

Monitoring the condition, availability and harvest of the Porcupine Caribou Herd 2000-2007: an analysis based on community interviews.

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ABSTRACT

Community interviews conducted by the Arctic Borderlands Ecological Knowledge Cooperative were analyzed in relation to caribou condition, availability and harvest for the period 2000-2007. Responses to relevant interview questions were categorized into discreet classes and trends identified. The results indicate that conditions are generally improving for the Porcupine Caribou and for caribou harvesters. Body condition improved, caribou became more available and more hunters met their subsistence needs. However, additional work needs to be done to relate the results of this study to the measures of herd performance collected by management agencies.

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1.0 Introduction

Monitoring the population dynamics of the Porcupine Caribou Herd can be a complex and difficult task. While quantitative techniques such as caribou population estimates have traditionally been used to measure overall herd health, qualitative data pertaining to caribou condition and behaviour can also provide useful information. Utilizing a suite of both scientific and community-based methods perhaps yields the most insight into the status of this important natural resource.

The Arctic Borderlands Ecological Knowledge Co-op (ABEKC) monitors and assesses ecological change in the range of the Porcupine Caribou Herd and the adjacent Mackenzie Delta area in the Northwest Territories (NWT), Yukon and Alaska. Since 1996, the Co-op has applied both science and community-based monitoring techniques in an effort to track environmental change, with special emphasis on the impacts of development, climate change and contaminants.

The community-based monitoring component of the Co-op's mandate involves the gathering of local knowledge about the Porcupine Caribou Herd. ("Local knowledge" is used to describe recent observations of environmental change as interpreted by individuals who have spent significant amounts of time on the land and therefore have a unique opportunity to observe these changes first-hand¹).

Community monitors are recruited through a selection process led by the local Renewable Resource Councils and hunting and/or trapping organizations. The monitors are trained to administer the survey to local experts in each participating community. The survey itself encompasses over 65 indicators of environmental change grouped into several categories, including weather, berries, fish and animals². The survey results are entered into a database and spatial observations are digitized using a GIS platform. Database and GIS products are periodically reviewed to ensure that data is readily accessible to a broad spectrum of user.

New indicators and communities have been incorporated into the survey over time in an effort to better capture and describe the complexities of the Northern environment. Indicator data from external sources - particularly those which focus on weather and other biophysical measurements and observations – are also compiled annually (www.taiga.net/coop).

The recording of local knowledge via these surveys has been an important accomplishment for both the ABEKC and participating communities. However, the translation of survey results into tangible data and recommendations relevant to co-management bodies, stewards and communities has proven to be difficult.

The following study provides a starting point in this regard by analyzing data with respect to caribou condition, availability and harvest and relating this data to the overall status of

¹ Survey questionnaire described elsewhere: (1) Kofinas (2) Folliot

² The complete surveys are available at www.taiga.net/coop.

the herd. Results and analysis are discussed in the context of how community-based monitoring data can be used to assist in the sustainable and successful management of the herd.

2.0 Methodology

2.1 Temporal Scope of Analysis

The community-based surveys have been administered by ABEKC since 1996. Periodic changes and enhancements made to the survey since that time have resulted in data inconsistencies and precluded a consistent quantitative analysis for the entire set of data. As such, only responses to replicated survey questions recorded during the 2000-2007 field seasons were incorporated into the analysis.

The basis of this summary and comparative analysis was the percent frequency of various responses to questions posed to the interviewees. Inter-community comparisons were intentionally omitted from the scope of this study, despite the insights they may yield. Instead, the aggregate survey results from all participating communities were analyzed.

Community	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	Total
Aklavik Gwich'in	12	11	15	9	20	22	20	6	20	20	18	173
Aklavik Inuvialuit	11	21	23	20	21	20	16	20	20	20	14	206
Arctic Village					10	14	15	20	20	20	30	129
Fort McPherson	14	20	22	19	21	20	20	20	20	20	20	216
Inuvik Gwich'in								15			10	25
Inuvik Inuvialuit								20		20	20	60
Kaktovik						8					*	8
Old Crow	15	29	21	32	20	21	20	19	20	20	20	237
Tsiigehtchic								20	20		20	60
Tuktoyaktuk								20	16	20	20	76
Total	52	81	81	80	92	105	91	160	136	140	172	1190

* interviews conducted with significant variation

Table 1. Number of interviews conducted in participating communities from 1996 – 2007. (Selected response categories from 2000-2007 were used in the analysis presented here.)

2.2 Topical Scope of Analysis

Although the community-based survey includes more than 65 questions, only those questions deemed to relate directly to caribou use and observations were incorporated into the study (please refer to Table 2). The basis for the data summary and comparative analysis was the percent frequency of various responses to the questions posed to respondents.

