



6 Contact with nature

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1.0 Introduction

Historically, Arctic societies have fed, sheltered, and clothed themselves and maintained their well-being, in large part through a close relationship and interdependence with the natural environment. Arctic human-environment interactions fulfill the physical needs for food and shelter and also ground humans spiritually in their cultural worlds. Generally speaking, Arctic societies have undergone tremendous change in the last century, due mostly to the forces of globalization, resource development, urbanization, and modernity. These changes, in turn, have affected and transformed Arctic human-environment interactions by fragmenting and exploiting lands and ecosystems, redefining rural ways of life through structures such as settlement policies and working-class obligations, and replacing local ways of knowing with mass communication, information, and technology. Despite these changes, most Arctic inhabitants, to a greater or lesser degree, maintain an interrelationship with the natural world based upon their cultural legacy, continued need for food, clothing and shelter, and a strong sense of place and meaning in the Arctic environment. Contact with nature, albeit a somewhat intangible attribute of human development and therefore difficult to measure, is nonetheless central to the legacy of and contemporary state of well-being in Arctic societies.

1.1 Concept of Contact with Nature

A close connection to and need for contact with nature is not, of course, confined to the Arctic.

Human-environment interrelationships are central to global ecosystem health and human well-being. Key literature of the contemporary environmental movement in the West emphasizes the universal need for, on both physical and spiritual levels, humanity's continued contact and interdependence with the natural world (Leopold, 1948; Muir and White, 2006; Brody, 1997; Lopez, 2004). More recently, Louv (2005) has labeled our contemporary Western societies' disconnect with nature as a "nature deficit disorder," and has made this call to action: "Healing the broken bond between our young and nature is in our self-interest, not only because aesthetics or justice demand it, but also because our mental, physical, and spiritual health depend upon it." However, this broad expanse of literature is lacking in specific definitions of exactly what the contact with nature interrelationship looks like that would lead to measureable variables. We know that Arctic societies demonstrate a strong interdependence with the natural world for their identity and subsistence needs. Therefore, one logical path toward developing indicators for contact with nature would be by finding ways to measure participation in various livelihood activities. This is the path we paid special attention to and describe here in detail.

1.2 Overview of Contact with Nature in the Arctic

The *Arctic Human Development Report* (AHDR) identifies "living close to nature" as one of the three dimensions of human development that

Illustration of reindeer carved into antler bone from central Europe circa 12,000 B.C. Reproduced with permission from Rosengarten-museum, Konstanz, Germany.



Arctic residents perceive as essential to their well-being above and beyond the three United Nations Human Development Indicators. But what exactly does living close to nature or, as termed for our purposes, “contact with nature” mean as a measurable quality in a community and/or a region? The AHDR does not provide a set definition for the concept but does emphasize the important place of nature in human Arctic relations, characterizing Arctic societies as “place-based systems” that “feature human adaptations...closely tied to local environments” (AHDR 2004:241). Further, the report implies the importance to human well-being of contact with nature by saying that “a failure to stay close to nature results in a loss of roots and various forms of alienation from the natural world” (AHDR, 2004). Beyond that reference, the AHDR gives little guidance for the development of an indicator for contact with nature.

For Arctic societies, indicators of human development must be unique to the Arctic but also address the well-being of both indigenous and non-indigenous people and be appropriate to all communities and countries in the circumpolar North. For our purposes here, “indigenous” refers to those who inhabited an area prior to colonization or the establishment of state boundaries. The Arctic is home to a diversity of indigenous groups. Non-indigenous inhabitants of the Arctic are either 1) longtime residents whose ancestors settled during the

colonial process, or 2) relative newcomers from more southern climes who have either moved to the North to take a job and have stayed, or who have come as temporary residents to take advantage of high-paying jobs. The latter example pertains especially in the Russian context and the post-World War II Soviet efforts to develop the military-industrial presence across the country.

Whether northern residents are indigenous or non-indigenous, the majority participate in some or many activities in nature. Residents of urban and rural areas alike engage in outdoor activities for both utilitarian purposes, to procure wild and domestic food sources, and for recreational purposes. Although Arctic indigenous inhabitants generally depend on their natural environment for more of their food than do non-indigenous inhabitants, there is nevertheless a strong tradition across all Arctic communities to gather berries, fish, garden, and engage in other food-procuring activities such as hunting and herding.

The literature provides little guidance for indicator development in the area of contact with nature. Although community, sustainability, and conservation indicators are increasingly common, few are relevant to Arctic societies and almost none are relevant to contact with nature. There are, however, some exceptions. One is the Survey of Living Conditions in the Arctic (SLiCA), perhaps the best source for indicators with the potential to measure contact

Traditional Foods in the Arctic

From prehistoric and historic through to modern times, the procurement and slaughter of wild game and the management of domestic animals (e.g., reindeer, horses) has always been about much more than just food. In addition to basic sustenance, interaction with animals provides the basis for clothing, shelter, tools, art, language, education, calendar, status, spiritual fulfillment and, not least, the maintenance of intra- and interhousehold sociocultural relations through formal and informal codes of sharing and reciprocity (Nelson, 1969; Beach, 1981; Wenzel, 1991, 2005; Crate, 2006a; Stammers, 2005; Vitebsky, 2005; Müller-Wille, et al., 2006). In other words, interaction with animals is a key element of the social fabric of local communities throughout the Arctic.

Some people outside the Arctic may believe that hunting and herding represent dying ways of life. However, examples of consumption of wild foods and youth retention indicate otherwise. For example, in the early 1980s, ringed seal provided nearly two-thirds of the edible biomass entering the Inuit hamlet of Kangiqtugaapik, Nunavut, formerly known as Clyde River. Ringed seal figure prominently in the diet in all seasons, falling below 50% only in summer when ice is out (Wenzel, 1991). In 1984, even when sealskins had no exchange value because of the EEC ban on them, harvesting was demonstrably important to the Kangiqtugaapik economy. Since 1983, when the EEC ban began to have a strong negative effect on all forms of hunting, the total harvest of country foods has actually increased some 15% to 20% (Wenzel, 1991). On the other hand, the human population of Kangiqtugaapik has increased some 250% to 300% during the same period. Conservative estimates made with data from the recent Nunavut Wildlife Harvest Study (Priest and Usher, 2004) reveal that total harvest of the four staple species (ringed seal, caribou, narwhal, and arctic char) provided each of approximately 125 households with between 850 kg and 900 kg of edible foods in the late 1990s and early 2000s. Compared with a generation ago, the total harvest for Kangiqtugaapik is provided by relatively fewer hunters, highlighting the importance of sharing. Even though the increased harvest has not kept pace with population growth, it is difficult to argue that hunting and country food consumption are somehow disappearing. On the contrary, sharing and consumption of wild foods are seen as important components of modern Inuit identity (Wenzel, 1991, 2005).



