No. 19-35981

IN THE UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT

CENTER FOR BIOLOGICAL DIVERSITY,
Plaintiff-Appellant/Cross-Appellee,

v.

DAVID BERNHARDT, in his official capacity as Secretary of the U.S. Department of the Interior; **AURELIA SKIPWITH**, in her official capacity as Director of the U.S. Fish and Wildlife Service; and
U.S. FISH AND WILDLIFE SERVICE,
Defendants-Appellees/Cross-Appellants.

ON APPEAL FROM THE UNITED STATES DISTRICT COURT
DISTRICT OF ALASKA
NO. 3:18-CV-00064-SLG
THE HONORABLE JUDGE SHARON L. GLEASON, PRESIDING

BRIEF OF SCIENTIFIC EXPERTS BRENDAN KELLY, DON PEROVICH, ERIC POST, TIMOTHY RAGEN, CARLETON RAY, AND MARK SERREZE, AS *AMICI CURIAE* IN SUPPORT OF PLAINTIFF-APPELLANT

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CORPORATE DISCLOSURE STATEMENT

Pursuant to Federal Rule of Appellate Procedure 26.1 and Federal Rule of Appellate Procedure 29(a)(4)(A), *amici curiae* certify that they have no parent corporations and that no publicly held company owns 10% or more of the *amici curiae.*

Respectfully submitted,

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STATEMENT OF INTERESTS[1]

Each of the *amici* have expertise with respect to the Pacific Walrus, sea ice, and/or climate change impacts. They wish to inform the Court about "the best scientific" evidence available concerning the issues relevant to whether the Walrus should be listed as "threatened" under the Endangered Species Act, 16 U.S.C. § 1531 *et seq*.

- Dr. Brendan Kelly is a University of Alaska Professor of Marine Biology, and Executive Director of the Study of Environmental Arctic Change. Over the past 45 years, Dr. Kelly has studied Walruses in the Arctic and has worked with the National Science Foundation, the National Oceanic and Atmospheric Administration (NOAA), and the White House Office of Science and Technology Policy. Dr. Kelly has been an expert witness at Senate hearings on climate change and the polar bear Endangered Species Act listing; he was a reviewer of the U.S. Geological Survey's Bayesian model used in the proposed Walrus listing; a reviewer of NOAA's biological review for the ribbon seal listing; and a co-author of NOAA's biological reviews that informed listing decisions for ringed, bearded, and spotted seals.

- Dr. Donald K. Perovich is a Dartmouth Professor of Engineering. His research is aimed at observing and understanding the optical properties of snow and sea ice and the impact of sunlight on the heat and mass budget of sea ice. He has published more than 200 peer reviewed papers and book chapters and was the Chief Scientist of the

[1] Amici file this brief solely as individuals and not on behalf of the institutions with which they are affiliated. All parties have consented to the filing of this brief. Pursuant to Fed. R. App. P. 29(a)(4)(E), the undersigned counsel certifies that counsel for amici authored this brief in whole; no counsel for a party authored this brief in any respect; and no person or entity – other than amici and their counsel – contributed monetarily to this brief's preparation or submission.

1997–1998 Surface Heat Budget of the Arctic Ocean icebreaker drift experiment.

- Dr. Eric Stephen Post is a University of California, Davis Professor of Wildlife, Fish and Conservation Biology with expertise in ecological impacts of climate change in arctic systems. Dr. Post previously served a three-year term on National Science Foundation's Office of Polar Programs Advisory Committee, and a two-year term on National Science Foundation’s Studies of Environmental Arctic Change - Observing Change - Panel.

- Dr. Timothy Ragen is a marine mammal biologist and the former Executive Director of the Marine Mammal Commission. As Executive Director, Dr. Ragen approved/signed hundreds of letters to federal agencies regarding the potential effects of their activities on marine mammals. Before and after retirement, Dr. Ragen served as a chair and member on numerous federal advisory committees.

- Dr. G. Carleton Ray is a University of Virginia Research Professor. He has studied Walrus natural history, physiological ecology, and relationships with sea ice and climate. Dr. Ray’s research on ice-inhabiting marine mammals has been funded by the Office of Naval Research, the National Aeronautics and Space Administration, and the National Science Foundation.

- Dr. Mark Serreze is a University of Colorado Distinguished Professor of Geography, and Director of the National Snow and Ice Data Center. He specializes in Arctic climate research, including atmosphere-sea ice interactions and climate change. Dr. Serreze has published over 120 papers in peer-reviewed journals. He has testified before the U.S. Congress, has provided scientific expertise to U.S. Senators and Representatives, and is a frequent media contact on issues of climate and climate change.

ARGUMENT

I. THE "BEST AVAILABLE SCIENCE," REQUIRES THAT THE PACIFIC WALRUS BE LISTED AS "THREATENED" UNDER THE ENDANGERED SPECIES ACT.

The Endangered Species Act ("ESA") provides that the Fish and Wildlife Service (FWS) "shall" make a determination as to whether to list a species based on the "best scientific . . . data available." 16 U.S.C. § 1333(b)(1)(A). As the Supreme Court has observed, this ensures that the statute is "not [] implemented haphazardly, on *the basis of speculation or surmise*." *Bennett v. Spear*, 520 U.S. 154, 176 (1997) (emphasis added). Accordingly, the FWS may not ignore *available* biological information that counsels in favor of listing. Indeed, as this Court has explained, "[i]t is not enough for [the FWS] to *simply* invoke 'scientific uncertainty' to justify its action." *Greater Yellowstone Coalition, Inc., v. Servheen*, 665 F.3d 1015, 1029 (9th Cir., 2011) (emphasis added).

For example, in *Center for Biological Diversity v. Zinke*, 900 F.3d 1053, 1068 (9th Cir. 2018), this Court found that the FWS's failure to rely on the best scientific data available in determining not to list a species was arbitrary and capricious. There, the FWS relied on uncertainty to avoid making determinations as to if, and to what degree, climate change posed a threat to the arctic grayling—a freshwater fish. Therefore, applying the plain language of the ESA and precedent from this Court, the FWS's failure to list the Pacific Walrus based on the agency's recently expressed *uncertainty* about sea ice projections was unlawful.