Survey topics reviewed	Summarized and analyzed
Spring caribou availability	Yes
Spring caribou body condition	Yes
Spring caribou harvest needs met	Yes
Spring reasons for not hunting	Yes
Spring caribou unusual conditions	Yes
Spring number of caribou seen	No ³
Fall caribou availability	Yes
Fall caribou body condition	Yes
Fall caribou unusual conditions	Yes
Fall caribou harvest needs met	Yes
Fall reasons for not hunting	Yes
Winter caribou availability	Yes
Winter caribou body condition	Yes

Table 2. Summary of main topics reviewed from the Arctic Borderlands Ecological Knowledge Co-op database.

A set of categories was devised for each question in order to capture responses for subsequent comparison (e.g., “good”, “bad” and “average”). The frequency of responses in each class was subsequently converted to a percentage and plotted for each year of the survey. No statistical methods were applied to test for significant differences among interview sessions, years or trends. The survey questions and categories devised for analysis are described in the following sections.

2.2.1 Caribou Availability

Interviewees were asked how available (in terms of proximity) the caribou were to their community during the spring, fall, and winter: “close”, “not close” or “not available”. Many respondents further qualified their answers with information relating to weather factors, personal ability to travel or the difficulty of local terrain. Therefore, the responses can not be correlated directly to distance from participating communities (McNeil et al., 2005).

³ The number of caribou seen/ observations were extracted and summarized from the database; however, no further quantitative analyses were performed since the linkages to management applications were not apparent from the survey response data.

In order to draw comparisons between interview sessions an index of caribou availability was developed (i.e., all responses were collapsed into one metric). The caribou availability index (CA) was calculated as:

$$CA = 3 \times (\textit{close}) + 2 \times (\textit{not close}) + (\textit{not available})$$

where “close”, “not close” and “not available” were the percent frequency of the corresponding responses from each interview.

2.2.2 *Subsistence Needs*

The interviewees were asked if they had met their subsistence needs for caribou during the fall and spring hunting periods, specifically. The “yes” or “no” responses were converted to the percentage of respondents who answered in the affirmative. Most respondents qualified their answers with supporting information ranging from personal ability to hunt to whether or not they had shared some of their kill.

2.2.3 *Hunting Activity*

Survey participants were asked whether they hunted during the fall and spring hunting seasons and, if not, why. The percentage of respondents who actively hunted was compared among hunting periods and explanations for not hunting were organized into six different classes, as follows:

- *No means to hunt* – due to lack of equipment or money to purchase fuel.
- *Obtained meat elsewhere* – sources could be relatives, friends, First Nation office, etc.
- *No time to hunt* – hunters may have been away, busy working, or unable to get out on the land due to medical problems.
- *Never hunt in (season)* – some respondents indicated that they didn’t hunt caribou in a particular season.
- *Poor weather* – in some instances weather conditions were too adverse to access caribou.
- *Caribou unavailable* – if caribou were not available people did not go hunting.

2.2.4 *Harvest*

Hunters who responded “yes” to the previous question (“Did you hunt?”) were asked to recall the number of animals they harvested. A harvest index was devised by multiplying the average number of caribou taken by the percentage of respondents who had hunted. (For example, if the average take was five animals and the percentage of respondents who hunted was 70%, then the harvest index (HI) was calculated as $5 \times 70 = 350$.) The harvest index was then used to compare the caribou harvest between different seasons and years.

2.2.5 *Body Condition and Health*

Interviewees were asked to describe the relative body condition of animals they had seen and/or harvested. Answers varied by community and year and were thus organized into three categories: “good”, “mixed” and “poor”. In order to compare responses between interview sessions, an index for caribou condition was developed (i.e., all responses were collapsed into one metric). The caribou condition index (CC) was calculated as:

$$CC = 3 \times (\text{good}) + 2 \times (\text{mixed}) + (\text{poor})$$

where “good”, “mixed” and “poor” were the frequency of the corresponding responses from an interview session. Respondents also provided other specific information that related to caribou body condition where appropriate.

2.2.6 *Physical Abnormalities*

Interviewees were asked if they had observed any physical abnormalities during their contact with caribou during the previous hunting seasons. Due to the wide variation in responses, the information was organized into a discrete set of classes (please refer to Section 3.0).

3.0 Results

3.1 *Caribou Availability*

In general, the availability of Porcupine Caribou for harvest during the spring, fall and winter increased during the 2000-2007 study period (Figure 1). The availability of caribou in the fall season dropped significantly after 2000-01, steadily increased until 2004-05, and then decreased slightly from 2005-2007. The availability of caribou in the winter and spring seasons generally increased throughout the study period.

