# MOBILITY AND ECONOMY OF THE EVENKIS IN EASTERN SIBERIA

by

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## DEDICATION

This work is dedicated to the people of Erbogachën, Khamakar and the Kochëma who graciously took me in and shared their homes, tables and experiences with me.

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Mr. Mertens graduated from Minnesota State University in Mankato, Minnesota in 2008 with a Bachelor's degree in Social Studies teaching with an emphasis in history. During undergraduate studies, he studied the Russian language at Gustavus Adolphus College in St. Peter, Minnesota, and Irkutsk State University. His language abilities, broad-based knowledge of the social sciences, and keen interest in indigenous Siberian cultures led to his application and acceptance into the graduate anthropology program at Boise State University. The unique opportunity to research with the Evenki of the Katanga Region of Eastern Siberia was made possible through the Home, Hearth, and Household Project, NSF grant #0631970 of Dr. John Ziker.

# ABSTRACT

Mobility is an aspect of human activity that is highly contextual but also in need of a framework for comparative analysis through time and space. This thesis examines Evenki mobility patterns and how these patterns relate to the economic practices of hunting, fishing, and reindeer herding, and utilizes a framework for considering mobility cross-culturally. The Evenkis are an indigenous minority living throughout central and eastern Siberia in the Russian Federation. In the fall and winter of 2011/2012, fieldwork among two groups of Evenkis documented patterns of resource use, foraging, and mobility. One group lives in a village and disperses to the outlying area during the hunting and fishing seasons. The other group migrates year-round with their reindeer for hunting, trapping, fishing, and pasturage. Both groups are integrated into market and government systems through exchange of forest products for industrially produced goods, employment, taxes, and permitting. The information gathered through this research sheds light on contemporary indigenous mobility patterns connected to a variety of ecological, social, and economic factors.

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# CHAPTER ONE: CONTEXT OF MOBILITY

Mobility is a critical part of a foraging lifestyle where resources are seasonally and geographically disparate. Mobility has been investigated from the perspectives of patch choice theory (Sosis 2002, Begossi 1992, Smith 1991, Winterhalder and Smith 1981, Winterhalder 1977), Levy flight movement (Raichlen et al 2014, Brown et al. 2006), ethnoarchaeology (Kharinskii and Ziker 2013, Sellet et al. 2006, Kelly et al. 2005, Binford 1980), critical theory (Davydov 2012, Brandisauskas 2009, Anderson 2006, Oetelaar and Meyer 2006, Politis 1996), demography (Anderson et al. 2011), and economics (Pelto 1987, Sahlins 1972).

The research presented here incorporates empirical data on mobility and subsistence activities with an analysis of the constraints and opportunities of different patterns and means of mobility.

## How and Why Do Foragers Move?

The peoples of the Eastern Siberia forage and migrate in semi-mountainous region of forest, rivers, lakes, bogs, and tundra. The terrain and low density of resources make efficient mobility strategies of critical importance. Residents of this zone have developed a myriad of mobility patterns and technologies to enable more efficient foraging and logistical movement than is possible with pedestrian travel, the lowest common denominator of human mobility. Among these developments the domestication of reindeer and their use as mounts and pack animals has allowed the use of a larger territory than is possible on foot. The Evenki ethnic group has a wide spread population throughout Eastern Siberia and a well-developed system of reindeer husbandry (Vasilevich 1969: 3-6, 72-80). The spread of motorized transport in the 20th and 21st centuries has further augmented the range of transport options available to the Evenki. However, reindeer and other types of transport continue to exist alongside motorized transport. During the 2011 and 2012 field season, I researched with indigenous hunters and reindeer herders of the Katanga region of Eastern Siberia to learn how and why they move around the landscape. These experiences and the information collected illustrate some of the complexity of understanding and explaining the causes of behavior.

## Mobility in Context

There are many questions surrounding the mobility of foraging populations in relation to economic and social activity. Mobility is a process that involves human goals, means of transportation, natural and man-made transportation routes, and daily and seasonal environmental conditions. This research uses empirical data to describe and analyze the factors conditioning and causing mobility. People move as a part of accomplishing goals, such as transporting resources from the point of origin to the point of use, visiting friends or family who live at a distance, or gathering resources from the environment. The aim of this research is to analyze processes and patterns of mobility and how means of mobility are used to accomplish particular goals. The framework used to analyze mobility uses two pairs of categories: costs vs. benefits and opportunities vs. constraints.

These categories are oriented toward a pragmatic discussion of the many factors that affect mobility. Costs and benefits can be time, energy, money, or other measurable resources that result from mobility-related activity. In most cases, they will not be noted precisely, but compared to alternatives. For example, the costs of keeping a snowmobile vs. reindeer as a means of transport differ considerably. Snowmobiles require fuel and spare parts, whereas reindeer require pasture, training, and care. The costs of reindeer and snowmobiles are quantifiable, but not simply and directly comparable. Constraints and opportunities result from the structure of a pattern of residence, means of transportation, or other variable that may not have a precise or easily quantifiable benefit. For example, snowmobiles are quick and have a high payload but are noisy and frighten animals. Constraints and opportunities are a result of characteristics or circumstances and are distinguished from costs and benefits in that they have important observable effects but may not have economic costs or comparable alternatives. In most cases, there are significant barriers to manipulating constraints and opportunities; they are essentially structural factors.

The goal of this research is to explain how the Evenkis move and discuss the factors that structure their mobility. Since mobility is a widespread activity, connected with many types of goals, it may be beneficial to study it across contexts. There are a number of factors that prompt and structure mobility. Figure 1.1 illustrates the purpose and results of mobility in the foraging process and gives examples of some of the variables and results.

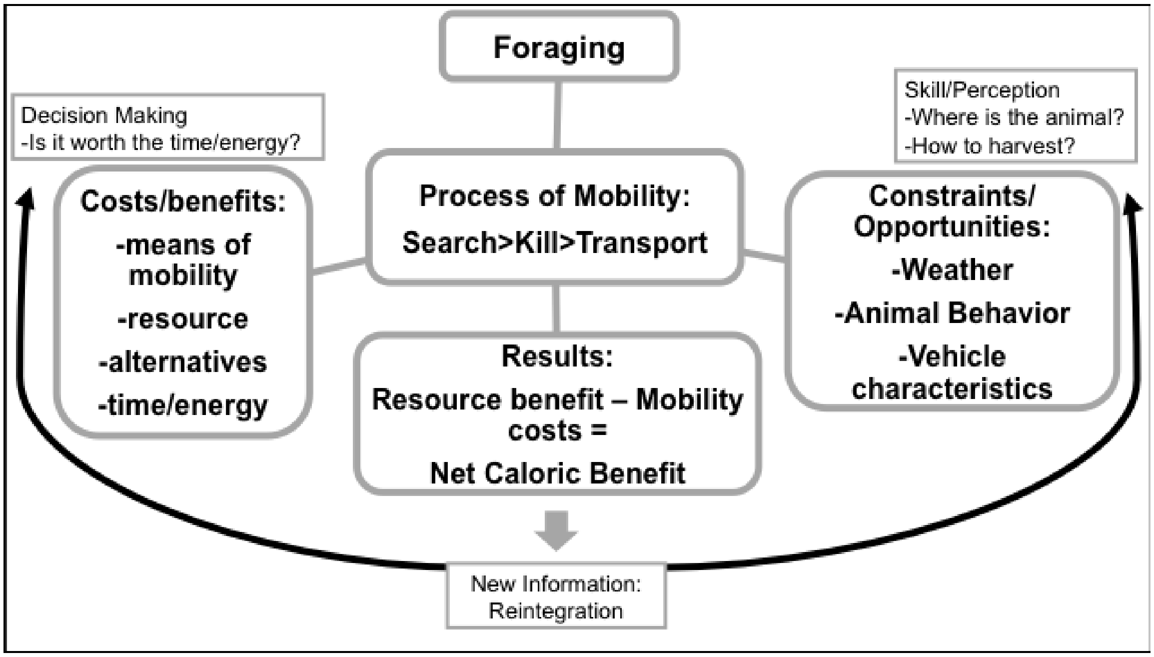


**Figure 1.1 Purpose and results of mobility in foraging**

A similar diagram could be generated for mobility related to other purposes, such as sociality or logistics. Foraging provides a good example because the dynamics are concrete and easily identifiable, in contrast to sociality where expending material resources to foster relationships can provide delayed or ambiguous results. The foraging process itself involves mobility to search for, harvest and transport resources from the environment. In this simplistic construction, there are two dimensions of mobility: economic and structural. On the left side of Figure 1.1 are some examples for economic factors and on the right for structural factors that affect the process of mobility. Patterns of behavior (e.g., a hunting technique, migration cycle) and physical resources (e.g., equipment, supplies, building) have economic and structural aspects.

The basic economic factors that govern mobility are costs and benefits. Generally, mobility itself is a cost of striving for a goal: the time and energy spent searching the woods for grouse is a cost of the number of grouse harvested. Additionally, opportunity costs concern alternative uses of time and alternate means of mobility. Since there are multiple means of mobility suitable for a given task – for example, moving during the snow season: skis, snowmobile, reindeer sleigh – there are opportunity costs for choosing a particular means of mobility over alternatives. A reindeer sled does not require petrol but is slower than a snowmobile and requires first locating and catching a team. In this case, the costs are in non-equivalent currencies of time, energy, and money.

The structural factors that shape mobility can include weather, environmental dynamics, animal behavior, seasonality, characteristics of a means of mobility, and residential patterns. These factors provide particular constraints and opportunities related to mobility. Continuing with the foraging example, the presence of snow makes it easy to track animal movements. In one sense, snow reduces search costs because it provides specific clues for where to search for game. However, it may be more appropriately viewed as a structural factor since it is outside human manipulation and is a circumstance that has particular constraints and opportunities.

The results of foraging mobility illustrated in Figure 1.1 are the net material benefit (resources acquired minus cost of mobility) and new information obtained during the process of foraging. The forager's cognitive processes noted in the rectangular boxes on the top left and right in Figure 1.1 are included to suggest how decision making and skill/perception affect the foraging process and to suggest that information gathered is a resource that can affect future foraging decisions (Mithen 1989, Gurven et al. 2006, but also Collings 2009). Discussions with research participants highlighted the value of information gathered about the environment as a resource and the value of practicing perception and analysis of environmental conditions and animal signs. In short, foraging is both a productive and a learning process.

The individual decision-making and analysis component of mobility is a topic that will be only partially addressed here. On one level, the Evenkis' mobility is a result of decisions and analysis. Evenkis' determine the timing, motivation, and means of mobility based on a number of factors. Factors such as weather, cooperation, and animal behavior are touched on briefly.

Similarly, an individual's skill and perception are aspects of mobility that are only partly addressed here. These factors were often brought up in many questions I asked of the Evenkis, but only partially explored. This information was largely qualitative and came up most frequently in interviews.

The cognitive and skill aspects of mobility were touched frequently during fieldwork but presenting this information below will be through description. Capacities of decision-making, perception, and skill are developed over many years. Some of this information regarding tracking, reindeer herding, and foraging may be similar to that found elsewhere in the ethnographic record. Important factors to recognize about cognition and skill are: there are considerable variations in efficacy, techniques differ in process but produce much the same outcome, and these capacities are developmental and situational.

## Literature Review

Three publications were foundational in developing the perspectives used here regarding mobility, technology and subsistence, the Evenkis' economy, and connection to the land.

One of the first studies of the Katanga Evenkis that integrated economic activity with environmental factors was published in 1990[1] by Mikhail Turov based on field research from 1970-1987 and extensive archival work (Turov 2010: 3-8, 117). His most intense areas of investigation were the use of reindeer for transport and explaining the links between the pastoral, fur harvest, and subsistence areas of the Evenkis' economy. In considering these factors, he found that the Evenkis' economy was complex, rational, and based on seasonal productivity and obtaining some resources was strongly influenced by access to reindeer for transport (Turov 2010: 18-57). The purposes of on foot and especially reindeer mobility in connection with economic activity are particularly relevant for the present work. The purpose of his work "was to reconstruct the… culture of mobile-reindeer herders… the Evenkis of Central Siberia at the turn of the 20th century" (Turov 2010: 116). Due to the reconstructive nature of his work, it is difficult to interpret some aspects of his observations regarding mobility and do more than contrast his model of the Evenkis' economy with the findings of this study. A narrow comparison of Turov's and my findings are in Chapter 7: Territories, Reindeer, and Sable.

The Evenkis have a particular orientation to residential space and the natural environment, both of which should be considered their home as Anna Sirina described through her research in the late 1980s and early 1990s (Sirina 2006: 1-12). The Evenkis have experienced fundamental changes over the past century in settlement, population, government, and subsistence activities (Sirina 2006: 23-30, 41-49, 70-78, 177-180). In the course of exploring these factors, Sirina examines the continuities of how the Evenkis

[1] I used an English translation published in 2010.

organize their living space according to principals of a mobile lifestyle, enact a spiritual ordering of space, and reside near the edges of settlements or in the taiga (Sirina 2006: 120, 130, 134-5, 191-92). Her work details the ethno-history of the Katanga region, the Evenkis' cultural resilience, and efforts toward social and legal recognition of their ways of life. Regarding legal and technical elements, Sirina gives an overview of contemporary land tenure issues, a thorough description of the types of caches and the structure and use of canvas tents (Sirina 2006: 122-131, 137-143, 180-188).

Extreme environments, such as the arctic, have been some of the last places to experience technological change and the resulting social, economic, and environmental impacts. Pertti Pelto (1987) studied these processes in the context of snowmobile adoption among Saami[2] reindeer herders in Scandinavia during the 1960s. Most motorized vehicles are only suitable for use on roads or waterways, limiting their utility to areas that have these travel routes, which are costly to develop or seasonally and spatially restricted (Pelto 1987: 5). While motorized vehicles rapidly dominated transportation outside of the arctic, reindeer, human, and dog transport remained the norm in the arctic up until the invention of the snowmobile (Pelto 1987: 4-6). Snowmobiles fit into a niche for arctic and subarctic populations because they are low cost, and the travel route they use has low geographical and developmental barriers (Pelto 1987: 8-12). Seasonal snow cover provided the travel route, and in comparison to roads route clearing labor is much less. Since most indigenous peoples in the arctic at the time had subsistence economies, one change of snowmobile adoption was "to create a sharp

[2] Saami is the modern ethnonym, Lapp was the term Pelto used but both refer to the same ethnic group.

rise in the need for cash" for initial purchase and ongoing parts and fuel costs (Pelto 1987: 9). Additionally, he wished to increase the visibility of technology as a topic of study for anthropology and study human uses of technology as a "heterogeneous and flexible system of adaptive responses" (Pelto 1987:10-11). Pelto's findings regarding reindeer mobility included:

- it was used for migrations and hauling resources,
- that reindeer sled and ski mobility were basically unchanged since prehistory up until 1960,
- travel by reindeer facilitated sociality
- and that the "pre-snowmobile transportation system did not require importation of any fuel or other material from the outside world" (Pelto 1987: 58-65).

However, with the availability of snowmobiles and the rapid decline of reindeer and ski transport, herders were not willing to travel on foot and use dogs to gather in the deer from the forest and smaller herds were brought back to the wintering and calving grounds (Pelto 1987: 68-9). The almost complete shift from using draught reindeer to snowmobiles as a means of transport occurred from 1962-1967 (Pelto 1987: 70-75). Some of the effects related to the adoption of the snowmobile were:

- "de-domestication" of reindeer as they came in less frequent and close contact with herders,
- grazing areas formerly reserved for domestic reindeer were occupied by wild reindeer,
- an increase in the number of round ups per year from one during the non-motorized transport period, up to six during the snowmobile period leading to increased stress on calves and pregnant females and a decline in population (Pelto 1987: 112-119).

Snowmobile adoption had unequal effects across the reindeer herding areas based on roundup practices, organizational policies, and more generally integrating the snowmobile into herding practices (Pelto 1987: 123-130). This is indicative of a period of adjustment in adapting the snowmobile into reindeer herding and the complications of political structures, terrain, and the organization of labor (Pelto 1987: 133-5, 149-151). It is important to note that the adoption of the snowmobile had different consequences for reindeer husbandry among the Saami than the Katanga Evenkis. Also, Pelto studied the process of snowmobile adoption, whereas at the time of this study snowmobiles have been widely available for several decades in the Katanga region. During his study, the Saami were actively integrating the use of the snowmobile into their economy and there were a variety of perspectives on its utility and application (Pelto 1987: 123-130).

## Research Questions

At the outset of this research, I developed general questions to address. These questions are in italics below with references to content that address these topics.

*1. What are the costs and benefits of using reindeer for transport?*

See Chapter 6: Reindeer Herding for a description of seasonal husbandry activities and reindeer use and Table 7.2 for analysis of non-motorized vehicles.

*2. What is the role of mobility in a foraging lifestyle of the Siberian taiga?*

For context, see Figure 1.1 above, quantification in Figures 6.4-7, yearly activity patterns Tables 6.1-2, and for analysis Chapter 7: Patterns of Mobility.

*3. What are determinates for using a particular kind of mobility in a rural taiga environment (foot, reindeer, boat, motor vehicle)?*

While “determinates” is perhaps too strong a term, for a summary of economic and characteristic factors see Table 7.1-2, vehicle choice by activity Figure 6.7, operational characteristics in Table 6.3 and Figures 6.8-9.

*4. How does the environment shape mobility in terms of season, geography, and resources?*

There are sharp differences in means of mobility used in the cold vs. warm seasons; see Chapter 6: Patterns of Mobility and Chapter 7: Patterns of Mobility.

*5. How is mobility structured in relation to foraging, living sites, pasture, availability of resources, sociality, and general logistics*[3]*?*

For foraging, see Figure 6.7 and Tables 7.1-2. Regarding living sites, pasture, and resources: see Tables 6.1-2, Maps 6.1-7, Figures 6.10-12, and Chapter 6: Transportation Routes. Sociality was embedded in many activities (Chapter 6: Time Allocation, Sable Harvest, Fishing, Cabin Building) but I did not find it to be a strong, primary factor in mobility goals outside of a very few instances that did not show up in the data and explanation. For topics relating to methods of studying sociality, see Chapter 5: Time Allocation, but also Chapter 7: Territorial Size, Reindeer and Sable Harvest for matters relating to cooperation and household size.

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[3] Within logistics, I include movement of cargo on a day-to-day basis, but also the use of caches (Anderson 2006 and Sirina 2006: 136-142). See Chapter 5: Methods.

# CHAPTER TWO: A BRIEF HISTORY OF EVENKIS AND SABLE

The Evenkis are part of an ethnic and linguistic group living throughout northeast Asia in present day Russia in the regions of eastern Siberia and the Far East, and in China in the region of Manchuria (Shirokogorov 1966: 13). However, archaeological evidence suggests that there are many similarities between the material culture of the Neolithic inhabitants of the Baikal region and that of the Evenki (Vasilevich and Smolyak, 1964: 623). These similarities between later Evenkis and earlier inhabitants of the Cis-Baikal include conical tents, clothing and ornamentation, fishing equipment, and boats, as pointed out by Okladnikov (Vasilevich and Smolyak, 1964: 623). These two lines of evidence are not necessarily contradictory, but fit with a hypothesis that proto-Evenkis migrated north and adopted some cultural traits of the Neolithic Baikal inhabitants while retaining their native tongue. Vasilevich and Smolyak note, “the origin of the Evenks [Evenkis] is the result of complex processes, different in time, involving mixing of different ancient aboriginal tribes from the north of Siberia with tribes formed in more southerly regions” and “the language [of the southern tribes] took precedence over the language of the aboriginal population” (Vasilevich and Smolyak, 1964: 623). Adoption of the local material culture could in some degree reflect borrowing from the aboriginal inhabitants methods of producing material items from available resources that are suitable for local ecological conditions and subsistence practices.

