

# Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaskan Eskimos during 2010

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## ABSTRACT

In 2010, 71 bowhead whales (*Balaena mysticetus*) were struck during the Alaskan subsistence hunt resulting in 45 animals landed. Total landed for 2010 was more than the average over the past 10 years (2000-2009: mean = 39.0; *SD* = 7.7). The efficiency (# landed / # struck) of the hunt was 63%, which is lower than the prior ten-year average during 2000-2009 (mean = 77%, *SD* = 7%). Spring hunts are logistically more difficult than autumn hunts because of severe environmental conditions and the sea ice dynamics. Typically, hunt efficiency during spring is lower than autumn. In 2010, the efficiency of the spring hunt (52%) was much lower than the autumn hunt (95%). This was due in part to difficult environmental conditions during spring, unanticipated equipment failures, and that four whales were not retrieved as they sank after they were killed. Bowheads typically float at death and it is not clear whether having a larger number of whales that sank is a signal that the oceanographic conditions or body condition of the whales is changing. Of the landed whales, 23 were females, 20 were males, and sex was not determined for two animals. Based on total length, 4 of the 23 females were presumed mature (>13.4m in length), although two others were near that length of maturity (13.1 and 13.3 m). Two of the mature females were pregnant, one landed in the autumn was carrying a 1.2m fetus (sex not determined) and the other landed in the spring had a 4.2m male fetus. One dead whale was found floating in Kotzebue Sound in early July entangled in crab pot gear similar to that used by commercial crabbers in the Bering Sea.

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 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 under a five-year block quota that began in 2008 (IWC 2008).

The subsistence hunt typically occurs during spring and autumn as whales 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 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 2010 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) report relevant additional observations (hunting conditions, unusual pathology, etc.).

## METHODS

Harvest data on sex, standard length, harvest and landed dates, and 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 13.4m in length are considered to be sexually mature (George *et al.* 2004). Previously, we assumed sexual maturity at a total length of 14.2m for females (Tarpley and Hillmann 1999). Although females shorter than this can be pregnant and females greater in length can be immature (George *et al.* 2004). Males with a total body length greater than 13m are considered to be sexually mature (O'Hara *et al.* 2002).

## RESULTS AND DISCUSSION

During 2010, 71 whales were struck during the Alaskan subsistence hunt. The total number of whales landed ( $n = 45$ ) in 2010 was more than the average number of whales landed (per year) over the previous 10 years (2000-2009: mean = 39.0 whales,  $SD = 7.0$ ).

Hunting conditions during spring 2010 were again problematic throughout the northern and western Alaskan coast. Ice and weather conditions prevented hunters from Little Diomede, Wales, Kivalina, and Point Lay from striking a whale. A total of 27 bowheads were landed during the spring (Table 1). Gambell and Savoonga, communities on Saint Lawrence Island in the Bering Sea, landed six and three whales, respectively, primarily during April and early May. Two of the bowheads struck by hunters from Gambell and Savoonga were found as floaters, one in late May (10G6) and the other in early June (10S5). Some edible muktuk (i.e., skin and the outer blubber) was recovered from both whales. Point Hope and Wainwright, on the coast of the Chukchi Sea, each landed two animals, mostly during May. Wainwright landed one whale in early June, which is not a typical harvest date. These two villages usually land whales in April or early May (Suydam and George 2004). In Barrow, 14 whales were landed during the spring from 1 to 15 May.

Eighteen whales were landed during the autumn migration by five villages (Barrow, Kaktovik, Nuiqsut, Savoonga, and Wainwright; Table 1). Kaktovik hunters landed three whales between 10 and 20 September. The hunt in Kaktovik typically occurs during the first week of September but high winds and seas precluded hunting prior to 10 September. Nuiqsut landed four whales during 29 August to 1 September. Hunting conditions were favorable for Nuiqsut in 2010 and the hunt was completed in four days. At Barrow, eight bowheads were landed between 7 and 11 October. Strong winds ( $> \sim 15$  knots) and high seas prevented hunters from pursuing whales during the first week of October. Wainwright landed a whale in the autumn (7 October) for the first time since at least 1974 (Suydam and George 2004) and likely the first in more than 50 years. Savoonga landed two whales in early December. Hunting during December and January at Savoonga and Gambell is a relatively

recent event and has mostly happened since about 1990 (Suydam and George 2004). More whales are now available to those villages during the winter, possibly due to changing environmental conditions or because the bowhead population is increasing (Noongwook et al. 2007).

Of the 26 whales that were struck and lost in 2010, one had an excellent chance of survival, five had a fair chance of survival, 11 had a poor chance of survival, six died, and three whales had an unknown chance of survival. The estimates of survival are 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).

The overall efficiency of the hunt (# landed / # struck) in 2010 was 63%, which is lower than the average efficiency over the past 10 years (2000-2009: mean = 77%,  $SD = 7\%$ ). Since the mid-1970s, the efficiency of the harvest has increased steadily until about the mid-1990s when it stabilized at about 85% (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, 2010 was an anomaly with a relatively low efficiency, because of struck and lost whales in the spring.

