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INTERNATIONAL WHALING COMMISSION

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ABSTRACT

In 2014, 53 bowhead whales (*Balaena mysticetus*) were struck during the Alaskan subsistence hunt resulting in 38 animals landed. Total number of whales landed in 2014 was similar to the average for the previous 10 years (2004-2013: mean of landed = 41.6; *SD* =8.6) as was the number of whale struck (2004-2013: mean struck = 54.9; SD =12.6). The efficiency (#landed /#struck) of the hunt (72%) was also similar to the average over the past 10 years (mean of efficiency = 76.5%; *SD* =0.1%). Total mortality for 2014 was estimated at 50 animals after the fate of the struck and lost whales was considered. Spring hunts are logistically more difficult than autumn hunts because of more difficult environmental conditions and sea ice dynamics. Typically, hunt efficiency during spring is lower than autumn. In 2014, the efficiency of the spring hunt (58%) was considerably lower than the autumn hunt (95%). This was largely due to presence of ice during spring. At least five of the struck whales were lost under sea ice, three sunken whales were lost during attempts to pull the carcasses to the surface, and high winds caused the loss of two whales. Of the landed whales, 18 were females, 19 were males, and sex was not determined for one whale. Based on total length, four of the 18 females were presumed mature (>13.4 m in length) and at least one was pregnant.

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 2014 under a six-year block quota that began in 2013 (IWC, 2013).

The subsistence hunt typically occurs during spring and autumn as whales generally migrate between the Bering and Beaufort seas. Hunters on Saint Lawrence Island in the northern Bering Sea may harvest whales during the winter (i.e., December and January) as well. Hunts of bowhead whales are subjected to considerable environmental interference from weather (wind speed and direction, fog, and temperature), stability of landfast ice, and sea ice concentration, type, and dynamics. The success of each hunt is greatly affected by these factors and results in considerable annual and regional variation.

Since 1981, the North Slope Borough Department of Wildlife Management has worked closely with the Alaska Eskimo Whaling Commission and village Whaling Associations to gather 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 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 2014 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 findings about landed whales, 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, and documented diagnostic scars resulting from attacks by killer whales (*Orcinus orca*) as well as evidence of previous human interactions caused by ship strikes or line entanglements.

We estimated the approximate animal age and reproductive status based on several published criteria. Females with a total body length greater than 13.4 m are considered sexually mature; however, females shorter in length can be pregnant and females greater in length can be immature (George *et al*. 2004). Previously, we assumed sexual maturity for females at a total length of 14.2 m (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 2014, 53 whales were struck during the Alaskan subsistence hunt. The total number of whales struck and landed (n = 38) in 2014 was similar to the average number of whales struck and landed over the previous 10 years (2003-2012: mean = 54.9 whales; *SD* = 12.6; mean = 41.6; *SD* = 8.6, respectively).

Spring Hunting Conditions

Nineteen bowheads were landed during the spring (Table 1). Hunting conditions during spring 2014 were difficult in the Bering and Chukchi seas, primarily because of sea ice and wind. One exception was at Point Hope.

Savoonga, on Saint Lawrence Island in the Bering Sea, landed three whales during April and May. Gambell was not able to land a whale in 2014, which is very unusual. More typically, Gambell lands one to four whales in a year (Suydam and George 2012). Hunters reported that poor weather set in after 27 April reducing opportunities for pursuing whales. A combination of poor ice and weather conditions prevented hunters from Little Diomede, Wales, and Kivalina from striking a whale. Point Hope was able to land six whales in the spring, during the last two weeks of April and May. No whales were landed at Point Lay during the spring. Wainwright and Barrow were able to land whales, three and seven, respectively. A major ice event occurred at Barrow on 29 April when the shorefast ice broke free and drifted offshore to the west taking a hunting crew with it. Helicopter rescue was not possible due to atmospheric icing conditions but a successful boat-based rescue took place after the storm abated (Figure 1). Following this event, a period of prolonged west-winds precluded whale hunting. Thus, hunters did not have access to open water until later in the season as reflected by the later landing dates (late May-early June). Prior research has shown that easterly winds are essential for a successful spring whale hunt for the villages along the northeast Chukchi Sea coast (i.e., Point Lay, Wainwright, and Barrow) (George et al., 2003).