Russian expansion into Siberia during the 17th century was part of a search for furs that was loosely organized by the state and implemented by merchants and military leaders with Cossacks under their authority (Forsyth 1992: 28-30). As the Russians moved along the rivers of Siberia they built fortresses at strategic and convenient locations (Forsyth 1992: 35-37, 57). The goal of eastward expansion was to bring new tribes under the authority of the Tsar and impose tribute, called *iasak*, on Siberian populations (Forsyth 1992: 38). This form of tribute was collected in furs; sables were the most desirable but others were accepted as well (Forsyth 1992: 40). Given the migratory way of life of many indigenous Siberians, collecting *iasak* was difficult (Forsyth 1992: 66). To compel collection of *iasak*, Russians endeavored to capture hostages from the population and they recruited collaborators to aid them in the collection of furs and the maintenance of a social order beneficial to the Russians (Slezkine 1994: 20-1, 63-71; Forsyth 1992: 38-42). Usually, assessment of *iasak* was roughly on a per capita basis – several furs for adult males, a single fur for women, and fractional furs for children and the elderly (Forsyth 1992: 41). By the 1620s, Russian colonizers had reached the Katanga region via the Nezhnaia Tunguska River, where the Evenkis resisted for several years and began paying *iasak* by 1640 (Forsyth 1992: 57, 59).

In the nearly four centuries since the Russian colonization of Siberia, there have been considerable changes in the Evenkis' economy and culture. There were a few major trends impacting the Evenkis' economy and mobility. Before contact with the Tsarist Russian state, the Evenkis' were surrounded by societies much like their own in terms of sociopolitical organization or more hierarchical societies, such as the Buriats and Iakuts, who also imposed *iasak* (Forsyth 1992: 53-5, 58-59, 68; Armory et al. 2006) and with whom they had sporadic conflict (Forsyth 1992: 51). When the Russians expanded into eastern Siberia they expanded and regularized the collection of *iasak*, established forts to project force, and made permanent settlements (Forsyth 1992: 29, 36-7, 63-7). The process of *iasak* collection had characteristics of trade (e.g., exchange of furs for goods), but also forced collection of furs through threats of violence, beatings, and taking hostages (Slezkine 1994: 19-21). Harvesting furs for trade or tribute was probably not a significant part of the Evenkis' economy before the arrival of the Russians on their territories (Turov 2010: 19-21). Into the eighteenth century, the exchange of furs became more normalized as a form of trade, rather than governmental obligation, in which the operative factor was credit rather than violence (Turov 2010: 19-23; Slezkine 1994: 99-109). The products Evenkis traded for included metal goods such as cutlery, cooking ware, firearms, and needles; and supplies such as ammunition, flour, tea and cloth (Slezkine 1994: 99). These industrial goods were either replacements for products Evenkis could produce themselves or more efficient than they could make from locally available materials.

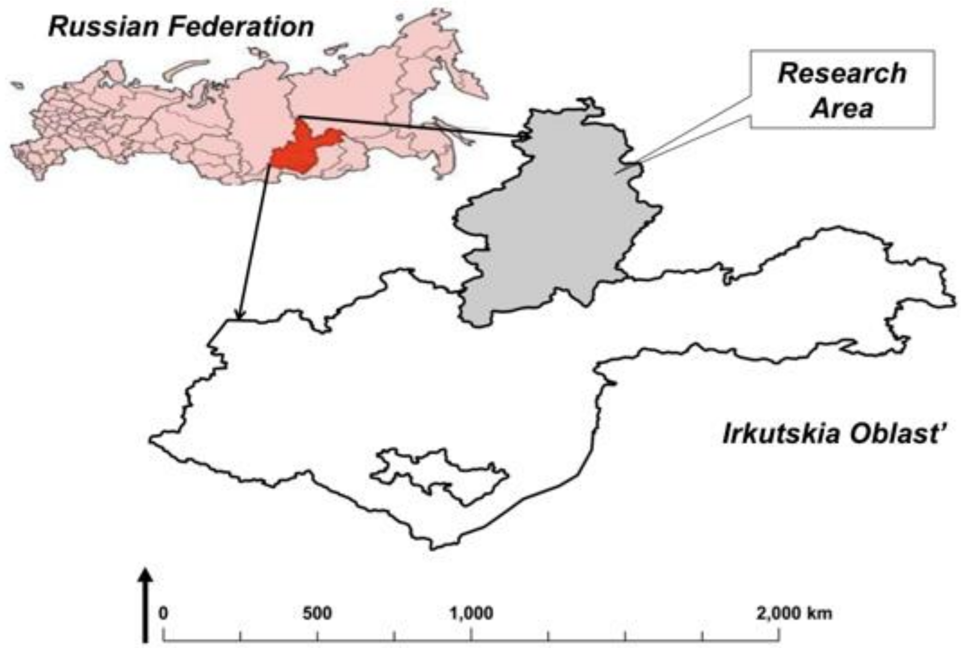
During the Soviet era, government policy was directed at transforming the Evenkis' family and clan-based society and migratory pattern of living into one based on sedentism, Soviet economic practices, and the division of labor (Turov 2010: 15-7; Sirina 2006: 38-45; Slezkine 1994: 204-216). In this process, the land was divided up into territories and the population was divided into specialists: hunters, trappers, fishermen, and reindeer herders on a seasonal or occupational basis. These policies varied over time and specific implementation (Sirina 2006: 38-49, Fondahl 1998). In brief discussions with research partners, they remarked that the state support and organization of subsistence activity (hunting, fishing, trapping, reindeer herding) in the Soviet period was a source of stability. After the collapse of these state organs in the early 1990s, the past two decades in the Katanga region have been a chaotic process of advocating for and adapting to government policy on land tenure and establishing market connections on both supply and demand sides (Sirina 2006: 173-188).

# CHAPTER THREE: ENVIRONMENT OF THE KATANGA

This chapter discusses the general ecology of the Katanga Region and how the Evenki population lives in this environment. The general characteristics and the behavior of many species important in the local economy are summarized from conversations with Evenki research partners.

## Katanga Region

The Katanga region is the northernmost part of Irkutskaia Oblast'. The regional center, Erbogachën, is located more than one thousand kilometers from Irkutsk, the Oblast' capital. There are no paved roads leading to Erbogachën. Instead, it is accessed by river, the winter road, or by plane, with flights one to two times per week depending on the season. Road transport in the region is complicated by permafrost and bogs, which make building permanent roads or railways difficult and prohibitively costly. In winter, temperatures can reach lows in the range of -50˚ Celsius, and it becomes possible to plow and maintain a winter road through the wetlands, rivers, and forests. This road is open from approximately December to March every year. In the summer, the village is accessed by boat or plane.




**Map 3.1 Irkutskaia Oblast' and Research Area**

## Climate of the Kochëma Region

The temperature profile is shown in Figure 3.2. The average maximum temperature is above freezing from May to September and below freezing from October to April. The transitional months in the fall are marked by ice formation and recession on the major waterways and in the spring by ice breakup. Please see Winterhalder for a thorough description of the climate of high latitude boreal forest environment in Canada (Winterhalder 1977: 97-125), which is in many ways comparable to this region of Russia.

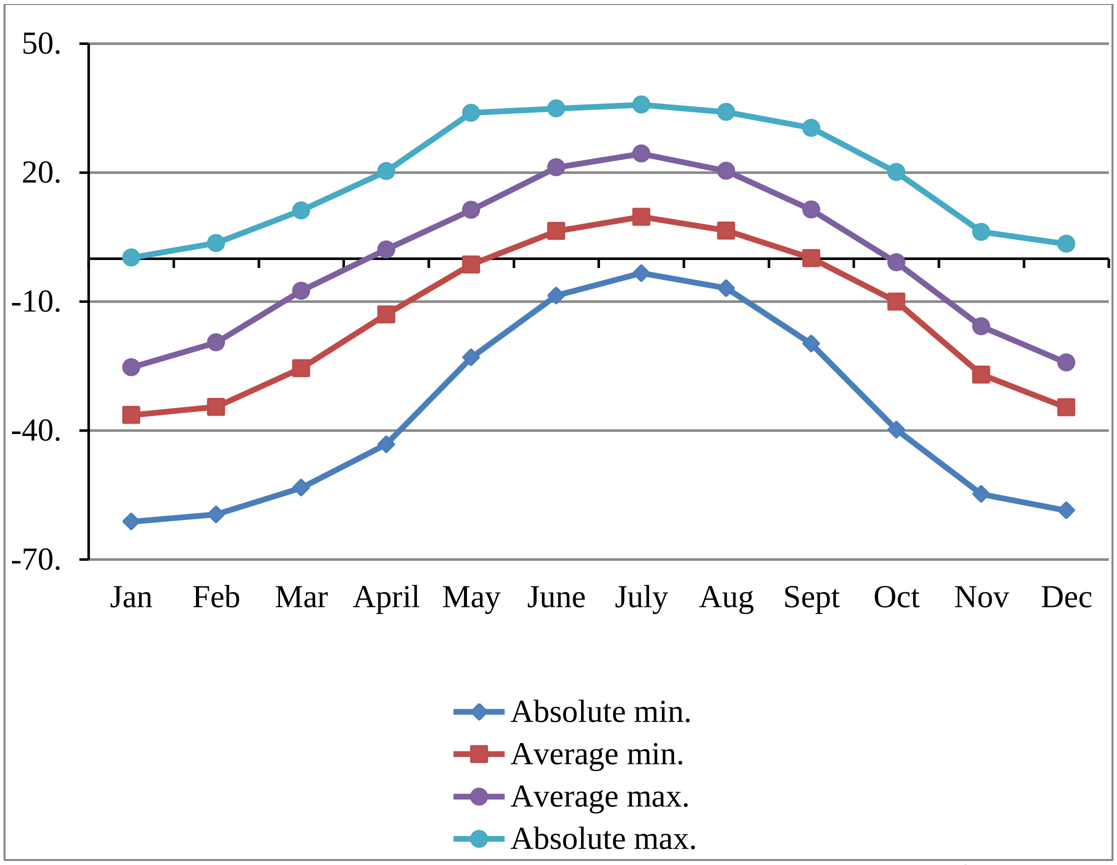



**Figure 3.1 Temperature (˚C) for Erbogachën, Russia[4]**

**Geographic Characteristics of the Khamakar and Kochëma Regions**

The two landscapes in which I spent the most time with my research partners were on the Lower Tunguska River near Khamakar (2011, 2012) and in the Lower Kochëma River Basin (2012). The relief and predominant vegetation of these two areas differ somewhat.

<u>Tunguska River Near Khamakar</u>

The right bank of the Tunguska downstream from the village of Khamakar and lower has rocky hills, ridgelines, and cliffs that mark the landscape. At the headwaters of

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[4] Adapted from *Klimaticheskie kharakteristiki Erbogachëna* (2014)

streams there are often large bogs called *mar'*, dominated by a low bushy plant called *marnik*,[5] favored by moose as winter fodder. This area was partially burned in the recent past and some areas have charred, fallen tree trunks and charcoal littering the ground. Some areas, particularly along ridgelines and hillsides, are covered in larch forest; see Picture 6.2 taken in fall, showing a large expanse of larch dominated forest. Older growth forest or "green woods"[6] as termed by the locals, of spruce, pine and fir, are sparse, save for a few along ridgelines and some waterways. These more mature areas of forest are more likely to support reindeer pasture (Jaakkola et al. 2006, Kumpula et al. 2007). Dense, brushy birch, alder and aspen dominate recently burned areas.

Verkhnaia Kochëma River Basin

The Verkhnaia Kochëma River Basin to the west of Erbogachën has markedly less relief and larger swampy areas. During the late 70s and mid 80s, forest fires swept large chunks of this region. These may have been the same fires that struck the Khamakar and Erbogachën region. Some of my research partners remember these fires very well. At the time of the 1986 fire, the Kochëma Evenkis were with their reindeer herd in camp and learned via radio that they were in the direct path of the fire. They and their reindeer were moved twice out of the path of the fire by helicopter. At the second location, they were on a swampy island in a lake. They tied their reindeer to the trees and poured water on themselves and the deer to keep from burning. One of the consequences of this fire was

[5] *Marnik* may be *Chenopódium*. Shirokgorov identifies *mar'* as "dense shrubs" *marekta* as the streams running through them (1929: 17); there is also a *Marekta* river in Chitinskaia Oblast'. Sirina identifies *marikta* as "river with a thicket of low birches" (2006: 81).

[6] "Green Woods" – conifers, forest that has not burned recently. Burned areas tend to be covered first with deciduous trees and larch, presenting a brown appearance in winter.

that the Kochëma Evenkis could no longer travel to Erbogachën by reindeer because pastures along the route were destroyed in the fire (see Map 6.4). Before the fire, they traveled all year round up and down the river valleys and making trips with reindeer to Erbogachën was much easier. Now they live on the upper reaches of the Kochëma and its tributaries. In this area, the landscape has slight relief and fewer and lower rocky hills than in the Khamakar region. There are significantly more wetlands. In summer, the only indication of crossing a river is that the water gets deeper. In the burnt areas along the Kochëma, standing dead forest has a dense growth of young larch, birch, and alder. The new growth is so thick that it is impossible to pass even on foot without cutting a trail. The main access routes between the territories of the Kochëma Evenkis are via river and the roads cut through the forest in the process of oil prospecting. Because of impassability, lack of lichen and other sources of fodder, this area is not currently used.

## Evenki Use and Relationship with Animal Species

There are several animal species that are particularly important to the Evenkis. Trapped sable furs provide cash income. Moose and wild reindeer provide meat. The major predators in the region – bear, wolverine, and wolves – impact the Evenkis' livelihood in various ways. The information below was gleaned from conversations and interviews with research participants. The Evenkis' use of and relationship with these animals are important to consider when examining their mobility and economy.

### Sable

Sable (*Martes zibellina*) is a medium-sized member of the mustelid family, harvested for their highly valuable fur. Throughout Siberia and the Russian Far East, there are a number of regional subtypes. These types differ in size and color from one another. For example, Evenkis described Eniseiskii sable as large with a tan/brown coat and Iakutskii sable as stocky and with a light undercoat and dark guard hairs. Barguzinskii sable is the most valuable type and is valued for its dark brown, sometimes black fur flecked with silver hairs. People in the Katanga encounter all three of these types. These regional types interbreed occasionally and each type has internal variation. Evenkis stated that Barguzinskii[7] sable was transplanted to the Katanga area in the early Soviet period for the purpose of establishing a viable population for trapping. Sometime prior to 1935, sable became extinct over much of Siberia, including the Katanga region, but expanded rapidly as a result of a moratorium on hunting 1935-1940/41 and reintroduction efforts (Nadeev and Timofeev 1955: 167-70, 177-8). Sable are generally the only furs buyers in Erbogachën will currently accept, so regardless of the availability of other fur bearing species, sable is the only one targeted for the monetary value of their fur. Furs of bear, wolverine, wolf, mink, and ungulate leg skins have monetary value but must be transported by arrangement to Irkutsk or another regional city for sale. Historically, there have been points to sell a variety of other furs in the Katanga region.

Sable is an omnivorous and highly mobile species. Interviewee comments indicate sables are usually solitary, but sometimes found in pairs. During the fall hunting season, when sables are hunted with dogs, sometimes two sables will be found on the same or neighboring trees. This is an infrequent but not extraordinary occurrence. Sables eat a wide variety of food, such as: birds, hares, carrion, berries, fish, squirrels, and

[7] Barguzin is a region on the eastern shore of Lake Baikal in the Buryat Republic, neighboring Irkutskaia Oblast’.

muskrat. Evenkis characterized sables as being one of two kinds: local and migratory. They explained that local sables are mature and live within a territory, while juveniles cross the landscape and may cover long distances. They also said that the intensity of sables' movement varies by season: in midwinter, they move very little; into February and March, they begin to be more active. Some Evenkis identified this period as the mating season, but Nadeev and Timofeev assert that this period of activity is connected with changes in reproductive organs and is poorly understood (Nadeev and Timofeev 1955: 65). There is evidence that the mating season is in the summer with a gestation of approximately 9 months (Nadeev and Timofeev 1955: 59-60). These conflicting observations are probably the result of reproductive diapause, common among mammals (Ptak et al. 2012), which may explain variability in mating and gestation periods. Sables produce litters of 3-7 cubs (Nadeev and Timofeev 1955: 62), an important factor to consider when interpreting Appendix C: Sable Population Density. Evenkis suspect that berry crops play a large role in affecting local sable populations. Depending on the availability of this food source, sable may be plentiful or locally disappear because they have migrated to other areas. Interestingly, in years when the berry crop is very good, sable neglect other resources and Evenkis stated this makes the fur weak and prone to breakage. The Evenkis sell all marketable sable furs they harvest. Sable carcasses will sometimes be included in dog food.

Moose

Moose (*Alces alces*) occupy a particularly important place in the subsistence economy as the single largest package of food in the taiga. Moose are highly valued for their meat and leg skins. Residents of the Katanga are allowed to hunt moose for household consumption. It is illegal to sell moose meat, but nevertheless it does happen – at times, one can find moose dumplings at stores and cafés in Erbogachën. Moose feed on a variety of aquatic and shoreline plants in addition to the leaves of deciduous trees. Evenkis noted that a particularly important winter feeding area is the *marnik*. Moose are usually solitary outside of mating season, although cows are with calves for the first year. Moose live within a territory, unless driven out by wolves. During mating season, bull moose can be aggressive and have been known to attack when spooked or shot. Similarly, cows are very protective of their young.

Reindeer

Wild reindeer (*Rangifer tarandus) a*re generally found in herds and also valued as game animals. Their behavior and habitat differ significantly from moose. Reindeer feed on a variety of plants, fungi, leaves, and lichen. During winter, they depend primarily on ground and arboreal lichens, which grow in patches of tundra and in some areas of the forest. They also dig through the snow to the plants on overgrown lakes (*kaltus*). In summer, they eat a wide variety of plants. In the late summer, when mushrooms are most abundant, they travel long distances, gorging themselves. Reindeer make a variety of problems for the herders of their domestic cousins. During the rut, wild bulls attempt to drive domestic cows away into their harem or enter the corral to breed with domestic cows. Herders keep a close eye during this time to drive away or kill wild bulls. The wolf packs that track wild reindeer are said to seek out domestic reindeer.

Bear

The Evenkis acknowledge bears (*Ursus arctos*) as masters of the taiga. While they have moral significance, encountering them in any season is dangerous. As omnivores, bears and humans target many of the same foods. They also break into cabins and caches in the taiga looking for food, whether it is present or not. They also hunt and kill domestic reindeer. Reindeer calving season occurs just after bears have left their dens and are looking to replenish calories lost over the winter. While the Evenkis respect bears, these attitudes do not preclude hunting or destruction of problem bears (Sirina 2006: 96-7; Vasilevich 1969: 216-218). In recent years, bears have been found with severe parasitic infections and at least one person has died from eating the meat and developing an infection.[8] The Kochëma Evenkis told me that for this reason they now avoid bear meat and do not even bother to take the skin if the individual is visibly diseased. Some Russians I spoke with reported no such problem and avidly hunt bear.

Wolverine

Wolverine (*Gulo sibiricus*) is a large member of the mustelid family. This creature lives a very mobile life and is notorious for stealing sable out of traps. A wolverine can ruin trapping success and leave a trapper penniless by stealing bait and sable from traps before they are checked. Wolverine are highly intelligent and cautious, so trapping them is very difficult. An Evenki[9] told a story about the wolverine's cleverness. Over several weeks, this man's son was checking sable traps but would find

[8] Trichinosis seems likely based on the symptoms described.

