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Subsistence harvest of bowhead whales (Balaena mysticetus) by Alaskan Natives during 2021

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INTERNATIONAL
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Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaskan Natives during 2021

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ABSTRACT

In 2021, 70 bowhead whales (*Balaena mysticetus*) were struck during the Alaskan subsistence hunt, of which 57 were landed. The total number of whales struck and the number landed in 2021 was higher than the averages for the previous 10 years (2011-2020: mean struck = 56.7, *SD* = 10.5 and mean landed = 44.3, *SD* = 8; respectively). The efficiency (# landed / # struck) of the hunt (81%) in 2021 was slightly higher than over the past 10 years (2011-2020: mean of efficiency = 78%; *SD* = 5.4). Spring hunts are logistically more difficult than autumn hunts because of difficulty in accessing open water, and changing sea ice thickness and dynamics. The hunting efficiency during spring is usually lower than in autumn, which was the case during 2021. In 2021, the efficiency of the spring hunt (77%) was higher than the previous 10-yr average (2011-2020; mean spring efficiency = 70%; *SD* = 10) but lower than the 2021 autumn hunt (87%). The efficiency of the 2021 autumn hunt (87%) was lower than the average autumn hunting efficiency over the past ten years (2011-2020; mean autumn efficiency = 92%; *SD* = 9). Thirteen whales were struck and lost in 2021. Of those 13 whales, four were lost due to equipment malfunction (i.e., harpoon failure), six whales were lost when they swam under the ice, four whales sank, and three whales were lost for other or unknown reasons. Additionally, some whales had more than one reason attributed to their loss. Of the harvested whales, 27 were females and 30 were males. Based on total length (≥13.7 m in length), seven of the females were presumed mature. One whale was pregnant with a midterm male fetus which was 1.7 m long.

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

INTRODUCTION

The subsistence harvest of bowhead whales (*Balaena mysticetus*) helps meet important nutritional and cultural needs for many Native communities in northern and western Alaska (United States) and eastern Chukotka (Russian Federation). The Alaska Eskimo Whaling Commission (AEWC), representing 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 harvest quota is based on the nutritional and cultural needs of Alaskan Natives 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 2021 under a seven-year block quota that began in 2019 (IWC, 2018).

The subsistence hunt typically occurs during spring and autumn when bowhead whales migrate between the Bering and Beaufort seas. Hunters on Saint Lawrence Island (SLI), in the northern Bering Sea, may harvest whales during the winter (e.g., December to February) as well. Bowhead harvests show considerable annual and regional

variation, and the success of each hunt is greatly affected by many factors, including: environmental conditions (e.g., wind speed and direction, wave size, fog, and temperature), stability of shorefast ice, sea ice concentration, sea ice type and movements, and other factors.

Since 1981, the North Slope Borough Department of Wildlife Management (NSB DWM) has gathered data on landed whales in several communities and has assisted the AEWC with compilation of statistics on landed as well as struck and lost whales (Albert, 1988). During 2021, the NSB DWM gathered detailed information and tissue samples on a subset of the whales landed at Utqiaġvik (formerly Barrow). The objectives of this paper are to document: (1) the number, location (village), and dates of landed and struck and lost bowhead whales during 2021 in Alaska, (2) the estimated fate of struck and lost bowhead whales, (3) basic morphometric data and sex composition of the harvest, (4) hunting efficiency, and (5) relevant additional environmental observations on hunting conditions.

METHODS

Data on sex, standard length, harvest date, and landed date, as well as the fate of struck and lost whales for all whaling villages were obtained from the AEWC. NSB DWM staff collected tissue samples, detailed morphometric data, and documented evidence from scarring of previous non-lethal human interactions (i.e., ship strikes or line entanglements) and killer whale attacks, for all whales landed at Utqiaġvik, Kaktovik, and Wainwright.

We estimated sexual maturity based on several published criteria. Historically, several estimates of average length at sexual maturity in females were used; this has changed as more data were collected. Initially 14.2 m was used (Tarpley and Hillmann, 1999), then 13.4 m (George *et al.*, 2004), and most recently 13.7 m (George *et al.*, 2018). For this report, we use the latter estimate of average length at sexual maturity (13.7 m) for female bowhead whales, which is based on maturity data through 2016. However, Givens *et al.* (in prep) consider maturity data between 1973-2021 and provide an updated average length at sexual maturity in females of 13.45 m. If this were to be used as the length at sexual maturity for females in this report, one additional individual (13.5 m in length) would be considered mature. We chose to continue to use 13.7 m as the length for sexual maturity in females as the Givens *et al.* paper has not been peer reviewed. Currently, males with a total body length equal to or greater than 13 m are considered to be sexually mature (O'Hara *et al*., 2002).