Children fishing through cracks in the ice near Kangiqtugaapik, Nunavut, Canada.

Photo by B.C. Forbes

with nature. However, SLiCA results are limited to the Inuit in northern Canada, northern Alaska, and Greenland, and the indigenous peoples of Chukotka, Russia. Despite its geographical limits, the three SLiCA Ties to Nature tables (Tables 13, 17, and 31) appear to be relevant to the contact with nature domain and could potentially provide data (Kruse et al., 2007; Kruse et al., 2008).

Another relevant source of existing Arctic indicators is the Inuvialuit Regional Corporation's socioeconomic indicators set out in the Inuvialuit Final Agreement of 1984. The three key goals of that agreement are to 1) preserve Inuvialuit cultural identity and values; 2) enable equal and meaningful participation in Canadian society; and 3) protect and preserve Arctic wildlife, environment, and biological productivity.

The Inuvialuit socioeconomic indicators were intended to track and measure progress toward those goals. Several of those indicators have potential as indicators for the contact with nature domain and may also provide a source of data for other ASI domains. In pursuing the goal of "a diverse economy" for instance, the first three indicators are potentially useful for the contact with nature domain:

- percentage of population who harvest for commercial use
- percentage of population who sell fish meat, carvings, etc.
- percentage of population who bought and/or sold country food

In addition, three other indicators may be relevant to the health domain:

- percentage of households where half or more of the meat and fish eaten in the last year was country food
- percentage of children consuming wild meat three or more days per week
- percentage of the population very or somewhat satisfied with the availability of country food to their household

Lastly, the Community Well-being Index, a composite index of the well-being of Inuit communities in Canada developed by Indian and Northern Affairs Canada (INAC), combines four measures: income, housing, education, and

labor market. However, it has little to say about contact with nature (O'Sullivan and McHardy, 2004; McHardy and O'Sullivan, 2004; Cooke et al., 2004).

Beyond specific existing projects that involve some level of indicators, other available data relevant to contact with nature are those pertaining to the harvesting and consumption of country food. One example, albeit primarily non-Arctic but nonetheless methodologically interesting, includes corroborating data from coastal Canada where country food consists of primarily mainly fish and seafood. In recent years studies have shown the decreasing or increasing consumption of seafood, the reasons for these changes, and the proportion of wild seafood in diets. A number of studies indicate that average Canadian consumption of traditional food is 4.5 kg per capita annually (Conacher, 1993) whereas Mohawk consumption is 8.4 kg per capita annually (Chan, 1998). Five Vancouver Island First Nations consume 60.5 kg per person per year (Ross and Child, 2008) and Quebec Inuit consume 109.5 kg per person per year (Dewailly et al., 1993). The Ross Vancouver Island Study reports that inhabitants procure their seafood via a mixture of traditional harvesting (89%), supermarkets (8%), and restaurants (3%). Reasons for declining consumption are given as "abundance has changed" (38%), "way of life has changed" (28%), "pollution concerns" (25%), "lack of time," "change of tastes," and "government regulation" (Ross and Child, 2008). This study also reveals that consumption of traditional food is highest in the older age groups, indicating a shift away from traditional food consumption in the young. This trend is a source of great concern to First Nations communities and individuals who are quick to point out that eating traditional food is central to their culture, spirituality, health, and well-being.

One major constraint to measuring contact with nature is the lack of current data. Recent data, although patchy both temporally and spatially, do indicate a strong connection between Arctic inhabitants and local resources. Clearly the mandate to develop indicators for contact with nature is extremely challenging. The task involves the development of a baseline, a flexible measure that could apply in dif-

Youth Retention

According to Turi (2002), in general there are no recruitment problems in reindeer herding except in certain taiga regions of Russia. There is general agreement among reindeer herders, scientists, and local authorities that reindeer husbandry cannot be learned in institutes or schools. To be a good herder, one must grow up in a reindeer-herding family. For the sake of recruitment, it is important that the child spend his or her first years before school in a brigade (Ulvevadet and Klovov, 2004). In order to get a school education, children from herding families can only stay with their parents for a few months a year during the summer holidays. The school administration accommodates the wishes of children who want to spend more time in the camp with their parents and learn more about reindeer herding and husbandry. These students are allowed to leave before the official end of the school year, and sometimes they arrive after it has begun. In this way the school children can stay in the herding camps up to five months a year (Ulvevadet and Klovov, 2004).

Research on the structure and size of reindeer herding families in YNAO, Taimyr, and Chukotka has shown that compared with families that are settled, nomadic families have better demographic indices for characteristics such as the average size of the family, average number of children per family, and natural increase (birth rate and death rate). For example, the average size of a nomadic family in Chukotka was 3.9 persons versus 2.8 in a settled family. In YNAO the corresponding ratio was 5.1 to 4.0, and in Taimyr it was 5.5 to 3.5. Nomadic families usually consist of married couples with children, while populations in permanent settlements often consist of a mix of families and divorced and unwed women with children. This shows that the maintenance of nomadic reindeer herding is an important demographic factor that contributes to the maintenance of indigenous peoples, although herder families are deprived of many material comforts and conveniences. It is important to emphasize that the last population census (2002) showed that the Nenets, with close relations to nomadic reindeer herding, had the largest population growth among all of the northern peoples of Russia (Ulvevadet and Klovov, 2004).

Most schools in the Baffin region of Nunavut, Canada, now run through Grade 12. Upon graduation, several students go to Iqaluit for training at Arctic College. According to Wenzel (Dept. of Geog., McGill, pers. comm., 2007.), two former Kangiqtugaapik residents have passed the college's law program. But if students want a job with the Government of Nunavut, the territory's largest employer, they must relocate to Iqaluit or one of the places to which departments have been decentralized (around northern Baffin these are Pond Inlet and Igloodik). As a result, Kangiqtugaapik underwent a slight population loss in 2006.

