Impacts of Climate Change on Traditional Food Security in Aboriginal Communities in Northern Canada

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December 2006

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Science

RESUME

Cette thèse regard l'impact des changements environmentales sur la récolte des aliments traditionnels et characterise l'implication de ses changements sur la diète des membres de la communauté. Une combinaison de méthode quantitative et qualitative ont été utilisé pour documenter et estimer la séquence de la récolte des animaux clées locales. En général, les résultats entre la nourriture disponible estimé provennant de la récolte et le montant estimé pour la consumption alimentaire n'étaient pas égaux, parcontre, la ratio entre aurignal et poisson blanc étaient bonne. La relation entre les résultats numériques concernent la récolte et la consumption alimentaire sont complèxes et requièrent deux coordonnées d'informations numériques completes. Si cela existe, il serait possible de prédir la consumption des aliments traditionalles provenant de la récolte. Les résultats qualitatifs dénoncent des changements climatiques affectant la récolte des aliments traditionnels et alterent la façon dont les membres de la communauté font leur récolte pour adapter à ces changements climatiques.

ABSTRACT

This thesis explores the impact of climate changes on the harvest of traditional foods and characterizes the implication of these changes on the diet of Aboriginal Peoples in northern Canada. Combinations of qualitative and quantitative methods were used to document and estimate the local harvest pattern of key species of traditional food. Overall results between the estimated amount of available food from the harvest and the estimated amount of dietary intake did not agree, however, strong agreements were seen in two species: moose and whitefish. The relationship of harvest data to dietary intake is complex and requires two accurate and complete data sets. If these exist, predicting the intake of traditional foods from harvest data is possible. Qualitative results portray that community members are witnessing variable changes in climate which are affecting their traditional food harvest and are altering their harvest mechanisms to adapt to these changes.

ACKNOWLEDGEMENTS

This thesis was possible with the help and support of many people. Thank you to my supervisor Dr. Laurie Chan, my committee members Dr. Murray Humphries and Dr. Harriet Kuhnlein for their guidance and expertise. Thank you to the staff and students of the Centre of Indigenous Peoples' Nutrition and Environment and the School of Dietetics and Human Nutrition. Thank you to Dene Nation and the Council of Yukon First Nation for their participation in the study. Thank you to Natural Resources Canada for the funding provided under Chan and Furgal and the National Science and Engineering Research Council Northern Research Chair Grant to Chan.

Thank you to my family, friends and especially my husband Steven for all of their continual support and encouragement.

Finally, for those whom without this thesis would not be possible, my sincere thanks to the people of Deh Gah Got'ie First Nation in the Northwest Territories and White River First Nations in the Yukon for sharing their knowledge and wisdom and welcoming me into their communities. Thank you also to the community coordinators, Cliff Vandell, Rick Sanderson, Sid Vandemeer and Rose-Marie Blair Smith.

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1. INTRODUCTION

> "The Arctic is extremely vulnerable to observed and projected climate change and its impacts. The Arctic is now experiencing some of the most rapid and severe climate change on earth. Over the next 100 years, climate change is expected to accelerate, contributing to major physical, ecological, social and economic changes, many of which have already begun." (Hassol, 2004)

Traditional food is food harvested from the local area (Receveur, Boulay & Kuhnlein, 1997) and prepared using procedures that have been passed down through generations. Indigenous peoples living in communities in northern Canada depend on traditional food for both spiritual and physical health (Kuhnlein, Receveur & Soueida, 2004). A replacement of nutrient dense traditional food with high sugar, high fat, market food has resulted in an emergence and continual increase in disease states that until recently have not been present in these populations. The Deh Gah Got'ie First Nation of Fort Providence in the Northwest Territories (NWT) and the White River First Nation in the Yukon are two populations that are experiencing this transition (Kuhnlein et al., 2004). To exacerbate this issue, a change in climate is occurring resulting in a potential threat to

traditional food security and at worst a complete loss of these principle food systems (Duerden, 2004).

Dietary studies have documented the nutrition transition in Canadian Indigenous populations, demonstrating the impact that a transition away from a diet composed of local mammals, fish and birds has on health (Kuhnlein et al., 2004). Bioenergetic models have been developed to predict what impact climate change will have on mammals, fish and birds in this region (Humphries, Umbanhowar & McCann, 2004). The scientific evidence is present, climate change is happening and traditional food sources are being affected.

Studies have been conducted in Inuvialuit communities in the northern NWT to understand the consequences of these changes on community members and document strategies being used to adapt to these changes (Nichols, Berkes, Jolly, Snow & Sachs Harbour, 2004). Are people living in more southern regions of the Canadian north experiencing similar changes to those that are being experienced further north? Are traditional food harvesters in these two communities noticing a change in availability and accessibility of the traditional food sources that surround them? If there is a change is it affecting their harvest? Is acquiring these nutritious

foods more difficult? Is it easier? Will they continue to harvest the food if more effort is needed? Will they begin to harvest new species if necessary?

The overall goal of this study is to investigate the potential impact of climate change on traditional food security in two northern Aboriginal communities, Deh Gah Got'ie in the Northwest Territories (NWT) and White River First Nation in the Yukon. I used a collection of qualitative and quantitative data composed from local traditional knowledge to gain an understanding of what impacts climate change related activities may be having on traditional food sources in these two communities and further understand the adaptive strategies members of the communities are using to adjust to these changes. The following thesis has been organized to provide an overview of existing literature related to the topic, a detailed description of data collection and analysis methods, study results, conclusions and finally a discussion.

2. REVIEW OF THE LITERATURE

2.1 Traditional Food in the Canadian North

Traditional food has been defined as food, both plants and animals from the local environment (Receveur et al., 1997). Traditional food sources are unique and almost always culturally and geographically specific (Kuhnlein et al., 2004). The systems that provide these foods are based on cultural values, cultural identity, and sustainable methods and are composed of a variety of local species (Kuhnlein et al., 2004; Kuhnlein & Receveur, 1996; Willows, 2005). Traditional food has played an imperative role in the health of Aboriginal peoples in Canada and remains a key component of the modern lifestyle of many northern Aboriginal communities. An abundance of literature accentuates the nutritional importance of these foods in these communities at various levels of intake.

In a dietary survey conducted with 122 Yukon First Nation adults from 4 different communities using 24 hour recalls and food frequency questionnaires, traditional food provided 17% of the total daily energy and was consumed more than once daily (Wein, 1995; Wein & Freeman,

1995). Moose, caribou, salmon and berries were of the most frequently consumed species of traditional foods. Traditional food sources contributed 50% or more of important nutrients such as protein, iron, zinc and vitamin B12. The lowest amounts of traditional food were consumed in the larger communities and the greater amount in the smaller most remote communities. Researchers found the frequency of traditional food consumption to be influenced by many different factors including the availability of traditional food in the geographical area and the cost of market foods in the local store. Participants also reported that they would eat more traditional food if it were available.

The general increasing trend of non traditional or market food in the diet of Aboriginal populations in the subarctic region seen by Ritenbaugh and colleagues (1995) was believed to one day play the main role in the increasing occurrence of chronic diseases. Results from 24 hour recalls and food frequency questionnaires of people over the age of 27 revealed a higher intake of non traditional foods by the younger ages when compared to the elders in the population. The addition of these non traditional foods appeared to be as a supplementation into the diet rather than a replacement of traditional food.

Researchers at the Centre for Indigenous Peoples' Nutrition and Environment (CINE) of McGill University performed an intensive dietary survey with Dene, Métis and Yukon First Nation communities in northern Canada (Kuhnlein, et al.; 1994, Kuhnlein, Receveur, Morrison, Apparoo, Soueida & Pierrot; 1995; Receveur et al.; 1997). The dietary survey consisted of 24 hour food recall interviews, food frequency questionnaires and sociocultural questionnaires involving 10 communities in the Yukon and 15 Dene/Métis communities in the NWT. Literature from these surveys confirmed the wide use of the traditional food system to the Dene of the NWT. Of the 101 traditional food species in the area, (Kuhnlein et al., 2003) moose, caribou, whitefish, spruce hen and jackfish were the most frequently consumed in the Deh Cho area (Receveur, Boulay, Mills, Carpenter & Kuhnlein, 1996). Caribou and moose meat were found to be the main sources of energy, protein, iron, zinc, copper and magnesium; all of which are nutrients that hold a vital role in human health. Smaller mammals, fish and birds were shown to also provide a large quantity of nutrients important for good health. A diet consisting of even small amounts of traditional food was found to provide a better composition of nutrients when compared to a diet of only market foods. Similar to so many other indigenous populations (Wein, Sabry & Evers, 1991; Kuhnlein, 1992; Ritenbaugh, Szathmary, Goodby & Feldman, 1995) who have

experienced a nutrition transition, a trend in shifts away from important traditional foods was observed, especially in the youth living in the communities (Receveur et al., 1997). An observed shift away from traditional food consumption to an increase in the consumption of market food has resulted in an increased intake of carbohydrates and saturated fats.

In 1998, Receveur and colleagues conducted the Yukon portion of the CINE survey. A total of 409 people were interviewed from 10 communities throughout the Yukon Territory. The 70 types of traditional food species that were consumed were found to be important dietary sources of energy, protein, iron and zinc. In addition, fat levels were closer to optimal on the days when traditional food was consumed (more than 50% of the days reported). Once again the younger generations were found to be consuming less traditional foods than those older than them.

2.2 Food Security

The World Health Organization (WHO) defines food security as when:

> "all people at all times have both physical and economic access to enough food for an active, healthy life; the ways in which food was

> produced and distributed are respectful of the natural processes of earth and are thus sustainable; both the consumption and production of food are governed by social values that are just and equitable as well as moral and ethical; the ability to acquire food was ensured; the food itself was nutritionally adequate and personally and culturally acceptable; and the food was obtained in a manner that upholds human dignity."

Food security is not only an issue of insufficient amounts of food but is a determinant of life, health, justice and sustainable dignity (McIntyre, 2003) and can be determined by national, international and environmental factors (Manetsch, 1985). In Canada, younger generations, women and Aboriginal people are the populations that are more likely to report being food insecure (McIntyre, Walsh & Connor, 2001; Ledrou & Gervais, 2005). Aboriginal status increases the risk of food insecurity by 60 percent (McIntyre, 2003). People who are food insecure are at an increased risk of being overweight, having chronic health conditions, mental health problems and lower learning capacity (Townsend, 2001; McIntyre, 2002).

Traditional food security involves the care of traditional food systems in a sustainable manner to ensure that Aboriginal peoples continue to have

physical access to their nutritionally, culturally and spiritually important foods. As Aboriginal communities become more modernized, an increase in wage employment combined with a decrease in subsistent activities helps to create a situation of traditional food insecurity for more people (Duhaime & Bernard, 2002). In addition, the state of the local and global environment plays an immense role in the maintenance of traditional food systems, affecting the local traditional food harvests. Factors such as changes in weather and changes in resources and environmental contaminants have the potential to greatly influence the security of traditional food.

2.3 Harvest Studies

The traditional food harvest involves the acquisition of traditional foods from the local environment. Aboriginal peoples in Canada are widely known for their skills and knowledge that enable them to harvest traditional food. Researchers have used a variety of social science methods to gather information from harvesters to establish counts for traditional food harvest in various Aboriginal populations throughout Canada (Berkes; 1990; Hopper & Power, 1991; Tobias & Kay, 1993; Berkes, Preston, Hughes, Turner & Cummins, 1994). Most have been successful in

calculating an accurate estimate of the harvest of traditional foods however some were more accurate for larger animals compared to smaller animals, fish and waterfowl (Berkes, 1990). These estimates were useful for research, policy and resource management planning (Usher & Wenzel, 1987). While there is an extensive history of harvest studies conducted with Aboriginal groups in Canada the majority of these studies have thoroughly investigated the conservation issues and economic value of the traditional food and have put very little consideration into the amount of edible food gained from the harvest. Further, none have actually tested the accuracy of these conversions by comparing the amount that the harvest provides for food with the amount consumed as recorded by dietary studies.

In an evaluation of methodologies used in previous harvest studies (Usher, Delancy, Wenzel, Smith & White, 1985), recall surveys involving hunters recalling the number of species they harvested themselves over a specified period of time, were stated as the only feasible way to gather harvest numbers. Other important points addressed included: the importance of the harvester's willingness to participate, trust and co-operation of all participants, and the idea that the reliance on oral transmission of knowledge and tradition that Aboriginal people have were

likely to result in a much greater ability to recall events than that of a culture that relies more on other forms of documentation, such as writing. Limitations of recall surveys included: “response bias” due to a poor questionnaire design, recall failure, and interviewer introduced bias.

A second critique of harvest surveys by Usher and Wenzel (1987) reiterates that the recall survey method was the only possible method for obtaining harvest data and even more reliable than administrative harvest data. In addition, due to the seasonal variation in harvests, recalling harvest for an annual period has been found to be superior to recalling it for a period of time such as a month and then projecting the annual harvest from this (Usher & Wenzel, 1987). The participation of women, who are often the primary people involved in food preparation and butchering of the animals, in the harvest study was also mentioned to be a way to ensure accurate recall of harvest. Finally, an extremely important issue for harvest surveys is the influence of strategic bias on the harvest statistics. Either an underestimation or overestimation of harvest could be reported by harvesters if they have a reason to believe that they could either be penalized, or on the other hand, benefit from the results. Harvesters must choose to participate in order to accurately report their harvest (Berkes, 1990). Many harvest studies to date have been

expensive and authors concluded by stating the need and importance of less expensive elaborate studies in which the above methodologies are applied.

One of the first subarctic and perhaps best known Canadian Aboriginal harvest studies was the James Bay and Northern Quebec Native Harvest Study (JBNQNHRC) done in the late 1970's and early 1980's. The objective of this study was to estimate the level of harvesting done by the James Bay Cree in Ontario (Ashley, 2002). The edible weights of many local species were established using local expert knowledge and existing literature but also took factors such as sex of the animal, age of the animal and weight of some bone into consideration: all of which affect the edible weight (JBNQNHRC, 1976).

Hopper and Power (1990) estimated the subsistence fish harvest by the northern Ontario Ojibwa community of Webequie by using a combination of methods including hunter recall, catch diaries and direct observation over a period of one year. The information collected by recall from the harvesters was compared with their partner's recall and was proven to be reliable but also to provide a conservative estimate of the annual fish harvest. Researchers found that diaries were not an effective way to

collect harvest data, many were not returned and those that were, were not completed. Recalled data was found to be underestimated when compared to the few diaries that were returned but remained within 20% which confirms previous belief that recall method would result in accurate harvest statistics.

More recently, Tobias and Kay (1993) conducted a one-year hunter recall survey in a Cree-speaking Métis community in Northern Saskatchewan to estimate the economic value of the bush harvest. One hundred and forty-five adult males and 14 adult females participated in a single interview to report what they had harvested over the previous one year period. The totals of each participant's harvest numbers were used to estimate the total community harvest. Researchers collected the weights of fish and waterfowl. Reported harvest numbers were reviewed and any that seemed inaccurate were double checked with the harvester. Conversion factors derived from weights of local community harvests and the JBNQNHRC (1976) were used to translate harvest numbers into total edible weight. Unlike previous literature, a relatively high underestimation of numbers of fish harvested was seen. Small mammals and waterfowl were also found to be underestimated, however the reported amount of larger mammals such as moose and bear were believed to be accurate.