[9] An acquaintance met during the winter field season, 2012.

them recently robbed by a wolverine. It would come just before or just after him and so he caught very few sables. Judging by the tracks, the number of sables it was stealing there was half a dozen or more each time. He told his son to follow the wolverine's tracks to see what the it was up to. He found multiple caches of largely intact sable, buried in the snow.

Wolves

Wolves (*Canis lupus lupus*) are a threat to trapped sable, reindeer and moose. During the Soviet period, populations were kept small by state programs that funded and equipped specialized teams to trap, poison, and shoot wolves from helicopters. Since the cessation of these programs, wolf populations have expanded to levels most Evenkis have probably never seen before. They believe that wolves wantonly chase and kill moose and reindeer. Moose live in a particular territory and if attacked by wolves will often leave permanently. Wild reindeer migrate over long distances in small herds, often followed by wolves. The Evenkis believe that wolves target domestic reindeer and that in contrast to wild reindeer, domestic reindeer are particularly vulnerable to wolves. They say that when a wild reindeer is spooked by wolves it will run for a long distance, whereas a domestic reindeer will run some distance and then look back on its trail. Several Evenkis pointed out that the expansion of forest roads has allowed wolves to travel more quickly and decimate moose and wild reindeer populations. This is corroborated by research from Canada showing that encounters between wolf and caribou are more frequent near roads (Whittington et al. 2011).

Fish

The Evenkis harvest fish year round through mass catch devices such as nets and traps; a few have rods and reels, but this is more for recreation rather than food production. The species they catch include whitefish (*Coregonus vandesius*), greyling (*Thymallus thymallus*), dace (*Leuciscus leuciscus*), perch (*Perca fluviatilis*), burbot (*Lota lota*), ide (*Leucisus idus*), Crucian carp (*Carassius carassius*), and pike (*Esox lucius*). Both Evenki groups fish, but the Khamakar Evenkis have access to more productive waters of the Tunguska River system and preserve fish for use year round. The Kochëma Evenkis also fish, but mostly during the summer for daily consumption. The streams where they live are often quite small.

Small Game

The Evenkis harvest a variety of small game to supplement their diet. These species include members of the grouse family such as capercaillie (*Tetrao urogallus*), ptarmigan (*Lagopus lagopus*), ruffed grouse (*Bonasa bonasa*), black grouse (*Lyrurus tetrix*), mountain hare (*Lepus timidus*), and various kinds of ducks. Both the Khamakar and Kochëma Evenkis reported that hare populations are low. In years when the hare population is higher, they are caught with snares. Grouse are generally shot, with the exception of ptarmigan, which can be caught with fishnets strung across paths they frequent. Snaring and netting of hares and ptarmigan in the winter are more effective because this is the period of white phase for these animals, making them difficult to see against the snow. Other kinds of grouse retain the same coloration year round.

## Plant Species

The Evenkis use plant species for four main purposes: firewood, cabins, equipment, and food.

Over most of the subarctic, a considerable amount of firewood is need for heat over most of the year. The most desirable species of firewood trees are larch (*Larix gmelinii*) and spruce (*Picea abies, Picea obovata*), because they give off few sparks as they burn and leave little creosote in the firebox and flue of the woodstove. Pine (*Abies siberica*) is sometimes used for firewood but because of the higher pitch content, gives off sparks and leaves much more creosote, both of which create a fire hazard. Birch (*Betula platyphylla*) bark is used for starting fires, but the wood is only incidentally used for campfires and rarely harvested for firewood. Conifers are often found in dead, dense stands that make cutting and hauling a large amount of firewood quite efficient. Birch, although good firewood if it is cut green, split and dried, is not favored because it is bushy, often has small trunks and is generally not found it dense stands. In contrast to conifers, which dry out and remain standing after they die, birch retains moisture and rots in place, turning from living wood to pulp. The Kochëma Evenkis use dry standing pine to make smoky fires during the summer to keep insects off their reindeer. They also use old, partially rotten larch in their tents during the summer, which gives off very little smoke and sparks. Finding enough of this wood can be a problem, but it is favored because the canvas tent covering can easily light on fire.

Larch is favored for building cabins and other structures. It is rot resistant, strong, and generally straight grained. Propeller twist can be a problem but material from such trees can be put to use in non-critical areas or discarded. Most cabins on hunting territories are built with green wood, whereas house timbers are generally dried before construction. Floor and ceiling boards are less critical and any timber will suffice, although pitch seepage from most conifers except larch will be an issue, primarily for the first few months. Other conifers are used for cabin construction but they are more susceptible to rot. Generally, on hunting territories, the wood used to build a cabin is from the immediate surrounding area, making the location of tree stands an important consideration when choosing a site. In terms of rot resistance, the most critical timbers are those contacting the ground.

The Evenkis use wood for making a variety of equipment. These include: skis, backpacks,[10] and reindeer equipment: sleighs, saddles, hobbles, and guiding poles. These are some of the most common items made from wood. The Evenkis choose wood for different kinds of equipment based on its characteristics. Sled runners carry considerable weight and are subject to significant shock and friction. These are usually made from birch, one of the hardest woods in the region. Skis are made from conifer wood, which is lightweight and has straight grain that easily splits into boards. It is however not very strong and can crack easily. Other pieces of equipment are made from wood chosen based on its availability and desired characteristics.

The edible plant species the Evenkis use are largely berries, including: cranberries (*Oxycoccus*), bilberries (*Vaccinium myrtillus*), and cowberries (*Vaccinium vitis-idaea*).

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[10] Evenkis have two types of backpacks that are somewhat unique to them: the *tuktui* and *poniaga,* but they also use commercially produced backpacks, usually of canvas. The *tuktui* is essentially a box with shoulder straps. These are about the size of a person's torso and have an arched oval (kidney bean) shape from above and a square profile from the back. The top and bottom are made from wood and the sides from birch bark or sheet aluminum. The *poniaga* is a backboard, a shaped piece of wood with shoulder straps and ties for fastening cargo. Cf. Davydov 2012 for illustrations.

Cowberries are probably gathered the most often and are the easiest to find in large, dense patches. The size of berry crops varies based on weather patterns and local conditions. Cowberries grow well in the region because of the many exposed hillsides that offer plenty of sunshine. Berries are consumed within a few days of picking or if stored in a cool place until the onset of freezing weather, can be used over the winter. Evenkis make simple preserves by boiling or crushing berries in a hand-cranked meat grinder.

Other wild edibles available include the seeds of Siberian Pine (*Pinus sibirica*) and mushrooms. In other parts of Irkutskaia Oblast', Siberian Pine nuts are a favorite snack food, even sold on the street corners of major cities. Research participants said there are stands of Siberian Pine in the area but they rarely gather the nuts because the groves are too far away. Mushrooms abound in the forest but I only observed one instance of Evenkis eating them and was told that they were gathered with the help of a Russian friend. Evenkis of the Katanga region generally consider mushrooms to be reindeer food.

## Conclusion

The Evenkis' way of life and economy are based on local productivity and availability of particular resources. Since these resources are distributed over time and space, the Evenkis orient their seasonal and daily mobility patterns to gather resources throughout their region and individual territories. Predators are particularly important because they compete with the Evenkis for game and can harm the Evenkis' reindeer. Sable provide a cash income and checking traps and hunting involve a considerable degree of mobility. The Evenkis’ use of plants for construction, firewood, and food may be broader than covered here.

# CHAPTER FOUR: FIELD SETTING

During fieldwork, I was the sole researcher and lived with the Evenkis in their homes. For the most part, research was unscheduled as my primary task was to record their activities. Interviews were the only instances when we formally set aside time to discuss specific questions. Otherwise, since my research was about their activities, my questions fit quite well into the daily rhythm. As a guest and temporary member of the household, I helped as much as I was allowed to or could get away with. Such help as I gave was usually minor chores, such as splitting wood and bringing it inside. Exceptions included several days of cutting and hauling firewood with the Kochëma Evenkis and a few weeks of cabin construction with the Khamakar Evenkis. Also as a temporary member of the household, we pooled resources. By all measures, their hospitality outweighed my minor contributions.

**Table 4.1 Field season and research participants**

| **Group** | **Number of research participants** | **Dominant Topics** | **Field season** |
|---|---|---|---|
| **Kochëma Evenkis** | 2 households,<br>6 individuals | Reindeer herding,<br>hunting moose,<br>trapping sable,<br>logistical mobility | Winter 2012 |
| **Khamakar Evenkis** | 4 households,<br>8 individuals | Cabin construction,<br>sable hunting and<br>trapping preparation,<br>fishing, hunting moose | Fall 2011, Winter 2012<br>– very brief |

## Khamakar Evenkis

Khamakar is a village approximately 150 km down river from Erbogachën, with a population of approximately 90 people. The village is named for a nearby stream, the Khamakarka. There are few paid jobs in the village: postman, schoolteachers, mayor, storekeeper, meteorology station operator, and power station operator. Other sources of cash income include pensions and seasonal work away from the village. The surrounding environment provides a large part of the diet through gathering, fishing, hunting, and trapping, other than a few store bought staples, such as flour and pasta, and gardening.[11] Some research partners said that Khamakar is the only Evenki village in the region where the cultural norm of widespread food sharing is still practiced. Current and former village residents also confirmed that among Evenki families voluntary and request-based sharing is the norm.[12] Observations during fieldwork indicate this to be true, but also that social relationships in the village are complex. Other research partners indicated that food sharing is common and not particular to Khamakar village. Further investigation into sharing practices would be needed to clarify this issue.

The Khamakar Evenkis reside primarily in the village for most of the year. Residents make extended visits to Erbogachën to visit relatives and obtain supplies. The men move to hunting territories in the surrounding taiga for several months during the fall to hunt, trap, and fish, where they live in one or more cabins on their individual

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[11] Gardening fails occasionally because of the short growing season.

[12] There is one Russian family in the village, to whom the Evenkis sell meat, but do not reciprocally share with. This family also occupies virtually all of the paying jobs in the village.

territories. Women seem to rarely visit hunting territories, but do pick berries in the taiga and help net fish on the river.

In fall of 2011, I worked with a core group of three Evenki/Iakut men: Roma, Boris, and Vadim, whose main activities at the time were fishing, finishing a cabin, and preparing for the sable and moose hunting season. Also during the field season, two other men from Khamakar, Vlad and Kesha, visited the hunting territories we were living and working on and cooperated with Roma, Boris, and Vadim. Below are brief biographies of these men.

Roma was born in Khamakar in 1954. His ancestry is largely Iakut, although he had at least one Evenki grandmother. His ancestors moved south into the Katanga region from Iakutia to escape collectivization during the Soviet period. He was taught to hunt by his older brother. He hunts and fishes during the fall and works odd jobs during the rest of the year. In the past, he has worked in the timber industry and for resource exploration companies clearing roads.  He currently resides in Erbogachën and travels to and from his hunting territory downstream from Khamakar several times per year. In 2011, he exchanged territories with another man from Khamakar, Kesha. Many of his activities observed during the fall field season were connected with moving into and improving his new territory. His primary game is sable, caught through trapping and hunting. He hunts moose opportunistically because he does not have the patience or skill for stalking.

Boris was born in 1952. He lives in Khamakar. His ancestry is mostly Evenki, with some Iakut ancestors, although he was not very precise about his lineage. He hunts in the territory neighboring that of Roma on the Tunguska River. He did not serve in the military and has spent virtually all his life in the Katanga region. He has hunted in several different territories over the years. The parcel where he now hunts belonged to his older brother, before he passed away.

Vadim was born in 1978 and while he grew up in Khamakar, his family originally came from Iakutia. He lives in Khamakar and is married to Boris's daughter. Vadim grew up hunting and fishing, but also has worked at a meteorological station in southern Iakutia, just across the border to the east of Irkutsk Oblast'. In fall 2011, he hunted and trapped sable on a subsection of Boris's land. During the fall study period, he spent several days hunting with two other men from Khamakar, Vlad and Kesha, introduced below. He is particularly skilled in fixing motors.

Kesha exchanged hunting territories with Roma in spring 2011. He frequently hunts with his half-brother, Vlad. The territory he now occupies borders Vlad's territory. There were several reasons for the territorial exchange mentioned by different people: Kesha's new territory is larger and as a younger man he can use it more effectively, this territory borders that of Vlad and so the brothers can more easily assist one another. Finally, Kesha is the primary provider for his family in Khamakar through hunting, trapping, and fishing, whereas Roma lives in Erbogachën and works a variety of jobs in addition to hunting.

Vlad is Kesha's older half-brother. He has worked in resource exploration companies in Irkutskaia Oblast' and Iakutia. He is one of the few people with a newer house in Khamakar. His party shot 3 moose in the course of a week during the fall study period, parts of which he shared with Vadim (who participated in one hunt), Roma, and Boris. The remainder he took back to the village. Presumably to share with other residents.

Pëtr is from Khamakar and in his early 30s. I was able to interview him while he was in Erbogachën in the winter of 2012 about his hunting and land use. He hunts on a section of his father's territory. He said he is still learning to stalk moose, but has been successful a few times.

### Verkhnaia Kochëma Evenkis

The Verkhnaia Kochëma River flows into the Tunguska several kilometers downstream from Erbogachën. The two remaining nomadic reindeer herding families in the Katanga region live along the upper reaches of the Verkhnaia Kochëma River and its tributaries. The borders of their territories are about one hundred kilometers west of Erbogachën. When referred to collectively, I will call them the Kochëma Evenkis. Everyone in both these families speaks fluent Evenki among themselves, using only a few Russian terms. While they spoke in Russian with me, they said they found it tiring and prefer to speak Evenki.

### Kochëma – Kolia's Household

Kolia took over his father's herd and local fame as one of the last reindeer herders in the Katanga region. He is in his 50s and lives with his two sisters, Daria and Anastasia. Daria, his younger sister, helps manage the household. Anastasia is the youngest and takes a significant role in making household decisions. She left to the village on errands the day I arrived. Kolia hunts, cuts fire wood, takes care of the reindeer, and does other heavy chores. Kolia is skilled in stalking moose and hunts and traps sable, which provide a large portion of the family's cash income.

**Kochëma – Dima's Household**

Dima is 38; he is Kolia's nephew. He lives with his aunt, Natalia, and her cousin Pavel. Natalia takes care of the household and Dima and Pavel take care of the reindeer. Dima took over his father's herd and territory. He is skilled in stalking moose and hunts and traps sable. Pavel is in his 50s and has his own hunting territory sandwiched between Kolia and Dima, but has not lived there for a number of years and spends time living with both families.

# CHAPTER FIVE: METHODS

During both field seasons, methodology was substantially identical. Since my primary focus is on mobility and its connections to natural resource use and economic activity, GPS was used to track movement, trace routes, and map activity areas. In the process of carrying out various activities, many of the trails, rivers, and roads used by research partners were recorded. Daily activities and information provided by research partners were recorded in a notebook and several interviews were taken using an audio recorder. Research participants led a very active lifestyle, and I participated in a variety of activities, as allowed and appropriate.

## Methods

During fieldwork, I utilized a number of techniques for eliciting information and insight from research participants. Since much of my data collection concerns activities I observed or was engaged in much of the information was contextual and recorded immediately or at a convenient moment. Frequently, weather, time of day, or activity conditions frustrated or delayed data recording. My primary data recording tools were notebook, audio recorder, camera, and GPS device. Due to the effects of cold on battery life, the GPS unit and camera ran out of battery power and shut off several times partway through use. Research participants were cooperative and forthcoming; however, it was sometimes difficult to solicit information out of context. For instance, when asking about cabins, how many they had, where they were located, etc., some participants gave vague or equivocal answers. However, when passing by or staying in a cabin, they would freely expound on why a cabin was built in a particular location, when it was built, or how often they stay there. The names of all persons in the text have been changed.

**Table 5.1 Fieldwork Season**

| **Group** | **Season** | **Primary activities** | **Dates** | **Days** |
|---|---|---|---|---|
| Khamakar | Fall | Cabin building, fishing, trap checking | September 2nd to 23rd, 2011 | 21 |
| Khamakar | Winter | Traveling between Erbogachën, Khamakar and the hunting territory | January 28th to February 4th, 2012 | 8 |
| Kochëma | Winter | Caring for reindeer, trapping sable, hunting | February 12th to March 20th 2012 | 37 |

## Time Allocation

Time allocation data was gathered using two methods (cf. Paolisso and Hames 2010). During the fall with the Khamakar group, time spent on particular activities was recorded from beginning to end of a particular activity. For example, daily activity was recorded as: 9-10am – breakfast, 10-1pm – working on the cabin, 1-1:30pm – lunch, and so on. I also noted participants and further description of the day’s activities, events, and conversations in a journal. During the winter field season with the Kochëma group, I spent several days recording what all observable members of the household were doing at 10-minute intervals. The block sampling data for the Khamakar group was converted into 10-minute intervals to allow comparison with the Kochëma group.

To calculate the daily percentages of each activity, day length was nominally set at 12 hours for both the time allocation and mobility data below. The underlying assumption is that the non-sleeping activity period is 12 hours long. The consequence of this assumption is that if the actual period of non-sleeping activity differs from 12 hours, the proportion of activities would be over or under represented. In effect, the nominal 12-hour day acts as a crude constant, which may minimize proportional variations between activities and days because actual daily activity periods had a range of values. Also, this analysis does not factor in temperature or duration of daylight. Both are highly seasonal and differed between the two research periods. Of course, any number of measurable variables could change the probably of time allocation to one or another activity. However, research partners pointed out or implied that daylight and temperature are significant factors in particular activities. Due to data processing constraints, no attempt was made to control for variations of the non-sleeping activity period or seasonality, but it may be possible to do future analysis accounting for some of these factors.

The data on general activity patterns comes from both groups. The Khamakar data set was from 21 consecutive days during waking hours. The Kochëma data set is from 5 random days within the study period. These observations total more than 5,000 records of activities throughout the day. On any given day, I observed 1-4 people. These instantaneous scan sample records show the activity patterns for the Evenkis. Additional data on the locations, purposes, cooperation, and outcomes were also recorded. The analysis below focuses on activity patterns but the depth of information available may allow further exploration to address a broader array of questions.

**Table 5.2 Time Allocation Codes**[13]

| **Code** | **Activity** | **Source** | **Note** |
|---|---|---|---|
| C | commercial activities | original | Subsistence activity, sable, wood cutting/stacking |
| E | eating | original | Meals |
| F | food production | original | Fishing, hunting, foraging |
| H | housework | original | Cleaning, feeding the stove |
| I | individual activities | original | Relax, daytime rest, reading |
| M | manufacture | original | Making shelter, equipment |
| P | food preparation | original | Preparing meals, processing meat |
| S | social activities | original | Conversation, drinking tea |
| U | away | original | Very low frequency, omitted in results |
| X | other activities | original | Omitted |
| R | repair | KM | Motor, chainsaw, boat, skis, etc. |
| T | Transport/Loading/moving | KM | Logistical, preparing for travel, function check of vehicles |
| K | Care for Domestic Animals | KM | Feeding dogs, salting reindeer |
| SR | Searching for Reindeer | KM | Locating and/or bringing them home |

Time allocation data is useful for analysis of investment in different areas for a particular people group and for comparisons between groups (Hames 1992). Anthropologists have come up with different methods for quantification of many aspects of human behavior and time allocation offers the possibility of chronological, individual and group, and seasonal analysis of behavior between different cultures and environments. Time is a currency that is easily compared between different cultures and facilitates quantitative analysis.

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[13] The coding for these activities was adapted from Johnson and Behrens (1989). KM indicates addition by the author.

## Mobility Data

In addition to recording daily activities, detailed records of mobility and related activity were taken for both groups. These records contain the date, duration, purpose, means of transportation, origin/destination, and participants in each activity. The basic rule I used in distinguishing mobility events from simple movements was whether the individual(s) involved left the vicinity of the residence for a significant time or distance. For example, fetching a wrench from the garage by the cabin was not considered a mobility event, but cutting and moving wood from the nearby forest was.

