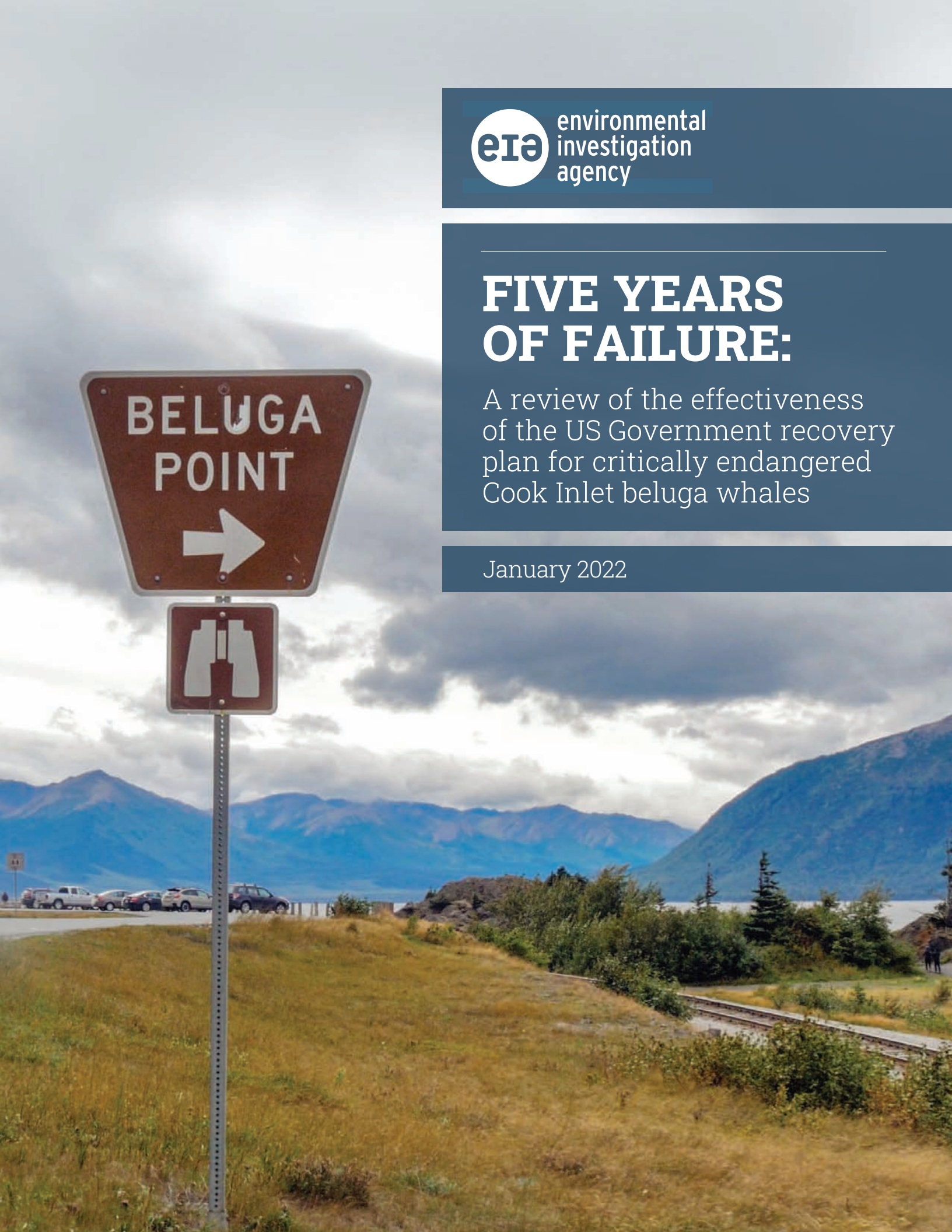


environmental investigation agency

FIVE YEARS OF FAILURE:

A review of the effectiveness of the US Government recovery plan for critically endangered Cook Inlet beluga whales

January 2022



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EIA wishes to thank the Tilia Fund and other philanthropic organizations and individuals for their support of our work to protect Cook Inlet belugas.

ABOUT EIA

We investigate and campaign against environmental crime and abuse. Our undercover investigations expose transnational wildlife crime, with a focus on elephants and tigers, and forest crimes such as illegal logging and deforestation for cash crops like palm oil. We work to safeguard global marine ecosystems by addressing the threats posed by plastic pollution, bycatch and commercial exploitation of whales, dolphins and porpoises. Finally, we reduce the impact of climate change by campaigning to eliminate powerful refrigerant greenhouse gases, exposing related illicit trade and improving energy efficiency in the cooling sector.

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A CALL TO ACTION

Cook Inlet beluga whales (CIBWs) are in peril. Only about 279 individuals remain and at their current rate of decline the population faces a serious risk of functional extinction in about a decade. Cook Inlet belugas have been in decline for almost two decades and were designated as endangered in 2008. While the situation is distressing, it is sadly not surprising.

When a population is designated as endangered, the agency in charge of their management is required to develop a recovery plan that is supposed to guide decision-making with the aim of reversing decline and consequently improving the population's conservation status. Five years ago, in December 2016, the National Marine Fisheries Service (NMFS), the agency charged with management of CIBWs, published its Recovery Plan. The Recovery Plan identified and ranked ten potential threats to CIBW recovery and developed 66 recovery actions aimed at reducing these threats.

Since publication of the plan, the decline of the population has only accelerated and the window of time to make meaningful interventions to save Cook Inlet belugas is closing. It is evident that the status quo approach taken to managing CIBWs and their habitat is not working. The Environmental Investigation Agency (EIA) believes that the next three to five years are crucial and that NMFS must re-examine its approach to managing CIBWs and make dramatic changes to every aspect of its program, from permitting and pollution testing and stranding response to understanding the role of prey availability and climate change to the population.

To support NMFS in such an effort, EIA commissioned Broad Conservation LLC to analyze the status and effectiveness of NMFS's Recovery Plan for the Cook Inlet beluga whale (*Delphinapterus leucas*) and to make recommendations for how to improve management of the population to give the belugas the best shot at recovery. This report is a summary of Broad Conservation's extensive analysis, key findings and detailed recommendations.

EIA urges NMFS to take urgent action to protect Cook Inlet belugas in line with the recommendations made in this report. We stand ready to work together to prioritize the recovery of these animals which are so special to the people and ecosystem of Cook Inlet.

1

INTRODUCTION: ANCHORAGE'S WHITE WHALES

Beluga whales, also called "white whales," are found mainly in the Arctic waters of Russia, Greenland, Alaska, and Canada. Cook Inlet belugas are one of only two sub-Arctic populations located near an urban center. CIBWs are beloved by the people of Anchorage, Alaska's largest city, where they can be spotted surfing the tide along some of the area's busiest coastal highways.

Belugas are highly social marine mammals. They produce a great variety of sounds, including squeals, squeaks, chirps, and trumpeting – which is why belugas are also known as the "canaries of the sea." In the Alaskan waters of the United States, five populations of beluga whales have been identified by NMFS. The populations, based on their summer distributions, include those in Bristol Bay, the Eastern Bering Sea, the Eastern Chukchi Sea, the Beaufort Sea, and Cook Inlet.[1] Of these five US beluga whale populations, the Cook Inlet population is the smallest, most geographically isolated, and genetically distinct from the others.[2] Thus, if the CIBW go extinct, no other beluga whales will re-occupy this marine habitat.[3]

Beluga whales are marine sentinels - a thriving beluga whale population indicates a healthy and resilient marine ecosystem. In addition to the subsistence value the CIBW population once had for Alaska Natives, CIBWs have a cultural and spiritual value. Despite their importance, CIBWs are at continued risk of extinction. Exposed to various threats, such as habitat degradation, pollution, and underwater noise, CIBWs are showing no signs of recovery.[4]