Berkes and colleagues (1994) investigated the sustainable economy of wildlife harvesting in Aboriginal communities of the Hudson Bay and James Bay lowland by administrating a detailed questionnaire to a 56% stratified sample of potential hunters in the region. Researchers admitted that shortcomings of the study included that it was based on only one annual cycle and that the lengthy questionnaire used in the study may have created a "response burden" (Usher & Wenzel, 1987) and therefore resulted in an omission of detail.

2.4 Climate Change

Climate change has been described as "among the most serious of the environmental issues that we face today" (Environment Canada, 2006) having a variety of negative and positive impacts on human health (McMichael et al., 1996). The Canadian Climate Centre (CCC) has participated in numerous studies (Environment Canada, 1994) that investigated the potential impacts of climate warming. Conclusions from these studies identified a change in precipitation, decrease in Arctic sea ice, change in the boreal forest stability, species composition, forest fires and difficulty in food foraging for caribou resulting in a decrease or

relocation of herds, as impacts of climate change on resource management in the north. Cohen (1995) concluded from scenario based output models that climate change will cause a thawing in permafrost which creates the possibility of changes in land and water. The devastation resulting from these changes includes a serious threat to food security and possibly the survival of some of these cultures (Hassol, 2004).

The indicators of climate change, such as changes in permafrost, water and ice levels, have raised the level of concern of climate change and led to a wealth of recent literature describing the impacts of climate related changes to species of the polar regions of the world. Arctic communities are believed to be the first to feel the effects of global warming. Changes in climate could have a wide-ranging affect on Arctic communities (Hassol, 2004) which may result in either a negative or positive impact on local traditional food sources and food choices however, a clearer understanding of the impact that climate change will have on human activity is still needed (Duerden, 2004).

A pair of researchers (Brotton & Wall, 1997) investigated the impact of climate change on the Bathurst caribou herd of the NWT. A combination

of qualitative and quantitative information was used to conclude that climate change could have serious implications on the caribou herd, possibly reducing their numbers and in turn reducing harvesting potential.

A collaborative project between the International Institute of Sustainable Development (IISD) and the Inuvialuit community of Sachs Harbour, NWT was carried out to explore climate change activities and learn about adaptative strategies in use by local people of Sachs Harbour. (Ashford & Casteldon, 2001) A combination of traditional knowledge and western science was used. The project was the first of this kind done in the NWT. Local observations were recorded. The Inuvialuit reported changes in fish and wildlife distribution, severe storms, and a change in sea ice and permafrost making transportation across the water or land during harvest more difficult (Riedlinger, 1999). This was the first study in the Canadian Arctic that explored the effect of climate change and used local traditional knowledge to document the adaptative strategies of the people.

Another group of Canadian northern Aboriginal peoples who are feeling the consequences of climate change are the Inuit of Nunavik and Labrador (Furgal & Sequin, 2005). For these people climate change means warmer

temperatures, changes in weather patterns, ice and local species, all of which are impacting their traditional food.

2.5 The Communities

Deh Gah Got'ie First Nation

The people of Deh Gah Got'ie First Nation reside in the community of Fort Providence, located where the Deh Cho (the Mackenzie River) flows into the Tucho (Great Slave Lake), 300 km southwest of Yellowknife in the Northwest Territories (NWT). The 2004 NWT Bureau of Statistics reported a population of 835, with the majority being Dene and a smaller number of Métis and non Aboriginal people. A total of 200 households and 265 dwellings were reported, 64% of which reported eating traditional food. Forty-four percent of the households in the community hunt and fish. Main traditional food items included whitefish, northern pike, grayling, moose and waterfowl. Trapping small mammals such as marten, otter and beaver are very important economic activities, 15% of the households trap. Local languages are South Slavey and English. The community belongs to the land claim area of Deh Cho Treaty 11. The employment rates of males and females in the community are 38.3 and 51.9,

respectively. About 40% of the population aged 15 years and older are not in the work force. (Statistics Canada, 2001)

White River First Nation

Beaver Creek in the Yukon is the most western community in Canada, located just east of the Alaska border, about 500 km northwest of Whitehorse. The community is situated on flat terrain and is the home of the White River First Nation, which is culturally affiliated with the Upper Tanana and Northern Tutchone people. The Upper Tanana, Southern and Northern Tutchone make up the membership of the White River First Nation. Main traditional food items include moose, salmon, whitefish, grayling and berries. The Statistics Canada 2001 census reported a population of 88 people, including 50 households. The employment rate in 2001 was 75% for males and 83.3% for females. They have experienced 2 consecutive wet summers and many of the traditional hunting grounds have become wetland and inaccessible. Harvest of berries has substantially declined.

3. RATIONALE

The physical, spiritual and cultural role of traditional food in northern Aboriginal communities is critical to the health of the communities and the people who reside there. The Canadian north is rich in natural resources including food that is nutrient dense, culturally acceptable and gathered from local resources (Kuhnlein & Receveur, 1996). At levels of just 20% of total energy, traditional food is still critical for providing important nutrients that are necessary for health (Kuhnlein et al., 2004) and remains an important factor in maintaining food security in remote communities. Climate change is a current threat to traditional food security (Pellett, 1991) and has been identified as a major concern among Aboriginal people in the north (Canadian Institute of Health Research, 2002). Changes in climate have the ability to alter the distribution and health of animal species, and affect the land and water. Unhealthy appearance of food, increased distance of travel, reduced seasonal availability and quantity of species have all been recognized as factors that have the ability to decrease the consumption of traditional foods (Simoneau & Receveur, 2000; Kuhnlein & Receveur; 1996). A change in harvest has the potential to create a greater shift away from traditional food and a loss

of traditional culture affecting both the physical and spiritual health of the people. The role of the environment on the determinant of food choices is vast, if people are not able to acquire these foods a replacement of market foods does not mean an equal replacement of essential nutrients and cultural importance (Raine, 2005). The extent of these impacts on the well-being of individuals and communities is not yet well understood but is important to governments of all levels (Duerden, 2004). To my knowledge this is the first study to date that has been done to document changes in the traditional food harvest experienced by people of Deh Gah Got'ie First Nation, in the southern NWT and the people of the White River First Nation, in the Yukon. This study involves participatory research and has created an opportunity for local people to combine their traditional knowledge with scientific knowledge to gain a deeper understanding of what current impacts climate change is having on the harvest of traditional food, what further implications this could have on the health of the communities, and finally to document what adaptive strategies are currently being used by community members to address these changes. Understanding how climate change is affecting the traditional food harvest will mean communities can work with governments to ensure their traditional environments are protected and to develop programs to support traditional food security in their communities.

4. OBJECTIVES

The objectives of this thesis are to investigate: 1) Can self reported harvest data collected from an Aboriginal community in northern Canada be used to predict intake of traditional foods in this community, and 2) What are the perceived effects of climate change on traditional food harvest by community members in two Aboriginal communities in northern Canada?

5. BRIDGE

The use of traditional food frequency questionnaires and 24 hour dietary tools have been successful in determining the frequency of traditional food intake and providing an accurate estimation of the nutrient intake of individuals within a population. The possibility of using other means, such as harvest data, to gather this information exists. The following manuscript explores the use of harvest data to predict traditional food intake for a population and gain dietary information similar to that gained by using dietary assessment tools such as the food frequency questionnair

6. MANUSCRIPT 1

Estimation of Traditional Food Consumption Using Self Reported Harvest Data Collected From an Aboriginal Community in Northern Canada.

Abstract

Objectives.

The objective of this paper is to explore the possibility of using self reported data gathered from an Aboriginal community to estimate average daily intake of key species of traditional food in a northern community.

Study Design.

A participatory study with a northern Aboriginal community in Canada.

Methods.

Focus groups were conducted in an Aboriginal community to gather harvest numbers of traditional food species. Harvest numbers were converted to amount of edible weight and compared to regional dietary data.

Results.

Ratios between estimated harvest weight and food use for two key traditional food species, moose and whitefish were the closest to one. Ratios for small mammals and fish were greater than one suggesting under estimation of harvest numbers for these species.

Conclusion.

The relationship between dietary intake and harvest estimates is complex. Precise information from accurate harvest surveys could help to estimate the level of change in traditional food available to communities.

Keyword Suggestions: harvest data, traditional food, Aboriginal communities, food security

Introduction

Global changes in climate have brought recent attention to the traditional food harvest of Aboriginal peoples living in the Arctic regions of the world (Hassol, 2004). Although recent increases in the consumption of market foods by northern Aboriginal communities has occurred, the traditional food harvest remains a main component in the modern lifestyle providing vital characteristics of health (Kuhnlein et al., 1994). Determining the impact of environmental changes on dietary intake available to the community can help to develop strategies that will help minimize the possible detrimental effects of these changes.

Traditionally, 24-hour records, food histories, FFQ interviews and direct observation have been used to assess dietary intake. Although these have proven to be successful in gaining dietary assessments, there are limitations and disadvantages associated with these methods. The cost, time required, level of representation gained, validity and the quality of measure are all possible flaws in using these methods (Barrett-Connor, 1991).

Harvest estimates are defined as the number of a particular species taken from a specific area over a specific time (Usher & Wenzel, 1987) and have been widely used in resource management studies as well as for the purpose of examining the economical contribution of the harvest to Aboriginal communities (Tobias & Kay, 1993). If precise enough, harvest estimates could potentially predict the level of impact of environmental changes on the amount of traditional food provided to the community. A major advantage of using harvest data in replacement of dietary data is the ability to assess intake more frequently. Collecting harvest data from a community on an annual basis would require less time and resources than it would to conduct a dietary assessment that would be representative of the community for the entire community.

The objective of this paper is to explore the possibility of using self reported data gathered from an Aboriginal community to estimate average daily intake of key species of traditional food in a northern community. The estimate will be compared to reported values previously estimated in the region using dietary interviews as a mean for validation. The main hypothesis is that the food use estimate based on self reported harvest data is comparable to similar estimates collected using dietary interviews.

It is expected that methods can be used to predict potential impact of changes of harvest on food use pattern in the northern communities.

Methods

This study was a partnership between the Centre for Indigenous Peoples' Nutrition and Environment (CINE) at McGill University and the Dene First Nations. Community consultation remained an important part during all stages of the study. The project was approved by the ethics review board of the Faculty of Agricultural and Environmental Sciences at McGill University. A local community member was hired to act as the community coordinator and was responsible for informing the community about the study as well as inviting community members to participate in the study. Ethical consent forms were signed by all participants prior to the start of the focus group. Interpreters were available to ensure all participants understood the information provided in the consent forms.

Community Profile

Fort Providence in the Northwest Territories (NWT) is home to the Deh Gah Got'ie First Nation. The community is located at the mouth of the Deh Cho (Mackenzie River), where it meets the Tucho (Great Slave Lake). The

population in 2001 was 835 (Statistics Canada, 2001). 44.3% reported that they hunted and fished and more than half (64%) of the population reported eating traditional food in 2004. The community was selected to participate in the study due to interest from the community and the relative importance of traditional food.

Food Frequency Questionnaires

Researchers at CINE (Receveur et al., 1996) conducted a comprehensive dietary survey of 15 communities in the Northwest Territories. Communities were grouped into 5 regions. A total of 1,012 food frequency questionnaires and 24 hour recall individual interviews were conducted to assess dietary intake of Dene and Métis individuals residing in these communities. Moose, caribou, whitefish, spruce hen and northern pike were the most frequently consumed traditional foods in the region. In the Deh Cho region, moose was the largest contributor of protein, iron and zinc to the diet.

Table 6.1

Deh Cho Regional FFQ (CINE) compared to Fort Providence FFQ.

Species	Deh Cho mean times per week for winter and summer combined (n=269)	Fort Providence mean times per week for winter (n=16)
Moose	2.9	2.6
Caribou	2.1	2.4
Rabbit	1.1	1.1
Muskrat	1.1	0.3
Beaver	0.8	0.5
Whitefish	1.5	2.1
Trout	0.7	0.5
Loche	1.0	1.0
Spruce Grouse	1.3	1.6

I conducted food frequency questionnaires (FFQ) with a random sample of adults in Fort Providence during the winter season. A total of 45 people were randomly selected to participate in the study. Households were chosen from the community phone book and people from these households were then approached by the community coordinator, the purpose of the study was explained and community members were then asked if they were willing to participate. The study resulted in a low

participation rate, mostly due to high employment rates and an unwillingness to be involved. 16 adults completed the FFQs.

As seen in table 6.1, results were similar when compared with previously published regional data from the Deh Cho region (Receveur et al., 1996) which included Fort Providence. Researchers at CINE were successful in gathering a representative assessment of diet within this population that included all seasons. Therefore, published dietary data from this survey were used for calculations of intake in this paper.

Focus Groups

A list of traditional food species harvested by community members was compiled using the results of the CINE Dietary Survey (Receveur et al., 1996). Consultation with the community coordinator occurred ahead of time to ensure that the list was accurate and complete. Local names of species were verified to make certain that communication between informants and interviewers was consistent. A total of 12 community members participated in a one and a half day focus group at the local community centre in May 2004. These included male and female adults and elders who reside in the area around the community and have hunted,

fished and gathered traditional plants and berries and are responsible for providing the majority of the traditional food for their family. All participants were chosen by the community coordinator and represented the main families and each of the harvesting areas in the community. A local translator was present so that participants were able to communicate in the language of their choice as well as to ensure that all participants of the focus group understood what was being communicated. The passionate concern of environmental changes by community members as well as a statement from the band Chief at the beginning of the focus group helped to reduce the threat of "strategic bias" (Usher & Wenzel, 1987) by helping community members understand the purpose of the study.

One of the main purposes of the focus group was to collect harvest numbers for the traditional food harvest for the community over the previous twelve month period. For the purpose of the survey, harvest was defined as the number of species killed for human consumption by community members (Usher & Wenzel, 1987). A recall method was used to gather harvest estimates for a twelve month time frame, which was chosen for the purpose of attempting to derive an estimation of all species harvested throughout the year instead of only focusing on species harvested during one season (Usher & Wenzel, 1987). Although the area

of the harvest was not specifically defined, a map of the local harvesting area was present to assist participants to recall harvest locations and the quantity from each location. Cautions were made to decrease the risk of respondent bias by fully explaining ahead of time to participants how the harvest data would be used. Open ended questions were used and an open discussion among participants was encouraged (Usher & Wenzel, 1987). In addition, the community coordinator was present to check individual counts to ensure that they were reasonable as well as to ensure that a duplication of harvests was not being reported. Harvest counts for each species of animals were first estimated by family units and then multiplied by number of families identified by the group members that would harvest that particular species of animal. The calculated number was then verified by the focus group participants to ensure the number was realistic.

