

The Endangered Beluga Whales of Cook Inlet, Alaska

by Kim Sheldon

Beluga whales (*Delphinapterus leucas*) reside year-round in the waters of Cook Inlet, Alaska, where they are accessible to residents and visitors of the state's largest city, Anchorage, home to 42% of the state's population. Concern about the high level of human-caused mortality on this small population of whales prompted the National Marine Fisheries Service (NMFS) to designate Cook Inlet beluga whales as *depleted* under the U.S. Marine Mammal Protection Act in 1999. With an estimated decline of nearly 50% between 1994 and 1998, the Cook Inlet population has remained between 300 and 400 animals since 1999. The failure of the population to recover led to an *endangered* listing under the U.S. Endangered Species Act in October 2008. As of June 2010, the population still only numbered about 340 beluga whales.



Above: Beluga adult with calf in Eagle River.

Photo courtesy of Christopher Garner, U.S. Army—Fort Richardson.

Right: An adult beluga whale. Photo by Robyn Angliss.



Biology and Distribution

Beluga whales and narwhals (*Monodon monoceros*) are the only living species in the family Monodontidae. The common name beluga is derived from the Russian word for white, *belukha*; the species name *leucas* also means white and refers to the skin color of adult whales. Beluga calves are dark brown or blue-gray. As they age, their skin turns progressively whiter, becoming pure white by about age 9, though some females may retain some gray coloration up to 21 years. The lifespan of these whales may exceed 60 years (based on counts of layers deposited in beluga teeth). The physical and behavioral characteristics described here vary among beluga populations but in general provide a good overall description of the species. Among whales, belugas are medium-sized (3.5-5.5 m in length) and weigh up to 1,500 kg. Beluga whales are sexually dimorphic with males being significantly larger than females of the same age. Unlike most whales, belugas do not have fused cervical vertebrae, allowing neck flexibility. Adaptations to the cold environment include a thick insulating layer of blubber; a relatively small head, fluke, and flippers; a lack of a dorsal fin; and a tough dorsal ridge with little or no innervation – an advantage when breaking through sea ice.

Beluga whales are extremely social animals that typically travel, hunt, and interact together, often in close, dense groups. It is not known whether these represent distinct social divisions. These whales have been observed feeding cooperatively in and near river mouths on seasonally abundant fish. Mass strandings of beluga whales do occur in these shallow areas; however, they often survive stranding through part of a tide cycle (up to 6 hours) to refloat and swim away on the incoming tide. Deaths during strandings appear to be rare, and some strandings may occur purposely or accidentally to avoid predation by killer whales. In some regions in Canada, beluga whales are known to intentionally strand themselves during molting (when these whales shed a thick, yellow layer of dead skin) while rubbing their skin against rocky bottoms.

Beluga whales in Eagle Bay. Photo courtesy of Christopher Garner, U.S. Army—Fort Richardson.

