Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaskan Eskimos during 2011

[1]Robert Suydam, [1]John C. George, [1]Brian Person, [1]Cyd Hanns, [1]Raphaela Stimmelmayr, Leslie [1]Pierce and [2]Gay Sheffield

[1] Department of Wildlife Management, North Slope Borough, Box 69, Barrow, AK 99723 USA
[2] University of Alaska Fairbanks, Marine Advisory Program, Box 400, Nome, AK 99762 USA
Contact email: robert.suydam@north-slope.org

ABSTRACT

In 2011, 51 bowhead whales (*Balaena mysticetus*) were struck during the Alaskan subsistence hunt resulting in 38 animals landed. Total landed and efficiency (# landed / # struck) of the hunt (75%) for 2011 was similar to the past 10 years (2001-2010: mean of landed = 40.0; *SD* = 7.8: mean of efficiency = 76%; *SD* = 0.08%). Total mortality for 2011 was estimated at 49 animals after the estimated fate of the struck and lost whales was considered. Spring hunts are logistically more difficult than autumn hunts because of severe environmental conditions and sea ice dynamics. Typically, hunt efficiency during spring is lower than autumn. In 2011, the efficiency of the spring hunt (69%) was lower than the autumn hunt (82%). This was due in part to difficult environmental conditions during spring, unanticipated equipment failures, and that struck whales were lost under ice. Of the landed whales, 20 were females, 16 were males, and sex was not determined for two animals. Based on total length, eight of the 20 females were presumed mature (>13.4 m in length). Two of the seven mature females that were examined were pregnant. A 17.5 m female landed in the spring at Barrow was pregnant based on the presence of a large corpus luteum (~20 cm in diameter) although a fetus was not detected because it was not possible to examine the uterus. A 15.9 m female landed at Nuiqsut in the autumn was carrying a ~1.5m fetus (sex not determined).

KEYWORDS: ARCTIC; *BALAENA MYSTICETUS*; BOWHEAD WHALE; STATISTICS; WHALING-ABORIGINAL

INTRODUCTION

The subsistence harvest of bowhead whales (*Balaena mysticetus*) meets an important nutritional and cultural need for several Native communities in northern and western Alaska (United States) and eastern Chukotka (Russia). The Alaska Eskimo Whaling Commission (AEWC), comprised of 11 communities, locally manages the Alaskan harvest through an agreement with the U.S. National Oceanic and Atmospheric Administration (NOAA). The level of allowable harvest is determined under a quota system in compliance with the International Whaling Commission (IWC, 1980; Gambell, 1982). The quota is based on the nutritional and cultural needs of Alaskan Eskimos as well as on estimates of the size and growth of the Bering-Chukchi-Beaufort seas stock of bowhead whales (Donovan, 1982; Braund, 1992). Whales were harvested in 2011 under a five-year block quota that began in 2008 (IWC, 2008).

The subsistence hunt typically occurs during spring and autumn as whales generally migrate between the Bering and Beaufort seas. Hunters on St. Lawrence Island in the northern Bering Sea may harvest whales during the winter (i.e., December and January) as well. Bowhead harvests are subjected to considerable environmental interference from weather (wind speed and direction, fog, and temperature), stability of

landfast ice, and sea ice concentration and type. The success of each hunt is greatly affected by these factors and shows considerable annual and regional variation.

Since 1981, the North Slope Borough Department of Wildlife Management has gathered basic data on landed whales in several communities, especially Barrow. Additionally, with assistance from the UAF-Marine Advisory Program and previously with the Alaska Department of Fish and Game, we have collected detailed information and tissue samples from harvested whales landed at Kaktovik, Gambell and Savoonga on Saint Lawrence Island, and other villages in recent years. We assisted the AEWC in compiling statistics on landed and struck and lost whales (Albert, 1988). The objectives of this paper were to document: (1) the number, location (village), and dates of landed and struck-and-lost bowhead whales during 2011 in Alaska, (2) the estimated fate of struck and lost bowhead whales, (3) basic morphometric data and the sex composition of the harvest, (4) the hunting efficiency of the harvest, and (5) relevant additional observations (hunting conditions, unusual pathology, etc.).

METHODS

Harvest data on sex, standard length, harvest and landed dates, as well as fate of struck and lost whales for all whaling villages were obtained from the AEWC. Biologists recorded similar information for most whales taken at Barrow, Gambell, Savoonga, and Kaktovik. Biologists also collected tissue samples and detailed morphometric data.

