March 31, 2009

Via Electronic and Certified Mail

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U.S. Department of Commerce
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RE: 60-Day Notice of Intent to Sue: Violations of the Endangered Species Act; Actions Relating to December 30, 2008 Ruling on Petition to List the Ribbon Seal (*Histriophoca fasciata*) as Threatened or Endangered

Dear Mr. Locke, Dr. Balsiger and Dr. Lubchenco:

This letter serves as a 60-day notice on behalf of the Center for Biological Diversity ("the Center") and Greenpeace, Inc. of intent to sue the Department of Commerce, the National Oceanographic and Atmospheric Administration, the National Marine Fisheries Service/NOAA Fisheries, and their officers and directors (collectively "NMFS") over violations of Section 4 of the Endangered Species Act ("ESA")(16 U.S.C. § 1531 *et seq*.) for NMFS's failure to propose listing of the ribbon seal (*Histriophoca fasciata*) as threatened or endangered under the ESA. *See* 16 U.S.C. §§ 1533(a)(1), (b)(1) & (b)(3)(B).

On December 30, 2008, NMFS published its determination that listing of the ribbon seal was not warranted. *See* Endangered and Threatened Wildlife; Notice of 12–Month Finding on a Petition to List the Ribbon Seal as a Threatened or Endangered Species; Status Review; Notice of Finding, 73 Fed. Reg. 79822. As described below, this finding was arbitrary and capricious and otherwise unlawful as NMFS failed to use the best available science as required by the ESA, failed to apply a lawful and rational definition of "foreseeable future" in carrying out its analysis, and failed to properly analyze whether the species warranted listing in all or a significant portion of its range as required by the statute.

This letter is provided pursuant to the 60-day notice requirement of the citizen suit provision of the ESA, to the extent such notice is deemed necessary by a court. *See* 16 U.S.C. § 1540(g).

I. BACKGROUND

The ribbon seal is a strikingly-patterned ice seal that primarily inhabits the Okhotsk, Bering and Chukchi seas. 73 Fed. Reg. at 79823. It is strongly associated with sea ice during its whelping, mating, molting and nursing periods, from mid-March through June. *Id*. The primary threat to the ribbon seal is the rapid melting of its sea-ice habitat due to greenhouse gas-driven global warming. Greenhouse gas ("GHG") emissions are also acidifying the oceans and impacting the prey species upon which ribbon seals depend.

On December 20, 2007, the Center submitted a formal, detailed petition to list the ribbon seal under the ESA ("Petition"). On March 28, 2008 NMFS made a positive 90-day finding on the Center's petition and initiated a 60-day public comment period. Endangered and Threatened Species; Notice of 90–day Finding on a Petition to List the Ribbon Seal as a Threatened or Endangered Species, 73 Fed. Reg. 16617. NMFS also appointed a biological review team ("BRT") to undertake a status review of the ribbon seal ("Status Review"). Based on the Status Review, NMFS determined that listing was not warranted and published its decision on December 30, 2008. 73 Fed. Reg. 79822.

II. NMFS'S "NOT WARRANTED" DETERMINATION IS ARBITRARY AND CAPRICIOUS

The ESA requires NMFS to determine whether a species is endangered or threatened based on "the present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; the inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting its continued existence." 16 U.S.C. § 1533(a)(1). NMFS must make determinations of whether a species is endangered or threatened solely on "the best scientific and commercial data available." 16 U.S.C. § 1533(b)(1)(A).

NMFS's "not warranted" determination for the ribbon seal is arbitrary and capricious because: (1) it relies on an irrational time frame for "the foreseeable future;" (2) its analysis of the threat of present or threatened destruction, modification, or curtailment of ribbon seals' habitat from global warming is flawed and inadequate and fails to rely on the best available scientific data; (3) its analysis of the impacts of global warming on ribbon seal viability is flawed and inadequate and fails to rely on the best available scientific data; and (4) it fails to carry out a rational analysis of whether any distinct population segment of the ribbon seal may warrant listing or whether the species is threatened or endangered in a significant portion of its range. *See, e.g. Oregon Natural Res. Council v. Daley*, 6 F. Supp. 2d 1139 (D. Or. 1998) (setting aside not-warranted determination for unreasonably short foreseeable future analysis); *Western Watersheds Project v. Foss*, 2005 U.S. Dist. Lexis 45753 (D. Idaho Aug. 19, 2005) (setting aside no-list determination for using a foreseeable future analysis of shorter than 100 years); *Center For Biological Diversity v. Lohn*, 296 F. Supp. 2d 1223 (W.D. Wash. 2003) (setting aside non-warranted finding for failure to use the best available science); *Defenders of Wildlife v. Norton*, 258 F.3d 1136 (9th Cir. 2001) (setting aside no-list determination for failing to consider whether species was imperiled in a significant portion of its range).

A. NMFS RELIED UPON AN ARBITRARILY TRUNCATED FORESEEABLE FUTURE ANALYSIS

A species is "threatened" if it is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." 16 U.S.C. § 1531(20). While the ESA does not define the "foreseeable future," NMFS must use a definition that is reasonable, that ensures protection of the petitioned species, and that gives the benefit of the doubt regarding any scientific uncertainty to the species. *See Oregon Natural Res. Council v. Daley*, 6 F. Supp. 2d 1139, 1151 (D. Or. 1998). With regard to the ribbon seal, NMFS failed to meet these standards.

Despite finding that ribbon seals are "likely to decline gradually for the foreseeable future" due to melting of sea-ice habitat, NMFS determined that listing was not warranted at this time because ribbon seals are not likely to become endangered within the 43-year timespan studied (2008-2050). 73 Fed. Reg. at 79822-23. This truncated time frame is unsupportable.

In establishing the time frame over which future events impacting ribbon seal status can be said to be "foreseeable," the Status Review stated that "The BRT considered the time frame over which the effects of global climate change can be anticipated, as the primary factor in determining the horizon for reliable assessment of the risk of the ribbon seal becoming endangered." Status Review: 26. The BRT concluded that it would use a time frame of 43 years (2008-2050) for the foreseeable future because of a stated difficulty in projecting climate conditions beyond 2050:

> [W]e selected a time horizon from the present to the year 2050 because it is very difficult to project further ahead due to great uncertainty about and sensitivity to social and economic decisions that will determine future emission scenarios.

Status Review: 27.

Similarly, in the 12-month finding itself, NMFS stated:

> For this status review, the foreseeable future was determined to be the year 2050 because past and current emissions of greenhouse gases have already largely set the course for changes in the atmosphere and climate until that time, and because of enormous uncertainty about future social and political decisions on emissions that will dominate projection of conditions farther into the future. Beyond the year 2050, projections of climate scenarios are too heavily dependent on socioeconomic assumptions and are therefore too divergent for reliable use in assessing threats to ribbon seals.

73 Fed. Reg. at 79823.

This reasoning is unsupportable and legally and scientifically unjustified based on multiple counts:

(1) Global climate change has been projected through the end of the 21st century routinely in the climate literature, demonstrating that impacts within a 100-year time frame are inherently "foreseeable." Climate scientists often look at much longer time periods, and therefore a time horizon of 100 years or more with regard to this threat would be eminently reasonable.

As a primary example of the feasibility of a 100-year time frame, the Intergovernmental Panel on Climate Change ("IPCC"), a foremost world authority on climate change, has provided climate change projections through 2100 under a range of plausible emissions scenarios, the most recent of which are provided in the 2007 Fourth Assessment. For the Fourth Assessment, the IPCC performed an unprecedented internationally coordinated climate change experiment using 23 models by 14 modeling groups from 10 countries to project future climate conditions. This large number of models ranging from simple to complex, running the same experiments, provided both quantification of future climate conditions through the end of this century and the uncertainty in the results. As stated by the IPCC itself, climate projections run through the end of the 21st century under different emissions scenarios, and accompanied by the range of uncertainty, were provided in their 2007 Fourth Assessment Report specifically because of their policy-relevance:

> Advances in climate change modelling now enable best estimates and *likely* assessed uncertainty ranges to be given for projected warming for different emission scenarios. Results for different emission scenarios are provided explicitly in this report to avoid loss of this policy-relevant information. Projected global average surface warmings for the end of the 21st century (2090–2099) relative to 1980–1999 are shown in Table SPM.3. These illustrate the differences between lower and higher SRES emission scenarios, and the projected warming uncertainty associated with these scenarios. {10.5}

IPCC 2007: 13. And further that:

> The Fourth Assessment Report is more advanced as it provides best estimates and an assessed likelihood range for each of the marker scenarios. The new assessment of the *likely* ranges now relies on a larger number of climate models of increasing complexity and realism, as well as new information regarding the nature of feedbacks from the carbon cycle and constraints on climate response from observations. {10.5}

Id.

(2) Forecasting climate change impacts on species over a 100-year time frame is a routine analysis in the scientific literature (*see, e.g.* Lovejoy and Hannah (2005) and Thomas et al. (2004) for a small sample of numerous papers published in eminent journals that use a 100-year time frame). Thus there is a well-established scientific precedent for the analysis of climate change impacts over a 100-year time frame.

(3) Importantly, the federal government conducted an analysis of climate change impacts on the polar bear over a 100-year time frame specifically to inform the U.S. Fish and Wildlife Service's ("FWS") listing decision for the polar bear. Using a suite of IPCC climate models, USGS scientists forecast the status of polar bears 45, 75, and 100 years into the future (Amstrup

et al. 2007). Highlighting the importance of using time frames longer than 45 years, the USGS studies found that some polar bear populations faced extirpation over 45 year time frames, while populations in other parts of the range faced extirpation over 75 or 100 year time frames:

> To inform the U.S. Fish and Wildlife Service decision, whether or not to list polar bears as threatened under the Endangered Species Act (ESA), we forecast the status of the world's polar bear (*Ursus maritimus*) populations 45, 75 and 100 years into the future.

Amstrup et al. 2007: 1.

> We present our forecast in a "compared to now" setting where projections for the decade of 2045-2055, 20702080, and 2090-2100 are compared to the "present" period of 1996-2006.

Id. at 2.