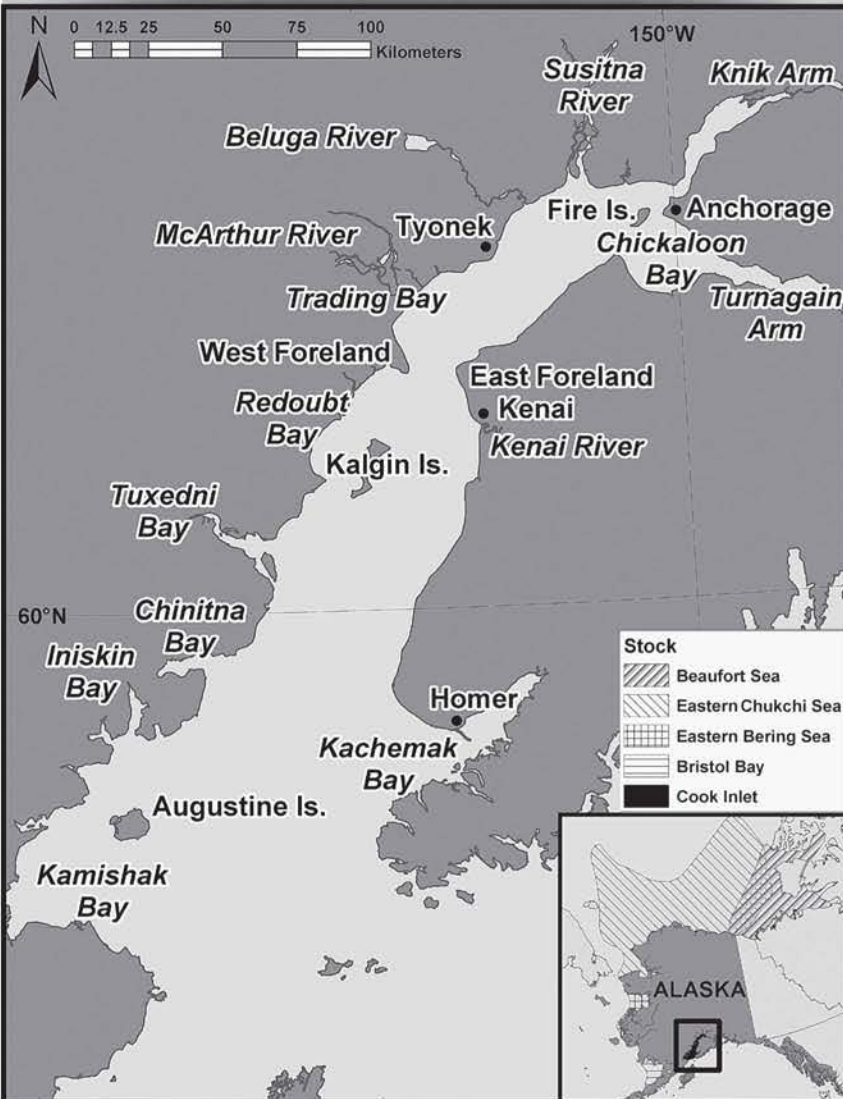
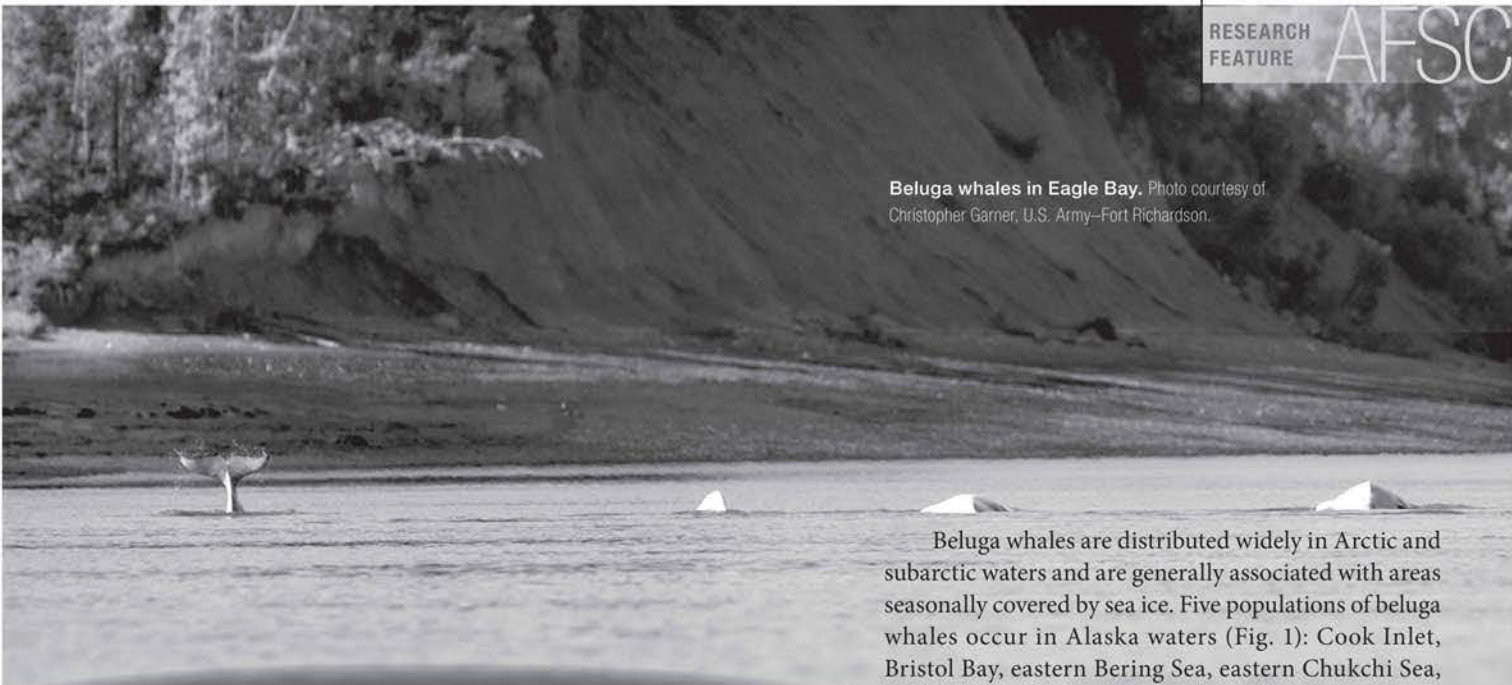


