

BELUGA WHALE (*Delphinapterus leucas*): Cook Inlet Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Beluga whales are distributed throughout seasonally ice-covered arctic and subarctic waters of the Northern Hemisphere (Gurevich 1980) and are closely associated with open leads and polynyas in ice-covered regions (Hazard 1988). Depending on season and region, beluga whales may occur in both offshore and coastal waters, with concentrations in Cook Inlet, Bristol Bay, Norton Sound, Kasegaluk Lagoon, and the Mackenzie Delta (Hazard 1988). During spring and summer months, beluga whales in Cook Inlet are typically concentrated near river mouths in the northern Inlet (Rugh et al. 2000). Although the exact winter distribution of this stock is unknown, there is evidence that some, if not all, of this population may inhabit Cook Inlet year-round (Fig. 19; Hansen and Hubbard 1999, Rugh et al. 2000). Satellite tags have been attached to 17 belugas in late summer in order to determine their distribution through the fall and winter (Hobbs et al. 2005). Ten tags have lasted through the fall and of those, three have lasted through the winter. The three tags that transmitted through the winter stopped working in April and late May. No tagged beluga moved south of Chinitna Bay. A review of all cetacean surveys conducted in the Gulf of Alaska from 1936 to 2000 discovered only 31 sightings of belugas among 23,000 sightings of other cetaceans, indicating that very few belugas occur in the Gulf of Alaska outside of Cook Inlet (Laidre et al. 2000). A small number of beluga whales (fewer than 20 animals; Laidre et al. 2000, O’Corry-Crowe et al. 2006) also occur in Yakutat Bay; these are considered part of the Cook Inlet stock (65 FR 34590; 31 May 2000).

The following information was considered in classifying beluga whale stock structure based on the Dizon et al. (1992) phylogeographic approach: 1) Distributional data: geographic distribution discontinuous in summer (Frost and Lowry 1990); distribution poorly known outside of summer; 2) Population response data: possible extirpation of local populations; distinct population trends between regions occupied in summer; 3) Phenotypic data: unknown; and 4) Genotypic data: mitochondrial DNA analyses indicate distinct differences among summering areas (O’Corry-Crowe et al. 2002). Based on this information, 5 stocks of beluga whales are recognized within U. S. waters: 1) Cook Inlet, 2) Bristol Bay, 3) eastern Bering Sea, 4) eastern Chukchi Sea, and 5) Beaufort Sea.

POPULATION SIZE

Aerial surveys for beluga whales in Cook Inlet have been conducted by the National Marine Fisheries Service each year since 1993. Starting in 1994, the survey protocol included paired, independent observers so that the number of whale groups missed can be estimated. When groups were seen, a series of aerial passes were made to allow each observer to make independent counts at the same time that a video camera was photographing the whale group (Rugh et al. 2000).

The annual abundances of beluga whales in Cook Inlet are estimated from counts by aerial observers and aerial video group counts. Each group size estimate is corrected for subsurface animals (availability correction) and animals at the surface that were missed (sightability correction) based on an analysis of the video tapes (Hobbs et al. 2000b). When video counts are not available, observer’s counts are corrected for availability and sightability using a regression of counts and an interaction term of counts with encounter rate against the video group size estimates (Hobbs et al. 2000b). The most recent abundance estimate of beluga whales in Cook Inlet, resulting from the 2006

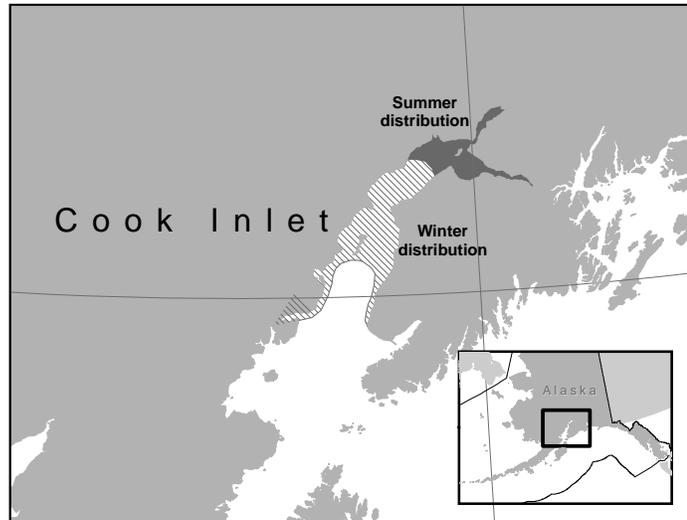


Figure 19. Approximate distribution of beluga whales in Cook Inlet. The dark shading displays the summer distribution. Winter distribution is depicted with dashed shading.

