

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). It is assumed that most beluga whales from these summering areas overwinter in the Bering Sea, excluding those found in the northern Gulf of Alaska (Shelden 1994). Seasonal distribution is affected by ice cover, tidal conditions, access to prey, temperature, and human interaction (Lowry 1985). During the winter, beluga whales occur in offshore waters associated with pack ice. In the spring, they migrate to warmer coastal estuaries, bays, and rivers for molting (Finley 1982) and calving (Sergeant and Brodie 1969). Annual migrations may cover thousands of kilometers (Reeves 1990).

During spring and summer months, beluga whales in Cook Inlet are typically concentrated near river mouths in northern Cook 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 (Hansen and Hubbard 1999). Satellite tags were attached to two belugas in September 2000 in order to determine their distribution through the fall and early winter. A review of all cetacean surveys conducted in the Gulf of Alaska from 1936-99 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).

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 unknown 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. 1997). 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 (Fig. 18).

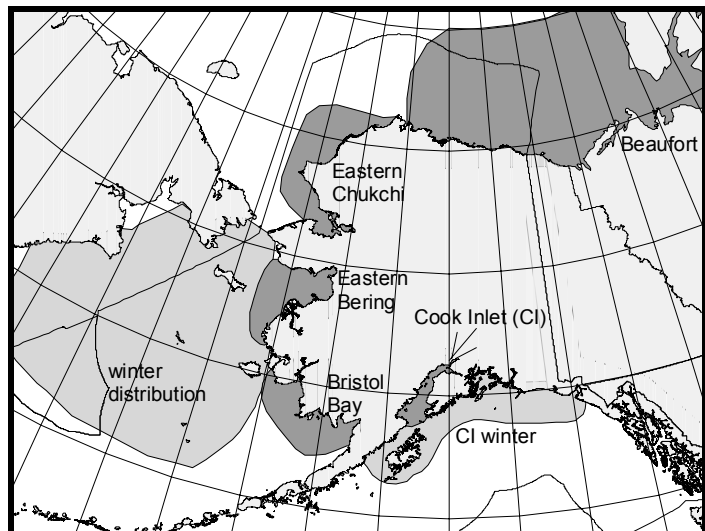


Figure 18. Approximate distribution of beluga whales in Alaska waters. The dark shading displays the summer distributions of the five stocks. Winter distributions are depicted with lighter shading.

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 documenting the whale group (Hobbs et al. 2000). Uncorrected aerial counts (using the sum of medians for each group) for 1993-00 were 304, 281, 324, 307, 264, 193, 217, and 184, respectively (Rugh et al. 2000). Median counts are appropriate for comparisons between surveys since the effects of outliers (extremes in high or low counts) are reduced, they can be compared to other surveys which lack multiple passes over whale groups, and are more appropriate than maximums corrected for missed whales (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. Each 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. 2000). The most recent abundance estimate of beluga whales in Cook Inlet, resulting from the June 2000 aerial survey is 435 (CV = 0.23) animals (Hobbs et al. 2000).

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 435 and its associated CV(N) of 0.23, N_{MIN} for the Cook Inlet stock of beluga whales is 360.

Current Population Trend

In general, uncorrected counts have ranged from 300 to 500 beluga whales within Cook Inlet between 1970 and 1996 (Rugh et al. 2000). However, median counts since 1996 have been below 300 animals (264 in 1997, 193 in 1998, 217 in 1999, and 184 in 2000). The abundance estimates for the period 1994-00 are shown in Figure 19. A statistically significant trend in abundance has been detected, although the power was low due to the short time series. However, the 2000 abundance estimate (435) is approximately 33% lower than the 1994 abundance estimate (653). In addition, a review of beluga distribution data suggest there has been a reduction in offshore sightings in upper Cook Inlet and a dramatic reduction in sightings in lower Cook Inlet (Rugh et al. 2000).