The cumulative annual index of caribou availability (sum of fall, winter and spring indices) showed a positive trend after the 2000-01 harvest year (Figure 2).

3.2 *Subsistence Needs*

During the years 2000-2007, an average of 63% and 70% of respondents indicated that they had met their needs for caribou during the fall and spring hunting seasons, respectively. There was a general increase in the fulfilment of subsistence needs over that time. In the latter three years of the surveys, 70% and 80% of the respondents met their needs during the fall and spring, respectively (Figure 3).

3.3 *Hunting Activity*

On average, weighted by year, 48% of survey respondents actively hunted and the average number of animals taken by successful hunters was 13. There was no apparent trend in the percentage of hunters successful (Figure 4a), nor the percentage of respondents indicating that they had harvested animals (Figure 4b).

A significant majority of interviewees indicated that they did not hunt because animals were not available to them relative to their ability to access areas occupied by caribou. In addition to availability, responses were equally distributed between the other categories, including: no means to hunt, meat obtained elsewhere, no time to hunt, never hunt in the particular season and bad weather. The effect of bad weather, in particular, was more prevalent during the spring hunting season than the fall (Figure 5).

3.4 *Body Condition and Health*

No trend was evident for fall and winter caribou body condition during the study period; however, spring condition of animals appeared to improve in the latter years of the study (Figure 6). Caribou condition remained consistent or declined between fall and winter each year. Animals appeared to lose condition the most over this period in 2004-05 and 2006-07 (Figure 7).

The body condition of caribou declined between fall and spring for all years, with 2000-01 and 2004-05 showing the most significant differences. As previously mentioned, however, most of the loss in condition in the 2004-05 year occurred between fall and winter (Figure 7).

3.5 *Physical Abnormalities*

A variety of physical abnormalities were reported by respondents, the most frequent response being “skinny” (although this may not represent a “true” abnormality). Other abnormalities included: cysts and white spots in the meat (four responses); sores and puss (four responses); wounded and/or limping animals (three responses); swollen joints, testes or glands (three responses); and bad liver (three responses). There was a strong negative trend in the reporting of abnormalities during the study period (Figure 8).