> In projections based upon ensemble mean ice predictions, the carrying capacity model forecasted potential extirpation of polar bears in the Polar Basin Divergent Ecoregion in 75 years. Projections using minimal ice levels forecasted potential extirpation in this ecoregion by year 45, whereas projections using maximal ice levels forecasted steady declines but not extirpation by year 100. Populations of polar bears in the other ecoregions were projected to decline at all time steps, with severity of decline dependent upon whether minimum, maximum or mean ice projections were used. Dominant outcomes of the BN model were for extinction of polar bear populations in the Seasonal Ice and Polar Basin Divergent Ecoregions by 45 years from present, and in the Polar Basin Convergent Ecoregion by 75 years from present.

Id. at 1-2.

(4) Beyond the use of a 100 year timeframe for the polar bear, FWS and NMFS have repeatedly used timeframes up to and beyond 100 years when assessing the status of species. For example, the Alaska Region of the USFWS stated in the Steller's Eider Recovery Plan:

> The Alaska-breeding population will be considered for delisting from threatened status when: The Alaska-breeding populations has <1% *probability of extinction in the next 100 years*; AND Subpopulations in each of the northern and western subpopulations have <10% probability of extinction in 100 years and are stable or increasing. The Alaska-breeding population will be considered for reclassification from Threatened to Endangered when: The populations has > 20% *probability of extinction in the next 100 years* for 3 consecutive years; OR The population has > 20% probability of extinction in the next 100 years and is decreasing in abundance

(FWS 2002 (emphasis added)). With regard to the Mount Graham red squirrel, the FWS stated "At least 10 years will be needed to stabilize the Mt. Graham red squirrel population and *at least*

100 to 300 years will be needed to restore Mt. Graham red squirrel habitat" (Suckling 2006 (emphasis added)). With regard to the Utah prairie dog, FWS defined the delisting criteria as "[t]o establish and maintain the species as a self-sustaining, viable unit with retention of 90 percent of its genetic diversity *for 200 years*" (Suckling 2006 (emphasis added)). NMFS stated of the North Atlantic right whale: "[g]iven the small size of the North Atlantic population, downlisting to threatened *may take 150 years* even in good conditions" (Suckling 2006 (emphasis added)).

More recently, in analyzing the status of the Southern Resident killer whales, NMFS listed the species as Endangered based on a risk assessment extended to *300 years*:

> The most optimistic model (29–year data set) predicted that the probability of Southern Residents becoming extinct (that is, no surviving animals) was less than 0.1 to 3 percent in 100 years and 2 to 42 percent in 300 years. Using the most pessimistic model (the last 10 years of data), the probability of meeting a quasi-extinction threshold (that is, such a small number of animals in the population that they could not reasonably be expected to persist), the probability of meeting the threshold ranged from 39 to 67 percent in 100 years to 76 to 98 percent in 300 years.

70 Fed. Reg. 69903 at 69909 (November 18, 2005). NMFS used a similar time frame for its analysis of the status of the Cook Inlet beluga whale:

> The 2006 and 2008 Status Reviews both found a significant probability of extinction. While many iterations of models were considered in these Reviews, using varying inputs for such variables as predation and survival, the model considered to be the most realistic and representative resulted in a 26 per cent probability of extinction within 100 years, and 70 per cent probability of extinction within 300 years.

73 Fed. Reg. 62919 at 62927. (October 22, 2008).

NMFS's use of a 100-year standard for analysis in not limited to cetaceans. In the recent final revised Recovery Plan for the Steller Sea Lion, NMFS again uses a 100-year time frame for analyzing extinction risk:

> A long lived species shall no longer be considered endangered when, given current and projected conditions, the probability of quasi extinction is less than 1% in 100 years.

NMFS 2008 at V-8.

Use of a 100 year or longer time frame for species risk assessment by NMFS has ample precedent. It was arbitrary and capricious for NMFS to use a much shorter time frame for the ribbon seal.

(5) The BRT's justification that a series of papers published in *Ecological Applications* also used a 50-year time frame should hold no weight for two reasons. The authors of these

papers were not working under the same mandate to determine if the ribbon seal or other Arctic marine mammals were threatened or endangered under the legal standards of the ESA. Secondly, these authors never provide a specific scientific justification for why they chose a 50-year time frame. Rather, Walsh (2008), which is specifically referenced by the Status Review on p. 27, provides the following reasoning for using a 50-year time frame: “Our synthesis presented here is for 2040–2060 in order to remain consistent with other papers in this Special Issue.” (p. S14). This is not a legally justifiable reason for NMFS to limit its review of the foreseeable future under the ESA to less than 50 years.

(6) Perhaps most importantly, the time period used by NMFS must be long enough so that actions can be taken to ameliorate the threat of global warming to the ribbon seal to prevent its extinction. *See Defenders of Wildlife v. Norton*, 258 F.3d 1136, 1142 (9th Cir. 2001) (quoting legislative history noting that the purpose of the ESA is “not only to protect the last remaining members of [a listed] species but to take steps to insure that species which are likely to be threatened with extinction never reach the state of being presently endangered”).

NMFS’s conclusion that it will only look at impacts to the ribbon seal until 2050 “because past and current emissions of greenhouse gases have already largely set the course for changes in the atmosphere and climate until that time,” 73 Fed. Reg. at 79823, flies in the face of this statutory mandate. NMFS seems to be taking the position that it will only look at impacts that are certain to occur, rather than impacts that are clearly foreseeable absent significant changes in national and global emissions policies. However, NMFS is required to address in its Status Review the “inadequacy of existing regulatory mechanisms” in addressing threats to the species. 16 U.S.C. § 1533(a)(1)(D). Rather than acknowledge that there are no adequate *existing* regulatory mechanisms to reduce greenhouse emissions, NMFS throws up its hands and says that the “enormous uncertainty” about such emissions renders consideration of such impacts unnecessary. This head in the sand approach has been explicitly rejected by the courts.

> It is incongruous for the NMFS to defer listing a species as “threatened” because the agency is hoping for a significant alteration in the conditions or practices presently threatening the long-term viability of the species, which in turn might prevent the species from actually reaching the “endangered” level. The whole purpose of listing species as “threatened” or "endangered" is not simply to memorialize species that are on the path to extinction, but also to compel those changes needed to save these species from extinction. By definition, a “threatened” species is one that is likely to become endangered in the foreseeable future *barring significant changes in the conditions or practices that are threatening the long-term viability of that species.* A listing decision is intended to cause those significant changes.

Oregon Natural Res. Council v. Daley, 6 F. Supp. 2d 1139, 1152 (D. Or. 1998)(emphasis in original).

Such an approach is particularly problematic with regard to greenhouse gas emissions. Habitat destruction from global warming is relatively unique in that habitat loss and degradation do not stop even if all greenhouse gas emissions were to be immediately curtailed. Instead, because of the long-lived residence time of carbon dioxide and other greenhouse gases in the atmosphere and the lag time between emissions and climatic changes, warming will continue for centuries to come even after greenhouse gas emissions are stabilized. Climate scientists have estimated that anthropogenic greenhouse gas emissions already in the atmosphere have committed to the world to 1.6°C to 2°C of warming that has not yet been realized and most of which will be experienced during this century (Hansen et al. 2008, Ramanathan and Feng 2008). This is in addition to the warming that will be generated from continuing future greenhouse gas emissions. Thus, slowing and reversing impacts from anthropogenic greenhouse gas emissions, the primary threat to the ribbon seal, will be a long-term process that must begin as soon as possible within this century. Deferring protection until some unstated point in the future when the purported "enormous uncertainty" about future emissions is resolved would condemn the species to extinction.

In sum, had NMFS used a scientifically and legally defensible time frame for the "foreseeable future," its conclusion that the ribbon seal does not warrant the protections of the ESA would almost certainly have been different. This deficiency of the finding and underlying Status Review is sufficient for NMFS to remand the decision and make a proper 12-month finding. Moreover, as outlined below, even within the unreasonably-truncated 43-year time frame used by the agency for its risk assessment, NMFS utterly failed to use the best available science in carrying out its review.

B. NMFS' ANALYSIS OF THE IMPACTS OF GLOBAL WARMING ON RIBBON SEAL HABITAT FAILED TO USE THE BEST AVAILABLE SCIENCE

The Endangered Species Act requires NMFS to determine whether a species is endangered or threatened based on, *inter alia*, "the present or threatened destruction, modification, or curtailment of its habitat or range." 16 U.S.C. § 1533(a)(1)(A). Ribbon seal listing is warranted based on "the present or threatened destruction, modification, or curtailment" of its sea ice habitat as a result of global warming. In finding to the contrary NMFS arbitrarily and capriciously failed to rely on the best available science as required by the ESA. 16 U.S.C. § 1533(b)(1)(A).

As stated in the Petition and acknowledged by NMFS in the Status Review, global warming poses the primary threat to the ribbon seal through the destruction and degradation of this species' sea-ice habitat. Thus, the Status Review's analysis of the Present or Threatened Destruction, Modification, or Curtailment of the Species' Habitat or Range from global warming is central to the listing decision. As detailed below, the analysis of this threat factor in the Status Review is flawed and inadequate because it (1) fails to conduct several feasible analyses of current and future trends in sea-ice extent, duration, and quality necessary for properly assessing the threat that global warming poses to the ribbon seal's habitat in the foreseeable future; (2) ignores the best available science on climate change relevant to the ribbon seal; (3) fails to analyze current and future sea-ice loss and degradation in the Okhotsk Sea which represents a significant portion of the ribbon seal's range; and (4) uses an inadequate 43-year time frame for the foreseeable future, as discussed above. As a result of these inadequacies, the Status Review draws conclusions about the threat that global warming poses to the ribbon seal that are not supported by the data presented in the Status Review nor supported by the best available science.

The analysis of climate change effects on the ribbon seal's habitat is presented in three parts in the Status Review: (1) Effects of climate change on annual formation of ribbon seals' sea ice habitat (Section 4.3.1.1.2), (2) Effects of climate change on the quality of ribbon seals' sea ice habitat (Section 4.3.1.1.3), and (3) Effects of climate change on ocean conditions (Section 4.3.1.1.4). For clarity, the inadequacies of these analyses will be discussed in a sequential section-by-section approach.

