

A Preliminary History of the Teshekpuk Caribou Herd: Reconstructing the Past and Imagining the Future

Karen Hibbard-Rode (PhD. Student), University of Alaska Fairbanks; USA

Alaska's North Slope caribou herds provide an important subsistence resource for many communities and are a key component of the terrestrial ecosystem. In order to manage for the long-term persistence of caribou herds, we need to better understand long-term patterns of change in these herds. That need is significant because caribou herds and their habitats are managed on the basis of relatively short-term monitoring efforts, yet large areas of North Slope caribou ranges are expected to be impacted by climate change and oil and gas development over the next 100 years. This issue is pertinent not only in Alaska but throughout the circumpolar North, where vast areas rich in wildlife and other renewable and non-renewable resources face similar challenges of managing resources for the long-term adaptive capacity of Arctic peoples and ecosystems.

I study long-term changes in North Slope herds, and interactions between caribou and domestic reindeer, using methods from population genetics and oral history. Hearing Iñupiat elders tell stories from their time on the land as youth raised interesting biological questions and spurred my interest in combining ethnohistorical and population genetics research for my PhD dissertation. Here, I will present some preliminary findings on historical changes in Alaska's Teshekpuk Lake Caribou Herd (TCH), centered between the North Slope communities of Barrow, Atkasuk, and Nuiqsut (see Figure 1), and reflect on their implications for some of the NRF themes.



Figure 1. Map of communities in the core Teshekpuk Lake Caribou Herd (TCH) range

Caribou and Reindeer in the TCH range

The TCH was first recognized as a herd in the 1970s (Burns, 1990) and little information about its relationship to neighboring herds, or its history and origins, is available to wildlife managers. There are four herds on the North Slope and the TCH is the only one in which a majority of caribou over-winter relatively near to their summer range on the coastal plain. Alaskan caribou herds are defined based on the fidelity of each herd's females to a particular calving area (Skoog, 1968). However, the extent to which the herd concept approximates the actual population structure is unknown. Given the uncertainty and scarce biological information, there are three possible explanations for the TCH's origins and history: 1) The TCH is a recent outgrowth of the neighboring Western Arctic herd; 2) The TCH is a product of historical mixing between caribou and domestic reindeer; and 3) The TCH has existed as a distinct yet unrecognized herd, utilizing the same calving grounds over the past century or more.

Caribou populations are known to vary dramatically in size over time, sometimes by orders of magnitude. As caribou herds grow, their ranges often expand and may shift. Occasionally, entire herds may be created or assimilated by neighboring herds (Burns, 1990;

Hinkes *et al.*, 2005). The Western Arctic Herd (WAH), whose range currently overlaps the TCH, has greatly fluctuated in size in the last 150 years (Burch, 1972; Burns, 1990; Burwell, 2006). One hypothesis is that the TCH originated from a subgroup of the WAH that dispersed from the main herd during a past population high (Burns, 1990).

There is also some speculation that the TCH has descended, at least in part, from domestic reindeer that were herded in the area. Reindeer were introduced to Alaska from Russia by the U.S. government in the 1890's to promote pastoralism among Alaska Natives (Lantis, 1950; Olson, 1969; Simon, 1998; Sonnenfeld, 1959) and were driven to Barrow in 1898 as part of a mission to provide food for shipwrecked whalers. By the 1930's, over 30,000 reindeer were being grazed by Iñupiat herders (Sonnenfeld, 1959) in five herds that spanned the current TCH range from Atqasuk to the east shore of Teshekpuk Lake and south to the foothills of the Brooks Range (see Figure 1). By 1951, all Barrow-area herds had been lost when reindeer escaped with migrating caribou herds.

There are reasons to wonder whether escaped reindeer may have interbred with TCH caribou. Reindeer and caribou are capable of interbreeding but differ in some aspects of morphology, behavior, reproduction, and sensitivity to human activity. Reindeer traits such as shorter legs and decreased wariness towards predators would be expected to eventually disappear in the wild due to natural selection (Klein, 1980), but there is some evidence of successful reindeer introgression into wild caribou populations (e.g. in Greenland) (Jepsen *et al.*, 2002). Local people on the North Slope have observed differences in the morphology and behavior of TCH caribou that are more "reindeer-like".