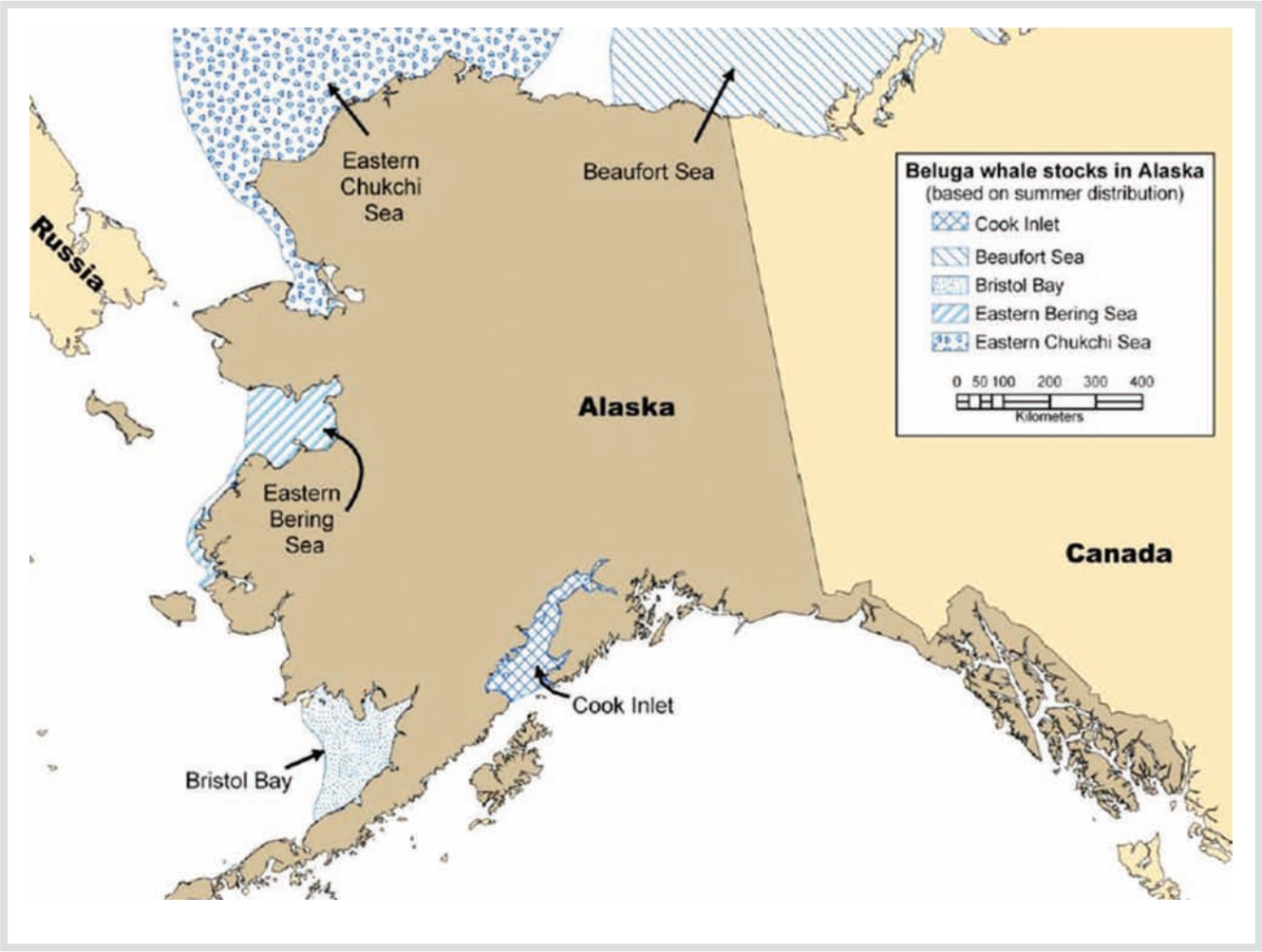


Figure 1
Identified stocks of beluga whales in the United States (reproduced from NMFS 2016a)

In the late 1970s, it was estimated that there were around 1,300 belugas in Cook Inlet.[5] However, this number rapidly declined through the 1990s, with almost 1000 whales lost in just two decades. A NMFS aerial survey in 1994 estimated 653 beluga whales inhabited Cook Inlet but by 1998 that number declined to 347 whales.[6] With a decline of nearly 50 percent in just four years, attributed to unsustainable levels of subsistence harvest, NMFS designated the CIBW population as depleted under the Marine Mammal Protection Act (MMPA) in 2000 and identified them as a distinct population segment (DPS) under the Endangered Species Act (ESA), but decided that listing them as a threatened or endangered species was not warranted at that time.[7]

In an effort to allow the CIBW to recover to a healthier population size, NMFS and the Alaska Native subsistence users worked together to significantly reduce subsistence harvests. Only five CIBW have been hunted since 2000, with none after 2005. Despite this joint effort by NMFS and the Alaska Native subsistence communities of Cook Inlet, subsequent aerial surveys indicated that the beluga population did not increase as expected. Consequently, in 2008 NMFS listed the CIBW DPS as endangered under the ESA.[8] Today, only 279 whales remain and the population is declining at a rate of 2.3% annually. Given their dire situation, NMFS considers the CIBW as one of eight "most highly at-risk marine species," in the US and the International Union for Conservation of Nature (IUCN) classifies the CIBW population as "Critically Endangered."[9]

The ESA listing necessitated the development of a recovery plan, which NMFS finalized in December 2016. At that time, the 2014 abundance estimate was the most recent estimate and indicated 340 belugas remained in the population.[10] In 2019, NMFS switched to a fully Bayesian analysis method for estimating group sizes and reanalyzed the prior estimates from 2004 through 2016 using the new model.[11] The outcome was that all the estimates changed and the new model showed early signs of population growth through 2010, after which there was persistent declines. The 2018 estimate of 279 whales was the lowest estimate since CIBWs were listed under the ESA. The 10-year trend using the original data for 2006-2016 indicated the population was declining at a rate of 0.5% annually, but under the new model and with inclusion of the 2018 data, the current trend indicates the population is actually declining at a rate of 2.3% annually.[12]

This could potentially lead to the 200-individual threshold as the point at which small population dynamics, such as inbreeding depression and loss of genetic diversity, begin to pose a significant risk to CIBW recovery. If the existing rate of decline continues, it is predicted that CIBWs will drop below the 200-individual small population dynamics threshold by the year 2033.

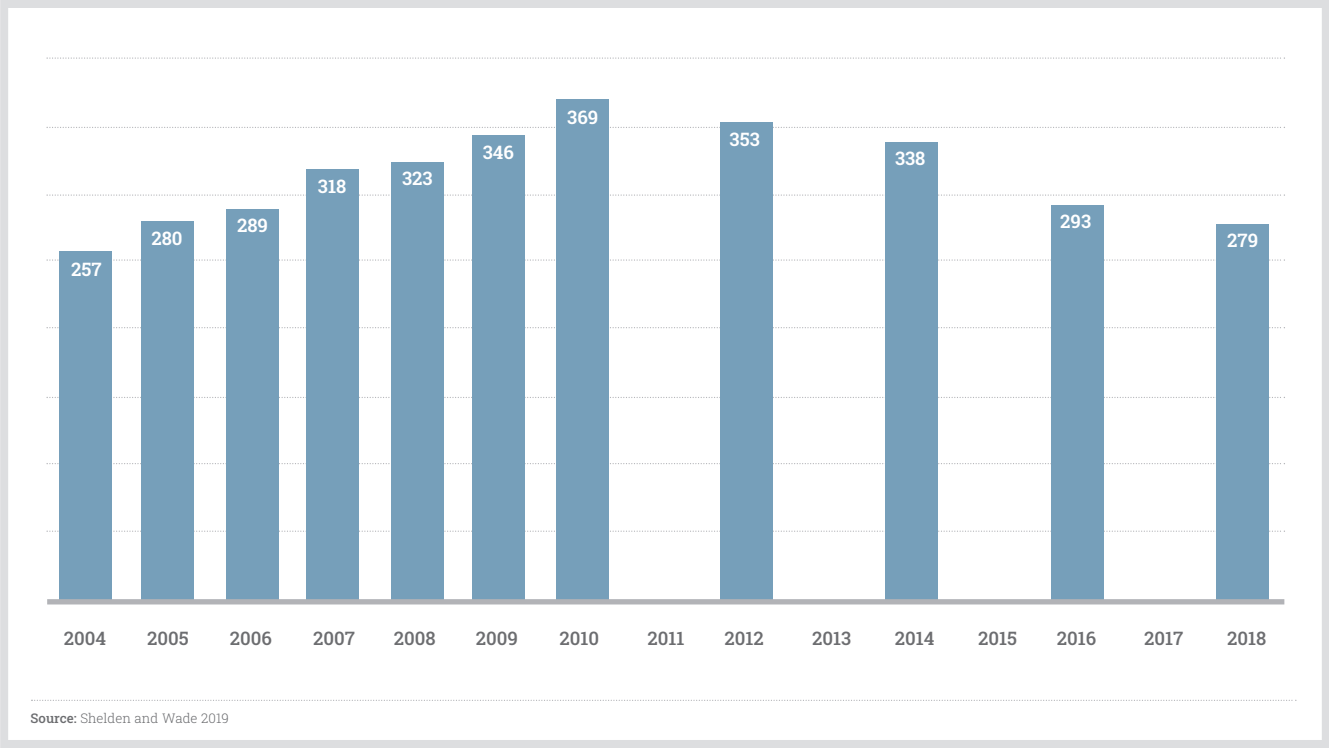


Figure 2
Revised CIBW Abundance Estimates 2004-2018*

* In 2011, a change in the type of aircraft used compromised the quality of the video data collected, thus that year's data were deemed unusable when data were reassessed using the new model developed by Boyd et al. (2019). After 2012, the aerial survey schedule was changed so surveys were only conducted in even years; however, no survey was conducted in 2020 due to COVID-19 restrictions.

