



Subsistence Harvest of Caribou in Eight North Slope Villages, Alaska: 2014-2018

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Overview:

The North Slope Borough Department of Wildlife Management (DWM) has collected subsistence harvest data on fish, birds, marine and terrestrial mammals, and plants utilized by residents of the North Slope beginning in the early 1990's. In some years this program has struggled to consistently collect and analyze these data in all communities due to various staffing, logistic, and financial set-backs. Beginning in 2014, the DWM has made a concerted effort to improve the consistent collection of caribou harvest data due to the decline of caribou populations on the North Slope. This report provides information on the methods used to collect and analyze caribou harvest data, discusses ways that we have tried to improve this program, and presents caribou harvest estimates for each North Slope community.

Methods:

The DWM attempted to conduct household caribou harvest surveys in all communities between 2014 and 2018 using the same survey instrument (Appendix A). In 2016 we slightly modified the survey instrument by adding 8 activity codes to facilitate data management. In 2015 the North Slope Borough Planning & Community Services Department collected data for an Economic Profile and Census Report in all North Slope communities. To avoid *survey fatigue* we requested that they include our survey instrument as part of the Census rather than having DWM staff conduct an independent survey. Similarly, in 2015 there were 3 independent surveys scheduled in most North Slope communities and we requested that Stephen R. Braund & Associates (SRB&A) collect household caribou harvest data on the DWM's behalf so as to avoid a 4th survey. Finally, as part of a stipulation to Conoco Phillips AK Alpine Satellite Development Project SRB&A was contracted to collect subsistence harvest data from the village of Nuiqsut. They agreed and collected household caribou harvest data using the DWM instrument between 2015 and 2018. DWM staff collected household harvest data from 2016 through 2018.

Caribou harvest data was collected at the household level for all surveys (*i.e.* if multiple hunters lived in the same household their harvest was combined into the reported household harvest). In most years data were collected using a one year recall- two exceptions to this exist. The 2017 data was collected using a two year recall for all communities except for Nuiqsut (NUI), Wainwright (AIN), and Kaktovik (KAK); and in 2015 through 2017 the communities of AIN and KAK data was collected using two six month recall surveys in each year.

In all communities other than Barrow (BRW) we attempted to conduct a census. Despite this, we worked off of a randomized household list because some of our visits to villages were only for a few days and we recognized that we might not be able to complete the census. We wanted to ensure that our choice of households to be interviewed was unbiased and therefore worked down the list of random households. In Barrow we also generated a random household list annually and we attempted to survey the first 300 households on that list (~ one-quarter of the total households).

Metrics:

Reported household harvest is the sum of male, female, and unknown sex (some respondents could not remember the number of bull or cows harvested) harvested caribou and reported during the interview. We estimated *community harvest* to be the ratio of the sum of reported household harvest divided by the number of households surveyed in each community multiplied by the total number of households in that community. We estimated the variation surrounding that estimate using methods by Cochran (1977) which are presented in Appendix B. We estimated the 95 % confidence interval (95 % CI) by multiplying the standard error by 1.96. We did not have the databases from the North Slope Borough Planning & Community Services Department's contractor or SRB&A therefore we cannot present 95% CI for those estimates. We estimated the *average household caribou harvest* to be the ratio of community harvest divided by the total number of households in that community. Our estimates of the *sex ratio* of the harvest are derived from the total number of males or females reported harvested divided by the sum of male and females reported harvested multiplied by 100. It is assumed that caribou reported with unknown sex were harvested at a similar ratio as the reported harvest.

We also collected information on the health of caribou harvested using standardized methods developed by CARMA, the general harvest location, and the month in which harvest occurred. We have yet to summarize that information.

Results and Discussion:

Community caribou harvest varied by community and year (Table 1). All communities harvest a fairly substantial number of caribou and its importance to the diet and culture of these largely Inupiat communities has been documented (Fuller and George 1997, Bacon et al. 2011, Braem 2017). Community caribou harvest was consistently highest in Barrow and Wainwright. Community harvest estimates for Point Lay in 2014 and 2015 were much higher than in 2016 through 2018 which could be attributed to the distribution of caribou being closer to the community in those years. Similarly, our 2017 estimate for Point Hope is high when compared to other years included in this report and reflects a favorable distribution of caribou near that community. Average household caribou harvest was consistently highest for the communities of Wainwright and Anaktuvuk Pass which underscores the importance of caribou to these communities (Table 2). Point Hope and Kaktovik tended to have the lowest average household harvest. Both of these communities have limited access to caribou when they are near the community. Kaktovik's best access is via snow machine in winter and caribou typically don't overwinter on the Coastal Plain in large numbers. Similarly, their access in the summer is limited via boat to coastal regions when caribou use the coast as insect relief for brief periods of the summer before moving back towards the mountains.