The TCH may have originated within the past century, or it may have existed much longer. My historical research into the abundance, distribution, and interactions of caribou and reindeer on the TCH range will help to answer that question.

Historical Approach

I use both oral history and archival research to study the TCH's history. Other researchers in Canada (e.g. (Ferguson and Messier, 1997; Ferguson *et al.*, 1998) and Alaska (e.g. (Burch, 1972) have also taken such an approach to studying past changes in caribou populations. Yet there are challenges to integrating archival and oral sources, especially when addressing biological questions. Archival and oral sources are complementary when used together, but there are advantages and disadvantages to each. Written sources have the advantage of capturing an experience or observation in time, without the filter of memory and future

experiences. Oral sources, on the other hand, rely on memories over the life span of a person. Each person is likely to remember better the things that are relevant to their personal beliefs and identity or to significant events in their life. Those particular memories, then, are told to others as stories at moments later in life that inspire them. Oral sources often differ from real-time written records because they are stories adapted anew each time they are told in a particular context, to a particular listener, for a particular reason (Schneider, 2008).

Despite the advantage of “capturing” a moment in time, archival records can be very limited. There is often limited information about the individual author and the context in which they chose to write a particular record. In the North, authors of historical archives were often explorers or brief residents of an area, making their observations on any given topic short-term and based on first impressions. Oral sources, by comparison, are advantageous. Observations on a given topic are often made repeatedly over a lifetime, making comparisons possible. Interviewers are also able to ask respondents for further explanation of a particular statement or for details about their life, so that the context of observations may be much more clear.

These considerations are especially important, and more complicated, when using written and oral sources from non-biologists to address biological questions. In Alaska, where long-term biological data about many animals and environmental features is not available, the traditional local knowledge of Alaska Natives can be an important source of biological information. People who’ve spent much of their life observing animals have sophisticated knowledge based on rational, critical analysis comparing present conditions to what is known about the past (Freeman, 1992). In interviews, however, respondents often communicate these memories in stories with personal, ethical, political, and cultural meanings and explanations.

Using oral sources for biological questions in a cross-cultural setting means that careful listening is perhaps one of the most important research methods. Ideally, this includes listening and clarification, some understanding of each respondent’s background and beliefs, and basic knowledge of their community, cultural history and identity. Using oral sources for biological research also requires care to avoid fragmenting information in a way that changes a story’s meaning or misrepresents the purpose for it was told (Cruikshank, 1998).

Oral History Methods

Thus far, I have used oral history interviews with former reindeer herders in North Slope communities to record stories about the Barrow area's history of reindeer herding, mixing between reindeer and caribou, and past observations of caribou. These interviews established that Iñupiat elders have detailed memories about reindeer and caribou embedded within their memories of herding. Using a snowball method, I identified all the Barrow residents who herded reindeer in their youth or remember being around reindeer herding. Many are deceased, but I identified twelve still living and was able to interview eleven of them. I also interviewed three descendents of herders. Of the elders, seven were interviewed once and four were interviewed twice. All had been on the land as herders, hunters, or trappers during the 1930s-1940s.

Many respondents spoke English as a second language and some preferred to be interviewed in Iñupiaq. I worked with a translator to contact respondents and ask interview questions. Interviews were informal, so I referred to a set of questions to direct the interviews when necessary, but otherwise let respondents tell the stories they considered important. Interviews were recorded with an audio recorder and the places we discussed were marked on maps. Because my research is ongoing, not all interviews have been transcribed and the results I present in this paper give a brief sketch, not a deep and systematic analysis.

Archival Methods

I am also conducting ongoing research in archives to locate observations and notes about caribou within the TCH range from explorers, schoolteachers, traders, missionaries, and early biological surveys from 1880 to the present. I look for sources within my study area, defined as the core areas of the TCH on the coastal range, which limits me to a feasible scope of sources from Barrow, Atqasuk, Wainwright, Nuiqsut, and historic settlements in between (see Figure 1). When reading sources, I look for any notes about caribou, including observations, harvest, and mentions of local or traditional knowledge. I also look for sources, when possible, from the same place and time.

