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Sent via electronic and certified mail

December 1, 2020
David Bernhardt, Secretary of Interior
U.S. Department of the Interior
1849 C Street, N.W.
Washington, DC 20240

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Re: Notice of Intent to File a Lawsuit for Overdue Stock Assessment Reports for Polar Bears, Walruses, Sea Otters, and Manatees as Required by the Marine Mammal Protection Act

Dear Secretary Bernhardt and Director Skipwith,

On behalf of the Center for Biological Diversity, we are writing to inform you that the Secretary of the Interior and the U.S. Fish and Wildlife Service (collectively "the Service") are not in compliance with their non-discretionary obligations under the Marine Mammal Protection Act ("MMPA"), 16 U.S.C. § 1361, *et seq*. Specifically, the Service has failed to issue updated stock assessment reports for two stocks of polar bears, the Pacific walrus, three stocks of northern sea otters in Alaska, the southern sea otter stock in California, and two stocks of West Indian manatee in the southeastern United States and Puerto Rico, within the timeframes mandated by the statute. *See id*. § 1386(c).

The agency's existing marine mammal stock assessment reports are woefully outdated. We urge the Service to promptly revise these stock assessment reports to provide managers and the broader public with the most up-to-date information for decision-making on marine mammal conservation. These reports provide valuable information on the range, population, threats, and status of each marine mammal stock. The stock assessment reports serve to protect marine mammals by setting sustainable levels of human-caused serious injury and mortality to marine mammals, and guiding management actions for commercial fisheries, oil and gas activities, military activities, coastal development, and other activities that may harm marine mammals.

The agency's failures are depriving polar bears, walruses, sea otters, and manatees of these important measures. Accordingly, the Center for Biological Diversity intends to file suit against the Service for failing to timely review and revise these stock assessment reports as required by section 117(c) of the MMPA. *See id.*

A. The MMPA Requires Timely Updates to Stock Assessment Reports

In enacting the MMPA, Congress found that "certain species and population stocks of marine mammals are, or may be, in danger of extinction or depletion as a result of man's activities" and that marine mammals "should be protected and encouraged to develop to the greatest extent feasible." 16 U.S.C. § 1361(1), (6); *see also Anderson v. Evans*, 371 F.3d 475, 498 (9th Cir. 2004) ("One need only review Congress's carefully selected language to realize that Congress's concern was not merely with survival of marine mammals . . . but more broadly with ensuring that these mammals maintain an 'optimum sustainable population.'"). The MMPA thus contains an array of provisions designed to protect and recover marine mammals both domestically and abroad.

This includes the requirement that the Service prepare stock assessment reports ("SARs") for all marine mammal stocks under its jurisdiction that occur in U.S. waters. 16 U.S.C. § 1386(a). The MMPA also requires that those SARs be reviewed and revised on a regular basis.

Specifically, for stocks deemed "strategic" and for stocks for which significant new information is available, the Service "shall review" SARs "at least annually." *Id.* § 1386(c)(1). The Service "shall review" SARs "at least once every three years" for all other marine mammal stocks. *Id.* § 1386(c)(1)(C). If the Service determines upon review that "the status of the stock has changed or can be more accurately determined, the Secretary shall revise the stock assessment" through public notice and review by the Scientific Review Group. *Id.* § 1386(c)(2). The Service must publish a notice of the availability of a draft stock assessment or any revision thereof and provide an opportunity for public review and comment during a period of 90 days. *Id.* § 1386(b)(1). Final stock assessments must be published within 90 days of the close of the public comment period. *Id.* § 1386(b)(3)(A).

Therefore, the MMPA places a nondiscretionary duty on the Service to review, and if necessary, revise the stock assessments at least annually for strategic stocks and for stocks for which there is significant new information, and at least every three years for all other stocks. *Id.* § 1386(c).

B. Requirements for SARs

A stock assessment must be based on the "best scientific information available." 16 U.S.C. § 1386. All SARs must include:

(1) a description of the stock's range,
(2) an estimate of the stock's minimum population, current and maximum productivity rates, and current population trend,
(3) an estimate of the number of human-caused mortalities and/or serious injuries to the stock annually, as well as other factors causing decline or impeding recovery,
(4) a description of fisheries that interact with the stock,
(5) the Service's categorization of the stock as one that either "has a level of human-caused, mortality and serious injury that is not likely to cause the stock to be reduced below its optimum sustainable population" ("OSP") or "is a strategic stock, with a description of the reasons therefor," and

(6) an estimate of the potential biological removal ("PBR") level for the stock.

16 U.S.C. § 1386(a).

The MMPA defines OSP as "the number of animals which will result in the maximum productivity of the population of the species, keeping in mind the carrying capacity of the habitat and the health of the ecosystem of which they form a constituent element." *Id.* § 1362(9). And it defines a "strategic stock" as one for which the level of direct human-caused mortality exceeds PBR; is listed or likely to become listed as threatened or endangered under the Endangered Species Act; or is designated as depleted. *Id.* § 1362(19). PBR is the "maximum number of animals . . . that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population." *Id.* § 1362(20).

C. SARs For Marine Mammals Are Long-Overdue

Obtaining robust and accurate estimates of abundance is essential in the study and management of marine mammal populations. Despite the changing threats and population trends of polar bears, walruses, manatees, and sea otters, the Service has not updated stock assessment reports as required by section 117(c) of the MMPA. For some species, SARs have not been revised *for over a decade* (see Table 1). During this time, significant new information about the status of these marine mammal populations has become available. New stock assessment reports are therefore long overdue.

Table 1: Status of Outdated Fish and Wildlife Service Stock Assessment Reports for Marine Mammals

Marine Mammal	Subspecies/Stock	Strategic/ Nonstrategic	Date of Last SAR	Last Action	Date of Last Action
Polar bear	Polar bear - Chukchi/Bering Seas Stock (*Ursus maritimus*)	Strategic	12/30/2009	Draft SAR	06/22/2017
Polar bear	Polar bear - Southern Beaufort Sea Stock (*Ursus maritimus*)	Strategic	12/30/2009	Draft SAR	06/22/2017
West Indian Manatee	Florida Manatee (*Trichechus manatus latirostris*)	Strategic	01/23/2014	Revised Stock Assessment	01/23/2014
West Indian Manatee	Antillean manatee - Puerto Rico Stock (*Trichechus manatus manatus*)	Strategic	01/23/2014	Revised Stock Assessment	01/23/2014
Pacific Walrus	Pacific walrus (*Odobenus rosmarus divergens*)	Strategic	04/21/2014	Revised Stock Assessment	04/21/2014

Sea otter	Northern sea otter - Southwest Alaska Stock (*Enhydra lutris kenyoni*)	Strategic	04/21/2014	Revised Stock Assessment	04/21/2014
Sea otter	Northern sea otter - Southcentral Alaska Stock (*Enhydra lutris kenyoni*)	Non-Strategic	04/21/2014	Revised Stock Assessment	04/21/2014
Sea otter	Northern sea otter - Southeast Alaska Stock (*Enhydra lutris kenyoni*)	Non-Strategic	04/21/2014	Revised Stock Assessment	04/21/2014
Sea otter	Southern sea otter (*Enhydra lutris nereis*)	Strategic	08/28/2017	Draft SAR	01/27/2020

D. Significant New Information Regarding Marine Mammal Populations

Research by the scientific community indicates that the status of each of these stocks has changed and that there have been significant natural, human, and climate-induced impacts on each stock. Therefore, significant new information is available concerning each stock that must inform a more accurate stock assessment. The Service is aware, or should be aware, that the statuses of these marine mammal stocks have changed or can be more accurately determined. Such new information triggers the MMPA's requirement that the Service publish revised stock assessment reports. 16 U.S.C. § 1386(c)(2). There are numerous examples of changed status and significant new information for each marine mammal stock, some of which are discussed below.

1. Polar Bears

The status of polar bear stocks has changed dramatically since 2009 when the Service last published final stock assessment reports. New data on polar bears prompted the Service to determine that it was appropriate to revise reports for both the Chukchi/Bering Seas ("CBS") and Southern Beaufort Sea ("SBS") Stocks in 2017. Accordingly, the Service prepared *draft* revised stock assessment reports for both polar bear stocks (the "Draft SARs"). However, the Service never finalized those reports, and therefore the 2009 stock assessment reports are still in force. Since 2009 and as indicated by the Service's publishing of the 2017 Draft SARs, the status of polar bears has changed dramatically.

a. Polar Bear Population Estimates Have Changed

Several new polar bear population assessments indicate a dramatic change in both SBS and CBS population numbers since 2009, thus requiring the Service to update the SARs for both these stocks. The Draft SARs indicate that, as of 2017, the SBS population stands at around 782 polar bears and the CBS population stands at approximately 2,000 polar bears. New scientific research indicates even further changes in population numbers for both stocks. For example, Bromaghin et al. 2015 estimates the SBS population at around 900 polar bears.[1] This is a 36 percent decline from the 2009 SBS stock estimate. A new 2020 study affirms this population

[1] Bromaghin, J.F. et al. 2015. Polar bear population dynamics in the southern Beaufort Sea during a period of sea ice decline. Ecological Applications 25(3): 634-651.