Autumn Hunting Conditions
Nineteen whales were landed by three villages during the autumn (Barrow, Kaktovik, and Nuiqsut; Table 1). Kaktovik hunters landed three whales during an exceptional three days (Aug 30 – Sep 1). Hunting conditions were also favorable for Nuiqsut where they completed their hunt by landing five whales from 30 August to 7 September.

At Barrow, 11 bowheads were landed between 22 September and 8 October. Weather conditions were generally good although strong winds prevented hunting for short periods of time.

No whales were landed in the autumn by Wainwright during 2014. Beginning in 2010, for the first time in many decades, Wainwright successfully landed bowheads during the autumn. This hunt was initiated because of increasingly difficult ice and weather conditions in the spring. They landed three whales in autumn of 2013.

No bowheads were landed by the Saint Lawrence Island villages of Gambell and Savoonga in autumn or early winter of 2014 due to nearly consistent strong winds that prevented safe boat travel. Since about 2000, hunters on Saint Lawrence Island have hunted more frequently for whales in the late autumn and early winter (Suydam and George 2012).

Struck and Lost and Hunting Efficiency
Of the 15 whales that were struck and lost in 2014, two had an excellent chance of survival, one a fair chance of survival, four a poor chance of survival, six died, and an estimated survival estimate was not recorded for two whales (Table 2 and 3). The estimates of survival are primarily based on the Captain's assessment but may be based on our assessment of the Captain's description of the circumstances of the struck and lost whale. This suggests the total hunting mortality for 2014 was 50 whales (i.e., 38 landed, six whales that likely died but were lost, four whales with a poor chance of survival, and two whales with unknown survival estimates) based on criteria in Suydam et al. (1995).

The overall efficiency of the hunt (#landed/#struck) in 2014 was 72%, which is similar to the average efficiency over the past 10 years (2004-2013: mean = 76.5%; *SD* = 0.1%). Since the mid-1970s, the efficiency of the harvest increased steadily until about the mid-1990s when it stabilized at about 80%. 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 (Suydam and George, 2012). 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 (Suydam et al., 2011) while 1999 had a high efficiency of 89% (George et al. 2000).

The success of the spring hunt is quite sensitive to variable environmental conditions (George *et al.*, 2003). As such, efficiency varies seasonally and annually. The efficiency of the spring harvest is lower on average than the autumn harvest due to more demanding conditions related to sea ice and weather, as well as struck whales escaping under the ice. In 2014, the overall efficiency of the spring hunt was quite low at 58% primarily due to whales being lost under the ice and whales lost during efforts to resurface sunken carcasses. Two whales were also lost because of high winds.

The autumn hunts were quite successful and efficient (95%) during 2014. Nineteen whales were landed and only one was lost. Autumn hunts typically occur in more open water conditions, thus sea ice is less of an influence on success. However, high wind speeds with the larger fetch of 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 persist after strong winds have abated. The overall hunting period has increased in recent years due to sea ice retreat, which appears to offset delays due to inclement weather by providing more opportunity for hunters to choose a period with favorable weather.

Sex and Maturity
Nineteen (51%) of the landed whales of known sex (n = 37) were males. The longest male was 13.9 m and the shortest was 7.0 m. Based on a length of >13 m (O'Hara *et al*., 2002), four males were presumably sexually mature. One of these whales was confirmed mature with combined testes weight of 83.4 kg (Table 1).

Eighteen (48.6%) of the landed whales of known sex (n = 37) were females. The longest female was 17.2 m and the shortest was 7.4 m. Based on a length >13.4 m (George *et al*., 2004), four of the females were estimated to be sexually mature and one other was slightly shorter at 13.2m. One (25%) of the whales >13.4 m was pregnant with a 4.2 m male term fetus (4.2 m length). Although the sample size of mature females is small for 2014, the pregnancy rate is consistent with the long-term average of about 33% (George et al., 2004; George et al., 2011).

The point estimate for length of maturity is 13.4 m; however, some animals may become mature at shorter or longer lengths (e.g., a pregnant 13.1 m female was landed during 2013). A 13.2m female was landed by Nuiqsut on 6 September and it is unknown if it was sexually mature. It was not examined by biologist but hunters did not observe a fetus.