Figure 1. Map showing place names in Cook Inlet, Alaska, mentioned in the text. Inset map shows the distribution of the five beluga whale stocks found in Alaska waters.

Beluga whales are distributed widely in Arctic and subarctic waters and are generally associated with areas seasonally covered by sea ice. Five populations of beluga whales occur in Alaska waters (Fig. 1): Cook Inlet, Bristol Bay, eastern Bering Sea, eastern Chukchi Sea, and the Beaufort Sea. Summer populations are found as far southeast as Yakutat Bay (northern portion of Southeast Alaska, 60°N 140°W) and northeast into the Canadian Beaufort Sea (east of 70°N 140°W). The most isolated of these is the Cook Inlet population, separated from the others by the Alaska Peninsula. These whales reside year-round in the waters of Cook Inlet.

Whaling: Past and Present

Alutiiq Eskimos and Dena'ina Athabaskan Indians have lived in the coastal areas surrounding Cook Inlet since prehistoric times. These hunting societies use many marine resources including beluga whales, seals, and porpoises. Beluga hunters employed several techniques to capture these whales. Some techniques unique to the Dena'ina in Cook Inlet include a hunting platform or "yuyqul" (spearing tree), as well as fences, weirs, and moveable dams made of poles. Each apparatus was designed to take advantage of seals and beluga whales that entered streams and rivers on the flood tide. Dams and fences trapped the animals as they attempted to leave the stream or river on the ebb tide. A hunter in the "spearing tree", usually a spruce tree driven upside-down into the mud of the river at low tide, would harpoon an animal as it swam past during higher tides. The harpoon was fitted with a toggle point and a floating bladder (usually made of seal-skin) attached with braided sinew ropes. Hunters in kayaks or baidarkas would then pursue the struck whale, subsequently killing it with a lance. Hunting platforms were still in use in Cook Inlet during the 1830s.

The Dena'ina in Tyonek (a small village on the west side of Cook Inlet) and Eskimo whalers from communities outside of Cook Inlet continued hunting beluga whales during the 20th century; the beluga whale population also was subjected to periodic, large-scale commercial hunts and sport hunting by non-Native hunters. Commercial whaling has occurred periodically in Cook Inlet during the last 100 years.

