Inuit harvesting levels of caribou in the Kitikmeot Region, Northwest Territories, Canada, 1982 — 1984

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Abstract: Information on the native harvest of caribou (*Rangifer tarandus* spp.) has been systematically collected in the Kitikmeot (Central Arctic) Region of the Northwest Territories since October 1982 through a cooperative effort between the Kitikmeot Hunters and Trappers Association and the Department of Renewable Resources. During the first 2 years of the study about 640 active hunters in 7 communities, or 20% of the Inuit population, were included. Local fieldworkers contacted an average of 80% of all hunters each month. The estimated regional harvest between October 1982 and September 1984 was 18 827±260 (SE) caribou. In the reported harvest (n=12 969), bulls dominated (54%) followed by cows (32%) and juveniles (<15 months old; 14%). The successful hunters harvested on the average 3.5 caribou/hunter/month. When extrapolated over the total Inuit population in the Region, the estimated caribou harvest was equivalent to an annual harvest of 3.1 caribou/person. This harvest level was relatively consistent between communities and years.

Key words: Canada, caribou, harvest, hunting, Inuit, Northwest Territories, *Rangifer*

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Introduction

The importance of documenting native harvesting is becoming increasingly apparent both to wildlife managers and users throughout the North. Reliable harvest data are essential not only for responsible wildlife management but also for documenting the economic and cultural importance of wildlife to northern communities. In the Northwest Territories, the latter has become particularly relevant in view of native land claims negotiations, impending industrial developments, and ongoing land use planning.

While information on native wildlife harvests in northern Canada has been collected over the last 40 years, the records are only of limited value due to incomplete, or sporadic, coverage in space and time, lack of systematic sampling techniques and inconsistent, or unknown, reporting rates. The basis and limitations of these data series have been discussed by Kelsall (1968), Berger (1977), Smith and Taylor (1977) and Usher *et al.* (1985). A system to formalize the collection of native harvest data was first used by the James Bay and Northern Quebec Native Harvesting Research Committee (JBNQNHRC, 1982). The system was based on a cooperative approach with extensive local involvement by native residents who were hired in each community to conduct periodic field interviews of hunters.

In the Northwest Territories, comprehensive harvest surveys based on the James Bay model were intiated in the Baffin Region in 1980 (Donaldson, 1984) and in the Keewatin Region in 1981 (Gamble, 1984). A review of the methodologies used in these studies was recently completed by Usher *et al.* (1985). In late 1982,

the Kitikmeot Hunters and Trappers Association passed a resolution in favour of a long-term harvest study to be initiated in the Kitikmeot (Central Arctic) Region. The survey was to be done in cooperation with the Department of Renewable Resources with the aim to establish present community harvest levels of a variety of wildlife species important to the Inuit population in the Region. Caribou (*Rangifer tarandus groenlandicus* and *R. t. pearyi*) is, by far, the most important source of red meat in the Kitikmeot Region and reported here are harvesting levels of caribou based on data collected during the first 2 years of the study (October 1982 - September 1984).

Methods

Study design

Community visits were made to explain the purpose of the harvest study and, in consultation with the local Hunters and Trappers Association, to hire a native fieldworker in each of the seven communities of the Region (Fig. 1). The fieldworkers were encouraged through a bonus pay system to collect harvest information by personally interviewing as many active hunters as possible each month. Most interviews were conducted in the native language (Inuktitut) using translated data forms. A «hunter» was defined as a holder of a General Hunting Licence (GHL) who hunted at least once a year. Lists of GHL holders from government records were updated by the fieldworkers to define the hunter population for each community. The definition of an active hunter included native residents 18 years of age or older and was, with few exceptions, restricted to males. Female GHL holders were not considered to take an active part in the harvesting of caribou and were, therefore, not contacted by the fieldworkers. To maintain the anonymity of respondents, hunters were assigned numbers and the master list was then kept by the local fieldworker. The only other person with access to the list was the project biologist, for purposes of data verification.

A hunter status form was used to determine the proportion of all hunters contacted (sample population) and whether or not a hunter had successfully hunted that month. A hunter who was away from the community for a whole month, as a result of travelling, rotational wage