The data on mobility also comes from both groups but was recorded differently. This data is essentially a focal follow of individuals engaged in mobility or related activities. It contains many of the same domains as the data on general activity patterns, but focuses on travel-related activity. This data set is not a subset of the scan sample data; it contains both data on mobility included in the scan sample data as well as any other travel that was observed outside of the scan sample dataset. Although it is a more complete data set in terms of details regarding mobility, it is not directly comparable to the scan sample data on general activity patterns. Unlike the time allocation data, this mobility data is a nearly complete record for both groups during the observation period.

I coded the mobility data according to the purpose of the activity and means of transportation. In addition to actual movement, time spent repairing a means of transportation and preparing for a trip. Through conversation with research participants and observation I determined the primary purposes of trips. In the data set, there are four columns for coding activity: Primary Code (one column), Secondary Code (two columns), and Means Column (one column).

**Table 5.3 Mobility Codes**

| Code Type | Code | Content |
|---|---|---|
| Primary | T | Transport |
| Primary/Secondary | SR | Searching for Reindeer |
| Primary/Secondary | F | Foraging mobility |
| Primary/Secondary | R | Repair or maintenance of a means of transportation |
| Secondary (T) | L | Logistical |
| Secondary (T) | W | Wood cutting, hauling and stacking |
| Secondary (T) | I | Individual |
| Secondary (T) | S | Social activities/visiting |
| Secondary (T) | C | Commercial - only used for sable trapping |
| Means | F | Foot travel |
| Means | B | Motorized boat |
| Means | P | Pogonka (canoe) |
| Means | K | Skis |
| Means | R | Reindeer Sled |
| Means | S | Snowmobile |

The Secondary Code columns were used to indicate whether the event was related to any activity other than that indicated by the Primary Code. This can include multiple goals, such as checking sable traps while transporting food stores or incidental activity, such as meeting a friend while traveling. In the first example, it could be said that the trip had multiple goals. Although coding activity as primary or secondary is potentially open to significant interpretation, I attempted to use two principals when coding the data. First, if research participants indicated the purpose of the trip, I chose the code that most accurately matched this purpose. Second, when there were many activities during the course of one mobility event (travel from point A to B), I attempted to judge which activity was more prominent or critical. One trip included checking sable traps along the route and carrying flour and pasta to store at the destination. Checking sable traps was the primary purpose of the trip since the fur is perishable and highly valuable, while moving the food stores was secondary because doing so was not time critical; it simply was beneficial to do in the course of the trip.

For the purposes of this research, it is not critical which goal is more important; in sum, they were sufficient to motivate the trip. In the second example, meeting the friend was incidental to the process of traveling and took little time during the trip but was included in the mobility data as a secondary purpose. Multiple goals and incidental activity are important to include because they may take significant amounts of time, involve gathering resources or information, and contribute to the overall purpose of the trip. There were many instances of multiple secondary activities; I established no rank among these activities.[14] There are two categories of secondary codes: one is an elaboration on the primary code of T – Transportation (L - Logistical, W - Woodcutting, I - Individual, S - Social, C - Commercial).

The other kind of secondary code relate to activities that were incidental to the primary purpose of the trip. These codes are simply duplicates of the primary codes, included if different from the primary codes, but in one of the secondary code columns of the data set: SR – Searching for reindeer, F - Foraging, and R - Repair.

[14] While I attempted to establish ranks beyond the primary and secondary codes, I did not find a satisfactory method. The secondary codes may be useful for future analysis.

In establishing codes for mobility activity, I attempted to highlight and distinguish between activities. The purpose of coding is to allow general analysis of time investment and therefore some activities are inevitably grouped under one classification. There are several splitting vs. lumping decisions I made that I would like to discuss briefly. The transport category is intended to encompass activity that involves moving cargo and people. These activities may be related to a variety of economic and social goals. The common factor with these activities is that they were essentially logistical in nature, in contrast to foraging, which involves additional considerations related to animal behavior. Transport activity was further defined in the secondary categories and can be analyzed according to these distinctions.

Sable harvesting was included in the transport category rather than foraging for two reasons. First, sable traps are rarely moved from year to year and trapping activity consists of baiting, setting and checking periodically to remove caught animals and reset sprung traps. Because sables are caught passively, the nature of travel is essentially logistical. Second, I consider sable trapping a commercial activity since furs are exchanged for money. Sable hunting on foot was not observed during the study period, but Evenkis described the process to me in detail. Sable hunting is a more active process and I would also code it as commercial mobility, but it was not observed during the field seasons. I think it is important to distinguish sable harvesting from foraging for food because it has a direct monetary result in contrast to food gathering, which may be personally consumed, shared, and only in rare cases sold.

Searching for reindeer is a type of mobility that I chose to put in its own category. Keeping track of the herd’s location and bringing it back to the residence is a critical part of maintaining the herd's proximity and security. Repair of means of transportation is an important aspect of measuring mobility. Outside of damage caused by a specific incident, repair is an incurred cost of mobility. Sometimes repairs occur within a mobility event, stopping to adjust a drive belt during travel, at others repair and maintenance are undertaken while stationary, such as greasing the clutch at regular intervals. Although repair and maintenance were not always part of a mobility event per se, it was recorded in the mobility data set when a means of transportation was the object. In the Mobility Data section of Chapter 6, I made limited use of the secondary code data.

The means code for mobility activity indicates the type of transportation used. These codes include all types of mobility observed during the study periods. The only means of mobility not observed, but used at other times of year, were reindeer with packsaddles, riding reindeer, and some types of motorized vehicles. These include truck/auto, all-terrain vehicle[15] and helicopter. These vehicles are rarely owned and used by rural Evenkis. Motorcycles with sidecars are common even in small villages, but they are not really used outside of the village to my knowledge. Similarly, the Evenkis use commercial aviation routes serviced by helicopter between their home villages and Erbogachën, but this type of mobility is not especially relevant to the topics discussed here. The codes for means of mobility the Evenkis do use in their pastoral and foraging activity are: F – Foot travel, B – Motorized boat, P – Pogonka (canoe), K – Skis, R – Reindeer Sled, and S – Snowmobile.

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[15] A tracked, amphibious vehicle, the size and configuration of a tank (*Gusenichnyi transporter-tiagach* 2014).

This code allows analysis of what means of mobility were associated with what kinds of activity. Here again there may be slight ambiguity in determining a single code for a particular mobility event since virtually all means of mobility involve some walking during the course of a trip. Instead of making primary and secondary codes for means of transportation, I simply chose the most dominant means of mobility. For motorized means of transportation, the amount of walking is insignificant: the boat or snowmobile is loaded and then traveled on for a particular distance and duration. However, some activities using a motorized means of transportation involved a lot of walking. For instance, cutting wood involves carrying and loading wood onto and off a sled towed by snowmobile or reindeer. In this process, more than half of the time is spent in manual labor, but I chose to code the activity under snowmobile rather than walking. Since walking is always implicit in other forms of transportation to varying degrees, I chose to code according to the most prominent means of transport. Realistically, woodcutting would not have been done on a production level without some means of hauling large loads. Conversely, traveling a few hundred meters by boat back to the cabin completed a two-day trek on foot and I coded this event as foot travel. Where possible, I recorded times of use for different means of mobility that were used alternately in the course of one trip.

In some instances, stationary activity is included in time, distance, and speed calculations for trips. Some of this is rest periods during travel or stationary activities during travel, such as making tea, setting traps, or checking vehicle function. One example of how this affected speed calculations was during a walking trip: while moving speed was 3-5 km/h, intermittent pauses to complete quick tasks lowered the trip average to about 1 km/h. Similarly, cutting and hauling wood involved multiple trips over a short distance that were recorded in one record, effectively showing the time and speed as if all the wood were loaded and hauled in one trip, the number of loads was recorded.

## Maps

The maps and quantitative information related to them are derived from GPS data and hand drawings on printed topographic maps. I used the ArcMap 10 Geographical Information System to process data gathered using a handheld GPS to geographically define information such as territorial boundaries, cabin sites, and activity areas. It was possible to verify some hand drawn information, such as cabin locations, using GPS data. In general, the locations of hand drawn features relative to the same features located using GPS were accurate within the limitations of the paper map's scale and detail. Exceptions were very minor and related to the proximity of similar geographical features, such as in one case a cabin was drawn approximately two kilometers from its geographical location. In the Katanga region, hunting territory borders are registered with the government using hand drawn maps of river drainages. In some cases, territorial borders were established using photocopies of these maps and in others from Evenkis' drawings on topographical maps of their own borders (cf. Sirina 2006: 80-83).

## Conclusion

The use here of time allocation and mobility data is one of the first applications of these methods to subarctic hunter-gatherer-pastoralists. The time allocation data includes over five thousand observations and the mobility data consists of one hundred thirty-one events over fifty-four unique days. Despite the limitations of the data collected and the methods used, there is a firm foundation for accurately representing the general time allocation and mobility activities of these two groups of Evenkis.

Outside of the circumpolar north, a number of anthropologists have used time allocation in their research (e.g. Hill et al. 1985, Hawkes et al. 1997), but in the arctic and subarctic time allocation studies are relatively rare. In a study of the Chipewyan foraging economy, Irimoto uses time allocation data to show seasonal and gender differences in the investment in different activities (Irimoto 1981). Along with this study, the data presented here on the Evenki are among the first applications of the block sampling method to subarctic foragers.

# CHAPTER SIX: RESULTS

This chapter presents the data on the Evenkis' economic and mobility patterns. While these topics are interrelated, I have chosen to organize the information according to three themes: patterns of activity, patterns of mobility, and economy. The first section presents data on the Evenkis' patterns of activity over daily and seasonal time scales. This data contextualizes mobility and economic activities among all other uses of time throughout the day and year. Second, patterns of mobility cover purposes, technical capabilities, and environmental factors. Third, I describe the Evenkis' economic activities with an emphasis on mobility in production and organization.

## Patterns of Activity

The Evenkis use of time is based on the decisions they make on how to structure their livelihood according to seasonal, environmental, biological, and economic factors. Some of these will be touched upon in the next two sections of this chapter. This section describes daily time allocation and seasonal activity patterns.

### Time Allocation

Time allocation data gives a general quantitative view of the Evenkis daily and seasonal patterns of activity. The two Evenki groups studied have different household composition, economic emphases, and I studied with them during different periods of the year. Time allocation data has several purposes. It shows time investment in particular activities and allows quantitative comparison between activities, seasons, individuals, and groups. This data also provides a backdrop to examining the Evenkis mobility patterns, which are a part of many economic, social, and pastoral activities. The time allocation data for each group will be presented along with pointing out any significant factors for interpreting the data. It is important to note that the mobility data in the next section is not a subset of the time allocation data. While there is some overlap in the activity they record, they are effectively two separate data sets. Please see Chapter 5 for clarification.

### General Time Allocation

The general time allocation data describes the relative amounts of time spent by each group in different categories of activity. In interviews and conversation, Evenkis described generally what kind of activity they emphasized during the observation period. This information will be discussed in the context of the quantitative data results. The results for each group are presented separately below. The time investment percentages describe how an average day was spent, by averaging the time investment of all group members across all categories of behavior on sampled days.

### Time Allocation – Khamakar Evenkis

The time allocation data for the Khamakar Evenkis comes from fall 2011 while three research participants were traveling to and living at their hunting territories. One was in the process of settling onto a new territory he had taken over the previous spring. The other two were helping him finish a cabin at his hunting territory and with other tasks. They occupy a neighboring territory during the hunting season.

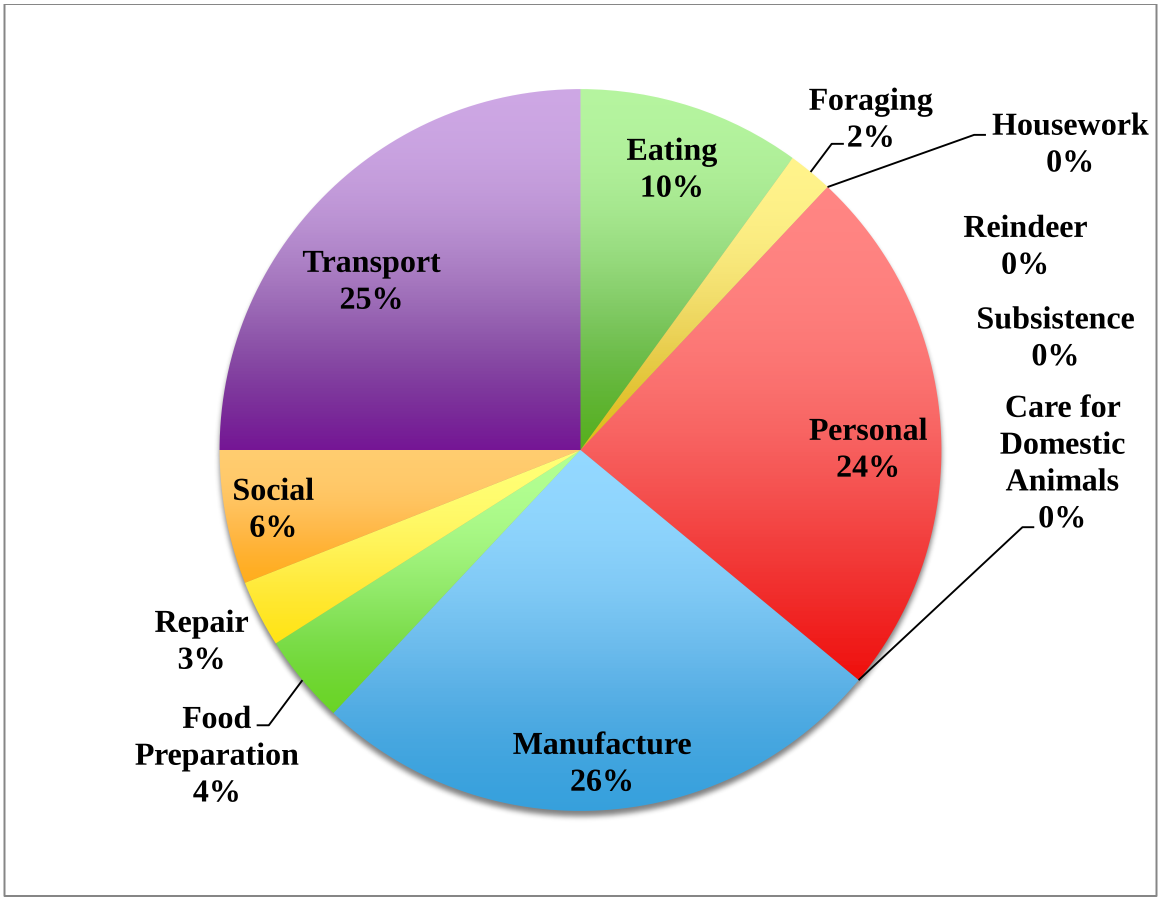


**Figure 6.1 Khamakar – Scan Samples**

The most prominent categories of activity during this period were manufacture, transport, and personal. Transport consisted of several activities. First, it includes 4 days of travel by boat from the village to the hunting territory in the taiga. Second, it includes about two weeks of daily travel between a cabin and a worksite via boat. Third and finally, 4 days of foot travel were spent checking trap lines. Manufacture consisted largely of finishing a cabin some distance away from the residence site. Personal activities consisted of activities like reading and relaxing, usually in the mornings and evenings, but not including sleep. The other activities are too minor to detail, consisting largely of routine daily tasks. Notably, foraging occupied a small proportion of time. Foraging activity was limited to checking fishnets and shooting ducks while moving up and down the river. The observations of Khamakar Evenkis are only of males while they were living on their hunting territories.

In interviews and conversations, the Khamakar Evenkis talked about this period being for preparing for the hunting season. At the time, the hunting seasons for sable and moose had not yet begun. The goals they talked about included finishing a base cabin at a hunting territory, walking the trap line to maintain trails and account for traps, and fishing to build up stores for the season before the river froze. Checking trap lines involved walking the trails all over the hunting territory to take account of the number, condition, and location of traps in preparation for the season. Traps are left in the taiga year round and can be disturbed by animals and weather. Fishing involved checking (1-2 times daily) a series of nets in a backwater in the river near the cabin using a canoe, cleaning the catch (removal of heads and entrails), and salting them in a barrel.

In some respects, the scan sample for the Khamakar Evenkis may not be representative of an average pre-hunting season activity pattern. First, a considerable part of the transport activity was affected by two activities: 4 days of travel from Erbogachën to the hunting territory downstream of Khamakar and daily travel between the cabin construction site and a cabin where the work group slept. Most residents of Khamakar have hunting territories in the surrounding area, however, one of the research participants lives in Erbogachën and traveled 4 days and 180 km to reach his hunting territory. Residents of Khamakar have a much shorter trip to reach their hunting territories, in the range of 30 km. For about a week, the Khamakar Evenkis made daily trips between a cabin construction site and a cabin where they slept. This travel would not have been done if there were a finished, habitable cabin. Second, cabin construction at hunting territories is an infrequent occurrence. If properly maintained, a cabin can easily last several decades. There was a cabin at the hunting territory in question but it was damp, had a low ceiling, and was quite small. Third and finally, due to cabin construction and the fact that one of the Khamakar Evenkis was moving onto a new territory, the time that two other Khamakar Evenkis allocated to manufacturing and transportation reflect assistance to this individual. In a more typical year, each person would prepare for the hunting season more individually.

<u>Time Allocation – Kochëma Evenkis</u>

The general time allocation for the Kochëma Evenkis comes from mid to late winter 2012. The scan samples come from two households and each household contributed approximately one half of the records.

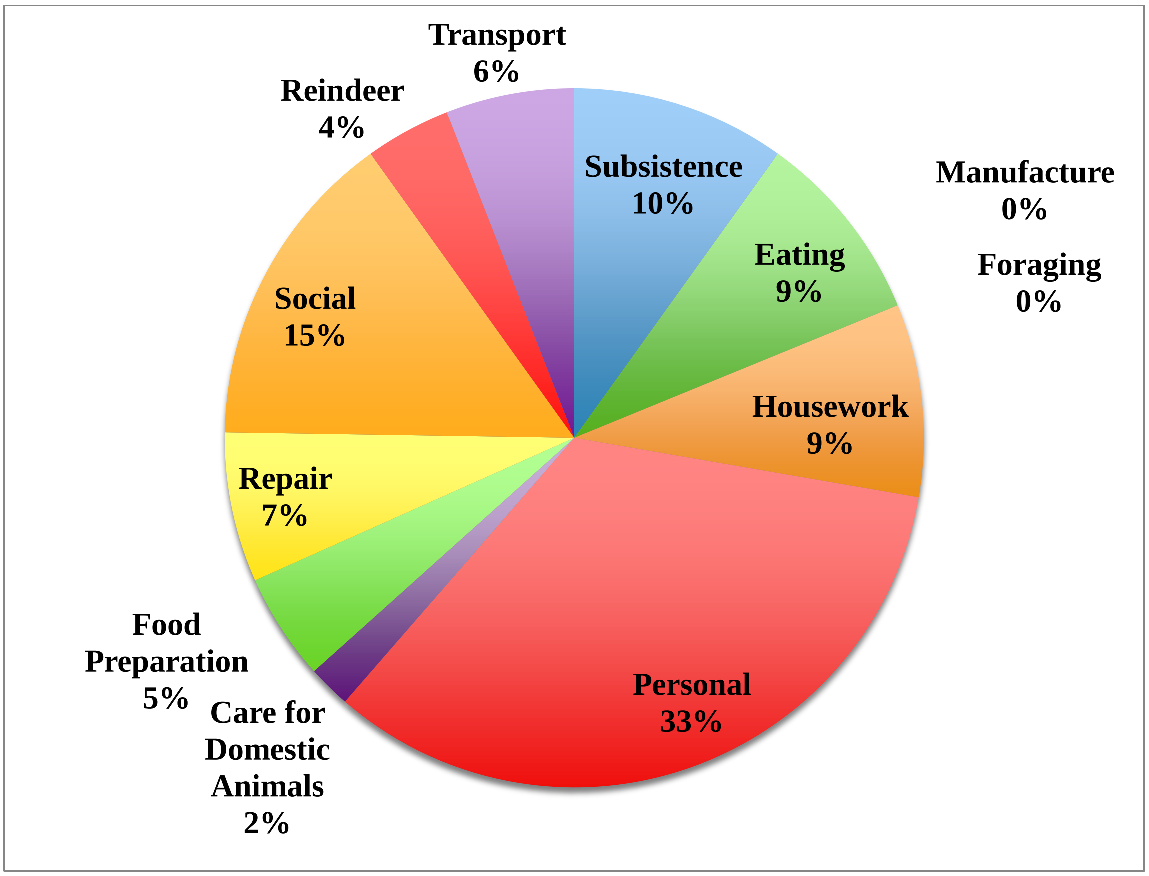


**Figure 6.2 Kochëma – Scan Samples**

The Kochëma Evenkis live in the taiga and migrate periodically throughout the year with their reindeer herds. Unlike with the Khamakar Evenkis, few activities clearly dominate. In fact, the two largest percentages of time were spent in personal (33%) and social activities (15%). Activities with economic aspects include subsistence (10%), repair (7%), transport (6%), reindeer (4%), and care for domestic animals (2%). Notably, domestic activities such as food preparation, care for domestic animals, and housework are more diversified than with the Khamakar group. This is in part because the Kochëma Evenkis have households with male and female members. The scan sample data have a male bias since I spent the most time with the male Evenkis.