Edible Weight

Edible body weight for the purpose of this study was defined as the portion, expressed in weight, of the animal available and used for human consumption as food. Edible body weight is based on conversion factors that use the proportion of the animal available for food multiplied by the

weight of the species to establish the edible body weight of the species. Various studies have used this method to gather a total harvest weight from a population. Estimated edible weights of each of the species were taken from existing literature (Berkes et al., 1994; Berger, 1977; Beckley & Hirsch, 1997; Usher, 2000; Tobias & Kay, 1994; Gamble, 1984; JBNQNHRC, 1982) and used to calculate a total estimate of edible weight from each of the species reported harvested by community members. Edible weights were adjusted to reflect the weight of cooked or dried food and then converted into amounts equivalent to the serving sizes of traditional foods reported in similar communities (Receveur et al., 1996)

Average daily intake of each species was calculated using data previously reported from dietary interviews conducted in 1994 (Receveur et al., 1996). Intake (table 6.5) was calculated as the frequency of consumption as times per week multiplied by the estimated portion size in gram multiplied by 52 weeks and divided by 365 days (Receveur et al., 1996). CINE reported intake of different parts of the animals. All parts of the animal consumed were added and aggregated into one value.

The average available food intake per person per day for each species of animals from the harvest data was calculated by dividing the total amount

of edible meat estimated from the reported harvest by the total number of traditional food consumers in the community as estimated by the focus group members. In addition, an assumption of 10% decrease in weight was used to convert the weight reported for cooked or dried meat to that of raw meat. Ratios of harvest to consumption were calculated.

Results

Twelve participants (8 male and 4 female) reported the harvest for a total of 16 families (numbered 1 through 16 in table 6.2) involving 68 households in the community. The reported number of traditional food consumers from these households was 269 (Table 6.2).

Yield of Harvest

The mammals accounted for the largest amount of edible weight reported from the harvest (Table 6.3). Fish was the next biggest contributor and birds contributed the least to the edible weight. Focus group participants reported that 68 households consumed animals.

Table 6.2

Reported households and consumers of traditional food, Fort Providence NWT, Winter 2004

Family	Households in each family	Consumers in each family
1	10	23
2	3	32
3	1	4
4	4	21
5	5	26
6	8	33
7	9	35
8	9	25
9	5	12
10	3	5
11	4	8
12	3	28
13	1	7
14	1	5
15	1	2
16	1	3
Totals	**68**	**269**

Table 6.3

Total number of animals harvested and estimated edible weight of meat reported by focus group participants, Fort Providence, Winter 2004

Species	2003 Harvest (68HH)	Edible Weight kg/animal	Total kg	% of Total Harvest
Caribou (w)	50	62[a]	3 090	7.3
Caribou (b)	187	48[b]	8 976	21.1
Moose	68	199[b]	13 532	31.8
Rabbit	500	0.9[c]	450	1.1
Muskrat	231	0.6[c]	138	0.3
Beaver	73	7.9[a]	576	1.4
Total animals	**1 109**		**26 763**	**62.9**

(w) Woodland Caribou

(b) Barren-ground Caribou

[a]Berkes et al. (1994), [b]Berger (1977), [c]Beckley & Hirsch (1997), [d]Usher (2000), [e]Tobias & Kay (1994), [f]Gamble (1984)

Table 6.4

Total number of fish harvested and estimated edible weight of meat reported by focus group participants, Fort Providence, Winter 2004

Species	2003 Harvest (68 HH)	Edible Weight Kg/fish	Total kg	% of Total Harvest
Northern Pike	790	1.6[e]	1 264	3.0
Grayling	276	0.9[f]	248	0.6
Walleye	613	0.7[e]	429	1.0
Trout	33	1.7[e]	56	0.1
Suckers	1 930	0.9[a]	1 737	4.1
Whitefish	6 720	0.8[e]	5 376	12.6
Coney	220	2.6[d]	572	1.3
Loche	107	1.0[a]	107	0.3
Total fish	**10 689**		**9 789**	**23**

[a]Berkes et al. (1994), [b]Berger (1977), [c]Beckley & Hirsch (1997), [d]Usher (2000), [e]Tobias & Kay (1994), [f]Gamble (1984)

The total fish harvest accounted for 23% of the total reported harvest. Of all of the fish, whitefish were the biggest contributor to the harvest.

The bird harvest supplied the community with the lowest portion (14%) of edible meat. Snow and Canada geese (7.5% and 3.2% of the total harvest respectively) accounted for over 75% of the total edible weight from birds.

Table 6.5

Total number of fish harvested and estimated edible weight of meat reported by focus group participants, Fort Providence, Winter 2004

Species	2003 Harvest (68 HH)	Edible Weight kg/bird	Total kg	% of Total Harvest
Duck (Squaw)	50	0.6[d]	30	0.1
Duck (Canvas)	143	0.8[a]	114	0.3
Duck (Black)	298	0.8[a]	238	0.6
Duck (Mallard)	500	0.9[d]	450	1.1
Canada Goose	651	2.1[a]	1 367	3.2
Snow Goose	2 000	1.6[a]	3 200	7.5
Pintail	350	0.7[d]	245	0.6
Spruce Grouse	550	0.3[b]	165	0.4
Swan	35	4.8[d]	168	0.4
Total birds	**4 577**		**5 977**	**14.0**

[a]Berkes et al. (1994), [b]Berger (1977), [c]Beckley & Hirsch (1997), [d]Usher (2000), [e]Tobias & Kay (1994), [f]Gamble (1984)

Table 6.6

Ratio of Intake reported by CINE and amount of edible weight calculated from the reported harvest Deh Gah Got'ie, Winter 2004

Species	Intake g/day CINE (217 FFQ)	Available g/day Harvest (269 people)	Ratio
Caribou	267	526	0.5
Moose	241	147	1.6
Rabbit	31	5	5.7
Beaver	44	13	3.3
Trout	15	1	13.2
Whitefish	70	62	1.1
Loche	21	1.7	12.3
Spruce Grouse	80	3.3	23.9

Intake data and harvest data were comparable for moose and whitefish but not for other species such as trout, loche and spruce grouse (Table 6.6) A ratio of one means the intake of the species and the amount of edible food available from harvest of that species are similar. A ratio smaller than one means the intake is less than the amount available from the harvest. A ratio larger than one means the intake is greater than the amount available from the harvest.

Discussion

Although the discussion around the number of people that consumed traditional food in each household was extensive, a limitation of the method of the survey used in the focus groups was that an assumption existed that the population was relatively homogenous and that each person consumed the same amount of traditional food (Usher & Wenzel, 1987). In addition the constant number of consumers (n=269) is a potential error for inaccuracy for the estimate of per person intake.

As seen in table 6.6, the ratios for both moose and whitefish are the closest to one. Both of these species are key traditional food species in the community (Receveur et al., 1996) and therefore community members may be more likely to recall accurate amounts for these due to the importance they have to their diet. The size of moose most likely contributes to the ability to recall the number harvested over a specific time. When community members were asked to report the number of whitefish, many of them were able to recall quite easily by counting the number of “sticks” of fish they had dried over the past year. This was useful in gathering an accurate harvest number.

On the contrary, the ratio for caribou is less than one. Community hunts for caribou had only been occurring for the past three years and were not in place during the period that the dietary survey was conducted. These annual hunts involve a group of community members travelling a fair distance away from the community by truck and all terrain vehicles to hunt and bring back caribou to be dispersed to members of the community. The hunt has increased the harvest and intake of caribou in the community, which would help to explain why the ratio of harvest to consumption is so small for caribou. The smaller mammals, rabbit and beaver and all of the fish except for whitefish had ratios greater than one suggesting that the intake was higher than the amount harvested. This agrees with previous literature that recognizes under reporting is likely to occur for fish and small game (Berkes et al., 1994). Recall failure for fish surveys has been found to cause an underestimation of the actual harvest (Usher & Wenzel, 1987; Berkes, 1989; Tobias & Kay, 1992). In addition to recall failure, other factors can greatly affect the accuracy of the fish data. Fluctuations in fish harvests could be due to changes in harvest patterns of other animals. Economical changes within the community such as an increase in employment (Berkes, 1990) and the size of fish can vary depending on the age of the individual fish and the level of fishing in the body of water that the fish were taken from (Ashley, 2002). The use of individual harvest

information which includes the weight of the fish should be used when predicting the amount of edible weight. In addition, a possible explanation of the difference in intake and harvest of rabbits could be due to the cyclical nature of the rabbit and the difference in the timing of this cycle between the years reported.

The five species that contributed the most to harvest are moose, caribou, whitefish, snow goose and suckers. The results from the CINE survey reported the top five nutrient providers in the region as caribou, moose, whitefish, rabbit and spruce hen. The estimates from the harvest data revealed that the main species contributing to the traditional food supply remained similar to those reported in the 1990s. In the future, harvest estimates similar to those calculated in this paper can help to provide a broad understanding of the nutrient composition of the diet. For example, if the caribou harvest was replaced with deer, an assumption could be made of how the nutrient composition would be affected. Similarly if the harvest of caribou or moose declined and the harvest of whitefish increased, a change in the fat and vitamin composition of the diet could be assumed.

Most likely the greatest limitation of this study was the use of aged regional dietary data. Although food species and patterns are similar within

the region and when compared to more recent FFQs intake was considered similar, variance in levels of intake of each species are likely. A fluctuation of each species from year to year is also likely to occur (Berkes et al., 1994). Accurate dietary data that is specific to and representative of the population is necessary to create a precise image of the relationship between harvest data and dietary intake. Further, a clear understanding of what proportion of the population actually being reported is needed to provide accurate harvest estimations (Usher & Wenzel, 1987). The amount of usage of each animal, seasonality and how the natural fluctuation of traditional food species affects the year to year harvest need to be individually considered for each population. A multi year harvest survey from one community would help to provide a more complete picture of the amount of traditional food available to the community for consumption.

The use of focus groups to gather harvest data was shown to be acceptable by community members and provided an environment to gather information for a larger sample of people over a shorter time period than would have been needed using a food frequency tool. Due to the difficulty in recruiting participants for the food frequency questionnaire described in appendix C there is reason to believe that the methods used

to collect harvest data may be more acceptable than participating in a food frequency questionnaires would be.

Conclusion

It is feasible to obtain a reasonable estimate of harvest data using semi-quantitative methods such as focus groups. Though the estimate may not provide adequate accuracy for nutritional assessment, it provides a snap shot on the relative importance of each species of animals to the diet of the members of the communities. Climate change, development projects, the economy of the community and the increase in amounts of market food available to a community all has the potential to impact the traditional food harvest. Accurate harvest surveys that provide precise information on the species harvested and the use and size of each species could help to document how changes could impact the traditional food security for the community. Necessary steps must be followed in order to gain this information. Traditional food consumers and households need to be defined and time specific dietary data and actual weights for fish and small mammals need to be collected. Even with these precautions, harvest studies may only be able to provide an overall picture to the level of traditional food security in a community but could be provide information

that is useful in planning health promotion messages and programming specific to areas of nutrition and contaminant risk management.

7. BRIDGE

Although many variables from harvest estimates can be used to predict the amount of traditional food available in the community, harvest estimates could be used to determine an overall impact of climate change on traditional food security. Understanding how traditional food species available for harvest will be impacted by environmental changes is only one component in predicting the impact of these changes on the traditional food security and the health of the community. Another equally important component that must be considered is how the people themselves are affected by these changes as well as how they react to these changes. How will the environmental changes impact their harvest and how will community members respond to these impacts? Will traditional food be replaced by market food or will new species replace unavailable species? How will this affect the nutrient composition of diet? For example, a decline in the harvest of caribou and moose could result in a shift from these healthy traditional meats to higher fat market foods such as beef resulting in an increased intake of saturated fat. On the contrary, if animals such as deer become more available to community members, and community members begin to harvest them this may have a positive

impact on their diets, possibly replacing higher fat nutrient lacking store foods. The next manuscript documents how community members are adapting to changes in the traditional food harvest.

8. MANUSCRIPT 2

Local observations of climate change and impacts on traditional food security in two northern Aboriginal communities.

Local observations of climate change and impacts on traditional food security in two northern Aboriginal communities.

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Received 24 July 2006, Accepted 21 November 2006, International Journal of Circumpolar Health.

Abstract

Objectives.

Our primary objective was to record participant observations of changes in the local environment, harvesting situations and traditional food species and to explore what impact these may have on traditional food.

Study Design.

A participatory study with 2 northern Aboriginal communities in Canada.

Methods.

Focus groups were conducted in both communities. Both specific and open-ended questions were asked, in order to gather information about the traditional food harvest and a qualitative analysis was conducted.

Results.

Members from both communities are witnessing variable changes in climate that are affecting their traditional food harvest. New species and changes in migration of species being observed by community members have the potential to affect the consumption of traditional food. Similarly, changes in water levels in and around harvesting areas are affecting access to harvest areas, which in turn affects the traditional food harvest.

Conclusions.

Community members have changed their harvest mechanisms to adapt to changes in climate and ensure an adequate supply of traditional food. A

strong commitment to programs that will ensure the protection of traditional food systems is necessary.

Keywords: climate change, traditional food, aboriginal communities, food security

Introduction

Traditional food is local food, animals, fish, birds and plants that are harvested from the environment for human consumption (Receveur et al., 1997). People living in the northern parts of Canada have a nutritional, spiritual and cultural dependence on these systems (Receveur et al., 1997; Kuhnlein et al., 1994; Kuhnlein et al., 1995; Ritenbaugh et al., 1996; Wein & Freeman, 1995; Receveur et al., 1996). In an intensive dietary survey of Dene, Métis and Yukon communities in northern Canada, researchers found caribou and moose meat to be the main sources of energy, protein, iron, zinc, copper and magnesium (Kuhnlein et al., 1995). Smaller mammals, fish and birds were shown to also provide a large quantity of nutrients vital for good health. Further, a shift from traditional food to more market food has resulted in an increase in the consumption of carbohydrates and saturated fat in these same Dene/Métis communities of the Northwest Territories (NWT) (Receveur et al., 1997). A replacement of nutrient-dense traditional food with high-sugar, high-fat market food has contributed to an emergence and continual increase in disease states, such as diabetes and obesity, in similar populations and has the potential to do the same with Aboriginal communities in northern Canada (Ritenbaugh et al., 1996; Kuhnlein et al., 2004).

A report published by the Canadian Institute of Health Research (CIHR, 2002) identified environmental degradation as a major concern among Aboriginal northerners. Changes in climate have the ability to change the distribution and health of animal species, as well as to affect the land, water and ice, potentially changing the traditional food harvest. Unhealthy appearances of food sources, distance of travel, seasonal availability and the quantity of species have all been recognized as factors that have the ability to decrease the consumption of traditional foods (Simoneau & Receveur; 2000; Kuhnlein et al., 1996). A change in harvest has the potential to create a greater shift away from traditional food and a loss of traditional knowledge and culture, affecting both the physical and spiritual health of the people. The extent of these impacts on the nutritional well-being of individuals and communities is not yet well understood, but is important to governments of all levels, in order to ensure that appropriate policies are created to protect these systems (Duerden, 2004).

The purpose of this paper is to document local traditional knowledge and observations of change in the local environment and traditional food harvest of two northern Aboriginal communities, record current adaptative strategies used by community members and, finally, to explore what

effects the observed changes in climate may have on the diet of the people living in these communities.

Methods

This participatory study was carried out as a partnership between the Centre for Indigenous Peoples' Nutrition and Environment of McGill University, the Council of Yukon First Nations (CYFN) and Dene Nation. Full community consultation remained a priority at all stages of the study. Ethics approval was obtained from the ethics committee of the Faculty of Agriculture, McGill University.