1. <u>Effects of climate change on annual formation of ribbon seals' sea-ice habitat (Status Review Section 4.3.1.1.2)</u>

The two most important sections of the Status Review that discuss the effects of climate change on the ribbon seal's sea-ice habitat are Section 4.3.1.1.2.2 on observed sea-ice conditions in the Bering Sea and Section 4.3.1.1.2.3 on projected sea-ice conditions.

a. Observed sea-ice conditions in the Bering Sea (Section 4.3.1.1.2.2)

In the Status Review NMFS performed an analysis of habitat threats to ribbon seal by first looking at current ice conditions in the Bering Sea. As detailed below, this analysis was flawed as it made clearly erroneous assumptions, ignored readily available data, and utterly failed to look at significant aspects of the problem.

i. NMFS erroneously suggests that recent sea-ice conditions will be analogous to future sea-ice conditions

Section 4.3.1.1.2.2 of the Status Review, which discusses observed sea-ice conditions in the Bering Sea in recent decades (~1972-2008), is titled "Analogs" and is framed as a "consideration of previous warm years as analogs for future conditions" (Status Review: 35). The Status Review states that years during 2001 to 2005 "when sea temperatures over the southern Bering Sea shelf were ~3°C above normal" provide possible analogs for "conditions to be encountered in the Bering Sea due to global warming from anthropogenic sources." (Status Review: 36). However, there are several important reasons why conditions in recent warm years will not be analogous to conditions in the future, making this framing misleading and over-optimistic. Most notably, conditions in the Bering Sea in the future will be situated in a significantly different climatic context than found today.

First, average Arctic surface temperatures will rise significantly under all emissions scenarios of the Intergovernmental Panel on Climate Change ("IPCC") and Arctic Climate Impact Assessment ("ACIA"), meaning that baseline conditions in the future will be much warmer than today. As documented in the Petition, the ACIA projected that Arctic surface temperatures will rise by an average of 2.7°C under the B2 emissions scenario and 3.0°C under the A2 emissions scenario by 2050 (relative to 2000) (ACIA 2005: Figure 4.17). Similarly, using a subset of IPCC Fourth Assessment Report models, Walsh (2008) reported that Arctic surface temperatures will rise by an average of ~3°C by mid-century (2040-2059) relative to 1980-1999 under the A1B mid-level emissions scenario. Importantly, surface air temperatures over the Bering Sea are projected to increase by a mean of ~6°C in winter (Dec-Feb) and a mean of ~3°C in spring (Mar-May) by mid-century under the A1B scenario (Walsh 2008: Figure 10), resulting in significant warming during the winter and spring months when the sea ice must last long enough and be of sufficient thickness for ribbon seals to successfully rear pups and molt. Due to this warmer baseline, future conditions in the Bering Sea will not be analogous to recent warm years: (1) As temperatures rise in the future, the average heat content of the surface ocean will increase, accelerating the ice-albedo feedback and impacting sea-ice formation, duration, and thickness. Sea ice in the Bering Sea in average future years is likely to break-up earlier, experience more melting in fall through spring, and be thinner when compared to warm years today. (2) In addition, “warm years” in the future will be much hotter and have less sea ice than “warm years” today. Significantly lower sea-ice cover during future “warm years” will accelerate the ice-albedo feedback, impacting Bering Sea sea-ice formation, duration, and thickness more than in warm years today. (3) The Arctic Ocean is likely to be ice-free in the summer well before mid-century. Once this occurs, the Bering Sea will experience an entirely different climate context than today. Stroeve et al. (2008) proposed that a seasonally ice-free Arctic Ocean might occur as early as 2030. Other leading climate scientists believe that current climate models markedly underestimate important melting processes and that current trends in sea-ice extent indicate the Arctic Ocean could be mostly ice free by the late summer of 2012 (Amos 2007, Borenstein 2007). The transition to a seasonally ice-free Arctic will likely negatively influence sea-ice formation, duration, and thickness in the Bering Sea due to an increasing ice-albedo feedback that impacts the marginal Arctic seas. Overall, conditions in recent “warm years” provide an inappropriate proxy for conditions in future years.

ii. NMFS failed to conduct a necessary, scientifically feasible analysis to quantify declines in *monthly* sea-ice extent in recent decades during the March to July sea-ice season, which would inform the assessment of the magnitude of sea-ice habitat loss for the ribbon seal

Scientific studies presented in the Petition indicate that Arctic sea ice is diminishing in extent and melting earlier during critical months (April-July) when ribbon seals rely on sea ice for pup-rearing, pup maturing, and molting (see Figure below taken from the Status Review). Thus monthly analyses of sea-ice extent are imperative for understanding how the ribbon seal’s sea-ice habitat is changing, particularly during spring and summer when sea ice is especially vulnerable to melting.

Of the two figures shown in Section 4.3.1.1.2.2 of the Status Review, Figure 9 averages sea-ice coverage across six months from December through May and thus it is impossible to make conclusions about the availability of sea ice across the range of months important for ribbon seal reproduction and molting. Figure 10 of the Status Review indicates that sea ice disappeared from the northern Bering Sea shelf by the first week of May in 1996, 2003, and 2004, a point which the Status Review never discusses. Importantly, during these years, sea-ice in the northernmost region of the ribbon seal’s range in the Bering Sea disappeared during the peak of the nursing, breeding, and pup-molting periods; before the peak of the pup maturing and adult molting periods; and during the whelping and subadult molting periods (as shown by the line inserted into Figure 6 of the Status Review below).

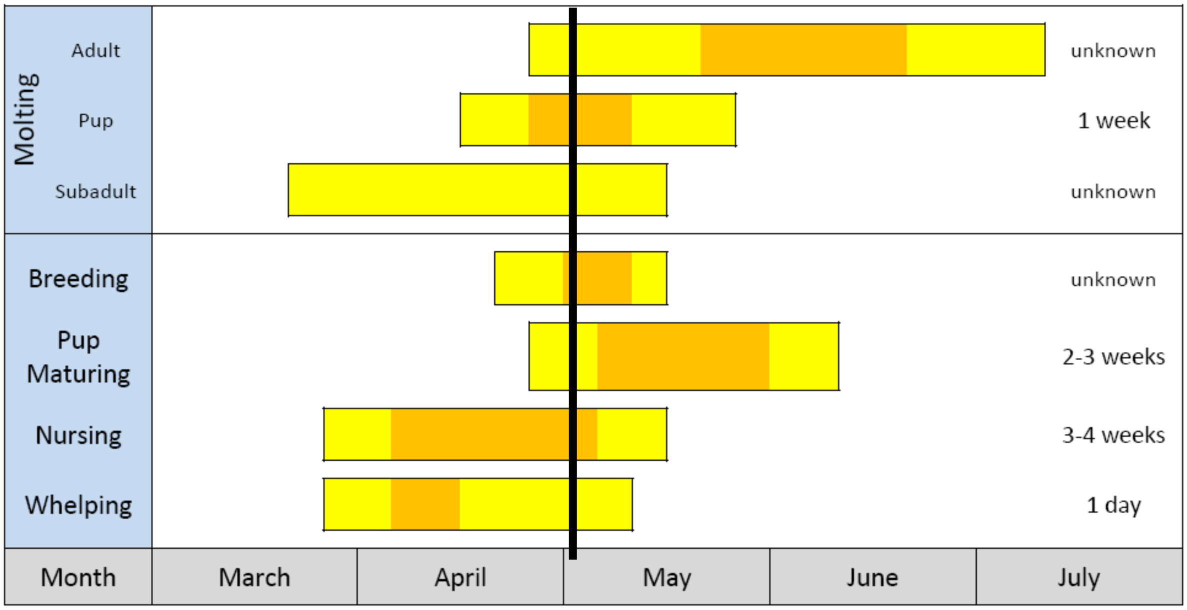

Figure 6. -- Approximate annual timing of the ribbon seal's ice-associated life history events. Yellow bars indicate the approximate range over which each event is reported to occur and orange bars indicate the reported peak timing of each event. "Pup Maturing" refers to the period when weaned pups may remain at least partially dependent on sea ice while they develop proficiency at diving and foraging for themselves. The approximate duration of each event for an individual ribbon seal is listed along the right side of the figure (Sources: Krylov et al. 1964, Tikhomirov 1964, Shustov 1965d, Tikhomirov 1966, Tikhomirov 1968, Fedoseev 1973, Heptner et al. 1976, Burns 1981).

Figure 11 of the next section of the Status Review (see Figure below taken from the Status Review) shows observed sea-ice extent (plotted by the red line) in the northern Bering Sea in April, May, and June from 1950 to 2008, indicating that data were readily available for an analysis of trends in monthly sea-ice extent. Based on the data in this figure, sea-ice extent appears to have undergone a large downward trend in April, May, and June over the ~58 year time period. These data indicate that the ribbon seal's habitat is diminishing in area and extent. Clearly, as sea-ice habitat area declines, sea-ice in the Bering Sea will able to support fewer ribbon seals (based on the well-established ecological principle of the species-area relationship). In addition, the frequency of years with minimal sea-ice cover (i.e. little or no ice coverage) in May has clearly increased in recent decades while the frequency of years with no sea-ice cover in June has also greatly increased. Overall, the Status Review failed to analyze or discuss observed loss in sea-ice area from March through July and the increasing frequency of years with minimum sea-ice cover in the northern Bering Sea in May and June, which are critical months for ribbon seal reproduction and molting.