In rural Viliui Sakha villages of northeastern Siberia, Russia, post-Soviet demographic trends show youth relocating to regional centers or to the capital city, Yakutsk. Although it is commonly thought that youth leave because they prefer the more cosmopolitan lifestyle in the centers, recent research reveals that most desire to live in their home villages, raise their own food, and be close to their kin, but they are forced to leave because the rural areas lack jobs opportunities (Crate, 2006b; 2006c).

Nenets boy, with reindeer herding dog on tundra, holding boxes of tea and a biscuit. Yamal Peninsula on the summer pastures of Yarsalinski sovkhos, near Bovanenkovo Gas Field, July 2005. Name of boy unknown.
Photo by B.C. Forbes.



ferent regions such as Alaska, Iceland, and Russia, access to current and consistent data in all countries and regions, and means to address data gaps, among other issues.

2.0 Possible Indicators of Contact with Nature

The first step in identifying indicators for contact with nature is to develop a set of criteria that potential indicators would have to fulfill. The indicators need to be few in number and reflect key aspects of Arctic human development in the contact with nature domain. They need to be tractable in terms of measurement and be either monitored at a reasonable cost or have data readily available from other sources. They also need to be policy relevant, generalizable, stable, easy to measure, and suitable for longitudinal analysis. Additionally, indicators need to be relevant across the circumpolar Arctic to both Aboriginal and non-Aboriginal peoples and communities, and to both women and men.

To begin the process of identifying and evaluating indicators, we first free-listed potential indicators, subjected each to a test of several criteria outlined in an evaluation matrix, and then, based upon that test, chose the 10 most suitable:

- Time on the land
- Number of traditional activities
- Number of people or households engaged in the traditional economy
- Harvest (kilograms per annum per capita)
- Consumption of country foods (kilograms per annum per capita)
- Income spent on nature-related activities
- Local control of resources
- Proportion of economy dependent on natural resources
- Youth in traditional subsistence activities
- Demography (youth retention)

We further subjected these 10 indicators to the following criteria: data availability, feasibility of measurement, clear meaning, affordability, robustness over time, reporting level, and applicability to indigenous and non-indigenous peoples. Three of the indicators proved robust for these criteria:

- Harvest (kilograms per annum per capita)
- Consumption of country foods (kilograms per annum per capita)
- Number of people or households engaged in the traditional economy

The main hurdle for all three indicators is data availability. While data are available for most of the circumpolar North, Russia is highly problematic. There are statistical data for these three variables through the end of the Soviet period, but all such data remain questionable due to inconsistency and rounding up to “meet the plan.” Furthermore, there exists a data gap during the transition period after the fall of the Soviet Union, and what data exist are patchy. For example, the government did count wild reindeer hunted and also kept numbers of domestic reindeer in households—so there are numbers of households involved in the economy. Another nuance is that in the Arctic north of Russia, data are more available for indigenous communities because they are more routinely collected. Some data are available at republic and oblast levels, but may be expensive to obtain – even more expensive if you’re a “white” researcher from the West. Being in business to sell data is widespread in Russia.

There are also problems for tracking household or individual harvest and consumption patterns in Fennoscandia. For households that are involved in reindeer herding, statistics are not kept on the number of animals or amount of meat retained for personal consumption. In Fennoscandia and Russia, both non-indigenous and indigenous households are often heavily engaged in the traditional economy through activities such as fishing and berry and mushroom picking. Since some products, such as fish and cloudberries, are sold commercially, there may well be excellent statistics for annual harvest, yet these will not reflect personal or household consumption levels. That being said, it should be noted that SLiCA offers a promising source of data for two of the three potential indicators (participation in traditional economy and consumption of country foods).

It is also important to note that in addition to the issue of data availability, all measures of contact with nature involving harvest and resource use pose a special challenge for inter-

pretation and therefore demand some triangulation of the data with other domains. Human development is traditionally measured on a one-dimensional scale: the higher the observed value on a human development scale, the higher the level of human development. In the case of contact with nature, however, we must accept the fact that more is not always better. Consider the case of a community with a single employer who decides to leave. Jobs are lost. Cash is scarce. People choose to hunt and fish more. Contact with nature increases. Consider the same community, only this time a second employer arrives with a policy of granting leave for hunting and fishing. Cash incomes increase, and the subsistence leave policy is successful. People choose to hunt and fish more. Contact with nature increases. Thus, we cannot understand whether an increase in our measures of contact with nature is positive or negative with respect to human development by only examining the contact with nature measure itself. We can, however, properly interpret its meaning if we corroborate contact with nature measures with those of material success.

2.1 Indicator: Participation in the Traditional Economy

2.1.1 Participation in Traditional/Outdoor Activities

Although the indicator of participation in traditional/outdoor activities appears at first to be an excellent and tangible indicator of contact with nature, it presents two challenges: poor availability of data and difficulty in translating measures across the diversity of Arctic populations. For example, consider the diversity and range of activities possible across the Arctic, from hunting, fishing, and foraging to bird watching, hiking, and dog sledding – and the list goes on. Such a slate of activities for different populations and regions is found in SLiCA data, but similar data would need to be collected for the non-SLiCA regions. Some of these activities are more relevant to indigenous than non-indigenous populations and some are pursued predominantly by either women or men. In sum, ensuring that the diversity of activities would be inclusive of all groups would make this indicator too complex and would

necessitate an enormous and unwieldy data-gathering effort.

2.1.2 Time on the Land

Perhaps there would be a way to solve the data problem of the participation in the traditional economy indicator by focusing on the quantitative measure of time spent in activities or “time on the land.” Many rural Arctic populations depend on subsistence resources for some percentage of their household food. Subsistence-dependent Arctic inhabitants, by design, need to spend significant time in nature engaged in harvesting activities (Berkes and Jolly, 2001). The more a household depends on subsistence resources, the more time its members need to spend on the land.

The rationale for considering time on the land as an indicator for the contact with nature domain is that it represents time away from a household context, spent in nature and involved in subsistence and/or other outdoor activities. It is important to note that some research has shown Arctic inhabitants are spending less time on the land and in contact with nature, and that this trend is in turn affecting other aspects of well-being. As Young (1996) succinctly states, “Spending less time on the land has been shown to be a direct correlate of obesity in Arctic populations, suggesting that along with less time on the land, Arctic populations are also engaging in less healthy diet practices. Again, this is a reminder of the importance to corroborate indicators to gain the most robust measures of well-being.

Before considering the applicability of time on the land as an indicator, we first provide a few “close-ups” of how time on the land is, in fact, key to human well-being in the Arctic.