The Beluga Whaling Company operated for 5 years at the Beluga River in upper Cook Inlet, where the company harvested 151 belugas (9, 42, 0, and 100 during 1917–20, respectively) before going bankrupt in 1921. Long-time residents interviewed by Alaska Department of Fish and Game (ADF&G) personnel recalled a commercial hunt of 100 beluga whales on the Beluga River in the 1930s; however, no record of this hunt exists in the Alaska fishery and fur-seal industries' documents for this time period. Beluga products were sold in Anchorage during the 1940s and 1950s by residents of the lower Susitna Basin and the villages of Knik and Eklutna. Some of these products, such as muktuk and meat, were sold to the Alaska Native Medical Center (which opened in 1953) in an effort to supply traditional foods to the patients.

In the summer of 1963, the Kenai Chamber of Commerce sponsored the organization of The Beluga Whale Hunt Club, in part to attract tourists to the Kenai area. The club advertised beluga hunting as one of the most exciting big game sports in Alaska. The beluga hunt and subsequent whale barbecue of "beluga-burgers" were featured events at the Kenai Days fair from 1963 through 1965 (reported in the local newspaper, The Kenai Peninsula Cheechako News). In 1963, the Chamber offered a \$100 prize for the first whale landed at the fair. A "practice" whale was killed on 21 July 1963 at the mouth of the Beluga River and about 150 lb of meat were transported to Kenai with a piece of hide measuring 6 ft × 6 ft. Hunt organizer John Hulien reported that "other portions of the whale were too full of bullet holes to make a good hide." In 1964, hunting began 1 May and continued through the Kenai Days fair held in late August. At least two whales (female with calf) were harvested prior to the Kenai Days fair. A whaling station was proposed, and attempts were made to develop beluga products such as whale oil soap and canned meat. Hunts were not always successful, and at least in one case "about 250 rounds of ammunition [were expended before] the hunters gave up the chase." After 1965, the hunt and barbecue were no longer part of the scheduled Kenai Days fair, and the club's activities were no longer featured in the local paper.

Sport and commercial whale harvests in U.S. waters were banned by the Marine Mammal Protection



Christy Sims videotaping a beluga whale group found in the Little Susitna River. Photo by Kim Sheldon.

Act (MMPA) of 1972. Only subsistence hunts undertaken by Indians, Aleuts, or Eskimos residing in Alaska or along the coasts of the North Pacific or Arctic Ocean are exempt from all MMPA provisions (except those under § 109, described in the Legislation and Harvest Monitoring section). The Dena'ina in Tyonek continued to hunt small numbers of belugas (a sustainable harvest level of 10 whales per year was proposed by NMFS and the U.S. Fish and Wildlife Service in 1978) but by the 1980s few if any whales were killed. It wasn't until the end of the 1980s that Alaska Native subsistence hunting experienced a resurgence.

North Slope oil revenue contributed to growth throughout the state during the 1970s and 1980s, firmly establishing Anchorage as a hub of transportation and commerce in Alaska. In 1980, the Alaska Native community in Anchorage numbered roughly 9,000 (about 14% of all Alaska Natives in the state). By 1990, the community numbered a little over 14,500, with Eskimos comprising the single largest ethnic group in Anchorage (6,034) followed closely by American Indians (5,985). Eight years later, the Native population had increased to 20,531, representing 20% of all Alaska Natives in the state. Ease of air travel between rural villages and Anchorage since the 1970s has made Cook Inlet accessible to nonlocal beluga hunters. Contemporary beluga hunters in Cook Inlet include 1) the Dena'ina who continue to hunt beluga whales near the village of Tyonek; 2) Alaska Natives who have moved to Anchorage, the Matanuska Valley, or Kenai Peninsula from other areas of the state; 3) and Alaska Natives who visit Cook Inlet to hunt and then return to their communities. Hunting methods have changed dramatically since the mid-1800s. Hunters now approach belugas in shallow water using motor-driven boats; individual whales are singled out from a group, pursued, shot with a high-powered rifle, then gaffed or harpooned and towed to shore by running a rope through the lower mandible or around the tail stock. As hunting pressure increased, it was not always possible to obtain accurate numbers of whales killed or shot but lost. However, it appears that at least 30 beluga whales were taken annually by subsistence hunters during the mid-to late-1990s, a period in which the population declined.

