Submitted via email and U.S. Postal Service

7 December 2022

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Dear Secretary Haaland and Director Williams:

As scientists with expertise in Pacific walrus (*Odobenus rosmarus divergens*) ecology, sea ice, and/or climate change impacts, we write to convey our concerns about the future of this species in the face of climate change and emphasize the need to promptly list the Pacific walrus under the U.S. Endangered Species Act.[1] Swift action is necessary in light of the Intergovernmental Panel on Climate Change's (IPCC) recent Working Group reports and Special Reports, which describe myriad ways climate change is impacting and will continue to impact the walrus and its habitat.[2]

In 2021, the Ninth Circuit Court of Appeals rejected the U.S. Fish and Wildlife Service's 2017 determination that protection for the Pacific walrus was not warranted under the Endangered Species Act.[3] That determination, based on alleged "uncertainty" about sea ice projections and walruses' presumed ability to respond to climate-induced changes in Arctic ecosystems, was both scientifically and legally improper. The Endangered Species Act requires listing decisions to be made "solely on the basis of the best scientific and commercial data available."[4] Courts have been clear that this mandate does not require the Fish and Wildlife Service to obtain the

[1] 16 U.S.C. § 1531 *et seq.*
[2] *See* IPCC, *Special Report: Global Warming of 1.5°C* (2018); IPCC, *Special Report: Climate Change and Land* (2019); IPCC, *Special Report on the Ocean and Cryosphere in a Changing Climate* (2019); IPCC, *Climate Change 2021: The Physical Science Basis*, Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2021); IPCC, *Climate Change 2022: Impacts, Adaptation, and Vulnerability*, Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2022), *Climate Change 2022: Mitigation of Climate Change*, Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2022). The IPCC currently is "synthesiz[ing] and integrat[ing] materials contained within the Assessment Reports and Special Reports." *See* IPCC, AR6 Synthesis Report: Climate Change 2022, *at* https://www.ipcc.ch/report/sixth-assessment-report-cycle/. The AR6 Synthesis Report will be "based on the content of the three Working Groups Assessment Reports … and the three Special Reports." *Id.*
[3] 82 Fed. Reg. 46642–44 (Oct. 5, 2017); *Ctr. for Biological Diversity v. Haaland*, 998 F.3d 1061 (9th Cir. 2021).
[4] 16 U.S.C. § 1533(b)(1)(A).

best science possible, but rather, the best science available.[5] The best available science clearly demonstrates that sea ice is melting at an alarming and accelerating rate due to anthropogenic climate change and that the Pacific walrus—dependent on sea ice for essential life functions—will decline towards extinction as a consequence. Immediate action is required to protect this imperiled species.

The Arctic Sea Ice Upon Which the Pacific Walrus Depends Continues to Decline

The Arctic ecosystems that the Pacific walrus calls home are particularly vulnerable to climate change.[6] While the Earth has warmed by approximately 0.8°C since the late 19th century, the Arctic has warmed by 2-3°C over the same time frame.[7] This warming has led to a rapid and substantial loss of Arctic sea ice, particularly along Alaska's coast.[8] Arctic summer sea ice extent and thickness have decreased by 40% during the past several decades,[9] with each metric ton of CO_2 emissions causing a sustained loss of three square meters of summer sea ice area.[10] The Arctic lost 94% of its oldest and thickest sea ice during the past three decades, and the remaining younger, thinner ice melts more rapidly.[11] Climate models project that the Bering Sea will experience total sea ice losses of 60-90% by late century—and climate models have consistently underestimated the rate of Arctic sea ice decline.[12] As Arctic sea ice cover diminishes and the ice-free season lengthens,[13] scientists anticipate that melting will accelerate at least through 2100, when their model projections end.[14] Indeed, a nearly "ice-free summer Arctic ocean may be realized within a few decades."[15] Remaining sea ice increasingly is more fragmented and less