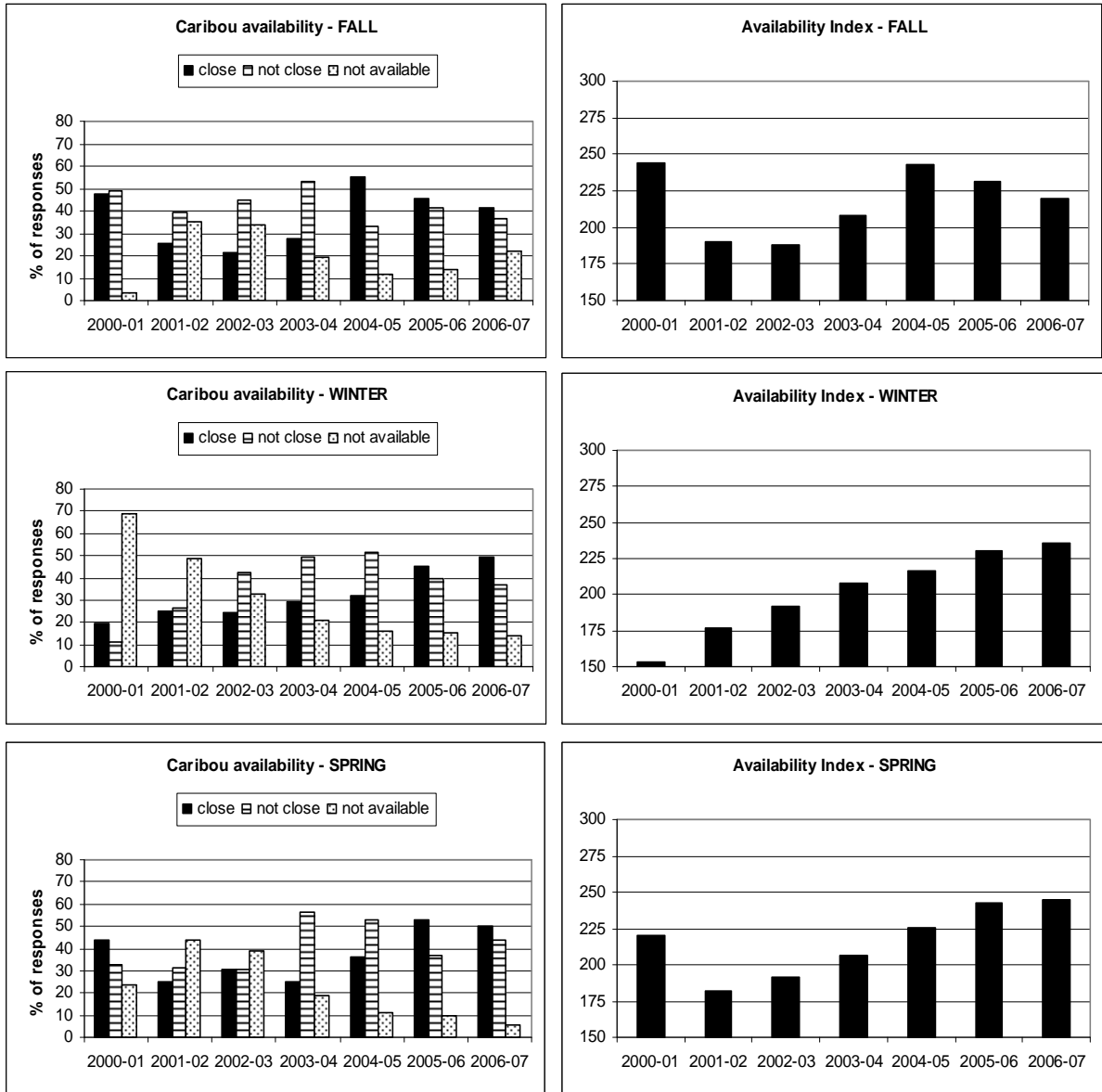


Figure 1. Availability of Porcupine Caribou from 2000-2007 based on survey responses in user communities. (Graphs in the left column are segmented into frequency of “close”, “not close” and “not available” responses. Graphs in the right column display the seasonal index of availability.)

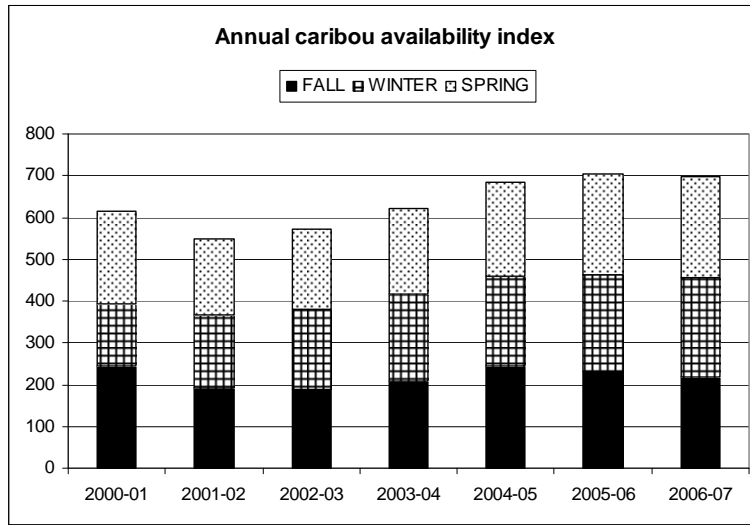


Figure 2. Total annual availability of Porcupine Caribou, 2000-2007, based on survey responses in user communities.

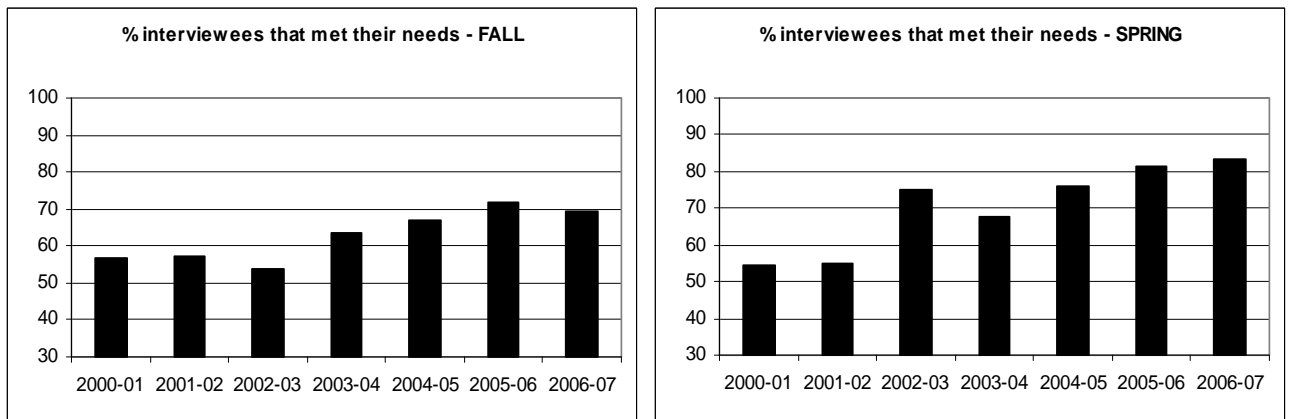


Figure 3. Percentage of respondents who met their needs for Porcupine Caribou, 2000-2007, based on survey responses in user communities.