Sport and commercial whale harvests in U.S. waters were banned by the Marine Mammal Protection Act (MMPA) of 1972.



Clip from video of beluga whales in Cook Inlet. Note the varying shades from dark gray to white. Photo by Christy Sims.



NMFS beluga whale tagging project in Cook Inlet, Alaska. From left to right: monitoring the whale are Kristin Laidre and Rod Hobbs; restraining the fluke and assisting with the blood draw are Laura Hoberecht, Matt Eagleton, Bill Walker, Greg O'Corry-Crowe, Dan Vos, and Barbara Mahoney (standing). Photo by Dana Seagars, NMFS Alaska Regional Office.

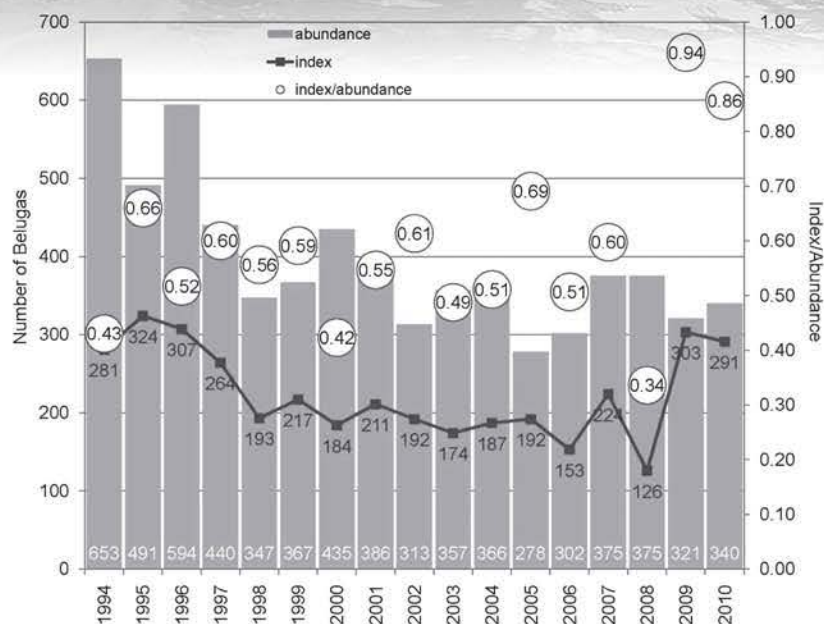


Figure 2. Annual abundance estimates (gray bars) and median index counts (dark line) for beluga whale aerial surveys, Cook Inlet, Alaska, 1994-2010. Circles show index counts divided by abundance estimates (note: in most years the index count is between 50% - 70% of the total abundance estimate).

Concern about the high level of human-caused mortality on this small population of whales, particularly during the period from 1994 to 1998, prompted NMFS to regulate the Alaska Native subsistence hunt in 1999 and to designate Cook Inlet beluga whales as *depleted* under the MMPA. The failure of this population to recover led to an *endangered* listing under the U.S. Endangered Species Act (ESA) in October 2008. Since 1999, NMFS has worked cooperatively with the Cook Inlet Marine Mammal Council, Native village of Tyonek, Cook Inlet Treaty Tribes, Alaska Beluga Whale Committee, and Alaska Native beluga whale hunters to co-manage the subsistence use of beluga whales in Cook Inlet pursuant to Section 119 of the MMPA. To promote the long-term recovery of the whales, while allowing for a subsistence hunt by Alaska Natives, NMFS implemented a long-term harvest plan. Harvest levels are established every 5 years based on the most recent 5-year average population abundance

and a 10-year measure of the population growth rate. No hunting will occur from 2008 to 2012 because the most recent 5-year average abundance (2003-07: 336 beluga whales) was below 350 whales.