Close-up: reindeer herding

Among nomadic tundra Nenets herders inhabiting the Yamal National Autonomous Okrug (YNAO) of northwestern Russia’s tundra, reindeer are intensively managed 24 hours a day, 365 days a year, by whole families and across generations (Krupnik, 1993; Stammeler, 2005). Among intensive herding populations, the herd size of individual households varies greatly (Stammeler, 2005). Generally, the further north a herder lives, the bigger the herd. In northern-

Nenets women
corralling reindeer
outside chums at winter
pastures near Nadym,
YNAO. Notice reindeer
skin coats, boots and
chum covering.
Photo by B.C. Forbes



Reindeer Herding in the Arctic

There are more than three million semi-domesticated reindeer across northern Eurasia of which 700,000 are in the Saami area (Baer, 2002). Reindeer herding is a small activity in terms of its employment and economic impact. There are fewer than 100,000 people engaged in it, including elderly people and children. In other words, reindeer herders make up less than 1% of the total human population of the Arctic. On the other hand, while the rest of the total Arctic human population is declining in most areas, the number of reindeer herders is actually growing (Turi, 2002). It is estimated that, including consumption of meat for personal use, the total meat production by reindeer herding is 18,000 tons per year with an approximate commercial value of USD \$50 million to \$52 million. The Nordic quota constitutes more than 50% of this amount. This roughly equates with the combined production capacity of three to four medium-size fish farms (Turi, 2002). Reindeer herding is, therefore, significant for thinly populated northern regions but fairly insignificant economically compared with the main competing interests within modern Fennoscandia such as the mining, hydro power, timber, and tourist industries (Beach, 1981; Turi, 2002; Forbes et al., 2006).

Reindeer management has brand value in modern Finland, meaning marketable value over and above that of meat. Some herders have created niche markets for custom-made meat products, such as high-end restaurants in Helsinki. After Finland joined the EU, the much-criticized centralized slaughterhouses had an unintended positive side effect. Reindeer meat slaughtered in these slaughterhouses and processed in meat factories is not considered good enough for private buyers. Demand for traditionally slaughtered reindeer that is cut specifically for household use is higher than some herders can produce (Hukkinen et al., 2006).

On the Yamal and Kola Peninsulas in Arctic Russia, annual per capita consumption of reindeer meat is extremely high (ca. 200 kg to 225 kg) (Konstantinov, 2005; Stammeler, 2005). Although figures for harvest and consumption were not available, we know that herders also spend a great deal of effort procuring fish year-round, especially in summer when they prefer not to slaughter their reindeer to avoid wasting the molting fur. On the Yamal Peninsula, large families are the norm among nomadic Nenets, and youth retention appears to be high (Ulvevadet and Klovov, 2004). Along with the steadily increasing reindeer population, these data indicate that reindeer herding is a vibrant livelihood, albeit one faced with threats from accelerating oil and gas development (Stammeler, 2005; Forbes et al. 2009 in press).

most Yamal, a herd of 500 is seen as sufficient for the subsistence needs of a household, whereas in the central and southern parts, a herd of 150 to 300 is adequate. Among the mountain herders in the southwest of YNAO, a private herder with 100 animals is thought to be well-off. The absence of firewood in the far north and the need to transport wood over long distances considerably increases the need for transport animals. Monthly reindeer meat consumption among tundra Nenets is fairly consistent outside of summer, when the staple food becomes freshwater fish to avoid slaughtering molting animals and in doing so wasting the valuable fur, which can be used for many purposes (clothing, bedding, tent covering, etc.). According to Stammler (Univ. of Lapland, pers. comm., 2007), an average household may slaughter an adult male or female animal every 10 days for consumptive use, including food for dogs kept for managing the herd. Nenets reindeer are the smallest in size among the four domestic breeds or ecotypes in Russia. The average weight for male after slaughter is 52 kg to 58 kg (Stammler, 2005). Across YNAO in 1998, there were 2,618 nuclear family-based household units managing nearly 600,000 reindeer (WRH, 1999). As of 2007 the number of herded animals was over 630,000 (UralPolit, 2008).

Whereas the actual number of deer owned by a household is based on the people's need for subsistence and on their herding skills, the size of the grazing herd is a management decision. Baskin (1991) has established that the minimum herd size that can be managed effectively is 35 animals, the most efficient herd sizes is between 100 and 300 animals, and that a herd of more than 3,000 becomes mostly unmanageable.

In addition to matters of basic management, herd size must be considered with regard to a wide array of different factors, such as husbandry form (e.g., intensive versus extensive; see Ingold, 1980), security, workforce, and wealth storage, all of which are interdependent (Beach, 1981). Beach (1981) notes that a big herd can supply a herding family with enough food in the way of meat without suffering a steady decline in numbers. All slaughtered reindeer will be replaced in the course of reproduction, a resource not available to the small herd-

er, who would consume more meat per year than the herd could reproduce. In earlier times, the herder would have been forced into milking husbandry. Thus, for big herders, extensiveness and meat consumption traditionally went together at the other end of a gradient from small herding, intensiveness, and milking, which formed a unit (Beach, 1981).

Since the transition from traditional Saami herding to the modern mixed economy, most small herders in Fennoscandia must now supplement their income from other sources to maintain their herds and their households above the poverty line or subsistence minimum (Beach, 1981; Ulvevadet and Klovoy, 2004). However, as it goes with hunting in a mixed economy (Wenzel, 1991), while alternative income may help one to remain in herding, any part-time or seasonal supportive work necessarily takes time away from the active herding job (Beach, 1981).

Müller-Wille et al. (2006) explore the transition from hunting to herding in the Saami region of Fennoscandia during the period ca. 1400–1700. In the newly emergent economy, the reindeer-herding Saami had the most secure social system among all the Saami subgroups as well as the colonizing settlers. Their food supply exceeded their own needs, and poorer

About Much More Than Just Food

Of course, the procurement and slaughter of wild game and the management of domestic animals (e.g. reindeer, horse, cattle) is about much more than just food, from prehistoric and historic through to modern times. In addition to basic sustenance, interaction with animals provides the basis for clothing, shelter, tools, art, language, education, calendar, spiritual fulfillment and, not least, the maintenance of intra- and inter-household socio-cultural relations though formal and informal codes of sharing and reciprocity (Nelson 1969; Beach 1981; Wenzel 1991, 2005; Stammler 2005; Vitebsky 2005; Müller-Wille et al. 2006). In other words, interaction with animals is a key element of the social fabric of local communities throughout the Arctic.

members were provided with reindeer meat for survival. However, Krupnik (1993) argues that widespread intensive domestication in northern Russia after about 1600 was driven not by a shortage of food but by the limited supply of reindeer skins for clothing, shoes, winter tent coverings, and other household items necessary for surviving in such a cold climate.