Invitations to participate in the study were sent out to communities by First Nation representatives. Two communities were chosen based on their concerns about climate change, food availability, their respective geographical locations, their resource availability, as well the availability of previously published dietary data. Research agreements were signed with both communities.

A community coordinator was hired from each community to coordinate a focus group with community members in their home community. Focus

groups are an ideal method to collect data quickly from a large number of participants in a naturalistic way, and they also provide an opportunity to create a discussion that may help to identify similarities and differences in informant's experiences (Morgan, 1997). Male and female Elders, hunters, traditional plant harvesters, and any others who were considered to be knowledgeable in this area, were invited by the community coordinator to participate in the study. The group of participants was selectively chosen by the community coordinators, in order to represent each of the main hunting areas around the communities. Similar group settings have been shown to provide an environment where all informants can discuss openly about their experiences (Maykut & Morehouse, 1994), which helped to provide a rich understanding of the state of the traditional food harvest and how it may differ from the past. A local translator was present to ensure that informants were able to express themselves fully, as well as to ensure that all participants understood completely what was being communicated. Ethic consent forms were translated and signed by all participants before the focus group began. To help generate interest and develop a relationship with participants, the purpose of the focus groups was explained ahead of time, recognizing that this may at the same time present a bias in the responses. Both specific and open-ended questions were asked about the harvest of traditional food, in order to facilitate

discussion about these issues and to gather an understanding of how climate change may be affecting the traditional food harvest and, further, what implications these changes could have for community members. A map of the harvesting area was presented to both focus groups to trigger memories, provide an opportunity for participants to specify harvesting areas, and to record any changes that they have noticed in these areas.

Digital audio recordings were made of both groups, in order to eliminate the threat of having inaccurate or incomplete data (Maxwell, 1996). The recordings were transcribed twice by the researcher and “member checks” (Maxwell, 1996) were done with a selected group of the participants from each focus group to rule out misinterpretation. Transcripts were read and reduced into emerging themes and a qualitative analysis categorizing strategy was conducted. “Coding” in qualitative terms involves rearranging the data into categories that enable the comparison of data within these categories, in order to aid in forming theoretical concepts (Maxwell, 1996). In addition, a cross comparison analysis was done to compare information between the two communities.

The Communities

The people of Deh Gah Got'ie First Nation live in Fort Providence, at the source of Deh Cho (the Mackenzie River), which flows into the Tucho (Great Slave Lake) 300 km southwest of Yellowknife in the NWT (Figure 8.1). The 2001 Statistics Canada Census (Statistics Canada, 2001) reported a population of 753, a total of 200 families, and 235 dwellings. The community belongs to the electoral district of Deh Cho and to the land claim area of Deh Cho Treaty 11. Local languages are South Slavey and English. The main traditional food items include whitefish, northern pike, grayling, moose and waterfowl (Receveur et al., 1996). Hunting and trapping small mammals, such as marten, otter, and beaver, are very important economic activities.

The community of Beaver Creek in the Yukon is situated on flat terrain and is the most western community in Canada, located just east of the Alaskan border, about 500 km northwest of Whitehorse (Figure 7.1). Beaver Creek is the home of the White River First Nation, made up of people from the Upper Tanana, and Southern and Northern Tutchone. The main traditional food items include moose, salmon, whitefish, grayling and berries (Wein & Freeman; 1995, Statistics Canada; 2001). The statistics Canada 2001 census (Statistics Canada, 2001) reported a population of 88 people, including 20 families and 44 dwellings.

Results

A total of 22 participants were involved in two different focus groups. Participants included male and female adults, including Elders, who are from, and continue to live in, the local area, and who regularly harvest traditional food from the land. All but three of the participants lived in the community most of the time, otherwise spending time in camps outside of the community. Three of the participants lived full-time in camps that were a short distance away from the community. The main harvesting areas for each of the communities were represented. The number of people employed in the communities at the time of the focus groups and the number of people who were unable or not willing, to participate in the focus groups, contributed to the low number of participants.

Climate Related Changes Affecting the Traditional Food Harvest

Although observations differ slightly between the two communities, when asked to share observations of changes in the climate and environment that affect the traditional food harvest, the same four themes emerged:

changes in species, water, weather and ice. The themes are summarized in Table 8.2.

Figure 8.1.

Map showing the locations of the two participating communities.

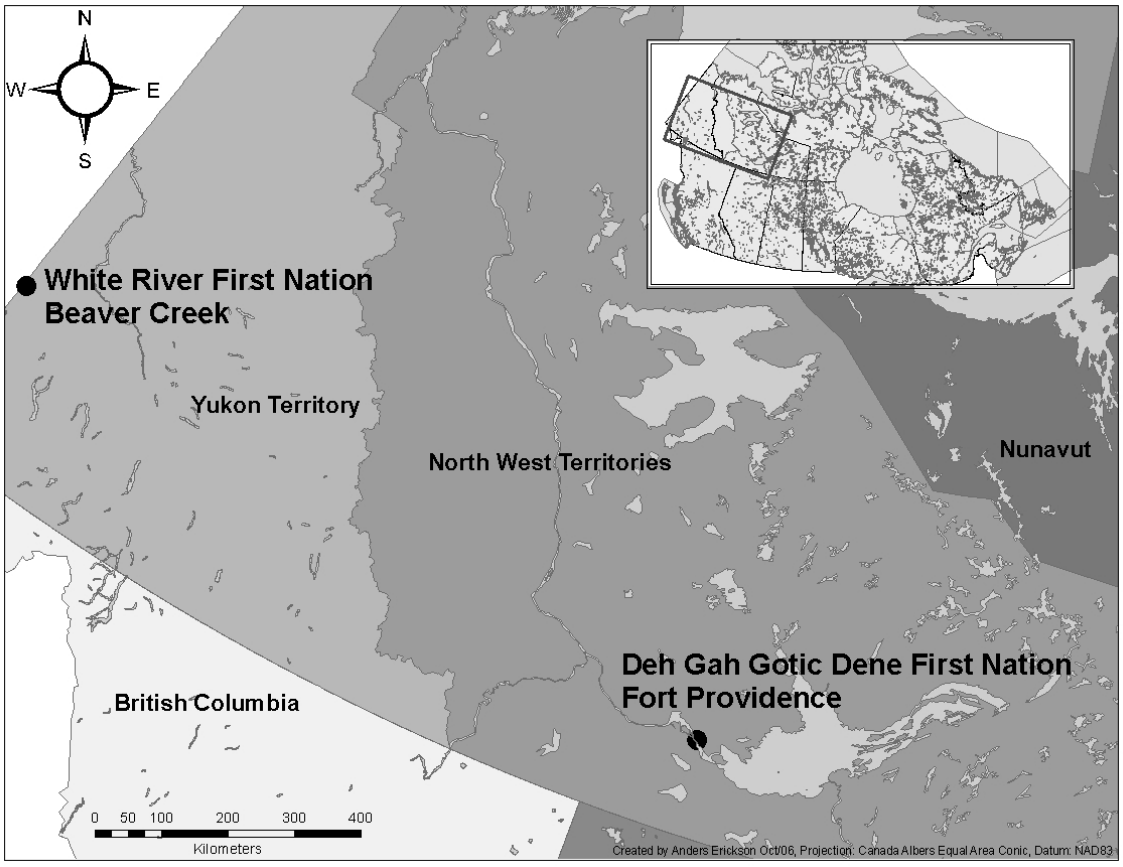

Table 8.1

Gender of focus group participants, Deh Gah Got'ie and White River First Nation, Winter 2004

	Deh Gah Got'ie	White River
Men	8	5
Women	4	5
Total	12	10

Changes in Species

Participants from both communities expressed that they have noticed changes in their local animals, bird, fish and plant species. For the first time, cougars have been seen around both communities. In addition, the people of Beaver Creek have also seen deer and lynx where they have not in the past.

A noticed change in the timing of migratory birds, and an increased amount of new bird species such as eagles, are all recent observations of the people of Deh Gah Got'ie First Nation. The later arrival of geese has shortened the spring goose hunt by about one week. Ducks have been found with spruce needles in their stomachs, indicating that the vegetation that they would normally consume as a food source may not be available until later than usual and suggesting a later spring thaw. Along with the

changes in bird species, women from Deh Gah Got'ie stated that they have noticed a number of different plant species that they have not seen before. They did however question whether this was related to warmer temperatures or if other environmental changes such as pollution from rusty equipment and machinery left on the land and in the water were the cause of this. An increase in beavers was also reported.

Table 8.2

Climate-related changes affecting the traditional food harvest, Deh Gah Got'ie and White River First Nation, Winter 2004

Theme	Deh Gah Got'ie	White River
Changes in species	-change in timing of bird migration, -geese later than before -spruce needles in ducks' stomachs -cougar seen -white spots on beaver -different bird species -lots of eagles	-bird migration changing (coming back earlier and leaving later) -different plants around -deer, cougar and lynx seen -no more caribou -too many beavers -no rabbits -plants earlier in the season -animals move around a lot -hair-loss on moose
Water	-more rain last year -recent flooding in the staging area for birds, never happened before -horn river really dried out -hardly any water in the fall -rain and snow before it gets really cold, so you get slush under the snow and creates overflow -water fluctuations are more evident -drier land -warmer water	-dry lakes, dry creeks, dry swamps -lakes getting lower -Beaver Creek dry -no rain -way less snow
Weather	-chinook in December -season is about 2 months later,	-thunder the wrong time of year -more weather activity

	even in the winter the weather changes -February wind has lessened, normally called the wind month -stronger storms in the summer -warmer weather in the winter -fluctuations have always been there, but they are more evident now -diseases in animals due to warmer weather	-more danger of forest fires -lots of earthquakes -warmer -1950's warm, then colder, now warm again -fluctuations in the weather
Ice	-so far no problem traveling on the ice -breaking up at different times, sometimes early, sometimes later -thicker ice, more abundant different break-up (a few years ago thick, then thin chunks again, then thick again)	-no ice to go out -river is open year round

Community members from White River First Nation have also noticed a change in the timing of migratory birds. They reported birds coming back earlier in the spring and leaving later in the fall. Both the women and men from this group stated that they have noticed different plants in the area surrounding their communities. Once again the discussion as to whether this was related to climate or other factors came up. One participant

believed it was the increase in lawn seed that is being shipped up by trucks on the highways. An increase in movement of the animals is being observed, which was attributed mostly to the increase in forest fires. People of White River First Nation have seen a huge decline in the population of their local caribou herd. Some focus group participants believe this is due to the vegetation drying up, while others believe that it is due to the increase of wolves present, making it more unlikely that the young caribou will survive. Community members reported that due to the cyclical nature of rabbits, there have been few rabbits around for the past few years. One hunter from this group reported that he had seen a few moose with hair-loss and water bubbles between their joints, and was concerned that this might be from a change in climate. Focus group participants in Beaver Creek also stated that there were "*too many beavers*", which was a contributing factor to the varying water levels around the community.

When asked how community members would react to these changes in species, focus group participants from both communities communicated that they would hunt and harvest the species that were around them.

"We have to do what we have to do"

"Eat what is around."

Water

Recent changes in water levels in the local creeks, rivers and lakes were a huge concern for members of both communities. People of Deh Gah Got'ie have said that water fluctuations were much more evident from year to year now and that most recently they have seen an increase in the current year's rain relative to previous years. This gave the women in the group reason to believe that there will be fewer berries in the summer to pick. The Horn River, a staging area for birds close to the community, is one area where major fluctuations in water levels are being noticed and have community members concerned. The staging area flooded in the spring and soon after became very dry. Participants attributed the drying of the area to an increase in beaver dams changing water levels of the local watershed. Community members were concerned that the spawning of fish could have been affected, decreasing the numbers of whitefish. Lower water levels in the Mackenzie River have made places that were accessible by boat inaccessible. Contrasting with this negative effect from dry water systems, drier conditions make it easier to travel during the fall harvest. Dry creeks, swamps, rivers and land require community members to change their methods of transportation from a boat to a truck or all-

terrain vehicle, which makes it easier to travel to the harvesting area for the moose, and to transport the moose back to the community. In addition, when there is less water, the people of Deh Gah Got'ie said that the moose come to the river and are therefore closer to the community, making the travel distance for the harvest shorter. A high amount of rain in the early winter before the snow fall creates a layer of slush under the snow which can cause overflow and generates complications and unsafe conditions for travel across the ice. At this time of the year, trappers are setting their trap lines and moose and caribou are still being harvested. When ice conditions are not safe, the ability to travel along the trap lines to the harvest areas is impaired, delaying the trapping period. Finally, residents of this community have also noticed a general warming of the water in the summer time. Community members recall that when the water is warmer they are more likely to catch fish that are "soggy". Fish caught in this state are not favoured and therefore would not be eaten.

White River First Nations residents have also experienced a general drying of the area, lakes, creeks and swamps around the community.

"I see the biggest change in this (the water)*"*

They have noticed much lower rainfall and snowfall amounts than in the past, which has contributed to fewer berries in the summer months.

Beaver Creek, which flows close to the community, was completely dry and the water levels in the lakes around the community were lower than they had been previously. Participants stated that this was making it easier for community members to travel out on the land and in the woods. This was of concern to community members because they knew that this was not typical. On the other hand, participants stated that when there is less snow, coyotes hunt in packs making it more likely that they would kill more caribou, thus decreasing the numbers in the caribou herds.

Weather

Community members in Fort Providence have experienced unusual weather changes in the winter describing these changes as "*fluctuations that have always been there but they are more evident now*". Participants stated that there has been a trend of warmer winters. A "*chinook*" that occurred during the December prior to the focus group had participants alarmed. Participants have also noticed a shift in the season, stating that "*the colder season is happening about 2 months later than previously*". Stronger storms in the summer are another change that is having an impact on the traditional food harvest. More frequent, stronger storms mean an increase in situations where it is unsafe for community members to travel on the water.

Residents of White River First Nation are also observing fluctuations in weather and more weather activity. Community members are witnessing thunder storms at the wrong time of the year, increasing the risk of forest fires. One participant recalled that there had been lots of earthquakes. An Elder in the group explained changes in weather, not as something unusual, but instead as weather patterns, recalling that in the 1950's it was warm and then it became colder and now has started to become warm again.

Ice

Although people of Deh Gah Got'ie First Nation have not had any trouble traveling on the ice so far, they have noticed changes in the ice. Spring break-up is occurring at different times, sometimes earlier than usual and sometimes later. The changes in break-up times are affecting the goose harvest making the geese more difficult to get to. While participants from this community reported a general trend of warmer winters, they also described that thicker ice is creating a more abundant break-up, sometimes causing the ice to pile up in the river and make it hard to travel down.

"I remember my father crossing it (Mackenzie River) *in May and now it breaks up and doesn't move; break-up happens at different times than it used to."*

The discrepancy of this may simply be due to participants recalling different years, as the fluctuation of weather patterns from year to year was a consistent response among all participants.

People in Beaver Creek are noticing a drastic difference in the ice around the community. Community members have not had any ice to go out fishing. The river south of the community had open water throughout the entire winter, making it impossible to cross by snow machine.

Adaptability

The environmental changes that are being observed by people from Deh Gah Got'ie First Nation and White River First Nation are of great concern to the people, but at the same time, people from these communities have been able to adapt in a way that fits their best interest.

