

UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

IN THE MATTER OF:
PROPOSED REGULATION GOVERNING
THE TAKING OF COOK INLET, ALASKA, BELUGA
WHALES BY ALASKA NATIVES

DECLARATION OF DR. RODERICK HOBBS, Ph.D.

I, DR. Roderick Hobbs, declare:

1. I am currently Leader of the Beluga Task of the Cetacean Assessment and Ecology Program at the National Marine Mammal Laboratory (NMML), Alaska Fisheries Science Center (AFSC), National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), which is located in Seattle, Washington. Most of my professional training has been in the fields of quantitative ecology and population dynamics. I have worked on abundance estimation and the population dynamics of marine mammals since receiving my Ph.D. in 1992 from the Graduate Group in Ecology, University of California at Davis. My Ph.D. dissertation was on the population dynamics of the Dungeness crab. A resume is attached.
2. I have conducted considerable research on beluga whales since 1993. I have 4 scientific, peer-reviewed publications and over 20 reports on beluga whales and have served as a member of the Alaska Beluga Whale Committee (ABWC) since 1995. I have served as a member of the Beluga and Narwhal Scientific Subcommittee of the North Atlantic Marine Mammal Commission since 2000. Further, I have participated in aerial surveys for belugas in Cook Inlet, Bristol Bay, and the eastern Chukchi Sea. I am the lead analyst for abundance estimates of the Cook Inlet population and have worked closely with researchers from the Alaska Department of Fish and Game to complete estimates for other beluga populations in Alaska. I also have conducted field experiments to study the movements and dive behavior of beluga in Cook Inlet.
3. From July 2003 to January 2004, I corresponded by phone and e-mail with Dr. Daniel Goodman and Dr. Andre Punt as part of a technical review team charged with reviewing data and population models for the purpose of developing a long-term harvest policy consistent with recovery of the Cook Inlet beluga population. This Technical Committee presented reports at a meeting in Seattle in September 2003 and Anchorage in December 2003.
4. Regarding the status of the Cook Inlet population of beluga whales, the population in 2003 was estimated to include 357 animals (NMFS unpublished data). A conservative estimate of abundance (as defined in the MMPA) based on the 2003 survey data is 326 (i.e., 20% percentile estimate from the abundance distribution). Since the harvest moratorium in 1999, point estimate of abundance for this population have been 367 (1999), 435 (2000), 386 (2001) and 313 (2002). None of these estimates over the past 5 years are significantly different from the estimate for 2003 in a statistical sense. The technique used to estimate abundance is described in Hobbs, Rugh, and DeMaster (2000) and Hobbs, Waite and Rugh (2000). Annual estimates were based on 1) counts of whales made by aerial observers in three geographical strata in Cook Inlet, 2) group size estimates made from aerial video recordings, 3) estimates of the fraction of time that whales are available to be counted using dive interval data from tagging studies, and 4) the estimated probability of missing entire groups based on sightings by a second independent observer in the survey aircraft. The coefficient of variation for the annual abundance estimates since 1999 varied between 0.09 and 0.29.
5. The technical Committee reviewed population projection models used in the past for this population and settled on the following model for projecting the abundance of the population.

The projection model is written algebraically as:

$$N_{t+1} = (N_t - H_t)(1 + (R_{max})(1 - ((N_t - H_t)/K)z))$$

With:

Abundance (Nt) calculated from the previous year;

Harvest (Ht) in year t;

Annual growth rate (Rmax)

and fixed values for other parameters (K =1,300 and Z =2.39). K is the estimated carrying capacity (1,300 belugas in Cook Inlet) .

This model calculates the abundance in each year from the abundance in the previous year with a minimum number of parameters. This formulation of the population projection model was used in three analyses necessary to determine the harvest levels in the harvest table.

6. The Technical Committee further agreed to use a fixed value of 1,300 belugas as the carrying capacity for this stock for the purpose of this population modeling effort to develop a harvest plan. The carrying capacity was estimated from the highest recorded count of belugas in Cook Inlet (479 whales counted in 1979; Calkins 1989) and the correction factor from Frost et al. (1985). At this time, this is the best available estimate of carrying capacity for Cook Inlet beluga whales. It should be recognized that considerable uncertainty is associated with this point estimate. As research continues there may be sufficient data to provide alternate methods for estimating this parameter, however for the purposes of the current modeling effort, a fixed value of 1,300 was considered reasonable.