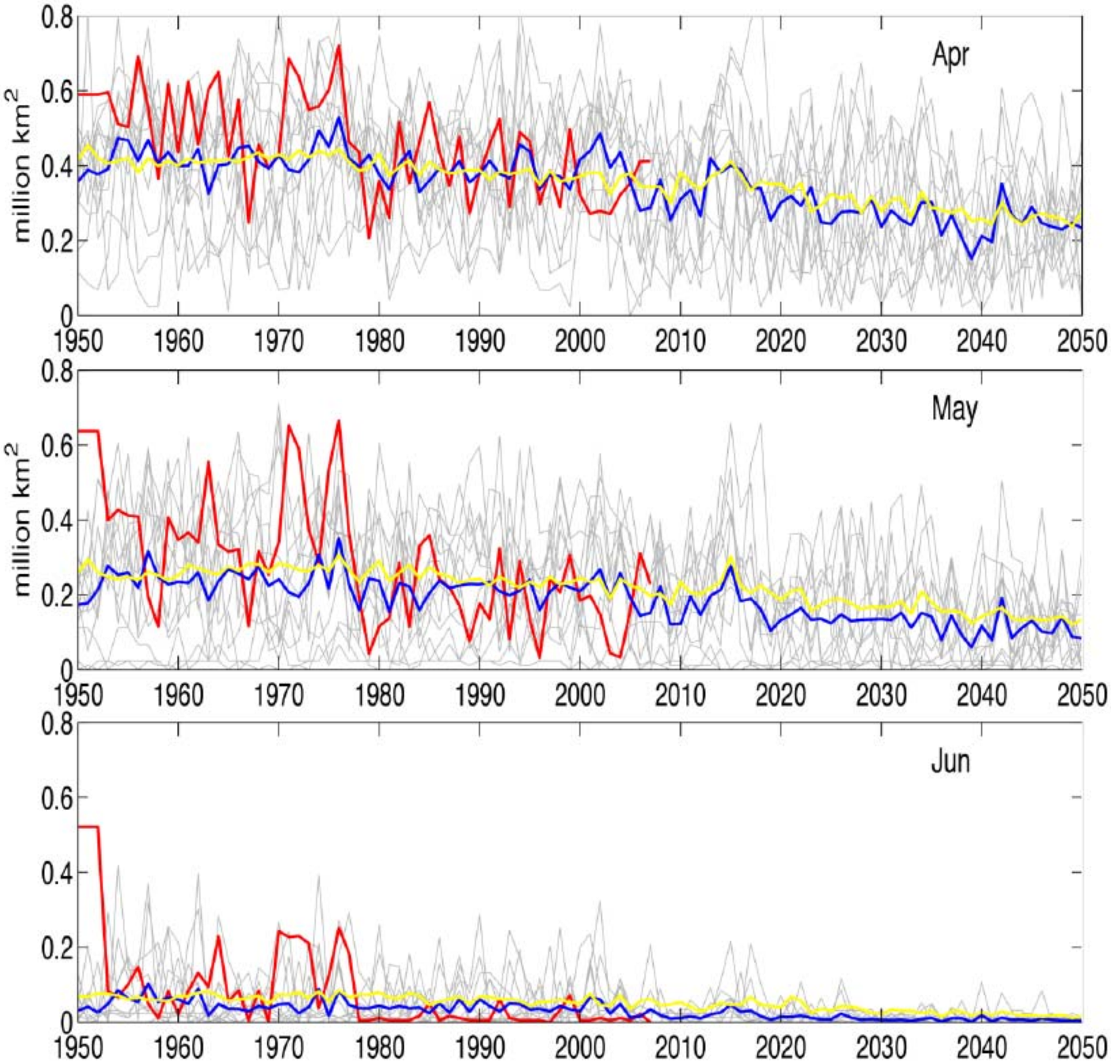

Figure 11. -- Simulation of 20th century Bering Sea ice cover extent and projections into the 21st century for the months of April-June based on IPCC/CMIP3 (Coupled Model Intercomparison Project Phase 3) global climate models. The red line is observations. The blue line is the average of four "better" models and the yellow line is the average of 23 IPCC models. The four "better" models were used to produce 12 independent runs (grey lines) with different initial conditions. The range of these individual runs provides an indication of the possible year-to-year natural variability of future sea ice extent.

iii. The Status review failed to consider the best available science by omitting any reference to a regional sea-ice analysis by Meier et al. (2007) (presented in the Petition) that reports sea-ice declines in the Bering Sea during March-July in recent decades

Meier et al. (2007) analyzed regional trends in sea-ice extent from 1979-2006 using pan-Arctic satellite data and found that sea ice has been declining in the Bering Sea during March to July (Table 1 below) (Meier et al. 2007). The downward trend in March sea-ice extent of -4.8% per decade is significant at the 95% level.

Table 1. Regional trends in sea-ice extent in the Bering Sea given as % per decade for each month for 1979-2006. Standard deviation values are provided in parentheses for the annual trends. Trends in bold are statistically significant at the 99% level and in italics at the 95% level. Blank fields indicate months where little or no ice is found in the region.
Source: Based on Meier et al. (2007: Table 2).

Month	**Bering**
Jan	5.4
Feb	2.0
Mar	*-4.8*
Apr	-1.8
May	-10.9
Jun	-7.8
Jul	-39.4
Aug	
Sep	
Oct	**-42.9**
Nov	*-20.3*
Dec	3.0
Annual	-1.9 (3.5)

iv. NMFS failed to assess the threat of sea-ice habitat loss and degradation in the Okhotsk Sea, which represents a significant portion of the ribbon seal's range

As described in the Petition and Status Review, the Sea of Okhotsk supports one of two global breeding populations of ribbon seal and roughly half the global population. Thus, the Sea of Okhotsk clearly represents a significant portion of the ribbon seal's range. However, the Status Review failed to analyze observed sea-ice trends in the Okhotsk Sea and failed to consider the best available science for this region, including a published study by Meier et al. (2007) presented in the Petition, which reports significantly declining sea-ice extent in the Okhotsk Sea from 1979-2006.

Meier et al. (2007) reported that annual sea-ice extent in the Okhotsk Sea declined significantly by -9.3% per decade during 1979-2006 (Meier et al. 2007). This rate of decline in the Okhotsk Sea is larger in fact than the decline of Arctic summer sea ice (-9.1% per decade) during the same period (Stroeve et al. 2007). Since climate scientists have raised strong concerns about the rapid loss of Arctic summer sea-ice, clearly the rapid rate of annual sea-ice loss in the Okhotsk Sea should have been highlighted by the Status Review as a significant threat to ribbon seals in the Okhotsk Sea. As discussed in the Petition, Meier et al. (2007) also reported that sea-ice extent in the Okhotsk Sea declined significantly and dramatically throughout the months critical for ribbon seal reproduction and molt. Sea-ice cover declined significantly by -7.8% per decade in March, -14.3% per decade in April, and -20.6% per decade in May (Table 2 below) (Meier et al. 2007: Table 2).

Table 2. Regional trends in sea-ice extent in the Okhotsk Sea given as % per decade for each month for 1979-2006. Standard deviation values are provided in parentheses for the annual trends. Trends in bold are statistically significant at the 99% level and in italics at the 95% level. Blank fields indicate months where little or no ice is found in the region.
Source: Based on Meier et al. (2007: Table 2).

Month	**Okhotsk**
Jan	**-11.8**
Feb	**-7.9**
Mar	**-7.8**
Apr	**-14.3**
May	**-20.6**
Jun	-11.4
Jul	
Aug	
Sep	
Oct	**-22.0**
Nov	**-20.3**
Dec	-4.6
Annual	**-9.3 (4.6)**

v. NMFS failed to consider the best available science on changes in sea-ice types and in ice dynamics important to the ribbon seal

As discussed in the Petition and acknowledged in the Status Review, sea ice is not homogenous but is composed of different ice types which are used by differentially by ice-seal species for reproduction, resting, and molting. The ribbon seal specifically uses thicker, larger, snow-covered floes of the inner portion of sea-ice front, often called the “loose pack” (Ray and Hufford 2006). This is corroborated in the Status Review: “Ribbon seals also seem to choose moderately thick ice floes (Burns 1970, Fay 1974, Burns 1981). These types of ice floes are often located at the inner zone of the ice front and rarely occur near shore (Burns 1981)” (Status Review: 8). In the later part of the sea-ice season, these floes become “remnant ice” or “last ice” that typically melt in place, and if they move northward, are the last floes to move (Ray and Hufford 2006).

Because sea ice is not a homogeneous mass, analyzing changes in the ice types used by the ribbon seal is an important component of assessing future habitat loss for this species. In regard to the ribbon seal, the loose pack of the sea-ice front used by this species typically melts in place. This means that as sea-ice melts earlier in spring and summer, the ribbon seal’s habitat will melt away underneath it rather than moving northward with the receding ice-edge. Thus, ribbon seal pups and molting seals will be forced to enter the icy waters as the floes melt, a point which is discussed in more depth in below. However, the Status Review failed to acknowledge the importance of understanding changes in ice-types and sea-ice dynamics; failed to conduct an analysis of changes in ice-types and ice-dynamics; and ignored the best available science on (a) associations between ribbon seals and sea-ice types and (b) changes in sea-ice types and ice dynamics in the Bering Sea as presented in Ray and Hufford (2006), Hufford (2008), and Hufford et al. (2008). Although Ray and Hufford (2006) was briefly cited by the Status Review in the "Distribution, Habitat Use, and Movements" section on page 8, this study was never discussed as part of the sea-ice analysis.

Using shipboard and helicopter observations in the Bering Sea in 2006 and 2007 combined with satellite imagery, Ray and Hufford (2006) and Hufford (2008) confirmed that ribbon seals prefer the "loose pack" of the sea-ice front for reproduction and molting, specifically where ice is thick and often of nearshore origin from the western Bering Sea. As noted by Ray and Hufford (2006), ribbon seals "exhibited extreme patchiness in distribution. Ribbon seals were rarely observed in the eastern Bering Sea, but were extremely abundant on loose pack in the southwestern extremity of the ice near the Date Line. This ice was thick and contained sediment, indicating nearshore origin."

Importantly, Ray and Hufford (2006), Hufford (2008) and Hufford et al. (2008) found that the Bering Sea is experiencing changes in sea-ice types, in addition to declines in sea-ice extent and thickness, which has "serious implications" for ribbon seals and other ice-dependent marine mammals:

> In particular, sea ice habitat [in the Bering Sea] has diminished from the 1990s. The ice field has become more chaotic as large areas of open water have allowed sea-ice types to become scattered and mixed due to fluxes in wind and ocean currents….We predict that the high variability of sea-ice conditions among years and a trend towards overall reduction of sea-ice habitat will play reinforcing roles, and the highly variable and poorly structured conditions observed in 2006 and 2007 will become more common in the future with serious implications for populations.