Current Research Conducted by NMFS

The NMFS Alaska Fisheries Science Center National Marine Mammal Laboratory (NMML), in cooperation with the NMFS Alaska Regional Office (AKR), has conducted Cook Inlet beluga whale research on an annual basis since the early 1990s. NMFS began calculating annual estimates of abundance for the Cook Inlet beluga whale population in 1993. Aerial surveys are flown in a twin-engine, high-wing aircraft at an altitude of 244 m (800 ft) and speed of 185 km/hour (100 knots). The abundance study includes surveys of all coastal areas (flown 1.4 km offshore) around most of the inlet and over 1,000 km of transects crisscrossing the inlet, effectively searching roughly 30% of Cook Inlet's total area. These annual surveys indicated that the population declined nearly 50% between 1994 and 1998 and that it has remained between 300 and 400 animals since 1999 (Fig. 2). NMML scientists estimated the Cook Inlet population at 340 beluga whales in June 2010.

In addition to the annual abundance survey in June, NMML and the AKR conducted year-round monthly aerial surveys in 2001 and 2002 and a satellite tagging study from 2000 to 2003, to assess the seasonal movements of Cook Inlet beluga whales during the fall, winter, and spring. Seasonal movements of 14 beluga whales were monitored by satellite telemetry between July and March. Whales used waters in the upper Cook Inlet intensively between summer and late fall and dispersed to mid-inlet offshore waters during winter months. All whales remained in Cook Inlet the entire time they were tracked, and several whales were tracked through March. During summer and early fall, movements were clearly concentrated in specific

areas, generally river mouths or bays, where whales were likely feeding on fish runs. Average daily travel distances ranged from 11 to 30 km per day. Monthly home ranges, estimated using the 95% kernel probability distribution of average daily positions, were smallest in August (982 km²), increased throughout the fall, and peaked in winter (reaching about 5,000 km²). Given that these whales occur in Cook Inlet year-round, NMML also began obtaining high-resolution aerial video of each group of beluga whales during August to determine age structure (white relative to gray individuals and dark gray calves) and number of calves to develop a calving index for the population. The aerial surveys covered the coastal areas north of East and West Foreland. The survey track paralleled the coast (1.4 km offshore), and surveys occurred during the low tide when possible. NMML has collected calf data every August since 2005. NMML is also studying a thriving population of beluga whales in Bristol Bay, Alaska. These whales live in an environment similar to Cook Inlet and by assessing the health of these whales (using satellite tags and collecting bodily fluids, skin and blubber samples), NMML will have data to compare to Cook Inlet that may explain why recovery there has not yet occurred.

There is also evidence of changes in beluga whale distribution throughout Cook Inlet since the mid-1990s, with 96% to 100% of beluga whales now gathering in shallow areas near river mouths in the upper inlet near Anchorage (Fig. 3). One possibility for this contraction in range is habitat change such as prey availability. Fish runs may have declined in the southern portion of Cook Inlet, more so than in the north. Or fish runs may have declined throughout the inlet and only in the shallow river channels in the northern areas is it still relatively easy for belugas to catch fish. Belugas feed on anadromous fish including eulachon and five species of salmon, but we don't have long-term data for commercial species such as salmon, and

especially not for noncommercial species, such as eulachon, that have been collected in a way that we can compare the fish run timing, location, and abundance to beluga distribution. Another possibility is avoidance of killer whales. Killer whale attacks on belugas in Cook Inlet are not uncommon, so do belugas retreat to the northern reaches of Cook Inlet to avoid killer whales? Belugas can hide from killer whales by entering shallow channels over mudflats, sometimes to the point where they strand through a tide cycle. However, predation on belugas has been documented in the northern portion of Cook Inlet, so this area is not a complete sanctuary. And to assume that killer whales are the primary factor driving beluga distribution would not explain why so many belugas were seen in the southern portion of the inlet in the past.