As demonstrated below, the Pacific Walrus is dependent on sea ice for its essential life functions; sea ice is melting at an alarming rate due to climate change; and reliable scientific predictions demonstrate that it will continue to do so well beyond 2060. Further, the FWS's failure to list the Walrus because the agency is uncertain as to whether the species will be able to adapt to changes in its environment past the year 2060 fails to take into account not only the Walrus's historical reliance on sea ice and sea ice structures, but also the science of adaptive evolution.

A. Arctic Sea Ice Has Been Integral to The Evolution and Behavior of the Pacific Walrus.

As reflected by the fact that Pacific Walrus populations are geographically located only within the Arctic region, sea ice has been vitally important to their evolution. *See, e.g.*, AR 150, Brendan P. Kelly, *Climate Change and Ice Breeding Pinnipeds, in* "FINGERPRINTS" OF CLIMATE CHANGE 43 (Walther et al. eds., 2001) (hereinafter "Kelly 2001"); AR 69, FRANCIS H. FAY, ECOLOGY AND BIOLOGY OF THE PACIFIC WALRUS, *ODOBENUS ROSMARUS DIVERGENS* ILLIGER 1 (1982) (hereinafter "Fay 1982"). Unlike the trends seen in other species, the number of pinniped species, such as walruses, actually increases as the latitude increases, and such species are found in especially large numbers in ice-covered seas. *See, e.g.*, Kelly 2001 at 44; Fay 1982 at 8–21. Contributing to this phenomenon is the fact that walruses are not wholly marine creatures and must come out of the water to give birth and nurse their young. *See, e.g.*, Kelly 2001 at 45; Fay 1982 at 202. Sea ice is also important to the species in providing refuge from predation. Kelly 2001 at 45. Thus, in the Arctic, sea ice as a substrate has been integral to the evolution of Walruses and is therefore a key part of their ability to survive in this region.

B. The Pacific Walrus Is Highly Dependent on Sea Ice for Essential Life Functions.

The Pacific Walrus depends on sea ice for a number of essential life functions, including courtship, giving birth, nursing young, foraging for food, and molting. *See generally* AR 69, Fay 1982.[2] Since the mid-1900's, studies and observations of Walruses have demonstrated that Walrus life functions are closely associated with sea ice. *See* Francis H. Fay, *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, 387 (D.W. Hood ed., 1972). "Walruses frequently come out of the water (haul out) onto ice or land to rest and, in certain seasons, to bear their young and to molt." AR 69, Fay 1982 at 7.

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[2] *See also* AR 891, G. Carleton Ray et al., *Seascape as an Organizing Principle for Evaluating Walrus and Seal Sea-Ice Habitat in Beringia*, 37 GEOPHYSICAL RES. LETTERS 1, 1 (2010) (discussing Walrus' "need for sea ice as habitat for reproduction, nursing, molt, and rest").

Walruses are also unique in that they have adapted to mate on moving ice. *See, e.g.*, AR 77, FRANCIS H. FAY ET AL., TIME AND LOCATION OF MATING AND ASSOCIATED BEHAVIOR OF THE PACIFIC WALRUS, *ODOBENUS ROSMARUS DIVERGENS* ILLIGER 97 (1984). In the winter, when sea ice is most abundant, female Walruses congregate on the ice, and males follow to engage in mating. *Id.* During mating season, males engage in visual and acoustic mating displays while females rest on the ice. AR 79, Francis H. Fay, *Odobenus rosmarus*, 238 MAMMALIAN SPECIES 1, 3 (1985) (hereinafter "Fay 1985"). In summer, females tend to remain on the ice while males move to isolated beaches to rest and molt. *Id.* at 4.

Moreover, the association between Walrus life functions and sea ice is not simple and depends on the seascape quality of the ice. *See, e.g.*, G. Carleton Ray & Gary L. Hufford, *Relationships Among Beringian Marine Mammals and Sea Ice*, 188 RAPPORTS ET PROCES-VERBAUX DES REUNIONS, CONSEIL PERMANENT INTERNATIONAL POUR LEXPLORATION DE LA MER 225, 229 (1989). "Walruses depend on sea ice not only for transport, but also as an essential habitat component. When walruses rest on sea ice, they passively move great distances" during which they may continuously feed. AR, 193, G. Carleton Ray, et al., *Pacific walrus: Benthic bioturbator of Beringia*, 330 J. EXPERIMENTAL MARINE BIOLOGY & ECOLOGY 403, 404 (2006) (hereinafter "Ray et al. 2006").

Of the different seascape types, "broken pack" is the major Walrus habitat. AR 516, G. Carleton Ray et al., *Decadal Bering Sea Seascape Changes: Consequences for Pacific Walruses and Indigenous Hunters*, 26 ECOLOGICAL APPLICATIONS 24, 24 (2016) (hereinafter "Ray et al. 2016"). "Broken pack" ice is "broken into angular floes" with intersecting fractures and open water stretches. *Id.* at 25. In areas of "broken pack," there is continuously available open water and/or thin ice. *Id.*

"During late winter to early spring, the entire [Walrus] population occurs in large aggregations on [the "broken pack"] where they reproduce." AR 193, Ray et al. 2006 at 404–05.[3] "[W]alruses seem not to wander far from specific areas of moving sea ice to feed and to return to the same ice area after feeding." *Id.* at 406. Studies indicate that "walruses 'home' to specific or neighboring floes to haul out following feeding." *Id.* As a result, scientists have concluded that movements of the sea ice determine the areas within which Walruses are able to feed over time. *Id.*

While feeding, Walruses use sea ice to alternate between periods of gorging and periods of resting. *Id.* at 407. Walruses use sea ice seasonally to reach food sources, such as bivalve beds, that are located too far from shore. AR 598, Kit M.

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[3] *See also* AR 79, Fay 1985 at 4 (in winter, Walruses reside within areas of divergent ice where constant motion creates fractures and open water stretches.).