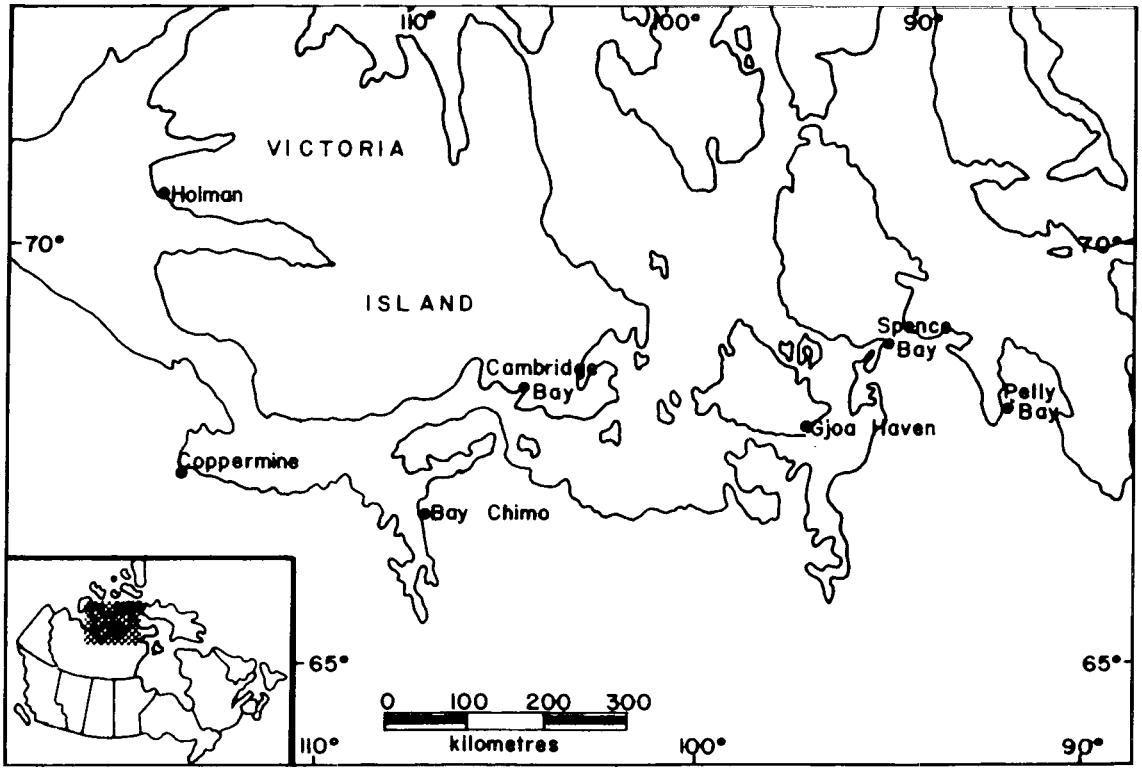

Fig. 1. The location of communities in the Kitikmeot (Central Arctic) Region of the Northwest Territories.

employment, etc., was not included in the hunter population for that month. Successful hunters were asked to report their harvest for several species including caribou, muskox (*Ovibos moschatus*), wolves (*Canis lupus*), marine mammals, waterfowl and fish. For caribou, information included numbers taken, age and sex (bull, cow, and calf), and location of harvest. Harvest kill was defined as the number of caribou actually retrieved and brought back to the community. It did not include crippling loss or any caribou cached and not retrieved. To aid hunter recall and facilitate data collection, calendars where individuals could record their own harvest were translated into local dialects and given to all hunters.

Data analysis

A method of proportional projection (JBNQNHRC, 1982; Donaldson, 1984) was used to estimate community harvest by month from the reported harvest, the sample size, and the number of hunters in the population. The respondents were treated as a random sample assuming the non-respondents were not different from the sampled population and the sample was large enough to contain a representative selection of the hunter population.

However, hunters were not selected strictly at random by the fieldworker but, rather, fortuitously depending on the availability of individual hunters in the community each month. To evaluate potential sampling biases and determine the nature of non-respondents, several verification tests of the data were made (Graf, 1984). Based on 1983 data from each of three communities (Cambridge Bay, Spence Bay, and Pelly Bay), the mean reported kill rate for each hunter was plotted to illustrate the distribution of hunters and their contribution to the total community harvest. From each hunter's record, the frequency of non-response was tabulated and compared with mean kill rate for the months when the hunter had been contacted.

Using proportional projection and the notations of Cochran (1963), the estimated harvest for month i in community j ($\hat{Y}ij$) is calculated by:

$$\hat{Y}ij = Nij \sum y/nij$$

where Nij=number of hunters in the Inuit population in month i, community j;
$\sum y$=harvest reported by those contacted;
nij=number of hunters contacted in month i, community j.

The variance for the estimated harvest, Var ($\hat{Y}ij$), is calculated as:

$$Var(\hat{Y}ij) = Nij^2 (1 - f) s^2/nij$$

where 1 - f=finite population correction factor and
f=nij/Nij (Cochran, 1963);
s^2=sample variance

Since each month is treated as a separate stratum, the estimated annual harvest for at particular community is the sum of estimates from each month ($\sum \hat{Y}i$). The standard error of that estimate, SE($\hat{Y}j$) is calculated from the sum of each month's variance, *viz.*

$$SE(\hat{Y}j) = \sqrt{\sum Var(\hat{Y}i)}$$

Similarly, the estimated annual harvest for the entire region is based on the sum of estimates from all communities with their associated variances.