(Hufford 2008). Ray and Hufford (2006) also emphasized the importance of using a more sophisticated view of Bering Sea sea-ice as a seascape "in which distinct ice habitats are formed by annual sea-ice dynamics" and of evaluating changes in these ice-types in assessing how climate change is impacting ribbon seals and other ice-dependent marine mammals:

> …future assessments must take sea-ice dynamics into greater account than in past years. Otherwise, we will not be able to predict the fates of these species under present scenarios of climate change.

(Ray and Hufford 2006). NMFS failed to take such sea-ice dynamics into account in the Status Review.

vi. NMFS' conclusion that freezing temperatures are likely to persist in the northern Bering Sea by 2050 in the critical month of April is questionable, at best

The Status Review rather optimistically concludes that freezing temperatures are likely to persist in the northern Bering Sea in April (a critical month for ribbon seal reproduction) at mid-century. For support, the Status Review states that mean monthly maximum surface temperatures for Nome, which borders the northern Bering Sea, are -3°C or below from

November through April. However, it is important to note that the mean maximum temperature at Nome, Alaska, (-64°31') in April was -2.9°C from 1971-2000 according to the Alaska Climate Research Center (http://climate.gi.alaska.edu/Climate/Location/West/Nome.html). Surface air temperatures over the northern Bering Sea are projected to increase by a mean of ~3°C in spring (March-May) by mid-century under the A1B scenario (Walsh 2008: Figure 10). Thus, mean maximum temperatures in April in the northern Bering Sea will at or above the melting point with the projected increase of 3°C global warming by 2050 under a climate scenario that in all likelihood underestimates actual emissions and warming. Thus, contrary to NMFS's optimism, temperatures are likely to not stay below freezing in the northern Bering Sea by 2050 in the critical month of April.

vii. NMFS reaches incomplete, overly-optimistic, and misleading conclusions based on the above-cited omissions and inadequacies

Section 4.3.1.1.2.2.2 of the Status Review concludes that "While there is considerable year-to-year variability, even the recent very warm years had sea-ice coverage in the northern Bering Sea into May or June. Thus, analogs point to considerable sea-ice coverage for the future in the northern Bering Sea, despite major losses in summer Arctic Ocean sea ice and likely future reduction of average sea-ice coverage in the southern Bering Sea" (p. 37). Contrary to the first conclusion statement, the data presented in the Status Review itself show that sea ice disappeared in the northern Bering Sea by early May in recent warm years, meaning there was little or no sea ice in May and June in these years (2003 and 2004). In addition, the data presented in the Petition and the best available science do not support the Status Review's conclusion that there will be "considerable sea-ice coverage for the future in the northern Bering Sea" (where the Status Review never defines "considerable"). Instead the best available science supports the conclusion that (1) sea-ice habitat area in the northern Bering Sea has declined extensively in March through July, which are critical months for ribbon seal reproduction and molting, and (2) sea ice in the northern Bering Sea reached a minimum extent (with little or no ice coverage) more frequently in May and June in recent decades. Moreover, this section of the Status Review also completely ignores the best available science documenting rapid declines in sea-ice habitat area in the Okhotsk Sea, which represents a significant portion of the ribbon seal's range.

b. Future sea-ice conditions (Status Review Section 4.3.1.1.2.2.3)

In addition to its deficient analysis of current ice conditions, NMFS also analyzed future ice conditions to determine their impact on the ribbon seal. This analysis suffers many of the same deficiencies of the current-condition analysis, including making clearly erroneous assumptions, ignoring readily available data, and failing to look at significant aspects of the problem.

i. NMFS failed to conduct an analysis of future sea-ice projections in the Okhotsk Sea

Although the Status Review states that it will assess threats to the ribbon seal across its range, it failed to conduct a feasible and necessary analysis of future sea-ice projections in the Okhotsk Sea, an area which comprises a significant portion of the ribbon seal's range. The Status Review should have conducted an analysis of future sea-ice projections for the Okhotsk

Sea similar to that conducted for the Bering Sea on page 39. In the absence of this analysis, the Status Review cannot make scientifically defensible conclusions about threats to the ribbon seal from future sea-ice loss in the Okhotsk Sea. The Status Review similarly failed to conduct a feasible and necessary analysis of sea-ice loss in the southern and central Bering Sea.

ii. NMFS failed to quantify projected declines in monthly mean sea-ice extent and the increase in frequency of years with minimum sea-extent in the northern Bering Sea

The Status Review failed to conduct a necessary, scientifically feasible analysis to quantify projected declines in monthly mean sea-ice extent and the increase in frequency of years with minimum sea-extent in the northern Bering Sea during the March to July sea-ice season, which would inform the assessment of the magnitude of future sea-ice loss for the ribbon seal. In presenting an analysis of future sea-ice loss in the northern Bering Sea, the Status Review showed IPCC model projections for sea-ice extent in April, May, and June through 2050 in Figure 11, but failed to quantify or discuss the downward trend in mean projected sea-ice extent. Quantifying the projected reduction in sea-ice extent by 2050 (and by 2075 and 2100) is critical for providing a proxy of the magnitude of sea-ice habitat loss for the ribbon seal. Indeed, based on the data in Figure 11, sea-ice extent appears to decline significantly by an average of 40% in April and 55% in May during 2000-2050, while sea-ice extent in June becomes virtually non-existent. Rather than quantifying and discussing these large projected habitat losses, the Status Review simply notes that "there is some decrease in sea-ice area in April out to 2050" (p.39). The Status Review also failed to quantify projected increases in the frequency of years of near-zero sea-ice extent during March to July. NMFS clearly had sufficient data to perform this analysis (such data is reflected in Figure 11 of the Status Review); its utter failure to do so is inexplicable and undermines the fundamental conclusions of the Status Review.

iii. NMFS failed to explain the basis for its sea-ice projections

In its analysis of sea-ice projections for the northern Bering Sea, the Status Review failed to discuss the assumptions used in this analysis that affect the interpretation of the projections and the conclusions of the Status Review. First, the Status Review failed to identify the emissions scenario used for the sea-ice projections for northern Bering Sea shown in Figure 11, although this is necessary information for assessing risk to the ribbon seal's sea-ice habitat. The rate of sea-ice loss (by 2050 and 2100) varies depending on the IPCC emissions scenario used, with lower emissions scenarios leading to lower rates of loss (IPCC 2007: Figure SPM.5). Because the worldwide emissions growth rate since 2000 has exceeded that of the most-fossil fuel intensive IPCC emissions scenario, A1F1 (Raupach et al. 2007), running sea-ice projections under a range of plausible emissions scenarios, including the A1F1 scenario, is important for providing a plausible bounded estimate of future sea-ice loss.

Second, the Status Review did not analyze how well the IPCC model sea-ice projections fit observed sea-ice loss in the Bering Sea. Thus, the Status Review makes the untested assumption that the IPCC models are accurately capturing Bering Sea sea-ice dynamics and making a good prediction of future sea-ice extent. Importantly, the IPCC Fourth Assessment Report ("AR4") models used by the Status Review are well-known to significantly and dramatically underpredict both summer and winter Arctic sea-ice extent (Stroeve et al. 2007). For example, Stroeve et al. (2007) found that Arctic winter (March) sea ice during the past few decades (1979-2006) declined more than twice as fast as the IPCC AR4 multi-model ensemble projected: -2.9 ± 0.3 % per decade based on observations versus -1.2 ± 0.2 % per decade based on IPCC models. In fact, in March 2006, winter sea-ice extent fell to a record-low minimum which IPCC model-ensemble mean forecast would not be reached until 2070 or beyond (based on Stroeve et al. 2007).

For its analysis, the Status Review used an ensemble of 23 IPCC AR4 models and a subset of 4 IPCC models that were identified as better capturing sea-ice dynamics (called the "better model composite"). Figure 11 of the Status Review suggests that the IPCC AR4 models, including the "better model composite," underpredict the natural annual *variability* in Bering Sea sea-ice extent. For May, the 23-model average and "better model composite" average never came close to reaching the observed sea-ice minima during 1950 to 2008, when sea ice approached a near-zero extent in 1979, 1996, 2003, and 2004, and reached lows in many other years. Based on the pattern of natural inter-annual variability and the declining trend in sea-ice extent, it is extremely likely that future sea-ice extent will reach zero or near-zero sea-ice minima in May much more often than the models predict, especially as mean extent continues to decline. However, the Status Review never quantifies the increased frequency of reaching near-zero sea-ice minima in May or June in the future.

iv. NMFS failed to discuss studies projecting significant sea-ice loss in the Bering and Okhotsk Seas

The Status Review failed to discuss a scientific study by Overland and Wang (2007) that projected a significant loss of sea-ice area in the Bering and Okhotsk Seas by mid-century. Overland and Wang (2007) used a subset of IPCC AR4 models that best simulated observed sea-ice concentrations from 1979-1999 to predict sea-ice extent in the southerly seasonal ice zones during winter (March–April) by 2050 under the mid-level A1B emissions scenario. The Bering and Okhotsk Seas were projected to lose 40% of their March-April sea-ice area by 2050 (Overland and Wang 2007). Thus, according to this study, the sea-ice habitat that ribbon seals depend on in March and April for pup-rearing would be greatly diminished across their entire breeding range by 2050. As discussed above, given current emission growth rates exceed even the most emission-intensive IPCC scenarios (Raupach et al. 2007), modeling based on the mid-level A1B scenario is likely overly-optimistic.

v. NMFS failed to disclose or discuss sea-ice projections beyond 2050

The Status Review failed to show sea-ice projections for 2050 through 2100. However, projections through 2100 provide critical information for assessing the threat that global warming poses to the ribbon seal in the foreseeable future. Additionally, the scientific literature has set an overwhelming precedent for conducting climate change impact analyses through 2100, as discussed above. Based on the steady downward decline in sea-ice extent in April, May, and June through 2050 shown in Figure 11, the Status Review cannot ignore sea-ice projections from 2050 to 2100 during March through July if it is to properly evaluate the magnitude of the threat that global warming poses to the ribbon seal's sea-ice habitat in the foreseeable future, particularly given the lag effect between the emission of greenhouse gases and the realization of climate impacts from those emissions.