Focus group participants were asked what individuals do to deal with these changes. Deh Gah Got'ie participants agree that the changes have

been small and therefore they have been able to continue to adapt. Although the amount and type of traditional food varies from year to year, focus group participants have not noticed a difference in the overall amount of traditional food in the community.

"The change is so gradual that we adapt without even noticing, our ability to adapt kind of makes it easier, we change without even knowing, we do what we have to do".

Discussion

As documented in Table 8.3, a change in species has the potential to alter the nutrient composition of the diet. For residents of Deh Gah Got'ie First Nation, a shortened goose hunt means less geese harvested for consumption by the community. In a community that has previously reported 76% of the population to be consumers of geese (Receveur et al., 1996), a reduction in the consumption of geese could mean a reduction in high-quality protein and important minerals such as iron and zinc (Belinsky & Kuhnlein, 2000). On the other hand, an introduction of species such as deer and new plant species could have a positive effect on the nutrient composition of the diet. Deer would be a likely addition to the diet if available for harvest, especially for the people of White River

First Nation whose local caribou herd has declined. An addition of new plant species could contribute to an increase in the variety and size of berries available and if available and consumed in large enough quantities, could increase the intake of nutrients such as fibre, a nutrient previously reported at low levels of intake for all age groups (Receveur et al., 1996).

Table 8.3

Possible nutritional implications of observed changes in species, Deh Gah Got'ie and White River First Nation, Winter 2004

Observation	Consequence	Traditional food consumption	Nutrients affected
New animal and bird species	will begin to hunt	↑ deer	Protein Iron Zinc
Changes in bird migration	shortened hunting period	↓ geese	Protein Iron Zinc
New plant species	will begin to harvest	↑ or ↓ berries ↑ or ↓ traditional greens	Vitamin C Fibre

There is great potential for the fluctuations in the water levels to create nutritional shifts in the local diet. The type of transportation used to cross

the water or travel into the bush, has a huge influence on the level of harvest brought back to the community.

"We are just changing techniques; we drive instead of using boat, so more hunters on the highway instead of the boat or on the water."

"We have to go further on the land if things change"

"We would go further away to hunt them."

In situations where the land is dry enough for a truck or all-terrain vehicle to be used, hunters will be able to travel longer distances to reach the animals. In addition, the ability to carry a greater amount of food back to the community will increase when using a truck as compared to traveling by boat. Moose meat is the most consumed traditional food in both of the communities; it is perceived as being good for the health and would be consumed more if available (Receveur et al., 1996; Receveur & Kuhnlein, 1998). If hunters were able to provide more moose for the community, we could expect an increase in the consumption of moose by community members, contributing to optimum protein, iron and zinc levels. At the same time, a decrease in travel over water could mean a decrease in the local fish harvest, negatively affecting the intake of these same important

nutrients. Whitefish is one of the main traditional food sources for the people of Deh Gah Got'ie, contributing energy, protein, iron, zinc and calcium to the nutrient composition of their diet (Receveur et al., 1996). The difficulty in transportation created by an increase in rain and a decrease in snow has the potential to decrease the caribou and berry harvest, further impacting nutrient intake of Vitamin C, fibre, protein, iron and zinc.

The biggest concern about the change of weather that community members from both focus groups have is the unpredictability that now exists when traveling out on the water or on the land.

"Can't predict anything anymore"

Stronger, more frequent storms are alarming the people and posing a safety risk to those who are out on the water, decreasing the time that community members spend fishing out on the lakes. Warmer weather is affecting food preservation methods, making it harder to successfully dry meat; the higher temperatures increase the chance that the meat will spoil before it is able to dry. On the one hand, warm weather can be hard on the skidoo, complicating travel by snow machine and affecting the amount of harvest brought back to the community. On the other hand, warmer weather means hunters are able to go out on the land with less gear, thus leaving more space for traditional food to be taken back.

When harvest is dependant on travel across ice and changes in the ice create conditions unfit for travel, lower levels of fish and geese harvested will impinge on the nutrient composition of the diet (Table 8.6).

"If it is more difficult to go out, people would just eat less (traditional food)."

Fish is a regular part of the annual diet for people from both Deh Gah Got'ie and White River. In the Deh Cho region, 86% reported eating fish at least once a day (Receveur et al., 1996).

Table 8.4

Possible nutritional implications of observed changes in water, Deh Gah Got'ie and White River First Nation, Winter 2004

Observation	Consequence	Traditional food	Nutrients affected
Drier lakes, swamps, creeks and land	-hunt by land instead of by boat, makes hunting easier -decrease in spawning area -vegetation dried up -increase in thunderstorms	↑ moose ↓ fish ↓ caribou	Protein Iron Zinc
Rain before snow	-trap lines delayed dangerous, people would not go out -people would eat less	↓ rabbits ↓ spruce grouse	Iron Zinc Calcium
Warmer water	-"*soggy*" fish	↓ whitefish	Protein Iron Zinc
More rain	-smaller berries	↓ berries	Vitamin C Fibre
Less snow and rainfall	-coyotes hunt in packs -fewer berries	↓ caribou ↓ berries	Protein Iron Zinc Vitamin C Fibre

Table 8.5

Possible nutritional implications of observed changes in weather, Deh Gah Got'ie and White River First Nation, Winter 2004

Observation	Consequence	Traditional food	Nutrients affected
Warmer	-pack less weight cannot fill toboggan up as much -less gear -moss could be covered in ice and there is no food for caribou	↑ moose ↓ moose ↓ caribou ↑ caribou	Iron Protein Zinc
Stronger storms	-cannot go fishing	↓ fish	Iron Protein Zinc

The most obvious impacts of climate change on the traditional harvest have been the required changes in mechanisms that are used to gather the food. Focus group participants stated that more funding is needed for the purchase of gas in order to enable hunters to reach the animals when they are further away. Further enhancements to existing initiatives that assist trappers with their trap lines are needed, as are improvements to the trails that are used to travel to trapping areas. Continual and increased support to the community hunt program, which is currently responsible for

providing caribou to all community members, would ensure that more people of Deh Gah Got'ie First Nation are able to acquire traditional food. A similar program would be of great use for the people of White River First Nation, where very few people have snow machines and are therefore unable to get out hunting. A long-term initiative to restore and maintain community freezer programs would be an asset to both communities

Table 8.6

Possible nutritional implications of observed changes in ice, Deh Gah Got'ie and White River First Nation, Winter 2004

Observation	Consequence	Traditional food	Nutrients affected
Less ice	-would not be able to get whitefish until later have to resort to using other fish species, even though the preference is whitefish -geese are getting harder to get because of the ice cannot cross rivers or lakes	↓ fish ↓ geese	Protein Iron Zinc

Conclusions

Members of both White River First Nation and Deh Gah Got'ie First Nation are experiencing changes that are affecting their local traditional food harvest. Accessibility and availability of traditional foods are changing and due to the immense adaptive qualities of the people, harvesting techniques and mechanisms are been changed in order to ensure a constant supply of traditional food to the community.

The World Health Organization (WHO, 2006) defines food security as when:

> "all people at all times have both physical and economic access to enough food for an active, healthy life; the ways in which food is produced and distributed are respectful of the natural processes of earth and are thus sustainable; both the consumption and production of food are governed by social values that are just and equitable, as well as moral and ethical; the ability to acquire food is ensured; the food itself is nutritionally adequate and personally and culturally acceptable; and the food is obtained in a manner that upholds human dignity."

Programs need to be put in place to support the people of Deh Gah Got'ie and White River First Nations as well as all other Aboriginal peoples of Canada in order to ensure traditional food security by making certain that these foods are available and accessible and that they remain nutritious, safe and culturally appropriate. Traditional food is an essential part of the culture for people in these regions (Receveur et al., 1997; Ritenbaugh et al., 1996; Wein & Freeman, 1995; Receveur et al., 1996; Kuhnlein et al., 2004; Receveur & Kuhnlein; 1998), and the potential for environmental changes to alter their cultural way of life is devastating. The changes in the

availability and accessibility of the traditional food harvest are not only an issue of food security but also one of cultural preservation and they deserve serious recognition by governments all around the world.

> *"The most important thing is that the land is changing and our people are changing at the same time, because of the relationship we have with the land we have lived on for thousands of years. Once that relationship changes, it means that we are not distinct anymore, we are not Dene anymore and that's the most important thing and the very biggest challenge we are dealing with; once we stop hunting and doing those traditional things, we are not Dene."*

Acknowledgments

It is important to acknowledge those without whom we would never have been able to conduct this project: the community members of Deh Gah Got'ie First Nation in the NWT, and White River First Nation in the Yukon, as well as community coordinators, Cliff Vandell, Rick Sanderson, Sid Vandemeer and Rose-Marie Blair Smith. Funding was provided by Natural Resources Canada to Chan and Furgal, and the National Science and Engineering Research Council Northern Research Chair Grant to Chan.

9. CONCLUSION

The relationship of harvest data to dietary intake is complex and requires two accurate and complete data sets. The possibility of predicting the amount of traditional food available to a community from harvest data exists but may be time and energy extensive. In order to derive an accurate prediction, complete harvest data including weights of species, specific levels of use for consumption and an accurate description of the survey population is needed. If these are all available a prediction of the overall level of traditional food available to the community is possible. In order to gain nutrient specific data, an accurate dietary assessment of the population would be needed to ensure factors such as serving size are taken into account.

Environmental changes are becoming more evident in northern regions of Canada and have the power to impact the traditional food harvest. As described in this thesis both Deh Gah Got'ie and White River First Nation are experiencing changes that are affecting their local traditional food harvest. Changes in water levels, ice, weather patterns and distribution of animals are being witnessed. Community members are adapting harvest

techniques to cope with these changes preventing an undesired change in the level of traditional foods available to community members.

Harvest journals or measures of effort required for harvest would be a compliment to harvest data. Numbers may not be and effective way to capture the complete effect of climate change on the traditional food harvest. Assessing the effort required for the harvest could be effective in gaining a deeper understanding in how the harvest is being impacted and how the changes in harvest affect the level of effort needed by community members.

Local, national and global initiatives must be a priority to ensuring that traditional food systems are sustained. Monitoring programs for harvest in communities and support for traditional food harvest will help to minimize the negative impact of climate change on diet and provide an overall assessment of the changes in the levels of harvested food. A commitment to community programs that have been developed with the input of local community members will help to promote traditional food consumption among community members, especially with the youth where consumption is not always frequent. Protection and preservation of the traditional food

system is important and any action towards doing so should incorporate traditional knowledge of community members.

The findings from this research will be useful in planning future harvest studies that can help predict the amount of traditional food available to a community from a specific harvest. If the limitations discussed above are addressed, an accurate estimation of food available from a harvest may be derived. Estimations of food yielded from a harvest in combination with qualitative data could then be used to create a model that can help to predict the changes in the food supply and nutrient composition. Future research could include the creation of a tool that could be used in the field by harvesters and would help to ensure the accuracy of harvest data.

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11. APPENDICES

11.A : Participant Consent

CONSENT FORM – Beaver Creek, Yukon

In participating in the study I agree to answer questions about my experiences on harvest of traditional foods in Beaver Creek, which will be tape recorded. I am aware that I will be paid an honorarium of $150/day for this participation. The written or recorded material will help the author in his analysis and may be quoted by him, although my name will be withheld if I so request.

I understand the purpose of the study, Impact of Climate Change on Food Security in Three Northern Aboriginal Communities – Plans for Adaptations under the supervision of Dr. Laurie Chan, Associate Professor, Centre for Indigenous Peoples' Nutrition and Environment, McGill University, 21,111 Lakeshore, Ste. Anne-de-Bellevue, Quebec, H9X 3V9.

I agree to participate in the workshop but understand that I may decide at any time to withdraw my participation.

I also understand that the use of my name will be respected as specified below:

My name may be used _____

My name may only be used after the following date _____

I do not want my name to be used _____

I have received contact information for the Research Supervisor and know that I may contact him if I have further questions.

Participants Name _____

Participants
Signature_____

Date _____ Researcher _____

Information for Study Participants – Beaver Creek, Yukon

STUDY TITLE:

Impact of Climate Change on Food Security in Three Northern Aboriginal Communities – Plans for Adaptation

NATURE & OBJECTIVES:

Researchers from McGill University and Laval University are directing a project funded by Natural Resources Canada. The purpose of this project is to explore the impacts of climate change on the food supply of three northern aboriginal communities.

Through this study we hope to learn how climate change may be affecting the traditional food supply in Beaver Creek. We will help you to develop a management program that will combine local and traditional knowledge. We will ask you questions about your hunting practice, seasonality, transport and distribution, storage, sharing and preparation methods and your observations on climate change.

All information will be confidential. Your name will not appear on any official documents. Only your comments will be recorded.

I will send draft copies of the research results to the community before they are published, in order to make sure that I have correctly interpreted your opinions; and I would be happy to send you a copy of any publications that result from our workshop. I look forward to having your cooperation, and to learning more about how to develop a way to deal with the impact of climate change.

Dr. Laurie Chan
Associate Professor and NSERC Northern Research Chair
Centre for Indigenous Peoples' Nutrition and Environment (CINE)
Macdonald Campus, McGill University
21,111 Lakeshore Road, Ste. Anne de Bellevue, Quebec, H9X 3V9
Tel: (514) 398-7757 FAX: (514) 398-1020
Email: laurie.chan@mcgill.ca

CONSENT FORM – Fort Providence, NWT

In participating in the study I agree to answer questions about traditional foods in Fort Providence. The written or recorded material will help the author in his analysis and may be quoted by him, although my name will be withheld if I so request.

I understand the purpose of the study, Impact of Climate Change on Food Security in Three Northern Aboriginal Communities – Plans for Adaptations under the supervision of Dr. Laurie Chan, Associate Professor, Centre for Indigenous Peoples' Nutrition and Environment, McGill University, 21,111 Lakeshore, Ste. Anne-de-Bellevue, Quebec, H9X 3V9.

I agree to participate in the interview but understand that I may decide at any time to stop. I also understand that my name will not be used.

I have received contact information for the Research Supervisor and know that I may contact him if I have further questions.

Participants Name _____

Participants Signature _____

Date _____ Researcher _____

Information for Study Participants – Fort Providence, NWT

Impact of Climate Change on Food Security in Three Northern Aboriginal Communities – Plans for Adaptation

Researchers from McGill University and Laval University are directing a project funded by Natural Resources Canada. The purpose of this project is to find out the impacts of climate change on the food supply of three northern aboriginal communities. Through this study we hope to learn how climate change may be affecting the traditional food supply in Fort Providence. We will help you to develop a management program that will combine local and traditional knowledge.

Draft copies of the research results will be sent to the community before they are published, in order to make sure that we have correctly interpreted your opinions; and we will be happy to send you a copy of any publications that result from this study.

If you would like to participate in this interview, it will take about 30 minutes of your time to answer questions about the traditional food that you eat. All information will be confidential. Your name will not appear on any official documents. Only your comments will be recorded. At any time you can refuse to answer any or all of the questions and ask us to leave.

