SC/69A/ASW/02

Sub-committees/working group name: ASW

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Kayla Scheimreif, John J. Citta, Raphaela Stimmelmayr, Rita Acker, Perry Anashugak, Andrew L. Vonduyke, Todd L. Sformo, Brian T. Person, Frances J. Olemaun, Leandra Sousa, Nicole Wojciechowski, And J. Craig George

INTERNATIONAL
WHALING COMMISSION

Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaskan Natives during 2022

[1]Kayla Scheimreif, [1]John J. Citta, [1]Raphaela Stimmelmayr, [1]Rita Acker, [1]Perry Anashugak, [1]Andrew L. VonDuyke, [1]Todd L. Sformo, [1]Brian T. Person, [1]Frances J. Olemaun, [1]Leandra Sousa, [1]Nicole Wojciechowski, and [2] J. Craig George.

[1] Department of Wildlife Management, North Slope Borough, Box 69, Utqiaġvik, AK 99723 USA
[2] Department of Wildlife Management, North Slope Borough, Retired
Contact email: kayla.scheimreif@north-slope.org

ABSTRACT

In 2022, 68 bowhead whales (*Balaena mysticetus*) were struck during the Alaskan aboriginal subsistence hunt, of which 53 were landed. The total number of whales struck and the number landed in 2022 was higher than the averages for the previous 10 years (2012-2021: mean struck = 58.6, *SD* = 11 and mean landed = 46, *SD* = 8.61; respectively). The efficiency (# landed / # struck) of the hunt (78%) in 2022 was consistent with the average for the past 10 years (2012-2021: mean of efficiency = 79%; *SD* = 0.053). 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 2022. In 2022, the efficiency of the spring hunt (68%) was lower than the previous 10-yr average (2012-2021; mean spring efficiency = 71%; *SD* = 0.10). The efficiency of the 2022 autumn hunt (93%) was the same as the average autumn hunting efficiency over the past ten years (2012-2021; mean autumn efficiency = 93%; *SD* = 0.08). Fifteen whales were struck and lost in 2022. Of those 15 whales, three were lost due to equipment malfunction (e.g., harpoon failure), six whales were lost when they swam into or under the ice, four whales sank, and one whale was lost for an unknown reason. Of the harvested whales, 26 were females and 27 were males. Based on total length (≥13.7 m in length), six of the females were presumed mature. One whale was pregnant with a midterm male fetus that was 1.7 m long, and another was pregnant with a fetus estimated to be 1 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), represents 11 communities and 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 2022 under a seven-year block quota that began in 2019 (IWC, 2018).

The subsistence hunts typically occur 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 environmental factors, including wind speed and

direction, wave size, fog, and temperature, stability of shorefast ice, sea ice concentration, sea ice type and movements.

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 2022, 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 2022 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.

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 collected through 2016. However, Givens *et al.* (in review) 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 (13.6 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 is still undergoing peer review. 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 2022 Alaskan subsistence hunt, of the 68 whales that were struck, 53 (78%) were landed. The total number of whales struck and the number landed in 2022 was higher than the averages for the previous 10 years (2012-2021: mean struck = 58.6, *SD* = 11 and mean landed = 46, *SD* = 8.61; respectively). During spring 2022, 27 bowheads were landed by five villages (Utqiaġvik, Gambell (SLI), Savoonga (SLI), Point Hope, and Wainwright) and 13 were struck and lost by the same five villages (Tables 1 and 2). During the autumn and winter harvest, 26 whales were landed by five villages (Utqiaġvik, Kaktovik, Wainwright, Savoonga (SLI) and Nuiqsut) and one was struck and lost in Utqiaġvik and Nuiqsut each.

Spring (2022) Hunting Conditions
On SLI, one whale was harvested by Gambell on 11 April, and one whale was landed by Savoonga on 23 April.

Point Hope landed seven whales between early April and early May. Wainwright landed two whales in late April. Utqiaġvik landed 16 whales between mid-April and early May. At Point Hope, hunters reported good, thick ice. In Utqiaġvik, conditions were fair, although at times high wind, strong currents, and thin ice at the edge of the lead combined to make hunting more challenging.