2

COOK INLET: A UNIQUE HOME FOR A UNIQUE POPULATION OF BELUGAS

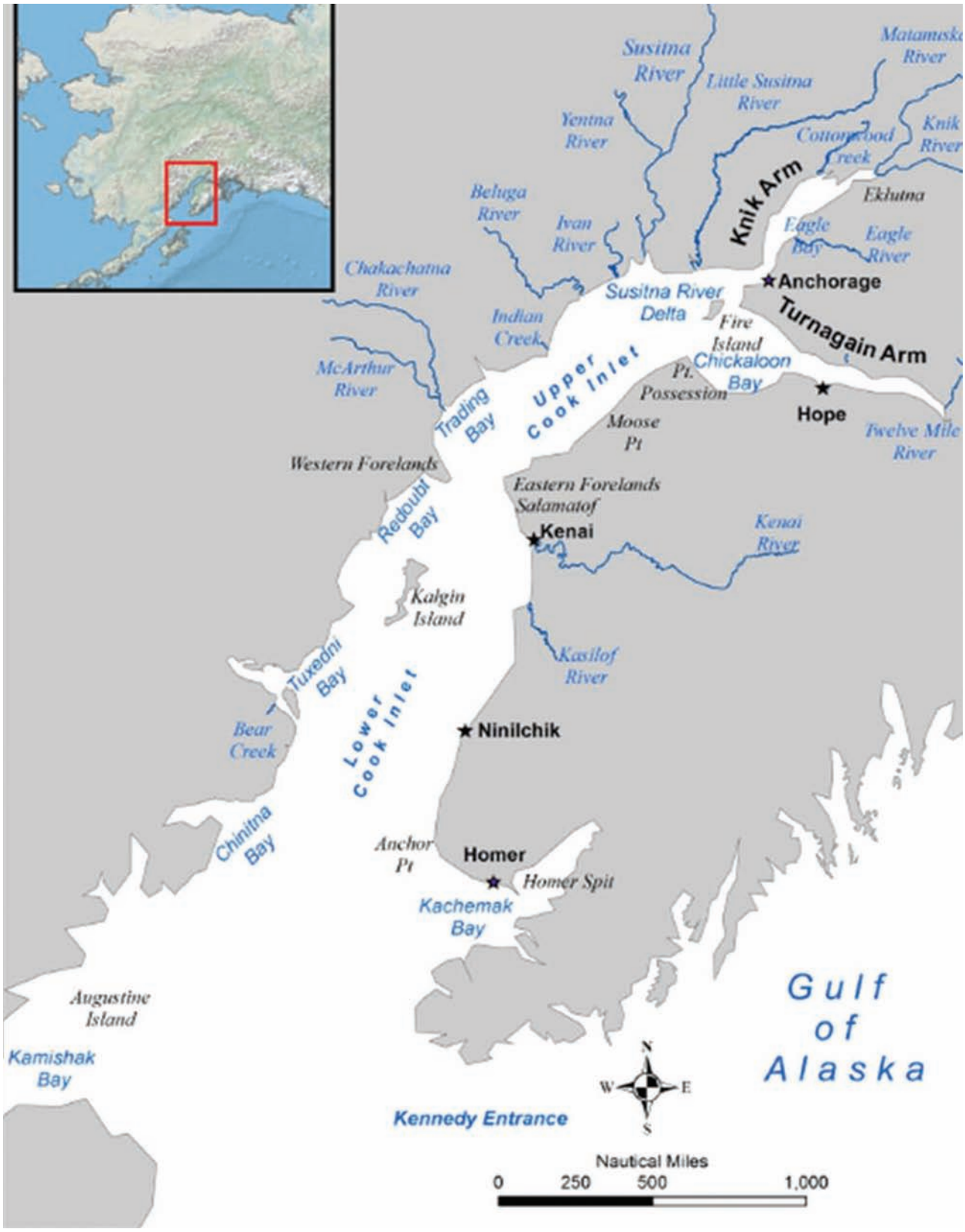
Cook Inlet is a large, semi-enclosed tidal estuary in southcentral Alaska, extending for 230 miles (370 km) from the Gulf of Alaska in the southwest (lower Cook Inlet) to the Knik and Turnagain Arms in the northeast (upper Cook Inlet). Numerous glacial rivers deposit large amounts of sediment in the Inlet creating a marine environment with low-visibility and high turbidity, especially in upper Cook Inlet.[13]

During the winter months, most of the upper Cook Inlet is covered in ice, with rivers starting to freeze between October and November, and the ice starting to retreat between March and May.[14] This seasonal trend is slowly changing due to the effects of climate change with freeze-up starting later and ice melt starting earlier. As is the case throughout the Arctic, Cook Inlet is experiencing a longer ice-free period, a trend that is likely going to accelerate over time.[15]

Although CIBWs spend their entire life in Cook Inlet, they exhibit some seasonal changes in their distribution and habitat use within the Inlet. These seasonal changes are associated with corresponding changes in the environment and food sources.[16] During the ice-free months, belugas are usually found in the upper region of the Inlet, with nearly the entire population concentrating at times near the Susitna River delta.[17] With shallower waters and vast amounts of fish, the upper region of the Inlet, especially the Susitna River delta, Knik Arm, and Turnagain Arm, are considered ideal feeding and nursery grounds.[18] It has been long speculated that upper Cook Inlet might be an important calving ground.[19] Recent documentation of three births in the Susitna River delta and Turnagain Arm support that speculation.[20] Once the ice starts to form in the upper region, which typically coincides with waning fish runs in the late fall, belugas begin to disperse into smaller groups to swim farther south into the lower regions of the Inlet but are often still found in the upper regions despite high ice cover.[21]

In addition to providing protections to the species, the ESA also provides protections to the species' habitat if the agency designates a portion of the range as critical habitat. The known distribution and seasonal movements of CIBW, along with identification of five physical and biological features deemed essential for the conservation of the whales, were used to designate 7,800 km^2 of Cook Inlet as critical habitat for the beluga whales in 2011.[22]





Source: Map created by MNFS 2013

Figure 3
Map of Cook Inlet, Alaska (reproduced from NMFS 2016a)

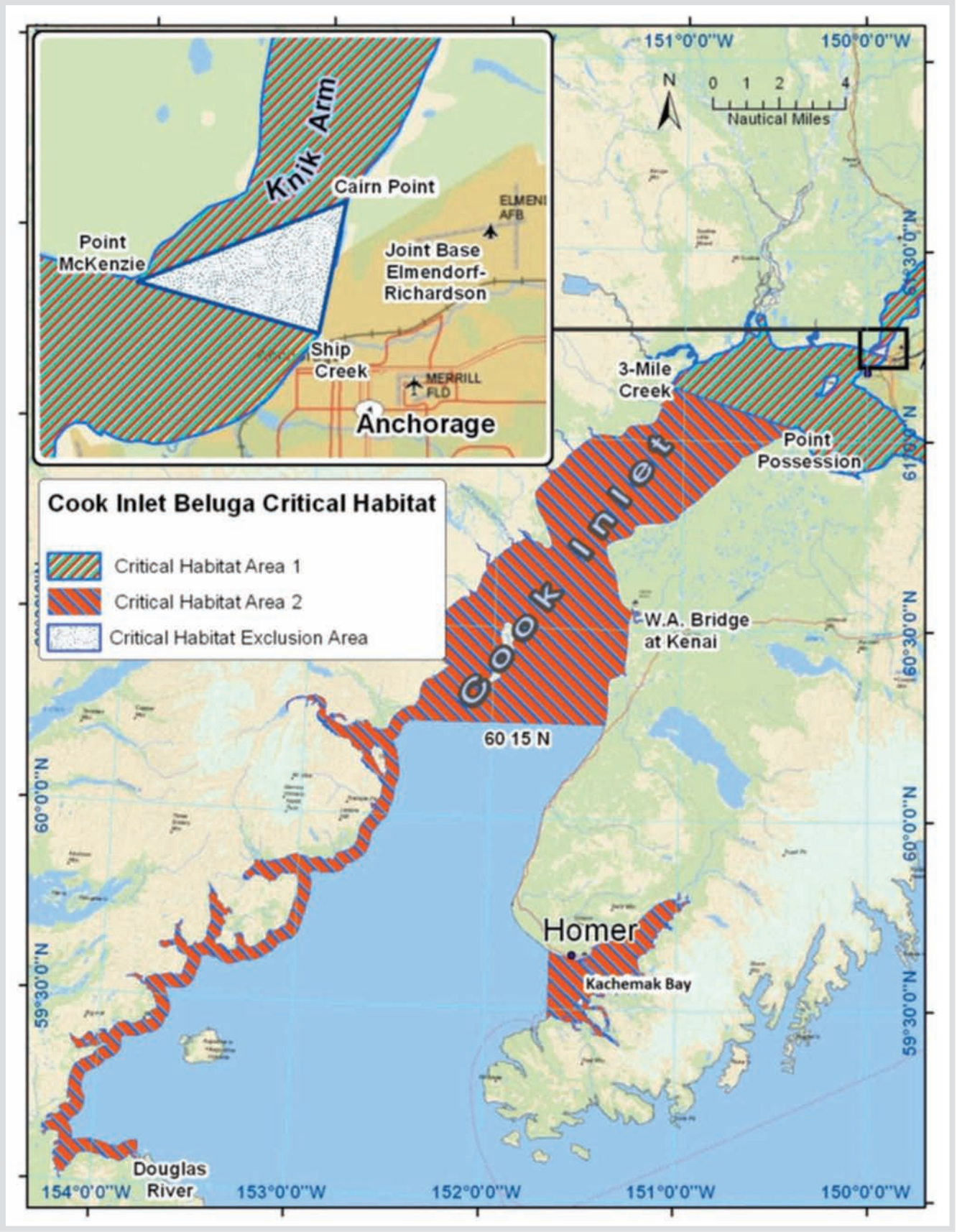


Figure 4
Cook Inlet Beluga Whale Critical Habitat (reproduced from NMFS 2016a)

BELUGAS UNDER THREAT

Cook Inlet belugas live in the most industrialized body of water in Alaska, which is adjacent to the Alaska's largest city, Anchorage. Anthropogenic noise, often exceeding NMFS's harassment thresholds, is pervasive throughout the Inlet and arises from large and small vessels, dredging, pile driving and other coastal development, aircraft, military exercises, and oil and gas activities, just to name a few.[23] These persistently high levels of noise potentially impair CIBWs' ability to communicate by preventing them from hearing important messages from conspecifics or from predators (i.e., masking). There is a major shipping channel to several ports in Cook Inlet, two of which are in the upper Inlet within critical habitat area for belugas. The vessels add noise to CIBW habitat and their physical presence in the water can pose a threat of direct harm if a CIBW is struck by a vessel.[24]

During the ice-free season, CIBWs compete for critical prey items, especially salmon, which are coveted by commercial, recreational and personal-use fishers. This competition for food is exacerbated by the decline in salmon stocks in Cook Inlet over the past decade, requiring management actions ranging from formal disaster declarations to early closures of fishing seasons. The influx of fishing vessels during the fishing season creates noise and increases the potential for ship strikes, and fishing gear such as nets poses entanglement threats.

Pollution from numerous sources is discharged directly into Cook Inlet, including from wastewater treatment facilities, oil and gas platforms, cruise ships, stormwater drains, runoff, and oil and gas leaks from vessels or pipelines crossing the bottom of Cook Inlet.

Other anthropogenic stressors include research conducted on CIBWs. The effects of these activities range from the fairly benign, such as the negligible impacts from aerial surveys and anchored passive acoustic monitors placed around the Inlet, to those which involve close approach with vessels, such as photo-identification studies, to those which involve direct contact with the whales, such as biopsy and attachment of tags.

Finally, transient killer whales have been spotted as recently as September and October 2021 in Turnagain Arm and the Kenai River, important areas for CIBWs to forage during those months. In Turnagain Arm, CIBWs have been documented stranding during low tide in an effort to escape killer whales; not all are successful. While they may escape from the killer whales, being live stranded for hours until the tide comes back places extensive physiological stress on their bodies, which need the water to counteract the effects of gravity on animals that can weigh in excess of 3,000 pounds. While encountering any one of these threats may not in and of itself cause death, the reality is that CIBWs must navigate a gauntlet of stressors on a daily basis, even at night. Cook Inlet belugas have no opportunity for prolonged escape to a low-stress environment.