RESULTS AND DISCUSSION

During the 2021 Alaskan subsistence hunt, of the 70 whales that were struck, 57 (81%) were landed. The total number of whales struck and the number landed in 2021 was higher than the averages for the previous 10 years (2011-2020: mean struck = 56.7, *SD* = 10.5 and mean landed = 44.3, *SD* = 8; respectively). During spring 2021, 30 bowheads were landed by five villages (Utqiaġvik, Gambell (SLI), Point Hope, Savoonga (SLI), and Wainwright) and 9 were struck and lost by three villages (Utqiaġvik, Gambell (SLI), Point Hope) (Tables 1 and 2). During the autumn and winter harvest, 27 whales were struck and landed by five villages (Utqiaġvik, Kaktovik, Wainwright, Savoonga (SLI) and Nuiqsut) and three were struck and lost in Utqiaġvik while one was struck and lost in Kaktovik.

Spring (2021) Hunting Conditions
On SLI, five whales were harvested by Gambell between 20 and 23 April, and one whale was landed by Savoonga on 22 April.

Point Hope landed 11 whales between mid-April and early May. Wainwright landed four whales between late April and mid-June. Utqiaġvik landed nine whales within eight days from 10 May to 17 May. At Point Hope, hunters reported environmental conditions favorable for hunting, including: an open lead, good ice, and calm water. In Utqiaġvik, spring ice conditions made for a short and difficult harvest season. The lead was closed during much of April and May and the longest period it remained sufficiently open for hunting was about eight consecutive days. Furthermore, the ice at the edge of the lead was thin and ungrounded, creating potentially dangerous conditions for hauling up whales and making camp.

Autumn (2021) Hunting Conditions
There are three villages that typically hunt bowheads in the Beaufort Sea during the autumn: Kaktovik, Nuiqsut and Utqiaġvik. The 2021 season offered good weather conditions with whales located close to shore, especially in the western Beaufort. For Utqiaġvik, this contrasts with autumn 2019 when bowheads were distributed farther offshore, resulting in an unusually unproductive autumn hunting season during which only one whale was harvested (Suydam *et al.,* 2020). Bowheads were migrating unusually close to shore near Wainwright in autumn 2021, resulting in the successful harvest of two whales on 14 September. Wainwright has only harvested bowheads in the autumn during four previous years: in 2010, 2011, 2013, and 2015.

At Kaktovik, three whales were landed between early and mid-September. Nuiqsut landed five whales at Cross Island from 28 to 31 August. At Utqiaġvik, 16 whales were landed between 28 September and 9 October. In autumn 2020, the Barrow Whaling Captains Association (BWCA) decided to begin the hunt on 25 August, which is about three weeks earlier than usual. This early start date was a response to autumn 2019 when only one whale was landed (Suydam *et al.,* 2020). In autumn 2021, the BWCA reverted to a more typical, later starting date (28 September). Ambient temperatures in September are usually below 0C and there is snow cover on the ground, which provides a clean surface during butchering and slows down post-mortem changes and the growth of spoilage bacteria.

Winter (2021) Hunting Conditions
On Saint Lawrence Island, hunters experienced favorable weather conditions and were able to harvest whales just one mile offshore (John Waaghyi, pers. comm., March 2022). The village of Gambell landed one whale on 16 December. Historically, the communities of Gambell and Savoonga hunted during spring; however, since 2000, environmental conditions have been increasingly variable and some whales are now harvested in late autumn and early winter (Noongwook *et al.,* 2007; Suydam and George, 2021).

Struck and Lost and Hunting Efficiency
Of the 13 whales struck and lost in 2021, nine occurred in the spring and four during the autumn. Of those 13 whales, four were lost due to equipment malfunction (e.g., harpoon failure), six whales were lost when they swam under the ice, four whales sank, and three whales were lost for other or unknown reasons. Additionally, some whales had more than one reason attributed to their loss. Of the 13 lost whales, survival estimates as provided by whaling captains and their crews are as follows: one had an excellent chance of survival, one had a good chance of survival, two had a fair chance of survival, five had a poor chance of survival, and the remaining four are known to have died (Tables 2 and 3).

The overall efficiency (# landed / # struck) of the 2021 hunt**,** 81% (see Table 3), was similar to the average over the past 10 years (mean of efficiency = 78%; *SD* = 5.4). Since the mid-1970s, efficiency of the hunt increased steadily until the mid-1990s, when it stabilized at approximately 75 – 80%. The increase in efficiency was due to many factors, including enhanced communication (i.e., improved marine radio capabilities) among hunting crews, education/training of beginner hunters, and improved weaponry (Suydam and George, 2012).