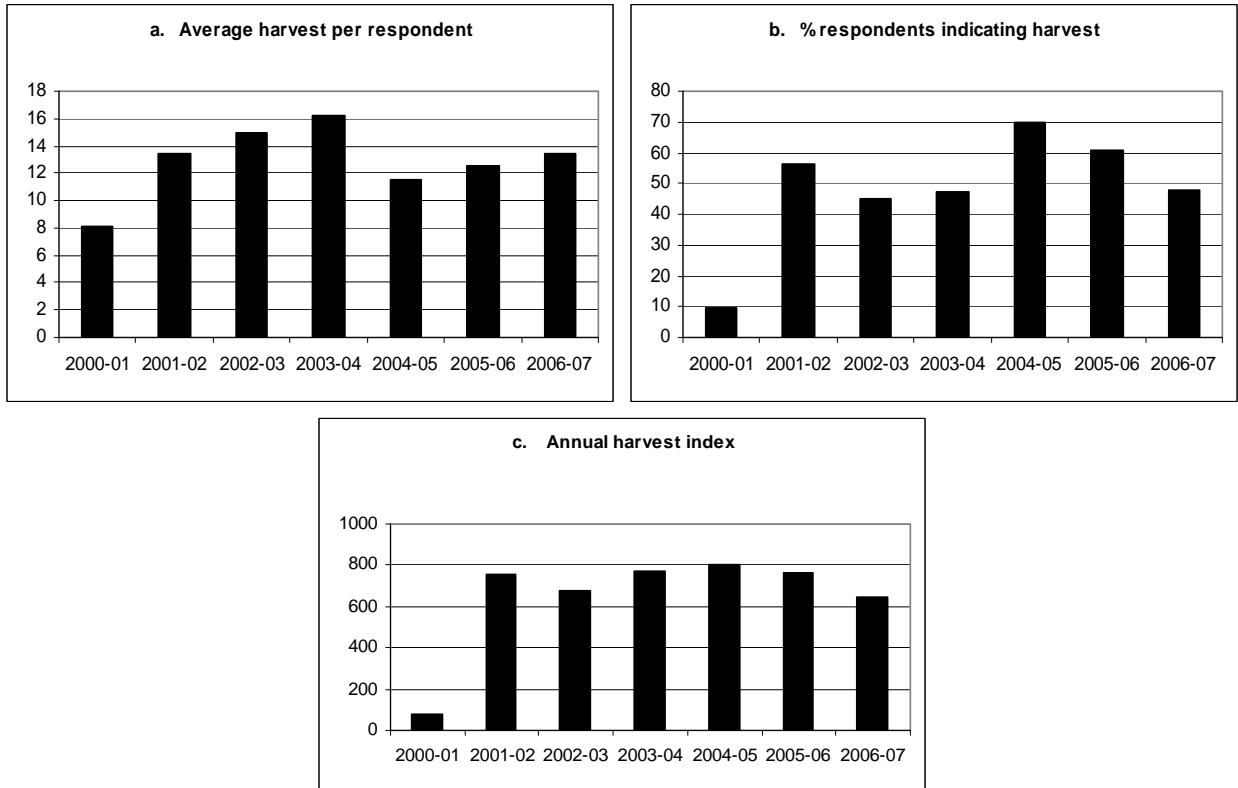
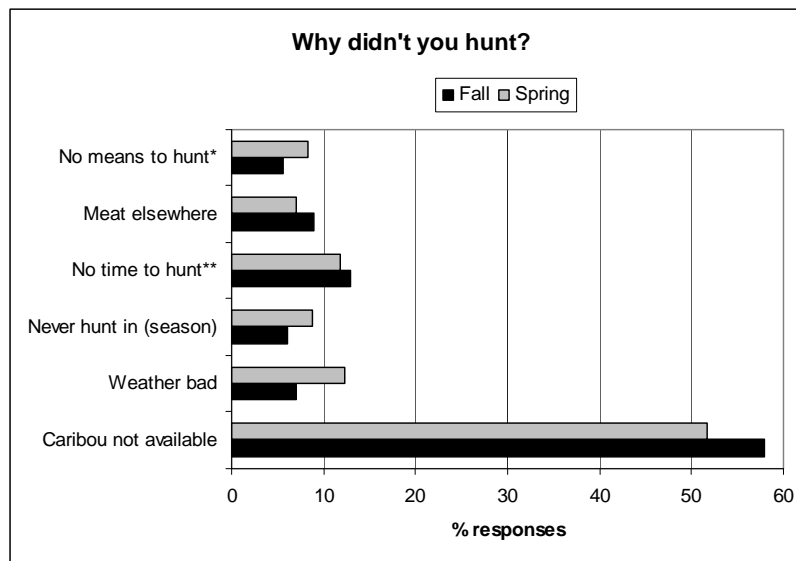