The CIBW Recovery Plan identified ten potential threats to CIBW recovery and ranked them as high, medium, or low based on consideration of factors such as: the threat's major effect to the whales; the extent of the threat; the frequency of the threat; the trend of the threat; the probability the threat will occur; and the magnitude of the threat.

Threats of High Relative Concern:
- Catastrophic events (e.g., natural disasters, spills, stranding)
- Cumulative effects of multiple stressors
- Noise

Threats of Medium Relative Concern
- Disease agents (e.g., pathogens, parasites, and harmful algal blooms)
- Habitat loss or degradation
- Reduction in prey
- Unauthorized take

Threats of Low Relative Concern
- Pollution
- Predation
- Subsistence hunting

New information suggests that several of the lower ranking threats (pollution, reduction in prey, habitat loss/degradation and unauthorized take) should be elevated in ranking. Appendix A to this report provides brief summaries of examples of research studies that have been published since the CIBW Recovery Plan which support the need to revisit the current threat ranking.

"Given the increases in the human population and development of Cook Inlet, it is likely that the level of pollution entering Cook Inlet is increasing and will continue to increase in the future."

- CIBW Recovery Plan (NMFS 2016a) at page III-34

4



DELAYS AND INERTIA: STATUS OF IMPLEMENTATION OF THE RECOVERY PLAN

The Cook Inlet Beluga Recovery Plan establishes 66 total actions targeted at achieving recovery of CIBWs in light of the numerous threats that they face. Fourteen recovery actions (RAs) are focused on population monitoring, Recovery Plan implementation, and education/outreach. The remaining 52 RAs are focused on addressing threats ranked as high or medium. It is worth noting that no actions were identified to address the low-ranked threats.[25,26]

A comparison of the status of implementation of the Recovery Actions to the schedule outlined in the Recovery Plan shows that NMFS is concerningly behind schedule:

- Only one of the 66 RAs has been identified as completed, and it was a low priority action (action 8, research techniques workshop).
- Half of the actions are listed as not started, and nearly half are identified as ongoing.
- Of the recovery actions that are designed to address threats to CIBWs, 60% have not begun and none are identified as completed.
- None of the actions aimed at addressing cumulative effects of multiple stressors, a high-ranked threat, have been started; instead, most efforts have been put towards the threats of noise (four actions ongoing) and reduction in prey (six actions ongoing).
- All 66 actions should have been started in the first five years according to the Implementation Schedule, yet after five years less than half of the actions recommended to start in Year 1 have been initiated.

In addition to being behind schedule, the Recovery Plan has failed to spur any meaningful changes in NMFS's management of Cook Inlet belugas. The Recovery Plan acknowledges that developing a strategy to recover CIBWs is a complex process which involves collecting data, integrating various datasets and, importantly, the

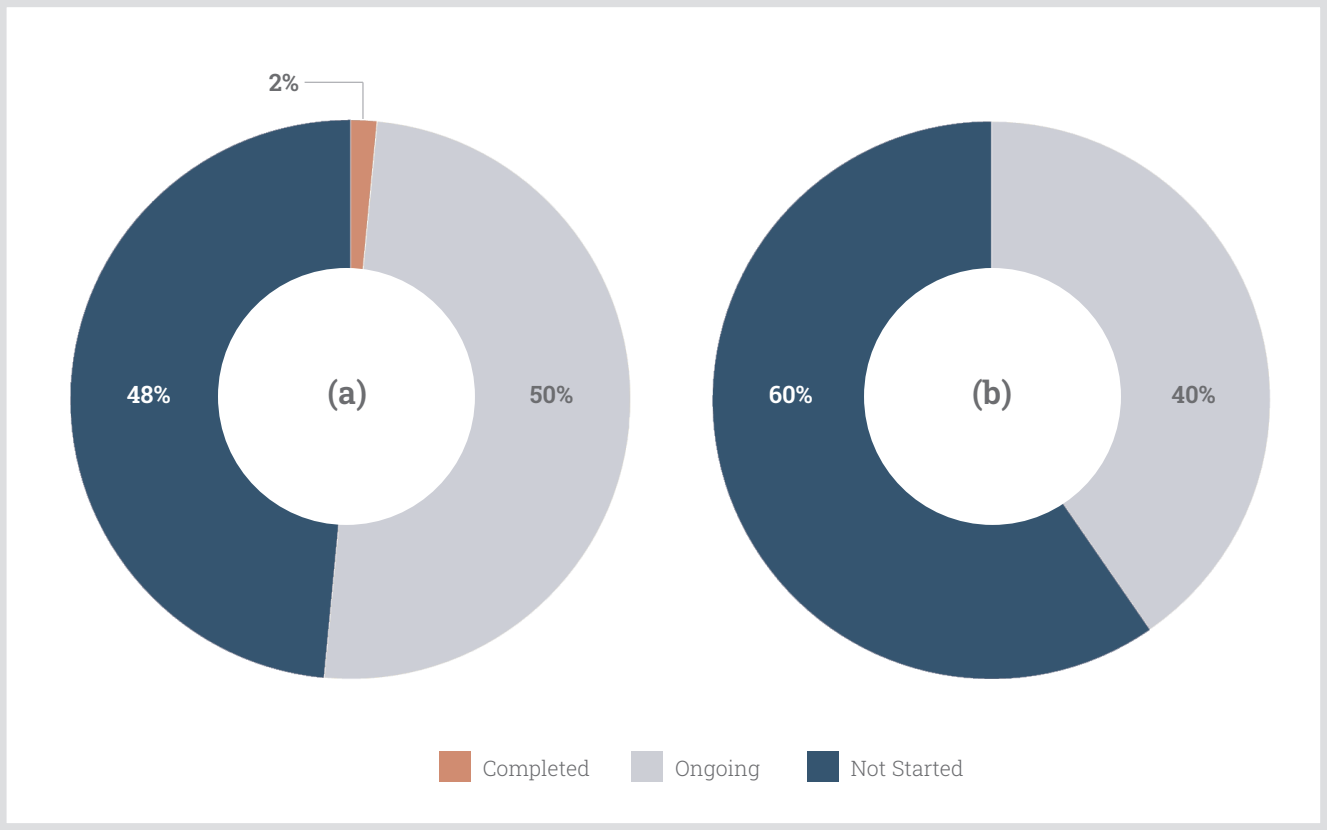


Figure 5
Implementation status of (a) all 66 recovery actions and (b) the 52 threats management recovery actions from the CIBW Recovery Plan (as of November 27, 2021)

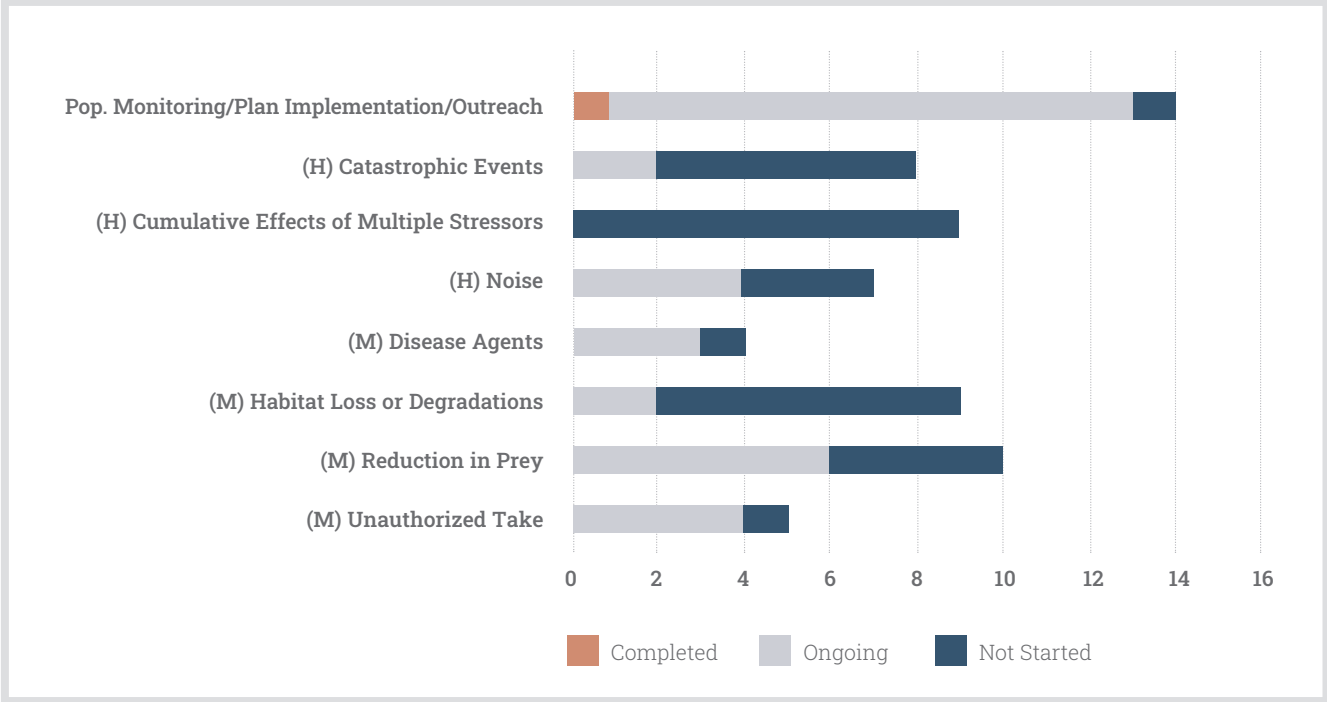


Figure 6
Implementation status of all CIBW recovery actions by category/threat type (as of November 27, 2021)

"The recovery plan is supposed to be a roadmap to get the species back to a population level that warrants removing the species from the list of endangered and threatened species. Unfortunately, NMFS has failed to fully assess the threats and identify measures to minimize and mitigate impacts. Instead, NMFS calls for more studies to better understand the threats. While further study is always helpful, a recovery plan that does nothing but attempt to confirm that the threats are indeed real, will at best, delay recovery. At worst, it will lead the beluga whale further down the road towards extinction."