Research Supervisor:

Dr. Laurie Chan
Associate Professor and NSERC Northern Research Chair
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MCGILL UNIVERSITY
FACULTY OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

ETHICS REVIEW
ANNUAL STATUS REPORT/RENEWAL REQUEST/FINAL REPORT

Continuing review of human subjects research requires, at a minimum, the submission of an annual status report to the REB. This form must be completed to request renewal of ethics approval or to close a project file once the research has been completed or terminated. In order to keep the REB records current, and to avoid any delays in the release of funds, please complete the following and return it at least **1 month** before the current approval expires.

Project Title: **Impact of climate change on food security**
Principal Investigator: **Chan HM. (Laurie. Chan)**
Department/Phone/Email: CINE, 7765, Laurie.Chan@mcgill.ca
Faculty Supervisor (for student PI):

1. Were there any significant changes made to this research project that have any ethical implications? _√_ Yes ___ No
   If yes, describe these changes and append any relevant documents that have been revised.
   A component is added to do further analysis on previous collected data. (see attached description)
   Data will be used by master's student Ying Chun Li
2. Are there any ethical concerns that arose during the course of this research? ___ Yes _√_ No. If yes, please describe.

3. Have any subjects experienced any adverse events in connection with this research project? ___ Yes _√_ No
   If yes, please describe.

4. _√_ This is a request for renewal of ethics approval. Please list all current funding sources for this project (indicate the title of the award/contract **if not exactly the same** as the project title indicated above)

5. _____ This project is no longer active and ethics approval is no longer required.

Principal Investigator Signature: _____ Date: Oct 20, 2005

~~Faculty Supervisor Signature~~: Yinghua Li Date: Oct. 26, 2005
(~~for student PI~~) MASTER'S STUDENT

For Administrative Use	**REB:** X AGR ___ EDU ___ REB-I ___ REB-II
___ The closing report of this terminated project has been reviewed and accepted	
X The continuing review for this project has been reviewed and approved	
X Expedited Review ___ Full Review	
Signature of REB Chair or designate: _____	Date: _____
Approval Period: OCT 26, 2005 to OCT 25, 2006	

Submit to Chair, Ethics Review Committee, Faculty of Agricultural and Environmental Sciences

From: Laurie Chan, Dr.
Sent: Saturday, January 28, 2006 10:49 AM
To: Lynn Murphy; Melissa Guyot
Subject: RE: Ethics approval + certificate

Hi Lynn,

I forgot to put Melissa Guyot's name on the renewal application this year. Please add her name back on. She has been working on this project since the beginning 2 years ago.

Thank you.

Laurie Chan

From: Lynn Murphy
Sent: Fri 1/27/2006 8:54 AM
To: Melissa Guyot
Cc: Laurie Chan, Dr.
Subject: Ethics approval + certificate

Melissa,

I inquired further about the certificate you need for the submission of your thesis and I was advised that given that your name does not appear on the certificate (I have on file), just ask Prof. Chan to send me an e-mail confirming that you did fact work on the project from the beginning. I will then fax you the certificate I do have and his e-mail and this wi[illegible] acceptable for the purpose of thesis submission.

Project title: "Impact of climate change on food security"
Principal Investigator: Laurie Chan
Graduate Students who worked on project: ?

Lynn Murphy
Administrative Coordinator
Macdonald Campus Research Office
McGill University
Faculty of Agricultural and Environmental Sciences
21 111 Lakeshore Road
St-Anne-de-Bellevue, QC CANADA H9X 3V9
Tel: 514 398-8716
Fax: 514 398-8732

> -----Original Message-----
> From: Melissa Guyot [mailto:melissa.guyot@mail.mcgill.ca]
> Sent: Thursday, January 19, 2006 3:42 PM
> To: Lynn Murphy
> Subject: Re: more...RE: Ethics approval
>
> Hi Lynn,
>
> The full title is "Impact of Climate Change on Food security in Three
> Northern
> Aboriginal Communities - Plans for Adaptations"

> I think it was approved in 2004, but may have been in 2003, I can check
> with
> Laurie if you need more information.
>
> Thanks again
> Melissa

> > -----Original Message-----
> > From: Melissa Guyot [mailto:melissa.guyot@mail.mcgill.ca]
> > Sent: Thursday, January 19, 2006 2:35 PM
> > To: Lynn Murphy
> > Subject: Ethics approval
> >
> > Hi Lynn,
> >
> > I am one of Dr Chan's graduate students and I need to get a copy of my
> > ethics
> > approval form to submit with my thesis. He has asked me to contact you
> > and ask
> > you if you could send me a copy please.
> >
> > It is the adaptations project conducted with the communities Beaver
> > Creek, Yukon
> > and Fort Providence, NWT.
> >
> > If you could please fax one to me I would really appreciate it. My fax
> > number is
> > 867-975-5780 and please put it Attention: Melissa Guyot.
> >
> > Many thanks,
> > Melissa
> >
> >
>
>
>

INTERNATIONAL JOURNAL OF
CIRCUMPOLAR
HEALTH

IJCH Editorial office
Aapistie1, FI-90220 Oulu
Finland

Oulu, Finland 13th of December 2006

Ref:
Local observations of climate change and impacts on traditional food security in two northern Aboriginal communities.
Melissa Guyot, Cindy Dickson, Chris Paci, Chris Furgal, Hing Man Chan
Int. J Circumpolar Health 2006; 65 no 5 (in press).

Dear Ms. Guyot,

We hereby grant you permission to include the aforementioned material accepted for publication in the *International Journal of Circumpolar Health* **in your thesis** subject to the following conditions:

1) If any part of the material to be used has appeared in our publication with credit or acknowledgement to another source, permission must also be sought from that source.
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Tiina Mäkinen, PhD
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International Journal of Circumpolar Health
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Email:tiina.makinen@oulu.fi

December 1st, 2006

To Whom It May Concern:

The purpose of this letter is to confirm that co-authors agree that the candidate (Melissa Guyot) includes the manuscript entitled *Local observations of climate change and impacts on traditional food security in two northern Aboriginal communities,* in her thesis.

The candidate's role in this study included hiring community coordinators to facilitate the focus groups, recruiting community participants, developing the study questionnaire, compiling the data and conducting the analyses. The candidate accomplished the above and wrote the manuscript under the guidance of the co-authors.

Melissa Guyot

Melissa Guyot

I, the co-author agree that the candidate, Melissa Guyot, include the manuscript entitled *Local observations of climate change and impacts on traditional food security in two northern Aboriginal communities* in her thesis.

Cindy Dickson

Chris Paci

Chris Furgal

Hing Man Chan

December 1st, 2006

To Whom It May Concern:

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Melissa Guyot

I, the co-author agree that the candidate, Melissa Guyot, include the manuscript entitled *Local observations of climate change and impacts on traditional food security in two northern Aboriginal communities* in her thesis.

Cindy Dickson

Chris Paci

Chris Furgal

Hing Man Chan

November 1st, 2006

To Whom It May Concern:

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Melissa Guyot

I, the co-author agree that the candidate, Melissa Guyot, include the manuscript entitled *Local observations of climate change and impacts on traditional food security in two northern Aboriginal communities* in her thesis.

Cindy Dickson

Keith McGuire

Chris Paci

Chris Furgal

Hing Man Chan

November 1st, 2006

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Melissa Guyot

Melissa Guyot

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Cindy Dickson

Keith McGuire

Chris Paci

Chris Furgal

Hing Man Chan

11.C: Food Frequency Questionnaire

11.C.1: Methods

An adapted version of the traditional food frequency questionnaire (FFQ) that was used in the survey done by Receveur et al. (1996) at CINE was administered to a random sample of 10% of the households in Deh Gah Got'ie First Nation. I picked names from the community phone book and asked these people to participate in the study. When a person was not at home or refused to participate, a person from the neighbouring household was approached and requested to participation in the study. Individuals were asked to report on the frequency of traditional food consumption by season over the previous year. FFQs have been found to be a suitable method for recording traditional food consumption in Aboriginal populations (Ritenbaugh, et al. 1995; Wein & Freeman, 1995).

11.C.2: Results and Discussion

A total of 16 people were interviewed during the winter season, including 7 females and 9 men (table 8.1). At the times of the interviews many people were away from their homes either working or out fishing. Also many people who were asked to participate in an interview refused to be

interviewed. The combination of the two resulted in a low participation rate, much lower than the anticipated 10% of households. A local community member was hired to set up interviews with individuals as well as interpret and translate during the interviews when needed.

Table 11.1

Number of respondents for FFQ: Fort Providence, Winter 2004

	% (N)
Female	43.8 (7)
Male	56.3 (9)

Woodland caribou was reported eaten at least once over the past 3 months by 13 (81%) people. The most common body part of the caribou eaten was the mean cooked. The mean frequency of consumption over the previous 3 months was 2.38 (standard deviation of 2.247) times per week. Barren-ground caribou was consumed much less than woodland caribou. Only 3 (19%) people reported eating woodland caribou and the mean frequency per week over the previous 3 months reported was 0.44 (std. deviation of 0.964). Again the meat from the caribou was the most common part eaten however more people reported eating the meat dried, with fewer reported eating the meat cooked most likely due to the season the interviews were conducted. Of all of the traditional food, moose was the animal that was consumed the most often. 94% of the people reported

eating moose during the recall period. The mean frequency for cooked moose meat was 2.56 times per week. Dried moose meat and moose ribs (1.75 times/week for both) were the next most frequently consumed part of the animal. Of all of the smaller mammals, rabbits were the ones that were consumed the most frequently, 13 people (81%) reported consuming rabbit with a reported mean frequency of 1.8 (standard deviation of 1.320). Beaver, muskrat, lynx and porcupine were consumed by fewer people. Beaver was eaten by 44% of people. The highest consumption was 2 times a week over the 3 month period. Muskrat was reported eaten by 4 people (25%) but only one time during a week. 5 people reported eating lynx meat once over the reported time period. Only 1 person (6%) reported eating porcupine once over the reported month period.

Table 11.2

Age of respondents for FFQ: Fort Providence, Winter 2004

Age	% (N)
20-40	25 (4)
41-60	50 (8)
61+	25 (4)
Total	100(16)

All but 2 of the 16 people (88%) interviewed reported eating whitefish. The flesh cooked was the most common way whitefish was consumed (mean

2.06, standard deviation of 1.73) but all forms and body parts were frequently eaten. Half of the people (50%) reported eating trout over the recall period. Loche (62.5%), northern (81.25%), connie (81%) and grayling (37%) were the next most frequently species of fish consumed.

When asked to recall the frequency of consuming bird species during the recall period, respondents stated that they have consumed some but not in the amounts that they would in the spring and summer. 88% people reported consuming spruce hen, and for those who reported eating it, the majority reported eating the meat cooked. Prairie chicken was eaten to a lesser extent, 50% people reported eating it over the previous 3 months. Ptarmigan was consumed by 56% or respondents. Only 2 people reported eating black ducks over the previous 3 months. Those who reported eating Canada goose (31%), were able to do so because they had preserved some from the spring hunt in their freezer. Only one person reported eating snow goose, over the previous 3 month period.

Table 11.3

Frequency (times/week over the past 3 months) of traditional food species eaten in Fort Providence, Winter 2004

		N	Minimum	Maximum	Mean	Std. Deviation
Woodland	meat-cooked	16	0	7	2.38	2.247
	meat-smoked	16	0	7	1.81	2.316
	Ribs	16	0	3	1.31	1.014
	Head	16	0	3	1.00	1.095
	Heart	16	0	3	1.06	0.998
	Tongue	16	0	3	0.88	0.885
	Liver	16	0	3	0.94	1.063
	Blood	16	0	3	0.88	1.147
	stomach	16	0	3	1.06	1.063
	stomach contents	16	0	3	1.06	1.063
	kidney	16	0	3	0.81	0.911
	bone-marrow	16	0	3	1.06	0.998
	bone-soup	16	0	4	1.38	1.258
	fat	16	0	3	1.19	1.047
	brain	16	0	3	0.44	1.031
Barren-ground	meat-cooked	16	0	3	0.44	0.964
	meat-smoked	16	0	7	0.69	1.815
	ribs	16	0	2	0.38	0.806
	head	16	0	2	0.25	0.683

	heart	16	0	2	0.31	0.704
	tongue	16	0	2	0.31	0.704
	liver	16	0	2	0.13	0.500
	blood	16	0	2	0.13	0.500
	stomach	16	0	2	0.13	0.500
	stomach contents	16	0	2	0.13	0.500
	kidney	16	0	2	0.13	0.500
	bone-marrow	16	0	4	0.38	1.025
	bone-soup	16	0	3	0.50	1.095
	fat	16	0	3	0.56	1.209
	brain	16	0	0	0.00	0.000
Moose	meat-cooked	16	0	4	2.56	1.094
	meat-smoked	16	0	4	1.75	1.125
	ribs	16	0	4	1.75	1.065
	head	16	0	3	0.88	0.719
	tongue	16	0	3	0.88	0.719
	heart	16	0	3	1.06	0.772
	liver	16	0	3	0.94	0.680
	kidney	14	0	2	0.79	0.699
	blood	16	0	3	0.94	0.929
	bone-marrow	16	0	3	1.38	0.885
	bone-soup	16	0	3	1.88	0.957
	fat	16	0	4	2.00	1.265
	brain	16	0	0	0.00	0.000
Rabbit	meat-	15	0	4	1.80	1.320

	cooked					
	meat-smoked	15	0	0	0.00	0.000
	head	15	0	4	1.73	1.387
	liver	15	0	4	1.53	1.506
	blood	15	0	4	1.47	1.552
	brain	15	0	4	1.47	1.552
	kidney	13	0	1	0.23	0.439
Beaver	meat-cooked	16	0	2	0.50	0.632
	meat-smoked	16	0	1	0.06	0.250
	tail & feet	16	0	2	0.44	0.629
	liver	16	0	1	0.06	0.250
	blood	16	0	2	0.25	0.577
	brain	16	0	2	0.13	0.500
	kidney	1	1	1	1.00	.
Muskrat	meat-cooked	16	0	2	0.31	0.602
	meat-smoked	16	0	1	0.13	0.342
	tail	16	0	1	0.19	0.403
	liver	16	0	0	0.00	0.000
	blood	16	0	1	0.13	0.342
	brain	16	0	0	0.00	0.000
Lynx	meat-cooked	16	0	1	0.31	0.479
	meat-smoked	16	0	1	0.06	0.250
	head	16	0	0	0.00	0.000

	liver	16	0	0	0.00	0.000
	blood	16	0	0	0.00	0.000
	brain	16	0	0	0.00	0.000
Porcupine	meat-cooked	16	0	1	0.06	0.250
	meat-smoked	16	0	0	0.00	0.000
	liver	16	0	0	0.00	0.000
	blood	16	0	0	0.00	0.000
	brain	16	0	0	0.00	0.000
Spruce Hen	meat-cooked	16	0	5	1.56	1.504
	meat-dried	16	0	0	0.00	0.000
	gizzard	16	0	3	0.44	0.814
	kidney	16	0	3	0.19	0.750
	heart	16	0	5	1.06	1.731
	liver	16	0	1	0.13	0.342
	eggs	16	0	0	0.00	0.000
Prairie Chicken	meat-cooked	16	0	3	1.06	1.237
	meat-dried	16	0	0	0.00	0.000
	gizzard	16	0	3	0.94	1.237
	kidney	16	0	3	0.19	0.750
	heart	16	0	3	0.88	1.258
Ptarmigan	meat-cooked	16	0	3	1.00	1.155
	meat-dried	16	0	0	0.00	0.000
	gizzard	16	0	3	0.25	0.775
	kidney	16	0	3	0.25	0.775
	heart	16	0	3	0.63	1.204