Close-up: hunting

After eight to 10 hours of active breathing-hole seal hunting in the eastern Canadian Arctic, hunters begin the one- to two-hour trip home, hopefully with at least one seal lashed to each sled (Wenzel, 1991). One out of every five to six waits at a breathing hole in a day is likely to yield a seal. The 30 kg of meat and edible organs provided by one adult seal can energetically sustain one adult hunter for six full days. Longer winter journeys for caribou or polar bear are made by parties of up to five hunters and carry enough fuel and equipment to be self-sufficient for a month (Wenzel, 1991).

Factors such as distance necessary to travel to find a species and the return that can be expected relative to the effort invested must be considered. Each hunt, therefore, involves an elaborate calculation by hunters of yields and how alternatively to deploy their time, energy, and material resources (Wenzel, 1991).

In 1971, among a team of four hunters from Clyde River (Kangiqtugaapik), Baffin Island, during a four-week period of winter sealing, hunting was done on 21 days (452 hunting hours) and a total of 34 ringed seals were captured. Hunters spent 204 hours actually hunting, another 160 hours repairing and manufacturing equipment, and 88 hours traveling to and from the ice. They were rarely absent from the community overnight and did all of their equipment repair and manufacture in the community (Wenzel, 1991).

In the contemporary context, winter sealing among Kangiqtugaapik Inuit is still mostly done on day trips, but longer distance hunting consumes at least weekends. The coastal area around modern Kangiqtugaapik is dotted with cabins, so being out is more comfortable than it used to be. The longest trips are for summer caribou and take a minimum of four to five days. There are still some hunters who are out

probably 200 days each year, but they are rare as money for equipment and fuel is always an issue. Wenzel believes that an average of 100 days out per adult male is probably a reasonable guess since his own data are biased toward hunters who are not restricted by, for example, employment during weekdays (Wenzel, Dept. of Geog., McGill, pers. comm., 2007).

According to Nelson (1969) northwest Alaskan “Eskimos are very particular about traveling when it is light outside, because they regard night travel as highly inadvisable. They always plan to travel so they camp or be home well before dark.” Hunters dictate their activities mostly according to the presence of game or the distance they have traveled during the day. Generally, hunters try to leave the village sometime in the morning and return by midnight. But nothing actually regulates when they will return except hunger or the urge to go home.

Ringed seal pups are a highly desired food and Kangiqtugaapik hunters spend considerable time searching for dens during the three- to four-week period from mid-April to mid-May when denning occurs. It is surprising how much hunting effort is spent: approximately five hours per pup with five attempts per successful capture (Wenzel, 1991). After the denning period ends in spring, both adults and pups can be hunted by rifle from a camouflaged snowmobile. This method means approaching from downwind and each stalk takes only about five minutes, so many more seals can be stalked. It is difficult to estimate the time and effort expended in the various types of spring sealing, as hunts may last up to 24 hours and are often combined with wider travel (Wenzel, 1991).

At Point Hope, Alaska, a single hunter may kill 200 ringed seals and a few bearded seals in a single winter. A crew of hunters at Wainwright, Alaska, can sometimes take 20 seals in a summer's day from the ice edge. Ice-edge sealing can provide a hunter with 1,000 pounds of game a day, even more on occasion. A single bearded seal may weigh that much alone. Under normal conditions during the winter, a hunter, if proficient, brings home one to three seals with each trip out. In the mid-1960s, only 200 or 300 seals were killed in years when caribou were abundant, more when there was not

enough of this preferred meat or when few walrus were taken (Nelson, 1969).

Considering time on the land

Although the indicator of time on the land, not unlike the indicator of participation in traditional/outdoor activities, may at first glance seem ideal, it too has irreconcilable issues. First, not all subsistence activities require the same time on the land (or sea) input in relation to energy/kCal return. Human populations use wild resources that are available within their ecosystem, and so we see herders, hunters, and fishers in inland areas and fishers/sea mammal hunters along the coasts. Similarly, some subsistence activities are located fully on the land (e.g., fish camps, bear hunts, Sakha horse breeding), others only require partial time on the land (e.g., cattle and some reindeer production), and some, no time on the land (e.g., gardening). Similarly, some subsistence requires a household to live close to full-time on the land (e.g., reindeer/caribou herding). In short, the diversity of time required for various subsistence activities, whether they are seasonal, daily, or one-time events, and whether they are located adjacent to a household or away, make developing and using this indicator problematic.

A second problem is deciding on consistent measures for this indicator. Are we talking about number of minutes, hours, days, weeks, or months per year? Do we measure overnights differently than returning home each night? Exactly what of the time do we count? If resources are far away, do we count travel time to those resources or just the time spent in the subsistence or other activity? These issues of time could be overcome by developing case-by-case or subsistence activity-by-subsistence activity average time input amounts. However, this would be a grandiose undertaking, considering the diversity of socioeconomic, political, and environmental contexts that the various Arctic populations live and practice.

A third problem with time on the land as an indicator is lack of data. To date there is only anecdotal evidence available and only in several (but not all) Arctic regions. Gathering data would require asking people in an extensive circumpolar survey, the likes of SLiCA, which is not possible, given the scope, time, and re-

sources needed. There may be some data from which time on the land could be extrapolated, as in Norway where there are data in municipalities on the number of licenses issued for fishing with skidoos. In that context, it is clear that Saami municipalities give more licenses for skidoos than other Norwegian municipalities. But again, extrapolating this data and comparing them across circumpolar countries is prohibitive.

A fourth issue is the gender bias that time on the land would introduce. In Arctic societies there is a tendency for women to be settled in villages and men to go out on the land. This could be resolved by developing different measures for men and women, but doing so would further complicate the process.

Lastly, the urban-rural difference would also be problematic. In urban settings individuals and/or households either make a complete summer exodus to the rural areas to participate in subsistence and other outdoor activities or reside part- or full-time at a *dacha* to grow gardens, forage, and perform other activities, sometimes while maintaining daily employment. This diversity of contacts makes time on the land an unmanageable indicator for contact with nature.

