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BELUGA WHALE (*Delphinapterus leucas*): Beaufort 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 summer concentrations in upper Cook Inlet, Bristol Bay, the eastern Bering Sea (i.e., Yukon Delta, Norton Sound), eastern Chukchi Sea, and the Mackenzie Delta (Hazard 1988). Satellite transmitters on a few whales from the Beaufort Sea, Chukchi Sea and Eastern Bering Sea stocks have lasted through the winter demonstrating that beluga whales from these summering areas overwinter in the Bering Sea and the stocks may use separate wintering locations (Suydam 2009; ABWC, unpublished data). Belugas found in Bristol Bay and the northern Gulf of Alaska/Cook Inlet remain in those areas throughout the year (Shelden 1994, Quakenbush 2003, NMFS and ADF&G unpublished data). Seasonal distribution is affected by ice cover, tidal conditions, access to prey, temperature, and human interaction (Lowry 1985).

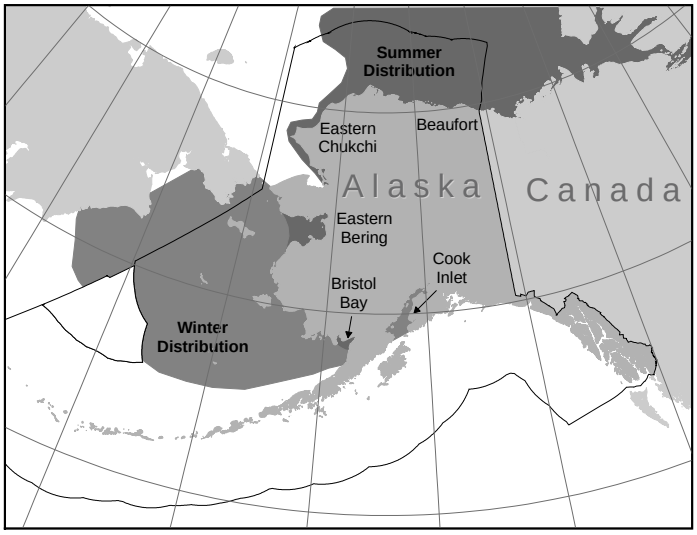

Figure 1. Approximate distribution of beluga whales in Alaska waters. The dark shading displays the summer distribution of the five stocks. Winter distributions are depicted with lighter shading.

The general distribution pattern for beluga whales shows major seasonal changes. During the winter, they occur in offshore waters associated with pack ice. In the spring, they migrate to warmer coastal estuaries, bays, and rivers where they may molt (Finley 1982, Suydam 2009) and give birth to and care for their calves (Sergeant and Brodie 1969). Annual migrations can be more than thousands of kilometers (Richard et al. 2001).

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); 2) Population response data: distinct population trends between regions occupied in summer; 3) Phenotypic data: unknown; and 4) Genotypic data: mitochondrial DNA analyses indicate distinct differences among the five summering areas (O'Corry-Crowe et al. 1997). Based on this information, 5 beluga whale 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 (Fig. 1).

POPULATION SIZE

The sources of information to estimate abundance for belugas in the waters of northern Alaska and western Canada have included both opportunistic and systematic observations. Duval (1993) reported an estimate of 21,000 belugas for the Beaufort Sea stock, similar to that reported by Seaman et al. (1985). The most recent aerial survey was conducted in July 1992, and resulted in an estimate of 19,629 (CV = 0.229) beluga whales in the eastern Beaufort Sea (Harwood et al. 1996). To account for availability bias a correction factor (CF), which was not data-based, has been recommended for the Beaufort Sea beluga whale stock (Duval 1993), resulting in a population estimate of 39,258 (19,629 × 2) animals. A coefficient of variation (CV) for the CF is not available; however, this CF was considered negatively biased by the Alaska SRG considering that aerial survey CFs for this species have been estimated to be between 2.5 and 3.27 (Frost and Lowry 1995). Additionally, the 1992 surveys did not encompass the entire summer range of Beaufort Sea belugas (Richard et al. 2001), thus are negatively biased.

Minimum Population Estimate

For the Beaufort Sea beluga whale stock, the minimum population estimate (N_{MIN}) is calculated according to Equation 1 from the PBR Guidelines (Wade and Angliss 1997). Thus, $N_{MIN} = N/\exp(0.842\times[\ln(1+[CV(N)]^2)]^{½})$. Using the population estimate (N) of 39,258 whales and an associated CV(N) of 0.229, N_{MIN} for this stock is 32,453 whales. Because the survey data are more than 8 years old, it would not be considered a reliable minimum population estimate for calculating a PBR and N_{MIN} would be considered unknown. However, trend data from Harwood and Kingsley (2013) indicate the stock is at least stable or increasing; therefore, the Alaska SRG recommended at the 2014 meeting that NMFS retain the N_{MIN} estimate of 32,453 whales.

