

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).

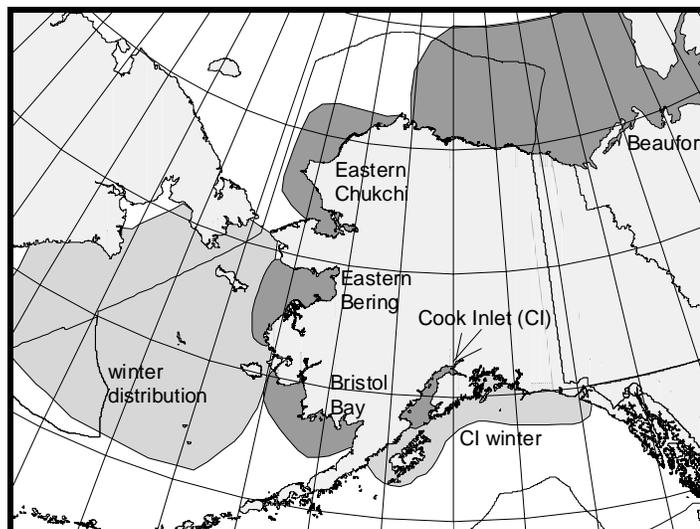


Figure 19. Approximate distribution of beluga whales in Alaska waters. The dark shading displays the summer distributions of the five stocks. Winter distributions are depicted with lighter shading.

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).

POPULATION SIZE

Aerial surveys for beluga whales in Cook Inlet were conducted annually in June or July during 1994-98 using an 'approach' survey technique that involves repeated circling of observed groups, and videotape recording. The approach technique differs from 'passing mode' surveys performed for belugas in other stocks, in that during passing surveys the aircraft maintains a straight flight path. The approach technique allows each group of whales observed and recorded on video to be corrected for 1) animals that were under the surface, and 2) animals missed by observers yet recorded on video. The sum of median counts for all groups observed in the 1994-98 surveys is 281, 324, 307, 264, and 193 whales, respectively (Rugh et al. In review). The process of using medians instead of maximum counts reduces the effects of outliers (extremes in high or low counts), makes the results more comparable to other surveys which lack multiple passes over whale groups, and is more appropriate than using maximums when the counts will be corrected for missed whales (Rugh et al. 1996).

The abundance of beluga whales in Cook Inlet is estimated from aerial observer counts and aerial video group size estimates. The group size estimates are corrected for subsurface animals (availability) and animals at the surface

that were missed (sightability) based on an analysis of the video tapes. Observer 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. 1998). The most recent abundance estimate of beluga whales in Cook Inlet resulting from the June 1998 aerial survey is 347 (CV = 0.29) animals (Hobbs et al. 1998).

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 347 and its associated CV(N) of 0.29, N_{MIN} for the Cook Inlet stock of beluga whales is 273.

Current Population Trend

In general, uncorrected counts have ranged from 300 to 500 beluga whales within Cook Inlet between 1970 and 1996. However, median counts since 1996 have been below 300 animals (264 in 1997 and 193 in 1998). The abundance estimates for the period 1994-98 are shown in Figure 19 (Hobbs et al. 1998). A statistically significant trend in abundance has not been detected, although the power was low due to the short time series. However, the 1998 abundance estimate (347) is approximately 47% 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 reduction in sightings in lower Cook Inlet (Rugh et al. In review).