The mid to late winter period for the Kochëma Evenkis is largely a period of rest. The preceding winter and fall periods involve high-intensity activities, including frequent migrations, moose hunting, and sable trapping. In broad terms, the activities observed during the field season can be described as rest and maintenance. Personal and social activities constituted a large percentage of the day. Subsistence activities consisted largely of closing sable traps for the season and woodcutting. Both of these activities were intermittent. The Evenkis cut firewood over a number of separate occasions lasting from a few hours to a few days. Closing sable traps sometimes occurred in the course of movements along trap lines, at others during dedicated trips.

The scan sample for the Kochëma Evenkis during the study period is probably typical. Nothing they said or did indicated that their activities were unusual or disrupted for this time of year. There are two aspects of the situations surrounding the scan sample that do bear explanation. First, I worked primarily with the men in the household and followed them about their daily tasks. This of course introduced a sampling bias in the records gathered skewed towards the men's activities. When their activities were in and around the household, I recorded the women's activities as well, but because the focus of my research was on mobility and the men were far more mobile the sample is not balanced concerning gender.

Comparing the Khamakar and Kochëma Evenkis

The Evenki groups have somewhat different economic emphases and I studied with them in different times of the year. However, they both live in similar conditions and engage in a similar pattern of daily activity in most respects. Figure 6.3 below shows the proportion of time spent in some of the most prominent activities.

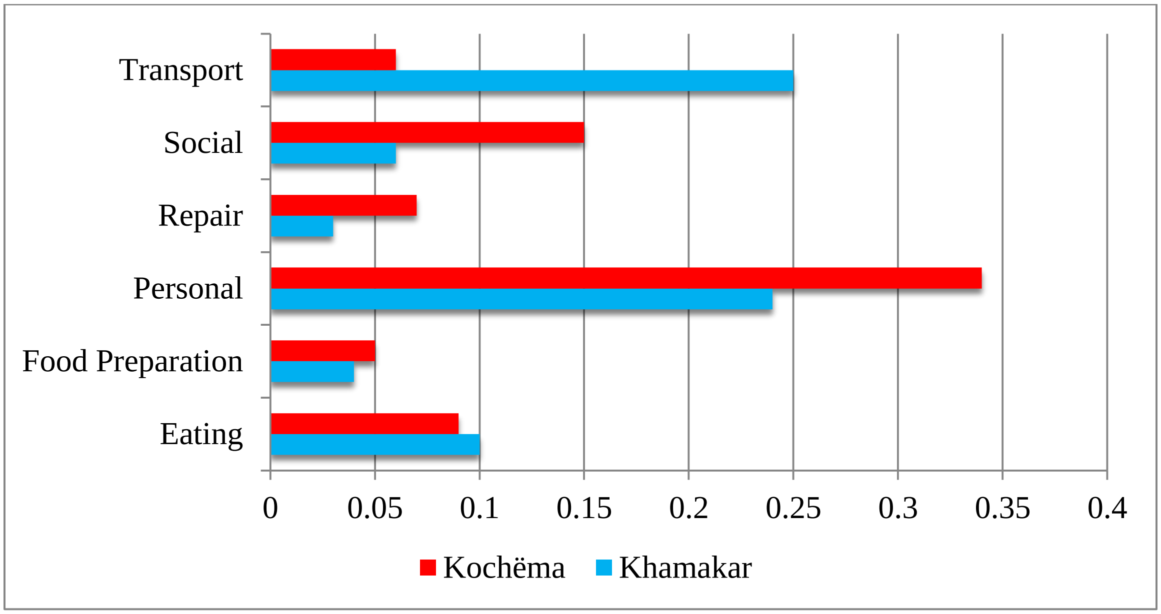


**Figure 6.3 Proportion of Time in Activities by Community**

In part, Figure 6.3 addresses the question of whether there are actual differences in time investment in common daily activities during different time of the year. The choice of these categories is somewhat arbitrary, but excludes hunting and trapping, which are presumed to be highly seasonal and includes transportation and repair, which can occur for many reasons throughout the year. The rest of the categories are daily activities, but are not directly determined by seasonal factors. Although Figure 6.3 shows time investment for two different groups and two different times of year, there are several notable differences that bear discussion. For most daily activities, the proportion of time spent is basically identical for both groups. The areas where there are differences are personal and social activities, with the Kochëma Evenkis spending more time in both categories. The transport category shows the most striking difference between the two groups. The comparison of these groups proportional time investment in these different activities confirms the descriptions of each group's seasonal activity above. Specifically, that the Khamakar Evenkis spent more time in transportation and manufacture, consistent with preparation for the hunting and trapping season and finishing the cabin. The Kochëma Evenkis' time figures are consistent with their stated emphasis of rest and maintenance and the data show that proportionally they spent more time in these areas.

Seasonal Activity

The activity patterns over the year are similar between the two groups, differing primarily in activity patterns, tasks relating to reindeer and type of residence. The charts below summarize the yearly activity patterns for the male population of the Khamakar and Kochëma Evenkis. On each territory among both groups there are two or more cabins, one of which the occupant designates as the "base cabin" because it is the closest and most accessible via large river or main trail. These cabins are often where they spend more time and so tend to be larger in size for comfort and storage of equipment and supplies.

The Khamakar Evenkis seasonal round involves residence in particular places and mobility for particular purposes. Their pattern of residence is heavily simplified here but is meant to show the most common practices. People with territories closer to the village may visit family and bring or take supplies more often than those farther away. Since the village is located on the shores of the river, there is frequent traffic between the village and river for fishing in the open water and ice periods. The Khamakar Evenkis pattern of mobility has two basic types: within hunting territories moving between up to a half dozen cabins and origin-destination-return trips, such as between the village and hunting territory, or the river to fish and returning to the village. During the hunting season, male Evenkis spend most of their time at hunting territories, but make short trips to the village to deliver meat and fish, visit family, or obtain supplies. By the official close of trapping season in February, most have returned to Khamakar or Erbogachën to sell their furs. Around this time residence is more according to choice rather than the demands of the hunting and trapping season in the prior months: individuals choose some combination of living at the hunting territories to hunt moose and small game, the village, fishing, and traveling to Erbogachën. Additionally, from mid-winter through summer is a period available for seasonal jobs for some Evenkis.

**Table 6.1 Khamakar Evenkis – Seasonal Round**

| **Period** | **Location of residence** | **Mobility** | **Activities** |
|---|---|---|---|
| **Spring/Summer**<br>June to late August | Village, short trips to hunting territories | Day trips along river, adjacent forest or hunting territories | Fishing and hunting, Provisioning and visiting in Erbogachën, seasonal jobs |
| **Fall/Winter**<br>September to January/February | Hunting territories | Within hunting territories, and between territories and village | Fishing – open water and ice, hunting: moose, sable, fowl; occasional trips to village, esp. New Years |
| **Late winter and Early spring**<br>February to May | Village, hunting territories | Between hunting territories, village, Erbogachën | Fishing, end of hunting season, selling furs in Erbogachën, seasonal jobs |

One major factor affecting the mobility of the Khamakar Evenkis are periods of freeze up and break up of ice on the Tunguska River. At freeze up, the river changes from open water to intermittent ice cover for a number of days, a period of thin ice, and finally ice thick enough for walking and snowmobile travel. The process is reversed in the spring, with the ice being of marginal strength and dangerous to travel during both transitional periods. The chunks of ice during breakup in the spring pose more of a problem for watercraft than the thin ice in the fall, which may form and stay overnight or melt during the day and is thin enough for a boat to break through. During these periods, travel is risky. Due to the proximity of Khamakar village and associated hunting territories to the river, long distance travel can be difficult during these periods. Seasonal freeze and thaw affect the Kochëma Evenkis similarly with the exception that their long distance travel routes cross smaller streams. These waterways freeze and thaw more quickly, but may or may not pose a hazard to break through depending on depth.

The Kochëma Evenkis have a seasonal round that is deeply tied to the needs of their reindeer. The chart below differs from the Khamakar chart to encompass the different seasonal periods and activities of the Kochëma Evenkis. The main difference in the mobility of the Kochëma Evenkis is that their mobility is cyclical and nomadic; they move among at least six cabins and perhaps twice or three times as many summer camps. Just like the Khamakar Evenkis, they obtain supplies from Erbogachën, but the Kochëma Evenkis trips are usually more directed, because of their need to keep track of their reindeer. This need to monitor and care for reindeer in various ways throughout the year is in part what makes their seasonal round distinct from the Khamakar Evenkis.

**Table 6.2 Kochëma Evenkis – Seasonal Round**

| **Period** | **Period and type of residence** | **Migration Distance and factors** | **Reindeer Control and Care** | **Other Activities** |
|---|---|---|---|---|
| **Calving**<br>Late April to Early June | 30 days<br>Cabin/tent | N/A<br>Calving | Corral; assistance with calving, protection from predators | Minor hunting and fishing |
| **Summer**<br>Early June to Early September | 10-15 days<br>Tent | 5-15 km<br>1) Water, 2) prepared wood, 3) pasture is everywhere | Smudges and insects;<br>Tending and cutting wood for 6-9 smudge fires | Minor hunting and fishing |
| **Rut**<br>Late September to Late October | 30 Days<br>Tent/Cabin | N/A<br>End of bug season/beginning of rut; reindeer come to smudges late in the day | Corral;<br>Keeping wild bulls away, adding and repairing fences | Watching for predators, preparing for hunting season |
| **Fall**<br>November to February | 10-30 Days<br>Cabin | 9-22 km<br>Hunting vs. reindeer care | Salt;<br>Herd monitoring, keeping reindeer near dwelling site | Primary Hunting season: moose and sable |
| **Winter**<br>February to April | 10-30 Days<br>Cabin | 9-22 km<br>Avoiding overgrazing, keeping deer near cabin | Salt;<br>Herd monitoring, keeping reindeer near dwelling site | Hunting meat, provisioning from Erbogachën, firewood production |

The Kochëma Evenkis migration pattern is to a significant extent based on the needs of their reindeer. Other works on the Katanga Evenkis' seasonal activities compare well with the information gathered here (Turov 2010: 72-83, 90-110; Sirina 2006: 79-99). The frequent migration schedule in the summer is purposed to allow reindeer to feed on the highest quality pasture and gain weight quickly. These frequent moves necessitate a living structure that can be quickly moved from place to place. The Evenkis tents are conical and supported by poles that are left at each summer campsite and used regularly from year to year (see also Sirina 2006: 120-6). Cabins are sometimes close to summer campsites, but the warm temperatures make them stuffy and uncomfortable to live in compared to tents. Similarly, a cabin retains heat better than a tent and provides more living and storage space for the winter when more time is spent indoors. The residence pattern of using both summer and winter living sites follows a rough plan of dividing the number of sites by the length of the season and staying at each site for approximately the same number of days, but also migrating to arrive at particular locations throughout the year. During the summer, Evenkis migrate with their reindeer over a large part of their territory and plan to arrive at one of several fall corrals by the start of the rut. During the winter, they migrate among their cabins, which are fewer in number than their summer camps, and plan to arrive at the farthest east and closest cabins to Erbogachën in mid to late winter, around late January and early February. At this time, they travel to Erbogachën to obtain supplies and sell their furs. The time of travel to Erbogachën has shifted due to a variety of factors. They also may travel at different times of the year or travel by boat in the summer.

## Patterns of Mobility

The Evenkis' mobility involves patterns of use, routes, the technical capabilities of vehicles, traveling conditions, and decisions regarding when and how to move. The first section quantifies patterns of mobility among several households from the Kochëma and Khamakar Evenkis.  Next, I describe the physical aspects of mobility: transportation routes, means of mobility, and conditions of use. Finally, I describe some techniques of motor vehicle operation and discuss the decision making involved in vehicle choice.

### Mobility Data

These data detail mobility events for both groups of Evenkis according to purpose, means of transportation, origin-destination, cargo, persons involved, and other dimensions. This information shows how different means of transportation are used during particular times of the year. The time in the field was before and after the primary hunting season, however, both groups of Evenkis were quite mobile during the study periods. Like the time allocation data, mobility data were coded according to the purpose of the trip. The data below address individual mobility, the purposes of mobility, types of mobility used for particular purposes, operation vs. repair time, and vehicle use by purpose and use.

In Figure 6.4 below, the letter after the name indicates which community the individual belongs to: Khamakar (T) or Kochëma (K).

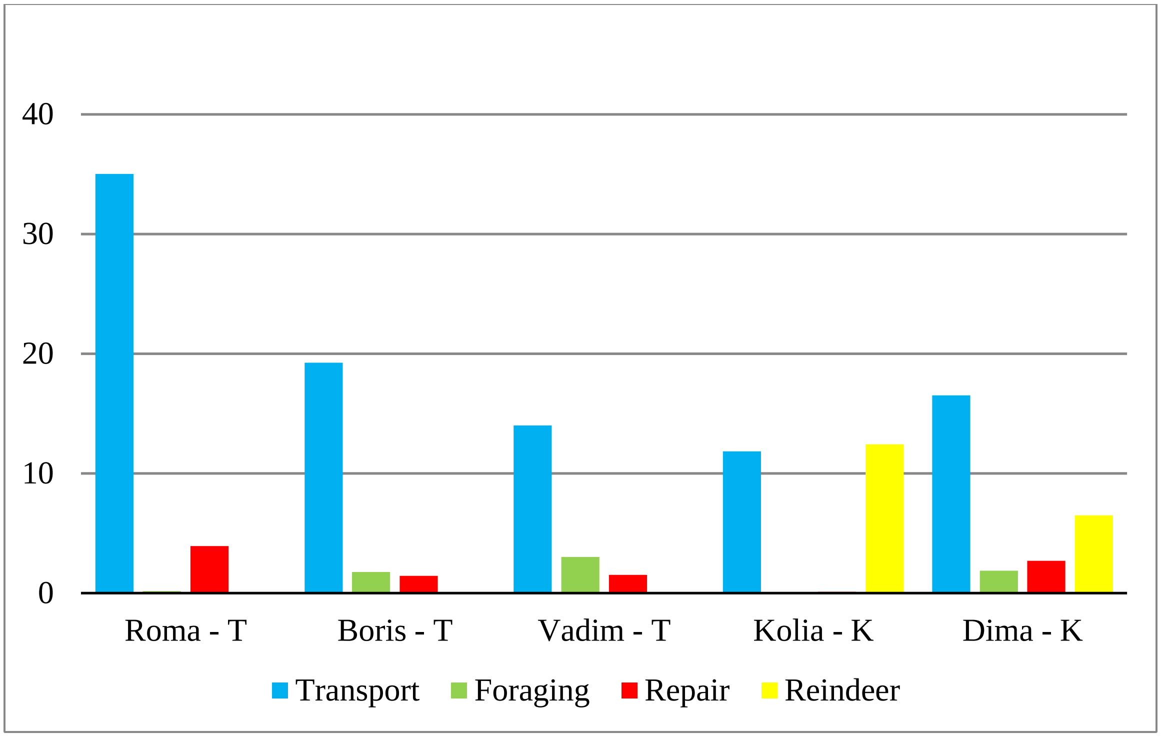


**Figure 6.4 Individual daily percentages by mobility category**

This graph depicts the average percentage of time spent on each category of mobility during a 12-hour day. There are a number of factors that explain the individual variances in mobility. For both groups, there are low levels of foraging mobility because the periods of observation were before or after the most active hunting period. Only the Kochëma Evenkis possess reindeer. The percentages are an average amount of mobility activity per day for each individual during the period of observation. The reindeer category in Figures 6.4-6 refers to reindeer-related mobility: locating and bringing them back to the corral at the living site rather than using reindeer as a means of mobility.

The differences in mobility within the Khamakar group were circumstantial and organizational. Roma and Boris set out from Erbogachën by river together, accounting for a large amount of their transport time, somewhat less than 19%. At Khamakar, they picked up Vadim and continued on to the hunting territory. Both Boris and Vadim spent little time in transport after the initial trip to the hunting territory. Roma spent significant amounts of time on the journey from Erbogachën tinkering with the boat motor, so his repair time is higher, 4% vs. <2% for the others. He also walked his trap line over three days, while Boris and Vadim stayed at the main cabin, which is why Roma's transport percentage is much higher at 35%. While at the hunting territory, Vadim and Boris took over primary responsibility for foraging (checking fishnets), amounting to 2-3% vs. Roma <1%.

The Kochëma group similarly shows differences in mobility due to circumstantial and organizational factors. Kolia spent more time searching for and checking on his reindeer herd, 12% vs. Dima's 6%. Wolves had attacked both herds in recent weeks. The most recent attack was on Kolia's herd and they killed a few of his reindeer. He went to check on them frequently after this and in particular search for a group that had split off a few days after the attack but later returned. Dima spent less time with his reindeer because they were fairly close by and staying in one herd. In terms of transport, Dima made a trip to Erbogachën by snowmobile and a trip lasting several days to his outlying cabins to close sable traps and tidy up, amounting to 24%. Kolia made a few short trips totaling 12%. Dima also went hunting several times (2%) and repaired snowmobiles (3%).

The daily percentage of mobility shown in Figure 6.5 illustrates the relative proportion of different kinds of mobility, and is merely a composite of Figure 6.4 above to compare the two groups.