[5] *See, e.g.*, *Alaska Oil & Gas Ass'n v. Pritzker*, 840 F.3d 671, 680–81 (9th Cir. 2016).
[6] *See generally* Sarmiento, J.L. *et al.*, *Response of ocean ecosystems to climate warming*, 18 GLOBAL BIOGEOCHEMICAL CYCLES 1 (2004); Overland, James *et al.*, *The urgency of Arctic climate change*, 21 POLAR SCI. 6 (2019).
[7] Post, Eric *et al.*, *The polar regions in a 2°C warmer world*, 5 SCI. ADVANCES 1 (2019); Rantanen, Mika *et al.*, *The Arctic has warmed nearly four times faster than the globe since 1979*, 3 NATURE COMMUNICATIONS: EARTH & ENV'T 168 (2022).
[8] U.S. GLOBAL CHANGE RESEARCH PROGRAM (USGCRP), CLIMATE SCIENCE SPECIAL REPORT: FOURTH NATIONAL CLIMATE ASSESSMENT, VOL. I (2017).
[9] Meier, Walter N. et al., *Arctic sea ice in transformation: A review of recent observed changes and impacts on biology and human activity*, 51 REVIEWS OF GEOPHYSICS 185 (2014); USGCRP (2017); U.S. GLOBAL CHANGE RESEARCH PROGRAM, IMPACTS, RISKS, AND ADAPTATION IN THE UNITED STATES: FOURTH NATIONAL CLIMATE ASSESSMENT, VOL. II (2018); Intergovernmental Panel on Climate Change (IPCC), *Summary for Policymakers In: Climate Change 2021: The Physical Science Basis*, Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2021).
[10] Notz, Dirk & Julienne Stroeve, *Observed Arctic sea-ice loss directly follows anthropogenic CO_2 emission*, 354 SCI. 747 (2016).
[11] MOON, TWILA A. *ET AL.* (EDS.), NOAA ARCTIC REPORT CARD 2021 (2021).
[12] *See* Overland, James E. *et al.*, *Future Arctic climate changes: adaptation and mitigation time scales*, 2 EARTH'S FUTURE 68 (2014); Taylor, Rebecca L. & Mark S. Udevitz, *Demography of the Pacific Walrus* (Odobenus rosmarus divergens): *1974-2006*, 31 MARINE MAMMAL SCI. 231 (2015); LOWRY, L., *ODOBENUS ROSMARUS:* THE IUCN RED LIST OF THREATENED SPECIES (2016).
[13] Along Alaska's northern and western coasts, the sea ice season has already shortened by more than 90 days. USGCRP (2017).
[14] Overland *et al.* (2014); Parkinson, Claire L., *Spatially mapped reductions in the length of the Arctic sea ice season*, 41 GEOPHYSICAL RESEARCH LETTERS 4316 (2014); USGCRP 2017; HOLLAND, MARIKA & WALT MEIER, WHAT DO WE KNOW ABOUT THE FUTURE OF ARCTIC SEA-ICE LOSS? (2018); Post *et al.* (2019).
[15] Post *et al.* (2019); *see also* Overland, James E. & Muyin Wang, *When will the summer Arctic be nearly sea ice free?*, 40 GEOPHYSICAL RESEARCH LETTERS 2097 (2013) (the Arctic is projected to be nearly ice-free in summer by

structured than the pack ice preferred by the Pacific walrus, with dire implications for the species' survival and persistence in a warming world.[16]

Sea Ice Decline Threatens the Pacific Walrus's Survival and Persistence

The Pacific walrus depends on sea ice—particularly broken pack ice—for essential life functions including foraging, courtship and mating, birthing and nursing, molting, and resting.[17]

Pacific walruses depend on sea ice to passively move them throughout their foraging grounds, allowing them continual access to high-quality food patches.[18] Many such food patches occur over the productive shallow continental shelf, some too far from shore to be otherwise accessible.[19] Sea ice "broaden[s] … the feeding distribution of this species markedly, which permits greater overall walrus abundance."[20] As the climate warms and sea ice melts, it becomes more difficult for Pacific walruses to access critical food resources—resources that are themselves undergoing climate change-induced shifts—with implications for walrus survival and persistence.[21] Loss of Arctic sea ice is leading to less effective foraging strategies and decreased foraging range and, ultimately, will result in a decline in Pacific walrus abundance.[22]

Sea ice provides particularly important habitat for female and juvenile walruses, cohorts critical to the species' viability.[23] For example, females tend to remain on ice in the summer while males move to isolated beaches to rest and molt.[24] Females and juveniles exhibit shorter foraging bouts closer to sea ice, whereas adult males may venture beyond the sea ice for extended periods of

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2040); Overland *et al.* (2014); USGCRP (2017); Peng, Ge *et al.*, *What do global climate models tell use about future Arctic sea ice coverage changes?*, 15 CLIMATE 1 (2020); IPCC (2021).