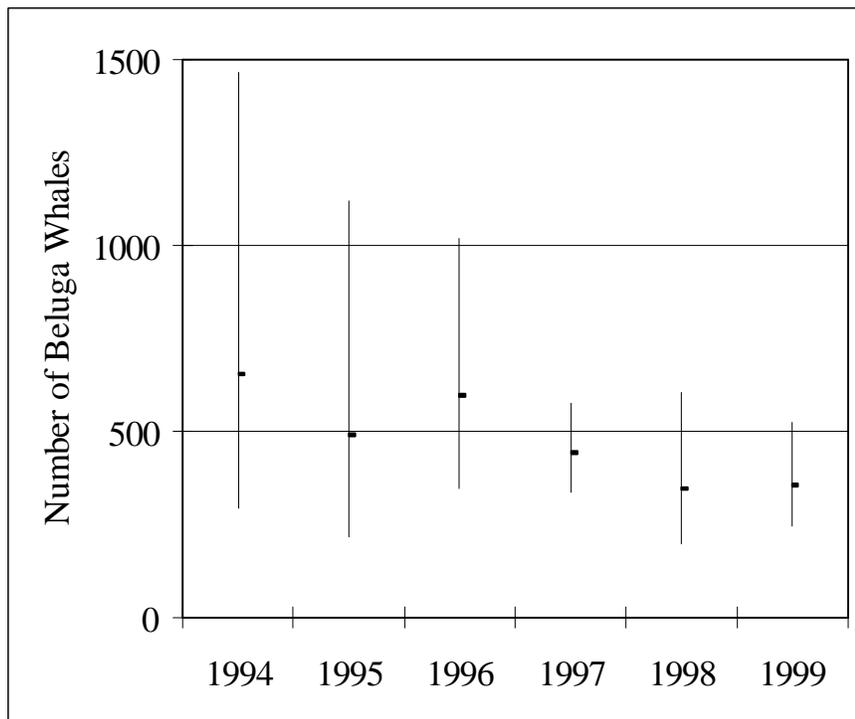


Figure 19. Abundance of beluga whales in Cook Inlet 1994-98 (adapted from Hobbs et al. 1998). Error bars depict the 95% confidence intervals

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 re-authorized 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 in Small and DeMaster (1995), Hill et al. (1997), and Hill and DeMaster (1998) were “undetermined” and “undetermined”; 1.0 and 15; and 1.0 and 14, respectively. However, based on the recent information on stock size, trends in abundance, and level of the subsistence harvest, the Alaska Scientific Review Group (ASRG) (Ferrero 1999) has recommended that NMFS reduce the F_R to the lowest value possible (i.e., 0.1). Further, the ASRG noted the

resulting PBR would be 0.54 (assuming an N_{\min} of 273 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 ASRG at this time. Rather, NMFS has selected an F_R of 0.3 based on the following: 1) this stock has formally been proposed for listing as depleted under the MMPA (which typically is associated with a F_R of 0.5), 2) in March 1999, NMFS was petitioned to list this stock as endangered under the Endangered Species Act, where NMFS has a period of 1 year to make an evaluation as to the merits of the petition (note: a listing of endangered is typically associated with a F_R of 0.1, while a listing of 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 = 1.6 animals ($273 \times 0.02 \times 0.3$) for the Cook Inlet stock of beluga whale. Additional data were collected on this stock in 1999; therefore, NMFS anticipates revising this report in 2000 and will evaluate all information and revise all statistics used in the PBR equation as needed.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Three types of commercial fishing gear that could possibly interact with beluga whales occur in Cook Inlet (purse seine, drift gillnet, and set gillnet) and are used to catch each of the five species of Pacific salmon, as well as Pacific herring. There are no observer data as fishery observers have not monitored any of these fisheries within Cook Inlet. 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 and 1997, fisher self-reports indicated no mortalities of beluga whales from interactions with commercial fishing operations (Table 17a). Self-reported fisheries data are incomplete for 1994, not available for 1995, and considered unreliable after 1995 (see Appendix 4).

In the past, beluga mortalities have been attributed to Cook Inlet fisheries with the fishing-related mortality during the 3-year period from 1981 to 1983 estimated at 3-6 animals per year (Burns and Seaman 1986). Accordingly, though there were no self-reported fishery mortalities of beluga whales, the Cook Inlet gillnet fisheries (having a combined total of over 1,325 active permits in 1997) have been included in Table 17a because logbook records (fisher self-reports required during 1990-94) are most likely negatively biased (Credle et al. 1994).