Figure 4. Summary of harvest information from Porcupine Caribou, 2000-2007, based on survey responses in user communities, including: average harvest per successful hunter (4a); percentage of interviewees who took caribou (4b); and annual harvest index (4c).



*lack of equipment or money

**out of town, working or medical reason

Figure 5. Reasons survey respondents from user communities provided for not hunting, 2000-2001.

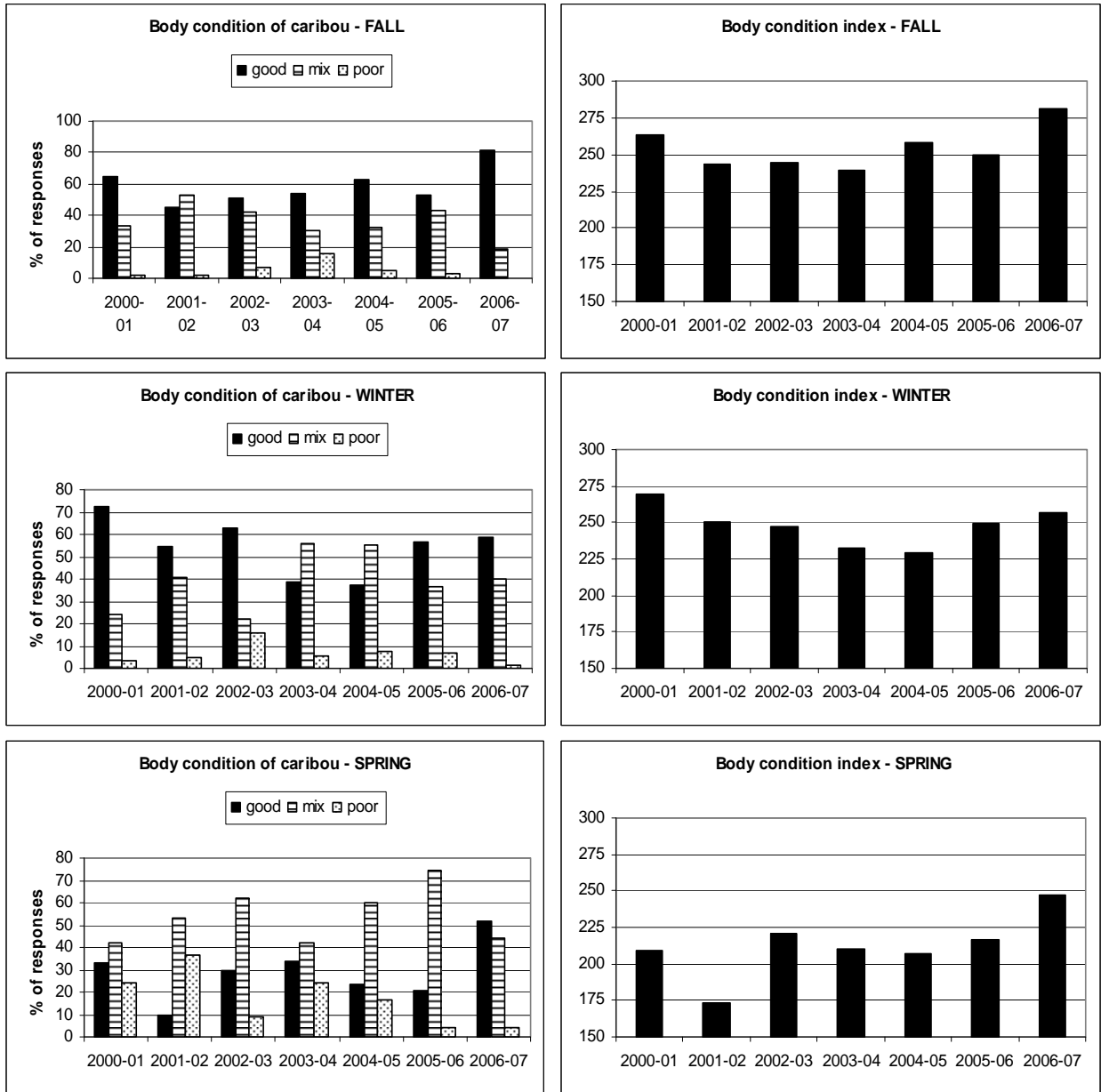


Figure 6. Body condition of Porcupine Caribou, 2000-2007, based on survey responses in user communities. (Graphs in the left column are broken into frequency of responses of “good”, “mix”, and “poor”. Graphs in the right column are the seasonal index of body condition.)