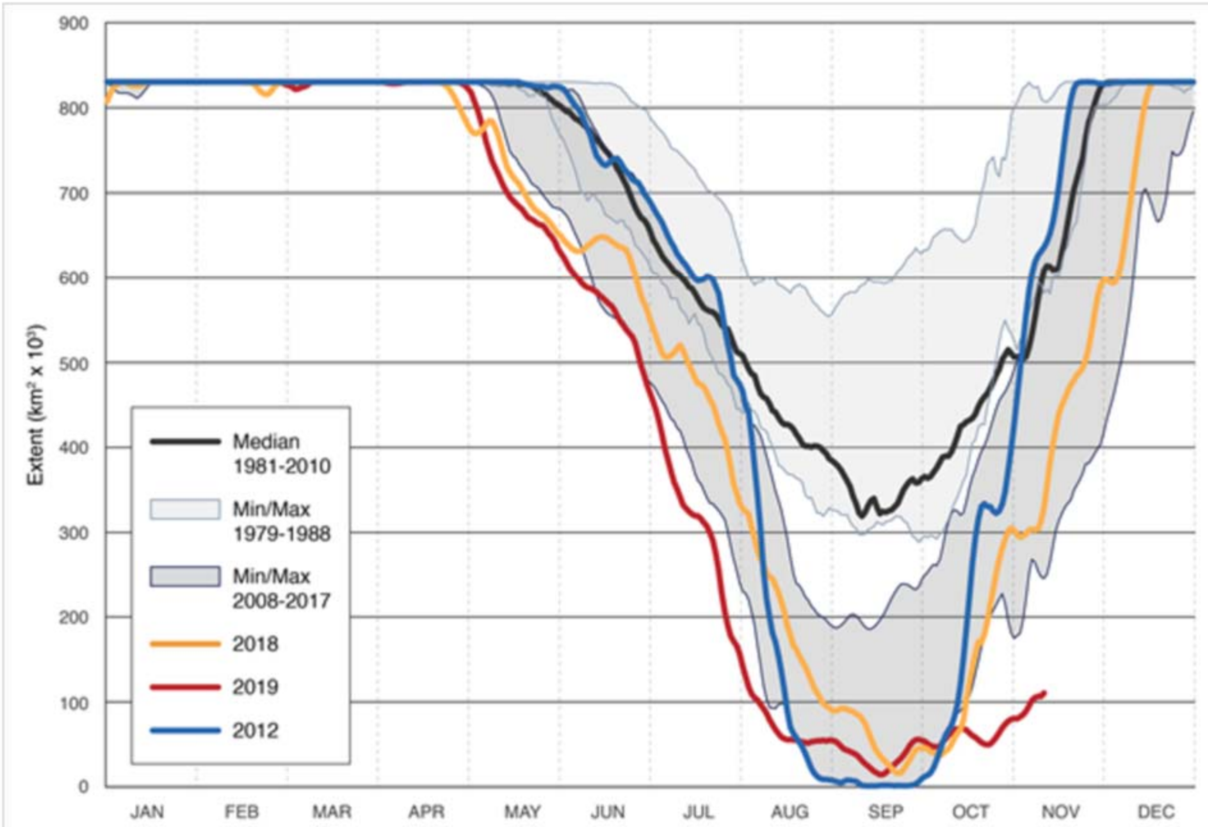
Kovacs et al., *Impacts of Changing Sea-Ice Conditions on Arctic Marine Mammals*, 41 MARINE BIODIVERSITY 181, 182 (2011) (hereinafter "Kovacs et al. 2011"). In the winter, following the ice floes allows Walruses to haul out "over the relatively shallow continental shelf."[4] AR 753, Kristin L. Laidre et al., *Quantifying the Sensitivity of Arctic Marine Mammals to Climate-Induced Habitat Change*, 18 ECOLOGICAL APPLICATIONS S97, S104 (2008) (hereinafter "Laidre et al. 2008"). "The constant motion of sea ice transports resting walruses over widely dispersed prey patches." CHADWICK V. JAY & ANTHONY S. FISCHBACH, PACIFIC WALRUS RESPONSE TO ARCTIC SEA ICE LOSSES 1 (Debra Grillo ed., 2008). "[I]f sea ice failed to transport walrus herds, [or if sea ice was only available to walrus herds during different times of the year,] as might occur under varying ice conditions or climate-warming scenarios, access to mid-shelf food resources would be diminished with implications for shelf ecology and productivity." AR 193, Ray et al. 2006 at 415. As climate change impacts the timing of sea ice availability, the

[4] This is particularly important for females and juveniles who, unlike adult males, do not rest at sea for extended periods of time "and therefore must confine their foraging efforts closer to ice or to shore." AR 528, Rebecca L. Taylor & Mark S. Udevitz, *Demography of the Pacific Walrus (Odobenus rosmarus divergens): 1974–2006*, 31 MARINE MAMMAL SCI. 231, 231–2 (2015). As a result, it is these females and juveniles who will be the most severely impacted as the timing of sea ice availability changes.

question for Walrus populations becomes how to survive periods of no (or very limited) sea ice.

C. Climate Change, and the Associated Rising Temperatures, Are Causing Sea Ice to Melt at an Alarming Rate.

As this Court recently found in *Juliana v. United States,* 947 F.3d 1159, 1166 (9th Cir. 2020), there is "little basis for denying that climate change is occurring at an increasingly rapid pace." The associated "extreme heat is melting polar ice caps," *id.*, and there is overwhelming scientific consensus that Arctic sea ice cover is declining and will continue to do so for many decades. *See, e.g.,* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE: SUMMARY FOR POLICYMAKERS, SPM-4–5 (2019). Observations indicate a trend of decreasing sea ice coverage, particularly in summer. D. Perovich et al., *Sea Ice,* Arctic Program (2019) https://arctic.noaa.gov/Report-Card/Report-Card-2019/ArtMID/7916/ArticleID/841/Sea-Ice. The chart below demonstrates the sea ice loss, over time, in the Chukchi sea, located off the coast of Northwest Alaska:



Id. at Fig.6. As this chart demonstrates, the largest concerns for Walrus populations are (1) what happens when ice melting is earlier in the spring and ice formation is later in the fall, and (2) what happens during the late summer period when ice may not be present at all, or is only present over water too deep for Walrus feeding. Seasonal sea ice loss also has long-term impacts as it "increases [the overall] ice sheet mass loss and lowers the ice sheet survival threshold." Eric Post et al., *The Polar Regions in a 2°C Warmer World*, 5 SCI. ADVANCES 1, 5 (2019) (hereinafter "Post et al. 2019").