So far, I have used sources in the Alaska and Polar Regions collection in Fairbanks and the National Archives in Anchorage. The accounts of Ray, Smith, and Murdoch from the First International Polar Year Expedition in 1881-83 contain notes on caribou near Barrow, the success of the caribou harvests, and an account of Lt. Ray's trip with Iñupiat guides to the inland "caribou hunting grounds". Charles D. Brower, a white whaler who came to Barrow in 1884 and stayed the rest of his life, also wrote down some of his observations about relative

caribou abundance and their location. The records of the Bureau of Education, which administered the Reindeer Service after domestic reindeer were brought to Barrow in 1898, also contain letters and reports that mention caribou at times. Annual reports and documents from biological monitoring provide information on the TCH in the last 30 years.

Preliminary Results

The preliminary results of my research show promise for constructing a more detailed picture of caribou and reindeer in the TCH range over time. Local knowledge of former reindeer herders and long-time caribou hunters, and archival information, indicates changes in the distribution, abundance, and morphological and behavioral characteristics of caribou over the last 125 years. Though my historical research is still in progress, I will give some examples from my sources and summarize some of the patterns in information at particular places and points in time, following the approach of other caribou history researchers (Ferguson and Messier, 1997; Thorpe *et al.*, 2001).

Caribou at the turn of the 20th century

The records of early explorers offer some information on caribou abundance and distribution before reindeer were brought to Barrow in 1898. It is important to point out that many authors of these early sources refer to caribou as “deer” or “reindeer”, and only after domestic reindeer were introduced do they call them “native deer” or, later, “caribou”. Information from my archival research, including trends, quotes, and sources, is summarized in Table 1.

YEAR	TREND	QUOTE	SOURCE
1909-1911	Decline in, or suggested near absence of, caribou inland from Barrow near the Meade River.	Barrow’s domestic reindeer were being grazed in “the old caribou country where once immense herds of these animals ranged”.	The school superintendent of Barrow, also responsible for overseeing the reindeer herds (Supt. Barrow 1911).
		“This Barrow School is growing larger all the time. Families are continually coming to the coast to live. They know that making a living is easier along the coast, now that the native deer have left these regions”.	C. W. Hawkesworth, a Barrow schoolteacher (Hawkesworth 1909).

1897-1898	Large caribou harvest near Barrow, but not seen in such abundance for many years.	1200 caribou were harvested by Barrow people to feed shipwrecked whalers in the winter of 1897-1898, though after that winter there were “not many since, until last 3 or 4 years starting to return”.	Charles Brower, a trader and whaler who settled in Barrow (Brower year unknown).
1881-1883	Caribou abundant in the coastal plain near the Meade River, inland from Barrow near Atqasuk. Not seen in the foothills to the south.	Native hunters “Mungyaloo and Appidow have taken 90 deer. They have more than they can bring home. Mongy is feeding the dogs with deer meat”	Middleton Smith, member of the First International Polar Year Expedition to Barrow from 1881-1883, wrote in his journal in April 1883 (Smith 1883)
		“Saw several large bands of reindeer” along the Meade River but noted, “we saw no signs of deer, wolves, or any game after we struck the foothills; the range of the reindeer seems to be in the flat country we had crossed to the north”	Lt. Ray, member of the First International Polar Year Expedition to Barrow from 1881-1883, who took a trip inland by dog team with local Iñupiaq hunter Apaidyao and others in March and April 1883 (United States Congress 1900)
		“Capt. Herendeen, who went inland with the deer hunters in the autumn of 1882, reports that the bottom lands of Kulugrua [Meade River] ‘looked like a cattle yard,’ from the tracks of the reindeer”.	John Murdoch, member of the First International Polar Year Expedition to Barrow from 1881-1883, who wrote a detailed ethnographic report of the expedition (Murdoch 1892)
1880	Caribou numerous in coastal area that is part of the TCH range	“Caribou are said to be most numerous in that section of the coast lying between Point Barrow and Point Belcher”.	A naturalist on the steamer Thomas Corwin, as reported by Capt. Hooper, summarized by Explorer Ivan Petrov (United States Congress 1900)