[16] FAY, FRANCIS H., ECOLOGY AND BEHAVIOR OF THE PACIFIC WALRUS, *ODOBENUS ROSMARUS DIVERGENS* ILLIGER 1 (1982); Ray, G. Carleton *et al.*, *Decadal Bering Sea seascape changes: consequences for Pacific walruses and indigenous hunters*, 26 ECOLOGICAL APPLICATIONS 24 (2016).

[17] *See generally* Fay, Francis H., *The role of ice in the ecology of marine mammals of the Bering Sea*, *in* OCEANOGRAPHY OF THE BERING SEA, WITH EMPHASIS ON RENEWABLE RESOURCES (HOOD, D.W., ED. 1972); FAY (1982); FAY, FRANCIS H. *ET AL.*, TIME AND LOCATION OF MATING AND ASSOCIATED BEHAVIOR OF THE PACIFIC WALRUS, *ODOBENUS ROSMARUS DIVERGENS* ILLIGER 97 (1984); Kelly, Brendan P., *Climate change and ice breeding pinnipeds*, *in* "FINGERPRINTS" OF CLIMATE CHANGE (WALTHER *ET AL.*, EDS. 2001); Ray, G. Carleton *et al.*, *Pacific walrus: benthic bioturbator of Beringia*, 330 J. EXPERIMENTAL MARINE BIOLOGY & ECOLOGY 403 (2006); Ray (2016).

[18] Ray *et al.* (2006); JAY, CHADWICK V. & ANTHONY S. FISCHBACH, PACIFIC WALRUS RESPONSE TO ARCTIC SEA ICE LOSSES (Grillo, Debra ed. 2008).

[19] Laidre, Kristin L. *et al.*, *Quantifying the sensitivity of Arctic marine mammals to climate-induced habitat change*, 18 ECOLOGICAL APPLICATIONS S97 (2008); Kovacs, Kit M. *et al.*, *Impacts of changing sea-ice conditions on Arctic marine mammals*, 41 MARINE BIODIVERSITY 181 (2011).

[20] Kovacs *et al.* (2011).

[21] Ray *et al.* (2006); Post, Eric *et al.*, *Ecological consequences of sea-ice decline*, 341 SCI. 519 (2013); Post, Eric, *Implications of earlier sea ice melt for phenological cascades in Arctic marine food webs*, 13 FOOD WEBS 60 (2017); Maniscalco, John M. *et al.*, *Contemporary diets of walruses in Bristol Bay, Alaska suggest temporal variability in benthic community structure*, DOI 10.7717/peerj.8735 (2020); Koch, Chelsea W. *et al.*, *Female Pacific walruses* (Odobenus rosmarus divergens) *show greater partitioning of sea ice organic carbon than males: evidence from ice algae trophic markers*, 16 PLoS ONE e0255686 (2021).

[22] Jay, Chadwick V. *et al.*, *Projected status of the Pacific walrus* (Odobenus rosmarus divergens) *in the twenty-first century*, 34 POLAR BIOLOGY 1065 (2011); Post *et al.* (2019); *see also* Ray *et al.* (2016).

[23] Koch *et al.* (2021).

[24] Fay, Francis H., *Odobenus rosmarus*, 238 MAMMALIAN SPECIES 1 (1985).

time.[25] While females and juveniles may use terrestrial haul-outs when sea ice is not available, the locations used are not a functional equivalent. Land-based walruses must swim farther distances to acquire food, which increases energy expenditure and results in reduced body condition.[26]

Reproductive-aged female Pacific walruses are showing reduced reproductive capacity that may be related to cumulative stressors including sea ice loss.[27] Virtually no suitable sea ice persists in the Bering Sea in May, a critical time for walrus birthing and migration.[28] Land-based haul-out and birthing sites do not serve as an adequate substitute for sea ice. As mentioned above, these sites do not occur in proximity to critical foraging sites, resulting in effects from increased energy expenditure to acquire food (and thus reduced body condition) to nutritional stress in calves to calf abandonment.[29] Critical nursing habitat thus has become uncoupled from adult foraging habitat. In addition, crowding on shoreline haul-outs increases the exposure of walruses to human-caused disturbance, death by trampling, disease transmission,[30] and predation by polar bears.[31]

Increasing Human Activity Places the Pacific Walrus at Increasing Risk of Extinction

Intensifying human activity in an increasingly ice-free Arctic places the Pacific walrus at further risk. Offshore oil and gas exploration and development, shipping, and ecosystem perturbations may impact walruses directly (*e.g.*, displacement, ship strikes, oil spills) or indirectly (*e.g.*, habitat degradation, impacts to prey resources).[32] These threats, especially when coupled with the threats posed by sea ice decline, place the Pacific walrus at increasing risk of extinction.

