Revised 6/07/2013

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 in Alaska may occur in both offshore and coastal waters, with summer concentrations in Cook Inlet, eastern Bristol Bay, Yukon Delta, Norton Sound, eastern Chukchi Sea, and Mackenzie River Delta (Hazard 1988). 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 (Frost and Lowry 1990); 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 populations in summering areas (O'Corry-Crowe et al. 2002). Based on this information, 5 beluga whales stocks are recognized within U. S. waters: 1) Cook Inlet, 2) Bristol Bay, 3) eastern Bering Sea, 4) eastern Chukchi Sea, and 5) Beaufort Sea.

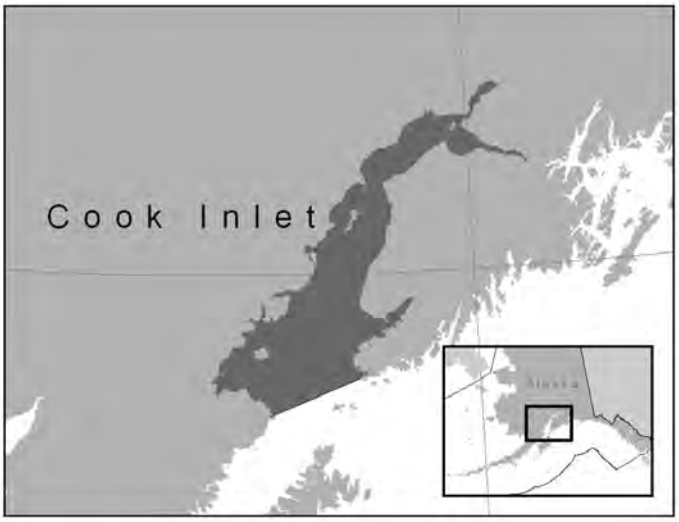

Figure 18. Approximate distribution of beluga whales in Cook Inlet.

During the open water months in upper Cook Inlet (north of the forelands), beluga whales are typically concentrated near river mouths (Rugh et al. 2010; Fig. 18). The winter distribution of this stock is not well known; however, there is evidence that some whales may inhabit upper Cook Inlet year-round (Hansen and Hubbard 1999, Rugh et al. 2004, Hobbs et al. 2005). Satellite tags were attached to 17 belugas in late summer during 2000-2002 in order to determine their distribution through the fall and winter (Hobbs et al. 2005). Ten tags transmitted through the fall, and of those, three tags deployed on adult males transmitted through April and late May. None of the tagged beluga moved south of Chinitna Bay on the west side of Cook Inlet. A review of all marine mammal surveys conducted in the Gulf of Alaska from 1936 to 2000 discovered only 31 beluga sightings among 23,000 marine mammal sightings, 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) are regularly observed in Yakutat Bay. Although not included in the Cook Inlet DPS as listed under the ESA, NMFS regulations under the MMPA (50 CFR 216.15) include the beluga whales occupying Yakutat Bay as part of the Cook Inlet stock (75 FR 12498, 16 March 2010), defined as depleted at 50 CFR 216.15. Notice-and-comment rulemaking procedures would be required to change this regulatory definition. Until such procedures are completed, these animals remain designated as depleted and part of the Cook Inlet stock.

POPULATION SIZE

Aerial surveys for beluga whales in Cook Inlet have been conducted by the National Marine Fisheries Service each year since 1994. The survey protocol includes paired, independent observers to estimate the number of whale groups missed. When groups were seen, a series of aerial passes were made to allow each observer to make independent counts simultaneously with video camera recordings of the whales (Rugh et al. 2000, 2005).