To analyze differences in harvesting levels between years, data were divided into two 1-year periods: October 1982 - September 1983 («1983») and October 1983 - September 1984 («1984»). In two communities, Bay Chimo and Coppermine, collection of harvest data did not start until January 1983. To allow for comparisons of annual regional harvest totals and per capita harvesting levels between communities, it was necessary to extrapolate harvests for those missing time periods by applying the proportion of the annual harvest (in %) that was respresented by the similar period during the following year when data were collected. An individual hunter «harvest rate» was calculated as the number of caribou taken per successful hunter per month. Per capita harvesting levels were calculated by dividing the estimated annual harvest of caribou by the total population size (number of caribou/person/year) and by the total number of hunters in the population (number of caribou/hunter/year).

Results

During 1983 and 1984, the size of the hunter population averaged 640 hunters (Table 1) which represented 20% of the Inuit population in the Kitikmeot Region. During 159 monthly sampling periods including 10 912 individual hunter contacts, the mean response rate was 80% (Table 1). Sample sizes varied depending on season and the energy of individual fieldworkers. The lowest response rates occurred in early summer

(June—July) when many families moved out into summer camps and could not be reached by the fieldworker. As the study progressed, mean response rates increased from 74% in 1983 to 86% in 1984 (Table 1).

Distribution plots, based on 1983 data and used to evaluate potential sampling biases, showed that individual hunter harvest rates approximated a normal distribution. This suggests that average hunters were responsible for most of the caribou harvest and not the very active hunters who may be more easily missed by the fieldworker. Apparently, missed hunters were not exceptional as there was no relationship between individual hunter harvest rate and the frequency of contact. Given the high response rates (74 - 86%) and that few individual hunters were missed more than 3 months of the year, the assumption of a representative («random») sample for the purposes of data analysis seems reasonable.

The total reported harvest for the 1983 and 1984 periods were 12 969 caribou (Table 1) and the corresponding estimate was 18 827±260 caribou. While the reported regional harvest was similar between years (Table 1), hunter response rates were higher in 1984 resulting in less inference and a lower ($P<0.05$) estimated harvest. Community harvest levels were lower throughout the Region in 1984. The largest proportion of the estimated harvest in both years was taken by hunters from Coppermine (23%), Cambridge Bay (20%), and Gjoa Haven (20%). Of the total reported harvest, 83% occurred between early and late winter (October to April). The successful hunters took, on the average, 3.5 caribou per hunter per month and this harvest rate was similar between years for most communities (Table 1).

When the annual caribou harvest is compared with Inuit population size for each community, the overall regional harvest was equivalent to 3.1 caribou per person per year (Table 2). The higher levels of harvesting by hunters in Bay Chimo is consistent with the dependancy on caribou as part of the traditional lifestyle maintained in that

Table 1. Community harvesting levels (means ± SE) of caribou in the Kitikmeot Region, NWT.

Community	Year	Hunter population[a]	Sample size (%)[b]	Reported harvest	Estimated harvest	Harvest rate[c]
Bay Chimo	1983	24±1	94±4	338	479±14[d]	3.8±1
	1984	27±2	99±0	295	298±3	3.2±0
Cambridge Bay	1983	132±3	77±6	1897	2351±59	4.3±0
	1984	127±1	94±1	1352	1445±24	3.7±0
Coppermine	1983	127±3	47±4	723	2279±117[d]	3.5±0
	1984	156±4	76±7	1437	2027±69	3.8±0
Gjoa Haven	1983	104±1	55±5	1097	2098±126	4.8±1
	1984	103±2	79±7	1035	1551±111	4.5±1
Holman	1983	58±1	72±7	723	1177±102	5.0±1
	1984	55±2	85±2	852	1072±38	3.6±1
Pelly Bay	1983	50±0	87±4	627	765±24	2.3±0
	1984	49±1	81±5	492	691±29	2.4±0
Spence Bay	1983	127±1	86±5	1050	1390±37	2.2±0
	1984	135±3	88±4	1051	1183±22	2.4±0
ALL	1983	622±4	74±7	6455	10 539±213	3.7±0
	1984	652±7	86±5	6514	8288±149	3.4±0
ALL	Combined	640±5	80±9	12 969	18 827±260	3.5±0

[a] The number of hunters determined monthly (N) between Oct. 1982 — Sept. 1984.
[b] The number of hunters contacted (n) expressed as a proportion of the hunter population.
[c] The number of caribou taken per successful hunter per month.
[d] Includes proportional estimates for periods with missing data (see Methods).

Table 2. Per capita harvesting levels (means ± SE) of caribou in the Kitikmeot Region, NWT.