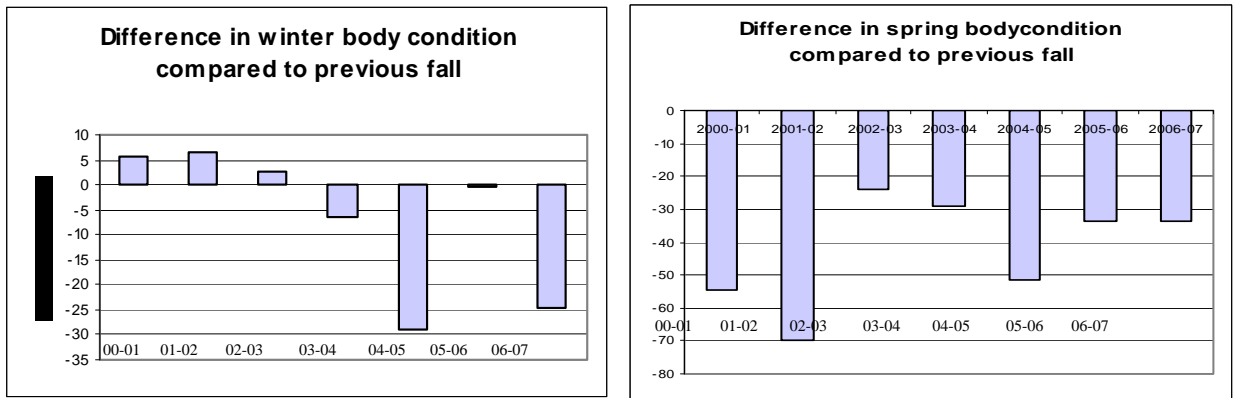


Figure 7. Change in body condition of Porcupine Caribou in winter and spring compared to the previous fall based on interviews in user communities, 2000-2007.

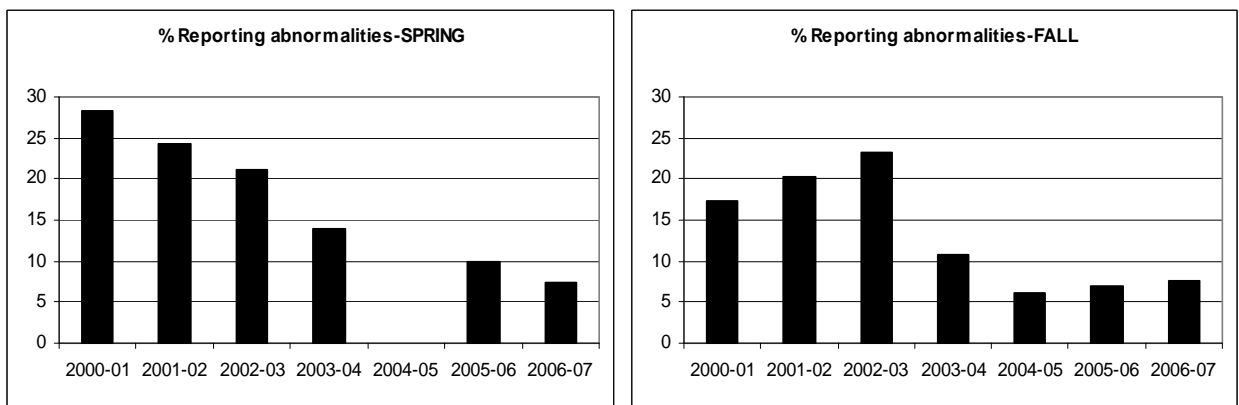


Figure 8. Percentage of respondents reporting abnormalities in caribou in fall and spring, 2000-2007.

4.0 Discussion

The Porcupine Caribou Herd declined by 55,000 animals from 1989 to 2001. Biologists have been unable to conduct a census since the summer of 2001, leaving communities and co-management boards anxious to learn whether the decline has continued. In the interim, agencies have been monitoring birth rates, early calf survival and calf-to-cow ratios in the spring. These indicators show that the herd may still be in decline.