The success of the spring hunt is quite sensitive to environmental conditions (George *et al.*, 2003), and thus is quite vulnerable to effects from climate change. In 2010, the overall efficiency of the spring hunt was 52%. At Barrow, the efficiency of the spring harvest tends to be lower than the autumn harvest due to ice and weather conditions as well as struck whales escaping under the shorefast ice. These factors contributed to the lower efficiency in Barrow and Point Hope in the spring but there were also some equipment failures, such as harpoons with attached floats pulling out of whales. Additionally, four whales sank after they were killed and were not able to be retrieved. Typically bowheads float but for various reasons some do not. The significance of the fact that several whales sank is unclear. Whale might sink if they are in poorer body condition caused by lower prey availability or some other factor.

The autumn hunts were successful and efficient (95%) in 2010. Eighteen whales were landed and one was 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 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 possibly offsetting periods with poor hunting conditions. During fall 2010, high winds and seas delayed hunts at Kaktovik and Barrow by one to two weeks.

Twenty (47%) of the landed whales of known sex ( $n = 43$ ) were males. The longest male was 15.3m and the shortest was 7.3m. Based on a length of >13m (O'Hara *et al.* 2002), five males were presumably sexually mature. Confirmation of reproductive status is pending results of histological and hormonal analyses of a subset of the whales.

Twenty-three (53%) of the landed whales of known sex ( $n = 43$ ) were females. The longest female was 17.1m in length and the shortest was 7.3m. Based on a length > 13.4m (George *et al.* 2004), four of these females were estimated to be sexually mature and two others (13.1 and 13.3m) may have been near maturity. Two of the whales were pregnant: one was landed in the autumn with a 1.2m fetus, and one landed in the spring with a 4.2m male fetus (Table 1).

The sex of two animals was not determined. DNA testing to determine gender is pending.

One bowhead was found dead in Kotzebue Sound in northwest Alaska. The ~12.2m long carcass was found in early July 2010. When examined, the whale was found to be entangled in crab pot gear similar to the kind used by commercial crabbers in the Bering Sea. The gear was entangled through the mouth and around the peduncle and may have caused the death of the whale.

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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 2010 subsistence hunt.

| Village    | Whale ID# | Date Landed                | Length (m)        | Sex            |
|------------|-----------|----------------------------|-------------------|----------------|
| Barrow     | 10B1      | 1 May 2010                 | 10.9              | F              |
|            | 10B2      | 3 May 2010 <sup>1</sup>    | 8.3               | F              |
|            | 10B3      | 4 May 2010 <sup>1</sup>    | 8.0               | F              |
|            | 10B4      | 4 May 2010                 | 8.7               | M              |
|            | 10B5      | 4 May 2010                 | 8.7               | M              |
|            | 10B6      | 4 May 2010                 | 8.4               | F              |
|            | 10B7      | 5 May 2010                 | 8.4               | M              |
|            | 10B8      | 5 May 2010                 | 7.3               | M              |
|            | 10B9      | 5 May 2010 <sup>1</sup>    | 8.7               | F              |
|            | 10B10     | 6 May 2010                 | 10.7              | F              |
|            | 10B11     | 7 May 2010                 | 7.5               | M              |
|            | 10B12     | 9 May 2010 <sup>1</sup>    | 9.8               | F              |
|            | 10B13     | 12 May 2010 <sup>1</sup>   | 13.1              | F              |
|            | 10B14     | 15 May 2010                | 8.3               | F              |
|            | 10B15     | 7 Oct 2010                 | 12.5              | F              |
|            | 10B16     | 7 Oct 2010                 | 7.9               | M              |
|            | 10B17     | 7 Oct 2010                 | 11.0              | M              |
|            | 10B18     | 8 Oct 2010                 | 9.1               | F              |
|            | 10B19     | 8 Oct 2010                 | 11.1              | F              |
|            | 10B20     | 9 Oct 2010                 | 7.8               | M              |
|            | 10B21     | 9 Oct 2010                 | 11.5              | M              |
|            | 10B22     | 11 Oct 2010                | 7.3               | F              |
| Gambell    | 10G1      | 5 April 2010 <sup>1</sup>  | 8.7 <sup>2</sup>  | F              |
|            | 10G2      | 22 April 2010 <sup>1</sup> | 11.8 <sup>2</sup> | M              |
|            | 10G3      | 2 May 2010                 | 7.8               | M              |
|            | 10G4      | 2 May 2010                 | 14.0              | M              |
|            | 10G5      | 3 May 2010 <sup>1</sup>    | 14.0              | M              |
|            | 10G6      | 28 May 2010 <sup>3</sup>   | ~8.4 <sup>4</sup> | F              |
| Kaktovik   | 10KK1     | 10 Sep 2010                | 8.3               | M              |
|            | 10KK2     | 12 Sep 2010                | 8.8               | F              |
|            | 10KK3     | 20 Sep 2010                | 10.9              | M              |
| Nuiqsut    | 10N1      | 29 Aug 2010                | 15.5              | F <sup>5</sup> |
|            | 10N2      | 31 Aug 2010                | 13.7              | M              |
|            | 10N3      | 1 Sep 2010                 | 7.9               | F              |
|            | 10N4      | 1 Sep 2010                 | 14.0              | F              |
| Point Hope | 10H1      | 20 May 2010 <sup>1</sup>   | ?                 | ?              |
|            | 10H2      | 7 June 2010                | 14.9              | M              |
| Savoonga   | 10S1      | 29 April 2010              | 15.0              | F <sup>6</sup> |
|            | 10S2      | 5 May 2010                 | 8.4               | M              |
|            | 10S3      | 8 Dec 2010                 | 15.5              | F              |
|            | 10S4      | 10 Dec 2010                | 13.3              | F              |
|            | 10S5      | 3 June 2010 <sup>7</sup>   | 12.2              | ?              |
| Wainwright | 10WW1     | 4 May 2010                 | 9.0               | M              |
|            | 10WW2     | 25 May 2010 <sup>1</sup>   | 15.3              | M              |
|            | 10WW3     | 7 Oct 2010 <sup>8</sup>    | 7.5               | F              |