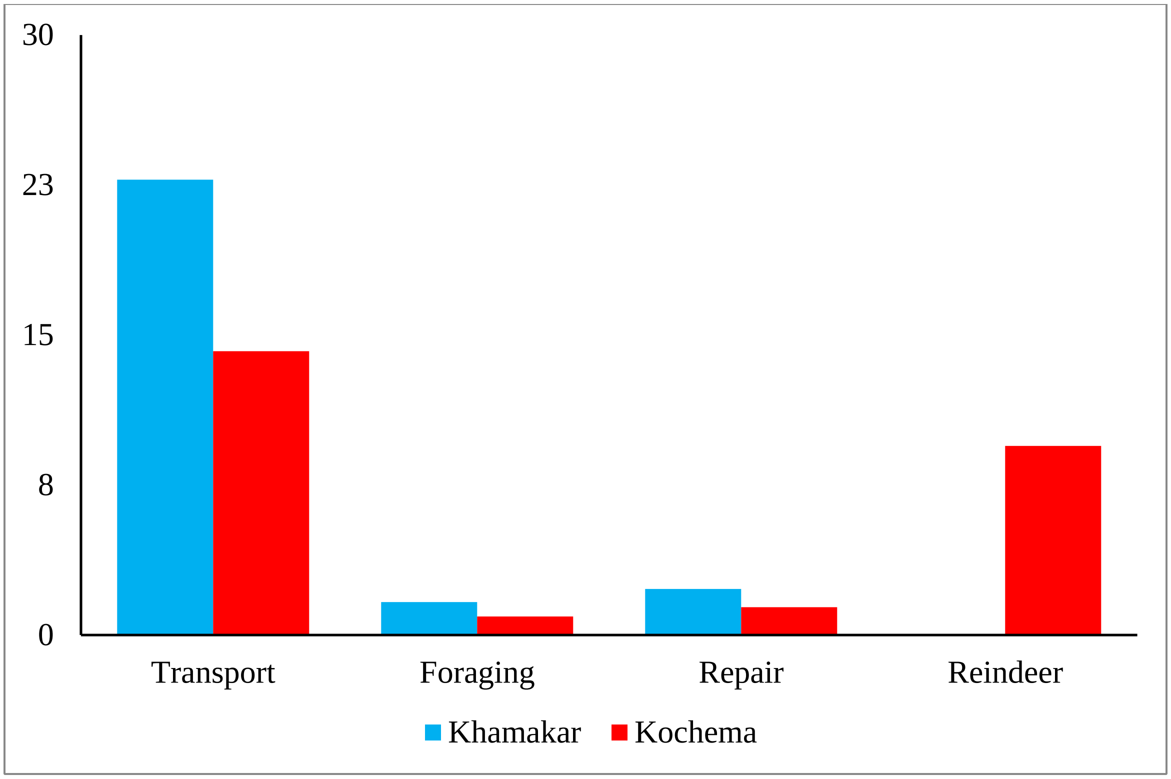


**Figure 6.5 Daily Percentage of Mobility Activity**

For both groups, transport of a logistical nature accounts for a large portion daily mobility. Foraging and repair have small shares of daily mobility. The Khamakar Evenkis engaged in more transport mobility on a daily basis (23%). However, the Kochëma Evenkis engaged in an equal amount of daily mobility when transport and reindeer-related mobility are summed (14% transport + 9% reindeer = 23%).

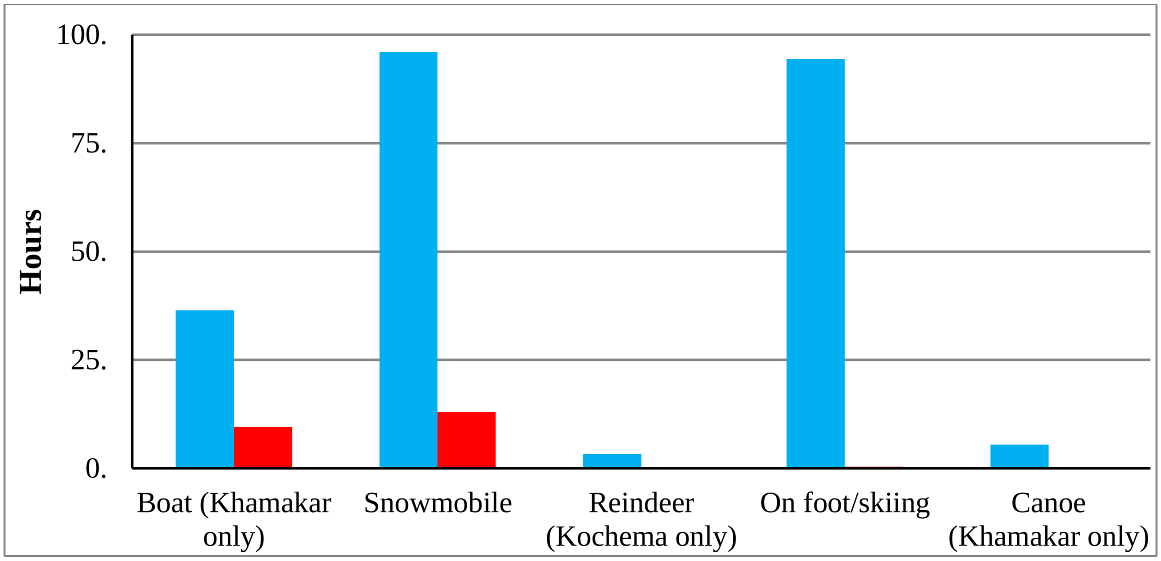


**Figure 6.6 Transport vs. Repair Time**

When looking at different means of transport one thing to consider are the incurred costs of operation. These include fuel and parts but also repair time. As a vehicle is used, whether it is a motor or a pair of boots, it undergoes wear and will eventually need repair or replacement. The Evenkis use all of their equipment hard, some of it is homemade, some is Soviet era, some is newly manufactured and all of it needs periodic repair and adjustment to remain in a functional state. Figure 6.6 above only shows the hours of operation and repair observed during fieldwork. Additionally, boots were worn while outdoors in all seasons, but the repair hours only reflect observed time and the usage hours only are from when they were the primary means of mobility during walking long distances or skiing. In categorizing mobility activities other than actual travel I folded preparation of a means of transport into repair. Therefore, time spent preheating a snowmobile engine was classified as repair for the purposes of Figure 6.6, but it is more accurately called preparation. Since this is a minor distinction, I did not deem it necessary to create a separate category for preparatory or maintenance activity.

**Picture 6.1 Servicing snowmobile clutch**

Figure 6.6 illustrates several factors. First, the repair time for motorized vehicles is much higher than human or reindeer powered means of transportation. For boats, repair time was 9.5 hours, compared to 36.5 hours of usage time. This amount of repair time is not normal. The outboard motor had a malfunctioning ignition coil and it had to be frequently adjusted to function at all.[16] After it was fixed towards the end of the trip, using a spare given by Vlad while we were at Khamakar, there were no more problems. For snowmobiles, repair time was 13 hours, compared to 96 hours of usage time. This is probably a more normal amount of repair time, as snowmobiles have possibly more daily maintenance than boat motors, which only need petrol, oil, and spark plugs if everything else is running fine. Snowmobiles must have the clutch lubricated every ~100 km and be preheated with a torch in cold weather. Reindeer and canoe usage incurred no repair during the field seasons and on foot/ski travel incurred a very low repair at 0.4 hours. The Kochëma Evenkis did repair winter boots, but I was not present to make a note of the time. This consisted of re-sewing a few centimeters of torn stitches on winter boots. The percentage of repair for footwear and skis that I did note consisted only of repairing skis.

There are two complicating factors regarding snowmobiles. First, one of the snowmobiles threw a fan belt, overheated, and partially burned the piston rings. It functioned, but sub-optimally and frequent temperature checks and waiting for it to cool contributed to repair time. Second, some of the repair time was spent fixing an exchanged snowmobile: fixing this one would allow the snowmobiles to return to their original owners. Since the goal was property recovery, rather than a favor or service, I included this time. As above, regarding the boat ignition coil: mechanical issues and relationship obligations are as much a part of movement around the landscape as travel conditions. In a larger sample, it may be worth adding more categories.

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[16] The running joke about Soviet boat motors: "*before you could hear nothing but cussing and yelling on the river, but now all you hear are motor sounds*" – now that many have switched to more reliable Japanese or American outboards.

Figure 6.7 addresses how members of each Evenki community used different means of mobility.

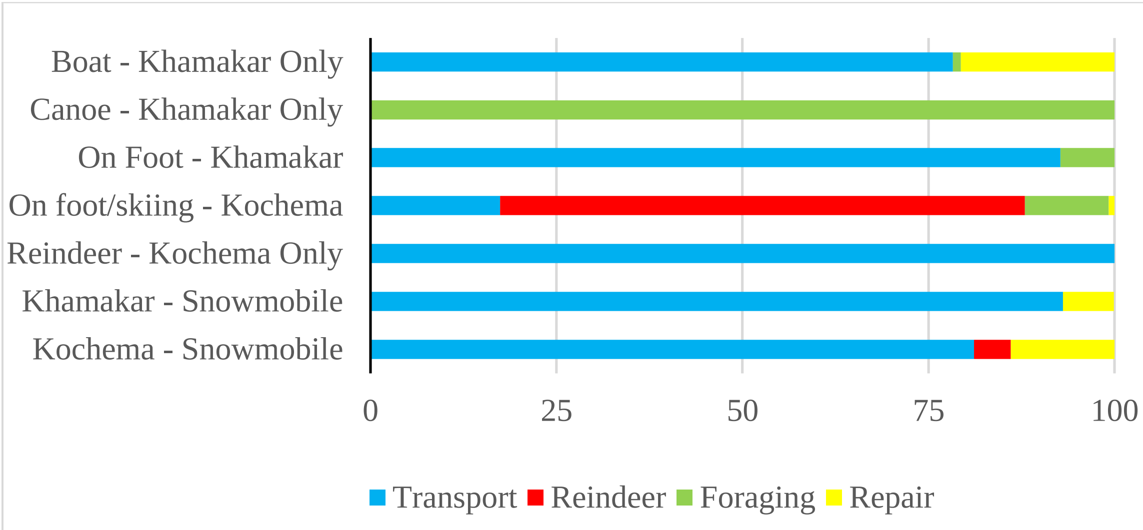


**Figure 6.7 Percentage of mobility by means, purpose and community**

For modes of mobility common to both groups, snowmobile and foot travel, the Kochëma and Khamakar Evenkis show similar patterns of usage. The Kochëma are of course unique in that they use foot and snowmobile travel to search for their reindeer. This difference aside, both use foot travel for transport and foraging. Transport time consisted partly of loading and unloading vehicles and partly in travel across the landscape. Foraging consisted both of hunting and fishing. Snowmobile transport was chiefly logistical. The Kochëma Evenkis did use the snowmobile to search for their reindeer. After finding them, they followed the frozen snowmobile track on foot, harnessed their reindeer, and led them home. The Kochëma Evenkis only used their reindeer for transport purposes: hauling firewood or household items during a migration. There was one instance of when reindeer were used in the process of a hunt, but this was only to search for tracks, rather than in the actual pursuit, which was on foot. The Khamakar Evenkis used boats almost exclusively in a transport capacity; there were a few instances of hunting birds but this was incidental to other trips, when they shot at ducks on the water or on the shore from the boat. For all kinds of foraging activity, human powered means of transportation dominate. For transport, motor vehicles and reindeer were most often used. The one exception, by the Khamakar Evenkis, was to travel the trap line by foot (30 hours), which accounts for almost three times the duration of all other activities time in the foot travel category (11 hours, 20 minutes for all other tasks).

Transportation Routes

In the Katanga region, there are several types of transportation routes, each bears particular kinds of traffic. Most of the travel done by Evenkis during fieldwork occurred on regional and territorial routes.

Regional Routes

Regional transportation routes include the Tunguska River and the winter road.

During the warm months, the Tunguska River is a major transportation route. Commercial goods, petrol, and food are barged down the Tunguska River, with the best conditions lasting from after thaw to mid-summer. Hunters and fishermen also access resource areas via the Tunguska River. From late summer to freeze-up around mid-October, the river is usually rather low and problematic to navigate. Luckily, the river bottom is mostly sand, so choosing the proper channel is an issue, but breaking a propeller or tearing the bottom off the boat is less of a concern than on the smaller, rocky rivers in the region. For these reasons, smaller rivers are rarely navigated from mid-summer through fall. Barges are also sent to the villages downstream of Erbogachën in the summer to supply them with staples. During the warm months, the Tunguska River is a primary transportation corridor for the Evenkis to access fishing areas, visit friends and relatives, and purchase supplies in Erbogachën. The river system throughout most of the Katanga region provides an opportunity to transport people and supplies between villages and foraging areas. The Tunguska River, because of its size and consequent reliability as a transportation corridor, is particularly important in linking Erbogachën, a point of supply for industrially produced goods, with the rest of the region.

The winter road is prepared and cleared with plows and heavy trucks across the land, and aside from tree removal it is undeveloped. In the winter it is a major route for supplies coming into stores in Erbogachën via truck from the rail lines and urban centers to the south.  This road runs approximately north to south, from the paved roads and rail lines in the south, parallel to the Lower Tunguska River, and connects with other roads of this type into Iakutia.

Rural Transportation

Rural transportation routes include forest roads, sled trails and smaller rivers.

Resource extraction companies clear roads across the landscape for seismic surveying of underground deposits. Locals call these *profil'*, borrowing the Russian surveyors' technical term; the English technical term is seismic line. For the sake of simplicity, I will refer to them as forest roads; please see Map 6.9-10. There are other roads through the forest, but seismic lines are more numerous and "forest road" best matches how the Evenkis use these routes.  Forest roads are cut in a straight line using compass bearings for underground survey purposes and so have little relation to surface features other than by chance. The only areas where forest roads diverge significantly from a straight-line bearing is where surface features block travel: steep grades, rock formations, wetlands, and water bodies. An additional purpose of forest roads is to allow trucks to haul equipment and personal to pass through the landscape. The width of a forest road is approximately 4 meters, enough to let a single truck pass. The most heavily used forest roads are widened to allow two trucks to pass side by side. Hunters, trappers, and reindeer herders actively use forest roads where it is convenient to do so.

**Picture 6.2 Forest road/Seismic line**

Often forest roads open up areas that would otherwise be difficult to access because of deadfall or dense forest, and provide a shorter route than alternatives. While in active use by the resource extraction companies, forest roads are cleared of undergrowth and deadfall every year. When they abandon forest roads, secondary growth brush and trees quickly fill up the denuded ground and make foot or snowmobile travel difficult if not impossible. To further complicate things, in many areas forest roads cross areas that have burnt in past decades and consist of densely growing larch, alder, aspen, and birch.

These species provide an abundant source of seedlings and secondary growth along road. The net problem is that after the resource company abandons a forest road, other users must maintain it and sometimes do not have an alternative, parallel road to use.

Territorial Transportation Routes

Historically, reindeer and horse drawn sleds traveled on sled trails. Currently, sled trails bear snowmobile, reindeer, and on foot travel. Along the Tunguska River, many sled trails cut across large bends in the river. In the winter, snowmobiles frequently travel on the frozen Tunguska from Erbogachën to Khamakar and villages farther downstream and these trails make travel markedly quicker by shortening the route by several kilometers, in comparison to following the winding river.

Smaller rivers have more variable water levels and so are less frequently traveled than the Tunguska, but are important for seasonal travel. In particular, two tributaries of the Tunguska, the Verkhnaia Kochëma and the Teteia, are only safely navigable in the spring and early summer. Outside of the high water season, travel becomes dangerous because the rocky bottom can easily break boat propellers and tear the hull of aluminum boats. The headwaters of the Verkhnaia Kochëma river are home to two nomadic reindeer herding families who participated in this research and the Teteia river leads to an Evenki village of the same name in and around which four semi-nomadic reindeer herding families live. These two rivers are the primary means for Evenkis to access Erbogachën for school, resupply, and visiting. Territorial transportation routes include sled trails and trapping trails Evenkis use within and between their territories. As above, originally horse[17] and reindeer sleds used sled trails with a width of one to two meters wide, although in most areas wider vehicles could easily pass. Based on observation and conversation with Evenkis, in some areas sled trails have fallen into disuse because a forest road offers a more convenient route or because the pasture and campsites they lead to are not currently used.[18] By my observation, sled trails often parallel streams and follow landscape features such as ridgelines and margins between forest and wetland and cross areas that are naturally more open, such as mature forest and semi-tundra. Kolia noted that in contrast to forest roads sled trails do not become overgrown as quickly or densely. There are likely a number of reasons for this, particularly in relation to reindeer herders. First, sled trails were probably established across topography that was naturally somewhat open. Second, it is probable that in comparison to forest roads, sled trail construction and maintenance probably does not significantly disturb the soil and root system of existing vegetation enough to allow rapid, dense secondary growth. Third, because sled trails are narrow, the section of disturbed ground is small by comparison, and so is the amount of secondary growth and canopy disturbance. In contrast, forest roads are several meters wide and disturb both the soil and canopy. Although forest roads are cut in the winter and when cleared leave some snow cover, the soil is still disturbed by stump removal and scraping in places. In either case, sled trails and forest roads must

[17] Khamakar Evenkis told of the former mail route on one of their territories that was traveled by horse and canoe. The carrier would cross the land by horse and water by canoe. This trail is now integrated into their trapping trails and is a route to a neighboring hunter's territory. Some sled trails and tractor routes are depicted on topographic maps, even though some have been out of use for many years.

[18] Pastures and campsites have varying usage intensities; they may be used for several years and then abandoned. This probably does not reflect a contraction of the scale of landscape usage but a period of use followed by a fallow period.

be cleaned periodically, both to allow the passage of sleds and snowmobiles but also to minimize brush hitting the vehicle or people as they pass. Cleaning also helps to minimize the sounds of passing people and vehicles, which may increase the possibility of encountering game, aside from the annoyance of being slapped and poked by brush. Cleaning trails also minimizes the effect of young trees, particularly birches and alders, bending over the trail in midwinter.

Trapping trails are within a particular person's territory. The Evenkis set traps along sled trails, forest roads, and special trails created by the occupant. More accurately, trapping is a particular activity that may take place on any trail within a person's territory and trails may be created to allow traps to be set in areas of the landscape not otherwise accessed. Use of trails specifically for trapping also highlights an organizational difference between the Khamakar and Kochëma Evenkis. The Khamakar Evenkis have trail systems within their territories that are specifically for trapping. While they may be used for other activities, such as hunting, picking berries, or reaching a neighboring territory, most usage involves trapping. The Kochëma Evenkis lay traps along their migration routes, which includes sled trails and forest roads. They do not have trails specifically to access traps.

Means of Transportation

The Evenkis of the Katanga region use a variety of transportation resources to move throughout their environment in summer and winter. Season and local topography restrict the means of mobility that can be used effectively. In the wintertime, snow cover and frozen waterways allow relatively unrestricted travel across the landscape. In summertime, the rivers open to boat traffic but lowland areas become difficult to travel through on foot or by vehicle. Below are brief descriptions of the means of transport used in the Katanga with an emphasis on characteristics and applications.

The means of transportation available to the Evenkis and used during the field season include a variety of vehicles and two types of pedestrian movement. To usefully compare and analyze these means of transportation, it is important to understand their configurations and capabilities.

Vehicle characteristics are shown in Table 6.3 with nominal figures for payload, fuel consumption, and speed. It should be noted that the payload given for snowmobile and boat motor are perhaps on the high side, probably far above manufacturers' recommendations. The low end of the payload figures for vehicles is intended to indicate an operator with minimum cargo. The fuel consumption figures are rough calculations from particular trips; consumption varies considerably by speed, payload, and condition of the route.

**Table 6.3 Characteristics of Vehicles**

| Transportation | Configuration | Payload | Fuel consumption | Speed |
|---|---|---|---|---|
| Snowmobile – Buran (28-32 hp) | Two tracks, one ski | 100-600 kg | 1 liter per 1.4 km (~500 kg load) | 1-50 km/h, 8-15 km/h Under load |
| Boat Motor (Soviet 20-25 hp) | 1-3 aluminum boats | 200-1500 kg | 1 liter per 1.8 km (1684 kg load) | 1-20 km/h, 8-12 km/h under load |
| Reindeer – Sled | 2 reindeer hitched to 1 sled | 110 kg | N/A | 1-8 km/h |
| Reindeer – Saddle | Pack saddle, riding saddle | 40 kg pack, 50-70 kg rider | N/A | 2-6 km/h |
| Pogonka | Small canoe made of planks | <90 kg | N/A | 1-4 km/h |
| On foot | - | <40 kg pack | N/A | 1-5 km/h |
| Skis | Short wide | <30 kg pack, plus skier | N/A | 1-5 km/h |

Foot Travel

Foot travel is common over short distances or when low noise and observation of the environment is needed, such as when hunting, trapping, and searching for reindeer. During the summer, walking riding reindeer are the only ways to access areas of the taiga away from maintained roads and waterways. The footwear of choice when walking in the taiga in the warm season is rubber boots or hip waders.