Based on a lack of reported mortalities, the estimated minimum mortality rate incidental to commercial fisheries is zero belugas per year from this stock. However, a reliable estimate of the mortality rate incidental to commercial fisheries is currently unavailable because of the absence of observer placements in the Cook Inlet fisheries mentioned above. The Cook Inlet salmon set and drift gillnet fisheries are scheduled to be observed in 1999 and 2000.

Table 17a. Summary of incidental mortality of beluga whales (Cook Inlet stock) due to commercial fisheries from 1990 through 1997 and calculation of the mean annual mortality rate. Mean annual mortality in brackets represents a minimum estimate from self-reported fisheries information. Data from 1993 to 1997 (or the most recent 5 years of available data) are used in the mortality calculation when more than 5 years of data are provided for a particular fishery. n/a indicates that data are not available.

Fishery name	Years	Data type	Range of observer coverage	Reported mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Observer program total	93-97					0
Cook Inlet salmon drift gillnet	90-97	self reports	n/a	0, 0, 0, 0, n/a n/a, n/a, n/a	n/a	[0]
Cook Inlet salmon set gillnet	90-97	self reports	n/a	0, 0, 0, 0, n/a n/a, n/a, n/a	n/a	[0]
Minimum total annual mortality						0

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 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 than 30 animals (DeMaster 1995: p. 5).

There was no systematic Cook Inlet beluga harvest survey in 1994. Instead, Cook Inlet harvest data for 1994 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, 1993-97. 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	68	n/a	42	26
1996	123	98-147	49	49-98
1997	70 ²	n/a	35 ²	35 ²
Mean annual take (1995-97)	87			

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

The most recent subsistence harvest data concerning the Cook Inlet beluga whale stock 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). The most thorough subsistence harvest surveys to date were completed in Cook Inlet by the CIMMC during 1995-97. 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. Given these data, the annual subsistence take by Alaska Natives averaged 87 during the 3-year period from 1995-97. Due to the thoroughness of the 1995-97 harvest reports as compared to earlier years, it is not possible to ascertain the trend in subsistence take. However, as the data from 1995-97 are considered the most reliable, subsistence mortality for the Cook Inlet stock has been averaged over a 3-year period whereas a 5-year period is used for the other four beluga whale stocks occurring in this document.

OTHER MORTALITY

Mortalities related to stranding events have been reported in Cook Inlet. For example, in June of 1996, 63 animals stranded in the Susitna Delta (Rugh et al. 1997). Four of these animals are known to have died as a result of the stranding event (B. Smith, pers. comm., NMFS, 222 W 7th Ave., Anchorage, AK, 99513). Such mortalities are not likely to be associated with human-related activities.

STATUS OF STOCK

Beluga whales are not listed as “depleted” under the MMPA or listed as “threatened” or “endangered” under the Endangered Species Act (ESA). A reliable estimate of the annual rate of mortality incidental to commercial fisheries is unavailable. Therefore, it is unknown whether the kill rate is insignificant. At present, annual commercial fishery-related mortality levels less than 0.16 per year (i.e., 10% of PBR) can be considered insignificant and approaching zero mortality and serious injury rate. Based on currently available data, the estimated annual level of total human-caused mortality is 87 beluga whales (estimated exclusively from subsistence harvest data) exceeds the PBR (1.6) for this stock. Therefore, the Cook Inlet beluga whale stock is classified as a strategic stock. It is not possible to ascertain trends in abundance at this time; however, the current level of human-caused removals is not sustainable.

Sustainable harvest levels for this stock will be determined from the analysis of information gathered through the cooperative management process, and will reflect the degree of uncertainty associated with the information obtained for this stock. Efforts were initiated in 1995 and continued in 1996 to develop an umbrella agreement among the Indigenous People’s Council for Marine Mammals, Fish and Wildlife Service (FWS), and NMFS regarding the cooperative management of certain stocks of marine mammals utilized by Native subsistence hunters in Alaska. The final agreement was signed August 27, 1997. During 1998, efforts were initiated to formalize a specific agreement with local Alaska Native Organizations and NMFS regarding the management of this stock. In addition, in October 1998 a formal status review was initiated to assess the potential listing of the Cook Inlet beluga whale stock as “threatened” or “endangered” under the ESA or “depleted” under the MMPA.