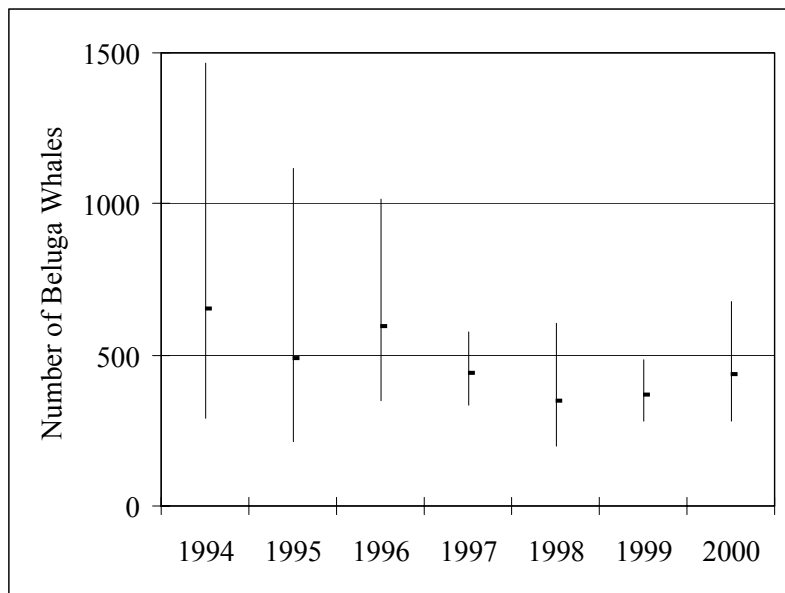


Figure 19. Abundance of beluga whales in Cook Inlet, Alaska 1994-2000 (adapted from Hobbs et al. 2000). Error bars depict 95% confidence intervals

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: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The F_R and PBR for the Cook Inlet stock of beluga whale were both undetermined in Small and DeMaster (1995), 1.0 and 15 in Hill et al. (1997), and 1.0 and 14 in Hill and DeMaster (1998). However, based on the recent information on stock size, trends in abundance, and level of the subsistence harvest, the Alaska Scientific Review Group (SRG) (Ferrero 1999) has recommended that NMFS reduce the F_R to the lowest value possible (0.1). Further, the Alaska SRG noted the resulting PBR would be 0.61 (assuming an N_{MIN} of 303 as the 1999 population size and an R_{MAX} of 0.04) and recommended that the agency use this value in managing interactions between Cook Inlet belugas and commercial fisheries in Cook Inlet.

NMFS has chosen not to accept the recommendation of the Alaska SRG at this time. Rather, NMFS has selected an F_R of 0.3 based on the following: this stock has been listed as “depleted” under the MMPA (65 Federal

Register 34590, 31 May 2000; which typically is associated with a F_R of 0.5); and NMFS has not listed this stock as endangered under the Endangered Species Act (65 Federal Register 38778, 22 June 2000; a listing of endangered is typically associated with a F_R of 0.1, while a listing of depleted or threatened is associated with a F_R of 0.5). Furthermore, the major mortality factor for this stock, subsistence harvest, has been reduced through legislation and cooperative efforts by Alaskan Natives. Thus, the PBR = 2.2 animals ($360 \times 0.02 \times 0.3$) 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. An additional source of information on the number of beluga whales killed or injured incidental to commercial fishery operations is the self-reported fisheries information required of vessel operators by the MMPA. During the period between 1990-00, fisher self-reports indicated no mortalities of beluga whales from interactions with commercial fishing operations (Table 17a). Logbook data are available for part of 1989-94, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-95 phase-in period is fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 for details).

Table 17a. Summary of incidental mortality of beluga whales (Cook Inlet stock) due to commercial fisheries for 1999-2000.