While walking for about four days in rubber boots, I developed a slight pain in my ankle and Vadim said this is common. To address this problem, he said they sometimes cut off the heels of their boots, which is supposed to help, however I did not see anyone with heel-less boots. I asked Kolia what they used before rubber boots and he said that they took their boots off to cross water or just walked in wet leather boots.

In the winter, snow and subzero temperatures necessitate footwear with heavy insulation. The two groups of Evenkis have different winter footwear. During periods of dry cold, outside the freeze/thaw cycles at the beginning and end of winter, the Kochëma Evenkis wear traditional reindeer skin boots. During freeze/thaw periods in the spring and fall, they wear insulated rubber boots. The Khamakar Evenkis wear a variety of manufactured boots made from wool felt or synthetic materials. Some wore Russian felt boots, *valenki*, during the dry cold and insulated rubber boots during fall and spring. Some wore insulated rubber boots during both periods. See Chapter 7: Thermoregulation.

Boats

Obviously, weight and speed have a considerable influence on fuel consumption, but the condition of the route is also significant. For boats, the speed and direction of travel relative to the current have a strong influence on how hard the motor must work to achieve a particular speed. If the boat is going up stream, the motor has to overcome the speed of the current plus displacement of the hull under the weight of the cargo. If downstream, the motor needs only move the boat slightly faster than the current for maneuverability and counteract the water displacement of the hull.

The two most basic elements of water travel are depth and direction of current. Water depth was an important factor during the fall when the Tunguska River is at its lowest levels. While traveling between Erbogachën and Khamakar, we occasionally came upon sandy, shallow areas were the motor had to be turned off and tilted up or where we had to pull the boats by hand to deeper water. When traveling on the Tunguska between territories in a single boat with only passengers, Roma told Vadim not to go too fast or the motor would strike the riverbed. This is because while traveling slowly the boat is relatively horizontal; as speed increases, the water pushes the nose of the boat upward, effectively tipping the motor toward the riverbed as the speed and weight of the boat displace water. Most of the Tunguska bottom is sand and soil, but there are rocky sections. Regardless, breaking a propeller by striking bottom is to be avoided. Other rivers, such as the Teteia, are quite rocky and not navigable for parts of the year; because of this shallow-draft jet boats are favored for all but the highest water periods.

**Picture 6.3 Boats lashed together and loaded for trip to hunting territory**

As well, the location of the deepest channel in the river varied from the outside of bends to meandering through sand bars. It was my impression that some navigation was done based on general principals of where the fastest water runs and some was based on knowledge, either firsthand or from other travelers. Understandably, with the yearly fluctuations in the water table, channels tend to shift on smaller and larger time scales. In some parts of the river, the deepest channel is predictable, but in others it meanders and must found by luck and error or followed by waypoints and individual knowledge.

Winter Traveling Conditions

Winter traveling conditions vary greatly due to the complicated properties of water at different temperatures. These conditions can be observed, investigated, and partially predicted. There are three basic factors that affect the quality and safety of winter travel: temperature, snow compaction, and overflow.

Temperature primarily affects the comfort and safety of travel for humans. For snow vehicles, travel is feasible at any temperature around to far below freezing. In conditions when the temperature fluctuates below and above freezing, snow behaves very differently than when the temperatures are consistently below freezing. The properties of snow under varying temperatures are very complex. These properties differ based on the conditions during formation and after ground accumulation. What follows is a description of some of the properties that are easily described and have practical consequences for travel.

There are two basic states where the properties of snow are strongly contrasting: around freezing and well below freezing. At warmer than 0˚ C temperatures, snow is saturated with water and is very dense and slushy. This is typically in the spring and fall, when daytime temperatures are above freezing and night time temperatures are below freezing and the most pronounced conditions tend to occur in the spring as the accumulated snow melts. After waterlogged snow freezes, it becomes hard and very slippery. When snow is formed and accumulates at below freezing (<-5˚ C), it has very low density and very high volume. However, when it is disturbed by wind or compressed by a vehicle or foot, it hardens depending on the area and force. Areas where people or reindeer pass frequently or in large numbers become packed into a very hard surface, while undisturbed surfaces remain powdery. Snow hardening begins from the moment of disturbance up to several days and low temperatures slow down the speed of hardening. For vehicle travel, this means that in powdery conditions the snow must be displaced and compressed. Since the density of powdery snow is so low, it is fairly light and easy to move, but it is quite deep for most of the winter and the cumulative loading of displacing it consumes a lot of energy. When snow is water saturated at near, but below freezing temperatures or at low temperatures but has been disturbed and hardened, travel becomes less taxing on vehicles with sufficient floatation. Generally, snow has low friction against vehicles that rely on sliding across the surface. While the Evenkis almost certainly recognize the changing friction levels of snow with temperature, this was not a topic of discussion outside of some brief comments regarding steel vs. aluminum sled characteristics.

Frozen waterways covered with snow can be dangerous to travel on even in the coldest months of winter. When the surface of a water body freezes over, it essentially becomes sealed. Factors such as flow, ice thickness, snow weight, and temperature fluctuations can cause the water to build pressure under the ice, causing the ice to fracture and water to flow on top of the ice (Conover and Conover 2006). This results in a condition known as overflow.[19] If snow cover is present, this forms a slushy layer on top of the ice that is not visible from the surface of the snow. Unless the snow is shallow and saturates up to the surface, overflow remains hidden. Since snow is a good insulator,

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[19] In Russian - *naled*. See Conover and Conover (2006: 152-157) for a description of techniques for dealing with overflow. Overflow is commonly referred to as *naled* or *aufeis* in scientific literature. See Hardin (1977) for an explanation of overflow formation.

overflow can persist for a day or so. Under the snow, the temperature is near freezing, but once the slush is uncovered or compressed, it is exposed to air temperature, rather than insulated by the snow. When a snowmobile or other vehicle enters the overflow area, water and slush stick to the underside and freeze. While traveling with the Evenkis in the winter, we encountered overflow on a river a few times, sometimes shallow slush, other times already frozen over. Although it did not give us any trouble, when meeting other travelers, they frequently asked if we had encountered overflow.

Since the ice is usually tens of centimeters thick, overflow only causes it to break up into large sheets, sinking into the water is not usually a problem since the sheets of ice are buoyant and wedged against one another. The issue with overflow is that the slush is both very dense and slippery and so does not provide enough friction for the snowmobile to gain traction. Additionally, slush, water, and snow fill the track of the snowmobile and freeze. If the track and drive system are run at high enough speed, the moving parts will tend to fling ice away or fracture it as it freezes, however if the temperature is low enough or the snowmobile is not kept moving it can potentially disable the machine until the ice is chipped out. Overflow is a problem whether encountered on reindeer, skis, or snowmobile, but with snowmobiles can be particularly difficult because their weight causes them to sink in the slush and water.

Winter Vehicle Floatation

Vehicles designed for traveling over snow distribute their weight over a large area to allow efficient travel. While the weight of skis and snowmobiles displaces and compresses snow, their surface area to weight ratio allows them to stay close to the surface. The surface area to weight ratios of Evenki skis, a reindeer sled, one example of modern cross-country skis (Ski DS; Formenti et al. 2005: 1562), snowmobiles (*Russkaia mekhanika* 2014, models A and AD), female reindeer (Nieminen and Helle 1980: 251, 253), and boots are shown in Figure 6.8, which describes the surface pressure of snow vehicles. The boots, modern skis, and reindeer are simply shown for reference. The vehicle calculations are based on the sum of vehicle weight and 70 kg human weight divided by the surface area of the vehicle. The reindeer weight is actual body weight divided by the surface area of the feet. Appendix B details how these figures were calculated. The fewer the grams per square centimeter, the greater the flotation on snow. The 70 kg was used as a constant load; however, the actual loaded weights of particular vehicles may differ. As noted in Table 6.3, reindeer sled cargo weight is around 80 kg, and in the case of skis body weight varies between individuals. The design of snowmobile sleds is such that no weight is on the snowmobile; the sled itself supports all of the weight so that the towing capacity of the snowmobile is based only on traction and power. Besides a driver, the other weight over the track includes parts and tools stored in a compartment underneath the seat, weighing perhaps up to 20 kg. Again, Figure 6.8 does not include these variables and is intended to show the relative difference between vehicles and their capabilities.

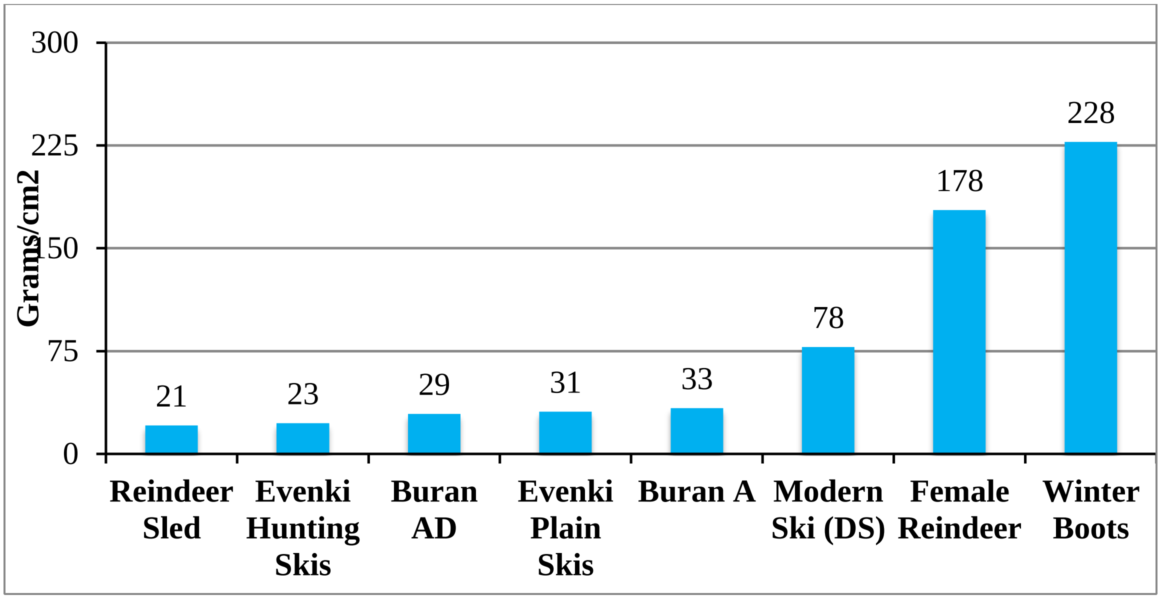


**Figure 6.8 Surface pressures of snow vehicles**

While the surface to weight ratio is not the sole determinant of floatation performance on snow, it is a simple metric and probably a close corollary in most respects. Comparing the most extreme examples, hunting skis have approximately 10 times and plain skis have approximately 7 times less surface pressure than boots. The penalty of wearing skis is moving the weight of the ski with each stride, but the benefit is in the reduced volume of snow displaced compared to walking in deep snow. The snowmobiles commonly used by the Evenkis are the mono ski, twin-tracked Buran A (short tracks) and Buran AD (long tracks). The Buran A is by far the most common variant, the AD being longer provides more floatation and traction for hauling heavy loads but turns less rapidly than the A. The AD is a more specialized machine, well suited to hauling freight, rather than general-purpose use, for which the A is satisfactory. Except for a slight weight increase due to the longer frame and track, both models of Buran are identical and have a similar displacement engine.

**Picture 6.4 Snowmobile, sled and skis**

The three snow vehicles the Evenkis commonly use: skis, snowmobiles, and reindeer sleds have values of 21-33 grams/cm$^2$. The usage of each vehicle differs somewhat and in the case of vehicles manufactured by the Evenkis themselves, skis and reindeer sleds, the dimensions can be tailored to conditions and preferences. Skis, as described above, are sized to give sufficient floatation based on the weight of the user(s) and the density of the snow. The reason for the size difference between hunting skis and plain skis is application rather than the varying properties of snow. Hunting skis have slightly more floatation to reduce the potential noise of the ski moving against snow and any twigs buried in the snow.

Notably, the two types of skis and the two track lengths of the Buran are within 4-8 grams/cm$^2$ of each other. For skis, the difference of 8 grams/cm$^2$ means hunting skis have 34% less ground pressure than plain skis. For snowmobiles, the difference of 4 grams/cm$^2$ means the Buran AD (long track) has 14% less ground pressure than the Buran A (short track). Presumably, there is a sufficient performance difference to justify making two different vehicles of the same type.

My limited experience with Evenki plain skis vs. walking in boots is that in the same snow conditions skis travel on the top 15-30 cm of the snow, whereas boots sink down to denser snow near ground level, 40-70 cm. Stride has a large impact on how well the skis float and the skis were too small for my weight.

The reindeer sled is commonly used for travel on established trails where the snow has been previously packed. The snowmobile is usually the first vehicle in line during the Kochëma Evenkis' migrations. The tracks help to compact loose powdery snow for the reindeer sleds and provide an even, wide path of travel once the snow hardens. Given that sleds have similar ground pressure to skis, travel over unbroken snow would seem to be quite easy. However, in this case, the sled is usually pulled by two reindeer, which have much higher ground pressure than the sled and work against the resistance of the snow acting on their own bodies as well as the sled. The resistance of the sled is fairly low in most cases, especially on packed snow. The greatest resistance is probably encountered on inclines and obstacles, rather than the resistance of the snow on the sled.

Skis

Evenkis use skis once there is enough snow in the winter. Skis and snowmobiles work on the same principal: by supporting weight on a low-density medium over a large surface area. The wooden skis the Evenkis use come in two basic types: regular skis – of plain wooden construction and made just wide enough to provide sufficient flotation and hunting skis also of wood, typically wider than regular skis, and with reindeer or moose leg skins covering on the bottom. The loose, powdery snow in the Katanga region does not form a strong crust until spring and so skis must have a larger surface area than typical of recreational skis used on prepared trails. Conditions in the Katanga region and the places the Evenkis travel demand skis with a high degree of floatation. The snow conditions vary throughout the cold season and range of temperature, but generally once the snow falls it has only a thin, weak crust outside of areas of wind pack or other disturbance and in the spring. Thus, in most places, during winter there is deep powder.

The skis the Evenkis use are designed for floatation and maneuverability. See Dresbeck (1967) for an overview and history of ski types worldwide and Antropova (N.d.) for types of Siberian skis. The plain wooden skis can sometimes be made to glide slightly, depending on snow conditions, but this is not a primary goal of design or usage. Instead, they are used with a shuffling gait rather than a kick and glide. Skis are used for travel across unbroken snow and along established trails. The length to width ratio is opposite of what most readers are probably familiar with. These short, wide skis can be easily maneuvered through brush and packed on a snowmobile or reindeer sled.

Evenki hunting skis are wider and slightly longer than plain skis, with a reindeer or moose leg skin covering on the bottom. Pieces of leg skin are sewn together in a sheet and glued on the bottom of the ski. This muffles the sound of the skis scraping against the snow or brush in comparison to bare wood skis. The stiff hairs are oriented toward the rear and give good purchase on the snow to prevent sliding backwards on the snow the ski has packed and for going up inclines. The fur also muffles the sound of the ski moving against the snow or brush. The primary purpose of these skis is for hunting, specifically stalking, where noise control is very important. Only some Evenkis make and use these skis because stalking is a difficult method of hunting. Soft furs, such as dog or wolverine are even quieter, but these are rarely used because they are more valuable for other purposes. Both Kochëma Evenki households have hunting skis. Only one of the Khamakar Evenki households had hunting skis visible. Others may have them in storage. Both groups of Evenkis were observed to use plain skis.

Snowmobiles

For snowmobiles, condition of the trail has a strong influence. Traveling over undisturbed, powdery snow takes considerable power. Therefore, at a given payload, it takes more fuel to travel over powder than it does an established, hardened trail. Pulling heavy loads through powder snow can be difficult because the snowmobile does not have enough floatation, power, and traction. Powdery snow behaves similarly to water. The snowmobile must achieve a certain speed to keep floating. When speed drops below this level, it begins to sink and potentially become stuck. The snowmobile makes forward progress by displacing snow under the track faster than it can flow out of the way. When speed decreases, this relationship reverses and the snowmobile displaces snow slower than it flows. This leads to the snowmobile sinking until the whole undercarriage, rather than just the ski and tracks, sink into the snow. When this happens, engaging the throttle usually just spins the tracks, causing it to sink deeper. Getting un-stuck involves clearing snow from around and in front of the snowmobile so that only the ski and tracks are touching the ground, packing the snow in front of the snowmobile to a similar height to what it is resting on and carefully engaging the throttle to avoid spinning the track. Powdery snow is a significant problem when going up a hill, especially with a loaded sled. The simplest thing to do, if it is known or suspected the snowmobile will not climb the hill, is un-hitch the sled and pack a trail just with the snowmobile. After going up and down the hill on the snowmobile, the trail is usually sufficiently packed to allow pulling the sled up most grades.

Snowmobiles are often used for breaking trail along established routes and in the forest. Their weight, power, and width leave behind a firm surface for walking, skiing, or driving reindeer sleds. Aside from usual use along sled trails, there was an instance when one of the Kochëma Evenkis used a snowmobile to make a path through the forest to where the reindeer were located. In this instance, the location of the reindeer was suspected to be several kilometers away. The snowmobile was both a means of searching for the reindeer and making a path to walk upon later to bring them back to the living site. The trails that reindeer make are narrow and can be difficult to walk on and even though skis are quite efficient, breaking through powder for long distances can be tiring.

Motor Vehicles: Dynamic Characteristics

The characteristics of motor vehicles under different speeds and loads have important consequences for how they can be used. The number of variables is high, but a brief discussion of speed and torque, transmission systems, and the relationship between operation and trail conditions will help explain the Evenkis patterns of vehicle operation.

Power and torque are both aspects of the ability of the motor to move the vehicle. Engine speed is measured by the revolutions per minute (rpm) of the crankshaft. The crankshaft is connected to one or more transmission systems that transfer the motor's rpm to the final drive mechanism (propeller, wheel, track). Torque is the rotational force the motor outputs. Transmission ratios are calibrated to keep the motor running near the intersection of the power and torque curves (Davis 2004). In simple terms, power is torque applied to do work over time. These two curves are nonlinear for a variety of complicated reasons (EPI 2011, Davis 2004). One way to conceptualize the difference is that torque is pulling force, whereas power is speed gained by faster rpm (EPI 2011). In Figure 6.9, the power and torque curves are shown across a range of engine speeds. This is meant to be representative of general principals of gasoline engine power output rather than a specific engine.