- Comments submitted in 2015 to NMFS by Trustees for Alaska on behalf of Cook Inletkeeper, North Gulf Oceanic Society, and Alaska Community Action on Toxics regarding the Draft CIBW Recovery Plan

"application of these results to management (e.g., development and implementation of mitigation to avoid or reduce adverse effects)."[27] Put simply, the Plan recognizes the value of not just studying belugas but actually changing agency behaviors and decisions in light of the science in order to meaningfully reduce threats and reverse decline.

Unfortunately, despite the importance the Plan ascribes to changes in management, there have been no measurable progress or quantifiable changes in the agency's management of the population to meaningfully address any of the medium or high ranked threats (i.e., reduced or eliminated).[28] Part of the problem is that the Recovery Plan was rather unambitious it its management-related actions to begin with. There are only three RAs, out of 66, which involve clear, concrete management activities targeted at reducing the effect of threats. Based on NMFS's Recovery Action Database,[29] implementation has not begun for any of these three actions:

- RA #22: Ensure fisheries management (e.g., escapement goals for CIBW prey species) adequately accommodates CI beluga prey requirements, and if necessary, expand the number of species with escapement goals. (Reduces the threat of reduction of prey and ensures adequate food supplies benefitting individual CIBW fitness and population growth.)

- RA #40: Assess the biological benefits, costs, and implementation feasibility of potential protection or restoration measures for particular habitats important to CI beluga recovery and implement such measures if determined warranted. (Reduces the threat of habitat degradation or loss.)

- RA #62: Review the current system for allocation of takes (by harassment) of CI belugas to see if a comprehensive approach, rather than by individual project, increases managers' ability to reduce the cumulative effects of harassment takes by numerous projects. (Reduces the threat of cumulative effects.)

Research on CIBWs is only helpful to recover the species if the results are being used to validate the effectiveness of existing management actions, or spur new management actions. Despite the clear statement in the Recovery Plan about the need for applying research results to management strategies for reducing or eliminating threats to CIBWs and the amount of research findings made available since the plan was published, no regulations which specifically address any of the threats to CIBWs have been promulgated since 2008 when CIBWs were listed under the ESA.[30] The only clear management/regulatory action taken to reduce a threat was the regulation of subsistence harvest in 2008 just prior to the ESA listing.



5

CUMULATIVE FAILURE: NMFS's BELUGA TAKE AUTHORIZATION SYSTEM

As previously noted, the Cook Inlet Recovery Plan considers cumulative effects from multiple stressors a high-ranking threat. The Plan acknowledges the concern that cumulative effects may not be merely additive, but rather synergistic, which results when "two stressors interact to cause greater harm than the sum of the effects of the individual component stressor."[31] Although the recovery plan does a good job describing the threat posed by cumulative effects to Cook Inlet belugas, including synergistic effects, NMFS has totally failed to make management changes to adequately take cumulative effects into account. This is particularly concerning when it comes to the agency's issuance of "take" authorizations. These authorizations allow belugas to be harmed or harassed either incidental to another activity (like oil and gas exploration) or directly (usually as part of a research related to the belugas).

The Recovery Plan acknowledges:

> "Although individual activities might be deemed insignificant when considered independently, creeping normality (e.g., death by a thousand cuts) can cause substantial adverse effects to nearly any entity, including CI belugas, at both individual and population levels. Applications for Incidental Harassment Authorizations (IHAs) historically have been reviewed on the basis of an individual activity in isolation. But the high level of human activity in Cook Inlet has increased such that cumulative effects of multiple activities must be appropriately accounted for. Although assessing cumulative impacts from multiple activities is challenging, results of such an assessment might be particularly relevant for understanding the lack of recovery for CI belugas. A framework should be developed by NMFS for assessing cumulative impacts to belugas from the numerous activities occurring in Cook Inlet."

Consequently, a key recommendation in the CIBW Recovery Plan is Recovery Action 62 which directs NMFS to "review the current system for allocation of takes (by harassment) of CI belugas to see if a comprehensive approach, rather than by individual project, increases managers' ability to reduce the cumulative effects of harassment takes by numerous projects."[32] Despite CIBW take authorizations being solely under NMFS control, five years since publication of the Recovery Plan, efforts to implement Recovery Action 62 have "not started."[33]

The lack of progress on this Recovery Action led to a recently published study assessing the number and types of takes of CIBWs effective after publication of the

> **"In the absence of a single threat clearly limiting recovery, the cumulative effects (including any synergistic effects) from multiple stressors limiting recovery is a most plausible explanation for why the CI beluga population has not recovered."**
>
> - CIBW Recovery Plan (NMFS 2016a) at page VI-27

Recovery Plan, issued as of December 31, 2020.[34] As of the end of 2020, NMFS had already authorized nearly 120,000 takes to harass CIBWs for the period 2017 through 2025, with take authorizations for the years 2022-2025 anticipated to increase.

The Recovery Plan stated that in 2012, when an estimated 312 belugas remained, "over 2,700 takes were requested for research and development projects," whereas the study authors documented over 22,000 takes (research plus incidental) authorized in 2020 when the population was estimated at 267 (assuming continued 2.3% annual decline).[35] They found a negative correlation between total take authorized annually and estimated population size. Assuming the status quo patterns continue into the future, total annual authorizations are anticipated to continue to increase while the population size continues to decrease. Given the unknown reasons why the CIBW population continues to decline, the increase in take authorizations may be a contributing factor to the cumulative effects for this species, and thus adding to their lack of recovery.

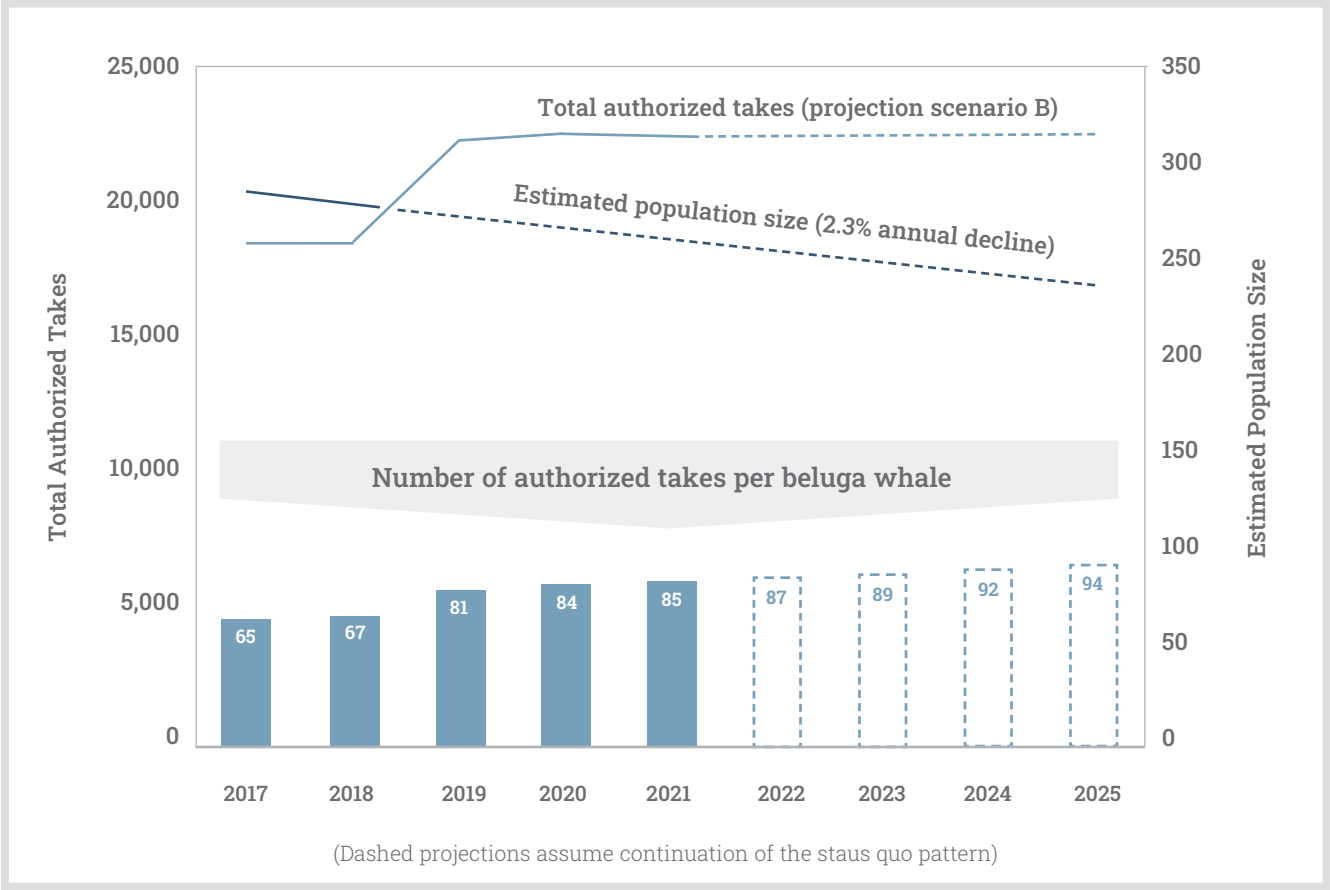


Figure 7

Cook Inlet beluga whale take authorizations and population size relationships, 2017-2025, based on continuation of the status quo patterns observed as of December 31, 2020 (reproduced from Migura and Bollini 2021).*

* In the Projection B scenario depicted here, take authorization values for 2022-2025 were projected as the average of the 2019-2021 value (n = 22,271). The 2017 population size is the mean of published survey results from 2016 and 2018, and 2019-2025 population sizes were estimated by presuming a continued 2.3% annual decline after 2018.