The abundance of beluga whales in Cook Inlet is estimated annually based on counts by aerial observers and video analysis of groups. Each count 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. 2000a). When video counts are not available, observers' counts are corrected for availability and sightability using a

regression of counts and an interaction term of counts with an encounter rate against the video count estimates (Hobbs et al. 2000a). The estimate of the variance of the abundance equation in Hobbs et al. (2000b) was revised to use the squared standard error of the average for the abundance estimates in place of the variance of the abundance estimate and the measurement error (Hobbs at al. 2012); this reduced CVs by almost half, as represented in Figure 19. The most recent annual abundance estimate of beluga whales in Cook Inlet from the 2012 aerial survey is 312 (CV = 0.13) (Hobbs et al. 2012). This estimate is more than the estimate of 284 for 2011; however, it falls within the statistical variation around the recent trend line (in red) and probably represents variability of the estimation process rather than an increase in the population from 2011 to 2012. Annual abundance estimates based on aerial surveys of Cook Inlet beluga during the most recent 3-year period were 340 (2010), 284 (2011), and 312 (2012), resulting in an average abundance estimate for this stock of 312 (CV = 0.10) belugas.

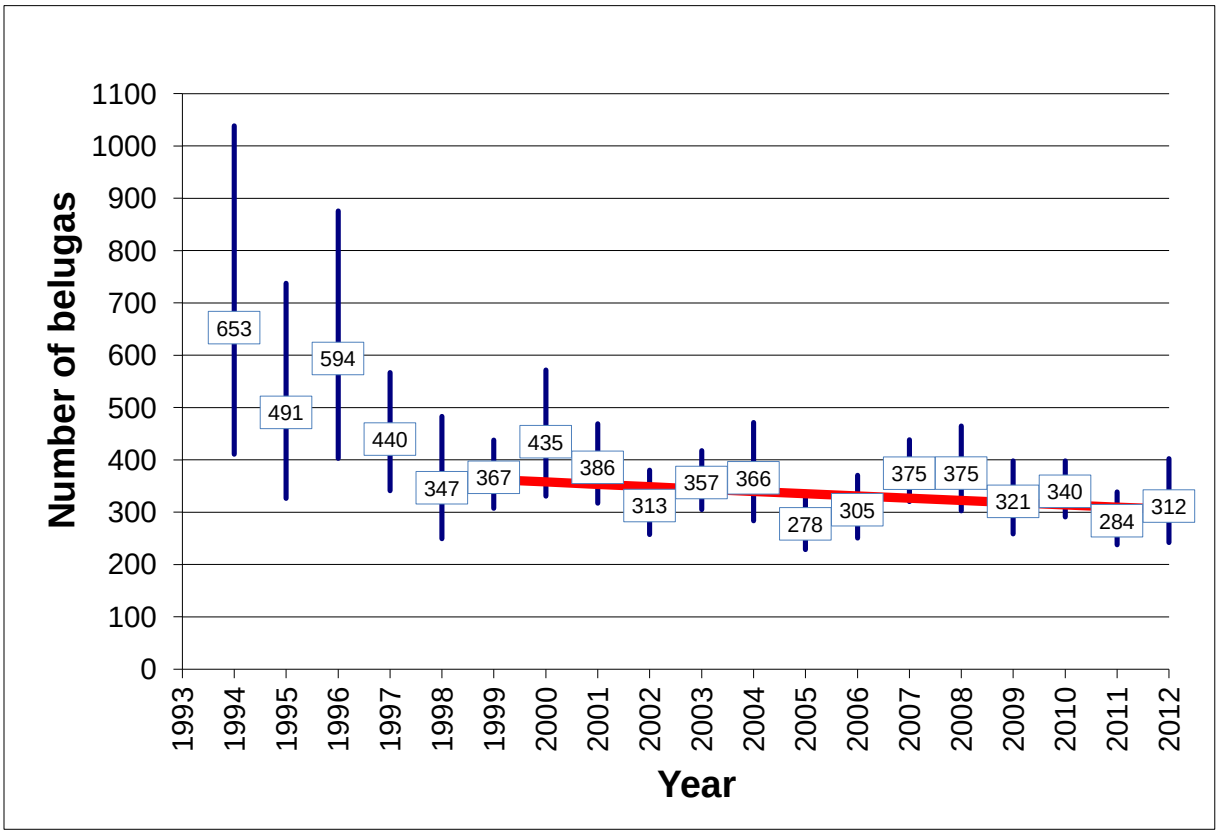

Figure 19. Annual abundance estimates of beluga whales in Cook Inlet, Alaska 1994-2012 (Hobbs et al. 2012). Vertical bars depict plus and minus one standard error. Over the last 10 years (2002-2012), the rate of decline (red trend line) has been -0.6% per year.