7. The long term harvest plan and the logic behind it is presented as described in the document filed with the court on May 3, 2004. This document was prepared in late April 2004 and included a table relating harvest levels as strikes per five year period using estimated 5-year averages of population abundance estimates and the trend in the abundance estimates over the previous 10 years. This table was developed using a computer program described in the technical notes. This computer program was distributed to Drs. Goodman and Punt with the harvest plan at the end of April. On June 29, I received an e-mail from Dr. Punt indicating that he had found two errors in the program. One of these errors made no difference but the other resulted in significant changes in the table. The nature of the error is described below and the new table is presented here with the changed values in bold font.

Lower Limit	Upper Limit	Increasing Trend	No Trend	Declining Trend
0	259	0	0	0
260	299	5	5	
300	349	9	7	
350	399	9	8	
400	449	10	9	
450	499	12	9	
500	549	12	11	
550	599	12	11	11
600	649	12	11	11
650	699	12	12	12
700	779	12	12	12

Note that all of the changes occurred in the declining trend column.

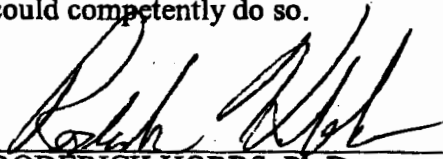
8. In a review of the risks associated with small population size, NMFS determined that a harvest from a population of 200 or fewer whales could represent an irreplaceable loss to the genetic diversity of the population. To put this limit into practice, the projection model was used estimate the distribution of 5 year averages of abundance estimates that could result in a harvest from a population of 200 or fewer when the population was declining with R_{max} between -0.02 and -0.10. This limit is a population size of 260.

9. To use the observed trend in abundance as a A trigger for setting the harvest level, NMFS chose to consider three cases: 1) an increasing population with R_{max} between 0.02 and 0.06 and archetype, $R_{max} = 0.04$; 2) a population with no apparent trend or a zero trend with R_{max} between -0.02 and 0.02 and archetype, $R_{max} = 0.00$; and 3) a population with a declining trend with R_{max} between -0.02 and -0.10 and archetype, $R_{max} = -0.04$. The number of years of data necessary to distinguish a population with R_{max} equal to the Archetypes for cases 1 and 3 from case 2 turned out to be ten years, so the trend from the previous ten years of abundance estimates was used as the indicator that the trend was different from the "no trend case."

10. With the determination of the lower bound of a population size for which a harvest would be allowed, and with a method for assessing the trend, it was possible to develop a model of the population with a harvest level determined by the abundance time series using the population projection model above. This projection continues until the population size exceeds 780 and is considered to be recovered. Following the harvest plan, every 5 years the program determines the trend category for the previous 10 years and estimates the average abundance for the previous 5 years. These values are used to set the harvest level for the next 5 years using the lookup table developed in the program. The delay in recovery is calculated from the time to recovery in the harvested and unharvested population projections. For each population size class and trend case, this process is repeated 100,000 times, and the fraction of times that the delay is greater than 0.25 is noted. If this fraction is greater than 0.05, the allowable 5-year harvest is reduced by one animal. If the fraction is less than 0.05, the allowable 5-year harvest is increased by one animal, and the new value is tested to determine if it still meets the 0.05 criterion. The error occurred at the point in the program where the harvest level was found in the lookup table. In essence the program was giving a harvest value in the "no trend" column when it should have been giving values in the "declining trend" column for tests of values in the declining trend column. Consequently, the program would incorrectly adjust the harvest values in the declining trend column downward each time the criterion was not met when using the value from the no trend column. This error has been corrected, and the analysis rerun to produce the corrected table above.

11. Pursuant to 28 U.S.C. Section 1746, I swear under penalty of perjury that the foregoing is true and correct and that if called upon to testify, could competently do so.

Dated: 15 July 2004


RODERICK HOBBS, Ph.D.

Literature Cited

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Frost, K. J., L. F. Lowry, and R. R. Nelson. 1985. Radiotagging studies of belukha whales (*Delphinapterus leucas*) in Bristol Bay, Alaska. *Mar. Mam. Sci.* 1(3):191-202.

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