Over the last four decades of satellite observations, consistent with global warming trends, Arctic sea-ice cover has undergone significant reductions in extent, proportion of perennial versus first-year ice, age of perennial ice, and thickness. Post et al. 2019 at 2. "Recent reconstructions of sea ice back to 1850 using historical observations" show that "contemporary sea-ice loss is *unprecedented in the record period*" and that "every month has displayed a *negative linear trend for the past 40 years*." *Id.* (emphasis added). In fact, between 1979 and 2018, September sea ice losses have averaged a loss of 83,000 km^2 each year, which translates to an almost *thirteen percent loss per decade*. *Id.* Changes in the annual timing of sea ice melt onset, *see generally* AR 377, J.C. Stroeve et al., *Changes in Arctic Melt Seasonal and Implications for Sea Ice Loss,* 41 GEOPHYSICAL RES. LETTERS 1216 (2014), represent threats to the Arctic ecosystem as a whole. The annual seasonal productivity in the entire arctic marine food web is fueled by an intricate set of linkages beginning with thinning of sea ice as its surface begins to melt in late winter/early spring, which allow penetration of sunlight that triggers a bloom of in-ice algae and under-ice phytoplankton. *See* Eric Post, *Implications of Earlier Sea Ice Melt for Phenological Cascades in Arctic Marine Food Webs*, 13 FOOD WEBS 60, 62 (2017). Some of the algae and phytoplankton "rain" down to the bottom, providing food for mollusks and other organisms consumed by vertebrate animals, such as Walrus. *See id.* A simplified representation of this is shown below:

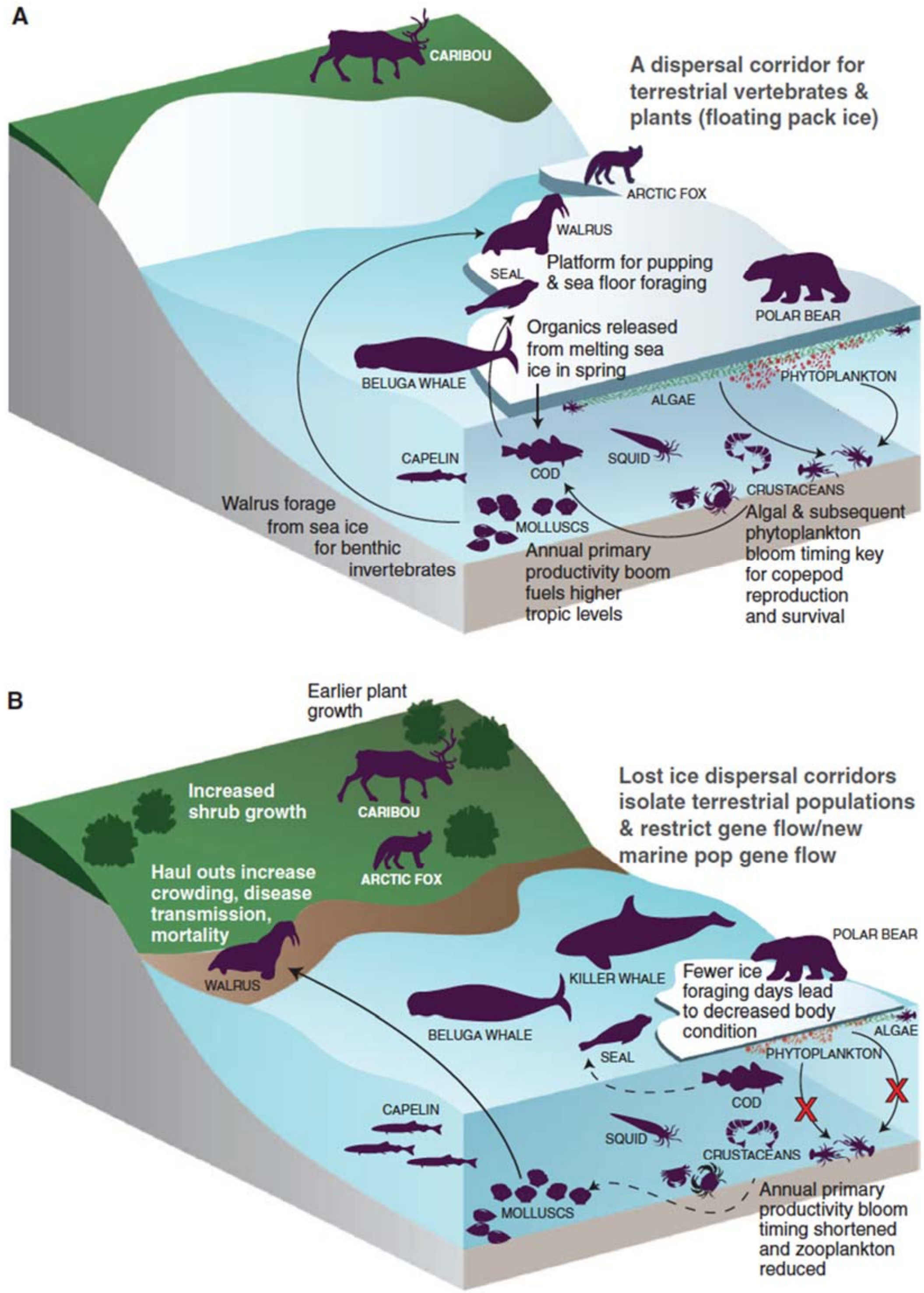


Fig. 1. Ecological interactions influenced by sea ice. The sea-ice biome influences the abundance, distribution, seasonality, and interactions of marine and terrestrial species by its presence (**A**). It is unique for its complete seasonal disappearance in portions of its distribution. Lengthening of this annual period of absence and an overall decline in ice extent, thickness, and stability will have considerable consequences for these species and interactions (**B**).