However, efficiency can vary substantially from year to year, primarily due to environmental conditions (George *et al.,* 2003). For example, spring harvest efficiency is affected by sea ice presence, extent, and type. Struck whales may dive under the ice and evade crews, even after hours of searching. During the autumn harvest, the sudden onset of storms can affect efficiency. A crew may have to cut the line towing the whale to prevent their boat from capsizing in rough seas, resulting in a struck and lost whale (Billy Adams, pers. comm., February 2022).

Spring hunts are logistically more difficult than autumn hunts because of difficulty in accessing open water; and changing sea ice thickness and dynamics. The hunting efficiency during spring is usually lower than autumn, which was the case during 2021. In 2021, the efficiency of the spring hunt (77%) was higher than the previous 10-year average (2010-2019; mean spring efficiency = 70%) but lower than the 2021 autumn hunt (87%). The efficiency of the autumn hunt over the past ten years (2010-2019) was 92% (SD = 9). Autumn hunts typically occur during mostly open water conditions, at which time sea ice is less of an influence on hunting success. However, high wind speeds with the larger fetch of the open water period during the autumn can generate large waves limiting hunting opportunities and making boating conditions extremely difficult (George *et al.,* 2003). As climate change reduces

sea ice extent in the Arctic Ocean, large areas of open water are exposed for longer periods of time. The corresponding increased fetch contributes to larger swells that persist even after strong winds abate. The overall hunting period has increased in recent years due to sea ice reduction and retreat, in an effort to compensate for inclement weather that typically results in poor hunting conditions and harvest.

Sex and Maturity
Thirty (53%) of the 57 landed whales were males. The longest male measured 14.8 m, and the smallest was 7.5 m. Based on a length of ≥13 m (O'Hara *et al*., 2002), five males were presumably sexually mature (see Table 1).

Twenty-seven (47%) of the 57 landed whales were females. The longest female was estimated to be 16.8 m. The shortest female measured 7.8 m. Based on pregnancy and a length ≥13.7 m (George *et al*., 2018), seven of the females were sexually mature. One whale was pregnant with a midterm male fetus that was 1.7 m long.

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REFERENCES

Albert, T.F. 1988. The role of the North Slope Borough in arctic environmental research. *Arctic Res. of the U.S*. (2): 17-23.

Baird, A.B., Givens, G.H., George, J.C., Suydam, R.S. & Bickham, J.W. 2018. Stock structure of bowhead whales inferred from mtDNA and SNP data. Submitted to the International Whaling Commission Scientific Committee, Document SC/67B/SDDNA/01.

Braund, S.R. 1992. Traditional Alaska Eskimo whaling and the bowhead quota. *Arctic Research* 6(Fall):37-42.

Donovan, G.P. (ed.). 1982. Report of the International Whaling Commission (Special Issue 4). Aboriginal Subsistence Whaling (with special reference to the Alaska and Greenland fisheries). International Whaling Commission, Cambridge. 86pp.

Gambell, R. 1982. The bowhead whale problem and the International Whaling Commission. Report of the International Whaling Commission (Special Issue 4):1-6.

George, J. C., Braund, S., Brower H. Jr., Nicolson, C., & O'Hara, T.M. 2003. Some observations on the influence of environmental conditions on the success of hunting bowhead whales off Barrow, Alaska. In: *Indigenous ways to the Present: Native whaling in the Western Arctic*. Studies in whaling No. 6. Canadian Circumpolar Institute (CCI) Press, Alberta Canada. 432 pp.

George, J.C., Follmann, E., Zeh, J., Suydam, R., Sousa, L., Tarpley, R., & Koski, B. 2004. Inferences from bowhead whale corpora data, age estimates, length at sexual maturity and ovulation rates. Paper SC/56/BRG8 presented to the Scientific Committee of the International Whaling Commission.

George, J.C., Sheffield, G., Reed, D.J., Tudor, B., Stimmelmayr, R., Person, B.T., Sformo, T., & Suydam, R. Frequency of Injuries from Line Entanglements, Killer Whales, and Ship Strikes on Bering-Chukchi-Beaufort Seas Bowhead Whales Vol. 70 No. 1 (2017): March: 1–120.