Fishery name	Years	Data type	Range of observer coverage	Reported mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Cook Inlet salmon drift gillnet	99-00	obs data		0, 0	0	0
Cook Inlet salmon set gillnet	99-00	obs data		0, 0	0	0
Observer program total	93-99					0
Minimum total annual mortality						0

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

Subsistence/Native Harvest Information

A study conducted by the Alaska Department of Fish and Game (ADF&G), in cooperation with the Alaska Beluga Whale Committee (ABWC) and the Indigenous People's Council for Marine Mammals, estimated the subsistence take of belugas in Cook Inlet in 1993 at 17 whales based on surveys of 16 of 19 households known to have hunted in 1993 (Table 17b: Stanek 1994). This was considered a minimum estimate, and was increased by adding the estimated number of whales taken from households not surveyed (3) and by hunters from areas outside of Cook Inlet (10) resulting in an estimated total take of 30 ($17 + 3 + 10$) whales. However, in consultation with native elders from the Cook Inlet region, the Cook Inlet Marine Mammal Council (CIMMC) estimated the annual number of belugas taken by subsistence hunters to be greater (DeMaster 1995).

There was no systematic Cook Inlet beluga harvest survey in 1994. Instead, harvest data were compiled at the November 1994 ABWC meeting. Representatives of the CIMMC, ADF&G Division of Subsistence, and an active Cook

Inlet hunter each presented harvest information they knew about. They discussed the information among themselves to eliminate redundancy, and agreed upon a final 1994 harvest estimate of 19 retrieved and 2 struck and lost. This included 2 belugas taken in Cook Inlet by hunters from Kotzebue Sound. The ADF&G representative estimated that there were 35-50 active beluga hunting households in the Cook Inlet region.

Table 17b. Summary of the Alaska Native subsistence harvest from the Cook Inlet stock of beluga whales, 1993-2000. n/a indicates the data are not available.

Year	Reported total number taken	Estimated range of total take	Reported number harvested	Estimated number struck and lost
1993	30 ¹	n/a	n/a	n/a
1994	21 ¹	n/a	19 ¹	2 ¹
1995	70	n/a	42	26
1996	123	98-147	49	49-98
1997	70 ²	n/a	35 ²	35 ²
1998	42 ²	n/a	21	21
1999	0	0	0	0
2000	0	0	0	0
Mean annual take (1999-2000)	0			

¹ Estimated value (see text); ² Represents a minimum value.

A summary of Cook Inlet beluga whale subsistence harvest data for 1993–00 is provided in Table 17b (ABWC unpubl. data, ABWC, P.O. Box 69, Barrow, AK, 99723; CIMMC unpubl. data, 26339 Eklutna Village Rd., Chugiak, AK, 99567; Mahoney and Sheldon 2000). The most thorough subsistence harvest surveys were completed in Cook Inlet by the CIMMC during 1995-97. While some of the local hunters believe the 1996 estimate of struck and lost is positively biased, the 1995-97 CIMMC take estimates are considered reliable. The annual subsistence take by Alaska Natives during this period averaged 87 whales. Because reliable data throughout the time series from 1993 to 1998 are not available, it is not possible to determine the trend in subsistence take. Congress imposed a moratorium on beluga harvest in Cook Inlet because of the decline in the Cook Inlet beluga whale stock until NMFS developed a cooperative plan for harvest management with the local Alaska Native organizations. Thus, the best estimate of subsistence take is 0 for 1999 and 2000.

OTHER MORTALITY

Mortalities related to stranding events have been reported in Cook Inlet. In August 1996, 60 beluga whales stranded in Turnagain Arm and four of these animals are known to have died as a result of the stranding event (Moore et al. 2000). In September 1996, 20-30 beluga stranded in Turnagain Arm and one animal died. In August 1999, at least 60 beluga whales stranded in Turnagain Arm, of which, five were subsequently found dead (Moore et al. 2000). There were no indications that either stranding event had resulted from human interactions.

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 this time (65 FR 38778; 22 June 2000) primarily because the subsistence

harvest, which appears to have been responsible for the majority of the decline in this stock, was prohibited in 1999 through an act of Congress. Preliminary results indicate that, once the subsistence harvest ceased, the decline in the stock ceased (65 FR 38778; 22 June 2000). In addition, NMFS and local subsistence organizations are actively pursuing the development of a co-management agreement which would allow subsistence harvest, but at a level far below historical levels.