Community	Year	Population (Inuit)[a]	Estimated harvest (±SE)	No. caribou/ person/year	No. caribou/ hunter/year
Bay Chimo	1983	81	479±14	5.9	19.8
	1984	82	298±3	3.6	11.0
Cambridge Bay	1983	706	2351±59	3.3	17.8
	1984	714	1445±24	2.0	11.4
Coppermine	1983	810	2279±117	2.6	16.9
	1984	815	2027±69	2.5	13.0
Gjoa Haven	1983	563	2098±126	3.7	20.2
	1984	615	1551±111	2.5	15.1
Holman	1983	308	1177±102	3.8	20.3
	1984	325	1072±38	3.3	19.5
Pelly Bay	1983	263	765±24	2.9	15.3
	1984	261	691±29	2.7	14.1
Spence Bay	1983	415	1390±37	3.3	10.9
	1984	413	1183±22	2.9	8.8
ALL	1983	3146	10 539±213	3.6±0	17.3±1
	1984	3225	8288±149	2.8±0	13.3±1
ALL	Combined	6371	18 827±260	3.1±0	15.3±1

[a] Based on GNWT Bureau of Statistics (1984) and Statistics Canada (1982).

community. About one-third of the residents in that community were reported to be active hunters by the fieldworker. While the per capita harvesting levels in the Region were similar between years and communities, the number of caribou harvested annually per hunter was more variable ($\bar{x}$=15.3; Table 2).

Of the total reported harvest (12 969; Table 1), 54% were bulls, 32% cows, and 14% «calves». Since some «calves» were reported taken in summer, this category includes yearlings up to 15 months old and is more appropriately called «juveniles». Differences in the sex/age distribution of the harvest were apparent between communities. The largest proportion of bulls were taken by hunters in Bay Chimo (74%) and Pelly Bay (72%). Cows dominated the harvest in Coppermine (46%) while the largest proportion of juveniles were taken by hunters in Holman (23%).

Discussion

The proportion of active hunters (20%) to total Inuit population size in the Kitikmeot Region is similar to the range of 19—21% reported for the Baffin Region (Donaldson, 1984). To maintain accurate lists of active hunters in each community, periodic updating of the lists were necessary as hunters and their families moved between communities and new GHL holders were added. The mean response rate (80%) compares favourably with the Baffin study (72% in 1981, 79% in 1982; Donaldson, 1984). Since the harvest of caribou is spread over a large number of hunters and months, high hunter response rates will help to ensure that a representative, or unbiased, sample is obtained. In the James Bay study, Steiger (1981) confirmed that a large fortuitous sample of hunters (>60%) yielded an unbiased estimate of total harvest using the proportional projection method. In the Kitikmeot Region, the unsampled hunter population does not appear atypical or likely to influence community harvest levels. The lower response rates in early summer do not significantly affect caribou harvest estimates as over 80% of the harvest is taken during fall, winter and spring.

Biases arising when hunters forget, or deliberately misrepresent their harvest (strategic response bias), have the potential to affect the reliability of survey data. I do not believe hunter recall was a serious problem due to the frequency

of interviews (monthly), the use of calendars and the fact that hunters have little problem remembering their harvest of larger species, such as caribou. Strategic response bias, or misrepresentation of the harvest, cannot be eliminated by technical methods as it depends on how the respondents perceive the survey and how they believe its results may affect their interests (Usher *et al.*, 1985). Short of demanding proof of kill, there is little that can be done to verify the accuracy of the reported caribou harvest. Through the establishment of trust and the acceptance of the need for reliable harvest data among hunters, fieldworkers and researchers, the effects of response bias should be reduced. Since this harvest study was cooperative and personal interviews were made by fieldworkers familiar with the local hunters, there was little reason, or opportunity, for misrepresenting the actual harvest. Underreporting, for fear of enforced controls, was not likely a factor for caribou as subsistence use has never been regulated in the Kitikmeot Region.

The per capita harvesting levels of caribou in the Kitikmeot Region ($\bar{x}$=3.1 caribou/person/year) were surprisingly consistent between communities and years despite local differences in caribou distribution and availability. When compared with other regions, the harvest levels remain reasonably consistent. Based on harvest data presented by Gamble (1984) from the Keewatin Region, I calculated the annual harvest in 1981/82 and 1982/83 to represent 3.2 and 2.8 caribou per person, respectively. Similar figures from the Baffin Region, based on data by Donaldson (1984), are somewhat lower (1.8 caribou/person/year in 1981 and 2.4 caribou/person/year in 1982). The greater dependancy on marine mammals in the Baffin Region will likely contribute to the apparently lower per capita harvest of caribou there. The estimate that Inuit annually need 5 to 7 caribou per person, stated in the Federal Court of Canada in 1979 (Miller, 1983), seems high in view of the harvest data now available. I believe present harvesting levels are sufficiently similar between communities, regions, and years, to suggest that Inuit in the Northwest Territories now require between 2 to 4 caribou per person on an annual basis.

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