George, J.C., Suydam, R., Givens, G., Horstmann, L., Stimmelmayr, R., & Sheffield, G. 2018. Length at sexual maturity and pregnancy rates of Bering-Chukchi-Beaufort seas bowhead whales. Report SC 67b/AWMP presented to the IWC Scientific Committee.

George, J.C., Suydam, R.S., O'Hara, T.M. & Sheffield, G. 2000. Subsistence harvest of bowhead whales by Alaskan Eskimos during 1999. Paper SC/52/AS24 presented to the Scientific Committee of the International Whaling Commission.

George, J.C., Givens, G.H., Horstmann, L., Suydam, R., Scheimreif, K., Stimmelmayr, R., Sheffield, G., Sformo, T., Person, B., VonDuyke, A., Sousa, L., & Tarpley, R. *In prep.* Age and length at sexual maturity and pregnancy rate of Bering-Chukchi-Beaufort Seas bowhead whales.

International Whaling Commission. 1980. Report of the Special Meeting on North Pacific Sperm Whale Assessments, Cronulla, November 1977. Report of the International Whaling Commission (Special Issue 2):1-10.

International Whaling Commission. 2018. Annual Report of the International Whaling Commission 2018. International Convention for the Regulation of Whaling, 1946, Schedule, revised 2018.

Noongwook, G., The Native Village of Savoonga, The Native Village of Gambell, Huntington, H.P., and George, J.C. 2007. Traditional knowledge of the bowhead whale (*Balaena mysticetus*) around St. Lawrence Island, Alaska. Arctic 60 (1): 47-54.

O'Hara, T.M., George, J.C., Tarpley, R.J., Burek, K., & Suydam, R.S. 2002. Sexual maturation in male bowhead whales (*Balaena mysticetus*) of the Bering Sea stock. Journal of Cetacean Research and Management 4(2):143-148.

Quakenbush, L.T., Citta, J.J., George, J.C., Heide-Jørgensen, M.P., Brower, H. Jr., Harwood, L.A., Adams, B., Pokiak, C., Pokiak, J. & Lea, E. 2018. Bering–Chukchi–Beaufort stock of bowhead whales: 2006–2017 satellite telemetry results with some observations on stock sub-structure. Paper SC/67B/AWMP/04 presented to the IWC's Scientific Committee.

Suydam, R.S. & George, J.C. 2012. Preliminary analysis of subsistence harvest data concerning bowhead whales (*Balaena mysticetus*) taken by Alaskan Natives, 1974 to 2011. Paper SC/64/AWMP8 presented to the IWC's Scientific Committee.

Suydam, R. & George, J.C. 2021. Chapter 32, Current Indigenous Whaling. In: J.C. George and J.G.M. Thewissen (eds.). The Bowhead Whale *Balaena mysticetus*: Biology and Human Interactions. Elsevier Press.

Suydam, R.S., George, J.C., Person, B., Hanns, C. & Sheffield, G. 2011. Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaskan Eskimos during 2010. Paper SC/63/BRG2 presented to the Scientific Committee of the International Whaling Commission.

Suydam, R., George, J.C., Person, B., Stimmelmayr, R., Sformo, T., Pierce, L., VonDuyke, A., de Sousa, L., & Sheffield, G. 2018. Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaskan Eskimos during 2017. Paper SC/68b/AWMP05 presented to the Scientific Committee of the International Whaling Commission.

Suydam, R., George, J.C., Person, B.T., Stimmelmayr, R., Sformo, T.L., Pierce, L., VonDuyke, A., de Sousa, L., Acker, R. & Sheffield, G. 2020. Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaskan Natives during 2019. Paper SC/68B/AWS/XX presented to the Scientific Committee of the International Whaling Commission.

Stimmelmayr, R., Rotstein, D., Sheffield, G., Brower, H.K., & George, J.C. Diseases and parasites. The Bowhead Whale. 2021:471–98. doi: 10.1016/B978-0-12-818969-6.00030-3. Epub 2020 Sep 25. PMCID: PMC7516376.

Tarpley, R.J. & Hillmann, D.J. 1999. Observations on ovary morphology, fetal size and functional correlates in the bowhead whale *Balaena mysticetus*. Report to the Department of Wildlife Management, North Slope Borough, Box 69, Barrow, AK from Department of Veterinary Anatomy, College of Veterinary Medicine, Texas A&M University, College Station, TX. 276 pp.

Willoughby, A.L., Ferguson, M.C., Stimmelmayr, R., Clarke, J.T., & Brower, A.A. 2020. Bowhead whale (Balaena mysticetus) and killer whale (Orcinus orca) co-occurrence in the U.S. Pacific Arctic, 2009–2018: evidence from bowhead whale carcasses. Polar Biol 43, 1669–1679.