vi. NMFS failed to analyze projected changes in sea-ice types important to the ribbon seal

As noted above, and discussed further below, the ribbon seal uses thicker floes of the interior sea-ice front, and the Status Review never discusses projected changes in this ice type. Analysis of changes in presence of the *type* of ice used by ribbon seals, in addition to changes in the overall *extent* of sea ice in the ribbon seal's range is essential to understanding global warming's impacts on the species.

vii. NMFS reaches incomplete, overly-optimistic, and misleading conclusions based on the above-cited omissions and inadequacies

Section 4.3.1.1.2.2.3 of the Status Review concludes "Models results suggest that April will always have an ice cover for the next 40 years, while May will have some years with considerable sea-ice cover and some years with reduced ice cover, not unlike the climatological record." (Status Review: 39). However, this conclusion is incomplete and is not supported by the data presented nor by the best available science. The conclusion fails to state that sea-ice extent in the northern Bering Sea in April, May, and June (and likely March if it were to have been analyzed) will undergo a continuing, significant downward trend, resulting in increasing habitat loss for the ribbon seal during critical months for reproduction and molting. The statement that "May will have some years with considerable sea-ice cover and some years with reduced ice cover, not unlike the climatological record" is erroneous because sea-ice extent in May will be much reduced and characterized by a higher frequency of years with no sea ice when compared with the climatological record. In addition, the Status Review failed to analyze sea-ice projections throughout the range of the ribbon seal, most importantly in the Okhotsk Sea, and failed to analyze sea-ice projections beyond 2050, both of which make the conclusion incomplete, overly-optimistic, misleading, and, ultimately, arbitrary and capricious.

2. <u>Effects of climate change on the quality of ribbon seals' sea-ice habitat (Status Review Section 4.3.1.1.3)</u>

The Status Review has a brief section on the impacts of global warming on the *quality* (as opposed to *quantity*) of ribbon seal habitat. As described in the Petition and acknowledged in the Status Review, changes in the quality of the ribbon seal's habitat are important to the species' viability, especially in regard to sea-ice thickness. Ribbon seals specifically use thicker floes of the inner ice front, which can extend inward 50-70 km from the ice edge zone and where ice floes are thicker, larger, more deformed, and more snow-covered than the fringe ice (Burns 2002). However, in relation to sea-ice thickness, the Status Review made unsupported conclusions that directly contradict the findings of the numerous scientific studies that have reported significant reductions in sea-ice thickness across the Arctic seas in recent decades linked to global warming.

In its analysis, the Status Review briefly reviews evidence that Arctic sea-ice is thinning, citing two scientific studies. Petitioners submitted three additional studies during the comment period also documenting Arctic sea-ice thinning: Maslanik (2007), Perovich (2007) and NSIDC (2008). Another study submitted with the Petition stated: "There is a general consensus that both

Arctic sea-ice extent and sea-ice thickness have been reduced over the past 20 years" (Clement et al 2004: C03022). Nonetheless, without providing any supporting scientific evidence, the Status Review concluded:

> The annual formation of winter ice in the Bering Sea and Sea of Okhotsk will likely continue to produce ice of about the same mix of thicknesses and types that have been typical in the recorded past.

Status Review: 41.

Not only does this conclusion contradict the science presented in the Petition and elsewhere in the Status Review itself, but it also fails to acknowledge at least one scientific study indicating that sea ice will not be about "the same mix of thicknesses" in the Bering Sea in the future. A study by Clement et al. (2004), submitted with the Petition, clearly documents that the thickness of annual ice in the Bering Sea declines in warmer years and increases in colder years. Thus, this study provides compelling evidence that surface warming due to climate change will result in declining thickness of annual sea ice in the Bering Sea. Specifically, Clement et al. (2004) evaluated seasonal sea thickness in the Bering Sea on a weekly basis during two years with contrasting temperatures and ice coverage: the cold year of 1999 characterized by negative surface ocean and air temperature anomalies and extensive ice coverage, and the warm year of 2001 when winter sea ice formed late, ice melt proceeded earlier during spring, and sea surface temperatures warmed earlier in spring, "similar to scenarios projected with global warming." Clement et al. (2004) reported that the annual ice in the Bering Sea in the warm year of 2001 was significantly thinner for the entire ice season than in the cold year of 1999:

> [18] In 1999, the SLIP region was predominately covered in young ice (10–30 cm) from December through February (Figures 6a, 6c, and 6e). In March the ice was mainly thin first year ice (30–70 cm) becoming medium first year ice (70–120 cm) in April, except for a polynya south of St. Lawrence Island, which was characterized by ice <10 cm thick (Figures 7a and 7c). SLIP was predominately covered by young ice (10–30 cm) for the entire ice season (Figures 6 and 7) during 2001. The only exception occurred in April, when the predominant stage of ice was thin, first-year ice (30–70 cm) in the west (Figure 7d).

(Clement et al. 2004: C03022).

In sum, NMFS ignored readily-available information specifically presented for its consideration, and, as a consequence, made overly-optimistic, and unrealistic projections about the quality of habitat that would be available to the ribbon seal by 2050.

3. <u>Effects of climate change on ocean conditions (Status Review Section 4.3.1.1.4)</u>

a. NMFS failed to discuss the implications of recent ocean warming in the Bering Sea.

The analysis of ocean warming in Section 4.3.1.1.4.1 of the Status Review failed to discuss the implications of the pronounced recent surface warming in the northern Bering Sea for future sea-ice melting and thinning, as discussed in Steele et al. (2008). The significant recent warming in the surface ocean of the Bering and Chukchi Seas is primarily attributable to increasing sea-ice loss in this region resulting in increased solar heating of the ice-free ocean (i.e. ice-albedo feedback) and to a lesser extent from the influx of warmer Pacific waters through the Bering Strait. Importantly, the increasing ocean heat content in this region will result in more heat being available to melt and thin sea ice, and delay sea-ice formation in this region (Steele et al. 2008). Thus, ocean surface warming in the northern Bering and southern Chukchi Sea has significant implications for further ice loss and thinning in this region, an important point which the Status Review failed to address.

b. NMFS's analysis of the impacts of ocean acidification on the ribbon seal uses inappropriate standards

In its analysis of ocean acidification in Section 4.3.1.1.4.2 of the Status Review, NMFS presents substantial scientific evidence for the significant threat that ocean acidification poses to the ribbon seal: (1) ocean acidification and aragonite undersaturation are occurring more quickly in the North Pacific Ocean and Arctic regions than in most other ocean regions; (2) ocean acidification will impact the ribbon seal's prey base through two pathways: direct physiological stress from changing pH and reduced abundance of species that use calcite and aragonite; and (3) aragonite undersaturation at the surface is projected to occur in the ribbon seal's range within this century. However, NMFS then minimizes this threat by using an inappropriately short 43-year (2008-2050) time frame and inappropriate standards on which to assess the impacts of ocean acidification:

> Following the same logic as in Section 4.1, the foreseeable future for ocean acidification is determined by the duration of influence of recent and current emissions, out to about 2050. Although the North Pacific Ocean is predicted to be one of the first areas where aragonite undersaturation will reach the surface, this is not likely to occur before 2050 (Orr et al. 2005). Nevertheless, there is considerable scope for ecosystem impacts prior to undersaturation actually reaching the surface.

(Status Review: 43).

As discussed above, the "foreseeable future" time frame used by NMFS must be long enough so that actions to reduce the threats to the species can occur. As carbon dioxide emissions rise through this century, aragonite and calcite saturation horizons and ocean acidity will also continue to rise, resulting in ever-increasing degradation and destruction of the ribbon seal's habitat and prey base as marine organisms are physiologically impaired and increasingly unable to build their shells. Clearly, ocean acidification should not be considered a significant threat to the ribbon seal only once it has resulted in aragonite undersaturation at the surface, when organisms like pteropods at the base of the food web are longer able to survive. Once aragonite undersaturation at the surface occurs, the ribbon's seals marine habitat will be irreversibly destroyed. As explained by the German Advisory Council on Global Change, ocean acidification is irreversible on practical timescales once it has occurred:

> Because the CO_2 input into the sea is caused by a rise in atmospheric CO_2 concentrations and therefore by anthropogenic CO_2 emissions, the pH drop in the ocean can be limited by reducing emissions. Once acidification has occurred, however, it is irreversible – as long as there is no possibility of lowering the atmospheric CO_2 concentration the pH value of the surface layer will not rise again in any foreseeable future. Overstepping the guard rail would thus be irreversible, which makes the precautionary principle particularly relevant to this problem.

(WBGU: 74).

Rather, as the precautionary principle and ecological principles dictate, ocean acidification poses a threat to the ribbon seal long before it results in irreversible destruction of the ribbon seal's habitat and prey base via aragonite undersaturation at the surface. Indeed, as acknowledged by the Status Review and discussed in the Petition, aragonite undersaturation at the surface is likely to occur in the range of the ribbon seal in this century. Thus, the time frame for assessing this threat should be at least 100 years so that NMFS will be able to "take steps to insure that" ribbon seals "never reach the state of being presently endangered." *Defenders of Wildlife v. Norton*, 258 F.3d 1136, 1142 (9th Cir. 2001).

C. NMFS' ANALYSIS OF THE IMPACTS OF GLOBAL WARMING ON RIBBON SEAL VIABILITY FAILED TO USE THE BEST AVAILABLE SCIENCE

In addition to its sections on global warming's impacts on sea ice and ocean conditions, the status review also contains a section on how these changes may affect ribbon seal viability. Unfortunately, Section 4.3.1.2 of the Status Review repeats many of the flaws in the other sections of the document. NMFS reached more optimistic conclusions on the impacts of climate change to ribbon seals than are warranted by the data on climate change presented in the Status Review and by the best available science. NFMS arrived at these conclusions by (1) basing its conclusions on a flawed and inadequate analysis of current and future climate conditions in the Bering Sea; (2) failing to conduct a climate change analysis or consider the best available science for the Okhotsk Sea; and (3) failing to use the best available science on ribbon seal natural history to inform the assessment. Section 4.3.1.2 was divided into sea-ice-related impacts and ocean-condition-related impacts to the ribbon seal, which are discussed sequentially below. In failing to use the best scientific data available, NMFS violated the Endangered Species Act. 16 U.S.C. § 1533(b)(1)(A).