aerial survey is 302 (CV = 0.16) animals (NMFS unpubl. data). Although this estimate is larger than the estimate of 278 for 2005, it is still below the average of 370 for the years 1999-2004 and a trend line fit to the estimates for 1999 to 2006 estimates an average rate of decline of 4.1% per year (SE = 0.0165) which is significantly different from a constant population level at the 5% level. A Bayesian inference on the data through 2005 gave a modal estimate of the population size in 2005 of 329 (Lowry et al. 2006).

Minimum Population Estimate

The minimum population size (N_{MIN}) for this stock is calculated according to Equation 1 from the PBR Guidelines (Wade and Angliss 1997): $N_{MIN} = N / \exp(0.842 \times [\ln(1 + [CV(N)]^2)]^{1/2})$. Using the population estimate (N) of 302 and its associated CV(N) of 0.16, N_{MIN} for the Cook Inlet stock of beluga whales is 264.

Current Population Trend

The corrected abundance estimates for the period 1994-2006 are shown in Figure 20. A statistically significant trend in abundance was detected between 1994 and 1998 (Hobbs et al. 2000a), although the power was low due to the short time series. A Bayesian inference on the population size estimates for 1994-2005 gave a modal estimate of the current trend of -1.2% per year, with a 71% probability that the population is declining (Lowry et al. 2006). A review of the status of the population indicated that there is a 65% chance that the population will decline further (Hobbs et al. 2006).

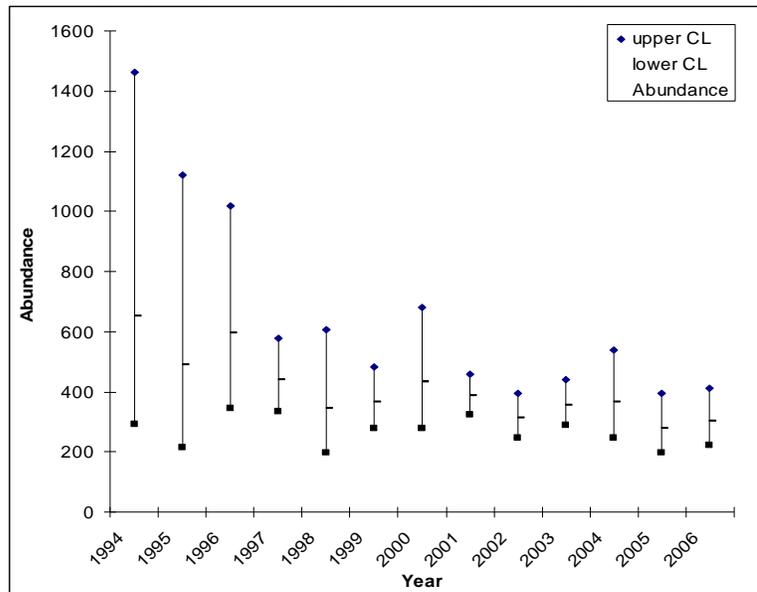


Figure 20. Abundance of beluga whales in Cook Inlet, Alaska 1994-2006 (Rugh et al. 2005, NMFS unpublished data). Error bars depict 95% confidence intervals.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is currently not available for the Cook Inlet stock of beluga whales. Hence, until additional data become available, it is recommended that the cetacean maximum theoretical net productivity rate (R_{MAX}) of 4% be employed for this stock (Wade and Angliss 1997).

POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} + 0.5R_{MAX} + Fr$. The Fr and PBR for the Cook Inlet stock of beluga whale were both undetermined in Small and DeMaster (1995). In reports from 1998 through 2005, NMFS calculated a value for PBR. However, given the low abundance relative to historic estimates and low known levels of human-caused mortality this stock should have begun to grow at or near its maximum productivity rate, but for unknown reasons the Cook Inlet stock of beluga whale does not appear to be increasing. Because this stock does not meet the assumptions inherent to the use of the PBR, NMFS cannot determine a maximum number that may be removed while allowing the population to achieve OSP. Thus, the PBR is undetermined for the Cook Inlet stock of beluga whale.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

In 1999 and 2000, observers were placed on Cook Inlet salmon set and drift gillnet vessels because of the potential for these fisheries to incur incidental mortalities of beluga whales. No mortalities were observed in either year (Manly in review).

Based on a lack of observed or reported mortalities, the estimated minimum mortality rate incidental to commercial fisheries is zero belugas per year from this stock.

Subsistence/Native Harvest Information

Subsistence harvest of beluga whales in Cook Inlet has been important to local villages. Between 1993 and 1999, the annual subsistence take ranged from 30 animals to over 100 (Mahoney and Sheldon 2000). The most thorough subsistence harvest surveys were completed by the Cook Inlet Marine Mammal Council during 1995-97; while some of the hunters believe the 1996 estimate was positively biased, the 1995-97 CIMMC take estimates are considered reliable. The average annual subsistence harvest between 1995 and 1997 was 87 whales.

Because of the decline in the Cook Inlet beluga whale stock in 1999, Congress imposed a moratorium on beluga harvest in Cook Inlet until NMFS developed a cooperative plan for harvest management with the local Alaska Native organizations (NMFS 2004). Thus, the best estimate of subsistence take in 1999 and 2000 is zero. Harvest through 2004 was conducted under an interim harvest management plan developed by the Alaska Native organizations and NMFS (69 FR 17973, 6 April 2004). Under that agreement the average take during 2001-2005 was one whale/year (see Table 24). In August 2004 a hearing before an administrative law judge was to determine a long-term harvest plan. The resulting ruling was completed in November 2005. The ruling allows a total of 8 whales to be harvested between 2005 and 2009 with harvest in subsequent 5-year periods to depend on the average abundance in the previous 5-year period and the observed growth rate of the population. No harvest would be allowed if the average abundance drops below 350. NMFS has set the 2007 harvest to zero because the 2005 and 2006 abundance estimates were below the threshold. Harvest levels for 2008 and 2009 are pending the completion of an EIS on harvest management (B. Mahoney, NMFS Alaska Region, pers. comm.)

Table 24. Summary of the Alaska Native subsistence harvest from the Cook Inlet stock of beluga whales, 2001-2005.

Year	Reported total number taken	Reported number harvested	Estimated number struck and lost
2001	1	1	0
2002	1	1	0
2003	0	0	0
2004	0	0	0
2005	2	2	0
Mean annual take (2001-2005)	1		

OTHER MORTALITY

Mortalities related to stranding events have been reported in Cook Inlet (Table 25). Since detailed recordkeeping was initiated in 1994, there have been mass strandings of beluga almost every year. These mass strandings resulted in known mortalities of 4 animals in 1996, 5 animals in 1999, and 6 animals in 2003 (NMFS unpublished data). Many of the strandings occurred in Turnagain Arm. Because Turnagain Arm is a shallow, dangerous waterway, it is not frequented by motorized vessels, and thus, it is highly unlikely that the strandings resulted from human interactions. Another source of mortality in Cook Inlet is killer whale predation. Killer whale sightings were rare in the upper Inlet prior to the mid-1980s, but have increased to include 18 confirmed sightings from 1985 to 2002 (Shelden et al. 2003). The three

Table 25. Cook Inlet beluga strandings investigated by NMFS (Vos and Shelden 2005; NMFS unpublished data). * Many belugas that strand do not die. Although some mortalities may have been missed by observers, and animals may die later of stranding-related injuries, the majority of animals involved in a stranding event often survive.