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): $N_{MIN} = N/\exp(0.842\times[\ln(1+[CV(N)]^2)]^{½})$. Using the 3-year average population estimate (N) of 312 and its associated CV(N) of 0.10, N_{MIN} for the Cook Inlet stock of beluga whales is 280 belugas.

Current Population Trend

The corrected annual abundance estimates for the period 1994-2012 are shown in Figure 19. A statistically significant declining trend in abundance was detected between 1994 and 1998 (Hobbs et al. 2000b). A Bayesian inference on the population abundance estimates gave a modal trend estimate of -1.2% per year for 1994-2005, with a 71% probability that the population was declining (Lowry et al. 2006), whereas the trend for 2002 to 2012 is a decline of 0.6% (SE = 0.011) per year. The 2008 status review of the population indicated there was an 80% chance that the population would decline further (Hobbs and Shelden 2008).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is currently not available for the Cook Inlet beluga whale stock. Hence, until additional data become available, the cetacean maximum theoretical net productivity rate (R_{MAX}) of 4% is recommended to be employed for this stock (Wade and Angliss 1997). This figure is similar to the 4.8% percent annual increase that has been documented for the Bristol Bay beluga stock (Lowry et al. 2008).

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: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. 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 since 1999, this stock should have begun to grow at or near its maximum productivity rate, but for unknown reasons the Cook Inlet beluga whale stock is not increasing. Because this stock does not meet the assumptions inherent to the use of the PBR, NMFS has decided it would not be appropriate to calculate 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

New Serious Injury Guidelines

NMFS updated its serious injury designation and reporting process, which uses guidance from previous serious injury workshops, expert opinion, and analysis of historic injury cases to develop new criteria for distinguishing serious from non-serious injury (Angliss and DeMaster 1998, Andersen *et al*. 2008, NOAA 2012). NMFS defines serious injury as an "*injury that is more likely than not to result in mortality.*" Injury determinations for stock assessments revised in 2013 or later incorporate the new serious injury guidelines, based on the most recent 5-year period for which data are available.

Fisheries Information

In 1999 and 2000, observers were placed on Cook Inlet salmon set and drift gillnet vessels because of the potential for those fisheries to entangle beluga whales. No mortalities or serious injuries were observed in either year (Manly 2006). No observer data have been collected in these fisheries since 2000. However, two entanglements have since been reported: 1) on July 14, 2005 a set net fisherman near Nikiski reported a beluga was entangled and then released from his net and the whale's condition was unknown; and 2) on May 7, 2012 a fisherman reported that a juvenile beluga was entangled in his salmon fishing net during a special use subsistence fishery near Kenai; the whale was dead, and necropsy findings reported this animal was in poor health prior to entanglement.

A photogrammetric study by Kaplan et al. (2009) did not find any instances where Cook Inlet belugas appeared to have been entangled in, or to have otherwise interacted with, fishing gear. However, in 2010, a beluga with a rope entangled around its girth was observed and photo-documented during the period of May through August. The same whale was photographed in July and August 2011, and August 2012, still entangled in the rope line (pers comm. Tamara McGuire, LGL Alaska Research Associates, Inc. 2000 W International Airport Road, Anchorage, AK 99502; 15 February 2013).

The estimated minimum mortality rate incidental to commercial fisheries is unknown, although probably low because only one known mortalitywas reported.

Subsistence/Native Harvest Information

Subsistence harvest of beluga whales in Cook Inlet has been important to one local village (Tyonek) and the subsistence hunter community in Anchorage. Between 1993 and 1999, the annual subsistence take ranged from 30 to more than 100 animals (Mahoney and Shelden 2000). The average annual subsistence harvest, including struck and lost, for 1995 and 1996 was 87 whales.