AR 345, Eric Post et al., *Ecological Consequences of Sea-Ice Decline*, 341 SCI. 519, 520 Fig.1 (2013). Thus, sea ice loss implicates the disruption of linkages across the arctic marine food chain which depend on the timing of annual sea ice melt onset.

The Arctic is particularly vulnerable to global warming, and sea ice in particular is subject to rapid climate change. *See generally*, J.L. Sarmiento et al., *Response of Ocean Ecosystems to Climate Warming*, 18 GLOBAL BIOGEOCHEMICAL CYCLES 1 (2004); *see also* James Overland et al., *The Urgency of Arctic Change*, 21 POLAR SCI. 6, 6 (2019) ("the Arctic is already changing rapidly as a result of climate change. Contemporary warm Arctic temperatures and large sea ice deficits (75% volume loss) demonstrate climate states outside of previous experience."). "Earth has warmed by approximately 0.8°C since the late 19th century, while *the Arctic has warmed by 2°C to 3°C over the same period*." Post et al. 2019 at 1 (emphasis added). Snow-covered sea ice is a particularly reflective natural material—i.e., it reflects most of the incoming sunlight back into the atmosphere. MARIKA HOLLAND & WALT MEIER, WHAT DO WE KNOW ABOUT THE FUTURE OF ARCTIC SEA-ICE LOSS? 1 (2018). In contrast, the ocean is a poor reflector and absorbs most incoming sunlight. Therefore, as the Arctic loses sea ice cover, less sunlight is reflected back to space and *more* sunlight is absorbed by the Arctic Ocean. *Id.* Thus, the surface in the Arctic warms further, which in turn melts more ice and reduces reflectivity—creating a self-perpetuating warming cycle that amplifies ice loss. *Id.*

D. Generally Accepted Scientific Models Predict that Melting Sea Ice Will Continue to Occur Well Beyond the Year 2060.

In determining whether to list a species as threatened, the FWS must determine whether a species "is likely to become an endangered species within *the foreseeable future* . . ." 16 U.S.C. §§ 1532(20), 1533(b)(1)(B)(ii) (emphasis added). In 2011, the FWS determined that listing the Pacific Walrus was warranted, but "precluded" by more pressing listing proposals. AR 5, 76 Fed. Reg. 7634, 7634 (Feb. 10, 2011). At that time, the agency determined the "foreseeable future" extended through the year 2100, *id.* at 7642, and identified loss of sea ice as one of "the primary threats to the Pacific walrus in the foreseeable future." *Id.* at 7674.

Significantly, for each year between 2011 and 2016, the agency *continued* to state that the Walrus "warranted" listing for the same reasons—but that listing was still precluded. *See, e.g.,* 81 Fed. Reg. 87246, 87256 (Dec. 2, 2016) ("We continue to find that listing this subspecies is warranted").[5] Then, suddenly, in 2017, with a

[5] *See also* 77 Fed. Reg. 69994, 70012 (Nov. 21, 2012) (discussing relative listing priority of Pacific Walrus); 78 Fed. Reg. 70104, 70118 (Nov. 22, 2013) (same); 79 Fed. Reg. 72450, 72462–3 (Dec. 5, 2014) (same); 80 Fed. Reg. 80584, 80595 (Dec. 24, 2015) (same).

change in Administrations, the FWS issued a new 12-month finding that the Walrus was no longer "threatened," without explaining why the evidence upon which it had relied for five years no longer controlled. AR 46, 82 Fed. Reg. 46618, 46642–44 (Oct. 5, 2017) (hereinafter "2017 Walrus Finding"). Moreover, in its new decision the FWS shortened the foreseeable future to 2060, stating "that beyond 2060 the conclusions concerning the impacts of the effects of climate change on the Pacific walrus population are based on speculation, rather than reliable prediction." *Id.* at 46643.

However, the "best available science" indicates that climate change predictions past 2060 are both reliable and, in the context of sea ice, actually *conservative* predictions. Indeed, climate change models have consistently *underestimated* the pace of change at which Arctic sea ice is declining. *See, e.g.*, James E. Overland et al., *Future Arctic Climate Changes: Adaptation and Mitigation Time Scales* 2 EARTH'S FUTURE 68, 69 (2014) (hereinafter "Overland et al. 2014"). There is also a consensus among the scientific models that sea ice will *continue* to decline, well past 2060 and through at least 2100. *See, e.g.*, *id.* at 70. Thus, the best available science contradicts the FWS's erroneous assertion that predictions past the year 2060 are "based on speculation" rather than "reliable predictions," AR 46, 2017 Walrus Finding at 46,643.

Even under a moderate carbon mitigation trajectory, climate models indicate "the Arctic is expected to continue to warm much more rapidly than lower latitudes." Post et al. 2019 at 1. Indeed, models indicate the "Arctic may experience as much as 4°C mean annual warming and 7°C warming . . . when a 2°C global mean warming . . . is reached." *Id.* Indeed, the Arctic has already reached 2°C warming during some months of the year, October through January, *id.* at 3, which are key months for the annual process of re-formation of sea ice. Global climate models suggest that, by the late-2000s, the Bering Sea will experience major sea ice losses of *sixty to ninety percent*. L. LOWRY, *ODOBENUS ROSMARUS*: THE IUCN RED LIST OF THREATENED SPECIES 6 (2016) (hereinafter "IUCN 2016").

Assertions of uncertainty about long-term projections are based on the idea that such projections change depending on which future emissions scenario is chosen, which in turn involves estimating future greenhouse gas mitigation efforts. Overland et al. 2014 at 70. However, such assertions ignore the fact that global climate models predict the Arctic will continue to lose summer sea ice under *all* emission scenarios except the implausible one under which there would be a 70% reduction in greenhouse emissions. *Id; see also* Alexandra Jahn et al., *How Predictable Is the Timing of a Summer Ice-Free Arctic?*, 43 GEOPHYSICAL RES. LETTERS 9113, 9119 (2016) ("continued decline of the Arctic sea ice cover over the

21st century [] is not the result of internal variability and occurs in all [models]"); AR 409, JULIENNE STROEVE & DIRK NOTZ, INSIGHTS ON PAST AND FUTURE SEA-ICE EVOLUTION FROM COMBINING OBSERVATIONS AND MODELS 9 (2015) ("agreement on key aspects of Arctic sea-ice evolution suggests that we can [use] models to gain insights into the short-term and long-term future evolution of sea ice on our planet"). Accordingly, there is no reliable scientific basis upon which to disregard these predictive models.