Table 1. Timeline of archival information about caribou in the Teshekpuk Lake Herd range

The trends in archival sources from a century ago suggest twenty years of caribou abundance declining into years of scarcity (see Table 1), though it is important to put that information in a broader context. For example, though caribou were clearly plentiful enough near the Meade River for successful harvests in the early 1880s, Lt. Ray’s account of his trip inland suggests that caribou were far more plentiful in the past. He writes,

“The natives say that three generations ago all this region was inhabited by a people that lived by fishing and hunting reindeer, and did not come to the coast, but that the deer and fish grew scarce and there came a very cold season and the people nearly all

died from cold and starvation. The few that survived went away to the Colville or joined the little bands on the coast, so that now this whole region is not inhabited and is never visited except by the hunters from Nuwuk and Uglamie [Barrow], who come here for deer during the months of February and March” (United States Congress, 1900).

Though the observations recorded in archival sources portray an abundance of caribou in the 1880s, the story told to Lt. Ray suggests instead that the caribou population had declined to its present size. Likewise, Burch (1972) learned from oral histories that the large Western Brooks herd (today’s WAH, whose peripheral range extends into the TCH range) had sharply declined by the late 1800s, leaving open the possibility that the declining caribou near the Meade River belonged to this herd. This example illustrates the value of using both archival and oral sources to put each into context.

It is also important to put sources in their spatial context. One limitation of using sparse archival sources is a lack of locally specific information over time. For example, the TCH is defined by its fidelity to a calving area near Teshekpuk Lake, but it is possible that caribou wintering near the Meade River in the past may not have calved by Teshekpuk Lake, as today’s TCH caribou do. While much is written about the area around Barrow and Meade River, I have not found any references specific to the area around Teshekpuk Lake to the east. One note by Murdoch, however, vaguely suggests that the calving areas around Teshekpuk Lake may have been used over 100 years ago. He writes, “During the spring the deer retire some distance from the Point [Barrow], and the does then drop their fawns”....”When the fawns are perhaps a month old a small party, say a young man and his wife, sometimes makes a short journey to the eastward to procure fawn skins for clothing”. Murdoch writes that he could not obtain further detail about the calving area because Barrow people were focused on whaling in that season, however it is possible that those calves were born in the same areas used today (Murdoch, 1892).

Reindeer herders’ memories of caribou

Former reindeer herders remember seeing caribou while they were out on the land in the 1930s and 1940s. Though each herder’s experience and memory is different, there are some general trends in their observations. Before the 1930s, caribou were scarce and far away in the foothills, making them difficult to reach for hunting. In the 1930s, there were not many caribou on the coastal plain in the winter, but in the summer they’d come to the coastal areas

and mix with reindeer. Wesley Aiken remembers losing reindeer to caribou when he worked for the Leavitt herd:

“In the summer when it get hot they always wanna go. Caribous come in, and some of them go away with the caribous. That’s how they get less and less, and the reindeers, the caribous took them away, some of them, in the summer when it get hot, after they come in from there. (Me-‘So the caribou were coming all the way to the coast then, in those areas?’) Yeah, all the way to the coast!”

Wesley and David Leavitt Sr. also remember “big herds coming in” the first time reindeer were lost to caribou while they were helping out with the Brower Herd (Aiken and Leavitt, 2007).

By the late 1930s, caribou were using a wide stretch of coastal ranges in the summer, where they mixed with reindeer herds, resulting in the loss of all the domestic herds by 1951. Brower stated in 1938: “now the reindeer and caribou are getting so mixed it’s hard to tell one from the other” (Brower year unknown). Herders tried to recover the reindeer but Samuel Nayukok remembers, “It was just not possible. [We] chased the herd to try to get the reindeer back for days, but couldn’t catch up with them” (Nayukok, 2007). Reindeer losses to caribou happened repeatedly, year after year—some herds were slowly lost to multiple events, while others were lost all at once.