Another possibility is that the few belugas that are left still remain in optimal habitat. The use of a limited range by the remnant population is consistent with the history of this population. The number of beluga whales in the Susitna area was consistently higher than in any other region of the inlet, even though this was the area in which most subsistence hunting occurred and although it is



Belugas with Mount Susitna in the background. Photo by Janice Waite.

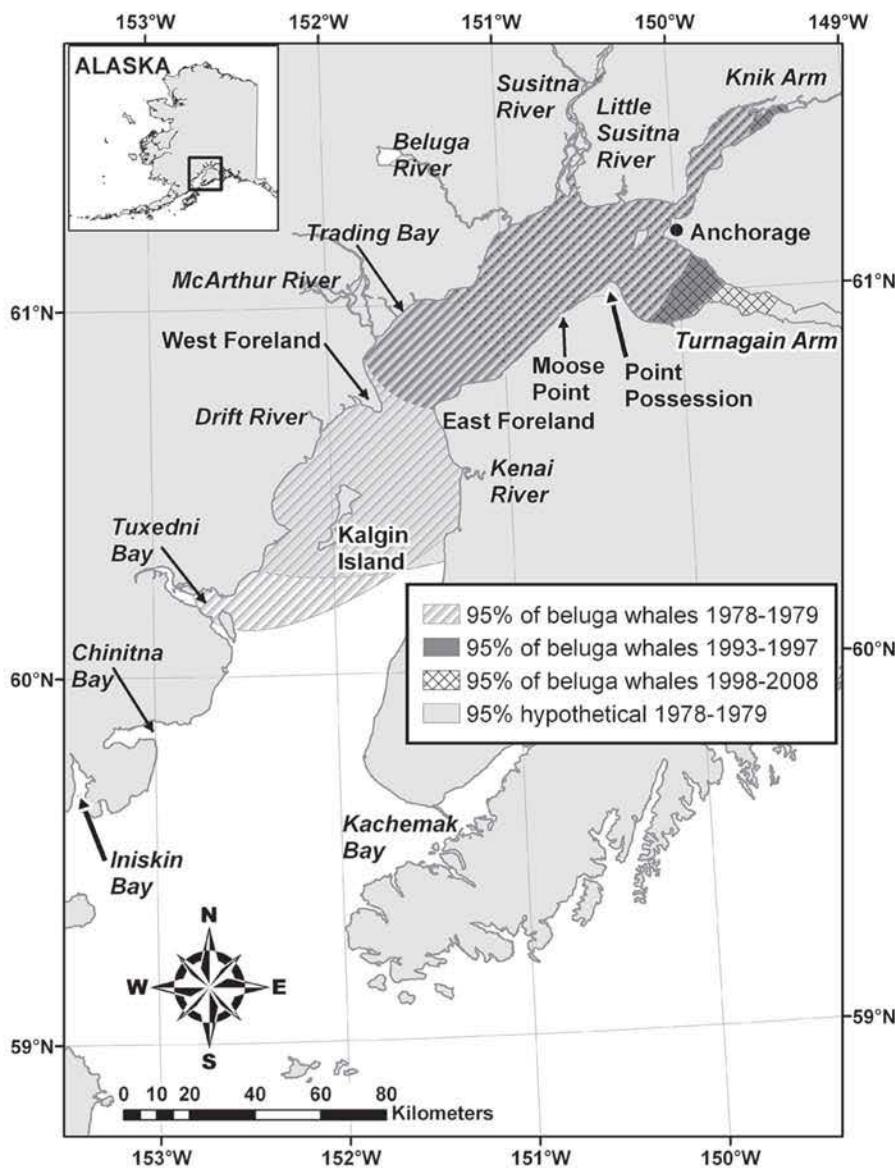


Figure 3. Map showing contraction in the range occupied by Cook Inlet beluga whales over time, 1978-79, 1993-97 (during a period of intense subsistence hunting), and 1998-2008 (after a moratorium and subsequent management of the hunt). The hypothetical distribution for 1978-79 includes large numbers of whales in Knik and Turnagain Arms to see how this would affect the overall distribution observed during this time period.

not far from ongoing coastal zone development near Anchorage. This does not explain why the upper inlet is preferred, but it seems reasonable that poorer quality habitat would be abandoned when the population gets smaller and there are fewer belugas competing for the same resources. This is particularly true for social animals like belugas that frequently gather in large groups and appear to return to the same summering areas their mothers use.