1. <u>Sea-ice related impacts</u>

The Status Review based its analysis of sea-ice-related impacts on the ribbon seal on two primary factors: (a) changes in the "frequency of years with extensive ice, the quality of the ice, and the duration of its persistence" (p. 49) and "frequency of years in which [years of low ice extent, poor ice quality, or early melting] occur and the proportion of the population's range over which they occur" (p. 51); and (b) the potential effects [of these changes in sea-ice conditions] on the vital rates of reproduction and survival (p. 49). Thus, the Status Review's joint analysis of these two factors (changing sea-ice conditions and effects of changing conditions on vital rates) is critical to the listing decision.

a. NMFS's flawed analysis regarding current and future sea-ice conditions renders its conclusions regarding impacts to the ribbon seal infirm

As described above, the Status Review's analyses and conclusions regarding observed and projected changes in sea-ice conditions are flawed and inadequate. Thus, the analysis of the effects of changes in sea-ice conditions on ribbon seal reproduction and survival presented in this section are also flawed and inadequate. To cite a few examples, (1) the Status Review failed to conduct an analysis of sea-ice conditions in the Okhotsk Sea, and thus the Status Review cannot draw conclusions about the impacts of climate change on the ribbon seal in the Okhotsk Sea, which represents a significant portion of the species' range. (2) The Status Review largely based its conclusions on how frequency of years with low ice extent will affect the ribbon seal's survival and reproduction on the unsupported statement that there will only be an "anticipated slight increase in frequency of years with low ice extent in May and June" (Status Review: 50, 51). Because the Status Review failed to quantify changes in frequency of years with low ice extent in May and June, it cannot make the assessment that there will be only "slight increases" especially when the presented data indicate that there will be substantial increases. (3) The Status Review never quantified the observed and projected loss of sea-ice habitat area for the ribbon seal, and thus never assessed how projected losses in habitat area will affect populations in the Bering and Okhotsk Sea. The data presented in Figure 11 indicate that there will be significant declines in mean sea-ice extent in April, May, and June, which equates to significant declines in sea-ice habitat area in critical months for reproduction and molting.

b. NMFS's analysis and conclusions regarding impacts of sea-ice loss on ribbon seal vital rates are flawed and inadequate on multiple counts

i. Reproductive success

The Status Review failed to analyze how earlier melting of the sea ice and the increasing frequency of years with complete loss of sea ice in the Bering Sea in May during the nursing period will reduce ribbon seal reproductive success by increasing pup mortality. As shown in Figure 6 of the Status Review, ribbon seals use sea ice for nursing their pups for a three to four week period during late March through May, peaking in April and early May. Ribbon seal pups rely on the dry platform of the sea ice during the nursing period since they cannot survive submersion in the icy waters until they have formed a sufficient blubber layer (providing protective thermoinsulation) and since they learn to swim after weaning (Burns 1981, Fedoseev 2000). As documented in the Petition, Lowry (1984) observed that ribbon seal pup survival and subsequent vigor likely depend in part in the stability and persistence of ice selected by its mother. Fedoseev (2000) noted that spring ice break-up has crucial influence on the duration of lactation, rates of development, and growth of pups. In addition, other Arctic ice seals, including harp and ringed seals, have been documented to suffer higher pup mortality in poor ice years when sea ice melted before the nursing period ended (Smith and Harwood 2001, Stirling 2005, Friedlaender et al. 2007). Thus, earlier sea-ice melt and an increasing frequency of years with ice disappearance by early May during the peak of the nursing period are very likely to result in higher pup mortality from two mechanisms: (1) mothers and pups are prematurely separated during the nursing period when sea ice disappears or becomes too thin, and pups are weaned before they are big enough or strong enough to survive; and (2) pups suffer from higher thermal stress when they are forced to enter cold water during the nursing period before they have accumulated a sufficient blubber layer and before they have learned swimming skills. The Status Review should have considered the impacts of changing sea-ice conditions on pup mortality during the nursing period, which is an important mechanism of reproductive failure documented for other Arctic seals.

The Status Review also failed to address how declining sea-ice area and thickness are likely to result in declining birth rates if female seals cannot find ice of sufficient quality on which to birth. As shown in Figure 6 of the Status Review, ribbon seals use sea-ice for giving birth from late March through mid-May. Female ribbon seals show a strong preference for thick pack ice for pup-rearing and are rarely found on thin ice. Females that are unable to find sea ice of sufficient quality for pupping could abandon their reproductive effort for the year by aborting their pups, as found for the harp seal. Friedlaender et al. (2007) found that the trend of diminishing sea ice in the Gulf of St. Lawrence and along the east coast of Newfoundland and Labrador threatened harp seal reproductive success by increasing abortion rates when female seals did not find ice on which to birth and increasing pup mortality when sea ice broke up or melted before the nursing period ended (Friedlaender et al. 2007).

In assessing reproductive success, the Status Review cites harp seals as a species analog for the ribbon seal and notes that harp seals have suffered breeding failures in low-ice years, also discussed in the Petition. While the Status Review points to two behaviors of harp seals (dense aggregations and ties to traditional geographic locations) that they suggest "may make harp seals more vulnerable than ribbon seals to interannual variations in ice extent," the Status Review fails to acknowledge ribbon seal behaviors that make the species more vulnerable to interannual variations in ice extent. For example, ribbon seals have a significantly longer nursing period (during which they are dependent on sea ice) lasting three to four weeks (Burns 1981) compared with the 12-day nursing period of harp seals. Thus, ribbon seals are dependent on sea ice for nursing pups for a significantly longer period than are harp seals.

ii. Survival of weaned pups

In its assessment of how changing sea-ice conditions are likely to affect the survival of weaned pups, the Status Review failed to consider how the increasing frequency of complete ice disappearance by early May would affect the survival of weaned pups. As shown in Figure 6 of the Status Review, the peak of the pup-maturing period occurs in May. As discussed in the Petition and acknowledged in the Status Review, ribbon seal pups are highly dependent on the sea ice during the two to three week period after they are weaned (Burns 1981). Weaned pups have poor swimming and diving skills because their hefty blubber stores make them buoyant. They spend substantial time on the sea ice while they slowly learn diving and foraging skills and eventually achieve aquatic proficiency in mid-June (Burns 1981). The pup-maturing period is an energetically stressful transition period for pups during which time they lose a significant amount of weight (Burns 1981).

The Status Review did not assess the impacts of the increasing frequency of complete ice disappearance in May on the survival of weaned pups. Instead the Status Review only considered the scenario that stable, clean, moderate-sized ice floes "may more frequently be confined to smaller areas or areas farther north than in the past" (Status Review: 50) rather than the projected scenario of sea ice being unavailable in May and June throughout the Bering Sea. Based on this inadequate sea-ice assessment, the Status Review minimized the impacts that sea-ice loss will have on weaned pups by conjecturing that "weaned pups may not require ice floes that can persist for weeks to meet their basic haul-out needs" (Status Review: 50) without analyzing the impacts on pups in years when sea ice is not available through most or all of the pup-maturing period. The Status Review's failure to discuss the impacts of complete or near-complete habitat loss during the pup-maturing period is a grave omission that ignores the best available science on climate change, ribbon seal natural history, and the comments of ribbon seal researchers.

In comments to NMFS, Dr. Carleton Ray, a ribbon seal expert and research professor at the University of Virginia, explained how observed losses of sea in the Bering Sea in May are likely *already* resulting in high pup mortality:

> The case of the ribbon seal is most urgent…. Pups remain on or near the ice during a 4-week molting period, when they begin to feed. However, during 2006 and 2007, little sea ice remained beyond mid-May, depriving the pups of their habitat and requiring a high-energy demand for aquatic life. It is highly unlikely that the pups could meet this demand, probably resulting is high mortality during the following summer.

(Carleton Ray: Comment Tracking No. 80601993). And further that:

> There is simply no ignoring the almost total loss of habitat for pup ribbon seals during May of 2006 and 2007 and the likelihood of continued sea-ice decline…

(Carleton Ray: Comment Tracking No. 80601993).

Also of importance, once sea-ice has melted, pups will likely not be able to swim long distances northward to find suitable ice for resting, a point which is acknowledged in the Status Review: "They may, however, be relatively limited in their capability to respond to rapidly deteriorating ice fields by relocating over large distances, a factor that could occur more frequently in the foreseeable future." (Status Review: 50). Thus, the increasing frequency of complete ice disappearance in May and June and its impacts on weaned pup survival is a critical analysis that cannot be ignored.

iii. Adult survival

The Status Review never assessed the impacts of the increasing frequency of complete ice disappearance in May in its assessment of how sea-ice loss will affect adult survival through interruption of molt. As stated in the Status Review and Petition, ribbon seals require the sea-ice platform in May through July for the annual molt of their fur since they do not haul out on land (Lowry 1984). Indeed, haul-out data cited by the Status Review found that individual adult ribbon seals haul out almost continuously for a period of 2-3 weeks, mostly during mid-May to late June. Thus, assessing how the increasing frequency of the loss of a haul-out substrate during the *entirety* of the adult molt period will impact adult survival is a critical and necessary part of this analysis. As noted by the Status Review, the likely impacts of loss of access to a haul-out substrate during this period include higher energetic costs, increased susceptibility to skin disorders and pathogens, and increased exposure to abrasion from crawling over snow and ice.

iv. Sub-adult survival

NMFS's analysis of how changing sea-ice conditions may impair sub-adult survival has two flaws: (1) Sub-adult molt occurs during April to mid-May, so this analysis should consider how sub-adult survival may be affected by the increasing frequency of complete ice disappearance in May. (2) In addition, the Status Review drew an unsupportable conclusion on impacts of sea-ice loss on sub-adult survival from a small sample of captured ribbon seals in 2007: that the sample "did not indicate that catastrophic losses had occurred in the ribbon seal cohorts produced during the warm years of 2001-2005":

> Of 31 ribbon seals caught, 6 were subadults, 22 were adults, and 3 were young of the year (which were commonly encountered but not always pursued for tagging). In other words, the obvious presence of seals in the subadult age class did not indicate that catastrophic losses had occurred in the ribbon seal cohorts produced during the warm years of 2001-2005 (Figure 9).