<sup>1</sup> Whale was landed on this date but struck the day before.<sup>2</sup> Length is an overestimate as the whale was measured in a curvilinear fashion and not in a straight line.<sup>3</sup> Whale was struck on 17 April and found ~40km south of Nome. Some muktuk was recovered.<sup>4</sup> Length was estimated at 7.6 to 9.1m in length.<sup>5</sup> Pregnant with a 1.2 m fetus. Sex was not noted.<sup>6</sup> Pregnant with a 4.2 m male fetus.<sup>7</sup> Whale was struck on 3 May 2010 and found floating on 3 June 2010. Some muktuk was recovered.<sup>8</sup> This is the first whale that has been landed in Wainwright during the autumn since at least 1976.

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 2010. Data provided by the Alaska Eskimo Whaling Commission.

| Village    | Date        | Season | Estimated Survival           |
|------------|-------------|--------|------------------------------|
| Barrow     | 29 Apr 2010 | Spring | Poor                         |
|            | 30 Apr 2010 | Spring | Poor                         |
|            | 1 May 2010  | Spring | Fair                         |
|            | 2 May 2010  | Spring | Died-sunk                    |
|            | 2 May 2010  | Spring | Died- abandoned <sup>1</sup> |
|            | 3 May 2010  | Spring | Poor                         |
|            | 3 May 2010  | Spring | Fair                         |
|            | 3 May 2010  | Spring | Died                         |
|            | 4 May 2010  | Spring | Poor                         |
|            | 5 May 2010  | Spring | Died                         |
|            | 6 May 2010  | Spring | Poor                         |
|            | 6 May 2010  | Spring | Poor                         |
|            | 7 May 2010  | Spring | Poor                         |
|            | 8 May 2010  | Spring | Unknown                      |
|            | 8 Oct 2010  | Autumn | Fair                         |
| Point Hope | 17 Apr 2010 | Spring | Poor                         |
|            | 17 Apr 2010 | Spring | Unknown                      |
|            | 17 Apr 2010 | Spring | Fair                         |
|            | 17 Apr 2010 | Spring | Poor                         |
|            | 18 May 2010 | Spring | Poor                         |
|            | 19 May 2010 | Spring | Died-sunk                    |
|            | 2 June 2010 | Spring | Unknown                      |
| Savoonga   | 3 May 2010  | Spring | Poor                         |
|            | 5 May 2010  | Spring | Died                         |
| Wainwright | 14 May 2010 | Spring | Fair                         |
|            | 22 May 2010 | Spring | Excellent                    |

<sup>1</sup> Abandoned while towing because of high winds and unsafe seas.

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 2010. Data provided by the Alaska Eskimo Whaling Commission.

| Village    | Landed | Struck & Lost | Total Struck | Estimated Survival <sup>1</sup> |
|------------|--------|---------------|--------------|---------------------------------|
| Barrow     | 22     | 15            | 37           | 1U; 3F; 7P; 4D                  |
| Gambell    | 6      | -             | 6            |                                 |
| Kaktovik   | 3      | -             | 3            | -                               |
| Nuiqsut    | 4      | -             | 4            | -                               |
| Point Hope | 2      | 7             | 9            | 2U; 1F; 3P; 1D                  |
| Savoonga   | 5      | 2             | 7            | 1P; 1D                          |
| Wainwright | 3      | 2             | 5            | 1E; 1F                          |
| Totals     | 45     | 26            | 71           | 3U; 1E; 5F; 11P; 6D             |

<sup>1</sup> U=unknown; E=Excellent; F=fair; P=poor; D=died.