Current Population Trend

The current population trend of the Beaufort Sea stock of beluga whales is stable or increasing. Recent and historical aerial surveys off the Mackenzie River Delta indicate that the stock is at least stable or increasing (Harwood and Kingsley 2013). There are no data to suggest the stock is declining.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is currently unavailable for the Beaufort Sea beluga whale stock. Hence, until additional data become available, it is recommended that the default maximum theoretical net productivity rate (R_{MAX}) for cetaceans 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: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. As the stock trend is at least stable, the recovery factor (F_R) for this stock is 1 (Wade and Angliss 1997). Thus, using the abundance estimate calculated from 1992 surveys, the PBR for the Beaufort Sea beluga whale stock would be calculated to be 649 animals (32,453 × 0.02 × 1.0). The 2005 revisions to the SAR guidelines (Wade and Angliss 1997) state that abundance estimates older than 8 years should not be used to calculate PBR due to a decline in confidence in the reliability of an aged abundance estimate. However, the recent trend data suggest that the stock is at least as large as it was during the last estimate of N_{MIN}; thus the 1992 estimate of N_{MIN} = 32,452 whales is sufficient to use for a PBR calculation. Therefore, the PBR for this stock is 649 (NMFS 2005).

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

The total fishery mortality and serious injury for this stock is estimated to be zero as there are no reports of mortality incidental to commercial fisheries.

Subsistence/Native Harvest Information

The subsistence take of beluga whales from this stock within U.S. waters is reported by the Alaska Beluga Whale Committee (ABWC). The most recent Alaska Native subsistence harvest estimates for the Beaufort Sea beluga stock are provided in Table 1 (Alaska Beluga Whale Committee, unpubl. data 2012). Given these data, the annual subsistence take by Alaska Native hunters averaged 65.6 belugas during the 5-year period from 2008 to 2012.

Table 1. Summary of beluga whales from the Beaufort Sea beluga whale stock landed by Alaska Native subsistence hunters, 2008-2012. Total taken includes landed and struck and lost in years 2010-2012; struck and lost data for 2008 and 2009 have not been quantified and are minimum counts.

Year	Harvested whales	Struck and lost whales	Reported total number taken
2008	48	N/A	48
2009	16	N/A	16
2010	71	1+	72
2011	42	6	48
2012	92	42+	144
Mean annual number of animals landed (2008-2012)			65.6+

The subsistence take of beluga whales within the Canadian waters of the Beaufort Sea is reported by the Fisheries Joint Management Committee (FJMC). The data are collected by on-site harvest monitors conducted by the FJMC at Inuvialuit communities in the Mackenzie Delta, Northwest Territories. The Canadian Inuvialuit subsistence harvest estimates for the Beaufort Sea beluga stock are provided in Table 2 (data for 2005 to 2009 from FJMC Beluga Monitor Program, Fisheries Joint Management Committee, Inuvik, NT, Canada). Given these data, the annual subsistence take in Canada averaged 100 belugas during the 5-year period from 2005 to 2009. Thus, the mean estimated subsistence take in Canadian (2005-2009) and U.S. (2008-2012) waters from the Beaufort Sea beluga stock is 166 (100 + 65.6) whales.

Table 2. Summary of the Canadian subsistence harvest from the Beaufort Sea stock of beluga whales, 2005-2009. N/A indicates the data are not available.

Year	Reported total number taken
2005	108
2006	126
2007	82
2008	81
2009	102
Mean annual landed (2005-2009)	100

STATUS OF STOCK

Beaufort Sea beluga whales are not designated as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. There are no reported fisheries mortalities, thus the estimated annual U.S. commercial fishery-related mortality is zero (0). The total mean annual human-caused mortality estimate is 166 based on the known subsistence harvest in the United States (65.6) and Canada (100). Because the PBR is less than 10% of PBR (65), the level of annual U.S. commercial fishery-related mortality is considered insignificant and approaching zero mortality and serious injury rate. Although the abundance estimates are more than 8 years old, since there are no records of incidental mortality in commercial fisheries, the level of incidental mortality and serious injury is considered to be insignificant. The Beaufort Sea beluga stock is classified as a non-strategic stock. At this time it is not possible to assess the status of this stock relative to its Optimum Sustainable Population size.

HABITAT CONCERNS

Evidence indicates that the Arctic climate is changing rapidly and significantly, and one result of this change is a reduction in the extent of sea ice in at least some regions (ACIA 2004, Johannessen et al. 2004). These changes are likely to affect marine mammal species in the Arctic. Ice-associated animals, such as the beluga whale, may be sensitive to changes in Arctic weather, sea-surface temperatures, or ice extent, and the concomitant effect on prey availability. Currently, there are insufficient data to make reliable predictions of the effects from Arctic climate change on beluga whales, but Laidre et al. (2008) and Heide-Jørgensen (2010) concluded that on a worldwide basis belugas were likely to be less sensitive to climate change than other Arctic cetaceans because of their wide distribution and flexible behavior. Increased human activity in the Arctic, including increasing oil and gas

exploration and development, and increased nearshore development, have the potential to impact beluga whale habitat (Moore et al. 2000, Lowry et al. 2006). However, predicting the type and magnitude of the impacts is difficult at this time.

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