Two fisheries suspected of possibly incurring incidental serious injuries or mortalities of beluga whales were observed in 1999 and 2000, but no takes of beluga whales were observed. At present, annual commercial fishery-related mortality levels, less than 0.18 per year (i.e., 10% of PBR), can be considered insignificant and approaching zero mortality and serious injury rate. In addition, based on the level of subsistence harvest in 1999 and the fact that there is currently a moratorium on the harvest, the total level of human-caused mortality does not exceed the PBR (1.8) level for this stock. However, because the Cook Inlet beluga whale stock has been designated as “depleted” under the MMPA, the Cook Inlet beluga whale stock is classified as strategic.

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. In 1995, development of an umbrella agreement among the Indigenous People’s Council for Marine Mammals, U.S. Fish and Wildlife Service, and NMFS was initiated. The agreement was ultimately 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. Prior to the expiration of the moratorium, a co-management agreement is expected to be completed, through which a longer term rule for managing harvests will be proposed. Determination of sustainable harvest levels for this stock will be based on analysis of information gathered under the co-management agreement, once in place.

Habitat Concerns

NMFS recognizes that municipal, commercial, and industrial activities may be of concern and may affect the water quality and substrate in Cook Inlet. This includes commercial fishing, oil and gas development, municipal discharges, noise for aircraft and ships, shipping traffic, and tourism (Moore et al. 2000). However, no indication currently exists that these activities have had a quantifiable adverse impact on the beluga whale population. The best available information indicates that these activities, alone or cumulatively, have not caused the stock to be in danger of extinction (65 FR 38778; 22 June 2000). Protection from industrial development is being provided at most locations where beluga whales commonly occur. However, susceptibility to adverse impacts may be greater now than previously because the stock, in its currently reduced state, occupies a more restricted portion of its prior range in Cook Inlet.

CITATIONS

- DeMaster, D. P. 1995. Minutes from third meeting of the Alaska Scientific Review Group, 16-17 February 1995, Anchorage, Alaska. 21 pp. + appendices. (available upon request - D. P. DeMaster, Alaska Fisheries Science Center, 7600 Sand Point Way, NE, Seattle, WA 98115).
- Dizon, A. E., C. Lockyer, W. F. Perrin, D. P. DeMaster, and J. Sisson. 1992. Rethinking the stock concept: a phylogeographic approach. *Conserv. Biol.* 6:24-36.
- Ferrero, R. C. 1999. Minutes from the tenth meeting of the Alaska Scientific Review Group, 6-8 October 1999, Juneau, Alaska. 42 p. (available upon request - Alaska Fisheries Science Center, 7600 Sand Point Way, NE, Seattle, WA 98115)
- Finley, K. J. 1982. The estuarine habitat of the beluga or white whale, *Delphinapterus leucas*. *Cetus* 4:4-5.
- Frost, K. J., and L. F. Lowry. 1990. Distribution, abundance, and movements of beluga whales, *Delphinapterus leucas*, in coastal waters of western Alaska. Pp. 39-57, *In* T. G. Smith, D. J. St. Aubin, and J. R. Geraci (eds.), *Advances in research on the beluga whale, Delphinapterus leucas*. *Can. Bull. Fish. Aquat. Sci.* 224.
- Gurevich, V. S. 1980. Worldwide distribution and migration patterns of the white whale (beluga), *Delphinapterus leucas*. *Rep. Int. Whal. Comm.* 30:465-480.
- Hansen, D. J., and J. D. Hubbard. 1999. Distribution of Cook Inlet beluga whales (*Delphinapterus leucas*) in winter. Final Rept. OCS Study. MMS 99-0024. U.S. Dept. Int., Minerals Management Serv. Alaska OCS Region, Anchorage, AK. v. p.