We estimated the approximate animal age and reproductive status based on several published criteria. Females with a total body length that is greater than 13.4 m in length are considered to be sexually mature; however, females shorter than this can be pregnant and females greater in length can be immature (George *et al*. 2004). Previously, we assumed sexual maturity at a total length of 14.2 m for females (Tarpley and Hillmann, 1999). Males with a total body length greater than 13 m are considered to be sexually mature (O'Hara *et al*., 2002).

RESULTS AND DISCUSSION

During 2011, 51 whales were struck during the Alaskan subsistence hunt. The total number of whales landed (n = 38) in 2011 was similar to the average number of whales landed (per year) over the previous 10 years (2001-2010: mean = 40.0 whales; *SD* = 7.8).

Spring Hunting Conditions

Hunting conditions during spring 2011 were again problematic throughout the northern and western Alaskan coast. Ice and weather conditions prevented hunters from Little Diomede, Wales, and Kivalina from striking a whale. A total of 20 bowheads were landed during the spring (Table 1).

Gambell and Savoonga, communities on Saint Lawrence Island in the Bering Sea, landed four and two whales, respectively, during April. Sea ice was typically less extensive and relatively thin near Saint Lawrence Island during spring 2011. Shorefast ice was noticeably absent in several locations and the ice available for hauling up and butchering whales was weak/thin – or non-existent. Additionally, based on the timing, numbers, and locations of whales observed during spring 2011, there were several local seasonal migratory paths (Noongwook et al. 2007) whereby many northbound whales bypassed Southwest Cape and passed closer nearshore at the northwestern end of the island. This resulted in fewer whales being available to Savoonga hunters who hunt at Southwest Cape in the spring.

Point Hope and Wainwright, on the coast of the Chukchi Sea, each landed three animals between 22 April and 24 May. Point Lay landed a whale in mid-May.

In Barrow, seven whales were landed during the spring from 26 April to 22 May. The hunting and butchering conditions were some of the worst seen in years. The landfast ice at Barrow was very rough and broken due to a major west wind storm on 17 February 2011. Wind speeds peaked at over 70 kmh. Mr. Johnny Aiken, Executive Director of the AEWC, described the ice as follows:

> *"The shorefast ice is in terrible condition this year; there's only one place to* [hunt for a] *whale. Jumble ice along the edge is pervasive along the coast and limits the areas where people can whale. One of the worst years for landfast ice in decades."*

The storm crushed up the landfast ice ~ 1km shoreward of the lead edge. It created a long *agiukpuk* (ice wall) several meters high from Point Barrow to at least 50 km SW of Barrow (Figure 1). Trail building to access the leads was long and tedious.

Autumn Hunting Conditions

Eighteen whales were landed by four villages during the autumn migration (Barrow, Kaktovik, Nuiqsut, and Wainwright; Table 1). Kaktovik hunters landed three whales between 5 and 12 September. Hunting conditions were favorable for Nuiqsut where they completed their hunt by landing three whales from 3 to 5 September. At Barrow, 11 bowheads were landed, two on 8 October and the other nine between 24 and 30 October. There were few whales near Barrow in early to mid October, which is very unusual. Hunters were out searching for animals in mid-October but few bowheads were observed. More whales arrived near Barrow on 24 October. The migration across the Beaufort Sea appeared to be very late in 2011 for unknown reasons. Wainwright landed a whale in the autumn (28 October) for only the second time since at least 1974 (Suydam and George, 2004). They also landed a whale in autumn 2010.

Struck and Lost and Hunting Efficiency

Of the 13 whales that were struck and lost in 2011, two had a fair chance of survival, eight had a poor chance of survival, and three died. The estimates of survival are primarily based on the Captain's assessment, or our assessment based on the Captain's description of the circumstances of the struck and lost whale (Table 2 and 3). This suggests the total hunting mortality for 2011 was 49 whales; i.e., 38 landed plus 11 whales that likely died (i.e., poor chance of survival plus animals that died but were lost) after being stuck and lost (Table 2).

Overall efficiency of the hunt (#landed/#struck) in 2011 improved to 75% compared to 2010, returning to the long-term average efficiency over the past 10 years (2001-2010: mean = 76%; *SD* = 7.8%). Since the mid-1970s, the efficiency of the harvest increased steadily until about the mid-1990s when it stabilized at about 80% (Suydam *et al.*, 2008). The increase was due to many factors, including enhanced communication (i.e., improved marine radio capabilities) among hunting crews, training of younger hunters, and improved weaponry. However, the efficiency can vary substantially from year to year, primarily due to environmental conditions. For example, 2010 had a relatively low efficiency of 63% for a variety of reasons (see Suydam *et al*., 2011).

