on the key considerations.

so suggests ways that the presentation of information might be restructured, and this is where I think the analysis might be improved the most. Conceptually, the types of information needed for this analysis are—

1. the biology and ecology of the polar bear, including its life history, natural history, habitat, prey, parasites, etc.;
2. the status of polar bear populations, including their abundance, trends, size/sex/age structure, and vital rates;
3. present and future threats to the species including, but not limited to, climate change; and
4. a mechanism for determining the significance of those effects.

The draft analysis provides complete summaries of points one and two. The analysis also discusses some present and future threats, although it is not apparent that the discussions are comprehensive. Point four does not appear to have been addressed in a comprehensive way.

Although the information corresponding to points one and two are essential background, points three and four are in many ways the heart of the analysis. With that in mind, it might be useful to insert a new section between items IV and V that lists present and future threats to polar bears including, but not limited to, climate change. This section could provide a narrative description of the threats, and it could also be used to identify hypotheses about potential effects on polar bears. Specifically, it could be used to create a table of hypothesized effects with threats listed in columns, polar bear biological and ecological attributes listed in rows, and hypothesized mechanism(s) of effect described in each cell. Column headings would include subsistence hunting, sport hunting, contaminants, human/bear interactions, disturbance, loss of prey secondary to loss of sea ice, increased exposure to pathogens, etc. Rows would include those parameters vulnerable to the threats such as growth, condition, age of first reproduction, natality, cub survival, juvenile survival, adult female survival, and adult male survival. The primary benefit of such a table is that it would provide the reader with a concise, defined set of hypotheses about the mechanisms by which current and future conditions threaten the persistence of polar bears. This comprehensive set of hypotheses could be used to structure your five-factor analyses. In its current form, the assessment provides an interesting and informative narrative describing how polar bears might be or are likely to be affected, but it is not clear how that information will be used to assess the significance of those effects.

With regard to the significance of effects, you could use your modeling efforts to define the amount of change required in individual and collective polar bear parameters (i.e., survival, reproduction) to cause negative population growth at a rate that would lead to extinction over a defined period of time. A table with all reasonable hypotheses and their predicted individual and cumulative effects on vital rates would provide a clearer basis for your analysis of extinction risk.

Regarding the length of time that should be used to estimate extinction risk, I believe a time frame of three generations is too short. I think we would all agree that a species declining at 50 percent per generation warrants special protection. Yet, a worldwide polar bear population of 20,000 animals declining at 50 percent per generation would still have more than 3,000 animals after three generations. An estimate of extinction probability might misrepresent the severity of the risk simply because the time frame used was too short. The same population would reach about 100 animals after eight generations, and for the purpose of determining the real risk of extinction, a time frame of 100-120 years seems to be a minimum feasible period. This period also is roughly consistent with the time frame used to model sea ice persistence. In addition, some precedence for this time frame has been or is being established in risk analyses for other species (e.g., large whales, right whales, manatees, Cook Inlet beluga whales). I would be happy to provide references and details if that would be helpful.

Finally, I believe that creating a table of explicit hypotheses would clarify the conceptual structure of the analysis and provide the reader a stronger basis for judging the soundness of the assessment and conclusion. Such a table would provide an explicit list of the threats considered and a clear format for evaluating the individual and cumulative significance of those threats.

Mr. Gary Edwards

24 July 2006

Page 3

In its current form, the draft assessment clearly demonstrates your staff's comprehensive knowledge and understanding of polar bears and their surroundings. The suggestions provided above are intended to help focus and direct the analysis of this information in a manner that gets at the question of extinction risk for polar bears in the clearest and most direct manner. This type of focus is always a challenge in large, complex analyses such as this.

Thank you for the opportunity to comment on the product of the extensive work already completed to address this important question. I hope you will contact me if we can be of further assistance regarding this analysis.

Sincerely

Dr. Gary Edwards
US Fish and Wildlife Service
1011 E. Tudor Rd
Anchorage, AK 99503-6199,
USA

Date: August 14, 2006

Your ref.:

Our ref.:

J.No.:

Dear Dr. Edwards,

Please find enclosed my comments to the status assessment of polar bears made by USFWS. In the present letter I list my general comment while specific comments are given directly in the manuscript.

Thank you for allowing me to review the assessment.

