

BELUGA WHALE (*Delphinapterus leucas*): Eastern Bering Sea 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).

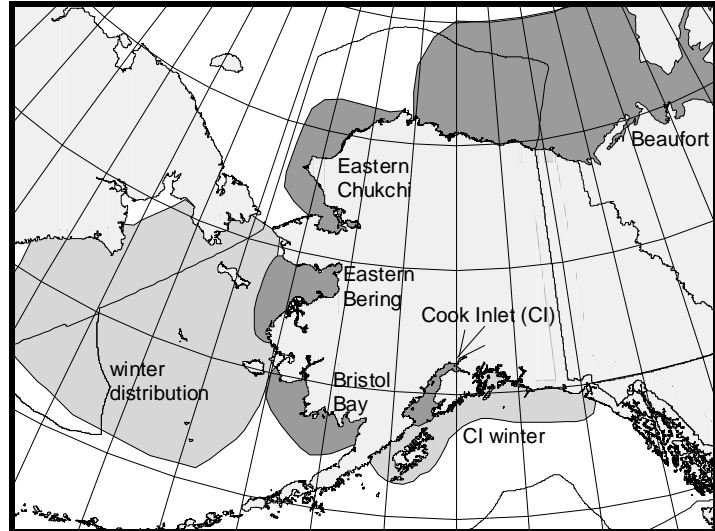


Figure 17. Approximate distribution of beluga whales in Alaska waters. The dark shading displays the summer distributions of the five stocks. Winter distributions are depicted with lighter shading.

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 (G. 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. 16).

POPULATION SIZE

DeMaster et al. (1994) estimated the minimum abundance (e.g., uncorrected for probability of sighting) of belugas from aerial surveys over Norton Sound in 1992, 1993, and 1994 at 2,095, 620, and 695, respectively (see also Lowry et al. 1995). The variation between years was due, in part, to variability in the timing of the migration and movement of animals into the Sound. As a result the 1993 and 1994 estimates were considered to be negatively biased. Due to the disparity of estimates, the Norton Sound aerial surveys were repeated in June of 1995 leading to the highest abundance estimate of any year, but not significantly different than in 1992. An aerial survey conducted June 22 of 1995 resulted in an uncorrected estimate of 2,583 beluga whales (Lowry and DeMaster 1996). It should be noted that a slightly higher estimate (2,666) occurred during the 1995 survey over three day period from June 6-8. The single day estimate of (2,583), instead of the 3-day estimate was used to minimize the potential for double counting of whales. Correction factors (CF) recommended from studies of belugas range from 2.5 to 3.27 (Frost and Lowry 1995). For Norton Sound, the correction factor of 2.62 (CV[CF] not available) is recommended for the proportion of animals that

were diving and thus not visible at the surface (based on methods of Frost and Lowry 1995), given the particular altitude and speed of the survey aircraft. If this correction factor is applied to the June 22 estimate of 2,583 (CV=0.26) along with the additional correction factor for the proportion of newborns and yearlings not observed due to their small size and dark coloration (1.18; Brodie 1971), the total corrected abundance estimate for the eastern Bering Sea stock is 7,986 ($2,583 \times 2.62 \times 1.18$) beluga whales.

An aerial survey of Norton Sound is scheduled to occur during the summer of 1999. Preliminary results from this survey are expected to be available in 2000.

Minimum Population Estimate

For the eastern Bering Sea stock of beluga whales, the minimum population estimate (N_{MIN}) is calculated according to Equation 1 from the PBR Guidelines (Wade and Angliss 1997). Therefore, $N_{\text{MIN}} = N/\exp(0.842 \times [\ln(1 + [CV(N)]^2)]^{1/2})$. Using the population estimate (N) of 7,986 and an associated CV(N) of 0.26, N_{MIN} for this stock is 6,439 beluga whales. A CV(N) that incorporates variance due to all of the correction factors is currently not available. However, the Alaska Scientific Review Group (SRG) considers the CV derived from the abundance estimate (CV=0.26) as adequate in calculating a minimum population estimate (DeMaster 1996, 1997; see discussion of N_{MIN} for the eastern Chukchi stock of beluga whales). Due to foggy conditions encountered during the 1995 surveys, it was not possible to survey the entire Norton Sound area occupied by belugas during a continuous time period. As a result, the 1995 abundance estimate is considered to be conservative (Lowry and DeMaster 1996).