6

CONCLUSION: THE STATUS QUO APPROACH IS FAILING COOK INLET BELUGAS

Five years after at the finalization of the CIBW Recovery Plan there has been no progress towards recovery. On the contrary, the CIBW population is in worse shape than when listed under the ESA in 2008 and is declining faster than previously understood. None of the threats to the species have been reduced, and no new protections, either for the whales themselves or their habitat, have been implemented since the Recovery Plan was published. Although there has been an increase in research activities, with few exceptions, much of the research does not provide information leading to near-term, actionable management change to promote recovery. The management of this population has essentially remained unchanged since they were listed under the ESA in 2008.

7

SAVING COOK INLET BELUGAS REQUIRES A FOCUS ON REDUCING MORTALITY AND INCREASING POPULATION GROWTH

While there are many ways to improve the current situation for Cook Inlet belugas, the only way to have a meaningful impact for the species' recovery is to alter the factors affecting survival and population growth. NMFS places most of their efforts on information gathering (research), mitigating effects of future noise (ESA section 7 consultations and MMPA take authorizations), and conducting outreach. Significant effort has been spent watching and listening to the whales, and having meetings to talk about the whales, however, little to no efforts have been undertaken since CIBWs were listed under the ESA to improve the existing conditions affecting their survival or growth.

What has been learned recently is that adult mortality is greater than expected and reproduction may be impaired compared to healthier beluga populations (e.g., later age at first reproduction and longer intervals between births[36]). For the period 2005-2017, 95 dead CIBWs were reported, and the estimated mean annual mortality rate for that time period was 2.2%.[37] That equates to an average of 7-8 dead CIBWs per year. A review of NMFS's stranding database indicated there were 59 CIBW strandings (live and dead) between January 1, 2017 and October 20, 2021, of which 53 were strandings of dead whales.[38] In 2021, 11 dead CIBWs were reported as of October 21st. This means that since publication of the Recovery Plan, the average number of reported dead CIBWs has increased from 7-8 per year (2005-2017) to 11-12 per year (2017-2021). Given the remoteness of many of Cook Inlet's coastlines, the seasonal pulse of human usage of the inlet in summer, and the potential that some carcasses sink rather than wash ashore, it is likely the actual number of CIBWs dying each year is much greater than the number of reports.

Based on calculations presented in two recent studies showing that 30-35% of the CIBW population are adult females (i.e., reproductively active females) and that 17-20% of the adult females produce a calf each year, then using the most recent abundance estimate of 279 whales, an estimated 14 to 19 calves are born each year.[39] Considering the current annual average number of reported dead CIBWs, it is likely that the actual mortality rate exceeds the recruitment rate (i.e., there are more deaths than births). The bottom line is, unless something is done in the near-term to result in significant change in the factors affecting survival and growth, annual mortality is likely to continue to exceed annual recruitment, and recovery will not be possible. This underscores the importance of focusing resources and efforts towards either improving the availability of quality prey to CIBWs or reducing pollution in CIBW habitat.

8

RECOMMENDATIONS

RECOMMENDATION ONE:

Improve Prey Quantity, Quality, and Availability to Promote Beluga Growth and Survival

Anadromous salmon and eulachon are both vitally important to CIBWs due to the high-fat content of these fish species, which helps belugas build up the necessary significant blubber reserves in the summer to get them through the winter when quality prey is scarce. This is particularly true for pregnant and lactating females whose energetic demands are greater. NMFS recognizes that lack of adequate prey may result in reductions in reproductive fitness and increases in mortality of CIBWs. Adequate prey is of such importance that key prey species are identified as an element of CIBWs' critical habitat, and reduction of prey is identified in the CIBW Recovery Plan as a medium-ranked threat to CIBW recovery.

> **"Without enough prey, belugas might experience decreased reproductive rates and increased mortality rates."**
>
> - NOAA Fisheries, Species Directory, Beluga Whale www.fisheries.noaa.gov/species/beluga-whale

Unfortunately, not only are the CIBWs in decline, but their primary prey species, especially Chinook salmon, are also showing evidence of decline as demonstrated by weak runs over the past decade necessitating fisheries closures.

A recent study determined Chinook salmon populations across Cook Inlet experienced low productivity beginning with the 2003 brood year, with recruitment of the 2003-2007 broods averaging 57% lower recruitment than pre-2003 levels.[40] Density dependent factors have been often been touted as major reasons why the Cook Inlet salmon runs have been so poor. Although individual populations of Chinook salmon in Cook Inlet watershed exhibited recruitment declines ranging from 38-93% from 2003-2007, density dependence could only explain 10% of the decline.[41] This suggests other factors are having a much greater effect on poor Chinook salmon runs; specifically, these broods experience a combination of adverse freshwater conditions involving a combination of heavy rains in the fall increasing in-stream flows, warm summer stream temperatures at levels above optimal spawning and rearing temperatures, and variable marine conditions between years.[42] Now that research study results are available, steps should be taken to identify methods for regulating stream temperature and reducing the detrimental effects of heavy fall rains.

Other ideas being pursued for salmon restoration in Canada include assessing the effect of coastal kelp farms for providing habitat for migrating Pacific salmon and salmon prey sources;[43] examining salmon migratory routes along tributaries and rivers to determine if there are impediments to salmon movements, and removing them if there are; and developing best practices for prioritizing the needs of salmon when carrying out habitat conservation and restoration efforts, especially landscape recovery after major fires.[44]

RECOMMENDATION TWO:

Reduce Pollution to Improve Health and Reduce Mortality

Years before the Recovery Plan was published, NMFS recognized the concern for CIBWs resulting from pollution. It was a threat identified in the 2008 Conservation Plan, and "waters free of toxins or other agents of a type and amount harmful to Cook Inlet beluga whales" was included as an essential feature of CIBW critical habitat in 2011. However, pollution was identified as a threat of low concern in the CIBW Recovery Plan, and because of that low ranking no RAs were identified to address the threat, and no evidence was found in the literature that steps have been taken to reduce the amount of pollution entering CIBW habitat since the Recovery Plan was published. On the contrary, the potential for new projects that will need to discharge into CIBW habitat continues to grow (e.g., new area of Cook Inlet currently under consideration for leasing for oil and gas exploration and production as part of Lease Sale 258.[45]

The Recovery Plan in and of itself provided sufficient information to conclude that the threat of pollution should have been ranked higher and warranted actions aimed at reducing this threat over the past five years. To briefly recap, the Recovery Plan: 1) acknowledged the amount of pollution entering Cook Inlet is increasing, and will continue to increase; 2) presented multiple cases where concentrations of tested contaminants were higher in CIBWs than other Arctic belugas (e.g., PCB, PFC, PAH, copper, Hexabromocyclododecane); and 3) presented a list of seven chemical classes which were identified as being of probable or possible concern.

Since the CIBW Recovery Plan was finalized, recent findings of various studies only elevate the concern that

pollution may be affecting survival and growth of CIBWs. It is clear there are factors at play which are reducing the reproductive potential of individual CIBWs as well as the overall population. NMFS's analyses of contaminants of emerging concern in water samples and resident fish collected in upper Cook Inlet in 2017 showed very interesting results of how various pharmaceuticals and manufacturing chemicals are found in CIBWs' environment and their prey. Recent studies have found that there is unexplained high mortality of reproductive-aged adults. Belugas are a long-lived species, with females going through menopause and living long past their reproductive periods, with individuals living in excess of 70 years in healthy beluga populations. Yet the oldest aged[46] CIBWs are a 49-year-old male and a 47-year-old female[47] and the female was lactating at the time of death indicating she was still reproductively active.[48]

Other reproductive concerns for the CIBW population include the apparent delay in age at first reproduction, the extended inter-birth interval,[49] and congenital defects observed in dead calves and aborted fetuses.[50] Contaminants in the environment have been proven to have detrimental effects on reproduction, as a pregnant female transfers, or off-loads, her contaminant burden to her calf. This can happen in the womb or during lactation while the calf is nursing. While this reduction of contaminants may be beneficial for the mother, the high contaminant burden for her offspring can be detrimental, causing congenital defects or premature death. Males do not have a similar mechanism to offload their contaminant burden, and often have higher contaminant loads than similarly aged females.

Also, recent tests looking for over 100 contaminants of emerging concern in resident fish in upper Cook Inlet revealed these fish, which are prey of CIBWs, are bioaccumulating contaminants and a variety of pharmaceutical drugs (e.g., antidepressants, antibiotics, stimulants, narcotics, pain relievers), as well as manufacturing chemicals such as nonphenols (in lubricating oils, laundry and dish detergents, antioxidants) and PFCs (in Teflon, water-resistant textiles, paper and furniture, and fire-fighting foam). Not only are these health concerns for the fish, and which may affect their survival and reduce the amount of food available to CIBWs, but these contaminants in the fish may impact CIBW health.

Discharge of pollutants into Cook Inlet may impair water quality and adversely affect beluga whales, which are often associated with nearshore waters adjacent to metropolitan areas. NMFS should work with EPA to ensure marine point-source discharges are consistent with the recovery of the Cook Inlet beluga whale and to develop Cook Inlet-wide discharge limits.

NMFS should also work with the state and local government to identify and support action to reduce non-point (runoff and storm drain) pollution into Cook Inlet including:

- Encouraging the development of new technologies for airport deicing agents that are chemical-free
- Supporting the uptake at the Port of Anchorage of ballast water requirements that meet the best technologically feasible standards;
- Comprehensively assessing pollution in the water and sediment throughout CIBW habitat.