Best wishes

**DRAFT STATUS ASSESSMENT IN RESPONSE TO A PETITION TO LIST
POLAR BEARS AS A THREATENED SPECIES UNDER THE U.S.
ENDANGERED SPECIES ACT – Prepared and edited by Schliebe et al.**

1. In general I find the assessment very thorough. It reviews most of the relevant literature. In some places I feel that the authors have more knowledge of North American than European literature.
2. I miss an evaluation of how the polar bear as a species has survived climatic changes through its evolutionary history
3. I miss a chapter on the fate of all ice breeding seals (possible bear food) in a warming Arctic
4. I miss an evaluation of the change in fish and plankton communities (food for seals) as a reaction to climate change

Please see attached manuscript for more specific comments.

Comments on USFWS Draft Response to a Petition to List Polar Bears as a Threatened Species under the US Endangered Species Act.

and,

3 July 2006

General Comments:

Overall, this document does a reasonable job of giving a fairly good overview of the life and times of the polar bear. As it is only a draft, and it is clear that things are still to be added, some comments may just apply to things that are in the works but have not been put in yet.

Given that this document has been put together to provide the basis for response to a specific petition, I think it would be very helpful for any reader to have a *concise* summary of the main issue here before wading into the minutiae of the life of polar bears. What does the petition ask for? What is the framework within which the USFWS has to respond? What should members of the public be thinking about when they look at this document? Certainly, you could make this easier for them by editing the information around key questions rather than giving them the whole dump truck in one fairly unsorted load.

To me, the present document represents a great deal of work but lacks focus. I think it would be helpful to any assessor if the document framed more carefully and concisely what the central questions are, and then proceeded to summarize our knowledge in relation to those critical questions. Clearly, climate warming and maybe contaminants are issues. Why not state those, harvesting, and whatever other primary issues up front and then go ahead and explain what we know, or don't know, that enable us to evaluate them? Some of what you include in the text at the moment could better (and less distractingly) be in appendices. Most people will not read the whole document so give them 10 pages or so that go to the meat of the issue.

In this document, you do not venture out into an interpretation so I will make a few comments. I don't think polar bears are endangered, as a species, at the moment but it is likely their numbers will be significantly reduced in the southern parts of their population in 45 years, and moreso in 90, provided the predictions of the IPCC are more or less correct. I think you need to make this proviso very clear because in fact everything hinges on it. These are large predators that are not going to lie down under a tree and die if they are starving – they are going to look for alternate food sources. Some hunting, if only for protection of life and property, is going to continue. Some recognition and support of this will go a long way toward helping a relatively balanced management plan evolve that can address a variety of known, and as yet unknown, problems.

Some more specific comments follow:

p. 11 re: “walking hibernation”

The ms misses the most important point here and that is that polar bears, unlike brown or black bears can enter a hibernation-like state facultatively, as needed (Derocher et al. 2004). This means that bears can feed hyperphagically, both seasonally and when an unpredictable opportunity presents itself, and then slow down their metabolism to make their stored fat reserves last longer during periods of food shortage. This, combined with an ability to digest fat with an efficiency of 98%, is probably the most important single adaptation of polar bears to the arctic environment. This is what allows bears to fast for months on shore in Hudson Bay in summer or “shelter” in Viscount Melville Sound for several weeks at a time in winter.

p. 11, para 3, line 2: The original reference to “walking hibernation” is Nelson et al. (1983)

p. 13, Para 2: The data available also clearly indicate that the Baffin Bay population is being overharvested by at least double sustainable levels and is declining as a result, not increasing (see p. 56, para 2). Such inconsistencies in the report should be weeded out so conflicting information is not presented unless the basis for the conflict is clarified.

p. 14, para 1, line 3: suggest rewording to read, “... considered to be sufficiently discrete to be managed independently, based on behavioral ...”

p. 17, para 1, line 4: The main conclusion of Lunn and Stirling (1985) is not given correctly. The following is from the abstract: “There was no evidence that bears using the dump gained either reproductive or survival advantages. We conclude that polar bears will use supplemental food sources which are available, or if they have previously learned their location; however, it is not necessary for their survival.” This conclusion is far more important conclusion than noting that feeding at the dump might have been beneficial to a few individuals.

p. 37, para 1 & 2. Reference is made here to where RISKMAN can be obtained on the web. Here and elsewhere, the implication is that it is a proven and universally accepted tool. I believe it is very important to explain at some point that this is a work in progress; a tool in the developmental stage. It has failed at some point in a number of workshops because of some bug or another, which is always alleged to be minor. It is a useful tool for doing simulations and projections using provided, and varied values. The program has been used as such at meetings of the IUCN PBSG and internally in Canada. To date however, confidence is lacking and to my knowledge, only Nunavut uses it for actual management. Several involved polar bear scientists would say that far too much weight is put upon its reliability than may be warranted for an extremely complicated model that has not been thoroughly subjected to peer review.

p. 61, para 2, re: time frame for consideration. When one takes into consideration the IUCN criteria, the documented changes to date in both multi-year and annual sea ice, and the direction and projected rates of change in sea ice in future decades, the chosen range for consideration of 45-90 years appears completely reasonable for this assessment.