The Alaska SRG recommended using the abundance estimate (7,986 whales) as N_{MIN} for this stock. They considered the estimate to be adequately conservative because 1) the June 22 survey covered only the Yukon Delta area, 2) fog precluded surveying the entire area where whales may have been encountered, and 3) the Beaufort sea state during the survey was less than ideal (DeMaster et al. In review). However, pending completion of an analysis on the effects of Beaufort sea state on beluga whale sighting rate, NMFS has decided to continue to use the N_{MIN} as calculated according to the PBR Guidelines above (6,439 whales).

Current Population Trend

Surveys to estimate population abundance in Norton Sound were not conducted prior to 1992. However, between 1992 and 1995, survey data indicate that the population is less likely to be declining than it is to be stable or increasing.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is currently unavailable for the eastern Bering Sea 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: $PBR = N_{\text{MIN}} \times 0.5R_{\text{MAX}} \times F_R$. The recovery factor (F_R) for this stock is 1.0, the value for cetacean stocks that are thought to be stable in the presence of a subsistence harvest (Wade and Angliss 1997). The Alaska SRG recommended using a F_R of 1.0 for this stock as the Alaska Beluga Whale Committee (ABWC) intends to continue regular surveys (i.e., 3-5 years) to estimate abundance for this stock and to annually monitor levels of subsistence harvest (DeMaster 1997). For the eastern Bering Sea stock of beluga whales, $PBR = 129$ animals ($6,439 \times 0.02 \times 1.0$).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Three different commercial fisheries that could have interacted with beluga whales in the eastern Bering Sea were monitored for incidental take by fishery observers during 1990-97: Bering Sea (and Aleutian Islands) groundfish

trawl, longline, and pot fisheries. Observers did not report any mortality or serious injury of beluga whales incidental to these groundfish fisheries. 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 did not include any mortality to beluga whales from this stock as a result of interactions with commercial fishing operations. Self-reported fisheries data are incomplete for 1994, not available for 1995, and considered unreliable after 1995 (see Appendix 4).

Based on a lack of reported mortalities, the estimated minimum mortality rate incidental to commercial fisheries is zero belugas per year from this stock. The estimated mortality is considered a minimum due to a lack of observer programs in fisheries likely to take beluga whales and because logbook records (fisher self-reports required during 1990-94) are most likely negatively biased (Credle et al. 1994).

In the near shore waters of the eastern Bering Sea, substantial effort occurs in gillnet (mostly set nets), herring, and personal-use fisheries. The only reported beluga mortality occurred in a personal-use king salmon gillnet near Cape Nome in 1996. This mortality results in an annual estimated mortality of 0.2 whales from this stock during 1993-97. Note that this is not a commercial fishery. As a result, this estimate is considered a minimum because personal-use fishers are not aware of a reporting requirement and there is no established protocol for non-commercial takes to be reported to NMFS. It should also be noted that in this region of western Alaska any whales taken incidentally to the personal-use fishery are utilized by Alaska Native subsistence users. It is not clear whether the 1996 entanglement was accounted for in the 1996 Alaska Native subsistence harvest report. If so, this particular mortality may have been double-counted.

Subsistence/Native Harvest Information

The subsistence take of beluga whales from the eastern Bering Sea stock is provided by the ABWC. The most recent subsistence harvest estimates for the stock are provided in Table 15 (Frost and Suydam 1995, Frost 1998). Given these data, the annual subsistence take by Alaska Natives averaged 121 belugas from the eastern Bering Sea stock during the 5-year period 1993-97. These estimates are based on reports from ABWC representatives. The 1993-97 average is considered negatively biased due to a lack of reporting in several villages prior to 1996. In addition, there is not a reliable estimate for the number of struck and lost prior to 1996. Furthermore, an unknown proportion of the animals harvested each year by Alaska Native hunters in this region may belong to other beluga stocks migrating through Norton Sound in both the fall and spring (DeMaster 1995: p. 4).