Autumn (2022) Hunting Conditions
There are three villages that typically hunt bowheads in the Beaufort Sea during the autumn: Kaktovik, Nuiqsut and Utqiaġvik. The 2022 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 2022 as they did the year prior,

resulting in the successful harvest of one whale on 31 July. Wainwright has only harvested bowheads in the summer or autumn during five previous years: in 2010, 2011, 2013, 2015, and 2021.

At Kaktovik, three whales were landed between early and late September. Nuiqsut landed five whales at Cross Island from 28 August to 5 September. At Utqiaġvik, 15 whales were landed between 1 and 5 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). A later starting date for autumn whaling is preferred in Utqiaġvik because of lower temperature and snow on the ground that provides a clean surface for butchering and reducing the risk of spoilage. In autumn 2021, the BWCA reverted to a more typical, later starting date (28 September). In 2022, autumn whaling began on 1 October and there was ample snow cover on the NARL runway, the primary butchering site for fall whaling.

Winter (2022) Hunting Conditions
Savoonga landed one whale on 13 December and another on 20 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 15 whales struck and lost in 2022, 13 occurred in the spring and two during the autumn. Of those 15 whales, three were lost due to equipment malfunction (e.g., harpoon failure), six whales were lost when they swam into or under the ice, four whales sank, and one whale was lost for an unknown reason. Of the 15 lost whales, survival estimates as provided by whaling captains and their crews are as follows: two had an excellent chance of survival, one had a good chance of survival, one had a fair chance of survival, five had a poor chance of survival, and the remaining six are known to have died (Tables 2 and 3).

The overall efficiency (# landed / # struck) of the 2022 hunt, 78% (see Table 3) was nearly the same as the average for the past 10 years (2012-2021: mean of efficiency = 79%; *SD* = 0.053). Since the mid-1970s, the 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 2022. In 2022, the efficiency of the spring hunt (68%) was lower than the previous 10-year average (2012-2021; mean spring efficiency = 71%) and lower than the 2022 autumn hunt (93%). The efficiency of the autumn hunt over the past ten years (2012-2021) was 93% (SD = 0.08). Autumn hunts typically occur during mostly open water conditions, at which time sea ice has 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. This longer harvest window helps to compensate for inclement weather that typically results in poor hunting conditions and a reduced harvest.

Sex and Maturity
Twenty-seven (51%) of the 53 landed whales were males. The longest male was estimated to be 15.6 m, and the smallest measured 7.2 m. Based on a length of $\geq$13 m (O'Hara *et al*., 2002), five males were presumably sexually mature (see Table 1).

Twenty-six (49%) of the 53 landed whales were females. The longest females were estimated to be 16.5 m (n = 2). The shortest female measured 7.3 m. Based on pregnancy and a length ≥13.7 m (George *et al*., 2018), six of the females were presumed sexually mature. One whale harvested at Utqiaġvik was pregnant with a midterm male fetus that was 1.7 m long, and one harvested at Savoonga was pregnant with a fetus estimated to be 1 m long.

ACKNOWLEDGEMENTS

We thank the Alaska Eskimo Whaling Commission and local hunters for providing data on the subsistence bowhead hunt. We especially thank the Captains' associations as well as the hunters from Utqiaġvik for their support and providing us access to their whales for examinations and sampling. Peter Detwiler, Jim McClusky, Kate Stafford Cyd Hanns, and Bobby Sarren provided support in Utqiaġvik. Financial support to the NSB DWM was provided by the North Slope Borough and NOAA. Finally, we thank NSB Mayor Harry K. Brower, Jr. and Taqulik Hepa (NSB DWM Director) for their encouragement and support.

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 2022 subsistence hunt.