An interesting question, given these events, is: where did all the reindeer go? They may have had low rates of survival due to wolf predation, among other things, or they may have survived, or even hybridized with caribou. Former reindeer herders had varying opinions about the fate of reindeer, based on a number of observations. All herders said it was easy to tell reindeer and caribou apart, and could always see when caribou were mixed in with their herds. Most respondents said they had seen, or heard about, reindeer mixed in with caribou herds. In recent years, reindeer from the Seward Peninsula (southwest of the North Slope) mixed with the Western Arctic herd, which may explain recent sightings of reindeer in the Barrow area.

A few respondents said that caribou had changed, likely as a result of interbreeding with reindeer. They explained their ideas based on observed morphological characteristics, such as fatness and fur coloration, and noted changes in caribou behavior, particularly decreased sensitivity to human activity. Kenneth Toovak Sr. says, “Now, today, I think we call the caribou half reindeer and half caribou” (Toovak, 2007).

Recent History

After WWII and the end of reindeer herding, biologists began to describe North Slope caribou herds in more detail. Biologists noted year-round, resident caribou near Teshekpuk Lake in the late 1960s and confirmed, based on radio-collaring in the late 1970s, that the TCH was a distinct herd (Burns, 1990). The first TCH census estimated ~11,000 animals in 1980 and the herd grew steadily since then to ~45,000 in 2003 (ADF&G Division of Wildlife Conservation, 2003). As the herd has grown, its known range has expanded. Limited radio-tracking in the 1970-80s showed the TCH using a relatively small area around Teshekpuk Lake (Burns, 1990). Since then, satellite-collaring of animals from 1990-2005 showed continued use of the coastal plain near Teshekpuk Lake, Barrow, and Atqasuk year-round, with groups of animals making long-distance migrations south of the Brooks Range, west to the Seward Peninsula, and even east towards the Canadian border (Person *et al.*, 2007). Though there is yearly variation in the migrations of all herds, the movements of the TCH appear relatively erratic and unpredictable in comparison to neighboring herds. These patterns show a distinct core range for the TCH, but also increasing overlap with the ranges of neighboring herds during the breeding season (Hibbard-Rode, 2008).

Summary of Results

A chronology of trends in the information from archival and oral sources suggests that caribou herds in the Barrow area moved and fluctuated in size over the past 125 years. Caribou were readily available to hunters in the late 1800s, before reindeer herding began, but decreased in the early 1900s, leaving vast areas of grazing land for reindeer. By the 1930s, caribou were increasingly using the reindeer ranges in summer, where reindeer joined caribou herds and were lost to herders. I have little information at this point on caribou abundance in the 1950s-1960s, but by the 1970s the TCH was recognized as a distinct herd. Since then, it has increased in size, expanded its range, and provides the majority of caribou harvested by hunters from Barrow, Atqasuk, and Nuiqsut (Pedersen and McIntosh, unpublished ongoing study).

Limitations

Though preliminary results show some basic trends and patterns in observations of caribou and reindeer over the past 125 years, there are limitations to drawing strong conclusions based on them. First, the TCH range encompasses a vast area with few human settlements, so observations are limited to those areas where people lived, wanted to go, and were able to

access in each season. In particular, very few people lived near Teshekpuk Lake during the calving season and I have not encountered any sources describing direct observations from this area and season. The people, who would have been most knowledgeable about calving areas, and the relative abundance and distribution of caribou year-round, were Iñupiat hunters and trappers, who were highly mobile before the 1940s, but their observations were not written down and few are still alive.

Second, few observations were made in the same place at the same time, so there is little opportunity to validate information or to know whether what one observer saw as “scarcity”, for example, another would see as “abundance”. Attempting to validate the accuracy of oral sources, or many written sources for that matter, is often not wise because of variations in what different people feel is important to tell or to write. In particular, there was quite a lot of variation in what former reindeer herders said about the fate of escaped reindeer. This may be based on several factors including their own personal experience, willingness to draw conclusions or speculate, their expertise and education in particular specialties, the clarity of their memory, what they felt was important for me to know, and other factors. Ultimately, asking questions of interest to biologists does not automatically produce answers that are purely biological; instead, biological knowledge is an element of stories that interviewees may be telling for a number of reasons, and tell in the context of the linguistic and cultural interchange of the setting.