Table 15. Summary of the Alaska Native subsistence harvest from the eastern Bering Sea 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	136 ^{1,2}	121-136 ¹	121-136	n/a
1994	132 ²	126-132 ²	116-122	10 ²
1995	56 ²	51-61 ²	45-55 ²	6 ²
1996	120	113-126	97-108	16-18
1997	160	146-173	127-141	19-32
Mean annual take (1993-97)	121			

¹ Does not include the number of struck and lost; ² Indicates a lower bound.

STATUS OF STOCK

The estimated minimum annual mortality rate incidental to commercial fisheries (0) is not known to exceed 10% of the PBR (16) and, therefore, is considered to be insignificant and approaching zero mortality and serious injury rate. Based on currently available data, the estimated annual rate, over the 5-year period from 1993 to 1997, of human-

caused mortality and serious injury (122, including the estimated mortality in non-commercial fisheries) is not known to exceed the PBR (129) for this stock. Beluga whales are not listed as “depleted” under the MMPA or listed as “threatened” or “endangered” under the Endangered Species Act. Therefore, the eastern Bering Sea beluga whale stock is not classified as strategic. No decreasing trend has been detected for this stock in the presence of a known harvest, although at this time it is not possible to assess the status of this stock relative to its Optimum Sustainable Population size.

REFERENCES

- Brodie, P. F. 1971. A reconsideration of aspects of growth, reproduction, and behavior of the white whale with reference to the Cumberland Sound, Baffin Island, population. *J. Fish. Res. Bd. Can.* 28:1309-1318.
- 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., K. Frost, L. Lowry, and T. Pierce. 1994. Abundance estimate for beluga whales (*Delphinapterus leucas*) in Norton Sound: June 1992, 1993, and 1994. Alaska Beluga Whale Committee Report No. 94-1, November 1994, 13 pp.
- DeMaster, D. P. 1995. Minutes from the 16-17 February 1995 meeting of the Alaska Scientific Review Group. Anchorage, Alaska. 22 pp. (available upon request - D. P. DeMaster, National Marine Mammal Laboratory, 7600 Sand Point Way, NE, Seattle, WA 98115).
- DeMaster, D. P. 1996. Minutes from the 11-13 September 1996 meeting of the Alaska Scientific Review Group. Anchorage, Alaska. 20 pp. (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).
- DeMaster, D. P., L. F. Lowry, K. J. Frost, and R. A. Paulson. In review. The effect of sea state on estimates of abundance for beluga whales (*Delphinapterus leucas*) in Norton Sound, Alaska. *Fish. Bull.* (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.
- Finley, K. J. 1982. The estuarine habitat of the beluga or white whale, *Delphinapterus leucas*. *Cetus* 4:4-5.
- Frost, K. J. 1998. Harvest report: statewide summary for the eastern Bering Sea beluga population, 1995-97. Alaska Beluga Whale Committee Rep. 98-1. 15 pp.
- 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 L. F. Lowry. 1995. Radio tag based correction factors for use in beluga whale population estimates. Working paper for Alaska Beluga Whale Committee Scientific Workshop, Anchorage, AK, 5-7 April 1995. 12 pp.
- 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. Commn.* 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.
- 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.

- Lowry, L. F., K. J. Frost, D. P. DeMaster, and R. R. Nelson. 1995. Distribution and abundance of beluga whales in the Norton Sound/Yukon Delta region, 1992-1994. Working paper for Alaska Beluga Whale Committee Scientific Workshop, Anchorage, AK, 5-7 April 1995. 13 pp.
- Lowry, L. F. and D. P. DeMaster. 1996. Alaska Beluga Whale Committee beluga whale surveys in Norton Sound, June 1995. Alaska Beluga Whale Committee Report No.96-1. 5 pp.
- 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.
- 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* D. E. Withrow, 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.
- 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.