Village	Whale ID	Date Landed	Sex	Length (m)
Utqiaġvik (formerly Barrow)	22B1	16 Apr	F	9.0
	22B2	18 Apr	F	7.3
	22B3	18 Apr	M	7.7
	22B4	18 Apr	M	7.9
	22B5	19 Apr	M	7.9
	22B6	20 Apr[1]	M	13.8
	22B7	21 Apr	F	7.6
	22B8	22 Apr	F	8.1
	22B9	22 Apr	M	8.0
	22B10	24 Apr	M	10.6
	22B11	30 Apr	M	10.8
	22B12	30 Apr	M	10.3
	22B13	30 Apr	M	7.9
	22B14	30 Apr	F	10.3
	22B15	6 May	F	8.2
	22B16	8 May[2]	F[3]	15.1
	22B17	1 Oct	F	8.2
	22B18	1 Oct	M	8.0
	22B19	1 Oct	F	7.8
	22B20	2 Oct	M	8.2
	22B21	2 Oct	F	9.2
	22B22	2 Oct	F	8.7
	22B23	2 Oct	M	8.2
	22B24	3 Oct	F	8.6
	22B25	4 Oct	M	9.9
	22B26	4 Oct	M	7.2
	22B27	4 Oct	M	7.9
	22B28	4 Oct	M	9.0
	22B29	4 Oct	M	8.7
	22B30	5 Oct[4]	F	10.4
	22B31	5 Oct[5]	F	8.9
Gambell	22G1	11 Apr	F	10.4
Kaktovik	22KK1	7 Sep	F	10.8
	22KK2	19 Sep	M	7.5
	22KK3	22 Sep	F	13.6
Nuiqsut	22N1	28 Aug	M	7.9
	22N2	28 Aug	F	8.2
	22N3	3 Sep	M	15.6
	22N4	5 Sep	M	7.2

Table 1: *Continued*

Village	Whale ID	Date Landed	Sex	Length (m)
Nuiqsut *(continued)*	22N5	5 Sep	F	9.8
Point Hope	22H1	6 Apr	F	8.8
	22H2	25 Apr	M	13.5
	22H3	25 Apr	M	12.1
	22H4	26 Apr	M	8.7
	22H5	26 Apr	F	16.5
	22H6	6 May	F	15.1
	22H7	17 May[6]	M	14.3
Savoonga	22S1	23 Apr	F	16.5
	22S2	13 Dec	F[7]	15.6
	22S3	20 Dec	M	15.2
Wainwright	22WW1	22 Apr	M	8.3
	22WW2	29 Apr	F	10.1
	22WW3	1 Aug[8]	F	13.8

[1]Struck on 19 April, [2]struck on 7 May, [3]pregnant with male fetus 4.4 m in length, [4]struck on 4 Oct, [5]struck on 4 Oct, [6]struck on 16 May, [7]pregnant with fetus estimated to be 1 m in length, [8]struck on 31 July

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 2022. Data provided by the Alaska Eskimo Whaling Commission.

Village	Date	Season	Estimated Survival
Utqiaġvik	22 Apr	Spring	Died
	23 Apr	Spring	Good
	29 Apr	Spring	Died
	19 Apr	Spring	Excellent
	4 Oct	Autumn	Excellent
Gambell	5 Apr	Spring	Poor
	11 Apr	Spring	Died
Point Hope	6 Apr	Spring	Poor
	26 Apr	Spring	Poor
	9 May	Spring	Died
Nuiqsut	5 Sep	Autumn	Died
Savoonga	20 Apr	Spring	Died
	23 Apr	Spring	Poor
Wainwright	6 May	Spring	Fair
	7 May	Spring	Poor

Table 3: Summary of the number of landed bowhead whales and the Captains' estimate of survival for whales struck and lost during 2022. Data provided by the Alaska Eskimo Whaling Commission.

Village	Landed	Struck & Lost	Total Struck	Estimated Survival[1]
Utqiaġvik	31	5	36	2E; 1G; 2D
Gambell	1	2	3	1P; 1D
Kaktovik	3	-	3	-
Nuiqsut	5	1	6	1D
Point Hope	7	3	10	2P; 1D
Point Lay	-	-	-	-
Savoonga	3	2	5	1P; 1D
Wainwright	3	2	5	1F; 1P
Totals	53	15	68	2E; 1G; 1F; 5P; 6D
Totals as percentages	78%	22%	100%	

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