In response to the apparent continued population decline and lack of accurate harvest data throughout the range of the herd, the Porcupine Caribou Management Board (PCMB) is developing a Harvest Management Strategy. The Strategy will guide the activities of the Board over the mid-term as it seeks consensus from user communities with respect to the

magnitude and structure of the harvest. One of the objectives of the analysis of the Arctic Borderlands interview data was to provide more information to the Board and management agencies during a time when little data is available on harvest levels and population trends.

Several general trends became apparent during the analysis of interview data. Caribou availability increased throughout the study period, although there was no clear explanation as to why. The fall, winter and spring locations of the herd are dictated primarily by the location of wintering areas, whereas the timing of movement is related to seasonal weather. Based on the distribution of satellite collars there were no apparent changes in distribution (i.e., gradual shift in wintering areas) that could account for the positive trend in caribou availability.

Regardless of the reason for increased caribou availability, there was a corresponding positive trend in the number of respondents who indicated that they had met their subsistence caribou hunting needs. Not surprisingly, there is a correlation between the caribou availability index and the percentage of hunters who met their needs for both fall ($n=7$, $r^2 = 0.22$) and spring ($n=7$, $r^2=0.69$).

Although caribou tended to become more available throughout the study period and a greater proportion of hunters met their needs, these factors did not translate into a corresponding higher harvest of caribou. The results for percentage of successful hunters and average number of caribou harvested indicate that the harvest index remained constant from 2000-07, with the exception of a low harvest in 2000-01. In that year, few people hunted and those that did took fewer animals compared to the other years.

The responses of hunters indicated that the body condition of caribou remained essentially constant throughout the study for the fall and winter period. However, spring body condition showed a trend towards improvement. The body condition of caribou is normally lowest in spring and integrates the environmental conditions faced by the individual since the previous calving period. Thus a positive trend in spring condition should indicate improved environmental conditions. However, this relationship would not hold true if fewer cows raised calves to weaning, in which case higher spring condition may relate to lower recruitment.

The decline in condition from fall to spring in the first two years of the study (2000-01 and 2001-02) coincided with two deep snow years and in the first year, high levels of early calf mortality (40%).

During the 2004-05 and 2006-07 seasons the reported decline in condition from fall to winter would indicate that adverse environmental conditions existed in early winter. Factors such as icing conditions, unusual early snowfall and exceptionally high fall snow levels may contribute to a rapid loss in condition early in the winter. For the 2004-05 hunting year, biologists reported the lowest spring birth rate (64%) among years where data exist for the Porcupine Herd. Russell et al. (1998) recorded early inter-uterine loss in 1990, a year of particularly severe climatic conditions for the Porcupine Herd. A similar phenomenon may have occurred in 2004-05.

The decline in condition early in 2006-07 did not translate into lower spring birth rates, however. This may be due to the fact that the fall condition of caribou was at its highest level in 2006 and a subsequent drop therefore did not result in poor condition in winter. (Rather, caribou body condition was reportedly highest in spring 2007).

Although there was a decline in reported abnormalities during the study, the fact that the majority of these “abnormalities” related to general animal condition may reflect the improved spring conditions of the caribou. If anything therefore this question tends to reinforce the question on body condition.

5.0 Management Implications

Overall, the results of community-based interviews administered by the ABEKC indicate that conditions are generally improving for the Porcupine Caribou and for caribou harvesters. Body condition improved, caribou became more available and more hunters met their subsistence needs. However, additional work needs to be done to relate the results of this study to the measures of herd performance collected by management agencies. For example, we have indicated that there may be some correlation between a decline in body condition and measures of herd productivity and weather conditions. A more thorough treatment should be conducted.

This analysis thus should serve to spark further analysis and be treated as an additional source of information for management agencies. Bases on this initial examination of the community data a number of questions could be examined:

- Under what weather conditions are people not able to access caribou?
- How does the distribution of caribou as revealed by the satellite collaring program relate to caribou availability in communities?
- How do the results of interview assessment of body condition relate to the body condition monitoring being conducted by Yukon Government, do they compliment each other?
- Is there a relationship between the harvest index derived from the interviews and the actual harvest of the herd?
- How can the results of this study inform the Harvest Management Strategy being developed by the PCMB?

6.0 Acknowledgement

This work would not be possible without the support of Gwich'in and Inuvialuit community partners of the Arctic Borderlands Ecological Knowledge Coop. The support received from co-management boards and government agencies has provided the resources necessary to collect community based data for this analysis. Lastly, we thank the Arctic Borderlands Ecological Knowledge board for their comments and review.

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