estimate.[2] For the CBS population, Regehr et al. 2018 estimates the abundance of polar bears in the Chukchi sea at 2,937 bears.[3] While this study shows a 47 percent population increase to the CBS population, it nevertheless indicates that there has been a significant change in population numbers since the previous SAR was conducted. And, as explained below, new science indicates climate change could drive this stock to extinction by the end of the century.[4] Overall, new scientific information, along with the Draft SARs, show significant changes to the SBS and CBS populations since the 2009 stock assessments and therefore both polar bear stock assessments must be revised.

b. Climate Change and Melting Sea Ice

Important new information, including significant new research on climate change, the loss of sea ice, and its effects on polar bear populations, has become available since 2009 that indicates population changes in both polar bear stocks.[5] The Service listed the polar bear as a threatened species throughout its range in 2008 due to the threat of extinction posed by the loss of sea ice as a result of climate change. Sea ice constitutes essential polar bear habitat and provides the platform from which polar bears hunt their primary prey, ice seals. Loss of sea ice also reduces barriers to dispersal and/or eliminates movement corridors, resulting in increased connectivity or geographic isolation.[6] Arctic sea ice has decreased in every season and every successive decade since 1979.[7] In 2019, the minimum ice extent was effectively tied for second lowest in the satellite record, along with 2007 and 2016, reinforcing the long-term downward trend in Arctic ice extent.[8] In 2016, the U.S. Geological Survey updated an analysis of the threats posed to polar bears and concluded that range-wide persistence of polar bears will likely require stabilizing greenhouse gas emissions by the middle of this century.[9] The consequences of

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[2] Atwood, T.C. et al. 2020. Analyses on subpopulation abundance and annual number of maternal dens for the U.S. Fish and Wildlife Service on polar bears (Ursus maritimus) in the southern Beaufort Sea, Alaska. U.S. Geological Survey Open-File Report 2020-1087, 16 p., https://doi.org/10.3133/ofr20201087.

[3] Regehr et al. 2018. Integrated population modeling provides the first empirical estimates of vital rates and abundance for polar bears in the Chukchi Sea. Scientific Reports 8: 16780.

[4] Molnar et al. 2020. Fasting season length sets temporal limits for global polar bear persistence. Nature Climate Change 10: 732–738, https://doi.org/10.1038/s41558-020-0818-9.

[5] Obbard, M.E. et al. 2018. Re-assessing abundance of Southern Hudson Bay polar bears by aerial survey: effects of climate change at the southern edge of the range. Arctic Science 4: 634–655 (Results suggest that abundance declined 17% from 943 bears (95% CI: 658–1350) in 2011/2012 to 780 (95% CI: 590–1029) in 2016.); Regehr, E.V. et al. 2016. Conservation status of polar bears (Ursus maritimus) in relation to projected sea-ice declines. Biology Letters 12: 20160556, doi:10.1098/rsbl.2016.0556. (The estimated probabilities that reductions in the mean global population size of polar bears will be greater than 30%, 50% and 80% over three generations (35–41 years) were 0.71 (range 0.20–0.95), 0.07 (range 0–0.35) and less than 0.01 (range 0–0.02), respectively.).

[6] Laidre, K. et al. 2018. Range contraction and increasing isolation of a polar bear subpopulation in an era of sea-ice loss. Ecology and Evolution 8(4): 2062-2075 (Examined changes in geographic range, emigration, and interpopulation connectivity of the Baffin Bay polar bear subpopulation over a 25-year period of sea-ice loss.); Macias-Fauria, M. and E. Post. 2018. Effects of sea ice on Arctic biota: an emerging crisis discipline. The Royal Society Publishing 14(3): 1744-9561.

[7] National Oceanic and Atmospheric Administration. 2019. Climate Change: Arctic sea ice summer minimum. Available at https://www.climate.gov/news-features/understanding-climate/climate-change-minimum-arctic-sea-ice-extent.

[8] National Snow & Ice Data Center. 2019. Arctic Sea Ice News & Analysis, December 5, 2019. Available at http://nsidc.org/arcticseaicenews/2019/.

[9] Atwood, T.C. et al. 2016. Forecasting the relative influence of environmental and anthropogenic stressors on polar bears. Ecological Society of America 7(6): e01370.

changing sea ice conditions are different in different regions of the Arctic, and not all polar bear populations will respond to the effects of climate change in the same way.[10] New science indicates that the SBS polar bear stock is currently one of the most vulnerable,[11] and that over time there will be so little sea ice left in the Chukchi Sea, that the CBS population will also not be able to survive.[12]

New research shows that reduced sea ice has adversely affected polar bear behavior.[13] Recent reductions in thickness and extent of Arctic sea ice have increased sea ice drift, which means that polar bears have to swim farther and expend more energy to hunt.[14] Compounding reduced foraging opportunities that result from habitat loss; changes in ice drift, and associated activity increases, exacerbate the physiological stress experienced by polar bears in a warming Arctic.[15] Reduced foraging leads to increased time periods of regular fasting for some polar bear populations, and these fasts are likely to lengthen as summer ice declines.[16] During the annual sea ice minimum between 1989 to 2014, adult female polar bears in the SBS and CBS populations have spent less time in their preferred, prey-rich, shallow-water sea ice habitat in recent years, corresponding with declines in availability of this preferred habitat type, and spent more time in lower quality habitat—land and sea ice off the continental shelf—where they have reduced access to prey.[17] Additionally, current reproductive success rates, as correlated with female polar bear energy reserve accumulation and denning practices, suggest that a continued decline in sea ice could negatively affect recruitment.[18]

For the SBS population, the Service should include new findings that provide further evidence for an increase in land-based denning in response to climate change. Olson et al. 2017 reported an increase in land-based denning of SBS polar bears between 1985 and 2013, where the frequency of land denning was directly related to the distance that sea ice retreated from the

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[10] Hamilton, S.G. and A.E. Derocher. 2019. Assessment of global polar bear abundance and vulnerability. Animal Conservation 22: 83-95 (An assessment of each subpopulation's vulnerability to climate change based on subpopulation size, amount of continental shelf habitat, prey diversity and changing ice conditions.).
[11] *Id.*
[12] Molnar 2020.
[13] Ware, J.V. et al. 2017. Habitat degradation affects the summer activity of polar bears. Oecologia 184: 87-99.
[14] Durner, G.M. et al. 2017. Increased Arctic sea ice drift alters adult female polar bear movements and energetics. Glob. Change Biol. 23(9): 3460-3473.
[15] Pagano, A.M. et al. 2018. High-energy, high-fat lifestyle challenges an Arctic apex predator, the polar bear. Science 359: 568-572 (Increases in mobility resulting from ongoing and forecasted declines in and fragmentation of sea ice are likely to increase energy demands and may be an important factor explaining observed declines in body condition and survival.); Durner, G.M. et al. 2017. Increased Arctic sea ice drift alters adult female polar bear movements and energetics. Glob. Change Biol. 23: 3460-3473; Whiteman, J.P. et al. 2018. Phenotypic plasticity and climate change: Can polar bears respond to longer Arctic summers with an adaptive fast? Oecologia 186: 369-381 (Found that of the polar bears studied, the ones that followed the retreating sea ice beyond the continental shelf were food deprived.); Molnar 2020.
[16] Whiteman 2018; Rode, K.D. et al. 2018. Spring fasting behavior in a marine apex predator provides an index of ecosystem productivity. Glob. Change Biol. 24: 410-423.
[17] Ware 2017.
[18] Rode, K.D. 2018. Den phenology and reproductive success of polar bears in a changing climate. Journal of Mammalogy 99(1): 16-26; Molnar 2020 (Establishes the likely nature, timing, and order of future demographic impacts of sea ice loss on polar bears by estimating the threshold numbers of days that polar bears can fast before cub recruitment and/or adult survival are impacted and decline rapidly.).

coast.[19] Atwood et al. 2020 also noted a pronounced shift from sea ice denning to land.[20] The results suggest that denning on land will increase as sea ice continues to diminish, and will likely increase human−bear interactions on shore. Increased polar bear activity near human settlements increases the risk of human—bear conflicts as well as risk of disease through exposure to terrestrial-based pathogens.[21]

c. Oil and Gas Development

The Service must update its assessments of the threats from oil and gas development with important new information that indicates polar bear stocks are at increased risk from oil and gas activity.