Furthermore, rather than insisting on a fixed timeline, the FWS should view the foreseeable future as threat-dependent, as NOAA did when considering the listing of *ringed seals*—another species adversely affected by climate change. B.P. KELLY ET AL., STATUS REVIEW OF THE RINGED SEAL (PHOCA HISPIDA): NOAA TECHNICAL MEMORANDUM xi (2010) (hereinafter "NOAA Ringed Seal Memo 2010"). Thus:

> [t]he foreseeability of a species' future status depends upon both the foreseeability of threats to the species and foreseeability of the species' response to those threats . . . a threat stemming from well-established, observed trends in a global physical process [such as climate change] may be foreseeable on a much longer time horizon than a threat stemming from a potential episodic process such as an outbreak of disease . . .

Id. at 41. As NOAA explained, "[i]ce and snow habitats are affected by climate which is forecasted to continue changing directionally *at least until the end of the century in response to greenhouse gas (GHG) forcing*." *Id.* at xi (emphasis added).

Additionally, multiple examples exist where models project over large numbers of years, and federal agencies have deemed them completely reliable as a basis for decision-making. *See, e.g.*, MICHAEL C. RUNGE ET AL., CORE STOCHASTIC POPULATION PROJECTION MODEL FOR FLORIDA MANATEES (*TRICHECHUS MANATUS LATIROSTRIS*) 2 (USGS, Mar. 27, 2007) (management decisions for the Florida manatee based on models extending out 100 years); NOAA Ringed Seal Memo 2010 at 41–42 (defining the foreseeable future for ringed seals to extend through 2100); Paul R. Wade, *Calculating Limits for the Allowable Human-Caused Mortality of Cetaceans and Pinnipeds*, 14 MARINE MAMMAL SCI. 1, 1 (1998) (the formulation for mortality limits under the Marine Mammal Protection Act was tested in simulations exceeding 100 years). Consequently, there is no scientific basis for the FWS's decision to arbitrarily restrict the foreseeable future to 2060.

E. Due to the Pacific Walrus's Reliance on Sea Ice, its Population Will Continue to Decline.

A loss of sea ice will result in "reductions in [Walrus] abundance coupled with range shifts and impacts to life history." Post et al. 2019 at 4.[6] "Loss of sea ice is considered to be the most significant factor affecting [the Pacific Walrus]." AR 516, Ray et al. 2016 at 24. The Walrus is particularly sensitive to changing sea-ice

[6] "[W]alruses are vulnerable to phenological and structural habitat effects occurring as a result of climate change." AR 516, Ray et al. 2016 at 32.

conditions because "[s]ea ice broadens the feeding distribution of this species markedly, which permits greater overall walrus abundances." AR 598, Kovacs et al. 2011 at 182. The International Union for Conservation of Nature ("IUCN") has listed the Pacific Walrus as "vulnerable"—the analog to an ESA listing of "threatened"—in part due to declining sea ice. *See* IUCN 2016 at 2, 6.[7]

Modeling of Walrus-specific population models out to 2095 shows consensus around climate change impacts on Walrus populations, indicating that robust populations will progressively decrease, while vulnerability increases. AR 295, Chadwick V. Jay et al., *Projected Status of the Pacific Walrus (Odobenus Rosmarus Divergens) in the Twenty-First Century*, 34 POLAR BIOLOGY 1065, 1074 (2011) (hereinafter "Jay et al. 2011"). About the turn of the 21st century, rapid loss in sea ice led to greater dispersion of floes and a breakdown of the sea-ice classification, including "broken pack" preferred by walruses. *See* Ray et al. 2016 at 26. As large, heavy ice floes have begun to significantly diminish, there have been several phenological repercussions on Walrus distribution and behavior, and

[7] The IUCN, however, currently has no method in place for incorporating climate change projections into the process of assigning protected area status. As a result, IUCN protected areas are currently lacking in parts of the current distribution of Walrus expected to be most impacted by climate change. *See* Eric Post & Jedediah Brodie, *Anticipating Novel Conservation Risks of Increased Human Access to Remote Regions with Warming*, 2 CLIMATE CHANGE RESPONSES 1, 4 (2015). This lack of protected area status for Walrus critical habitat is yet another reason the Walrus requires protection under the ESA.

especially on reproduction and migration. *See id.* at 32. Today, this situation has become critical, as there is virtually no suitable ice left in the Bering Sea in May, the time of birthing and migration. *See id.* at 26, 36.

Concurrently, coastal haul-outs are not an adequate substitute for sea ice. As explained by the IUCN: "Coastal haul-outs are less suitable because of increased energy required to reach prey resources and mortality due to crowding, disturbance events, and predation." IUCN 2016 at 6. Even though the Walrus is "anatomically and behaviorally capable of surviving in areas with no ice" the "critical factor" is "the proximity of the haul-out to adequate food resources at shallow depths." AR 753, Laidre et al. 2008 at S115.

1. Impacts on Feeding

A key sea-ice-related sensitivity for Walruses is that "all populations use [sea ice] as a platform to move over foraging areas that are too far from land-based haul-out sites to be energetically feasible sites for feeding." AR 598, Kovacs et al. 2011 at 183. Lower shelf ice availability is thus linked to greater amounts of energy which Walruses must expend foraging and swimming to other feeding grounds. AR 295, Jay et al. 2011 at 1072. This is particularly an issue for females and young Walruses who "are forced to use terrestrial haul-outs when ice is completely unavailable over the shelf during summer and must swim to and from offshore prey patches between resting periods on shore." *Id.* at 1072–73. In turn, this greater energy expenditure is linked "to lower walrus body condition and their ability to store energy." *Id.*

2. Impacts on Calves

Nutritional stress brought on by a lack of sea-ice resting platforms particularly impacts females with dependent young. AR 598, Kovacs et al. 2011 at 186. As the sea ice retreats north, females are separated from their usual feeding areas which increases the incidence of abandoned Walrus calves. *Id.* As sea ice cover has diminished, the summer sea ice on which female Walruses nurse their young increasingly occurs over water too deep for the mothers to feed. AR 150, Kelly 2001 at 50. Thus, the critical nursing habitat has become decoupled from the adult foraging habitat.