General comment on references: There are a lot of references to Stirling (1988) which is OK up to a point but where fairly technical material is being detailed, the document would appear more

scholarly if the authors went back to the original references. For example, on p. 74, last paragraph, there are several points raised to do with body temperature and walking speeds. This is all work done by Øritsland and his various students and summarized for a lay audience in Stirling (1988). The same comment applies to extensive citation of Derocher et al. (2004) which was itself a review paper but with references cited.

p. 76, para 2, sentence 1; There are data on the energetic costs of walking, e.g., Hurst et al. (1982) but what you mean here I think is there are no *comparative* data on the cost of walking vs swimming.

p. 77, para 2, Stirling et al. (1999) found a statistical correlation between year and breakup date of 0.7, which was just below the accepted level of 0.5. However, that was updated in Stirling et al. (2004, p.) as follows: “These results are consistent with a significant trend toward earlier breakup in the total area occupied through the winter by the WH bear population ($r = 0.497$, $df = 29$, $p = 0.0044$), as first reported by Stirling et al. (1999).”

p. 96, bottom para; I think there are two groups that will be most affected first, one of which is those around the polar basin as noted. The other is those that must fast for many months each year on land because most or all of the sea ice melts in summer. This includes Western Hudson Bay, Southern Hudson Bay, Foxe Basin, Davis Strait, and Baffin Bay. As the ice melts earlier and open water season grows longer, these bears will be affected earlier rather than later, similar to those that summer in the polar basin. The ones that will be affected last will be those associated with island archipelagos such as the Canadian Arctic Islands.

p. 96, bottom para, last sentence, Stirling et al. 1999 a better ref than 2004 here and Regehr et al. is also very good.

p. 98, bottom para: It is likely that some small number of polar bears will survive semi-indefinitely, even with the total loss of summer sea ice, provided there is still winter cover of some extent and some marine mammals continue to be available for capture or scavenging. It won't be very good for them probably but so long as ice persists for several months of the year, in some predictable area, the bears are unlikely to go extinct, in my judgment at least.

p. 103-104 (and maybe elsewhere), need to clarify that only Nunavut uses flexible quotas, RISKMAN, and so on for its management. This methodology is not used in NWT or any of the Provinces. A key argument for sport hunting used to always be that, because not all sport hunters were successful and unused tags could not be re-used by local hunters, the sport-hunt actually reduced the total harvest. This is still the practice in NWT but that policy has been reversed in Nunavut now so that all unused tags go back to the local Hunters and Trappers Organization for re-issue. (Note that the recent paper in Arctic by Freeman still, incorrectly, states that the sport hunter tags are not re-issued if the sport hunt was not successful.

It is also worth noting somewhere that although the modeling indicates a 2:1 sex ratio in the harvest is sustainable, in relatively unharvested populations, the adult sex ratio is usually 1:1. As a consequence of sex-selective harvesting, the sex ratio in some populations (e.g., WH) is now permanently skewed toward females). This skew also partially results from the focus of

sport hunters on larger males. The possible significance of these changes, or lack of them, over the longer term is unknown.

Ditto to above, the PBSG passed a resolution in support of use of the precautionary principle in managing polar bear harvests, at least in part because of the ongoing effects of climate warming. One of the main reasons for that was concern about rapidly changing sea ice environments as a result of climate warming.

p. 135, last para: Canada didn't delegate responsibility to manage polar bears. constitutional arrangement specifies that the Provinces and Territories have the authority to manage terrestrial wildlife. In Canada, the polar bear is not defined as a marine mammal.



07/09/2006 11:19 AM

cc

bcc

Subject RE: peer review of the US status determination re: listing polar bears under ESA

History:

This message has been replied to and forwarded.

Hello Scott.

My comments on the chlorinated hydrocarbon contaminants and metals sections of the US status determination for polar bears are embedded in the manuscript attached. In some cases I have added sentences or removed a few words as suggested changes. Generally they are just comments, however.

The bases have been very well covered. There were two instances where I added a reference you has missed. Otherwise, they literature is well covered. I believe that more work could be done to clearly state the significance of contaminants to Polar bears, past present and future. To do that also requires more synthesis of the temporal trend information.