Table 1. Village, whale identification number, dates landed, standard length (meters) and sex of bowhead whales landed by Alaskan Eskimos during the 2021 subsistence hunt.

Village	Whale ID	Date Landed	Sex	Length (m)
Utqiaġvik	21B1	10 May	F	12.9
(formerly Barrow)	21B2	13 May	F	11.8
	21B3	13 May	F	9.1
	21B4	14 May[1]	F	7.8
	21B5	13 May	M	8.1
	21B6	13 May	F	11.4
	21B7	14 May	F	8.4
	21B8	16 May[2]	F	13.9
	21B9	17 May	F	14.2
	21B10	28 Sep	M	12.6
	21B11	28 Sep	F	8.4
	21B12	28 Sep	M	13.8
	21B13	28 Sep	F[3]	14.8
	21B14	3 Oct	M	12.4
	21B15	4 Oct[4]	M	12.1
	21B16	4 Oct	M	9.3
	21B17	6 Oct	M	8.7
	21B18	7 Oct	M	8.4
	21B19	7 Oct	M	8.5
	21B20	7 Oct	M	9.6
	21B21	9 Oct	M	9.3
	21B22	9 Oct	F	9.3
	21B23	9 Oct	M	10
	21B24	9 Oct	F	9.2
	21B25	9 Oct	M	9.6
Gambell	21G1	20 Apr	M	8.5
	21G2	20 Apr	F	8.8
	21G3	21 Apr	M	11
	21G4	21 Apr	M	12.5
	21G5	23 Apr	M	10.2
Point Hope	21H1	13 Apr	M	7.5
	21H2	14 Apr	F	8.4
	21H3	30 Apr	F	8.7
	21H4	30 Apr	M	8.4
	21H5	2 May	M	8.8
	21H6	3 May[5]	F	16.6
	21H7	5 May	M	13.6
	21H8	5 May	F	8.4
	21H9	5 May	M	7.7

	21H10	6 May	M	13.9
	21H11	7 May	M	14.8
Kaktovik	21KK1	9 Sep	M	8.2
	21KK2	14 Sep	M	7.7
	21KK3	16 Sep	F	8.6
Nuiqsut	21N1	28 Aug	M	7.8
	21N2	29 Aug	F	9.2
	21N3	29 Aug	M	8.5
	21N4	30 Aug[6]	M	8.8
	21N5	31 Aug	M	7.7
Savoonga	21S1	23 Apr[7]	F	16.8
	21S2	16 Dec	F	9.6
Wainwright	21WW1	26 Apr	F	9.1
	21WW2	15 May[8]	F	14.8
	21WW3	18 May	M	14.5
	21WW4	14 Jun	F	14.1
	21WW5	14 Sep	F	8.9
	21WW6	14 Sep	F	13.5

[1]Struck on 13 May, [2]struck on 15 May, [3]pregnant with male fetus 1.7m in length, [4]struck on 3 Oct, [5]struck on 2 May, [6]struck on 26 Aug, [7]struck on 22 April, [8]struck on 15 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 2021. Data provided by the Alaska Eskimo Whaling Commission.

Village	**Date**	**Season**	**Estimated Survival**
Utqiaġvik	11 May	Spring	Poor
	12 May	Spring	Fair
	13 May	Spring	Excellent
	19 May	Spring	Poor
	28 Sep	Autumn	Died
	28 Sep	Autumn	Died
	3 Oct	Autumn	Died
Gambell	18 Apr	Spring	Fair
	20 Apr	Spring	Poor
	23 Apr	Spring	Died
	24 Apr	Spring	Poor
Point Hope	11 Apr	Spring	Poor
Kaktovik	9 Sep	Autumn	Good

Table 3. Summary of the number of landed bowhead whales and the Captains' estimate of survival for whales struck and lost during 2021. Data provided by the Alaska Eskimo Whaling Commission.

Village	**Landed**	**Struck & Lost**	**Total Struck**	**Estimated Survival[1]**
Utqiaġvik	25	7	32	1E; 1F; 2P; 3D
Gambell	5	4	9	1F; 2P; 1D
Kaktovik	3	1	4	1G
Nuiqsut	5	-	5	-
Point Hope	11	1	12	1P
Point Lay	-	-	-	-
Savoonga	2	-	2	-
Wainwright	6	-	6	-
Totals	57	13	70	1E; 1G; 2F; 5P; 4D
Totals (%)	81%	19%	100%	

[1] E=excellent, G=good, F=fair, P=poor, D=died, U=unknown