Oil and gas development is fundamentally incompatible with polar bear survival and recovery. An oil spill in sea ice habitat will likely result in the accumulation of oil in leads and between ice floes, features favored by polar bears and their main prey (ringed and bearded seals). Polar bears could be exposed to oil from ingesting oiled seals or by swimming through fouled water.[22] A polar bear population exposed to an oil spill could suffer mortality sufficient to reduce the population, with the magnitude of the reduction dependent upon the time of year, sea ice conditions, and the area and volume of the spill. Given the relatively low population growth rates of polar bears, a population affected by an oil spill may take many years to recover.[23]

Large oil spills are near-certain and can have devastating effects on polar bears and their prey.[24] Oil and gas exploration and development increases disturbance from industrial activities including seismic testing, icebreaking activities, aircraft flights, and transiting of ships; and the greenhouse gas emissions from extracting and consuming fossil fuels worsen sea-ice loss—the primary threat to the polar bear. In the event of an oil spill in the Arctic, toxic traces of oil would linger for much longer periods than in other environments as oil behaves differently in the cold water.[25] The Draft SARs acknowledge that the impacts of a large spill could be significant, particularly if clean-up efforts are ineffective: "Although the probability of an oil spill affecting a significant portion of Alaska's polar bears in the foreseeable future is low, we recognize that the potential impacts from such a spill could be significant, particularly if subsequent clean-up efforts were ineffective."[26]

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[19] Olson, J.W. et al. 2017. Collar temperature sensor data reveal long-term patterns in southern Beaufort Sea polar bear den distribution on pack ice and land. Marine Ecology Progress Series 564: 211-224.
[20] Atwood 2020.
[21] Atwood, T.C. et al. 2017. Environmental and behavioral changes may influence the exposure of an Arctic apex predator to pathogens and contaminants. Scientific Reports 7: 13193.
[22] IUCN SSC Polar Bear Specialist Group. July 2019. Polar Bears and Oil Development. Available at http://pbsg.npolar.no/en/issues/threats/oil-development.html.
[23] *Id.*
[24] Wilson, R.R. et al. 2018. Potential impacts of offshore oil spills on polar bears in the Chukchi Sea. Environmental Pollution 235: 652-659; Nevalainen M. et al. 2018. Estimating the acute impacts of Arctic marine oil spills using expert elicitation. Marine Pollution Bulletin 131: 782-792.
[25] Coastal Plain Oil and Gas Leasing Program Record of Decision. August 2020. U.S. Department of Interior and Bureau of Land Management; DOI-BLM-AK-0000-2018-0002-EIS.
[26] Draft SBS SAR at 19; Draft CBS SAR at 21.

President Obama's withdrawal in 2016 of the entire U.S. Chukchi Sea and the majority of the U.S. Beaufort Sea as indefinitely off-limits to future oil and gas drilling specifically recognized the importance of these areas to the polar bear, and identified the high risks from oil and gas drilling and the "limited" ability to clean up an oil spill in Arctic waters.[27] However, since the Draft SARs were released in 2017, federal support for Arctic oil and gas drilling has increased substantially. For example, in October 2018, the federal government approved Hilcorp Alaska LLC's oil and gas development and production plan for the Liberty project—the first oil and gas production facility in federal waters off Alaska.[28] The Trump administration also recently issued Record of Decision approving the Willow Master Development Plan Project that will adversely affect polar bears, as well as a revised Integrated Activity Plan for the National Petroleum Reserve-Alaska that could open important polar bear habitat to oil and gas activity.[29]

Additionally, in August 2020, the Trump administration finalized its plan to open up part of the Arctic National Wildlife Refuge in Alaska to oil and gas development.[30] The decision to open the Arctic National Wildlife Refuge comes amid a long-term overall increase in domestic oil and gas production.[31] New science shows that 34 percent of U.S. maternal dens for the SBS stock are on the coastal plain of the Arctic National Wildlife Refuge, and are thus threatened by plans to open the area to oil exploration and development.[32]

d. Harvest of Polar Bears

The MMPA requires the SARs to provide an "estimate [of] the number of human-caused mortalities and serious injury of the stock" annually and other factors causing decline or impeding recovery. 16 U.S.C. § 1386(a). Accordingly, the polar bear SARs must be revised to include estimates of direct harvest of polar bears from each stock. The estimated, average, total direct harvest of CBS bears over the past five years is 58 bears annually.[33] The quota recently increased from 58 to 85 bears per year, shared equally between the United States and Russia.[34] For the SBS stock, the annual 5-year average harvest of SBS polar bears (presumably representing combined U.S. and Canadian harvest) is 41 bears.[35]

2. Pacific Walrus

[27] White House. 2016. Statement by the President on Actions in the Arctic and Atlantic Oceans, December 20, 2016. Available at https://obamawhitehouse.archives.gov/the-press-office/2016/12/20/statement-president-actions-arctic-and-atlantic-oceans.
[28] 83 Fed. Reg. 54,136 (Oct. 26, 2018) (The Liberty project is located 8.85 kilometers offshore in the Beaufort Sea.).
[29] 85 Fed. Reg. 69,351 (Nov. 2, 2020); 85 Fed. Reg. 38,388 (June 26, 2020).
[30] 85 Fed. Reg. 51,754 (Aug. 21, 2020).
[31] Gramlish, J. 2020. Fast facts about U.S. views on oil and gas production as White House moves to open Alaska refuge to drilling. Pew Research Center. Available at https://www.pewresearch.org/fact-tank/2020/08/17/fast-facts-about-u-s-views-on-oil-and-gas-production-as-white-house-moves-to-open-alaska-refuge-to-drilling/.
[32] Atwood 2020.
[33] 82 Fed. Reg. 17,445 (April 11, 2017).
[34] *See, e.g.*, Koening, R. August 7, 2018. New data on Chukchi Sea polar bears leads to subsistence harvest level increase. Alaska Public Media. Available at https://www.alaskapublic.org/2018/08/07/new-data-on-chukchi-sea-polar-bears-leads-to-subsistence-harvest-level-increase/.
[35] Canadian Polar Bear Technical Committee "PBTC" Status Table (2015). Available at https://polarbearscience.files.wordpress.com/2015/03/2014-pbtc-status-table_polarbearscience-extracted-marked.jpg.

As indicated by ample scientific research, the status and available information on walrus stocks has changed dramatically since 2014, when the Service last updated the Pacific walrus stock assessment report. As with many other species, climate warming presents a significant threat to walruses. Arctic ecosystems, where walruses live, are particularly responsive to climate warming with temperatures increasing over three times the global rate due to a complex interaction of positive feedback loops.[36] Effects of climate warming, sea ice loss, and ocean acidification have the potential to reduce walrus prey and habitat, which affects the movement, space use, energy budget, and population abundance of the Pacific walrus.[37]

a. Population Status Changes

There are new population estimates for the Pacific walrus since the 2006 estimate used in the most recent stock assessment report. The 2006 estimate provided a minimum population estate of 129,000 walruses, with a 95 percent confidence interval of 55,000 to 507,000. Since then, new scientific research has become available regarding Pacific walrus population numbers.

Taylor et al. 2017, for example, developed models of walrus population dynamics using information on population size, age structure, rates of reproduction, and harvest from 1974–2015.[38] Of the three models they analyzed, two suggest that the population in 2015 was still declining. Specifically, the first model suggests the "severity of the [multidecade] decline lessened to the point where the population may have become nearly stationary by 2015" and that the probability that the population was declining in 2015 was 45 percent.[39] The second model suggests that juvenile survival decreased post-1998, the population continued to decline between 1998 and 2015, although at a lower rate than seen in the 1980s, and the probability that the population was declining in 2015 was 87 percent.[40] And the third model suggests that reproductive adult survival decreased after 1998, the population decline increased after 1998, and the probability that the population was declining in 2015 was 96 percent (though this model's results post-1998 are considered less reliable).[41] Therefore, new available scientific information provides evidence that there have been significant changes to the Pacific walrus population numbers since the 2014 SAR was published and that this stock assessment must be revised.

b. Climate Change and Loss of Sea Ice

[36] Comiso, J.C. and D.K. Hall. 2014. Climate trends in the Arctic as observed from space. WIREs Climate Change 5: 389-409; Overland, J. 2019. The Urgency of Arctic Change. Polar Science 21: 6-13.

[37] Kovacs, K.M. et al. 2015. Walruses in a time of climate change. Arctic Report Card: Update for 2015. National Oceanic and Atmospheric Administration Arctic Program. Available at https://arctic.noaa.gov/Report-Card/Report-Card-2015/ArtMID/5037/ArticleID/226/Walruses-in-a-Time-of-Climate-Change.

[38] Taylor, R.L. et al. 2017. Demography of the Pacific walrus (Odobenus rosmarus divergens) in a changing Arctic. Marine Mammal Science 34: 54-86 (Estimated annual calf survival as 0.73, juvenile survival as 0.84 and reproductive adult survival as 0.99.); *see also* Battaile, B.C. 2017. Evaluation of a method using survey counts and tag data to estimate the number of Pacific walruses (Odobenus rosmarus divergens) using a coastal haulout in northwestern Alaska. Polar Biology 40: 1359-1369; Beatty, W.S. et al. 2019. Estimating Pacific walrus abundance and demographic rates from genetic mark-recapture. Anchorage, Alaska, US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2019-059. 18 p.

[39] Taylor 2017.

[40] *Id.*

[41] *Id.*

Since the 2014 Pacific walrus SAR, new information indicates that the walrus's sea ice habitat has declined in the rapidly warming Arctic and will continue to threaten walruses.