Below is a copy of slide 1

plasma concentrations of PCBs in Svalbard bears given in two Norwegian studies to concentrations in adipose tissue lipids using conversion factors from Susan Polischuk's work and plotted them as yellow circles on the bar graph of trends in Hudson Bay bears. It is evident that Svalbard bears were not exceptionally contaminated in the late 1960s. In the late 1990s they were less than a factor of two higher than Hudson Bay bears. It is likely that steady state with global circulation of PCBs is gradually being reached which will result in quite uniform levels around the Arctic in future. However in the late 1980s and early 1990s, PCB concentrations were 2-4 times higher in Svalbard than Hudson Bay bears. Data from the circumpolar study published in 1998 suggested that Svalbard bears had 2-3 times higher concentrations. The Svalbard bears were sampled in 1990 for that study. The important thing to note is that we have likely not captured the peak of the Svalbard PCB contamination in any existing data sets. This quite possibly occurred in the mid-1970s to mid-1980s. Hypothetical backward extrapolation of the very steep decline in PCB concentrations in the early 1990s would lead to PCB concentrations in Svalbard bear adipose lipids as high as 100 ppm or more. This is the context needed for some of the effects observed in Svalbard bears. Note that the Polischuk data on mothers that did or did not keep their cubs suggest that the critical point for cub survival was somewhere between 1-6 ppm in milk lipid. (Note also that the interpretation of this study was incorrect in the text). There may not be a direct toxic link, e.g., cub survival could be the result of low fat content of the female which gets reflected as high PCB concentrations. However, *if* there is a toxic link between PCB concentrations and cub survival, it would fit with the lower cub survival noted by Derocher in Svalbard bears, and may also be the explanation for the scarcity of older females.

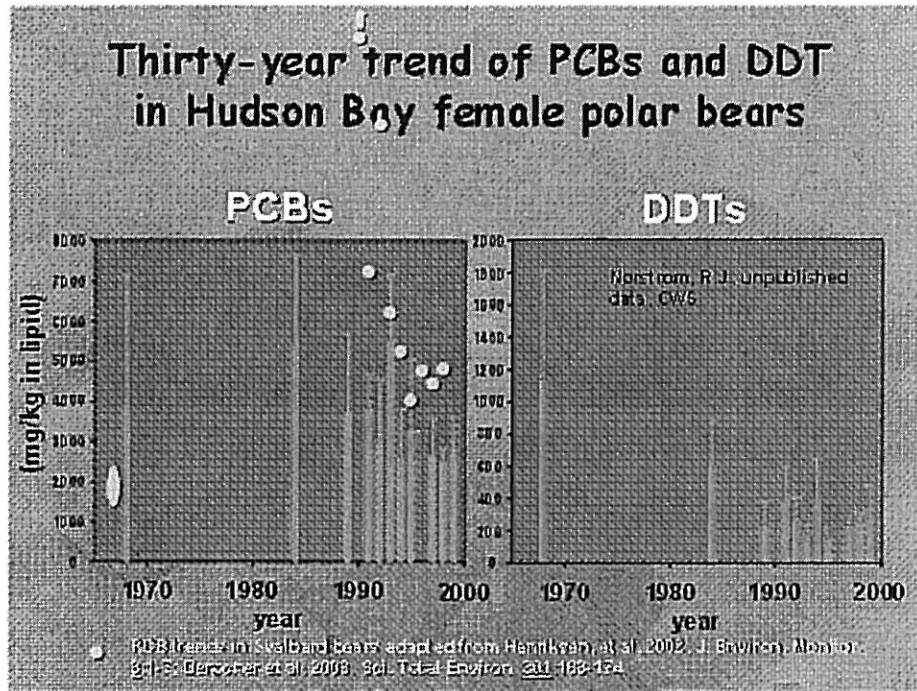
It would seem that the present levels of PCB (and oxychlorodane) contamination in polar bears are not exerting an influence at the population level. Reduced immune competence is something that would only be tested if an epizootic event occurred.

The big unknown is the influence that PFOS may be exerting. The discussion of this and related PFC chemicals missed the mark to some extent in my opinion. First of all the only tissue which has been studied in polar bears is liver. This appears to be the case for virtually all the other studies on wildlife. The only species in which we any decent tissue distribution studies is trout. Martin et al. showed that PFOS did not accumulate in lipid-rich tissues. It therefore incorrect to assume that polar bears are more contaminated with PFOS than PCBs. In the whole animal, there are still a lot more PCBs. However, from a toxicological standpoint, the very high concentrations of PFOS in liver may indeed be of significance.