Gardening, especially for such staple crops as potatoes shown here, represents one of the many forms of 'time on the land' for Sakha, native horse and cattle breeders of northeastern Siberia, Russia. July 2004.

Photo by S.A. Crate.



In most Arctic societies, men spend more time on the land hunting, fishing, and herding than their female counterparts, with the latter more often staying home to attend to the subsistence activities there. Here pictured is a Viliui Sakha grandmother cleaning the ducks that her sons brought home with her granddaughter looking on and learning her future role. Pictured Matryona Yegorova and granddaughter Kathryn Yegorov-Crate, Elgeei village, April 2000. Photo by S.A. Crate.

2.2 Indicators: Consumption of Country Food and Harvest

There is a wide range of wildlife and plant species in the Arctic used for food, especially by indigenous populations but also by non-indigenous residents (Crate, 2006a; 2008b; Forbes and Kofinas, 2000; Klein, 2005). Dietary and cultural changes in the last century have decreased the proportion of wild food that Arctic communities consume. Both the increased access to market food being available stores and a trend toward modernity, with youth aspiring to higher education and career paths outside their home villages, have contributed to a decrease of wild food harvesting activities in many communities. Nevertheless, wild foods are valued for their superior taste and nutritional qualities and for their connections to cultural identity.

Indigenous populations of Canada and Alaska refer to their wild foods as “country foods,” while other Arctic inhabitants refer to “traditional foods.” For our purposes, it is important to expand that understanding to include domesticates, both animals (reindeer, cattle, horses, etc.) and plants (garden and field), considering that again, these sources are produced on a small scale, subsistence and/or limited-market level in a human-environment context similar to wild species.

Despite the general tendency for Arctic residents to consume less country food, there are some anomalies. Census-type surveys of Inuvialuit harvesters conducted in the 1960s and 1970s, and then again in the 1990s, show that the geographic extent of harvesting over that time period stayed about the same, but the ratio of country foods from marine and terrestrial sources shifted, showing a reliance more on the latter. Despite the change in sources of country food, the central place of country food in the Inuvialuit household diet remained unchanged (Usher, 2002). Parallel observations were made in the eastern Canadian Arctic as detailed by Wenzel (1991) and Priest and Usher (2004).

Close-up: Viliui Sakha and other case studies

In the post-Soviet context, country foods became highly desired for reasons of economics and cultural identity. With high unemployment, households turned to country foods to

feed themselves. And in the case of the Viliui Sakha, native horse and cattle breeders of north-eastern Siberia, country foods represented what it meant to be “Sakha” in a post-Soviet ethnic revival (Crate, 2006a; 2008a). Village-level data show an overall increase in country food consumption since the fall of the USSR. These data also reveal great disparity among households, with some consuming close to 75% country food and other consuming none. Such disparity can be explained in various ways. Households not consuming country foods tend to be made up of single mothers with few, if any, kin relations in the immediate or adjacent villages (which limits their pooling of the needed resources of land, labor, and animals) and with substantial subsidies to allow for reliance on store-bought foods. Households consuming a majority of country foods tend to have ample resources (land, labor, animals, and tools) and the necessary knowledge base to produce country foods. To the extent that country food production requires intimate human-environment interaction, it can be used as an indicator of contact with and closeness to nature.

The importance of *kehii*, or house gift, to Viliui Sakha, illustrates beautifully one unexpected place that country foods can play (Crate, 2003). *Kehii* is considered a fundamental part of Sakha social interaction. Most often it is given by guests when they are staying with a household, but it can also be given to the guests by the host. Country food is most often given, and its rareness increases the value of the gift. An especially prized and rare *kehii* is wild strawberry jam because the berries are only slightly larger than a pinhead and grow in a sparse ground cover plant that is difficult to find. More common examples of a *kehii* include a jar of crème fraîche, a portion of blood sausage (either cow or horse), and wild-caught fish or meat, usually moose or bear. *Kehii* symbolizes the bond between guest and host. It also speaks to the level of country food the gift giver’s household accesses and its associated contact with nature.

Kehii also plays a central role in Viliui Sakha rural-urban etiquette. As in other Arctic contexts (Chan and Kuhnlein, 2005) indigenous communities closer to urban centers tend to eat less country food because they have greater ac-

cess to store-bought food, employment rates are higher and therefore there are greater monetary resources to purchase food, and there is less access to and time for country food harvesting. This does not mean that urbanites do not consume country food. In fact, it is common to visit a Sakha household in the capital city, Yakutsk, and find wild strawberry jam, crème fraîche, and homegrown meats in the larder. The source of country food in urban contexts is largely based upon kin relations in home villages. Often city dwellers spend their summers in the heavy labor of hay cutting for winter forage and receive in return their full year's supply of country food including cow, horse, and pig meats and organs; wild berry preserves; and milk products, including frozen milk, all of which is sent into the city on cargo trucks during the winter. In addition to or in the absence of such kin connections in the country, Sakha urbanites often have a dacha just outside of the city where they spend most of the summer, as their work permits, to grow a large portion of their vegetable needs, forage as they can, and "have contact with nature."

Other studies also suggest the role of country foods in bridging the urban-rural divide and in maintaining cultural identity. For example, the only ethnic and cultural distinctions between those urban Inuit living in northern Canada and those who have moved south to live in Montreal is the sharing of country food (brought to the city from the North) and the speaking of their native Inuktitut (Kishigami, 2002). The same study found that urban Inuit who intermarry soon lose their taste for country foods.

In some cases, studies on the urban-rural dynamic underscore the central role of country food for native urbanites and the country-specific politics involved. In an analysis of how urban native and non-native residents would be affected by the rural-residence option, Lee (2002) documented how urban Alaskan Yup'ik women exchange their city's riches, in this case day-old doughnuts with country foods including duck, caribou ribs, seal meat and skin, tom cod, and salmon berries. Greenland's Home Rule government has been active in promoting the marketing of country foods. Historically Greenlanders earning wages have bought country foods from Greenlandic hunters. Today this



continues in local *kalaalimineerniarfik* (place where Greenlandic foods are sold). The government today promotes the use of nutritious and culturally valued foods to further their goals of sustainable development and to bolster rural economies (Marquardt and Caulfield, 1996).