Habitat Concerns

The State of Alaska has held 41 oil and gas lease sales in Cook Inlet since 1959. The planned Cook Inlet Area-wide Sale is scheduled for Feb. 1999, and will offer 4.2 million acres in and around Cook Inlet including tracts at the major river mouths, such as the Beluga River, Susitna River, and Little Susitna River, which are areas of concentrated use by belugas in ice-free seasons. Activities associated with these sales include seismic geophysical exploration, drilling, discharge of drill muds and cuttings, discharge of sanitary wastes and production/formation waters, construction of drill platforms, vessel and aircraft support. It is unknown what effect, if any, the lease sales and associated activities will have on the Cook Inlet beluga whale stock.

REFERENCES

- Burns, J. J., and G. A. Seaman. 1986. Investigations of belukha whales in coastal waters of western and northern Alaska. II. Biology and ecology. U. S. Dep. Commer., NOAA, OCSEAP Final Rep. 56(1988):221-357.
- Credle, V. R., D. P. DeMaster, M. M. Merklein, M. B. Hanson, W. A. Karp, and S. M. Fitzgerald (eds.). 1994. NMFS observer programs: minutes and recommendations from a workshop held in Galveston, Texas, November 10-11, 1993. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-94-1, 96 pp.
- 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, National Marine Mammal Laboratory, 7600 Sand Point Way, NE, Seattle, WA 98115).
- DeMaster, D. P. 1997. Minutes from fifth meeting of the Alaska Scientific Review Group, 7-9 May 1997, Seattle, Washington. 21 pp. + appendices. (available upon request - D. P. DeMaster, National Marine Mammal Laboratory, 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: ninth meeting of the Alaska scientific review group (15-16 April, 1999). NOAA/NMFS/AFSC 7600 Sand Point Way, NE, Bldg 4, Seattle, WA 98115. 16p.
- 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.

- Frost, K. J., and R. Suydam. 1995. Harvests of beluga whales, *Delphinapterus leucas*, in Alaska, 1987-1994. Working paper for Alaska Beluga Whale Committee Scientific Workshop, Anchorage, AK, 5-7 April 1995. 14 pp.
- Gurevich, V. S. 1980. Worldwide distribution and migration patterns of the white whale (beluga), *Delphinapterus leucas*. Rep. Int. Whal. Comm. 30:465-480.
- 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.
- Hobbs, R. C, D. J. Rugh, and D. P. DeMaster. 1998. Abundance of beluga whales in Cook Inlet, Alaska, 1994-1998. Unpubl. doc. 14 pp. (available upon request - R. C. Hobbs, National Marine Mammal Laboratory, 7600 Sand Point Way, NE, Seattle, WA 98115).
- 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.
- 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 *Delphinapteras 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, R. P. Angliss, and D. P. DeMaster. 1996. Aerial surveys of beluga whales in Cook Inlet, Alaska, July 1995. Unpubl. doc. submitted to Int. Whal. Commn. (SC/48/SM8). 13 pp.
- Rugh, D. J., K. E. W. Shelden, J. M. Waite, R. C. Hobbs, and B. Mahoney. 1997. Aerial surveys of beluga whales in Cook Inlet, Alaska, June 1996. Unpubl. doc. submitted to Int. Whal. Commn. (SC/49/SM19). 22 pp.
- Rugh, D. J., K. E. W. Shelden, and B. Mahoney. In Review. Distribution of beluga whales in Cook Inlet, Alaska, during June and July, 1993-1998. 27 pp. Fish. Bull. (available upon request - D. J. Rugh, National Marine Mammal Laboratory, 7600 Sand Point Way, NE, Seattle, WA 98115).
- 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.
- 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.