	liver	16	0	3	0.25	0.775
	eggs	16	0	3	0.19	0.750
Black Ducks	meat-cooked	16	0	1	0.13	0.342
	meat-dried	16	0	0	0.00	0.000
	gizzard	16	0	1	0.06	0.250
	kidney	16	0	1	0.06	0.250
	heart	16	0	1	0.06	0.250
	liver	16	0	1	0.06	0.250
	eggs	16	0	0	0.00	0.000
Mallards	meat-cooked	16	0	0	0.00	0.000
	meat-dried	16	0	0	0.00	0.000
	gizzard	16	0	0	0.00	0.000
	kidney	16	0	0	0.00	0.000
	heart	16	0	0	0.00	0.000
	liver	16	0	0	0.00	0.000
	eggs	16	0	0	0.00	0.000
Fish Duck	meat-cooked	16	0	0	0.00	0.000
	meat-dried	16	0	0	0.00	0.000
	gizzard	16	0	0	0.00	0.000
	kidney	16	0	0	0.00	0.000
	heart	16	0	0	0.00	0.000
	liver	16	0	0	0.00	0.000
	eggs	16	0	0	0.00	0.000
Squaw Duck	meat-cooked	16	0	0	0.00	0.000
	meat-dried	16	0	0	0.00	0.000
	gizzard	16	0	0	0.00	0.000

	kidney	16	0	0	0.00	0.000
	heart	16	0	0	0.00	0.000
	liver	16	0	0	0.00	0.000
	eggs	16	0	0	0.00	0.000
Widgeon	meat-cooked	16	0	0	0.00	0.000
	meat-dried	16	0	0	0.00	0.000
	gizzard	16	0	0	0.00	0.000
	kidney	16	0	0	0.00	0.000
	heart	16	0	0	0.00	0.000
	liver	16	0	0	0.00	0.000
	eggs	16	0	0	0.00	0.000
Canvasback	meat-cooked	16	0	0	0.00	0.000
	meat-dried	16	0	0	0.00	0.000
	gizzard	16	0	0	0.00	0.000
	kidney	16	0	0	0.00	0.000
	heart	16	0	0	0.00	0.000
	liver	16	0	0	0.00	0.000
	eggs	16	0	0	0.00	0.000
Canada Goose	meat-cooked	16	0	1	0.31	0.479
	meat-dried	16	0	0	0.00	0.000
	gizzard	16	0	1	0.19	0.403
	kidney	16	0	1	0.06	0.250
	heart	16	0	1	0.06	0.250
	liver	16	0	1	0.06	0.250
	eggs	16	0	1	0.13	0.342
Snow Goose	meat-cooked	16	0	1	0.06	0.250

	meat-dried	16	0	0	0.00	0.000
	gizzard	16	0	1	0.06	0.250
	kidney	16	0	1	0.06	0.250
	heart	16	0	1	0.06	0.250
	liver	16	0	1	0.06	0.250
	eggs	16	0	0	0.00	0.000
Pintail	meat-cooked	16	0	0	0.00	0.000
	meat-dried	16	0	0	0.00	0.000
	gizzard	16	0	0	0.00	0.000
	kidney	16	0	0	0.00	0.000
	heart	16	0	0	0.00	0.000
	liver	16	0	0	0.00	0.000
	eggs	16	0	0	0.00	0.000
Swan	meat-cooked	16	0	0	0.00	0.000
	meat-dried	16	0	0	0.00	0.000
	gizzard	16	0	0	0.00	0.000
	kidney	16	0	0	0.00	0.000
	heart	16	0	0	0.00	0.000
	liver	16	0	0	0.00	0.000
	eggs	16	0	0	0.00	0.000
Whitefish	flesh-cooked	16	0	7	2.06	1.731
	flesh-dried	16	0	3	1.25	1.483
	head	16	0	7	1.69	1.922
	eggs	16	0	7	1.31	1.852
	fish-pipe	16	0	7	1.94	1.692
Trout	flesh-cooked	16	0	1	0.50	0.516

	flesh-smoked	16	0	1	0.13	0.342
	head	16	0	1	0.19	0.403
	eggs	16	0	0	0.00	0.000
	fish-pipe	16	0	1	0.06	0.250
Loche	flesh-cooked	16	0	3	1.00	0.966
	flesh-smoked	16	0	2	0.25	0.683
	head	16	0	2	0.19	0.544
	Eggs	16	0	2	0.50	0.816
	fish-pipe	16	0	1	0.06	0.250
	Liver	16	0	3	0.44	0.814
Northern Pike	flesh-cooked	16	0	3	1.44	1.031
	flesh-smoked	16	0	3	0.69	1.138
	Head	16	0	3	0.94	1.124
	Eggs	16	0	2	0.63	0.885
	fish-pipe	16	0	3	1.25	1.125
	Liver	16	0	3	0.31	0.793
Grayling	flesh-cooked	16	0	2	0.50	0.730
	flesh-smoked	16	0	2	0.19	0.544
	Head	16	0	2	0.19	0.544
	Eggs	16	0	2	0.13	0.500
	fish-pipe	16	0	2	0.19	0.544
Walleye	flesh-cooked	16	0	4	0.88	1.204

	flesh-smoked	16	0	3	0.31	0.873
	Head	16	0	2	0.19	0.544
	Eggs	16	0	2	0.13	0.500
	fish-pipe	16	0	2	0.13	0.500
Sucker	flesh-cooked					
	flesh-smoked					
	Head					
	Eggs					
	fish-pipe					

11.C.3: Questionnaire

Respondent's gender _____ Household number_____

For women only, please ask (and circle) whether:
Pregnant: Yes No Breastfeeding an infant: Yes No

Respondent's ID # _____

Self-identification: Dene____Métis___ Other___

Age-group: 20-40_____ 41-60____ Over 60_____

Interviewer's name _____ Date _____
(day/month/year)

Interviewer please read to respondent:
This questionnaire concerns traditional food: traditional food is food that comes from the local land and environment (animals, fish, birds, wild plants...)
For last _____(season), that is for the months of_____, please, recall as exactly as you can, how many days a week, you personally ate the following food:

McGill, Macdonald Campus
21,111 Lakeshore
Ste-Anne-de-Bellevue, Qc, H9X3V9

9/94

ID# _____ Eaten how many days a week1
6-7 (7); 3-5 (5); 1-2 (2); <1 (1); Never (0)
FISH: In the last _____months, did you eat any:
{Q1} 1. Whitefish: Yes No
Flesh
cooked (fresh or frozen) {Q1A}___
smoked/dried {Q1B}___
Organs/parts
head {Q1C}___
eggs {Q1D}___
fish-pipe (esophagus) {Q1E}___
other parts/organs (names)
{Q1G}_____ {Q1H}____
{Q1I}_____ {Q1J}____

{Q2} 2. Inconnu (conni): Yes No
Flesh
cooked (fresh or frozen) {Q2A}____
smoked/dried {Q2B}____
Organs/parts
head {Q2C}____
eggs {Q2D}____
fish-pipe (esophagus) {Q2E}____
other parts/organs (names)
{Q2G}_____ {Q2H}____
{Q2I}_____ {Q2J}____

{Q3} 3. Cisco (herring): Yes No
Flesh
cooked (fresh or frozen) {Q3A}____
smoked/dried {Q3B}____
Organs/parts
head {Q3C}____
eggs {Q3D}____
fish-pipe (esophagus) {Q3E}____
other parts/organs (names)
{Q3G}_____ {Q3H}____
{Q3I}_____ {Q3J}_____

{Q4} 4. Trout: Yes No
Flesh
cooked (fresh or frozen) {Q4A}____
smoked/dried {Q4B}____
Organs/parts
head {Q4C}____
eggs {Q4D}____
fish-pipe (esophagus) {Q4E}____

other parts/organs (names)
{Q4G}_____ {Q4H}____
{Q4I}_____ {Q4J}_____
1 6-7=every day or so; 3-5=every other day; 1-2=maybe once a week; <1=less than once a week; Never=not at all
Note: In 3 months 1= <12 days; 2=12-24 days In 1 month 1= < 4 days; 2= 4-8 days
ID# _____ Eaten how many days a week1
6-7 (7); 3-5 (5); 1-2 (2); <1 (1); Never (0)
{Q5} 5. Loche (burbot): Yes No
Flesh
cooked (fresh or frozen) {Q5A}___
smoked/dried {Q5B}___
Organs/parts
head {Q5C}___
eggs {Q5D}___
other parts/organs (names)
{Q5G}_____ {Q5H}___
{Q5I}_____ {Q5J}___
{Q6} 6. Northern Pike (jackfish): Yes No
Flesh
cooked (fresh or frozen) {Q6A}___
smoked/dried {Q6B}___
Organs/parts
head {Q6C}___
eggs {Q6D}___
fish-pipe (esophagus) {Q6E}___
other parts/organs (names)
{Q6G}_____ {Q6H}___
{Q6I}_____ {Q6I}____

{Q7} 7. Grayling (bluefish): Yes No
Flesh
cooked (fresh or frozen) {Q7A}___
smoked/dried {Q7B}___
Organs/parts
head {Q7C}___
eggs {Q7D}___
fish-pipe (esophagus) {Q7E}___
other parts/organs (names)
{Q7G}_____ {Q7H}___
{Q7I}_____ {Q7J}___

{Q8} 8. Walleye (pickerel): Yes No
Flesh
cooked (fresh or frozen) {Q8A}___
smoked/dried {Q8B}___

Organs/parts
head {Q8C}___
eggs {Q8D}___
fish-pipe (esophagus) {Q8E}___
other parts/organs(names)
{Q8G}_____ {Q8H}___
{Q8I}_____ {Q8J}____

1 6-7=every day or so; 3-5=every other day; 1-2=maybe once a week; <1=now and then; Never=not at all.
Note: In 3 months 1= <12 days; 2=12-24 days
In 1 month 1= < 4 days; 2= 4-8 days

ID# _____ Eaten how many days a week1
6-7 (7); 3-5 (5); 1-2 (2); <1 (1); Never (0)

{Q9} 9. Longnose Sucker: Yes No
Flesh
cooked (fresh or frozen) {Q9A}___
smoked/dried {Q9B}___
Organs/parts
head {Q9C}___
eggs {Q9D}___
fish-pipe (esophagus) {Q9E}___
other parts/organs (names)
{Q9G}_____ {Q9H}___
{Q9I}_____ {Q9J} ___

10. Other fish (name/part/preparation)
{Q10A1}_____ {Q10A2}____
{Q10B1}_____ {Q10B2}____
{Q10C1}_____ {Q10C2}____

1 6-7=every day or so; 3-5=every other day; 1-2=maybe once a week; <1=now and then; Never=not at all.
Note: In 3 months 1= <12 days; 2=12-24 days In 1 month 1= < 4 days; 2= 4-8 days

ID# _____ Eaten how many days a week1
6-7 (7); 3-5 (5); 1-2 (2); <1 (1); Never (0)

LAND ANIMALS

{Q11} 11. Caribou (woodland):	Yes	No
Meat		
cooked (fresh or frozen)		{Q11A}____
smoked/dried		{Q11B}____
Organs/parts		
ribs		{Q11C}____
head		{Q11D}____
heart		{Q11E}____
tongue		{Q11F}____
liver		{Q11G}____
blood		{Q11H}____
stomach		{Q11I}____
kidney		{Q11J}____
bone:		
marrow	{Q11K}____	
soup or broth with bone	{Q11L}____	
other (specify)	{Q11M}___	{Q11N}_____
fat (fresh, dried or stored)		{Q11O}____
brain		{Q11U}

other parts/organs (names)
{Q11Q}_____ {Q11R}____
{Q11S}_____ {Q11T}____

{Q12} 12. Caribou (barrenland):	Yes	No
Meat		
cooked (fresh or frozen)		{Q12A}____
smoked/dried		{Q12B}____
Organs/parts		
ribs		{Q12C}____
head		{Q12D}____
heart		{Q12E}____
tongue		{Q12F}____
liver		{Q12G}____
blood		{Q12H}____
stomach		{Q12I}____
kidney		{Q12J}____
bone:		
marrow	{Q12K}____	
soup or broth with bone	{Q12L}____	
other (specify)	{Q12M}____	{Q12N}_____
fat (fresh, dried or stored)		{Q12O}____

other parts/organs (names)
brain {Q12U}

{Q12Q}_____ {Q12R} ____
{Q12S}_____ {Q12T}____
1 6-7=every day or so; 3-5=every other day; 1-2=maybe once a week; <1=now and then; Never=not at all.
Note: In 3 months 1= <12 days; 2=12-24 days
In 1 month 1= < 4 days; 2= 4-8 days
ID# _____ Eaten how many days a week1
6-7 (7); 3-5 (5); 1-2 (2); <1 (1); Never (0)

{Q13} 13. Moose:	Yes	No
Meat		
cooked (fresh or frozen)		{Q13A}_____
smoked/dried		{Q13B}_____
Organs/parts		
ribs		{Q13C}_____
head		{Q13D}_____
tongue		{Q13E}_____
heart		{Q13F}_____
liver		{Q13G}_____
kidney		{Q13H}_____
blood		{Q13I}_____
bone:		
marrow	{Q13J}_____	
soup or broth with bone	{Q13K}_____	
other (specify)	{Q13L}_____	{Q13M}_____
fat (fresh, dried or stored)		{Q13N}_____
brain		{Q13U}

other parts/organs (names)
{Q13P}_____ {Q13Q}_____
{Q13R}_____ {Q13S}_____

{Q14} 14. Rabbit:	Yes	No
Meat		
cooked (fresh or frozen)		{Q14A}_____
smoked/dried		{Q14B}_____
Organs/parts		
head		{Q14C}_____
liver		{Q14D}_____
blood		{Q14E}_____
brain		{Q14F}_____

other parts/organs (names)
{Q14H}_____ {Q14I}_____
{Q14J}_____ {Q14K}_____

{Q15} 15. Beaver:	Yes	No
Meat		
cooked (fresh or frozen)		{Q15A}_____
smoked/dried		{Q15B}_____
Organs/parts		
tail & feet		{Q15C}_____

liver {Q15D}_____
blood {Q15E}_____
brain {Q15F}_____
other parts/organs (names)
{Q15G}_____ {Q15I}_____
{Q15J}_____ {Q15K}_____
1 6-7=every day or so; 3-5=every other day; 1-2=maybe once a week; <1=now and then; Never=not at all.