Dietary differences between northerners and "outsiders" persist today, even among groups that are considered highly acculturated and have long ago been brought into a cash economy:

An Eskimo once told me that his people simply could not live on a steady diet of white man's food. At first glance it seemed he might have made this statement only to support his wish to hunt, even though he was earning a steady income. But on second thought, the overwhelming truth of his statement is readily apparent if we simply reverse the roles, placing the outsider in a position of having to live entirely on the Aboriginal Eskimo diet. It would be very difficult, as I learned from personal experience and observation of others, for the white man to make such a shift in his own diet. And it is at least as difficult for the Eskimo to live on the white man's food. (Nelson, 1969).

Northwest Alaskan Eskimos believe that having good food, especially when camping, is essential if they are to work at full capacity and keep themselves fortified against the cold (Nelson, 1969). Nelson (1983) provides a tabulation of "uses for selected major species," which includes moose, caribou, and black and

Pictured here is a common sight when entering a rural Viliui Sakha home in mid-December. Most households slaughter annually, just after temperatures drop below freezing day and night. Once their total slaughter is in, they divide it between their household and the various kin households that helped with the haying the previous summer.

December 2000.
Photo by S.A. Crate.

brown bear. It reveals the thoroughness with which these and other species are consumed by the Koyukon of interior Alaska. In general, there is a strong seasonality of consumption patterns in most Arctic and boreal cultures (Nelson, 1969; 1983; Helm, 1981; Damas, 1984; Vitebsky, 2005). For example, among modern Nenets, mid-May to mid-June is the “month of bird nests.” During this time reindeer herders can shoot up to 30 geese a day, which provide a welcome addition to their diet at a time when they prefer not to slaughter their animals. For protein during summer migration, Nenets nomads subsist mainly on freshwater fish and similarly try to avoid killing useful animals (Stammler, 2005).

Animals are important to the Koyukon of interior Alaska not only as food and objectives of the subsistence quest, but also as personages and powers who share the world in which humans live (Nelson, 1983). In Eurasia, the utility of tame reindeer has gradually evolved over the last millennium from being primarily a means of transport for hunting other game to being used as meat—an end product regulated by agricultural norms set by the various states (Russia, Finland, Sweden, Norway) (Krupnik, 1993; Vitebsky, 2005; Hukkinen et al., 2006; Müller-Wille et al., 2006). For nomadic herders, meat is a by-product of the process of rejection. In other words, the animals eaten are those that are no longer useful enough to keep (Vitebsky, 2005).

There is a basic geography of consumption in the North, with marine mammals historically being the mainstay of most coastal dwellers north of the treeline, while caribou, reindeer, moose, and other land mammals figure more prominently in the diet of those who live in the boreal forest and forest-tundra regions (Helm, 1981; Damas, 1984; Krupnik, 1993). Within subsistence cultural groups, there can also be distinct ecological “exploitative” zones traditionally characterized by differences in hunting technology and diet (Damas, 1984). Although significant changes are possible in subsistence activities over time within a given region in conjunction with climate and other drivers, broad scale spatial variations persist in the modern Arctic and so have important implications for regional resource management (Forbes and

Kofinas, 2000; Klein, 2005; Nuttall et al., 2005; Forbes and Stammler, 2009).

Among Inuit in North America and eastern Asia, certain types of food with fats and oils are consumed to maintain body warmth – in both people and working dogs – during camping, hunting, traveling, and under emergency conditions (Nelson, 1969; Krupnik, 1993). Vitebsky (2005) remarks similarly on the Tungus reindeer herders of modern Sakha Republic in eastern Siberia; in their climate animal fat is as important as protein. Alaskan Koyukon consciously exploit the fat cycles of many animals, large and small, which strongly affects their harvesting patterns since fatter animals are selected for their better food value and flavor (Nelson, 1983). Skilled hunters can pick out the best animals, ranging from moose to over-flying ducks, in a split second and adjust their efforts accordingly. The Koyukon particularly prize the rich, fatty, and delicious meat of the black bear (Nelson, 1983), although they also consider the body and mesentery fat and rendered grease of both moose and caribou to be delicacies. Fats and oils have many other uses beyond their high caloric and lipid content (Nelson, 1969; Damas, 1984). The meat of the Siberian marmot is so full of fat that it cannot safely be eaten when hot and is regarded as medicine rather than food (Vitebsky, 2005). Indeed, among the Evenki, bear fat is used to heal wounds (Vitebsky, 2005), and marrow fat from the hind legs of mountain sheep is said to make a person a good hunter and stop bones from aching (Vitebsky, 2005).

Animal fats and oils are not commonly eaten alone, but used more as a condiment or additive, and especially in the cold season they constitute an almost essential part of every meal where meat is eaten (Nelson, 1969; Wenzel, 1991). They can also be used as emergency lighting and cooking fuel. Obtaining the seal meat and fat is hard work; an average hunter burns about 3,000 calories a day while standing motionless over a breathing hole and fighting off the cold (Wenzel, 1991). Among Inuit, young ringed seals are said to be the best for eating (Nelson, 1969; Wenzel, 1991). Seal meat is also considered high quality as dog food because it keeps the animals warm during fierce winter gales (Nelson, 1969).

As for food preference, Nelson (1969) com-

pares three different groups of Inuit from Wainwright, St. Lawrence Island, and northern Greenland. Among each group the most preferred food was the one most available. The Wainwright people are traditionally inland Eskimos and take more caribou whenever possible because, as they often say, a person can never get tired of caribou, even though it is easy to tire of all other kinds of meat. Similarly, north Greenlanders whose staple food is seal often say that a person may get tired of all other kinds of meat, but never seal meat. And, in turn, the St. Lawrence Islanders, who apparently shoot a greater volume of walrus than anything else, say that one never tires of walrus.

The use of meat for domestic or subsistence purposes carries with it a completely different set of notions to the use of meat as a commodity. Among Yamal Nenets, a shared meal of fresh, warm, raw reindeer meat and blood is called *aibat* (Stammler, 2005). After the men are finished, women and children are invited to have their share. Everybody brings their own knives for cutting the meat to eat on the spot. *Aibat* vividly exemplifies how the conversion from live to dead property is a conversion from shared rights to exclusive rights. The live animal might have been used by different people for various purposes. During subsistence slaughtering, its resources are shared for the last time, and entitlements literally become more exclusive as the life and warmth leaves the animal. Therefore, fresh, warm, unfrozen meat or blood is shared during *aibat*, but once it becomes cold, the animal enters the exclusive domestic sphere of the owner's household. The practice of slaughtering for *aibat*, in the community sphere of exchange, is done only with privately owned animals.