Pathological findings
We observed the following unusual findings in 2014 that were made in otherwise healthy subsistence harvested whales: (1) two whales with hepatic fatty tumors, (2) a single thyroid cyst, (3) one dermoid cyst type-like mass, (4) one case of kidney stones, and (5) one large roundworm specimen associated with the kidney (*Crassicauda crassicauda*). Hepatic lipoma, a benign tumor has been previously reported in a single bowhead whale (Migaki and Albert 1982). The observed pathological findings are considered incidental without a significant negative effect on overall bowhead whale health and/or human consumption of these animals.

Non-Harvest Human and Killer Whale Interaction
Observations of scars associated with past injuries from line wounds, ship strikes, and killer whales on harvested bowheads have been recorded for over 30 years. In 2014, at least two whales were scored as having scars associated with line entanglement (14B2, 14B6) and a third with "possible" line scars (14KK3). Two whales exhibited scars consistent with killer whale injuries to their flukes (14KK1, 14B6). One whale had scarring "possibly but unlikely" associated with a ship propeller injury (14B6). These injury rates are consistent with past years.

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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 2014 subsistence hunt.

Village	Whale ID#	Date Landed	Length (m)	Sex
Barrow	14B1	30 Apr 2014	11.9	M
	14B2	30 Apr 2014	12.1	M
	14B3	30 Apr 2014	13.2	M
	14B4[1]	2 May 2014	9.0	M
	14B5	26 May 2014	8.1	F
	14B6	29 May 2014	17.2[2]	F
	14B7	3 Jun 2014	13.9[3]	M
	14B8	22 Sep 2014	8.4	F
	14B9	22 Sep 2014	9.6	M
	14B10	22 Sep 2014	10.7	M
	14B11	25 Sep 2014	13.6	M
	14B12	5 Oct 2014	7.1	M
	14B13	5 Oct 2014	9.8	M
	14B14	5 Oct 2014	10.2	F
	14B15	7 Oct 2014	10.2	F
	14B16	7 Oct 2014	10.1	M
	14B17	7 Oct 2014	12.6	M
	14B18	8 Oct 2014	8.9	F
Kaktovik	14KK1	30 Aug 2014	9.6	M
	14KK2	31 Aug 2014	9.0	M
	14KK3	1 Sep 2014	8.8	F
Nuiqsut	14N1	30 Aug 2014	13.2	M
	14N2	31 Aug 2014	7.9	F
	14N3	6 Sep 2014	13.2	F
	14N4	6 Sep 2014	7.8	F
	14N5	7 Sep 2014	12.1	F
Point Hope	14H1	19 Apr 2014	7.4	F
	14H2	24 Apr 2014	9.2	M
	14H3	25 Apr 2014	9.6	M
	14H4	26 Apr 2014	8.5	F
	14H5	22 May 2014	12.2	F
	14H6	24 May 2014	14.0	F
Savoonga	14S1	6 Apr 2014	8.4	M
	14S2	27 Apr 2014	17.3[4]	U
	14S3	5 May 2014[5]	14.6	F
Wainwright	14WW1	29 Apr 2014	8.8	F
	14WW2	2 May 2014	12.0	M
	14WW3	2 Jun 2014	15.6	F

[1] Whale struck in Wainwright on 27 Apr 2014 but recovered in Barrow on 2 May 2014.
[2] Pregnant with a term fetus, male, 4.2 m in length.
[3] Mature male with testes weights of 40.5 kg (left) and 42.9 kg (right)
[4] Length estimated based on width of flukes (6.25 m); Body Length (cm) = [46.446+Fluke (cm)]/0.388
[5] Struck on 4 May and landed on 5 May.

Table 2. Locations, dates, season, and Captains' estimate of survival or our assessment based on the Captain's description, for whales struck and lost during 2014. Data provided by the Alaska Eskimo Whaling Commission.

Village	Date	Season	Estimated Survival
Barrow	30 Apr 2014	Spring	Died
	2 May 2014	Spring	Poor
	3 May 2014	Spring	Died
	26 May 2014	Spring	Unknown
	3 Jun 2014	Spring	Unknown
	21 Sep 2014	Autumn	Died
Point Hope	24 Apr 2014	Spring	Excellent
	26 Apr 2014	Spring	Poor
	27 Apr 2014	Spring	Poor
	18 May 2014	Spring	Excellent
	21 May 2014	Spring	Fair
	23 May 2014	Spring	Died
Wainwright	3 May 2014	Spring	Died
	26 May 2014	Spring	Died
	11 Jun 2014	Spring	Poor

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 struck and lost during 2014. Data provided by the Alaska Eskimo Whaling Commission.

