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Iqaluit

SUBMISSION TO THE NUNAVUT WILDLIFE MANAGEMENT BOARD

FOR

Information: X **Decision:**

Issue: DFO analysis of bowhead whale abundance and stock identity and interim advice regarding TAH of bowhead whales.

Background:
This is a follow-up to an information note submitted to NWMB in October 2005.

Since the settlement of the Nunavut land claim, DFO (Central and Arctic region) has conducted research on eastern Arctic bowhead whales, in support of wildlife management requirements. This research includes studies on bowhead whale abundance, long range movements, and genetic characteristics for stock identification, The results of this research suggests to DFO that the bowhead whales in the eastern Arctic are wide-ranging and belong to one stock. Papers for scientific publication are in preparation that summarize the results of this research.

DFO presented the results of the scientific research at the International Whaling Commission meetings in June 2006. At this meeting, the research was praised for the extent of the scientific work done over the relatively short time, but the conclusions regarding a single stock of bowhead whales and the abundance estimate were not endorsed in 2006. The main reasons for this lack of acceptance of DFO's conclusions were a lack of sufficient detail and clarity in the way the data was analyzed and criticism of some of the methods. It was recommended that revised and more detailed analyses be presented to IWC in 2007 at which time the evidence for a single stock and abundance would be considered.

DFO is presently preparing a more detailed account of the genetics and survey analysis. This information will be reviewed by a Canadian committee of marine mammal scientists (NMMPRC: the National Marine Mammal Peer Review Committee) and by the Bowhead Recovery team, prior to presentation at the next IWC meeting in May 2007.

Provisional Calculation of TAH
Pending more complete acceptance of abundance estimates and stock identity, an interim calculation of TAH is described here. For species considered endangered, a formula called PBR (Potential Biological Removal), developed by Wade (1998) is frequently used to calculate allowable human-induced removals from the population. PBR provides a conservative approach to estimating sustainable removal rates (Hammill and Stenson 2003) allowing the population to remain stable or increase in abundance.

PBR is estimated as follows:

$$PBR = N_{min} (1/2\ R_{max}\ F_R) \quad \text{where,}$$

N_{min} = 20th percentile of the abundance estimate
R_{max} = the expected maximum net recruitment rate (4% per year for cetaceans; Wade 1998), divided by 2 to account for the event that maximum net recruitment rate is not realized.

F_R = a recovery factor used as an additional safety factor to account for unknown biases or estimation problems. F_R = 0.1 for endangered, F_R = 0.5 for threatened.

Until the analysis of survey abundance and stock identity has been resolved, the most conservative and conservation minded approach is to use the PBR calculation for an endangered status. Using an abundance estimate of 7309 whales, the results of the PBR indicate that a total human-induced loss of 10 animals from the population would be sustainable. This includes all anthropogenic mortality including harvest, ship strikes, struck and lost and net entanglement mortalities, etc.

Conclusions
Until such time as the population estimates have been accepted scientifically by Canadian and international peers, DFO-Science C&A recommends that the most conservative approach be used to estimate the harvest level for bowheads. Based on the PBR calculation described above, the Eastern Arctic population of bowheads would be able to support 10 anthropogenic (human caused) mortalities annually. Bowhead deaths caused by human activities (e.g. net entanglements, ship strikes, hunting losses) must not exceed 10 animals per year. This does not include dead beached or floating whales where the cause of death is deemed to have occurred by natural causes such as disease or predation (e.g. killer whales).

Changes resulting from a re-analysis of the survey data or as a result of changes to our assumptions of stock identity may change this advice. However, because the advice given here is conservative and because the abundance estimate is based on only a portion of the bowhead range, it is unlikely that future recommendations for a total annual allowable removal will decrease below 10 animals.

Consultations:
Preliminary analyses of the survey, genetics and tagging results were presented and discussed at the bowhead workshop held in Iqaluit in April 2006. Further details of this work will be reviewed at the Bowhead Recovery Planning Meeting in March 2007.

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Appendix A

Summary of Aerial Survey Abundance Estimation and Calculation of PBR

In 2002 to 2004, aerial surveys were conducted in the eastern Arctic to estimate the size of the current bowhead population. In 2002, the surveys covered Eclipse Sound and most of Prince Regent Inlet and Gulf of Boothia. In 2003, the surveys covered Admiralty Inlet, the east Baffin Island coast, southern Gulf of Boothia, western Foxe Basin and north-western Hudson Bay. In 2004, the surveys covered Eclipse Sound, Admiralty Inlet and Barrow Strait, but too few sightings were made to estimate abundance. The surveys were conducted using parallel line transects that were spaced from 23 to 55 km apart.

The largest estimates of numbers from initial analyses of these surveys were based on sightings of whales in 2002 in the Eclipse Sound, Prince Regent Inlet and Gulf of Boothia regions. A total of 31 bowhead whales were counted during this survey, based on 21 separate sightings. With adjustments for unsurveyed areas between transects and for diving whales, the resulting estimate for this region was 7,309 bowheads (95% CI = 3,161-16,900).

The calculation of Potential Biological Removal (PBR) for preliminary aerial survey estimates are summarized in the Table 1 below.

Table 1. A summary of preliminary aerial survey estimates and PBR calculations for individual survey areas. PBRs are calculated for COSEWIC status of endangered and threatened. The mean proportion of time at the surface used for the calculations was 0.253 (on average, bowheads spent approximately one quarter of their time at the surface).

Survey area	Surface estimate	Dive-corrected estimate	N_{min}	PBR (threatened)	PBR (endangered)
Prince Regent Inlet, Gulf of Boothia, Eclipse Sound (2002)	1847	7309	5091	51	10
Gulf of Boothia, Foxe Basin and northern Hudson Bay (2003)	248	981	607	6	1
Admiralty Inlet and eastern Baffin Island (2003)	462	1828	1373	14	3