Ice cover and water depth are known to be very important for walruses. Long term changes in the ice conditions caused by the effects of climate change can severely alter conditions in the Arctic and therefore significantly impact Pacific walrus health and numbers. In the Arctic, recent reductions in sea ice extent and thickness continue to significantly alter both terrestrial and marine ecosystems in the region. These changes impact the Pacific walrus, which faces numerous challenges associated with climate warming, including changes in nutrient cycles, benthic production, and habitat loss. Pacific walrus populations may already have a reduced capacity to respond to novel immunological challenges associated with shifts in ecological communities and environmental stressors predicted for climate change.[42]

Recent studies emphasizing the importance of sea ice to walruses point out a host of indicators that melting sea ice will continue to have increasingly detrimental consequences to the Pacific walrus.[43] The Pacific walrus is an ice-dependent marine mammal.[44] They use sea ice for calving, nursing, resting, molting, access to offshore foraging areas, and refuge from terrestrial predators and disturbance. The amount of time walruses spend in water foraging and hauled out, as well as the seasonal timing of such haul-outs for walrus populations generally, are directly dependent on the seasonal availability of sea ice.[45] Virtually the entire Pacific walrus population winters in the ice pack of the Bering Sea, where they breed. In spring, most of the population, including almost all of the females and young, follow the retreating sea ice into the Chukchi Sea where they remain until they return to the Bering Sea as ice reforms in autumn.[46]

Ice along the Chukchi Sea was 81% of its average levels in June of this year, according to the University of Alaska's International Arctic Research Center.[47] Last year, July's sea ice extent

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[42] Sonsthagen, S. et al. 2014. Spatial variations and low diversity in the major histocompatibility complex in walrus. Polar Biology 37: 497-506.

[43] Ray, G.C. et al. 2016. Decadal Bering Sea seascape change: consequences for Pacific walruses and indigenous hunters. Ecological Applications 26(1): 24-41 (Integrates recent physical sea-ice change in the Bering Sea with biological and ecological conditions of walruses in their winter-spring reproductive habitat.); Fischbauch, A.S. and C.V. Jay. 2016. A strategy for recovering continuous behavioral telemetry data from Pacific walruses. Wildlife Society Bulletin 40: 599-604 (Tracking animal behavior and movement with telemetry sensors to understand the response of Pacific Walrus to rapid changes in sea ice availability and acquired geospatial chronologies of foraging behavior.).

[44] Hamilton, C.D. et al. 2015. Year-round haul-out behavior of male walruses in the Northern Barents Sea. Marine Ecology Progress Series 519: 251-263.

[45] Jay, C.V. et al. 2017. Walrus haul-out and in water activity levels relative to sea ice availability in the Chukchi Sea. Journal of Mammalogy 98: 386-396 (Used behavioral data collected from radio-tagged walruses in the Chukchi Sea in a Bayesian generalized linear mixed effects model to estimate the probability of a walrus being in the water foraging, in water not foraging, or hauled-out.).

[46] Fay, F.H. 1982. Ecology and biology of the Pacific walrus, Odobenus rosmarus divergens Illiger. North American Fauna (74): 1-279.

[47] Thoman, R. and J.E. Walsh. 2019. Alaska's changing environment: documenting Alaska's physical and biological changes through observations. International Arctic Research Center, University of Alaska Fairbanks. Available at https://uaf-iarc.org/our-work/alaskas-changing-environment/.

was less than half of its average, making it the lowest on record.[48] The declining extent of summer sea ice in the Chukchi Sea has caused Pacific Walruses to increase use of coastal haul-outs and decrease the use of more productive offshore feeding areas.[49] When coastal haul-outs are used by large numbers of walruses and the animals are disturbed, walruses may be trampled if the herd moves in a panic towards the water.[50] In recent years, walruses have begun occupying the Point Lay haul-out site beginning in August and either feeding close by or making trips back and forth to the Hanna Shoal area, about 180 miles each way.[51] These long-distance foraging trips may be especially difficult for females with dependent young.

Research suggests that as sea ice becomes less available in the Chukchi Sea, female walruses spend more time in the southwestern region of that sea, less time resting, and less time foraging, likely resulting in reductions in body condition.[52] Sea ice is especially important for females with young because it provides a safe platform for calving, nursing, and resting. Decreases in sea ice affect the energy demands and reproductive success of female walruses, and therefore ultimately affect the status of the Pacific walrus population.[53] As sea ice continues to retreat to ever higher latitudes, these trends are expected to continue.[54]

Sea ice loss in the Bering Sea is also negatively affecting the Pacific walrus. For example, Ray et al. 2016 documented substantial changes in the structure of sea ice in the Bering Sea from 2003 to 2013, which fundamentally changed the Pacific walruses' winter–spring reproductive and migratory habitat.[55] The study emphasized that walruses in winter–spring depend "on a critical mass of sea-ice habitat to optimize social networking, reproductive fitness, feeding behavior, migration, and energetic efficiency."[56] The study warns that the fragmentation of winter habitat preconditions the population toward mortality; and concludes

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[48] National Snow & Ice Data Center. 2019. Arctic Sea Ice News & Analysis, December 5, 2019. Available at http://nsidc.org/arcticseaicenews/2019/.
[49] Udevitz, M.S. et al. 2017. Forecasting consequences of changing sea ice availability for Pacific walruses. Ecosphere 8(11): e02014; U.S. Fish and Wildlife Service. 2019. Pacific walrus: Use of coastal haulouts along the Chukchi Sea coast. Available at https://www.fws.gov/alaska/sites/default/files/2019-08/coastal%20haulout%20walrus%20factsheet.pdf.
[50] Fischbach, A.S. et al. 2016. Pacific walrus coastal haulout database, 1852–2016—Background Report. U.S. Geological Survey Open-File Report 2016–1108, 27 p., http://dx.doi.org/10.3133/ofr20161108; MackCracken, J.G. et al. 2017. Final species status assessment for the Pacific walrus (Odobenus rosmarus divergens), May 2017. U.S. Fish and Wildlife Service.
[51] U.S. Fish and Wildlife Service. 2019. Pacific Walrus: Use of coastal haulouts along the Chukchi Sea coast. Available at https://www.fws.gov/alaska/sites/default/files/2019-08/coastal%20haulout%20walrus%20factsheet.pdf.
[52] Udevitz 2017.
[53] Noren, S.R. et al. 2014. Energy demands for maintenance, growth, pregnancy and lactation of female Pacific walruses. 87(6): 837-54; Tempel, J.T. and S. Atkinson. 2020. Pacific walrus reproductive capacity changes in three time frames. Polar Biology 43: 861-865 (Assessed how walrus reproductive capacity has changed over thirty-five years by analyzing ovaries of Pacific walrus females from over three distinct time frames.); Kryukova, N.V. et al. 2014. The influence of ice conditions on terrestrial haul-outs of the Pacific walrus in the Gulf of Anadyr, Bering Sea. Russian Journal of Marine Biology 40: 30-35; MacCracken, J.G. and R.B. Benter. 2015. Trend in Pacific walrus (Odobenus rosmarus divergens) tusk asymmetry, 1990–2014. Marine Mammal Science 32(2): 588-601.
[54] Fischbach, A. S. et al. 2017. Pacific walrus behavior data and associated Chukchi Sea ice observations and projections for use with bioenergetics models to forecast walrus body condition. U.S. Geological Survey data release; https://doi.org/10.5066/F7XG9Q2T.
[55] Ray 2016.
[56] *Id.*

that "sea-ice habitat change as it affects walrus behavior is resulting in higher energetic costs during every season of the year, both in the Bering Sea during winter–spring . . . and in the Chukchi Sea in summer–fall."[57]

Additionally, in the Pacific Arctic marine environment, sea ice loss has and will continue to alter nutrient flow dynamics and generate cascading effects within food webs.[58] These effects have significant impacts on the Pacific walrus. Sea ice dominates marine ecosystems in the Arctic, and recent reductions in sea ice have impacted food webs throughout the region, shifting benthic macrofaunal populations that Pacific walrus feed on northward.[59] Sea ice loss has increased the duration of the open water season in the Chukchi Sea, altering the spatial distribution of resting sites relative to current foraging areas.[60] This shift influences the timing, amount, and quality of algal material reaching the benthos, and therefore has significant effects on benthic-feeding invertebrates.[61] Therefore, sea ice loss additionally affects Pacific walruses by altering the distribution and availability of benthic macroinvertebrates on which they feed in the Bering and Chukchi seas.

c. Ocean Acidification

While the 2014 SAR discusses ocean acidification as a threat, there is new information about ocean acidification that should be considered in a SAR revision. Specifically, ocean acidification is driving changes in bivalve availability in the Arctic, reducing prey availability for walruses.

Increases of dissolved carbon dioxide into the oceans are changing the balance of chemical equilibria for the inorganic carbon system, affecting carbonate chemistry and speciation of carbon in the oceans, and resulting in ocean acidification. An increased rate of Arctic Ocean acidification, combined with rapidly changing physical and biogeochemical Arctic conditions, exacerbates the impacts of climate change on vulnerable Arctic marine ecosystems.[62] High latitudes have already been subjected to the effects of decreased pH and ocean acidification

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[57] *Id.*

[58] Denisenko, S.G. et al. 2015. Assessing bioresources and standing stock of zoobenthos in the Chukchi Sea. Oceanography 28(3): 146-157; Logerwell, E. et al. 2018. Environmental drivers of benthic fish distribution in and around Barrow Canyon in the northeastern Chukchi Sea and Western Beaufort Sea. Deep Sea Research Par II: Topical Studies in Oceanography 152: 170-181 (Benthic fish distribution and abundance suggest that sea ice dynamics are important for the ecology of benthic Artic fishes.).

[59] Grebmeier, J.M. et al. 2018. Trends in Benthic Macrofaunal Populations, Seasonal Sea Ice Persistence, and Bottom Water Temperatures in the Bering Strait Region. Oceanography 31(2): 136-151.