Conclusions

My results provide useful biological information about caribou on the TCH range, but they do not resolve questions about the origins of the TCH as a distinct herd. Archives and oral histories suggest that caribou inhabited parts of the TCH range throughout the past 200 years, though they were scarce in the 1910s-1920s. It is not clear, however, whether caribou have been using the same calving area near Teshekpuk Lake throughout this period of time. Caribou present near the Meade River in the winters of the late 1880s could have migrated to Teshekpuk Lake for the calving season, but they also could have belonged to the WAH. My results also show that thousands of domestic reindeer mixed with caribou herds in the 1930s-1940s, but there is little agreement among observers about whether they survived and interbred with caribou in the wild. Thus, there is some evidence to support the hypothesis that the TCH originated from escaped reindeer, but also to support the idea that it originated from the WAH, or that it has always existed.

Biologists have an interest in understanding the fidelity of caribou to particular calving areas and ranges. The permanence and interactions of herds over time has implications for defining, and thus properly managing, the caribou population(s) on the North Slope. Changes in the use of calving areas and seasonal ranges have implications for understanding the amount of variability and plasticity that caribou herds are capable of. These are questions of great interest because of concerns about how best to conserve herds of caribou over long periods of time on a changing landscape.

Landscape change on the TCH range

Due to climate change and industrial development, there will likely be significant changes to the TCH landscape in the near future, and over the next 100 years. The core range of the TCH falls within the Northeast National Petroleum Reserve of Alaska (NPR-A). Recent lease sales in the Northeast NPR-A, combined with an expected high domestic demand for oil and gas, will likely result in a rapid increase in human activity, industrial infrastructure, and habitat alteration in the TCH range in the near future.

Caribou habitat conservation efforts in the Northeast NPR-A have recently focused on protection of critical calving areas and movement corridors around Teshekpuk Lake. Deferments and lease stipulations designed to minimize disturbance to caribou and protect their critical habitats (Bureau of Land Management, 2008) are an important short-term conservation measure (Person *et al.*, 2007) but they are by no means guaranteed in the long term. In fact, the location of critical habitats is likely to shift as climate change impacts the distribution and phenology of forage vegetation, insect harassment, snow depth, and other environmental factors important to caribou.

Perhaps one of the most important adaptations that caribou possess to respond to seasonal and long-term environmental changes is their mobility, which allows them to shift their use of seasonal ranges. Long-term conservation will likely depend on the ability of caribou to respond to environmental changes in current critical habitats, which could be hampered if widespread industrial development occurs in surrounding areas. Thus, the conservation of large and spatially heterogeneous areas is also important to caribou management (Hinkes *et al.*, 2005; Mårell and Edenius, 2006). Historical information on the range use of TCH caribou, particular of calving areas, could improve our understanding of long-term range use needs and inform management of herds for flexibility in distribution and structure over the long term.

Value of history to the “New geography of a warming North”

One of the stated goals of the NRF is to provide “an international epistemic platform of experts or community that will facilitate the efforts of the research community on fundamental and relevant issues through dialogue”. The 5th Open Assembly of the NRF facilitated that process by engaging Northern experts, researchers, and policy-makers in discussions about the “new geography of a warming North” and the importance of traditional ecological knowledge, among many other issues. During the NRF, I posed a question: As the North changes, how do we conceive of long-term change and imagine creative policy actions and responses? Does environmental history have value to policy-makers imagining the future? I believe that Northern history is valuable, not as a prediction of the future, but as a scenario for imagining the complex and adaptive nature of Northern wildlife, landscapes, and people over long time periods.