The success of the spring hunt is quite sensitive to variable environmental conditions (George *et al.*, 2003). As such, efficiency varies between seasons and among years. The efficiency of the spring harvest is on average lower than the autumn harvest due to more demanding ice and weather conditions as well as struck whales escaping under the ice. In 2010, the overall efficiency of the spring hunt was quite low at 52%. However, in 2011, the efficiency of the spring hunt improved to 69% despite the difficult ice conditions. In Barrow there was a modest number of whales landed during the spring; seven were landed. The principle reason for the modest spring hunt at Barrow was what hunters described as the worst shorefast ice deformation in decades (see Spring Hunting Conditions, above). Difficult sea ice may have contributed to the relatively low efficiency in many of the spring hunting villages.

The autumn hunts were successful and efficient (82%) in 2011. Eighteen whales were landed and four were lost. Autumn hunts typically occur in more open water, thus sea ice is less of an influence on success. However, high wind speeds during the open water period in the autumn can make hunting opportunities extremely difficult (George *et al.*, 2003). As climate change causes a greater and longer period of retreat of sea ice, the increased fetch contributes to larger swells that even persist after strong winds have abated. The overall hunting period has increased in recent years due to sea ice retreat, which possibly offsets inclement weather resulting in poor hunting conditions.

Sex and Maturity
Sixteen (44%) of the landed whales of known sex (n = 36) were males. The longest male was 17.7 m and the shortest was 8.2 m. Based on a length of >13 m (O'Hara *et al*., 2002), nine males were presumably sexually mature. Confirmation of reproductive status of the whales is pending results of histological and hormonal analyses from a subset of these whales.

Twenty (56%) of the landed whales of known sex (n = 36) were females. The longest female was 17.5 m and the shortest was 6.6 m. This small whale was taken at Kaktovik after the hunters had observed the animal for quite some time prior to striking. Only after it was dead, did the mother appear. The small female was determined to be a calf based on the delayed presence of the mother, milk in the stomach, standard length, and short baleen (31 cm; George and Suydam, 2006). Another small whale was landed in Wainwright (6.7 m) during late October but the animal was not closely examined. Baleen length was not measured nor was the stomach examined. Because this animal was harvested during the late fall, it may have been an independent young and not a calf. Hunters did not report seeing a large whale accompanying the small one. Based on a length > 13.4 m (George *et al*., 2004), eight of the females were estimated to be sexually mature, seven of which were examined closely. Two of the whales were pregnant or presumed to be. A 17.5 m female landed at Barrow in the spring was presumed to be pregnant based on the presence of a large corpus luteum (~20 cm in diameter) although a fetus was not detected because of logistical difficulties examining the uterus. A 15.9 m female landed at Nuiqsut in the autumn had a ~1.5 m fetus (sex not determined).

The sex of two animals was not determined. DNA test results of gender are pending.

ACKNOWLEDGEMENTS

We thank the Alaska Eskimo Whaling Commission and local hunters for providing data on landed and struck but lost bowhead whales. We especially thank the Captains' associations and hunters from Barrow, Saint Lawrence Island, and Kaktovik for their support and providing us access to their whales for examinations and sampling. Billy Adams, John Bickham, Jed Blum-Evitts, Cynthia Christman, John Citta, Luke George, Martha Hanns, Hanson Johnson, Jason Herreman, Lara Horstmann, Nicole Kanayurak, Kalyn MacIntyre, JR and Jeanne Molitar, Kaiti Ott, Murali Pai, Timothy Richards, Todd Sformo, Laura Slater, Leandra de Sousa, Kate Stafford, Mark Stichert, Hans Thewissen, Amber Thomas, Suzanne Yin, and others assisted with data and sample collection in Barrow. Dolores Vinas, Molly Spicer, Janell Kaleak, Lucia Johnston, Bobby Sarren, Ross Burgener, and Dave Ramey provided logistical support in Barrow. The North Slope Borough and the National Oceanic and Atmospheric Administration provided financial support. Finally we thank Edward S. Itta (Mayor of the North Slope Borough) and Taqulik Hepa (Director of the North Slope Borough Department of Wildlife Management) for their encouragement and support.

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Table 1. Village, whale identification number, date landed, standard length (meters) and sex of bowhead whales landed by Alaskan Eskimos during the 2011 subsistence hunt.