Note: In 3 months 1= <12 days; 2=12-24 days; In 1 month 1= < 4 days; 2= 4-8 days

ID# _____ Eaten how many days a week1
6-7 (7); 3-5 (5); 1-2 (2); <1 (1); Never (0)

{Q15} 16. Muskrat: Yes No

Meat
cooked (fresh or frozen) {Q16A}_____
smoked/dried {Q16B}_____
Organs/parts
tail {Q16C}_____
liver {Q16D}_____
blood {Q16E}_____
brain {Q16F}_____
other parts/organs (names)
{Q16H}_____ {Q16I}_____
{Q16J}_____ {Q16J}_____

{Q17} 17. Lynx: Yes No

Meat
cooked (fresh or frozen) {Q17A}_____
smoked/dried {Q17B}_____
Organs/parts
head {Q17C}_____
liver {Q17D}_____
blood {Q17E}_____
brain {Q17F}_____
other parts/organs (names)
{Q17H}_____ {Q17I}_____
{Q17J}_____ {Q17K}_____

{Q18} 18. Porcupine: Yes No

Meat
cooked (fresh or frozen) {Q18A}_____
smoked/dried {Q18B}_____
Organs/parts
liver {Q18C}_____
blood {Q18D}_____
brain {Q18E}_____
other parts/organs (names)
{Q18G}_____ {Q18H}_____
{Q18I}_____ {Q18J}_____

{Q19} 19. Dall sheep: Yes No

Meat
cooked (fresh or frozen) {Q19A}_____
smoked/dried {Q19B}_____
Organs/parts
liver {Q19C}_____
blood {Q19D}_____
brain {Q19E}_____

other parts/organs (names)
{Q19G}_____ {Q19H}_____
{Q19I}_____ {Q19J}_____
1 6-7=every day or so; 3-5=every other day; 1-2=maybe once a week; <1=now and then; Never=not at all.
Note: In 3 months 1= <12 days; 2=12-24 days; In 1 month 1= < 4 days; 2= 4-8 days
ID# _____ Eaten how many days a week1
6-7 (7); 3-5 (5); 1-2 (2); <1 (1); Never (0)

{Q20} 20. Bear:	Yes	No
Meat		
cooked (fresh or frozen)		{Q20A}_____
smoked/dried		{Q20B}_____
Organs/parts		
fat		{Q20C}_____
blood		{Q20D}_____
brain		{Q20E}_____
other parts/organs (names)_____		{Q20H}_____{Q20G}
{Q20I}_____		{Q20J}_____

21. Other land animal (name/part/preparation)
{Q21A1}_____ {Q21A2}_____
{Q21B1}_____ {Q21B2}_____
{Q21C1}_____ {Q21C2}_____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

BIRDS

{Q22} 22. Spruce hen:	Yes	No
Meat		
cooked (fresh or frozen)		{Q22A}_____
smoked/dried		{Q22B}_____
Organs/parts		
gizzard		{Q22C}_____
kidney		{Q22D}_____
heart		{Q22E}_____
liver		{Q22F}_____
eggs		{Q22G}_____

other parts/organs (names)
{Q22I}_____ {Q22J}_____
{Q22K}_____ {Q22L}_____

{Q23} 23. Prairie chicken:	Yes	No
Meat		
cooked (fresh or frozen)		{Q23A}_____

smoked/dried {Q23B}_____

Organs/parts

gizzard {Q23C}_____

kidney {Q23D}_____

heart {Q23E}_____

liver {Q23F}_____

eggs {Q23G}_____

other parts/organs (names)

{Q23I}_____ {Q23J}_____

{Q23K}_____ {Q23L}_____

ID# _____ Eaten how many days a week1
6-7 (7); 3-5 (5); 1-2 (2); <1 (1); Never (0)

{Q24} 24. Ptarmigan: Yes No
Meat
cooked (fresh or frozen) {Q24A}_____
smoked/dried {Q24B}_____
Organs/parts
gizzard {Q24C}_____
kidney {Q24D}_____
heart {Q24E}_____
liver {Q24F}_____
other parts/organs (names)
{Q24H}_____ {Q24I}_____
{Q24J}_____ {Q24K}_____

{Q25} 25. Black ducks/Scoter: Yes No
Meat
cooked (fresh or frozen) {Q25A}_____
smoked/dried {Q25B}_____
Organs/parts
gizzard {Q25C}_____
kidney {Q25D}_____
heart {Q25E}_____
liver {Q25G}_____
eggs
other parts/organs (names)
{Q25I}_____ {Q25J}_____
{Q25K}_____ {Q25L}_____

{Q26} 26. Mallards: Yes No
Meat
cooked (fresh or frozen) {Q26A}_____
smoked/dried {Q26B}_____
Organs/parts
gizzard {Q26C}_____
kidney {Q26D}_____
heart {Q26E}_____
liver {Q26F}_____
eggs {Q26G}_____
other parts/organs (names)
{Q26I}_____ {Q26J}_____
{Q26K}_____ {Q26L}_____

1 6-7=every day or so; 3-5=every other day; 1-2=maybe once a week; <1=now and then; Never=not at all.
Note: In 3 months 1= <12 days; 2=12-24 days
In 1 month 1= < 4 days; 2= 4-8 days

ID# _____ Eaten how many days a week1
6-7 (7); 3-5 (5); 1-2 (2); <1 (1); Never (0)

{Q27} 27: "Fish" ducks:	Yes	No
Meat		
cooked (fresh or frozen)		{Q27A}_____
smoked/dried		{Q27B}_____
Organs/parts		
gizzard		{Q27C}_____
kidney		{Q27D}_____
heart		{Q27E}_____
liver		{Q27F}_____
eggs		{Q27G}_____
other parts/organs (names)		
{Q27I}_____		{Q27J}_____
{Q27K}_____		{Q27L}_____

{Q28} 28. Oldsquaw (squaw duck):	Yes	No
Meat		
cooked (fresh or frozen)		{Q28A}_____
smoked/dried		{Q28B}_____
Organs/parts		
gizzard		{Q28C}_____
kidney		{Q28D}_____
heart		{Q28E}_____
liver		{Q28F}_____
eggs		{Q28G}_____
other parts/organs (names)		
{Q28I}_____		{Q28J}_____
{Q28K}_____		{Q28L}_____

{Q29} 29. Wigeon (whistling duck):	Yes	No
Meat		
cooked (fresh or frozen)		{Q29A}_____
smoked/dried		{Q29B}_____
Organs/parts		
gizzard		{Q29C}_____
kidney		{Q29D}_____
heart		{Q29E}_____

liver {Q29F}_____
eggs {Q29G}_____
other parts/organs (names)
{Q29I}_____ {Q29J}_____
{Q29K}_____ {Q29L}_____

1 6-7=every day or so; 3-5=every other day; 1-2=maybe once a week; <1=now and then; Never=not at all.
Note: In 3 months 1= <12 days; 2=12-24 days
In 1 month 1= < 4 days; 2= 4-8 days

ID# _____ Eaten how many days a week1
6-7 (7); 3-5 (5); 1-2 (2); <1 (1); Never (0)

{Q30} 30. Canvasback: Yes No
Meat
cooked (fresh or frozen) {Q30A}_____
smoked/dried {Q30B}_____
Organs/parts
gizzard {Q30C}_____
kidney {Q30D}_____
heart {Q30E}_____
liver {Q30F}_____
eggs {Q30G}_____
other parts/organs (names)
{Q30I}_____ {Q30J}_____
{Q30K}_____ {Q30L}_____

{Q31} 31. Canada goose: Yes No
Meat
cooked (fresh or frozen) {Q31A}_____
smoked/dried {Q31B}_____
Organs/parts
gizzard {Q31C}_____
kidney {Q31D}_____
heart {Q31E}_____
liver {Q31F}_____
fat {Q31G}_____
eggs {Q31H}_____
other parts/organs (names)
{Q31J}_____ {Q31K}_____
{Q31L}_____ {Q31M}_____

{Q32} 32. Snow goose (wavies): Yes No

Meat
cooked (fresh or frozen) {Q32A}_____
smoked/dried {Q32B}_____
Organs/parts
gizzard {Q32C}_____
kidney {Q32D}_____
heart {Q32E}_____
liver {Q32F}_____
eggs {Q32G}_____
other parts/organs (names)
{Q32I}_____ {Q32J}_____
{Q32K}_____ {Q32L}_____

1 6-7=every day or so; 3-5=every other day; 1-2=maybe once a week; <1=now and then; Never=not at all.
Note: In 3 months 1= <12 days; 2=12-24 days
In 1 month 1= < 4 days; 2= 4-8 days
ID# _____ Eaten how many days a week1
6-7 (7); 3-5 (5); 1-2 (2); <1 (1); Never (0)

{Q33} 33. Pintail: Yes No
Meat
cooked (fresh or frozen) {Q33A}_____
smoked/dried {Q33B}_____
Organs/parts
gizzard {Q33C}_____
kidney {Q33D}_____
heart {Q33E}_____
liver {Q33F}_____
eggs {Q33G}_____
other parts/organs (names)
{Q33I}_____ {Q33J}_____
{Q33K}_____ {Q33L}_____

{Q34} 34. Swan: Yes No
Meat
cooked (fresh or frozen) {Q34A}_____
smoked/dried {Q34B}_____
Organs/parts
gizzard {Q34C}_____
kidney {Q34D}_____
heart {Q34E}_____
liver {Q34F}_____
eggs {Q34G}_____

other parts/organs (names)
{Q34I}_____ {Q34J}_____
{Q34K}_____ {Q34L}_____

35. Other birds (name/part/preparation)
{Q35A1}_____ {Q35A2}_____
{Q35B1}_____ {Q35B2}_____
{Q35C1}_____ {Q35C2}_____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

1 6-7=every day or so; 3-5=every other day; 1-2=maybe once a week; <1=now and then; Never=not at all.
Note: In 3 months 1= <12 days; 2=12-24 days
In 1 month 1= < 4 days; 2= 4-8 days

ID# _____ Eaten how many days a week1
6-7 (7); 3-5 (5); 1-2 (2); <1 (1); Never (0)

PLANT
(Please note whether the plant was eaten fresh or preserved (frozen, jamed or bottled)
How often Preparation

36. Labrador tea	Yes	No	{Q36}_____
37. Low (grey) blueberries	Yes	No	{Q37}_____
38. High (black) blueberries	Yes	No	{Q38}_____
39. Cranberries	Yes	No	{Q39}_____
40. Gooseberries (green)	Yes	No	{Q40}_____
41. Gooseberries (purple)	Yes	No	{Q41}_____
42. Blackberries	Yes	No	{Q42}_____
43. Wild raspberries	Yes	No	{Q43}_____
44. Wild strawberries	Yes	No	{Q44}_____
45. Cloud berries/knuckleberries	Yes	No	{Q45}_____
46. Red currants	Yes	No	{Q46}_____
47. Black currants	Yes	No	{Q47}_____
48. Saskatoon berries	Yes	No	{Q48}_____
49. Rosehips	Yes	No	{Q49}_____

50. Wild peppermint	Yes	No	{Q50}_____
51. Mushrooms (get local names)	Yes	No	{Q51}_____
52. Wild greens (get local names)	Yes	No	{Q52}_____
53. Wild onions	Yes	No	{Q53}_____
54. Wild rhubarb	Yes	No	{Q54}_____

55. Other plant food (names)

{Q55A1}_____ {Q55A2}_____
{Q55B1}_____ {Q55B2}_____
{Q55C1}_____ {Q55C2}_____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

[Interviewer, make sure all the pages have been completed]

1 6-7=every day or so; 3-5=every other day; 1-2=maybe once a week; <1=now and then; Never=not at all.
Note: In 3 months 1= <12 days; 2=12-24 days; In 1 month 1= < 4 days; 2= 4-8 day

11.D : Reported Harvest

Table 11.4

Harvest data reported for birds, Deh Gah Got'ie, Winter 2004

Family	Hhslds	TF Consumers	Squaw Duck	Canvasback Duck	Canada Goose	Pintail	Spruce Grouse	Black Duck	Mallard Duck	Swan	Snow Geese
1	10	23		20	250	20	40	20	60		
2	3	32									
3	1	4									
4	4	21			20	10	10		8	1	
5	5	26			50	30	9	15	5	15	
6	8	33		10	51		8	32	27		
7	9	35			80	31				6	
8	9	25		48			80	95	100		
9	5	12	50	15	60	20	10	20	20	5	75
10	3	5			20	15	6		12	4	
11	4	8			15		10	6	10		
12	3	28		20	25		30	30	40	1	
13	1	7		10	45	12	10	10	20		
14	1	5			20		12	40	20	3	

15	1	2		10	15	20	10	20	10		
16	1	3		10		10	10	10	10		
Totals	68	269	50	143	651	168	550	298	342	35	2000
						350			500		
Edible Weight per bird (kg)			0.60	0.80	2.10	0.70	0.30	0.80	0.90		1.60
Harvest Weight (kg)			30.00	114.40	1367.10	245.00	165.00	238.40	450.00	0.00	3200.00
Harvest Weight (g/per./yr)			111.52	425.28	5082.16	910.78	613.38	886.25	1672.86	0.00	11895.91
Harvest Weight (g/per./day)			0.31	1.17	13.92	2.50	1.68	2.43	4.58	0.00	32.59

Table 11.5 *Harvest data reported for mammals, Deh Gah Got'ie, Winter 2004*

Harvest Weight (g/person/yr)			11486.99	33368.03	50304.83	0.00	1672.86	515.24	2143.87
Family	Hshlds	TF Consumers	Woodland	Barrenground	Moose	Lynx	Rabbit	Muskrat	Beaver
Harvest Weight (g/person/day)			3147	9142	13782	0.00	458	141	587
1	10	23	12			12	30	81	12
2	3	32	10		37		42		3
3	1	4							
4	4	21					15		3
5	5	26	7		2	18	20		4
6	8	33	2		3	4	37		
7	9	35			2	52		14	
8	9	25	6			10	42	60	23
9	5	12	7		12		10	1	
10	3	5			5	5			
11	4	8	4				10		
12	3	28			2		30	5	8
13	1	7			1		10		
14	1	5	2				30	20	5
15	1	2			4		10	50	15
16	1	3							
Community Hunt				187			214		
Totals	68	269	50	187	68	101	500	231	73
Edible Weight (kg) per animal			61.80	48.00	199.00		0.90	0.60	7.90
Harvest Weight (kg)			3090.00	8976.00	13532.00	0.00	450.00	138.60	576.70

Table 11.6

Harvest data reported for fish, Deh Gah Got'ie, Winter 2004

Family	Hshlds	TF Consumers	Northern	Grayling	Walleye	Trout	L. Suckers	Whitefish	Connie	Loche
1	10	23	50	20	25		300	300	15	
2	3	32								
3	1	4								
4	4	21	300	20	300		400	1000	10	20
5	5	26	10	10	20	10	50	80	5	5
6	8	33	40	16	28	8	30	800	40	22
7	9	35								50
8	9	25	100	50	80	5	800	1050	40	
9	5	12	20	10	40		30	120		
10	3	5								
11	4	8	20	20	50	10	30	40	5	
12	3	28	50	50			100	3000	20	
13	1	7	90	30	20		150			10
14	1	5	50	30	40		20	130	80	
15	1	2	60	20	10		20	200	5	
16	1	3								

Totals	68	269	790	276	613	33	1930	6720	220	107
Edible Weight (kg)			1.60	0.90	0.70	1.70	0.90	0.80	2.60	1.00
Harvest Weight (kg)			1264.00	248.40	429.10	56.10	1737.00	5376.00	572.00	107.00
Harvest Weight (g/person/yr)			4698.88	923.42	1595.17	208.55	6457.25	19985.13	2126.39	397.77
Harvest Weight (g/person/day)			12.87	2.53	4.37	0.57	17.69	54.75	5.83	1.09