Following a significant decline in Cook Inlet beluga whale abundance estimates between 1994 and 1998, the Federal government took actions to conserve, protect, and prevent further declines in the abundance of these whales. In 1999 and 2000, Public Laws 106-31 and 106-553 established a moratorium on Cook Inlet beluga whale harvests except for subsistence hunts by Alaska Natives conducted under cooperative agreements between NMFS and affected Alaska Native organizations. There were no signed co-management agreements in 1999, 2004, and 2007, so no harvest was authorized. Harvest from 2001 through 2004 was conducted under harvest regulations (69 FR 17973, 6 April 2004) following an interim harvest management plan developed through an administrative hearing; three belugas were harvested in Cook Inlet under this interim harvest plan. In August 2004, an administrative hearing was held to determine a long-term harvest plan, which allowed for 8 whales to be harvested during 2005 - 2009. From 2010 until recovery, allowable harvest levels are established for a 5-year period, based on the average abundance in the previous 5-year period and the growth rate over the previous 10-year period; no harvest is allowed if the previous 5-year average abundance is less than 350 belugas. Because the 5-year average abundance during 2003-2007 was 336 (i.e., below 350 whales), no harvest was allowed during the subsequent 5-year period, 2008–2012. (73 FR 60976; 15 October 2008). Since the average abundance of Cook Inlet beluga whales remains below 350 whales, no harvest is allowed for 2013.

OTHER MORTALITY

Mortalities related to stranding events have been reported in Cook Inlet (Table 31). Improved record-keeping was initiated in 1994, and reports have since included the number of stranded belugas, including live strandings. The majority of whales involved in a live stranding event probably survive, recognizing some mortalities are missed by observers and whales may die later of stranding-related injuries. The following are the number of whale mortalities suspected to have resulted from live strandings: 5 in 1996, 5 in 1999, 5 in 2003 (Vos and Shelden 2005); and 1 in 2005 (Hobbs and Shelden 2008). In 2012 there were 38 live strandings, with no mortalities reported (Table 31). Most live strandings have occurred in Knik Arm and Turnagain Arm, shallow and dangerous waterways not frequented by motorized vessels; thus, vessel disturbance of belugas is likely at low levels and probably not the cause of many live strandings.

Year	Number Dead from Natural or Unknown Causes	Number of Belugas per Live Stranding Event* (# associated known mortalities)
1994	10	186 (0)
1995	3	0
1996	12	63(0), 60(4), 25(1), 1(0), 15(0)
1997	3	0
1998	10	30(0), 5(0)
1999	12	58(5), 13(0)
2000	13 (2 predations)	8(0), 17(0), 2(0)
2001	10	0
2002	13	0
2003	20 (1 predation)	2(0), 46(5), 26(0), 32(0), 9(0)
2004	13	N/A
2005	6	7(1)
2006	8	12(0)
2007	15	0
2008	11 (1 predation)	28(0), 30(0)
2009	4	17-20 (0)
2010	5 (1 predation)	11(0), 2(0)
2011	3	2(0)
2012	3	12(0), 23(0), 3(0)
Total	179	735-738 (16)

Table 31. Cook Inlet beluga strandings investigated by NMFS (Vos and Shelden 2005; Hobbs and Shelden 2008, NMFS unpublished data). * Harvested beluga are not included in the number dead.

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 now include 18 reported sightings from 1985-2002 (Shelden et al. 2003).

The most recent predation event that was reported in the upper Inlet in June 2010, where an adult beluga carcass discovered near Point Possession showed evidence of possible predation.

STATUS OF STOCK

The Cook Inlet beluga whale stock was designated as "depleted" under the MMPA (65 FR 34590, May 21, 2000), and on October 22, 2008, NMFS listed Cook Inlet belugas as endangered under the ESA. Therefore, the Cook Inlet beluga whale stock is considered a strategic stock. There are no fisheries observers in Cook Inlet and there have been no voluntary reports of beluga mortalities in U. S. commercial fisheries. Thus, annual mortality levels are considered insignificant and approaching zero mortality and serious injury rate for commercial fisheries, although the incompleteness of fisheries data for fisheries operating within the range of Cook Inlet beluga is a concern for this small population. NMFS convened a Recovery Team consisting of a Scientific Panel and Stakeholder Panel, which submitted a draft Recovery Plan for Cook Inlet beluga whales in March 2013. (http://www.fakr.noaa.gov/protectedresources/whales/beluga/recovery/ci.htm). NMFS will consider revisions to the draft Recovery Plan, seek public comment, and then finalize the Recovery Plan in 2014.