[60] Beatty, W. 2016. Space use of a dominant Arctic vertebrate: effects of prey, sea ice, and land on Pacific walrus resource selection. Biological Conservation 203: 25-32 (Examines the effects of sea ice on foraging Pacific Walrus space use patterns by studying walrus foraging resource selection as a function of proximity to resting substrates and prey biomass.); Onarheim. I.H. et al. 2018. Seasonal and regional manifestation of Arctic sea ice loss. J. Clim. 31: 4917–32; Young, J.K. et al. 2017. Abundance, biomass, and caloric content of Chukchi Sea bivalves and association with Pacific walrus relative density and distribution in the Northeastern Chukchi Sea. Deep Sea Research Par II: Topical Studies in Oceanography 144: 125-141.

[61] Schollmeier, T. et al. 2018. Tracing sea ice algae into various benthic feeding types on the Chukchi Sea Shelf. Polar Biology 41: 207-224; Seymour, J. et al. 2014. Proportion of higher trophic-level prey in the diet of Pacific walruses. Polar Biology 37: 941-952.

[62] Terhaar, J. et al. 2020. Emergent constraint on Arctic Ocean acidification in the twenty-first century. Nature 582: 379-383.

because of pre-existing natural conditions that magnify ocean acidification, including cold water temperatures (increasing dissolved gas capacities) and low concentrations of carbonate ions.[63] The proportionally high contribution of freshwater at high latitudes, including from both sea ice melt and runoff, is an additional factor increasing vulnerability to anthropogenic inputs of carbon dioxide.[64]

Ocean acidification impacts bivalve development and alters benthic communities that Pacific walruses rely on as a food source. These bivalves are common prey items for benthivorous predators such as Pacific walruses. A 2017 report identified that ocean acidification from increases in anthropogenic carbon dioxide is a significant stressor to calcifying organisms, including bivalves. At least one out of the three common Arctic bivalves has displayed a decrease in shell length in response to decreased pH.[65] Because shells and hard structures provide many benefits for the organisms that produce them, including protection from predators, dissolution of shell structure from carbonate under-saturations may lead to reduced fitness of such organisms and therefore the availability of such organisms as food sources for the Pacific walrus.[66] Additional changes to bivalve physiology, development, morphology (phenotypic plasticity), and behavior may also occur.

3. Manatees

The Florida manatee and Antillean manatee are treated as two separate stocks for the purposes of the Service's SARs. The Florida and Antillean manatee stocks represent two different subspecies of West Indian manatee that exist in the United States—in Florida and Puerto Rico, respectively. While the Florida manatee population has been separated into management units, the Service identifies the Florida manatee population as a single stock. The Antillean manatee was listed as a federally endangered species in Puerto Rico in 1970. [67] Both subspecies were down-listed as part of the re-classification of the West Indian manatee as threatened in the United States.[68] The West Indian manatee, however, still faces many threats to its survival throughout its range. Threats to both stocks include habitat loss and fragmentation, entanglements in fishing gear, collisions with boats, the loss of warm water habitat, death and injury from boat strikes, harmful algal blooms, tropical storms and hurricanes, tidal entrapments, deaths from canals/locks, and disease.[69] Significant new information regarding the impacts of watercraft related mortality, increasing storm events, and other anthropogenic and climate-related population impacts has become available over the past six years that indicates that, since the publishing of the 2014 SARs, the status of the Florida and Antillean manatee stocks has changed and can be more accurately determined.

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[63] Goethel, C.L. et al. 2017. Implications of ocean acidification in the Pacific Arctic: Experimental responses of three Arctic bivalves to decreased pH and food availability. Deep Sea Research Par II: Topical Studies in Oceanography 144: 112-124.
[64] *Id.*
[65] *Id.*
[66] *Id.*
[67] 35 Fed. Reg. 18,319 (December 2, 1970).
[68] 81 Fed. Reg. 1000 (January 8, 2016).
[69] United Nations Environment Programme. 2010. Regional Management Plan for the West Indian Manatee, CEP Technical Report 48; Black, S.A. and S.C. Leslie. 2018. Understanding impacts of mitigation in waterway control systems on manatee deaths in Florida. Avian & Wildlife Biol. 3(5): 386-390.

a. Manatee Population Status

New population estimates have been conducted for the Florida manatee and Antillean manatee stocks that indicate significant changes to both stocks since 2014. The 2014 SARs estimate the minimum Antillean manatee stock at 142 manatees and the Florida manatee stock at 4,834 manatees. Since then, new research shows dramatic changes to both stocks. In 2016, the Service cited population estimates of 532 Antillean manatees and 6,350 Florida manatees as a reason to down-list both subspecies.[70] Further scientific research provides additional new population estimates. Collazo et al. 2019 estimates the Antillean manatees in Puerto Rico at 386 individuals island-wide.[71] Martin et al. 2015 estimates the Florida manatee population at 6,350.[72] These estimates indicate that the Florida and Antillean manatee populations have changed since the 2014 SARs were published. While these population estimates show a short-term increase in both manatee subspecies, significant and ongoing threats continue to harm West Indian manatees and impact their population numbers, as discussed below.

b. Watercraft-Related Mortality

While the 2014 SARs discuss watercraft-related mortality as a threat to both manatee stocks, there is significant new information available regarding increasing and persistent manatee declines caused by watercraft-related injury that should be considered in a SAR revision.

One of the most immediate threats to manatees are watercraft-related mortality and injury and are the number one cause of manatee deaths.[73] In the most recent and comprehensive population viability analysis of the Florida manatee found that mortality from watercraft collisions was one of three major threats (along with red tide and loss of warmwater habitat) to the manatee's long-term persistence in Florida.[74] Although manatees will try to avoid approaching boats, manatees are often too slow to get out of the way and many living manatees bear scars from multiple encounters with fast-moving boats. Mortality from collision can occur year-round and involve all age classes.[75]

In Florida, boat collisions are responsible for approximately 25% of all reported manatee deaths and for 54% of deaths of adult manatees for which the cause of death is known.[76] The details surrounding manatee-boat collisions are rarely reported, but existing reports indicate that manatee boat-strikes have reached record highs in recent years. In Florida, 520 manatees were found dead in waterways across the state in 2016. Of those 520 deaths, at least 104 deaths were

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[70] 81 Fed. Reg. 1000 (January 8, 2016).
[71] Collazo, J.A. et al. 2019. Population estimates of Antillean manatees in Puerto Rico: an analytical framework for aerial surveys using multi-pass removal sampling. Journal of Mammalogy 100(4): 1340-1349.
[72] Martin, J. et al. 2015. Combining information for monitoring at large spatial scales: First statewide abundance estimate of the Florida manatee. Biological Conservation 186: 44-51.
[73] Ball, R.L. et al. 2020. Trends of the Florida manatee (Trichechus manatus latirostris) rehabilitation admissions 1991-2017. PLoS One 15(7): e0223207.
[74] Runge, M.C. et al. 2017. Status and threats analysis for the Florida manatee, 2016. U.S. Geological Survey Scientific Investigation Report 2017-5030, 40 p.; https://doi.org/10.3133/sir20175030.
[75] *Id*.
[76] Rycyk, A.M. et al. 2018. Manatee behavioral response to boats. Marine Mammal Science 34(4): 924-962.

watercraft-related. This was the third deadliest year since recordkeeping began, according to records collected by the Florida Fish and Wildlife Conservation Commission.[77] So far in 2020, the Florida Fish and Wildlife Commission has recorded 69 manatee deaths due to watercraft collisions out of 483 total recorded manatee deaths.[78] The rise in fatal collisions could be the result of declining enforcement of boat speed limits in manatee zones, the expansion of private marinas into manatee habitat and "swim with manatees tourism" that may drive manatees out of safe areas and into dangerous channels.[79] New scientific research has been done to collect and integrate data on free-ranging manatee behavior, acoustics at the manatee location, habitat features, and vessel trajectories to characterize the behavioral responses of manatees approached by boats in the coastal waters of Florida and to identify the factors affecting those responses.[80]

c. Increasing Storm Events

Since the 2014 SARs, increasing and more severe storm activity (exacerbated by anthropogenic climate change) has negatively impacted both manatee stocks.

Numerous scientific studies have tracked increases in storm events across the United States, and especially in Florida and Puerto Rico.[81] The Florida manatee stock inhabits the subtropical waters of the southeastern United States and the Antillean manatee stock inhabits the coastal marine habitat around the Island of Puerto Rico.[82] In both these areas, hurricanes have been a regular and increasing occurrence. The U.S. Environmental Protection Agency reports that tropical storms and hurricanes in Florida and Puerto Rico have become more intense during the past 20 years.[83] For example, Hurricane Maria was a deadly Category 5 hurricane that devastated Puerto Rico in September 2017. It is regarded as the worst natural disaster in recorded history to affect the island. This year, Hurricane Sally flooded the Florida Panhandle and became the eighteenth named storm, and seventh hurricane of the extremely active, record breaking 2020 Atlantic hurricane season.

The increase in the intensity of extreme weather events associated with climate change decreases the welfare of manatees due to direct mortality, indirect mortality, and/or emigration

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[77] Florida Fish and Wildlife Conservation Commission 2016 Final Manatee Mortality Table by County. Available at https://myfwc.com/research/manatee/rescue-mortality-response/statistics/mortality/.

[78] Florida Fish and Wildlife Conservation Commission 2020 YTD Preliminary Manatee Mortality Table by County. Available at https://myfwc.com/research/manatee/rescue-mortality-response/statistics/mortality/.