3. Increased Mortality from Predation and Stampedes

Disappearing sea ice forces Walruses to rely more heavily on land haul-out sites, which increases risks of trampling and death. AR 295, Jay et al. 2011 at 1067; *see also* Kristin L. Laidre et al., *Arctic Marine Mammal Population Status, Sea Ice Habitat Loss, and Conservation Recommendations for the 21st Century*, 29 CONSERVATION BIOLOGY 724, 732 (2015) (Sea ice loss "is expected to lower Pacific walrus calf survival due to crushing at crowded haul-out sites."). Increased use of land haul-outs in recent decades has led to multiple mass mortality events where large numbers of Walruses have died in stampedes. *See generally* AR 63, Francis H. Fay & Brendan P. Kelly, *Mass Natural Mortality of Walruses (Odobenus Rosmarus) at St. Lawrence Island, Bering Sea, Autumn 1978,* 33 ARCTIC 226 (1980); *see also* AR 250, A.S. FISCHBACH ET AL., ENUMERATION OF PACIFIC WALRUS CARCASSES ON BEACHES OF THE CHUKCHI SEA IN ALASKA FOLLOWING A MORTALITY EVENT, SEPTEMBER 2009 (USGS, 2009). More time spent at land-based haul-outs also increases the risk of polar bear predation. AR 598, Kovacs et al. 2011 at 188.

4. Increased Risk of Disease

Decreased shelf ice availability is linked to increased incidence of disease and parasites in the Walrus population. AR 295, Jay et al. 2011 at 1071. Sea ice habitat is "virtually free of disease vectors." AR 598, Kovacs et al. 2011 at 181. This is not true of terrestrial haul-outs, where disease transmission is of greater risk due to Walrus crowding. AR 295, Jay et al. 2011 at 1072. There have already been reports of skin lesions and mortalities for Walruses hauling out onto land in Alaska. *See* NOAA, *2011 Arctic Seal Disease Outbreak Fact Sheet,* NOAA Fisheries, 2 (Nov. 10, 2011) https://www.fisheries.noaa.gov/alaska/marine-life-distress/diseased-ice-seals (link to November 10, 2011 Disease Fact Sheet).

5. Indirect Impacts as a Result of Human Activity

"[E]xpected increases in human activity in marine and coastal zones in an ice-free Arctic in summer, such as offshore oil and gas drilling or trans-Arctic shipping, are likely to result in cumulative negative impacts on [Arctic marine mammals]." Post et al. 2019 at 4. Declining sea ice also means increased ship traffic that increases risks of oil spills and "could adversely affect walrus body condition by direct contact or indirectly from bioaccumulation through the food chain and into walrus prey." AR 295, Jay et al. 2011 at 1073. Furthermore, increased "benthic perturbations from activities associated with the extraction of natural resources, such as from commercial fishing and oil and gas development, could influence benthic prey abundance." *Id.*

F. Even Applying the FWS's Definition of Foreseeable Future, the Best Available Science Indicates that the Arctic Ocean May Become Seasonally Nearly Sea Ice Free Before 2050.

Most alarming, even accepting the FWS's limited view of the foreseeable future, the best available science demonstrates that threats to the Pacific Walrus through the year 2060 *still warrant listing the species as threatened*. Sea ice is "diminishing more rapidly than [originally] predicted by climate change models." *See, e.g.*, AR 528, Rebecca L. Taylor & Mark S. Udevitz*, Demography of the Pacific Walrus (Odobenus rosmarus divergens)*: *1974–2006*, 31 MARINE MAMMAL SCI. 231, 231 (2015). Consequently, a nearly "ice-free summer Arctic Ocean may be realized within a few decades, as the pace of observed ice loss has exceeded some model projections under [multiple modeling] scenarios." Post et al. 2019 at 2–3.

Model simulations do "agree with the observational record on the *large-scale sensitivity* of Arctic sea ice to global warming." AR 409, JULIENNE STROEVE & DIRK NOTZ, INSIGHTS ON PAST AND FUTURE SEA-ICE EVOLUTION FROM COMBINING OBSERVATIONS AND MODELS 7 (2015) (emphasis added). Thus, it is "very likely" that "a future with nearly sea ice-free conditions [will occur in] the first half of the 21st century, with a possibility of a nearly complete loss within a decade or two." Overland et al. 2014 at 69.

A study published this year curve-fitted statistical models with satellite observational data and supported this conclusion that "ice-free" summers[8] are likely by 2060, and possibly earlier. Ge Peng et al., *What Do Global Climate Models Tell Us about Future Arctic Sea Ice Coverage Changes?*, 15 CLIMATE 1, 1 (2020). The results showed that, on average, the first "ice-free Arctic summer year" may occur between 2042 and 2054. *Id.*

Furthermore, observations demonstrate that sea ice is transitioning "to a less structured, fragmented sea ice [and] to a pattern of relatively independent, free-moving floes." AR 516, Ray et al. 2016 at 32. This "dispersion of floes" from the "broken pack" (preferred by Walruses) to a mix of fragmented sea ice type, is

[8] The study defined an Arctic ice-free state as "when the total Arctic sea ice extent [] falls below one million square kilometers." Models generally consider an area to be "ice-free" if less than 15% of the area is covered in ice.

already creating unfavorable conditions for the Walrus. *Id.* at 36. While Walruses can tolerate some variability in ice concentrations, Walrus herd formation becomes increasingly unlikely as floes become more widely dispersed with mixed sea ice types. *Id.* (citing Fay 1982). Consequently, the best available science demonstrates that the Pacific Walrus faces the threat of extinction through destruction and curtailment of its habitat, even *within* the period of time FWS has defined as the foreseeable future.