Habitat Concerns

Based on visual observations and satellite tagging, the distribution of Cook Inlet belugas during the ice-free summer period is currently restricted to the upper inlet, especially the Susitna Delta, Knik Arm, and Chickaloon Bay (Rugh et al. 2000, 2005, 2010; Goetz et al. 2007). During the ice-covered winter period, belugas are distributed in the deeper water areas of the upper inlet and mid-inlet (Hobbs et al. 2005). With the very restricted range of this stock, Cook Inlet beluga are vulnerable to human-induced or natural perturbations within their preferred habitat. Although the best available information indicated that human activities, including those associated with oil and gas development, were not a contributing factor in the stock becoming in danger of extinction (65 FR 38778; 22 June 2000), potential effects from human activities impeding on beluga recovery remain a concern (73 FR 62919, 22 October 2008). Additional effects that have the potential to impact this stock and its habitat include: changes in prey availability due to natural environmental variability, ocean acidification, and commercial fisheries; climatic changes affecting habitat; competition with fisheries; increased predation by killer whales; contaminants; noise; vessel traffic; waste management; urban runoff; construction projects; and physical habitat modifications that may occur as Cook Inlet becomes increasingly urbanized (Moore et al. 2000, Lowry et al. 2006). As part of the NMFS Recovery Plan for Cook Inlet Beluga Whales, acoustic threats are being evaluated and a list of actions will be proposed to better understand the impact of anthropogenic noise on Cook Inlet Belugas, fill the gaps in knowledge and improve mitigation. A photogrammetric study by Kaplan et al. (2009) recorded a few instances where belugas had probably been struck by boat propellers or ships. Projects planned that may alter the physical habitat include a highway bridge across Knik Arm, construction and operation of a coal mine near Chuitna River; oil and gas exploration and development, as well as planned 3-D seismic surveys; and expansion and improvements to the Port of Anchorage. Beluga whale critical habitat includes two geographic areas of marine habitat in Cook Inlet that comprise 7,800 km^2 (3,013 mi^2), excluding waters by the Port of Anchorage (76 20180, 11 April 2011).

CITATIONS

Angliss, R. P. and D. P. DeMaster. 1998. Differentiating Serious and Non-Serious Injury of Marine Mammals Taken Incidental to Commercial Fishing Operations. NOAA Tech Memo. NMFS-OPR-13, 48 p.

Andersen, M. S., K. A. Forney, T. V. N. Cole, T. Eagle, R. Angliss, K. Long, L. Barre, L. Van Atta, D. Borggaard, T. Rowles, B. Norberg, J. Whaley, and L. Engleby. 2008. Differentiating Serious and Non-Serious Injury of Marine Mammals: Report of the Serious Injury Technical Workshop, 10-13 September 2007, Seattle, Washington. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-39. 94 p.

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.

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.

Goetz, K.T., D. J. Rugh, A. J. Read, and R. C. Hobbs. 2007. Summer habitat preferences of beluga whales (*Delphinapterus leucas*) in Cook Inlet, Alaska. Mar. Ecol. Prog. Ser. 330:247-256.

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 Rep. OCS Study. MMS 99-0024. U.S. Dep. Int., Minerals Manage. 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.

Hobbs, R.C., K. L. Laidre, D. J. Vos, B. A. Mahoney, and M. Eagleton. 2005. Movements and area use of belugas, *Delphinapterus leucas*, in a subarctic Alaskan estuary. Arctic 58(4):331-340.

Hobbs, R. C., and K. E. W. Shelden. 2008. Supplemental status review and extinction assessment of Cook Inlet belugas (*Delphinapterus leucas*). AFSC Processed Rep. 2008-08, 76 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

Hobbs, R. C., C. L. Sims, and K. E. W Shelden. 2012. Estimated abundance of belugas in Cook Inlet, Alaska, from aerial surveys conducted in June 2012. NMFS, NMML Unpublished Report. 7 pp. Available at: http://alaskafisheries.noaa.gov/protectedresources/whales/beluga/abundance/2012estimates.pdf

Hobbs, R.C., J. M. Waite, and D.J. Rugh. 2000a. Beluga, *Delphinapterus leucas*, group sizes in Cook Inlet, Alaska, based on observer counts and aerial video. Mar. Fish. Rev. 62(3):46-59.