[79] Rycyk 2018 (Investigated manatee behavior during boat approaches to better understand factors that lead to manatee–boat collisions.).

[80] *Id*.; Bass, C.A. 2017. Emerging hotspot analysis of Florida manatee (Trichechus manatus latirostris) mortality (1974-2012). Master's thesis. Nova Southeastern University. Available at https://nsuworks.nova.edu/occ_stuetd/456 (Identified significant spatial clusters of high value "hotspots" of manatee mortality and the temporal patterns of these hotspots.).

[81] U.S. Global Change Research Program. 2018. Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II. U.S. Global Change Research Program 1515 pp. doi:10.7930/NCA4.2018.

[82] Ruiz, M. 2014. Assessment of the potential effect of climate change on hurricane risk and vulnerability in Florida. Master's thesis. Texas A&M University; Athair, A.S. et al. 2019. Climate Change Adaptation Strategies for Protected Areas in Puerto Rico. Available at https://digitalcommons.wpi.edu/iqp-all/5498.

[83] EPA 430-F-16-011. 2016. What Climate Change Means for Florida; EPA 430-F-16-063. 2016. What Climate Change Means for Puerto Rico.

from the region as a consequence of storms.[84] These effects increase the exposure of manatees to disease and their vulnerability to predators.[85] The magnitude of impact on manatee populations varies with the destructiveness of the storm, which depends on storm intensity, size, speed of forward motion, proximity to the coast, track direction relative to the coast, and coastal and ocean bottom topography.[86] Other factors then exacerbate or ameliorate risk, such as density of manatees in the strike area, the number of storms within a season, or coincidence with other mortality factors.[87] Florida manatees, already living at the northern limit of their natural range, are already subject to multiple sublethal stresses (e.g. injury and maiming from boat collisions, cold weather events, variable winter refuges, degraded feeding areas). These threats have chronic and debilitating effects on manatees, making individuals more vulnerable to storm death.

The destruction of feeding grounds by hurricanes also has bearing on sustainability of the species in both Florida and Puerto Rico. Past storms in the southeastern U.S. have damaged both seagrasses and freshwater aquatic plants through wave action, sediment deposition, and changes in water salinity.[88] Important seagrass communities can be severely damaged by tropical storms, and although freshwater plants may recover quickly, seagrasses take up to a decade or more to recover.

4. Northern and Southern Sea Otter

The status of northern sea otter stocks in Southwest Alaska, Southcentral Alaska, and Southeast Alaska has changed dramatically since 2014, and the status of the southern sea otter stock has changed since 2017. New data on southern sea otters prompted the Service to determine that it was appropriate to revise reports for the southern sea otter stock in a draft SAR this year. For all four sea otter stocks, significant new information has become available since their last published SARs, examples of which are addressed below.

a. Population Numbers

Several new sea otter population assessments indicate a significant change in the northern sea otter (Southwest, Southcentral, and Southeast) and southern sea otter population numbers since 2014 and 2017, respectively, indicating the need for the Service to update the SARs for these stocks.

The southern sea otter draft SAR indicates that, as of 2018, the southern sea otter population stands at a minimum population of 3,081 otters (2,986 along the mainland and 95 at San Nicolas Island). It is important to note that even the draft SAR lacks reference to significant

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[84] Langtimm, C.A. and C.A. Beck. 2003. Lower survival probabilities for adult Florida manatees in years with intense coastal storms. Ecological Applications 13: 257-268.
[85] Marsh et. al. 2017. Impact of climate change and loss of habitat on sirenians. Marine Mammal Welfare 17: 333-357.
[86] So, S. et al. 2019. Storm surge from Hurricane Irma along the Florida Peninsula. Estuarine, Coastal and Shelf Science 229: 106402.
[87] *Id*.
[88] Wilson, S. et al. 2020. Assessment of Hurricane Irma impacts on South Florida seagrass communities using long-term monitoring programs. Estuaries and Coasts 43: 1119–1132 (Investigated the impacts of Hurricane Irma on benthic macrophyte communities in Florida Bay and the Florida Keys National Marine Sanctuary, USA.).

research that has emerged since the last published SAR in 2017—most notably from Gagne et al. 2018, who concluded that the suppositions underlying the effective population size and the delisting threshold in the Final Revised Recovery Plan for the Southern Sea Otter (2003) were flawed.[89] Additional new research conducted by the scientific community indicates further changes in population numbers since the 2017 SAR was published. According to data released by the California Department of Fish and Wildlife and U.S. Geological Survey in 2019, the three-year average population index dropped to 2,962, which is 166 sea otters fewer than the 2018 survey and 310 sea otters fewer than the 2017 SAR minimum population estimate.[90]

For the northern sea otter stocks in Southeastern, Southcentral, and Southwestern Alaska, new research indicates that there have been significant population changes since the 2014 SARs estimates.

For the Southeastern Alaska stock:

- Tinker et al. 2019 provides the most recent abundance estimate (2011) for the Southeastern Alaska sea otter stock. It estimates the Southeastern population at 25,583 otters. This is a 17 percent increase from the 2014 SAR minimum population estimate.[91]
- Raymond et al. 2019 investigated the spatial and temporal patterns of subsistence sea otter harvest and assessed the effect of harvest on population growth. Annual sea otter harvest in Southeastern Alaska increased from 55 animals in 1988 to a reported maximum of 1449 animals in 2013.[92]
- In 2016, the Southeast Alaska Inventory & Monitoring Network and other organizations initiated a study to better understand the spatial distribution, abundance, and colonization dynamics of sea otters in Glacier Bay National Park. This survey analyzed sea otter aerial survey data collected in Glacier Bay from 1999–2012 to determine the most efficient use of sampling effort for obtaining precise annual estimates. The most recent abundance estimate in 2012 was > 8,000 otters, representing an average annual growth rate of 42%.[93]

For the Southcentral Alaska stock:

- Gerlach-Miller et al. 2018 conducted a series of replicate aerial surveys of sea otters across the Lower Cook Inlet ("LCI"). Sea otters occupying eastern LCI are considered

[89] Gagne, R.B. et al. 2018. Measuring of effective population size in sea otters reveal special considerations for wide-ranging species. Evolutionary Applications 11(10): 1779-1790.
[90] Hatfield, B.B. et al. 2019. Annual California sea otter census - 2019 spring census summary: U.S. Geological Survey data release; https://doi.org/10.5066/P9B2KNB3.
[91] Tinker, M.T. et al. 2019. Trends in carrying capacity of sea otters in southeast Alaska. Wildlife Management. 83(5): 1073-1089.
[92] Raymond, W.W. et al. 2019. Location-specific factors influence patterns and effects of subsistence sea otter harvest in Southeast Alaska. Ecosphere 10(9): e02874.
[93] Esslinger, G. G. 2019. Sea Otter aerial survey data from Glacier Bay National Park and Preserve, 1999-2012. U.S. Geological Survey data release; https://doi.org/10.5066/P9SBAFF6; Esslinger, G.G. et al. 2015. Monitoring population status of sea otters (Enhydra lutris) in Glacier Bay National Park and Preserve, Alaska—Options and considerations. U.S. Geological Survey Open-File Report 2015-1119, 42 p., http://dx.doi.org/10.3133/ofr20151119.

part of the southcentral Alaska stock. This study estimated the total number of sea otters in the eastern LCI at 9,152 otters.[94]

- The Service used a 2003 population estimate for the sea otter population in Prince William Sound to conduct its 2014 Southcentral Alaska SAR. New research by Bodkin et al. 2011 estimated the 2009 population size of Southcentral sea otters in Western Prince William Sound to be 3,958 otters.[95]
- Esslinger et al. 2017 conducted sea otter aerial surveys in the Kenai Fjords.[96]

For the Southwestern Alaska stock:

- Gerlach-Miller et al. 2018 conducted a series of replicate aerial surveys of sea otters across the LCI. Sea otters on the west side of LCI are considered part of the southwestern Alaska stock. This study estimated the total number of sea otters in the western LCI as 10,737. [97]
- Esslinger et al. 2018 conducted sea otter aerial surveys in the Katmai National Park and Preserve in 2008, 2012, and 2015.[98]

Overall, new scientific information, along with the draft SAR, show significant changes to the northern and southern populations since their previously published stock assessments and therefore these stock assessments must be revised.

b. Oil and Gas Exploration and Development

Since the 2014 SARs were published for the northern sea otter, Southeast, Southcentral, and Southwest Alaska stocks, new information has become available that indicates significant changes in the threats faced by all three stocks. Specifically, there has been a substantial increase in oil and gas exploration and development within northern sea otter habitat in Alaska, which has negatively impacted these stocks.

The 2014 Southeast and Southcentral Alaska stock SARs do not identify oil and gas development as a threat to the northern sea otters other than from oil spills, and the 2014 Southwestern Alaska stock SAR states that "there is no evidence that other effects (such as disturbance) associated with routine oil and gas development and transport have had a direct impact on the Southwest Alaska sea otter stock."[99] These statements are no longer accurate.

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[94] Gerlach-Miller et al. 2018. Aerial surveys of sea otters (Enhydra lutris) in Lower Cook Inlet, Alaska, May, 2017. U.S. Fish and Wildlife Service, Marine Mammals Management Technical Report: MMM 2018-01. 22pp.