G. FWS's Refusal to Rely on Certain Other Scientific Data was Arbitrary and Does Not Comport with the Best Available Science.

In determining the status of the Pacific Walrus, the FWS imposed additional arbitrary limits on the scientific data it considered, including evidence of population decline. Despite abundance estimates showing a clear trend of decreasing Walrus populations, FWS declined to consider this information relevant, insisting that it should not be relied upon for the purpose of estimating abundance and trend. *See* AR 34, FWS, FINAL SPECIES STATUS ASSESSMENT FOR THE PACIFIC WALRUS (ODOBENUS ROSMARUS DIVERGENS), MAY 2017 25 (2017) (hereinafter "2017 Species Status Assessment").[9] However, that decision

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[9] The FWS argued that "[c]omparisons of estimates across years (population trends) are not appropriate due to differences in methods." *Id.* However, the use of different methods does not rule out a meaningful comparison—particularly where those models all support a general conclusion, here a decline in population.

contradicts the general understanding that a species' risk of extinction, and thus its basis for being listed, is a function of a number of factors *including* abundance, trend, and threats or risk factors. Furthermore, even though the FWS referred to the aforementioned stock assessment report as "imprecise" in the context of abundance, AR 34, 2017 Species Status Assessment at 25, the agency relied upon those very numbers to support their 2017 conclusion that harvest rates were sustainable and did not pose a threat to Walrus populations, *id.*at 49. Thus, the FWS arbitrarily chose when to rely upon data to support its own conclusions.

II. THE NOTION THAT THE WALRUS NEED NOT BE LISTED BECAUSE IT MAY "ADAPT" TO CHANGING HABITAT RELIES ON A FUNDAMENTAL MISAPPREHENSION OF HOW ADAPTIVE EVOLUTION WORKS.

Finally, the FWS's decision not to list the Walrus because the species may be able to "adapt" to the loss of sea ice, 82 Fed. Reg. at 46643, is also not supported by the best available science.[10] As explained, *supra* at 4*,* Arctic sea ice

[10] The FWS may be assuming that Walrus populations will nonetheless demonstrate resilience—which occurs if the population has "a large number of different response types" to a given disturbance, allowing the population to absorb habitat disturbances. Brian Walker et al., *Crossing the Threshold: Be Careful about the Path You Choose - You May Not Be Able to Return*, *in* RESILIENCE THINKING: SUSTAINING ECOSYSTEMS AND PEOPLE IN A CHANGING WORLD 69–70 (2006). While there is the possibility that the Pacific Walrus population has sufficient response type diversity to enable it to demonstrate resilience in the face of habitat destruction, this certainly does not preclude the strong likelihood that climate change will result in significant, negative impacts on the Walrus population, as for example has occurred with respect to coral. *Id.* at 65-70.

has been integral to the evolution of the Pacific Walrus. The following explanation was developed in the context of the ringed seal, but is just as true for the Pacific Walrus:

> Sea-ice phenology will change substantially over the next 90 years and probably beyond. Changes will be rapid relative to . . . generation time and, thereby, *will limit adaptive responses*. The changes will be most severe in the marginal ice zones, and suitable ice regimes for . . . reproduction and molting likely will be *substantially reduced or lost . . . by the end of the century*.

NOAA Ringed Seal Memo 2010 at 105 (internal citation omitted) (emphasis added).

Amici stress that a species' ability to adapt to a new environment requires (1) that the species exhibit suitable genetic variability,[11] and (2) that environmental changes are slow to develop relative to a change in generation. This means that while organisms with *short* generation times (e.g., bacteria) might be able to adapt to environmental change, organisms with *long* generation times—such as Walruses—will not be able to do so.[12]

Sea ice is likely to be gone within only a few generations of Walruses, making adaptation highly unlikely. Indeed, the relationship between generation

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[11] This means the population has genes that could increase in frequency in subsequent generations in response to the new environmental conditions, which in this case would be no sea ice.

[12] For a more thorough explanation of this evolutionary concept *see, e.g.*, Douglas J. Futuyma & Mark Kirkpatrick, EVOLUTION (4th ed. 2017).

time and the *possibility* of adaptive response (formerly rare genes become common in the population over multiple generations) explains at a macro level why slow environmental change (e.g. plants adding oxygen to earth's atmosphere over a billion years) typically is accompanied by adaptive radiations (many animals evolved over that billion years) while *rapid* environmental change (e.g. meteor strikes that abruptly change the atmosphere) is accompanied by mass extinctions.

This very logic has led the FWS to list other species under the ESA due to concerns over their lack of adaptability to climate change. *See, e.g.*, 81 Fed. Reg. 20058, 20063 (Apr. 6, 2013) (rejecting contention that green sea turtles will adapt to climate change as such adaptation only occurs over many generations).

The same logic applies here—there is no scientific basis for believing that the Pacific Walrus will be able to readily adapt to the relatively abrupt loss of sea ice. On the contrary, the "best available science" indicates the opposite is true. Therefore, given the available science regarding the *continuing loss of sea ice in the Arctic*—upon which the Pacific Walrus critically depends—this species should be listed as threatened under the ESA.

CONCLUSION

For the foregoing reasons, the Court should reverse the district court's grant of summary judgment for Appellee.

Respectfully submitted,

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CERTIFICATE OF COMPLIANCE

Pursuant to Federal Rule of Appellate Procedure 29(a)(4)(G), I hereby certify that the attached brief is proportionally spaced, has a typeface of 14 points or more, and contains 6,499 words (excluding the exempted parts of the brief). I also certify that this amicus brief complies with the word limit of Federal Rule of Appellate Procedure 29(a)(5).

DATED: April 17, 2020

____/s/______________________
Katherine Anne Meyer

CERTIFICATE OF SERVICE

I hereby certify that on April 17, 2020, I electronically filed the foregoing Brief of *Amici Curiae* Scientific Experts in Support of in Support of Plaintiff-Appellant in Support of Reversal with the Clerk of the Court of the United States Court of Appeals for the Ninth Circuit by using the appellate CM/ECF system. In addition, a courtesy copy of the foregoing brief has been provided via-email to the following counsel:

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