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[25] Taylor & Udevitz (2015).
[26] Jay *et al.* (2011).
[27] Larsen Tempel, Jenell T. & Shannon Atkinson, *Pacific walrus* (Odobenus rosmarus divergens) *reproductive capacity changes in three time frames during 1975-2010*, 43 POLAR BIOLOGY 861 (2020).
[28] Ray *et al.* (2016).
[29] Kelly (2001); Cooper, Lee W. *et al.*, *Rapid seasonal sea-ice retreat in the Arctic could be affecting Pacific walrus* (Odobenus rosmarus divergens) *recruitment*, 32 AQUATIC MAMMALS 98 (2006); Laidre *et al.* (2008); Jay *et al.* (2011); Kovacs *et al.* (2011); MacCracken, James G., *Pacific walrus and climate change: observations and predictions*, 2 ECOLOGY & EVOLUTION 2072 (2012); MacCracken, James E., *Trend in Pacific walrus* (Odobenus rosmarus divergens) *tusk asymmetry, 1990-2014*, 32 MARINE MAMMAL SCI. (2016).
[30] In addition to disease, the increase of harmful algal bloom toxicosis is increasing in the Arctic as sea ice melts and ocean temperatures warm. Lefebvre, Kathi A. *et al.*, *Prevalence of algal toxins in Alaskan marine mammals foraging in a changing arctic and subarctic environment*, 55 HARMFUL ALGAE 13 (2016). Walruses exhibited the highest concentrations of both domoic acid and saxitoxin of 13 marine mammal species sampled by Lefebvre *et al.* (2016), with domoic acid concentrations similar to those known to produce clinical signs of domoic acid toxicosis in California sea lions (*id.*). *See also* Lefebvre, Kathi A. *et al.*, *Paralytic shellfish toxins in Alaskan Arctic food webs during the anomalously warm ocean conditions of 2019 and estimated toxin doses to Pacific walruses and bowhead whales*, 114 HARMFUL ALGAE 102205 (2022) (high levels of saxitoxin detected in Pacific walruses).
[31] Jay *et al.* (2011); Kovacs *et al.* (2011); Nat'l Oceanic & Atmospheric Admin., *2011 Arctic seal disease outbreak fact sheet* (Nov. 10, 2011); MacCracken (2012); Laidre, Kristin L. *et al.*, *Arctic marine mammal population status, sea ice habitat loss, and conservation recommendations for the 21st century*, 29 CONSERVATION BIOLOGY 724 (2015); Lowry (2016); *see also* Fischbach, A.S., D.H. Monson & C.V. Jay, *Enumeration of Pacific walrus carcasses on beaches of the Chukchi Sea in Alaska following a mortality event, September 2009*, U.S. Geological Survey Open-File Report 2009-1291 (2009).
[32] Jay *et al.* (2011); Post *et al.* (2019).

The Pacific Walrus Must Be Listed Under the Endangered Species Act

In sum, ecosystem changes induced by climate change including sea ice decline increasingly threaten the Pacific walrus with extinction.[33] Given the species' reliance on Arctic sea ice, the rapidity of Arctic ecosystem change, and the species' inability to adapt quickly enough to this change,[34] the Pacific walrus is at risk of extinction or likely to become so in the foreseeable future. It has been more than a decade since the initial petition to list this species, and the Pacific walrus warrants immediate protection under the Endangered Species Act.

Sincerely,

Scientists signing this letter do so in their individual capacity and not on behalf of the institutions with which they are affiliated.

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[33] *See* Jay *et al.* (2011).
[34] *See* Kelly, B.P. *et al., Status Review of the Ringed Seal* (Phoca hispida), NOAA Tech. Memo. NMFS-AFSC-212 (2010); FUTUYMA, DOUGLAS J. & MARK KIRKPATRICK, EVOLUTION (4TH ED. 2017).

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