One important thing that the history of the TCH illustrates is the dynamic nature of caribou herds over the span of a century. Even if we cannot predict what caribou herds will do over the next 100 years, how might wildlife and land management policies use the herd’s history to imagine scenarios of change for the next 100 years, and make sure that the capacity of herds to adjust and adapt to change is conserved? Within the format of NRF and other cross-cutting forums on the future of the North, histories can remind us that the world has changed, and implore us to consider what people one hundred years from now, given the benefit of hindsight, might think about our actions today. I believe this perspective is valuable for goal-oriented discussions about conserving wildlife as a subsistence resource for Arctic people, and for making decisions that maintain the adaptive capacity of wildlife, Northern peoples, and the valued elements of the relationship between them.

Acknowledgements

I would like to thank the NRF and the Young Researcher network for supporting my participation in the 2008 NRF Open Assembly. The National Science Foundation IGERT and Alaska EPSCoR, the Social Science Research Council, and the Alaska Department of Fish and Game--Division of Subsistence provided fellowship and research funds for my research.

I would also like to thank and acknowledge the many people who contributed to my research. Wesley and Anna Aiken, Arnold Brower Sr., David Leavitt Sr., Samuel Nayukok, Tommy Pikok, Alfred Shugaluk, Kenneth Toovak Sr., Whitlam Adams, Mary Lou Leavitt, George Edwardson, Robert Edwardsen, Ben Nageak, and Tom Brower III shared their

knowledge and memories about reindeer herding and caribou. Margaret Ahngasuk, Ben Nageak, and Robert Edwardsen interpreted during interviews. Tom Brower III took me to the Half Moon 3 Reindeer Ranch and Fannie Akpik at Ilisagvik College allowed me to participate in 2008 Iñupiaq Culture Camp. The staff of the Iñupiat Heritage Center, Alaska and Polar Regions Collection at UAF, NARA Anchorage, and the North Slope Borough Wildlife Department helped me to locate documents, photos, and films in their archives. The Barrow Arctic Science Consortium and its staff provided logistical support during my time in Barrow.

References

- ADF&G Division of Wildlife Conservation (2003). *The status of Alaska caribou and factors influencing their populations*. Alaska Department of Fish and Game. Caribou 02-03.
- Aiken, W. and Leavitt, D. (2007). Wesley Aiken and David Leavitt Sr. are interviewed by Karen Hibbard-Rode in Barrow, Alaska, August 2007.
- Brower, C. D. [Year unknown]. Diary of Charles D. Brower.
- Burch, E. S. J. (1972). The caribou/wild reindeer as a human resource, *American Antiquity* 37, 339-368.
- Bureau of Land Management. (2008). *Northeast National Petroleum Reserve-Alaska Supplemental Integrated Activity Plan Record of Decision*.
- Burns, J. J. (1990). *Report of the scientific workshop on caribou in the NPRA, Barrow, Alaska, April 19-20, 1989*. Report by Living Resources, Inc., Fairbanks, AK for North Slope Borough, Department of Wildlife Management, Barrow, AK.
- Burwell, M. (2006). *The 1976 decline of the Western Arctic Caribou Herd: Contested constructions of ecological knowledge*. [Unpublished].
- Cruikshank, J. (1998). Yukon Arcadia: Oral tradition, Indigenous knowledge, and the fragmentation of meaning. In: J. Cruikshank (ed.), *The social life of stories: Narrative and knowledge of the Yukon Territory*. Lincoln, Nebraska: University of Nebraska Press.
- Ferguson, M. and Messier, F. (1997). Collection and analysis of traditional ecological knowledge about a population of Arctic tundra caribou, *Arctic* 50, 17-28.
- Ferguson, M. A. D., Williamson, R. G. and Messier, F. (1998). Inuit knowledge of long-term changes in a population of Arctic tundra caribou, *Arctic* 51, 201-219.
- Freeman, M. M. R. (1992). The nature and utility of traditional ecological knowledge, *Northern Perspectives*, 20(1), <http://www.carc.org/pubs/v20no1/index.html>
- Hawkesworth, C. W. (1909). Letter to the U.S. Commissioner of Education, Washington, D.C., dated Oct. 31, 1909. Rasmussen Library, University of Alaska Fairbanks. APR ARCH, M/F 122, Reel 2. Record of the Bureau of Indian Affairs. Alaska Div. General Correspondence 1908-35. School Files. Anvik, Atka, Barrow. (R.G. 75, National Archives).