[95] Bodkin, J.L. et al. Trends in sea otter population abundance in Western Prince William Sound, Alaska: Progress Toward Recovery Following the 1989 *Exxon Valdez* Oil Spill. U.S. Geological Survey Scientific Investigations Report 2011-5213, 14 p.

[96] Esslinger, G. G. 2017. Gulf watch Alaska nearshore component: Sea otter aerial survey data Kenai Fjords National Park, 2002-2016. U.S. Geological Survey data release; https://doi.org/10.5066/F7CJ8BN7.

[97] Gerlach-Miller 2018.

[98] Esslinger, G. G. 2018. Gulf Watch Alaska Nearshore Component: sea otter aerial survey data from Katmai National Park and Preserve, 2008 - 2018 (ver. 2.0, March 2020). U.S. Geological Survey data release; https://doi.org/10.5066/F7930SG7.

[99] 2014 SAR Northern Sea Otter, Southwest Alaska Stock.

The Cook Inlet Basin located in Southcentral Alaska has been exposed to significant oil and gas activity, including recent seismic surveys. For example, in 2018, the Service authorized an incidental take permit for Hilcorp Alaska, LLC, for take of sea otters due to aerial surveys needed to collect gravitational and magnetic data for oil and gas exploration.[100] Hilcorp had acquired 14 lease blocks in the BOEM OCS Lease Sale 244 held on June 21, 2017.[101] An airborne survey was conducted over all 14 lease blocks in the summer of 2018. [102] In 2019, Hilcorp also conducted an in-water three-dimensional (3D) seismic survey over 8 of the lease blocks to determine the location of possible oil and gas prospects. Hilcorp plans to conduct additional in-water seismic surveys, geohazard surveys, and drill exploratory wells over the next several years.[103] As acknowledged by the Service, activities associated with exploration, development, and transport of oil and gas resources can adversely impact sea otters and nearshore coastal ecosystems in Alaska.[104] In the LCI, sea otter occurrence overlaps with much of the area where oil and gas development and exploration is taking place.[105] These activities have impacted and continue to impact the sea otter population in Southcentral Alaska.

Noise pollution can contribute to a range of damaging impacts on sea otters. Seismic surveys can harm marine mammals through hearing impairment; physiological changes like stress; behavioral impacts such as avoidance or displacement from important habitats; and masking that impairs their ability to communicate, find prey, or detect predators.[106] Sea otters are affected by masking, and they have difficulty distinguishing signals from background noise.[107] Exposure to moderate durations of very loud noise or long-term continuous exposure of moderate noise levels may cause the hairs within the inner ear system of the sea otter to die or disable the synapses between hair cells and their neurons, resulting in a permanent threshold shift (PTS).[108] Sea otters' auditory profile is similar to sea lions,[109] which have been found to suffer fatigue when exposed to longer duration noise and require longer periods of recovery than 24 hours.[110]

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[100] 83 Fed. Reg. 18,330 (May 29, 2018).

[101] OCS PERMIT 19-01. Hilcorp Alaska LLC. 2019 Lower Cook Inlet 3D Seismic Survey Environmental Evaluation Document.

[102] *Id*.

[103] *See* 84 Fed. Reg. 2 (Aug. 1, 2019); 84 Fed. Reg. 37,716 (printed version).

[104] 2014 Northern Sea Otter Southeastern SAR.

[105] Garlich-Miller, J. L. et al. 2018. Aerial surveys of sea otters (Enhydra lutris) in Lower Cook Inlet, Alaska, May, 2017. USFWS Marine Mammals Management Technical Report MMM 2018-01. Available at https://www.fws.gov/alaska/fisheries/mmm/seaotters/pdf/2017_Cook_Inlet_Sea_Otter_Survey_Final_Report.pdf.

[106] Hildebrand, J.A. 2005. Impacts of Anthropogenic Sound on Cetaceans in Marine Mammal Research: Conservation Beyond Crisis. Baltimore: The Johns Hopkins University Press 101-124; Weilgart, L.S. 2007. The Impacts of Anthropogenic Ocean Noise on Cetaceans and Implications for Management. Canadian J. Zoology 85: 1091-1116; National Research Council. 2003. Ocean Noise and Marine Mammals. Washington, DC: The National Academies Press; doi: 10.17226/10564.

[107] Ghoul, A. and C. Reichmuth. 2014. Hearing in the sea otter (Enhydra lutris): auditory profiles for an amphibious marine carnivore. Journal of Comparative Physiology 200: 967–981; Southall, B. L. et al. 2019. Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. Aquatic Mammals 45(2): 125–232.

[108] 84 Fed. Reg. 32,932 (July 10, 2019).

[109] Ghoul 2014; Southall 2019.

[110] Kastak, D. et al. 2007. Onset, growth, and recovery of in-air temporary threshold shift in a California sea lion (Zalophus californianus). J. Acoust. Soc. Am. 122(5): 2916-2924.

Seismic surveys can also harm fish and invertebrates,[111] which can impede prey availability and foraging for sea otters. Fish and invertebrates use sound for their life functions. Seismic air gun surveys have been found to damage fish ears at distances of 500 m to several kilometers from seismic surveys, with no recovery apparent 58 days after exposure.[112] Even under moderate levels of noise exposure, some fish experience temporary hearing loss, with fish occasionally requiring weeks to recover their hearing.[113] Noise has been shown to produce a stress response and behavioral reactions in some fish that include loss of coherence, dropping to deeper depths, milling in compact schools, "freezing," or becoming more active.[114] For example, tuna schools in pens were less coherent in the presence of boat noise. In addition, fish have also been reported to flee from seismic shooting areas as inferred from decreased catch rates for both long lines and trawler fisheries.[115] Reduced catch rates of 40%–80% and decreased abundance have been reported near seismic surveys.[116] In one study, fish presence declined by 78 percent during seismic surveys.[117] Science shows that seismic surveys are also detrimental to zooplankton, which could have damaging effects up the food chain. The study found that a single airgun blast caused an abundance decline of at least 50 percent in 58 percent of the zooplankton species observed.[118] The study found two to three times more dead zooplankton after the seismic airgun exposure compared to controls, and the krill larvae experienced 100 percent mortality.[119]

c. Climate Change Induced Impacts on Sea Otter Food Availability

Significant new information has become available regarding climate-induced changes to habitat and food availability for both the northern and southern sea otter.

Climate-induced changes to habitat nutrient levels have significant effects on northern and southern sea otters. This is not mentioned in any of the previously published SARs. In nearly all areas occupied by sea otters, primary production is provided by two pathways. One is through macrophytes (kelps, seaweeds and sea grasses) that provide a stable source of productivity. The other is through seasonal blooms in phytoplankton that can occur within an area or be transported to nearshore habitats. These complementary sources of carbon provide some resilience to species of suspension feeding invertebrates that depend on particulate organic carbon.[120] Cyclical changes in ocean climate or emerging changes due to climate change (e.g., ocean temperature, acidification) significantly influence invertebrate populations on which sea

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[111] Popper, A.N. and M.C. Hastings. 2009. Effects of anthropogenic sources of sounds on fishes. Journal of Fish Biology 75: 455; Weilgart, L.S. 2018. The Impact of Ocean Noise Pollution on Fish and Invertebrates. Report by OceanCare.
[112] Weilgart, L. 2014. A review of the impacts of seismic airgun surveys on marine life. Submitted to the CBD Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25-27. Available at http://www.cbd.int/doc/?meeting=MCBEM-2014-01.
[113] *Id*.
[114] *Id*.
[115] Slabbekoorn, H. N. et al. 2010. A noisy spring: the impact of globally rising underwater sound levels on fish. Trends in Ecology and Evolution 25(7): 419-427.
[116] Welgart 2014.
[117] Paxton, A. B. et al. 2017. Seismic survey noise disrupted fish use of a temperate reef. Marine Policy 78: 68-73.
[118] McCauley, D. et al. 2017. Widely used marine seismic survey air gun operations negatively impact zooplankton. Nature Ecology and Evolution 1(7): 195.
[119] *Id*.
[120] Davis, R.W. 2019. Future directions in sea otter research and management. Front. Mar. Sci. 5: 510-516.

otters depend on by affecting either transport and recruitment of pelagic larvae or survival and growth of recruits and adult invertebrates on the benthos.[121]

Food availability plays an important role in determining the abundance and distribution of sea otters. Interannual changes in carbon and nutrient productivity can influence the abundance and growth of sea otter prey, which has an important bottom-up effect on the carrying capacity of an area.[122] Also, foraging effort (i.e., number of hours per day spent feeding) appears to be related to the status of the population relative to food availability across nearly all the sea otter's current range.[123] In areas occupied by younger or non-territorial males, food may be the primary factor driving density and emigration to unoccupied areas. Because of their reproductive system and high fidelity to small annual home ranges, sea otter populations are demographically structured at small spatial scales, with population dynamics often driven by juvenile mortality rates.[124]

d. Fisheries Impacts on Northern and Southern Sea Otters

Since the last published SARs, new information has become available regarding the impacts of fisheries on both northern and southern sea otters. This new information indicates significant changes to sea otter populations since the last published SARs.