RECOMMENDATION THREE:

Cap beluga takes, undertake a programmatic EIS and develop a take tracking system

Despite increasing threats to Cook Inlet beluga whales reducing the likelihood of recovery, NMFS continues to authorize take without adequately and comprehensively assessing the cumulative effects of its authorizations on Cook Inlet beluga whales under the National Environmental Policy Act (NEPA), the ESA, or the MMPA and responding with appropriate management measures. It has instead defaulted to a fragmented approach that promises to result in death by a thousand cuts. NMFS should:

- Prepare a Programmatic Environmental Impact Statement (EIS) under NEPA on NMFS's system of authorizing takes of Cook Inlet beluga whales in state and federal waters, with an emphasis on the cumulative and synergistic effects of the multiple stressors facing these whales;
- Complete programmatic consultation under the ESA on NMFS's system of authorizing takes of Cook Inlet beluga whales in state and federal waters;
- Promulgate regulations establishing an annual cap on NMFS's authorizations for take of Cook Inlet beluga whales;
- Set this cap at zero allowed instances of authorized take until programmatic NEPA and programmatic ESA consultation are completed and Cook Inlet beluga whales are meeting recovery criteria. Limited exceptions for research and a limited number of other activities may be considered where the activity is non-invasive and has a clear link to Cook Inlet beluga recovery; and
- Create an online, publicly accessible system that tracks all applications for take authorization, all issuances of take authorization, and all reported takes of Cook Inlet beluga whales, including documented unauthorized takes. This system must inform management decisions.

RECOMMENDATION FOUR:

Revise the CIBW Recovery Plan

Recovery plans are not supposed to be static documents, but rather evolve as new information is learned. During the five years since the CIBW Recovery Plan was published all of the RAs were scheduled to at least have started, but at time of writing just over half have been started.[51] The emphasis over the past five years has been on learning more about the CIBWs and promoting outreach. It is time to revise the CIBW Recovery Plan to reflect what has been learned, while pivoting the emphasis to focus on taking action to reduce threats.

Threat rankings should be reassessed, especially for pollution, reduction in prey, and unauthorized takes, which all may be more impactful to recovery than previously believed. NMFS places significant emphasis on the threat of noise. For CIBWs, collecting acoustic data has been a priority research project, with anthropogenic noise being the primary source of take examined during MMPA incidental harassment authorizations and ESA section 7 consultations. One reason for this may be because it is easier to quantify noise and NMFS has policies in place for identifying thresholds of when noise causes Level A and B harassment. This may have also led to the identification of noise as a high-ranked threat to CIBWs. However, despite NMFS's emphasis on noise management, the population is worse off now than when listed under the ESA. As time goes by, it is evident that the existing emphasis and method of noise management is not effective at promoting recovery and efforts need to be made to address other threats. NMFS's justification for excluding RAs addressing the low-ranked threats was because "the most expedient way to achieve recovery is by first addressing those threats identified as of medium or high relative concern" and "if a choice has to be made between addressing a threat of high/medium relative concern or a threat of low relative concern, we recommend the resources be allocated to addressing the higher ranked threats". Unfortunately, this means that efforts to address lower-ranked threats, such as reducing pollution, limiting unauthorized takes, and increasing prey availability, are not happening. Improving the status of these threats, especially reduced prey and pollution can have the most impact at altering the factors affecting survival and mortality.

Recovery actions should be revised to emphasize threat reduction. The CIBW Recovery Plan is primarily a research plan, not a recovery plan. The Recovery Plan explicitly states that the threats-management recovery "actions are intended to reduce or eliminate medium- and high-ranked threats and to recovery CI belugas", however only three actions in the CIBW Recovery Plan involve clear, concrete management activities targeted at reducing a threat or its effect (RAs #22, 40, and 62), none of which have been started.[52] Most of the RAs involve watching or listening to the whales, talking about the whales, or reviewing old data to learn more about the whales and their threats.

A revised Recovery Plan needs to be more focused and more proactive in reducing the existing threats, and must include actions to reduce pollution as a potential source of mortality for reproductive-aged adults and cause of congenital defects in calves. While many Recovery Plans are written by researchers, who often want more certainty (i.e., more research means more data) before taking action, the status quo of watch/listen/talk isn't a path to recovery for CIBWs.

A revised Recovery Plan needs to focus more on proactive actions to reduce the threats and result in changed management strategies and less on research and outreach. When revising the RAs, emphasis should also be placed on having fewer actions with greater likelihood of improving the existing conditions, rather than a laundry list of actions that have no beneficial effect to CIBWs.

RECOMMENDATION FIVE:

Protect Cook Inlet Beluga Habitat

Habitat loss or degradation is identified as a threat of medium concern for CIBWs, with nine RAs identified in the CIBW Recovery Plan. Yet little to no action has been taken to reduce the current extent of impact of this threat to CIBWs. CIBWs are already primarily found in the northernmost part of Cook Inlet in the summer, so there is little elsewhere for them to go. This emphasizes the need to increase protections of the existing habitat from degradation by anthropogenic activities, especially given future effects predicted from a warming climate. Currently, the primary method for protecting CIBW habitat is associated with the designation of critical habitat, which only applies to Federal actions and is assessed during ESA section 7 consultations. For some projects, the ESA section 7 consultations implement a seasonal exclusion zone around the Susitna River Delta as a method of reducing the introduction of additional anthropogenic noise into the habitat during key reproductive and foraging periods. However, those protections are only associated with some projects some of the time. Other than mitigation measures included in ESA section 7 consultations for reducing the effects of future projects, there have been no new protections implemented for reducing the existing level of this threat since the CIBW Recovery Plan was published.

RECOMMENDATION SIX:

Improve the Stranding Response Program

The term "stranded" applies to CIBWs that are alive but in waters too shallow for them to swim, and to dead CIBWs found on the beach or floating in the inlet. The CIBW Recovery Plan's RA #11 specifically says to "improve the stranding response program for both live and dead CI belugas." This action is one of the few actions that may actually save a whale; for instance, if a live stranded beluga got stuck in the mud on its side and human responders were able to roll it onto its abdomen before

the tide returned.[53] The primary effort to improve the CIBW stranding response program since the CIBW Recovery Plan was published has been to conduct outreach urging the public to report a stranding immediately. NMFS should also:

- Prepare to respond to live strandings when conditions are favorable
- Develop partnerships and methods for retrieving carcasses to allow for necropsies, ideally in a laboratory.
- Increase data collected during a necropsy to improve cause of death analyses and improve understanding of life history parameters

RECOMMENDATION SEVEN:

Reduce Existing Levels of Anthropogenic Noise in Cook Inlet

There has been a perception throughout the years that because the natural environment of Cook Inlet is naturally noisy that the effects of introducing anthropogenic noise were reduced. This actually led to some projects being granted variances by NMFS to increase the standard acoustic thresholds for harassment by five decibels. Recent acoustic studies have, expressed concern with raising the harassment threshold and concluding that previous acoustic studies did not measure ambient (i.e., natural) conditions because anthropogenic noise was included in the baseline measurements, which led to a conclusion that the natural conditions were louder than they really were.[54]

Anthropogenic noise is one of the highest ranked threats to CIBWs and is the primary threat NMFS focuses on during ESA section 7 consultations. However, these consultations only address reducing the amount of additional future noise through monitoring and mitigation measures, such as shutdown zones, but do not address reducing existing or ongoing noises. NMFS has no authority to regulate a specific industry to mandate noise reducing technologies (e.g., NMFS does not regulate vessel or aircraft operations). While NMFS will continue to mitigate future noise through ESA consultations, to meaningfully reduce the impact of noise collaborative efforts across sectors and including the relevant local, state and federal authorities, are necessary to identify and implement methods for reducing anthropogenic noise in Cook Inlet.

Noise-reducing activities should be promoted across sectors. The CIBW Recovery Plan identified and ranked a wide variety of anthropogenic noise sources in CIBW habitat which could interfere with recovery. The top three noise sources of concern were all associated with vessels: tug boat noise, cargo/tanker noise, and small vessel noise. There are eight ports in Cook Inlet ranging in size from very small (e.g., Drift River Marine Terminal) to medium (e.g., Port of Alaska).[55] Reducing noise associated with commercial shipping should be the highest priority for CIBWs, noting other major harbors and ports overlapping with habitat of endangered cetaceans have already successfully taken proactive steps to mitigate ship noise.

> **"These mitigation measures have focused on providing seasonal, localized protection of belugas from certain types of anthropogenic noise, but have not extended beyond temporarily reducing a particular threat. A more systematic attempt to consider and potentially adopt specific habitat protection measures for vulnerable areas during sensitive times of year for feeding or reproduction would benefit belugas while providing greater predictability for human users of these areas."**
>
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> "The best example is at the Vancouver Fraser Port Authority (Canada), within the critical habitat for the endangered southern resident killer whale population. In 2014, the Port Authority launched the Enhancing Cetacean Habitat and Observation (ECHO) Program, designed to better understand and manage the impact of shipping activities on endangered killer whales and

other cetaceans throughout the southern coast of British Columbia, and to develop mitigation measures to reduce potential threats. This program and other actions were implemented to characterize and subsequently reduce the acoustic threat from impacts of cumulative vessel noise (Vancouver Fraser Port Authority, 2016)."

Although logistically complex, the ECHO Program[56] has successfully coordinated with partners toward the goal of better understanding how to reduce the impacts of marine shipping on at-risk whales, with emphasis placed on reducing anthropogenic noise on endangered southern resident killer whales (SRKWs). Through the program, partners have: voluntarily implemented commercial ship slowdowns and a lateral displacement for tugboats; published studies highlighting the efficacy of management measures such as vessel slowdowns for reducing vessel noise in SRKW critical habitat; and implemented studies and efforts to functionally reduce the amount of radiated underwater noise by exploring options to proactively design and build quieter vessels[57] Another noise-reducing methodology employed by the Port of Vancouver is the availability of shore power, which allows ships to plug into land-based electrical power instead of running their diesel-powered auxiliary engines.