- Hazard, K. 1988. Beluga whale, *Delphinapterus leucas*. Pp. 195-235, In J. W. Lentfer (ed.), Selected marine mammals of Alaska. Species accounts with research and management recommendations. Marine Mammal Commission, Washington, D.C.
- Hill, P. S., D. P. DeMaster, and R.J. Small (eds.) 1997. Alaska marine mammal stock assessments, 1996. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-78. 150pp.
- Hill, P. S. and D. P. DeMaster (eds.) 1998. Alaska marine mammal stock assessments, 1998. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-97. 166pp.
- Hobbs, R. C, D. J. Rugh, and D. P. DeMaster. 2000. Abundance of belugas, *Delphinapterus leucas*, in Cook Inlet, Alaska, 1994-2000. Mar. Fish. Rev. 62(3):37-45.
- Laidre, K. L., K. E. W. Shelden, D. J. Rugh, and B. Mahoney. 2000. Beluga, *Delphinapterus leucas*, distribution and survey effort in the Gulf of Alaska. Mar. Fish. Rev. 62(3):27-36.
- Lowry, L. F. 1985. The belukha whale (*Delphinapterus leucas*). Pp. 3-13, In J. J. Burns, K. J. Frost, and L. F. Lowry (eds.), Marine mammals species accounts. Alaska Dep. Fish and Game, Game Tech. Bull. 7.
- Mahoney, B. A. and K. E. W. Shelden. 2000. Harvest history of belugas, *Delphinapterus leucas*, in Cook Inlet, Alaska. Mar. Fish. Rev. 62(3):124-140.
- Moore, S. E., K. E. Shelden, L. K. Litzky, B. A. Mahoney, and D. J. Rugh. 2000. Beluga whale, *Delphinapterus leucas*, habitat associations in Cook Inlet, Alaska. Mar. Fish. Rev. 62(3):60-80.
- O'Corry-Crowe, G. M., R. S. Suydam, A. Rosenberg, K. J. Frost, and A. E. Dizon. 1997. Phylogeography, population structure and dispersal patterns of the beluga whale *Delphinapterus leucas* in the western Nearctic revealed by mitochondrial DNA. Mol. Ecol. 6:955-970.
- Reeves, R. R. 1990. An overview of the distribution, exploitation and conservation status of belugas, worldwide. Pp. 47-58, In J. Prescott and M. Gauquelin (eds.), For the future of the beluga: Proceedings of the International Forum for the Future of the Beluga. Univ. Quebec Press, Canada.
- Rugh, D. J., K. E. W. Shelden, and B. Mahoney. 2000. Distribution of beluga whales in Cook Inlet, Alaska, during June/July, 1993 to 1999. Mar. Fish. Rev. 62(3):6-21.
- Sergeant, D. E., and P. F. Brodie. 1969. Body size in white whales, *Delphinapterus leucas*. J. Fish. Res. Bd. Can. 26:2561-2580.
- Shelden, K. E. W. 1994. Beluga whales (*Delphinapterus leucas*) in Cook Inlet - A review. Appendix, In Withrow, D. E., K. E. W. Shelden, and D. J. Rugh. Beluga whale (*Delphinapterus leucas*) distribution and abundance in Cook Inlet, summer 1993. Annual report to the MMPA Assessment Program, Office of Protected Resources, NMFS, NOAA, 1335 East-West Highway, Silver Spring, MD 20910.
- Small, R.J. and D. P. DeMaster (eds.) 1995. Alaska marine mammal stock assessments, 1995. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-57. 93pp.
- Stanek, R. T. 1994. The subsistence use of beluga whale in Cook Inlet by Alaska Natives, 1993. Draft Final Rep. Study No. 50ABNF200055, submitted to NMFS by Alaska Dep. Fish and Game, Juneau, AK. 24 pp.
- Wade, P. R., and R. Angliss. 1997. Guidelines for assessing marine mammal stocks: report of the GAMMS workshop April 3-5, 1996, Seattle, Washington. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-12, 93 pp.