Our estimates of the sex ratio of caribou harvest are presented in Table 3. Bull caribou are the preferred harvest (Fuller and George 1997, Bacon et al. 2011). Our bull : cow harvest estimates don't necessarily reflect that preference. Atqasuk usually has caribou near the community year round and their bull : cow ratio reflects that they typically have the option to harvest bulls. Cow harvest is usually higher when caribou are only accessible during rut or in the few months post rut. Anaktuvuk Pass prefers to harvest

caribou in August and September if caribou migrate through their valley. Over the past decade caribou have only been accessible in large numbers in late October and November and in those months they have to rely on cow caribou. Our bull:cow ratios may reflect a change in caribou preference towards the harvest of cows, the lack of accessibility to bull caribou during the fall and early winter months, a decrease in the bull:cow ratio in the population, or a combination of these factors.

Moving Forward with our Harvest Documentation Program:

We have made a concerted effort to census caribou harvest in all 8 North Slope communities (Table 4). We are very grateful to SRB&A for their efforts to collect harvest information in Nuiqsut and in the coastal communities in 2015 for our Department. It is unfortunate that we failed to collect caribou harvest information in Anaktuvuk Pass in 2015 and 2018 and we intend to improve these efforts by hiring a Subsistence Research Assistant (see below) from that community and by traveling to AKP more often. We recognize that we surveyed a fairly low percentage of households in Barrow. Barrow is a large and culturally diverse community that has posed challenges to researchers in the past. One problem we encountered was that household participants were working when we attempted to interview them. Shifting our schedule to evenings and weekends helped somewhat but in the future we will try to interview participants at their work place.

We have made several improvements to our harvest documentation project and we will continue to find new ways to improve it while maintaining consistent data collection. We listened to suggestions from participants and have begun to provide communities with calendars which an increasing number of hunters use to document their harvest. This helps to improve harvest recall, thus data quality. We have created a database and continue to update it to facilitate data management, data quality, and data storage. We have changed the structure of the subsistence section of our Department and are attempting to fill Subsistence Research Assistant positions in more communities. We have not yet summarized harvest location data. This data exists in the format of Inupiat place names. Our plan is to work with focal hunters in each community to document those place names on maps (some already exist) and to translate those areas into a GIS format. Similarly, we have yet to summarize the data on the health and body condition of harvested caribou and intend to work on that in the near future. Finally, we are in the early stages of developing a program for our database that will summarize harvest data by sex and month.

Table 1. Estimated annual caribou harvest by community.

Estimated community harvest of caribou ($\pm 95\%$ CI)								
Year	AIN	AKP	ATQ	BRW	KAK	NUI ²	PHO	PIZ
2014 ¹	951	1042	173	2860	248	358 ¹	212	951
2015 ²	756	----	----	3000	303	621 \pm 82	422	756
2016 ³	914 \pm 372	859 \pm 474	269 \pm 55	3246 \pm 1033	133 \pm 37	481 \pm 108	242 \pm 22	215 \pm 43
2017 ³	806 \pm 188	548 \pm 133	145 \pm 70	2636 \pm 1397	119 \pm 202	635 \pm 104	1282 \pm 243	290 \pm 74
2018 ³	1012 \pm 453	----	380 \pm 127	3829 \pm 1866	108 \pm 122	497	294 \pm 241	191 \pm 24

Villages are abbreviated as follows: AIN=Wainwright, AKP = Anaktuvuk Pass, ATQ = Atqasuk, BRW = Barrow, KAK = Kaktovik, NUI = Nuiqsut, PHO = Point Hope, and PIZ = Point Lay.

¹Survey was conducted during the NSB 2015 Economic Profile & Census

²Survey was conducted by Stephan R. Braund & Associates (SRB&A)

³Survey completed by the NSB DWM

Table 2. Average annual household caribou harvest by community.

Average household caribou harvest								
Year	AIN	AKP	ATQ	BRW	KAK	NUI ²	PHO	PIZ
2014 ¹	6.2	9.7	2.7	2.4	3.1	2.9	1	12.7
2015 ²	4.9	----	----	2.5	3.8	5	2	10.1
2016 ³	5.9	8	4.1	2.7	1.7	1.7	1.1	2.9
2017 ³	5.2	5.1	2.2	2.2	1.5	5	6	3.9
2018 ³	6.6	----	5.8	3.2	1.4	4	1.4	2.5

Villages are abbreviated as follows: AIN=Wainwright, AKP = Anaktuvuk Pass, ATQ = Atqasuk, BRW = Barrow, KAK = Kaktovik, NUI = Nuiqsut, PHO = Point Hope, and PIZ = Point Lay.