Year	Total Dead (includes subsistence)	Total Dead of Natural or Unknown Cause	Number of Belugas Stranded* (known mortalities)
1994	10	7	186 (0)
1995	12	1	N/A
1996	19	11	63(0), 60(4), 25(1), 1(0), 15(0)
1997	6	3	N/A
1998	21	7	30(0), 5(0)
1999	13	13	58(5), 13(0)
2000	13	13 (2 killer whale)	8(0), 15-20(0), 2(0)
2001	11	10	N/A
2002	14	13	N/A
2003	21	20 (1 killer whale)	2(0), 46(5), 26(0), 32(0), 9(0)
2004	13	13	N/A
2005	9	5	7(0)
Total	162	116	603-608 (15)

most recent predation events that occurred in the upper Inlet were one in September 1999 in which the outcome was unknown, and one in September 2000 that involved two lactating females that subsequently died (Shelden et al. 2003), and one in 2003 (Vos and Shelden 2005).

STATUS OF STOCK

An analysis of available data on the population size and dynamics of the Cook Inlet beluga whale stock led NMFS to conclude that this stock is currently below its Optimum Sustainable Population level. Thus, this stock was designated as “depleted” under the MMPA (65 FR 34590; 31 May 2000). NMFS also made a determination that this stock should not be listed under the ESA at the time (65 FR 38778; 22 June 2000) primarily because the subsistence harvest, which appeared to have been responsible for the majority of the decline in this stock, was prohibited in 1999 through an act of Congress. Once the subsistence harvest ceased, the decline in the stock ceased (65 FR 38778; 22 June 2000, Hobbs et al. 2000a). However, there has been a lack of recovery, and the most recent analysis suggests that the population is declining slowly. Two fisheries suspected of possibly incurring incidental serious injuries or mortalities of beluga whales were observed in 1999 and 2000, and no takes of beluga whales were observed. At present, annual U. S. commercial fishery-related mortality levels can be considered insignificant and approaching zero mortality and serious injury rate. Because the PBR for this stock is undetermined, it is not possible to say whether or not the annual level of human-caused mortality (1.0) exceeds the PBR. Because the Cook Inlet beluga whale stock has been designated as “depleted” under the MMPA, it is classified as strategic. In 2006 NMFS published a review of the status of this population (Hobbs et al. 2006). NMFS was also petitioned to list the Cook Inlet stock as endangered under the ESA. A final determination on this action is due in 2007.

Efforts to develop co-management agreements with Native organizations for several marine mammal stocks harvested by Native subsistence hunters across Alaska, including belugas in Cook Inlet, have been underway for several years. An umbrella agreement on co-management among the Indigenous People’s Council for Marine Mammals, U.S. Fish and Wildlife Service, and NMFS was signed in August 1997. During 1998, efforts were initiated to formalize a specific agreement with local Alaska Native organizations and NMFS regarding the management of Cook Inlet belugas, but without success. In the absence of a co-management agreement, Federal legislation was implemented in May 1999, placing a moratorium on beluga hunting in Cook Inlet until a co-management agreement is completed. Co-management agreements between NMFS and the Cook Inlet Marine Mammal Council have since been signed each year since 2000.

Habitat Concerns

Observation and tagging data both indicate that the northernmost parts of upper Cook Inlet, including the Susitna Delta, Knik Arm, and Chickaloon Bay, are the focus of the stock's distribution in both summer (Rugh et al. 2000; Goetz et al. 2007) and winter (Hobbs et al. 2005). Because of the very restricted range of this stock, Cook Inlet beluga can be assumed to be sensitive to human-induced or natural perturbations. Although the best available information indicated that human activities, including oil and gas development, had not caused the stock to be in danger of extinction as of 2000 (65 FR 38778; 22 June 2000), potential effects of human activities on recovery remain a concern. Contaminants from a variety of sources, sound, onshore or offshore development, construction, and competition with fisheries for available prey have the potential to impact this stock or its habitat. Additional concerns include changes in prey availability due to climate changes; contaminants and sounds associated with oil and gas exploration; vessel traffic; waste management and urban runoff; and physical habitat modifications that may occur as upper Cook Inlet becomes increasingly urbanized (Moore et al. 2000, Lowry et al. 2006). Projects planned that may alter the physical habitat include a highway bridge across Knik Arm, a proposal for a Knik Arm ferry, and improvements to the Port of Anchorage.

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