Hobbs, R.C., J. M. Waite, and D.J. Rugh. 2000b. Abundance of beluga whales, *Delphinapterus leucas*, in Cook Inlet, Alaska, 1994-2000. Mar. Fish. Rev. 62(3):37-45.

Kaplan, C.C., T.L. McGuire, M.K. Blees, and S.W. Raborn. 2009. Longevity and causes of marks seen on Cook Inlet Beluga Whales. Chapter 1 *In*: Photo-identification of beluga whales in Upper Cook Inlet, Alaska: Mark analysis, mark-resight estimates, and color analysis from photographs taken in 2008. Report prepared by LGL Alaska Research Associates, Inc., Anchorage, AK, for National Fish and Wildlife Foundation, Chevron, and ConocoPhillips Alaska, Inc. 32 p.

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., O'Corry-Crowe, G., and Goodman, D. 2006. *Delphinapterus leucas* (Cook Inlet population). In: IUCN 2006. 2006 IUCN Red List of Threatened Species.

Lowry, L. F., K. J. Frost, A. Zerbini, D. DeMaster, and R. R. Reeves. 2008. Trend in aerial counts of beluga or white whales (*Delphinapterus leucas*) in Bristol Bay, Alaska, 1993-2005. J. Cetacean Res. Manage. 10:201-207.

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.

Manly, B. F. J. 2006. Incidental catch and interactions of marine mammals and birds in the Cook Inlet salmon driftnet and setnet fisheries, 1999-2000. Report to the NMFS Alaska Region. 98 pp. (Available online: http://www.fakr.noaa.gov/protectedresources/observers/bycatch/1999-2000cookinlet.pdf)

Moore, S. E., K. W. Shelden, D. J. Rugh, B. A. Mahoney, and L. K. Litzky. 2000. Beluga, *Delphinapterus leucas*, habitat associations in Cook Inlet, Alaska. Mar. Fish. Rev. 62(3):60-80.

NOAA. 2012. Federal Register 77:3233. National Policy for Distinguishing Serious From Non-Serious Injuries of Marine Mammals. http://www.nmfs.noaa.gov/op/pds/documents/02/238/02-238-01.pdf.

O'Corry-Crowe, G. E., A. E. Dizon, R. S. Suydam, and L. F. Lowry. 2002. Molecular genetics studies of population structure and movement patterns in a migratory species: The beluga whale, *Delphinapterus leucas*, in the western neoarctic. Pp. 464 *In* C. J. Pfeiffer (ed.), Molecular and cell biology of marine mammals. Kreiger Publishing Company. Malabar, Florida.

O'Corry-Crowe, G., W. Lucey, C. Bonin, E. Henniger, and R. Hobbs. 2006. The ecology, status, and stock identify of beluga whales, *Delphinapterus leucas*, in Yakutat Bay, Alaska. Report to the U.S. Marine Mammal Commission. 22pp.

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.

Rugh, D. J., B. A. Mahoney, and B. K. Smith. 2004. Aerial surveys of beluga whales in Cook Inlet, Alaska, between June 2001 and June 2002. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-AFSC-145.

Rugh D. J., K. E. W. Shelden, R. C. Hobbs. 2010. Range contraction in a beluga whale population. Endangered Species Research 12:69-75.

Rugh, D.J., K. E. W. Shelden, C. L. Sims, B. A. Mahoney, B. K. Smith ,L. K. Litzky, and R. C. Hobbs. 2005. Aerial surveys of belugas in Cook Inlet, Alaska, June 2001, 2002, 2003, and 2004. NOAA Tech Memo. NMFS-AFSC-149. 71 pp.

Shelden, K. E. W., D. J. Rugh, B. A. Mahoney, and M. E. Dahlheim. 2003. Killer whale predation on belugas in Cook Inlet, Alaska: Implications for a depleted population. Mar. Mammal Sci. 19(3):529-544.

Vos, D., and K.E.W. Shelden. 2005. Unusual mortality in the depleted Cook Inlet beluga (*Delphinapterus leucas*) population. Northwest. Nat. 86:59–65.

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.