Since the 2014 and 2017 SARs, co-occurrence of sea otters with fishing gear and traps has been increasing in both California and Alaska, especially as sea otters reoccupy portions of their former habitat.[125] Northern and southern sea otters are top predators that compete with human beings and commercial fisheries for prey species. A sea otter diving and foraging for food or wrapping up in kelp is likely to come into contact with fishing lines, hooks, or other fishing gear. Sea otters are at high risk of mortality from such fishing gear. When a sea otter becomes entangled in fishing gear, they are at risk of starvation, infection, physical trauma, and

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[121] Batten, S.D. et al. 2018. Interannual variability in lower trophic levels on the Alaskan Shelf. Deep Sea Research Part II: Topical Studies in Oceanography 147: 58-68. (Results suggest that anomalous warming events, such as the "heat wave" of 2014–2015, could fundamentally influence typical lower trophic level patterns, possibly altering trophic interactions.); Beas-Luna, R. et al. 2020. Geographic variation in responses of kelp forest communities of the California Current to recent climatic changes. Glob. Change Biol. 26(11): 10.1111.

[122] Davis 2019.

[123] Coletti, H. A. et al. 2016. Detecting and inferring cause of change in an Alaska nearshore marine ecosystem. Ecosphere 7: e01489; Monson, D. H. and L. Bowen. 2015. Evaluating the status of individuals and populations: advantages of multiple approaches and time scales in sea otter conservation. London: Elsevier Academic Press 119–155; Cortez, M. et al. 2016. Development of an altricial mammal at sea: I. activity budgets of female sea otters and their pups in Simpson Bay, Alaska. J. Exp. Mar. Biol. Ecol. 481: 71–80.; Stewart, N. et al. 2014. Sea otter foraging habitat use in heterogenous environment in Kachemak Bay off Alaska. Bulletin of Marine Science 90: 921-939.

[124] Gagne 2018; Bodkin, J. L. 2015. Historic and contemporary status of sea otters in the North Pacific in sea otter conservation. London: Elsevier, 43–61.

[125] Carswell, L.P. et al. 2015. Sea Otter Conservation. Academic Press 333-368; Resneck, J. 2019. Solutions sought to ease conflicts over Southeast Alaska's rising sea otter populations. Alaska Public Media. Available at https://www.alaskapublic.org/2019/11/11/solutions-sought-to-ease-conflicts-over-southeast-alaskas-rising-sea-otter-populations/; Hatfield, B.B. et al. 2011. Sea otter mortality in fish and shellfish traps: estimating potential impacts and exploring possible solutions. Endangered Species Research. 13: 219-229.

exhaustion.[126] Trap lines cause sea otter entanglement and death, especially from vertical lines. Compared to other plastic items, ghost or derelict fishing gear (i.e. gear that is abandoned, lost, or discarded) such as nets, pots, traps, lines, and buoys, is widely recognized as a major source of mortality for marine mammals, including sea otters.[127] Entanglement in this fishing gear can lead to physical injuries that include lacerations, constriction (i.e. flesh clearly drawn in by impacting material, such as packing bands or monofilament line, which puts enough pressure on the animal's skin to impede blood or air flow),[128] severe sclerosis, loss of limbs, and difficulty breathing if the airway becomes restricted.[129] The animal may starve, drown, or be unable to escape predators or hazards if the entangled material hampers movement.[130] Sea otters entangled in plastic ropes, lines, and floats may develop systemic infections and chronic debilitation from extensive tissue damage.[131]

Fishing industry practices also have negative impacts on the marine environment in which sea otters live and feed on. Degradation of seafloor habitats by trawling has been widely studied, along with ghost fishing by traps.[132] Trap fishing causes direct impacts on benthic habitats during setting and retrieval, including dragging along the seafloor, which can lead to the damage and destruction of habitat components.[133] Lines connecting multiple traps increase the overall footprint and cause additional damage. Lost traps and debris can cause damage to submerged aquatic vegetation. Although the trap footprint is small, movement of the trap can expand the impact footprint by an order of magnitude.[134] Chronic bottom trawling can lead to large scale shifts in the functional composition of benthic communities, directly affecting the distribution and availability of benthic invertebrates that northern and southern sea otters feed on, and therefore negatively impacting these sea otter stocks.[135]

e. Changes in Kelp Abundance and Habitat for the Southern Sea Otter

In addition to the threats and changes to the southern sea otter population referenced in the 2020 draft SAR, changes in kelp abundance have also had significant impacts on southern sea otters. New scientific research on changes in kelp abundance and distribution has become available since 2017, the last time the Service issued a final stock assessment report for the southern sea otter.

Kelp species are the primary structuring component of highly-productive temperate nearshore rocky reefs growing up to 60 cm per day, but are vulnerable to climate change

[126] Senko, J.F. 2020. Understanding individual and population-level effects of plastic pollution on marine megafauna. Endangered Species Research. 43: 234-252.
[127] Wilcox, C. et al. 2016. Using expert elicitation to estimate the impacts of plastic pollution on marine wildlife. Marine Policy 65: 107-114.
[128] Senko 2020.
[129] *Id.*
[130] *Id.*
[131] *Id.*
[132] Stevens, B.G. 2020. The ups and downs of traps: environmental impacts, entanglement, mitigation, and the future of trap fishing for crustaceans and fish. ICES Journal of Marine Science fsaa135.
[133] *Id*.
[134] *Id*.
[135] Davis 2019; Tillin, H.M. 2006. Chronic bottom trawling alters the functional composition of benthic invertebrate communities on a sea-basin scale. MEPS 318: 31-45.

stressors. Historically, kelp forests have occupied 25% of the world's coastlines, providing a wide range of ecosystem services, including both habitat structure and food resources, as well as modifying light levels and sedimentation, water flow, nutrient dynamics, carbon sequestration, and physical disturbance. Dense kelp beds are biodiversity hot spots, with many kelp-forest obligate species as well as species utilizing kelp forests as critical nursery habitats, including southern sea otters.[136] Due to extreme climatic events, bull kelp canopy has gone through catastrophic reductions along more than 350 km of Pacific coastline.[137] Though annually variable, since 2014, California's kelp forests have declined by 93% and conditions have not recovered.[138]

Changes in distribution and productivity of kelp beds influence the abundance and distribution of southern sea otters.[139] Absence of kelp intensifies density-independent threats to southern sea otters in the range peripheries.[140] For example, absence of kelp intensifies sea otter exposure to increased shark-bite-related mortality—one of the most significant threats to southern sea otter populations.[141] All sea otter life history stages in California are confined to a narrow coastal corridor, where spatial gaps in giant Macrocystis pyrifera and bull Nereocystis luetkeana kelp forest canopies may expose sea otters to fatal bites from white sharks.[142] Encounters between white sharks and otters are mostly concentrated along the range peripheries where kelp cover is nearly absent (in the north) or less extensive and more ephemeral (in the south).[143] In addition, reduced kelp abundance across the range may be inhibiting the rate of female dispersal from the range center, because reproductive females tend to avoid areas without kelp canopy for nursery habitat.[144]

CONCLUSION

In summary, the Service's stock assessment reports for polar bears, walrus, manatees and sea otters are woefully outdated and promptly need revision as required by the MMPA. If you

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[136] Rogers-Bennett, L. and C.A. Catton. 2019. Marine heat wave and multiple stressors tip bull kelp forest to sea urchin barrens. Scientific Reports 9: 15050.
[137] Kenner, M.C. and J.A. Tomoleoni. 2020. Kelp forest monitoring at Naval Base Ventura County, San Nicolas Island, California: Fall 2018 and Spring 2019, fifth annual report. U.S. Geological Survey Open-File Report 2020–1091, 93 p., https://doi.org/10.3133/ofr20201091 (The U.S. Geological Survey implemented a kelp forest monitoring program for the U.S. Navy at San Nicolas Island in 2014, building on sites and methods established by USFWS scientists in 1980.); Beas-Luna 2020 (Analysis of data from 469 sites spanning Alaska, USA, to Baja California, Mexico in the context of climate change effects on structure, functioning, and resilience of kelp forests.).
[138] California Department of Fish and Wildlife. 2019. California's Disappearing Kelp Forests: What Scientists and Divers can do to Reverse the Trend. Available at https://wildlife.ca.gov/Science-Institute/News/californias-disappearing-kelp-forests-what-scientists-and-divers-can-do-to-reverse-this-trend; Hatfield, B.B. et al. 2019. Annual California sea otter census - 2019 spring census summary. U.S. Geological Survey data release; https://doi.org/10.5066/P9B2KNB3.
[139] Nicholson, T.E. et al. 2018. Gaps in kelp cover may threaten the recovery of California sea otters. Ecography 41(11): 1751-1762.
[140] *Id*.; Tarjan, L.M., and M. T. Tinker. 2016. Permissible home range estimation (PHRE) in restricted habitats: A new algorithm and an evaluation for sea otters. PLoS One; https://doi.org/10.1371/journal.pone.0150547.
[141] Tinker, M.T. et al. 2015. Dramatic increase in sea otter mortality from white sharks in California. Marine Mammal Science. 32(1): 309-326.
[142] Nicholson 2018.
[143] *Id*.
[144] *Id*.

have any questions or would like to discuss this matter please contact us at the email addresses below. We would prefer to resolve this matter without the need for litigation and urge the Service to promptly publish revised stock assessment reports. If the Service does not come into compliance, the Center for Biological Diversity intends to file suit.

Sincerely,

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