Similar practices governing the slaughter, consumption, and sharing of food among North American Inuit are detailed by Nelson (1969) and Wenzel (1991). Reviewing historic and modern practices, Wenzel (2005) concludes that sharing among Inuit, or *ningiqtuq*, is more nuanced than can be represented in the two main models prevailing within the literature. The result is an economy that, from Alaska to Greenland, optimizes social inclusiveness rather than the maximization of individual or family economic well-being (Wenzel, 2005).

In modern Nordic reindeer management, the most immediate goal is to maximize the efficiency and profitability of meat production. In the case of Sweden, such so-called rational herd management derives from a combination of agricultural and Saami innovations but is neither completely Saami nor Swedish in content (Beach, 1981). Similarly, the main aim of tundra reindeer herding in Russia from the perspective of the state is meat production (Jernsletten and Klovov, 2002). The number of domestic animals has varied widely over the last century, just as the intensity of herding ranges widely in space and time (Ingold, 1980). Average annual meat production as measured by kilograms per animal increases threefold from so-called low-intensity to high-intensity herding. After the fall of the Soviet Union, numbers declined moderately to precipitously in several sectors of the Russian north, a strong exception being the YNAO, where numbers continued to increase (Jernsletten and Klovov, 2002).

Since the economic significance is minor, there are clearly other factors of reindeer herding that make it attractive to so many people across such a large portion of the Arctic. The strength of the livelihood is probably that it represents a lifestyle that is professionally challenging and rewarding, and thus represents a meaningful life for people (Turi, 2002).

Swedish law permits a maximum of 276,000 reindeer in the country and the number varies annually according to conditions. Since the early 1980s, 70,000 animals are slaughtered annually, about 60% of which are calves, representing some 2,000 tons of meat. About 20% of the production is exported, while in recent years Sweden has also imported reindeer meat, mainly from Russia (Baer, 2002).

According to a report by the Russian Ministry of Agriculture, a five-person family in YNAO needs 385 reindeer for subsistence based on an average supply of meat, furs, and live reindeer needed for transport. However, the general model used in this calculation does not account for the particularities of place; in the North, for example, more transport animals are needed to carry firewood, and in the forest-tundra there might be alternative sources of income and food (e.g., from game) (Stammler, 2005).

On average, the Swedish population con-

sumes only 250 g of reindeer meat per person per year (Beach, 1981). In Finland, average annual reindeer meat consumption is slightly higher at 400 to 500 g per person (Hukkinen et al., 2006; Särkelä. Finn. Assoc. of Reindeer Herding Districts, pers. comm., 2007). This contrasts with the situation among herders of Russia's Kola Peninsula, who in the mid-1990s were slaughtering one animal every six days or



A small sample of the bounty of country food in a permafrost cooler in Tuktoyaktuk, an Inuvialuit hamlet located in the Inuvik region of the Northwest Territories, Canada.
Photos by L. King.

so, thus consuming about 570 g of reindeer meat a day (Konstantinov, 2005). At slaughtering time in the “really venison-oriented public” of Lovozero, village residents are allowed to buy meat at wholesale prices and a typical family stocks their freezer with 30 to 40 kg per person (Konstantinov, 2005).

Country foods in conflict

Country foods have also met with resistance from the outside world. In parts of the Arctic the rise of the animal rights movement has come into direct conflict with country food consumption (Wenzel, 1991). These actions impacted northern residents most notably following the 1969 anti-sealing campaigns, after which the animal rights drive attacked all fur trapping (Myers, 2005). Contaminants, most notably persistent organic pollutants (POPs), present a second area of “conflict,” or pressure not to utilize country foods. Although the 2001 Stockholm Convention on POPs, which obligates the elimination of certain chemicals, the Arctic and its residents who mostly eat high on the food chain, are sinks for POPs. This issue came into public consciousness when high levels of POPs were found in the blood and breast milk of Inuit in northern Canada (Downie and Fenge, 2003).

3.0 Selected Indicator of Contact with Nature: Consumption or Harvest of Traditional Food

Based upon our analysis above, we recommend that the one indicator for contact with nature should be “consumption or harvest of country food”. One of the most frequently cited means of maintaining contact with nature is the harvesting and eating of traditional foods. Chief Charlie Jones of the Pacheedaht First Nation in British Columbia, Canada, who died at age 113, attributed his longevity to eating “proper food” – whale, seal, elk, deer, bear, beaver, and salmon. But he went on to lament that “now the rivers are fished out; there is too much felling of forests and the wild animal have been driven away” (Ross and Child, 2008). These sentiments are echoed across the Arctic where good health as well as spiritual and cultural sustenance are supported by the harvest and consumption of traditional or country food. The harvest and consumption of traditional food is also cited as the primary, if not the only, contact with nature in Arctic societies.

Table 6.1 is a matrix of the consumption and harvest of traditional food as indicators for contact with nature.

Table 6.1: Contact with Nature Matrix

Indicator	Data Availability	Data Affordability	Ease of Measurement	Robustness	Scalability	Inclusiveness
Consumption of Traditional Food	Tier 3	Low	Medium	High	1-4	High
Harvest of Traditional Food	Tier 3	Medium	High	High	1-4	Medium

• 1 = scalable to individual; 2 – scalable to household; 3 - to community; 4- to region; 5 – to country

4.0 Concluding Comments

The primary reasons for recommending the consumption and harvest of country food are: the centrality of its consumption to Arctic cultures and peoples; the availability of data and the ability of communities across the Arctic to collect those data; the generalizability of the concept across Arctic regions, for indigenous and non-indigenous peoples, for rural and urban residents, and for women and men; and finally, the data also lend themselves well to aggregation and to time series.

This indicator provides the flexibility needed in the diversity of Arctic contexts. With it, one could measure both harvest and consumption or could choose one or the other depending on relevance to the particular region as well as ease and feasibility of data collection. Choices can and must be made about: whether to use household or individuals or aggregates of communities and /or regions; how to measure proportions of food consumed by the households (i.e. – none, less than half, half, or more than half); whether to tally harvest by species; and in what contexts kilogram per household could be used.

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Two more examples of how northern inhabitants continue their contact with nature: Sakha freeze extra milk in shallow pans for later use, utilizing the continuous freezing temperatures of the long winter months and, following autumn rains, gather wild mushrooms for fresh use and to preserve. 2000. Photos by S.A. Crate.

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