The ECHO Program demonstrates the feasibility of a collaborative approach to proactively reducing effects of vessel noise on an endangered cetacean facing similar threats as CIBWs. Recognizing that commercial vessels are not the only source of anthropogenic noise, other methodologies should be proactively implemented to reduce noise, and potentially other threats, to CIBWs. In addition to promoting noise-reducing technologies (e.g., development and purchase of quieter engines), protective measures such as speed restrictions in key CIBW habitat areas, such as the Susitna River Delta and Kenai River, could be a way to reduce noise from smaller vessels. An added benefit of speed restrictions would be the reduction in the threat of smaller vessels striking a whale (i.e., unauthorized take).

While vessel noise is a chronic source of underwater noise in Cook Inlet, there are other significant sources of anthropogenic noise that are more seasonal. This includes oil and gas exploration and coastal development activities. Oil and gas exploration in Cook Inlet is likely to expand in future years,[58] and the resulting large harassment zones from seismic activities means CIBWs are negatively affected at great distances from the seismic airguns.

Coastal construction in Cook Inlet has been expanding with new infrastructure and repairs to, or replacement of, aging infrastructure. Given there is a history of harassment continuing to be authorized for these types of activities, which is unlikely to change in the future, steps to develop noise-quieting technologies for these industries is also necessary. Incentive-based programs (e.g., reduced harbor dues fees) have already been implemented at the Port of Vancouver for vessels installing propeller technologies that reduce underwater noise.[59] Several international airports have adopted an incentive-based award program for airlines complying with noise abatement efforts, flying quieter aircraft, or taking proactive steps to voluntarily reduce operational noises.[60] Pursing similar collaborative and innovative ways to reduce threats in CIBW habitats would be beneficial to CIBW recovery.

RECOMMENDATION EIGHT:

Improve the Connection between Research and Management for Recovery

Research is critical to learn about a species. To understand the big picture, managers must collaborate with numerous researchers to put together the pieces of the puzzle in order take appropriate management action. While acknowledging the importance of research in elucidating gaps in the understanding of the species, such research has not led to any evident change in the way CIBWs are managed for recovery since the Recovery Plan was published (i.e., no new regulations promulgated protecting the whales or their habitat). Given the continued decline of the CIBWs and the absence of changed management strategies, despite the additional research and resources associated with CIBWs being a **Species in the Spotlight**, it appears there is a general disconnect between CIBW research and management for CIBW recovery. There have been extensive research efforts that monitor the species (e.g., aerial abundance surveys; photo-identification surveys; passive acoustic studies; citizen science observations), but the information being provided is not leading to protective actions by management to change the conditions for CIBWs. Based upon the research findings, only a small number of projects provide information useful for near-term management changes, suggesting there needs to be more emphasis connecting research and management for promoting CIBW recovery.

APPENDIX A

Research Studies corresponding to selected CIBW threat categories post Recovery Plan publishing.

Pollution

Mathavarajah et al. (2021) analyzed wastewater management practices in Alaska and identified locations of primary treatment facilities adjacent to marine mammals as high-risk locations, including Palmer and Anchorage for CIBWs. The findings indicate that primary treatment wastewater facilities may not be sufficiently reducing pollution/contaminants when adjacent to high-risk marine mammals, thus may be leading to sub-lethal effects which could inhibit recovery.

Poirer et al. (2019) evaluated polycyclic aromatic hydrocarbon (PAH)-DNA adduct formation in beluga intestines, comparing whales living in areas with low or no PAH contamination (Arctic and aquaria), and those living in known PAH-contaminated St. Lawrence Estuary (SLE) and Cook Inlet. Although cancer has not been documented in CIBWs, this study provides a direct link between gastrointestinal cancer in belugas to environmental PAH contamination, indicating there are significant health risks to CIBWs from PAH pollution of sediment and beluga prey.

Loss or Degradation

Skovrind et al. (2018) examined beluga genomes from around the Arctic, including CIBWs, and combined that data with habitat modeling and found a past association between climate, beluga population size, and available habitat. The findings suggest there is concern for CIBW habitat declining significantly as a result of a warming climate in the next several decades, especially since the CIBW habitat has already shifted north in the past several decades with virtually no more capacity for further northward shifts.

Reduction in Prey

Norman et al. (2020) modeled survival age of CIBWs, and found that increasing survival has a greater effect on population growth than increasing births. They concluded that reproductive success of CIBWs is tied to salmon abundance in the Deshka River and if the salmon runs remained at their current levels, the CIBW population would likely continue its slow decline and per capita births would continue to be low; however, if Chinook salmon increase at least 20%, the current decline of CIBW would be reversed. If the salmon abundance doubled, recovery of CIBW could occur regardless of impacts from other threats. The study highlights the importance of increasing CIBW survival rates, demonstrates a linkage between key prey species abundance and CIBW abundance, and provides fishery managers an estimate of the magnitude of increase in salmon escapement that could be necessary to promote CIBW recovery.

Unauthorized Take

Castellote et al. (2018) documented at least two activities in April 2012 at Kenai that created noises that should have required federal permits but were not, and concluded that activities involving important acoustic disturbances within beluga critical habitat are occurring without prior evaluation of their potential impact. The research provides documentation of unauthorized take and suggests the development of underwater noise reduction incentive programs for different industries to reduce unpermitted activities, such as the documented pile driving or sub-bottom profiling operations in the Kenai River mouth area, may reduce this threat. McGuire et al. (2020c) analyzed CIBW photographs and stranding records to determine prevalence of scars indicative of anthropogenic trauma and classified these scars according to their likely sources (e.g., entanglements, vessel strikes, puncture wounds, and research). The researchers found that over one-third of the individuals in the examined dataset had scars indicative of human-caused trauma. They concluded that the medium rank of unauthorized takes in the Recovery Plan was too low and did not consider many factors, namely how the low carcass recovery rate, especially of younger animals which may sink after death, precludes knowledge of the true extent of anthropogenic-caused trauma and mortality and how long-term effects from anthropogenic-caused injury may lead to reduced lifespan or reduced reproduction in animals that survive traumatic event.

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25. "the most expedient way to achieve recovery is by first addressing those threats identified as of medium or high relative concern" and "if a choice has to be made between addressing a threat of high/medium relative concern or a threat of low relative concern, we [NMFS] recommend the resources be allocated to addressing the higher ranked threat"
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28. The threat of subsistence harvests has effectively been managed (i.e., abated) for the past 15 years and will not be allowed, and hence, not a threat, for the foreseeable future given the low population size of CIBWs. Similarly, while killer whales are known predators of CIBWs, the mortalities attributed to killer whale predation is low, and not something NMFS can functionally manage.
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30. It is worth clarifying that NMFS has issued regulations pertaining to CIBWs, but those were incidental take regulations, which authorize projects to harass CIBWs. In this report, these are not being considered as regulations to reduce a threat.
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36. Himes Boor will be submitting a revised version of the Himes Boor and McGuire 2020 report to correct a miscalculation in the modeling of the inter-birth interval, which was reported as 2-3 years but which should be 1 year longer; pers. comm. August 31, 2021.
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43. See 2021 British Columbia Salmon Restoration and Innovation Fund, award #9 for the coastal kelp farm project. https://www.canada.ca/en/fisheries-oceans/news/2021/08/twelve-applications-have-received-approval-for-funding-under-the-british-columbia-salmon-restoration-and-innovation-fund-bcsrif-totaling-approximat.html
44. See 2021 British Columbia Salmon Restoration and Innovation Fund, award #1 for the idea of examining routes for impediments, and for development of best practices for habitat conservation, restoration, and landscape recovery post fire. https://www.canada.ca/en/fisheries-oceans/news/2021/08/seven-projects-have-been-approved-for-funding-under-the-british-columbia-salmon-restoration-and-innovation-fund-bcsrif.html
45. BOEM's website for Lease Sale 258 is available at: https://www.boem.gov/oil-gas-energy/leasing/lease-sale-258
46. CIBWs are aged by examining their teeth after death, and counting the growth layer groups, similar to counting the rings in a tree.
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49. Himes Boor will be submitting a revised version of the Himes Boor and McGuire 2020 report to correct a miscalculation in the modeling of the inter-birth interval, which was reported as 2-3 years but which should be 1 year longer; pers. comm. August 31, 2021.
50. NMFS unpublished data
51, 52. NOAA Fisheries Recovery Action Database: Recovery Plan for the Cook Inlet Beluga Whale (Delphinapterus leucas). Last accessed November 27, 2021. Available at https://www.webapps.nwfsc.noaa.gov/apex/f?p=154:400:::NO::P400_PLAN_TITLE,P400_SPECIES:Recovery%20Plan%20for%20the%20Cook%20Inlet%20Beluga%20Whale%20(Delphinapterus%20leucas),Whales
53. It is speculated that a CIBW that gets stuck in the mud on its side when the tide goes out is more susceptible to aspirating mud and asphyxiating when the tide returns (M. Migura pers. knowledge).
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55. Information about the number and sizes of ports in Cook Inlet obtained from World Port Source, Waterways - Cook Inlet Map webpage. http://www.worldportsource.com/waterways/Cook_Inlet_283.php
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57. ECHO Program research study results. https://www.portvancouver.com/environmental-protection-at-the-port-of-vancouver/maintaining-healthy-ecosystems-throughout-our-jurisdiction/echo-program/echo-program-annual-reports-and-peer-reviewed-papers/
58. BOEM's website for Lease Sale 258. https://www.boem.gov/oil-gas-energy/leasing/lease-sale-258
59. The Port of Vancouver's EcoAction Program is the incentive-based program for shipping companies taking additional steps to protect the environment. https://www.portvancouver.com/environmental-protection-at-the-port-of-vancouver/climate-action-at-the-port-of-vancouver/ecoaction-program/
60. Examples of airport incentive programs – SEA-TAC Airport: https://www.portseattle.org/programs/fly-quiet-award; LAX Airport: https://www.lawa.org/-/media/lawa-web/noise-management/files/fly-quieter-program-files/lax-fly-quieter-program-flyer-final-for-web-page.ashx#:~:text=To%20minimize%20noise%20for%20our,by%20evaluating%20and%20scoring%20these

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