Village	Whale ID#	Date Landed	Length (m)	Sex
Barrow	11B1	26 April 2011	8.8	M
	11B2	28 April 2011	8.6	M
	11B3[1]	6 May 2011	17.5	F
	11B4	12 May 2011	7.8	F
	11B5	21 May 2011	16.0	F
	11B6	21 May 2011	16.9	F
	11B7	22 May 2011[2]	15.4	M
	11B8	8 Oct 2011	8.4	F
	11B9	8 Oct 2011	12.5	F
	11B10	24 Oct 2011	8.6	M
	11B11	24 Oct 2011	8.5	M
	11B12	27 Oct 2011	10.2	M
	11B13	27 Oct 2011	8.2	M
	11B14	29 Oct 2011	11.7	M
	11B15	29 Oct 2011	14.6	M
	11B16	29 Oct 2011	13.9	M
	11B17	29 Oct 2011	14.5	F
	11B18	30 Oct 2011[3]	10.2	F
Gambell	11G1	17 Apr 2011	8.8	F
	11G2	19 Apr 2011	8.5	F
	11G3	26 Apr 2011	14.9	M
	11G4	30 Apr 2011	~18.3	?[4]
Kaktovik	11KK1	5 Sep 2011	13.9	F
	11KK2	8 Sep 2011	6.6[5]	F
	11KK3	12 Sep 2011	8.9	F
Nuiqsut	11N1	3 Sep 2011[6]	15.9[7]	F
	11N2	5 Sep 2011	15.3	M
	11N3	5 Sep 2011	15.0	F
Point Hope	11H1	22 Apr 2011	8.5	F
	11H2	29 Apr 2011	8.5	?
	11H3	30 Apr 2011	7.6	F
Point Lay	11PL11	13 May 2011	15.2	F
Savoonga	11S1	14 Apr 2011	17.7	M
	11S2	18 Apr 2011	14.5	M
Wainwright	11WW1	29 Apr 2011	14.1	M
	11WW2	9 May 2011	8.2	F
	11WW3	24 May 2011	15.8	M
	11WW4	28 Oct 2011	6.7	F

[1] Whale was likely pregnant based on the presence of a very large corpus luteum (~20 cm in diameter). No fetus was located.
[2] Whale was struck on 21 May and landed on 22 May.
[3] Whale was struck on 29 October and landed on 30 October.
[4] Whale was abandoned during towing because of inclement weather but some muktuk (i.e., skin and blubber) was retrieved.
[5] Single small whale was later determined to be a calf.
[6] Whale was struck on 2 September but landed on 3 September.
[7] Whale was pregnant with a ~1.5 m fetus (sex not determined).

Table 2. Locations, dates, season, and Captains' estimate of survival or our assessment based on the Captain's description, for whales that were struck and lost during 2011. Data provided by the Alaska Eskimo Whaling Commission.

Village	Date	Season	Estimated Survival
Barrow	28 Apr 2011	Spring	Poor
	28 Apr 2011	Spring	Died
	8 Oct 2011	Autumn	Poor
	27 Oct 2011	Autumn	Fair
	27 Oct 2011	Autumn	Poor
	29 Oct 2011	Autumn	Poor
Gambell	16 Apr 2011	Spring	Fair
	19 Apr 2011	Spring	Poor
	26 Apr 2011	Spring	Died
Point Hope	22 Apr 2011	Spring	Poor
	28 Apr 2011	Spring	Poor
	28 Apr 2011	Spring	Poor
Wainwright	29 Apr 2011	Spring	Died

Table 3. Summary of the number of landed bowhead whales and Captains' estimate of survival, or our assessment based on the Captain's description, for whales that were struck and lost during 2011. Data provided by the Alaska Eskimo Whaling Commission.

Village	Landed	Struck & Lost	Total Struck	Estimated Survival[1]
Barrow	18	6	24	F; 4P; D
Gambell	4	3	7	F; P; D
Kaktovik	3	-	3	-
Nuiqsut	3	-	3	-
Point Hope	3	3	6	3P
Point Lay	1	-	1	-
Savoonga	2	-	2	-
Wainwright	4	1	5	D
Totals	38	13	51	2F; 8P; 3D

[1] F=fair; P=poor; D=died.

Figure 1. Photo of a 2.5 m "agiuppak" or ice-wall along the lead edge about 4 km directly west of the village of Barrow. Normally, there are low ice pans at various places along the lead edge from which crews can hunt whales. In spring 2011 at Barrow, whaling areas had to either be cut into the agiuppak or refrozen pans were used similar to that shown in this photo. However, only small whales can be hauled onto thin ice pans which was the case for whales 11B1 and 11B2. Large whales were hauled onto ramps cut into the agiuppak. (photo credit: Matthew Druckenmiller).