Management Concerns and Future Studies

This unique whale population is accessible to residents and visitors of the state's largest city, Anchorage, home to 42% of the state's population. Southcentral Alaska is the state's most populated and industrialized area. Many cities, villages, ports, airports, wastewater treatment plants, fishing boats, oil rigs, refineries, and highways are situated in or very near to Cook Inlet. Beluga whales are not uniformly distributed throughout the inlet, but are predominantly found in nearshore waters. Where beluga whales must compete with people for use of nearshore habitats, coastline development (both construction and operation of a project) leads to the direct loss of habitat. Indirect alteration of habitat may occur due to bridges, boat traffic, in-water noise, and discharges that affect water quality. Overall, this population's recovery is potentially hindered by live strandings; predation by killer whales and possibly sharks; continued development in Cook Inlet and its cumulative effects on important beluga whale habitat; industrial activities that discharge or accidentally spill pollutants; disease; and oil and gas exploration, development, and production.

With the *endangered* listing of Cook Inlet beluga whales, the ESA not only provides additional protections for the whales, but also provides a means whereby the ecosystems upon which endangered and threatened species depend may be conserved (i.e., as Critical Habitat). The ESA requires designation of critical habitat whenever a species is listed for protection. Federal agencies must consult with NMFS to ensure that they do not fund, authorize, or carry out a project that will either jeopardize the continued existence of the species or destroy or adversely modify the critical habitat. This requirement does not apply to activities on private land that do not involve a federal agency, permit, or funding. The NMFS proposal designates a total of 3,016 square miles, including the upper portions of Cook Inlet, where whales concentrate in summer months, mid-Cook Inlet, the western shore of lower Cook Inlet, and Kachemak Bay on the eastern side of the lower inlet.

The ESA also requires the creation of a recovery plan (ESA Section 4(f)). A recovery team composed of two advisory groups, a Scientific Panel and a Stakeholder Panel, will aide NMFS in the development of the Recovery Plan. NMFS has allotted just over 3



Beluga whales off Anchorage. Photo by Janice Waite.

years to the recovery planning process which began with the first Recovery Team meeting in March 2010. According to the recovery plan outline: "The Cook Inlet beluga whale is assigned a recovery priority number of 3, based on a high degree of threat, its low-moderate recovery potential, and its high potential conflict with economic activities. The high degree of threat is linked to the high probability of extinction (26% within the next 100 years), and due to the fact that one additional mortality beyond what was modeled increases that probability. The low-moderate potential for recovery is based upon the long life span and slow reproductive growth, and the apparent lack of recovery as a result of previously implemented conservation efforts. The high potential conflict with economic activities relates to the fact that the belugas' summer range has constricted to the upper reaches of Cook Inlet, overlapping with the areas undergoing the highest levels of coastal development in Cook Inlet." The Recovery Team is currently developing criteria and thresholds for endangered, threatened and recovered status.

To meet the management objectives as mandated by the MMPA and ESA, specific information must be available to managers. Knowledge of the species' biology and ecology is required to determine how the species may be affected and by what factors. The primary objectives of past and proposed future studies are to 1) monitor population status, health, and condition; 2) characterize habitat and determine habitat requirements for recovery; 3) identify and quantify impacts to the population; 4) determine causes of decline and lack of recovery; and 5) establish measures to mitigate causes of decline and to support recovery. NMFS continues to work with academia, Native organizations, environmental organizations, and industry interested in collaboration with NMFS or conducting other research necessary to foster the recovery of this population. ~