First, the extremely small sample size of 31 seals is too small to draw any scientifically meaningful or supportable conclusions. Second, because the ages of the sub-adult seals were not given (or were unknown) and because the sample size is prohibitively small, it is impossible to draw conclusions about losses of specific year cohorts in relation to ice conditions. Subadults seen in 2007 would have been born between 2002 and 2006 since ribbon seals take 1 to 5 years to reach sexual maturity (Status Review: 12), and these cohorts would have experienced different sea-ice conditions. Sea-ice conditions were notably worse in 2003 and 2004 when sea ice disappeared completely by early May, compared with 2002 and 2006 when sea ice persisted through mid-May (Status Review: Figure 10). Thus some cohorts produced during 2002-2006 were likely to have been more impacted by sea-ice loss in their natal year and subsequent years than other cohorts. Because the identity of the cohorts in the subadult sample is unknown, these data provide no means of determining how cohorts produced during 2002-2006 were impacted by sea-ice conditions in their natal year and subsequent years..

2. <u>Ocean condition related impacts</u>

The Status Review's assessment of the impacts of ocean acidification on the ribbon seal in Section 4.3.1.2.2 suffers from the same flaws as the assessment of ocean acidification impacts on ocean conditions in Section 4.3.1.1.4.2 of the Status Review. Namely, the Status Review uses an inappropriate time frame for assessing this threat: "because the major effects of ocean acidification may not appear until the latter half of this century, this threat should be of less immediate concern that the direct effects of potential sea-ice degradation" (Status Review: 53). As discussed above, NMFS should have used a time frame of at least 100 years for assessing the threat of ocean acidification in which case the acknowledged effects of ocean acidification on the ribbon seal would likely be readily apparent. Moreover, as discussed above, significant negative impacts of ocean acidification are expected in ribbon seal habitat by mid-century even under relatively optimistic emission scenarios. NMFS's summary dismissal of this important threat is arbitrary.

D. NMFS' ANALYSIS OF OTHER ESA LISTING FACTORS WAS FLAWED

While the primary threat to the ribbon seal, the loss of its sea-ice habitat do to global warming, falls within the ESA listing factor "the present or threatened destruction, modification, or curtailment of its habitat or range," 16 U.S.C. § 1533(a)(1)(A), several other ESA listing factors are also implicated in the plight of the species. NMFS's treatment of these factors was also arbitrary.

NMFS acknowledges that overutilization of ribbon seals in Russia is a serious threat: "the proposed level of harvest is comparable to the commercial harvest levels of the 1950s and 1960s, which was shown to be unsustainable (Shustov 1965b) and 'disastrous' to this species (Fedoseev 1973)." (Status Review: 55). NMFS also acknowledges that existing regulatory mechanisms to control such harvest are likely ineffective: "It is unclear what mechanisms are currently in place in Russia to ensure that potential commercial harvests remain within sustainable levels." (Status Review: 65). Nevertheless, NMFS makes no effort to actually analyze such impacts in it risk assessment for the species. Similarly, the discussions of disease and predation and other natural and anthropogenic factors describe threats to the species, such as increased orca predation, oil and gas development, and increased shipping, are summarily dismissed as of little consequence with no analysis of how they might cumulatively affect the species.

Finally, two consecutive sentences in NMFS's finding dealing with the inadequacy of existing regulatory mechanisms highlight the schizophrenic and arbitrary nature of the decision.

> There is little evidence that the inadequacy of existing regulatory mechanisms currently poses a threat to ribbon seals throughout all or a significant portion of their range. However, there are no known regulatory mechanisms that effectively address global reductions in sea ice habitat at this time.

73 Fed. Reg. at 79827. NMFS admits that no regulatory mechanisms address the greatest threat to the species, the loss of sea ice as a result of global warming. Yet, somehow, NMFS simultaneously concludes that this is not a problem for the species. Such a conclusion is the height of arbitrary government decision-making.

E. NMFS FAILED TO ANALYZE WHETHER ANY DISTINCT POPULATION SEGMENT OF THE RIBBON SEAL WARRANTED LISTING OR WHETHER THE SPECIES WAS THREATENED IN A SIGNIFICANT PORTION OF ITS RANGE

NMFS based its not-warranted finding for the ribbon seal on an analysis of the extinction risk facing the species as a whole. In so doing, it failed to properly analyze whether any distinct population segment ("DPS") of the species might warrant listing or whether the species might be threatened or endangered in a significant portion of the range. To the limited degree the Status Review and 12-month finding purport to make these analyses, they did so in violation of NMFS's own DPS policy and binding caselaw on significant portion of the range.

The actual 12-month finding's DPS analysis consists of a single sentence:

> Although there are two main breeding areas for ribbon seals, one in the Sea of Okhotsk and one in the Bering Sea, there is currently no evidence of discrete populations on which to base a separation into DPSs.

73 Fed. Reg. at 79824. The Status Review expands this to a paragraph (p. 25). The Status Review acknowledges that Russian scientists have postulated discrete Bering Sea and Okhotsk stocks and that studies of helminthes showed different species found in northern versus southern seals. *Id*.[1] Nevertheless, NMFS concludes that "no compelling evidence has been presented for demographically significant population structure within the ribbon seal breeding distribution." *Id*. This conclusion, even if were deemed correct, is simply not the standard under NMFS's own DPS policy.

Under the DPS policy a population segment of a vertebrate species is discrete if it satisfies either of the following conditions:

> 1. It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors.
>
> 2. It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act, 61 Fed. Reg. 4722 (Feb. 7, 1996). While the geographical barriers between the Bering Sea and the Sea of Okhotsk likely qualify under the first prong of the policy, there can be no dispute that Russian and Alaskan ribbon seals are separated by an international boundary and that the two countries management regimes for the species clearly differ, thereby satisfying the second prong of the policy. The very fact that Russia allows a significant commercial hunt for the species is ample evidence of differing management of the species. NMFS's disregard of its own policy and complete failure to consider whether any DPSs of ribbon seal might warrant listing renders the 12-month finding arbitrary and unlawful.

NMFS's significant portion of the range analysis fairs little better. The Status Review's standard for what constitutes a significant portion of the species' range improperly renders the term meaningless.

> However, in assessing extinction risk, the BRT considered whether any of the threats set forth below posed a risk to the species throughout all or a significant portion of its range, as a species must be declared to be endangered or threatened even if it is at risk in only a portion of its range, *when that portion is important to the species' continued viability*.

[1] The Status Review concludes that the sample size of 80 seals in the helminthes study was too small to draw any conclusions about actual stock structure. In contrast, as discussed above, elsewhere the Status Review relies on a sample size of just 31 seals to conclude that low ice years do not pose a threat to the species. NMFS's inconsistent standard for dismissal of data inconvenient to its preordained conclusions is arbitrary.

Status Review: 26 (emphasis added).

By defining a "significant portion of its range" as a portion that "is important to the species' continued viability" NMFS is, in effect, rendering the phrase "significant portion of its range" meaningless. If threats in a "significant portion" of a species range threaten the "species' continued viability," then that is no different than the species being in danger of extinction in *all* of its range. For if a species' continued viability is at risk, then the entire species is in danger of extinction.

By using this definition of a "significant portion of its range" NMFS is committing the exact error stuck down by the Ninth Circuit in *Defenders of Wildlife v. Norton*, 258 F.3d 1136 (9th Cir. 2001). In that case, FWS argued that "a species is eligible for protection under the ESA if it 'faces threats in enough key portions of its range that the entire species is in danger of extinction, or will be within the foreseeable future.'" *Id*. at 1141. The court rejected this construction.

> If, however, the effect of extinction throughout "a significant portion of its range" is the threat of extinction everywhere, then the threat of extinction throughout "a significant portion of its range" is equivalent to the threat of extinction throughout *all* its range. Because the statute already defines "endangered species" as those that are "in danger of extinction throughout all . . . of [their] range," the Secretary's interpretation of "a significant portion of its range" has the effect of rendering the phrase superfluous.
>
> Such a redundant reading of a significant statutory phrase is unacceptable.

Id. at 1141-42 (emphasis in original).

In sum, in addition to its errors with regard to whether the ribbon seal as a global species warrants the protections of the ESA, NMFS also failed to properly analyze whether the species might warrant protection as one or more DPSs or because it was in threatened or endangered in a significant portion of its range. This failing renders the 12-month finding unlawful.

III. CONCLUSION

NMFS's determination that listing of the ribbon seal is "not warranted" violates the specific mandates of the ESA regarding how a determination as to whether to list a species is to be made. NMFS's determination relies on an unreasonable time frame for the "foreseeable future;" is not based on the "best scientific and commercial data available;" and does not appropriately consider whether the ribbon seal, or any DPS of the species, is likely to become threatened or endangered "throughout all or a significant portion of its range" 16 U.S.C. §§ 1531(20) & 1533(b)(1)(A). NMFS's determination is therefore arbitrary and capricious in violation of the ESA and APA.

If NMFS does not act within 60 days to correct this violation of the ESA, the Center for Biological Diversity and Greenpeace, Inc. will pursue litigation in Federal Court against NMFS and will seek injunctive and declaratory relief regarding these violations. If you have any questions, wish to discuss this matter, or believe this notice is in error, please contact me at 760-366-2232x304. Thank you for your concern.

Sincerely,

Brendan Cummings
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P.O. Box 549
Joshua Tree, CA 92252

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(Each of the documents cited above and listed below was provided to NMFS either with the Petition or in subsequent comments on the Petition or was cited by the Ribbon Seal Status Review, and therefore is clearly part of the administrative record for the 12-month finding.)

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