Village	Landed	Struck & Lost	Total Struck	Estimated Survival[1]
Barrow	18	6	24	P; 3D; 2U
Kaktovik	3	-	3	-
Nuiqsut	5	-	5	-
Point Hope	6	6	12	2E; F; 2P; D
Savoonga	3	-	3	-
Wainwright	3	3	6	P; 2D
Totals	38	15	53	2E; F; 4P; 6D; 2U

[1] E=excellent; F=fair; P=poor; D=died; U=unknown.

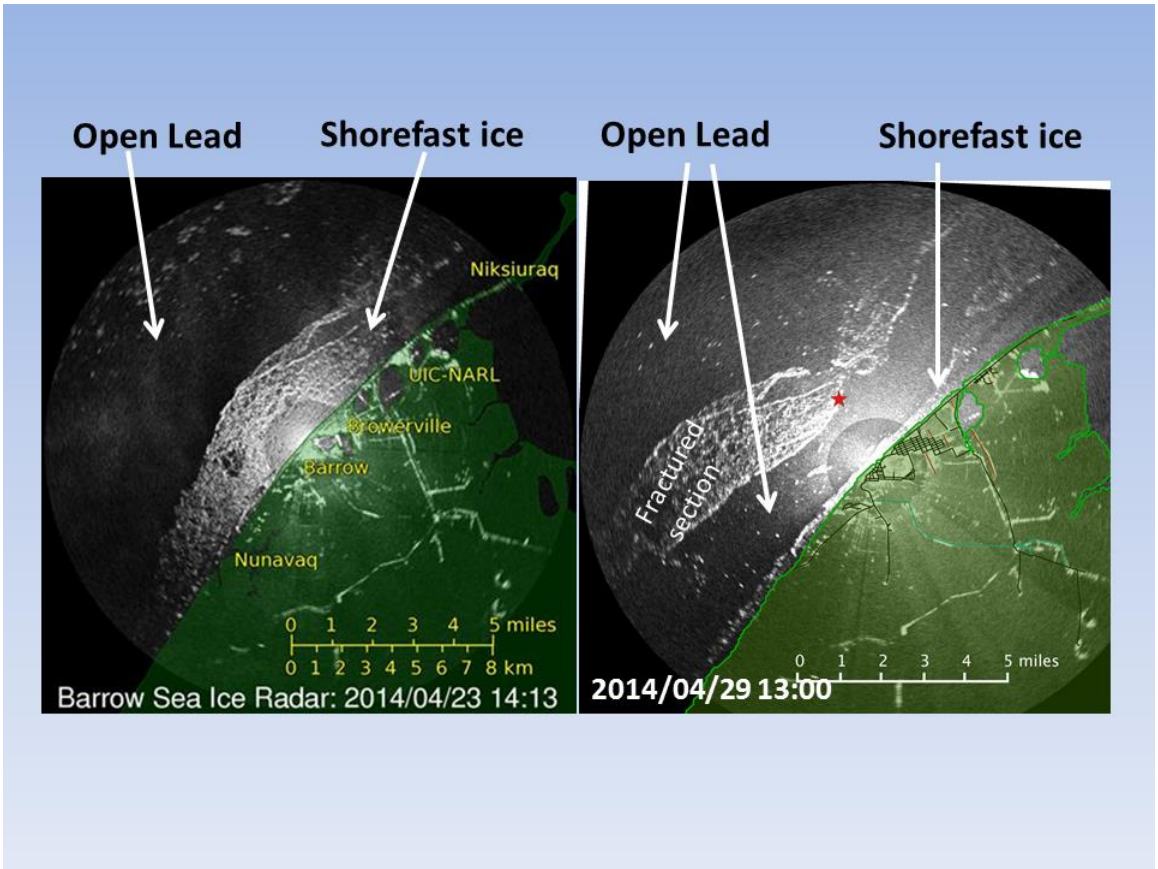

Figure 1. Radar images of the shorefast sea ice west of Barrow, Alaska where the spring whale hunting camps are typically set up (23 April (left) and 29 April (right)). Note that on 29 April, the sea ice broke free close to shore in a powerful east-wind storm, taking a hunting camp with it (red star). The crew self-rescued using small boats with the assistance of other crews after the storm abated.