- Hibbard-Rode, K. (2008). *Kernal density estimation, elevation and vegetation characteristics of caribou rut locations of the Teshekpuk Lake Herd*. [Unpublished].
- Hinkes, M. T., Collins, G. H., Daele, L. J. V., Kovach, S. D., Aderman, A. R., Woolington, J. D. and Seavoy, R. J. (2005). Influence of population growth on caribou herd identity, calving ground fidelity, and behavior, *Journal of Wildlife Management* 69, 1147-1162.
- Jepsen, B. I., Siegismund, H. R. and Fredholm, M. (2002). Population genetics of the native caribou (*Rangifer tarandus groenlandicus*) and the semi-domestic reindeer (*Rangifer tarandus tarandus*) in Southwestern Greenland: Evidence of introgression, *Conservation Genetics* 3, 401-409.
- Klein, D. R. (1980). Conflicts between domestic reindeer and their wild counterparts: a review of Eurasian and North American experience, *Arctic* 33, 739-756.
- Lantis, M. (1950). The reindeer industry in Alaska, *Arctic* 3, 27-44.
- Mårell, A. and Edenius, L. (2006). Spatial heterogeneity and hierarchical feeding habitat selection by reindeer, *Arctic, Antarctic, and Alpine Research* 38, 413-420.
- Murdoch, J. (1892). *Ethnological Results of the Point Barrow Expedition*. Washington, D.C.: Smithsonian Institution Press, 1988 edition.
- Nayukok, S. (2007). Samuel Nayukok is interviewed by Karen Hibbard-Rode in Barrow, Alaska, August 2007.
- Olson, D. F. (1969). *Alaska Reindeer Herdsmen: A study of Native management in transition*. University of Alaska Anchorage: Institute of Social, Economic and Government Research.
- Pedersen, S. and McIntosh, S. [Unpublished ongoing study]. NPR-A community caribou harvest monitoring project: Atqasuk, Barrow and Nuiqsut.
- Person, B. T., Prichard, A. K., Carroll, G. M., Yokel, D. A., Suydam, R. S. and George, J. C. (2007). Distribution and movements of the Teshekpuk Caribou Herd 1990-2005: prior to oil and gas development, *Arctic* 60, 238-250.
- Schneider, W. (2008). Introduction, in W. Schneider (ed.) *Living with stories: telling, re-telling, and remembering*. Logan, Utah: Utah State University Press.
- Simon, J. (1998). *Twentieth century Inupiaq Eskimo reindeer herding on northern Seward Peninsula, Alaska*. Dissertation, University of Alaska Fairbanks.

- Skoog, R. O. (1968). Ecology of the caribou (*Rangifer tarandus granti*) in Alaska. Dissertation, University of California--Berkeley.
- Smith, M. (1883). Personal diary from the First International Polar Year Expedition, Barrow 1881-1883.
- Sonnenfeld, J. (1959). An Arctic Reindeer Industry: Growth and Decline. *Geographical Review* 49, 76-94.
- Supt. Barrow (1911). Letter to Mr. W. T. Lopp, dated Jan. 10, 1911. Rasmussen Library, University of Alaska Fairbanks. APR ARCH, M/F 122, Reel 2. Record of the Bureau of Indian Affairs. Alaska Div. General Correspondence 1908-35. School Files. Anvik, Atka, Barrow. (R.G. 75, National Archives).
- Thorpe, N., Hakongak, N., Eyegetok, S. and D., K. E. (2001). *Thunder on the tundra: Inuit qaujimajatuqangit of the Bathurst caribou*. Ikaluktuuttiak, Nunavut.
- Toovak, K. S. (2007). Kenneth Toovak Sr. is interviewed by Karen Hibbard-Rode, Barrow, Alaska, July 2007.
- United States Congress. (1900). *Compilation of narratives of explorations in Alaska*. Senate Committee on Military Affairs, Government Printing Office.