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Table 3. Sex ratio of reported caribou harvest by community and year.

Sex ratio of reported harvest (% Bull : % Cow)								
Year	AIN	AKP	ATQ	BRW	KAK	NUI ²	PHO	PIZ
2014 ¹	24 : 76	44 : 56	70 : 30	62 : 38	75 : 25	¹ 84 : 16	65 : 35	52 : 48
2015 ²	52 : 48	----	----	65 : 35	22 : 78	14 : 86	37 : 63	52 : 48
2016 ³	61 : 39	77 : 23	76 : 24	57 : 43	55 : 45	----	69 : 31	72 : 28
2017 ³	55 : 45	56 : 44	74 : 26	76 : 24	51 : 49	----	94 : 6	71 : 29
2018 ³	57 : 43	----	83 : 17	77 : 23	71 : 29	----	100 : 0	78 : 22

Villages are abbreviated as follows: AIN=Wainwright, AKP = Anaktuvuk Pass, ATQ = Atqasuk, BRW = Barrow, KAK = Kaktovik, NUI = Nuiqsut, PHO = Point Hope, and PIZ = Point Lay.

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Table 4. Percent of total households surveyed in each community by year.

Percent of total households surveyed								
Year	AIN	AKP	ATQ	BRW	KAK	NUI ²	PHO	PIZ
2014 ¹	50 %	48 %	42 %	15 %	26 %	¹ 45 %	22 %	75 %
2015 ²	59 %	----	----	65 %	67 %	81 %	76 %	82 %
2016 ³	47 %	36 %	68 %	21 %	76 %	83 %	88 %	79 %
2017 ³	79 %	58 %	52 %	10 %	83 %	79 %	39 %	63 %
2018 ³	52 %	0 %	52 %	8 %	64 %	----	35 %	88 %

Villages are abbreviated as follows: AIN=Wainwright, AKP = Anaktuvuk Pass, ATQ = Atqasuk, BRW = Barrow, KAK = Kaktovik, NUI = Nuiqsut, PHO = Point Hope, and PIZ = Point Lay.

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Appendix A.

NSB DWM caribou harvest questions for JAN-DEC 20XX:

Village _____ Household ID _____ Interviewer _____

Date of Interview _____

1. Did you hunt caribou from January to December in 20XX? Yes _____ No _____

Activity Code _____ 1) Harvested 2) Attempted but no harvest 3) Did not attempt harvest
4) Out hunting 5) Out of town 6) Could not contact 7) Did not want
to be interviewed 8) Other

If Yes:

2. What month/s did you harvest them? Please write the number harvested and sex in each month:

Month	Bull	Cow	UNK	Month	Bull	Cow	UNK
Jan				Feb			
Mar				Apr			
May				Jun			
Jul				Aug			
Sep				Oct			
Nov				Dec			

3. How many did you harvest? Male _____ Female _____ UNK _____ Total _____

4. In general how would you assess the health of the caribou you harvested? _____

1. **Skinny** (no back fat, little or no gut or kidney fat).
2. **Not Bad** (little back fat, some gut or kidney fat).
3. **Fat** (nice layer back fat, plenty of gut or kidney fat).
4. **Very Fat** (thick layer back fat all the way up the back & fat inside).

5. General hunt location (kill site/s)

Appendix B.

Computing a total annual harvest estimate for a species and its standard error

Let y_{hi} represent the total number harvested by the i th sampled household in Stratum h . Then the sample mean number \bar{y}_h harvested in stratum h is given by Equation (1):

Equation (1)

$$\bar{y}_h = \frac{1}{n_h} \sum_{i=1}^{n_h} y_{hi},$$

and total annual harvest T is given by Equation (2):

Equation (2)

$$T = \sum_{h=1}^6 N_h \bar{y}_h.$$

with estimated variance $V(T)$ given by Equation (3):

Equation (3)

$$V(T) = \sum_{h=1}^6 N_h (N_h - n_h) s_h^2 / n_h$$

where s_h^2 , the sample variance in Stratum h , is given by Equation (4):

Equation (4)

$$s_h^2 = \frac{1}{n_h - 1} \sum_{i=1}^{n_h} (y_{hi} - \bar{y}_h)^2$$

so s_h is the sample standard deviation in the stratum. Note that s_h^2 cannot be computed if $n_h = 1$, i.e. only a single household in the stratum harvested the species.

The standard error SE of T is given by Equation (5):

Equation (5)

$$SE = \sqrt{V(T)}$$

with $V(T)$ given by Equation (3).

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