We do not know whether the upward trends are continuing, but with doubling times of 10-13 years to 2002 for PFOS, and even shorter for some other PFCs, if there are effects, they will be even more evident.

The significance of PBDEs should be down-played relative to PFOS. Concentrations of PBDEs are not high enough to be of concern, and there is evidence that they have peaked. The chemicals of concern to polar bears at present are PCBs, PCB metabolites, oxychlorane and PFOS. The only one which may be increasing is PFOS. It may worth mentioning that PCDDs, PCDFs and dioxin-like PCBs are all at relatively low concentrations in polar bears (Letcher et al. 1996). There is low likelihood of CYP1A-related effects being seen in polar bears.

I hope this informal comment is of some benefit to your assessment.



Sincerely,

ESA

That would be perfect. Thank you in advance.

Review of Arctic Climate Change Section ()

The section on Arctic climate change is comprehensive and nicely written. The following are just suggestions to improve clarity and enhance presentation.

page 62, last paragraph: change the first sentence to "Sea-ice extent in the Arctic has a strong seasonal cycle."

page 63, change last sentence of the first paragraph as follows: "Record low minimum extents in the ice cover during the last four years (2002-2005) caused an acceleration of the negative trend in the extent of the perennial ice cover (i.e., summer ice minima) from -6.5% per decade to -8.5% per decade (Stroeve et al., 2006; Comiso, 2006).

p. 63, change last 3 lines of the last paragraph as follows:

"...(c) an increase in melt season length (Stroeve et al., 2006; Comiso, 2006), which enhances the ice albedo feedback, and a decrease in ice season length (Parkinson 2000), which limits the winter ice extent and the average thickness of ice during the season; and (d) the recent transport of multiyear ice out of the Arctic Ocean (Lindsay and Zhang 2005; Kwok et al., 2005).

Reference:

Kwok, R., W. Maslowski, and S.W. Laxon, 2006, On large outflows of Arctic sea ice into the Barents Sea, *Geophys. Res. Lett.*, 32, L22503, doi:10.1029/2005GL024485.

p. 64, add at the end of the second paragraph (after, "... decline of the perennial ice cover."): "Note that a longer melt period means a shorter ice growth season which also means less extent and thickness of the ice cover."

p. 65, second paragraph, rewrite as follows:

"Early onset of melt can have other consequences as well. For example, according to Derocher et al., (2004), in the western Hudson Bay, break-up of the annual ice is now occurring approximately 2.5 weeks earlier than it did 30 years ago (Stirling et al., 1999 and unpubl data of Stirling and Lunn). An advanced date of break-up in recent years compared with that of previous years, is prevalent in the Arctic as can be inferred qualitatively from satellite data."

p. 65, It would be desirable if some statements are made regarding the current state and trends in Land-fast ice and Polynyas. Also, the different types of polynyas (sensible and latent heat) should be mentioned including spring polynyas which would arrive earlier because of early onset of melt. Also, the importance of landfast ice and polynyas in the ecosystem and ecology of the region should be discussed.

p. 66: It would be good if the recently observed changes cited for snow cover, glaciers, permafrost, river discharge, breakup, sea level rise, and precipitation are accompanied by references.

p. 68: insert after the first paragraph:

During the satellite era, the Arctic winter ice maximum had been basically stable with the trend in extent being negative but only about -1.5% per decade. Such modest trend compared to the trend during the summer minima of about -8.5% per decade was puzzling since the effect of

greenhouse warming was projected by models to be pronounced during the winter when the region is in darkness and longwave radiation is dominant. This may change soon with the observation of record low extents during winter maxima in 2005 and also in 2006 (Comiso, 2006, in press). The winter maximum extent in 2005 and 2006 were both about 6% lower than average values indicating significant decline in the winter ice cover. In both cases, the observed surface temperatures were also significantly warmer and the onset of freeze-up was later than normal. In both years, onset of melt also happened early. A continued decline would mean an advance to the north of the 0°C isotherm and a warmer ocean in the peripheral seas of the Arctic. This in turn would cause further decline in the winter ice cover.

Comiso, J., Abrupt decline in the Arctic winter sea ice cover, *Geophys. Res. Lett.* (in press, 2006)

p. 71, modify last sentence as follows: change "Once triggered, they may..." to "Once triggered, the changes may ..."

In this regard, it may be useful to cite Jim Hansen's work as well, especially in the climate modeling section. Jim thinks that the warming trend would change considerably if we act soon enough to keep atmospheric greenhouse gases from going up.

Hansen, J., et al., 2005, Efficacy of climate forcing, *J. Geophys. Res.*, 101, D18104, doi:1029/2005JD005776.