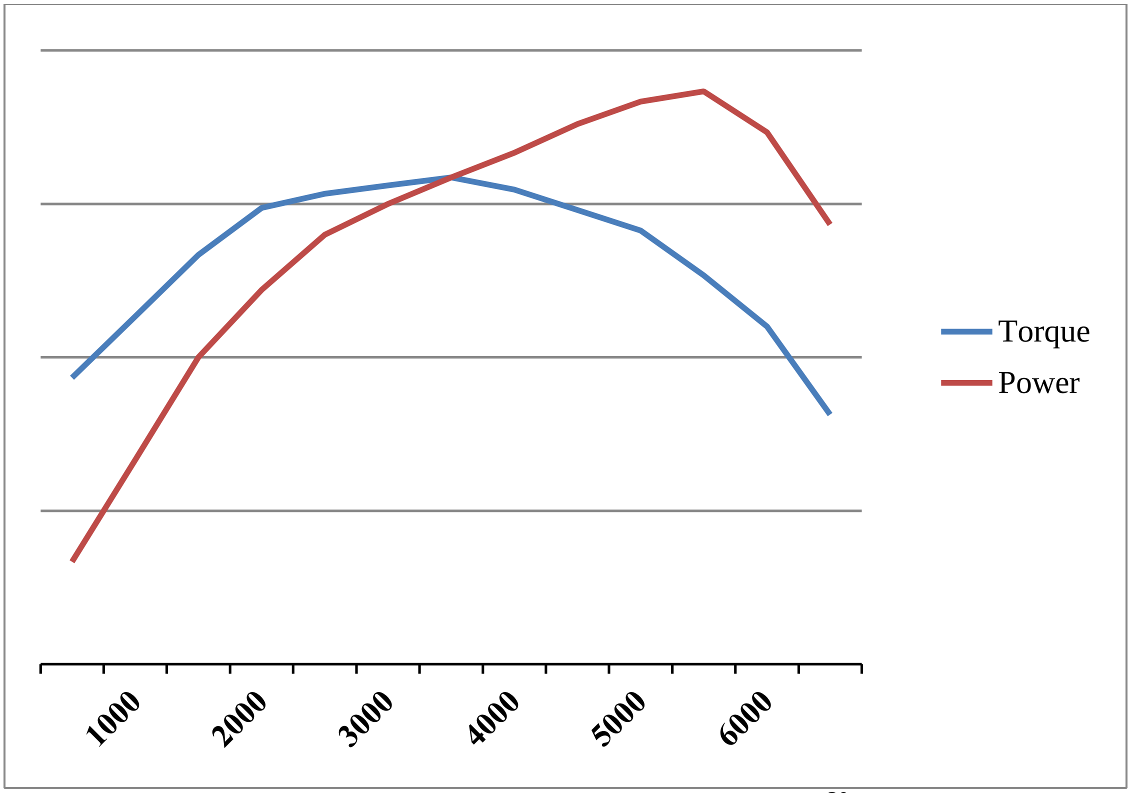


**Figure 6.9 Motor power vs. torque**[20]

Due to friction and various other factors, torque peaks at before peak rpm and as a result power declines as well because turning force declines at each additional rpm. In practical terms, when a motor is moving a vehicle of considerable weight, it will

[20] This figure was adapted from Giri 2014. The scales of Newton meters of torque and kilowatts of power have been removed for simplicity.

accelerate in speed to a point, the peak of the torque curve, after which it will accelerate very little, if at all, and poorly maintain speed past the peak.

When Roma, Boris, and I were leaving Erbogachën by boat in fall 2011, Boris ran the motor. He varied our speed between approximately 5-15 km/h for the first few kilometers and settled into an average speed of 7 km/h. When going downstream, the boat must go faster than the current (~5 km/h) to allow maneuvering. The river was at a seasonal low and following the deepest channel often required steering across the current.

Our speed might have been higher were it not for the trouble we were having with the poorly running motor. Low speed also contributed toward fuel conservation, at the cost of time. Roma noted that the trip from Erbogachën to the hunting territory usually takes about two days, but took us four. Boats have a high and low range. The factors affecting the force the motor must work against are the weight of the cargo and the displacement of water around the hull. Since this is a fluid, the load is broadly proportional at different speeds, unlike on land where bumps and hills change the amount of load the engine must work against.

Similarly, in winter 2012, while traveling by snowmobile, Roma and Dima allowed me to drive for a while. Roma instructed me to feel how the snowmobile and sled move and how the motor sounds and feels at different speeds. The ideal speed is when the motor vibrates minimally and makes a consistent, smooth sound. Slower than this speed, the motor struggles to hold speed, seemingly either wanting to go slower or faster. Faster than this speed, the motor vibrates more, surges[21], makes a louder and more variable sound, and the snowmobile and sled become less controllable. Motor vibration and sound, and vehicle controllability are indications of vehicle performance and trail conditions. These variables should sound familiar to anyone experienced in cargo hauling, mechanized farming, or motorsports. The snowmobile transmission system is continuously variable, which allows the engine to operate near the intersection of the torque and power curves as ground speed increases.

The Evenkis also paid close attention to fuel consumption. They estimated how much fuel was consumed over a particular known distance and compared that rate of consumption to their expectations and past rates of consumption. They would also estimate by sight, using a measuring stick or tapping on the side of a container to estimate quantity of fuel it held. Estimating fuel consumption rates also helps the Evenkis to fine tune the motor's carburetor for efficiency as well as infer mechanical problems when fuel economy is less than expected.

The Evenkis operate motor vehicles based on their experience and observations of traveling under different conditions. They have developed rules of thumb regarding proper operation, such as varying speed according to terrain or current and load, keeping the throttle where the motor runs smoothly, and observing sound as an indicator of engine performance and fuel consumption.

[21] Engine rpm surges as clutch ratios vary and the tracks slip or grip because the sled alternates between drag, no load, and pushing on the snowmobile hitch over rough terrain.

Vehicle Choice

Given that both Kochëma families have both snowmobiles and reindeer it was interesting to observe and ask them how they choose between these methods of transport. This section describes the decision-making process and my observations of their vehicle choices for different purposes.

During the field season, one of the tasks that Dima wanted to complete was closing up some of his cabins for the winter and collecting trapped sable in a part of his territory. He had planned to take about a week to complete these tasks, but his snowmobile was out on loan. The snowmobile was far past due for return and it became apparent that the time of return could not be predicted. Since the snowmobile was unavailable, Dima discussed using reindeer instead. He planned to take about ten reindeer; some of these would be needed for extra teams, others for company. In practical terms, he only needed maybe four or six deer. This would allow for several spare teams if he needed or wanted to move fast. The purpose of taking more deer than needed is because as herd animals, reindeer feel most comfortable in a group. If he only took as many reindeer as were needed for transportation, there was a good chance that they would run back to the main herd at night, but if he took a small group they would feed together at night and probably stay in the general area. Some days went by, but Dima did not prepare to leave. In the meantime, Kolia and his family moved to a cabin about 9 km away. Dima asked Kolia if he could borrow the snowmobile for a few days. Since Kolia had no plans to move and was a bit under the weather, he lent Dima the snowmobile. After Dima and I completed the trip, he stayed with Kolia for a few days, helping us cut wood and making technical repairs and adjustments the household.

In asking Dima about the comparative advantages of snowmobiles, he gave a number of interesting responses. I asked: why not just take the snowmobile when hunting? It takes time to round up reindeer, hitch them, and then they stand tied up for several hours while he is out hunting. Dima replied that this is not quite true. Unlike a snowmobile, reindeer are quiet; many times when he is traveling, he approaches quite close before game spooks near the trail; this is because to a moose the sound of reindeer trotting is not particularly alarming and the radius from which the sound of reindeer and sled can be heard is small. When he finds a promising track, he simply turns the sled around and ties the reindeer to a branch while he goes hunting. When he returns, he unties the deer and jumps on the sled to return home. Reindeer do not start hard or have mechanical problems.

For cargo hauling, reindeer also have their peculiarities. For almost all firewood hauling we used a snowmobile. However, while Dima's snowmobile was absent, we hauled wood back to the cabin using reindeer. Although the distance from the cabin was comparable to other instances when we used a snowmobile, we used a different work process for hauling wood with reindeer. We walked to the cutting site and stacked the rounds next to the trail. The next day Dima fetched the reindeer and locked most of the herd inside the corral around the cabin. He harnessed two reindeer each to two sleds and led them on foot to the cutting site as I waited at the corral. While unloading wood near the cabin inside the corral, the herd milled about and when letting the harnessed deer and sleds out of the gate the herd would crowd the gate to follow. I manned the gate to keep the herd from rushing out of the corral while Dima passed in and out.

In discussing with Dima the considerations of using reindeer and snowmobiles, it was my impression that he did not think of them as two interchangeable options, but rather two means of transport, each with their own complications and advantages. From my observation, the snowmobile was the first option both Kolia and Dima used for chores, such as hauling cargo or people and making long distance trips or short errands. While little hunting was done during the field season, reindeer and skis were the means of transportation chosen to scan for tracks. Looking for reindeer was almost exclusively done on foot.

From my observations, the Evenkis travel almost exclusively in the daylight. The one exception is by snowmobile. While snowmobile travel is usually done during the day, my impression is that night travel is not particularly dangerous and in fact it may be easier in some respects. Both the Kochëma and Khamakar Evenkis traveled by snowmobile at night. One informant who has vision problems and wears thick glasses said that he very much prefers night travel. The reasons why night travel by snowmobile can be done have to do with the direction and properties of light. In contrast to some other forms of transportation, snowmobiles have headlights and often travel on established trails. Foot travel on established snowmobile trails was another instance of night travel. In the wintertime sunlight is reflected off the snow, and when it is overcast, but with thin cloud cover, the light is diffuse and gives very little definition to the snow, making it hard to perceive shapes, shadows, and distance. In bright conditions when the sky is clear snow reflects light into the eyes, while definition might be high, the sheer volume of light can be blinding.[22] Snowmobile travel at night provides good visibility conditions because the headlight casts a beam out on to the trail and the rider's head position is higher than the headlight. When traveling at night, the shapes of the snow and trail are defined by light or shadow, rather than diffuse, uniform white or overwhelmingly intense light conditions that often occur during the day. In my experience, a higher angle relative to the headlight gives better visibility, so standing is better than sitting for driving a snowmobile in some conditions. Visibility is one potential advantage of night travel by snowmobile. Some of its disadvantages are lower temperatures than daytime, slightly greater potential for navigational errors, and more difficulties if forced to stop. Temperature differences are variable, potentially negligible, and not specific to night travel. Regardless of the time of day, you simply dress to temperature conditions and activity level. The potential for nighttime navigational errors is largely hypothetical. All the travel I did with Evenkis was on their own territories or on routes they regularly travel. In all the travel Evenkis did or that I heard discussed, night travel was regarded as normal.

The influence of daylight and temperature on travel conditions change during the snow season. In midwinter, there are fewer daylight hours and temperatures are generally low. Travel is preferentially, although not exclusively, done during the day to take advantage of light and slightly higher daytime temperatures. In the late winter and early spring, above daytime freezing temperatures and intense sunlight conditions make

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[22] While I did not discuss this in detail with research partners, in the late winter and early spring, sunlight can cause condition called snow blindness, see Jacobs 2013.

nighttime travel preferable, when temperatures are below freezing and so that trails are firm rather than slushy and navigation is done by headlight. These comments apply mainly to logistical travel and are not in any way categorical. For other kinds of mobility, such as hunting or searching for reindeer, it is necessary to travel during the day. For these kinds of mobility, close observation of the environment and seeing long distances are critical, whereas for logistical travel – movement from one point to another – daylight and wide field of view are less important.

Snowfall and trail conditions can also shape time of travel. During mid-winter, snowfall is usually minimal and infrequent. However, in one instance, the wind came up slightly and snow began to fall, threatening to bury the packed snowmobile trail. Since travel is much more difficult on powdery snow than a packed trail, we left earlier than planned in order to travel on the packed trail while it was still visible.

During the winter, low temperatures did have an effect on travel. Roma said that he prefers not to travel when it is below -30˚C if it can be avoided and that certainly at minus 50˚C people generally do not travel. Not only is it difficult to keep warm and avoid frostbite at these temperatures, but also should anything go wrong one quickly loses the ability to perform fine motor skills when the hands are exposed to the cold during building a fire or fixing an engine. Should travel in the deep cold or high winds become necessary, Evenkis have discovered an interesting trick for keeping the face warm – diapers. Roma claimed that a diaper covering the nose and mouth does an excellent job. I never tried it or saw it demonstrated but I was assured of its effectiveness and observed that they pack diapers when traveling in the winter. Perhaps ironically, the material's properties of absorbance and breathability make it suitable for more than one application.

Distances Between Cabins

For the Evenkis, cabins are usually the beginning and end points of trips from fall to spring. The distance between cabins within individual territories for both the Kochëma and Khamakar Evenkis range from approximately 4-23 kilometers. The distances in Figure 6.10 were calculated based on straight-line travel, rather than the routes that are on the landscape. The method I used to calculate these distances among all possible pairs was to measure in a straight line between a single cabin and others around it in all directions. If two cabins were in approximately the same direction from the nodal cabin, but there were only a few kilometers of separation between the two cabins, I included both distances. However, if the line to a faraway cabin passed close to one or more other cabins, this distance between cabins was not included. This method is somewhat arbitrary but intended to only include travel distances between residences, rather than for other purposes, such as hunting or provisioning. This is based on the Kochëma Evenkis statement that they migrate between their cabins in succession and the range of migration distances is 9-22 kilometers in periods when they live in cabins. The locations of cabins were fixed using recorded coordinates or Evenkis marking the locations of their cabins on paper maps. Some of the lesser distances, particularly among the Khamakar Evenkis may be cabins that were drawn on the map, but not in actual use due to age and state of repair. Similarly, the Kochëma Evenkis had at least two cabins, possibly more, that were no longer used because of age or being surrounded by young forest, unsuitable for reindeer pasturage. However, these non-active cabins were not drawn on the map.

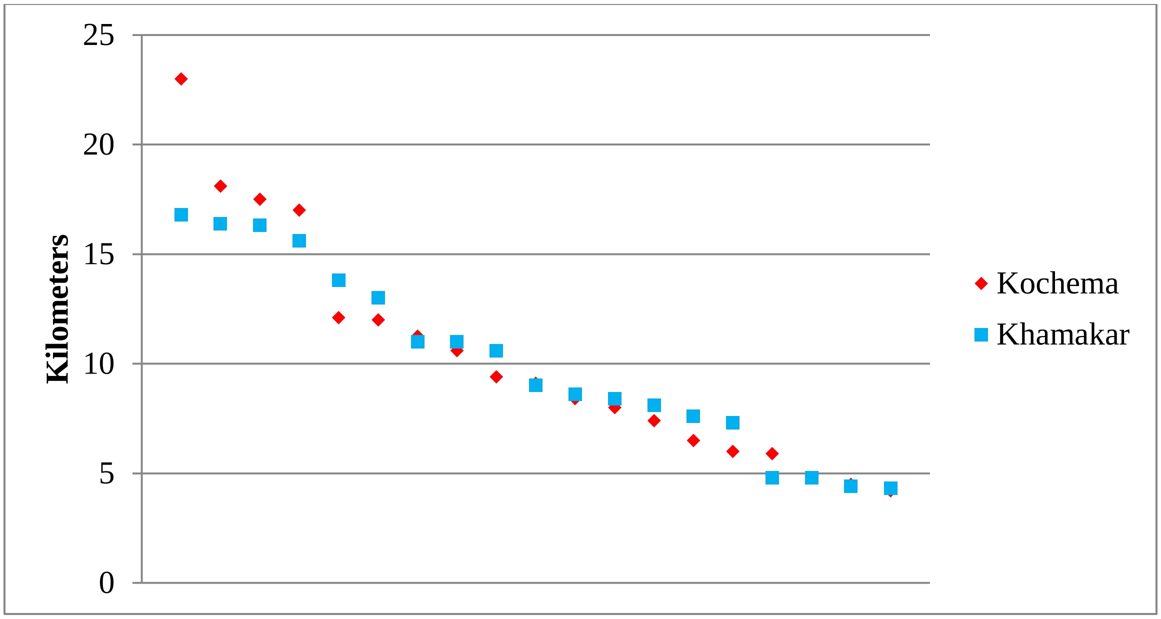
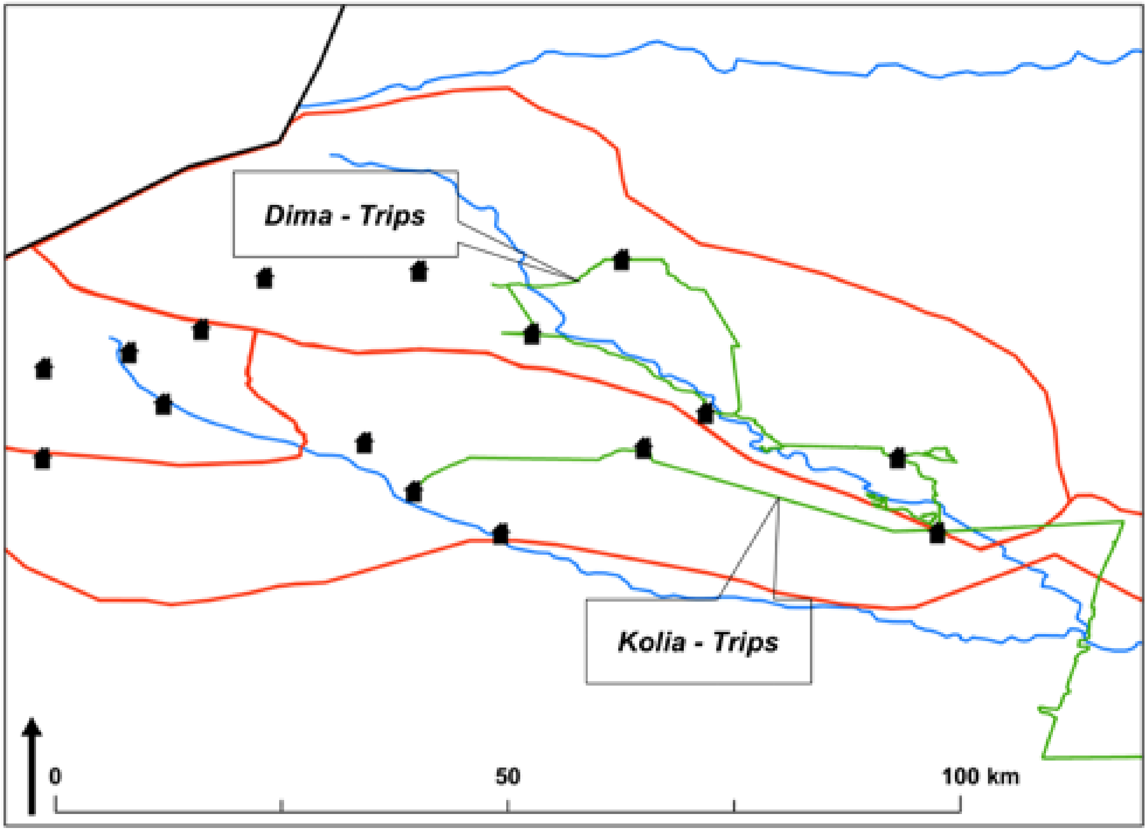



**Figure 6.10 Distances between cabins**

The Evenkis of both groups show an almost identical range of distances between their cabins. Given that both groups have broad similarities in their economic orientation and use the same vehicles, with minor exceptions, perhaps this similarity is not surprising. The figure above indicates that on a group level the range of distances between cabins is very similar, but masks the range of distances within each territory by amalgamation. Calculating the number of cabins compared to the size of the territory allows direct comparison.

During the winter, Dima and Kolia traveled between their cabins on logistical trips. The spatial extent and routes between cabins are shown in Map 6.1.




**Map 6.1 Kochëma Logistical Trips**

This map shows that cabins are located unequally across the landscape, but with moderate positive association with proximity to larger rivers. The factors involved in dwelling site choice are variable by season, and purpose (Tables 61-2; Sirina 2006: 92-100).

Cabin density for the Khamakar Evenkis varies from .006-.011 per square kilometer and the Kochëma group from .002-.005. The differences in cabin densities may have to do with their periods and purposes for residing on the land, covered above in the section describing the seasonal round (Table 6.1-2).

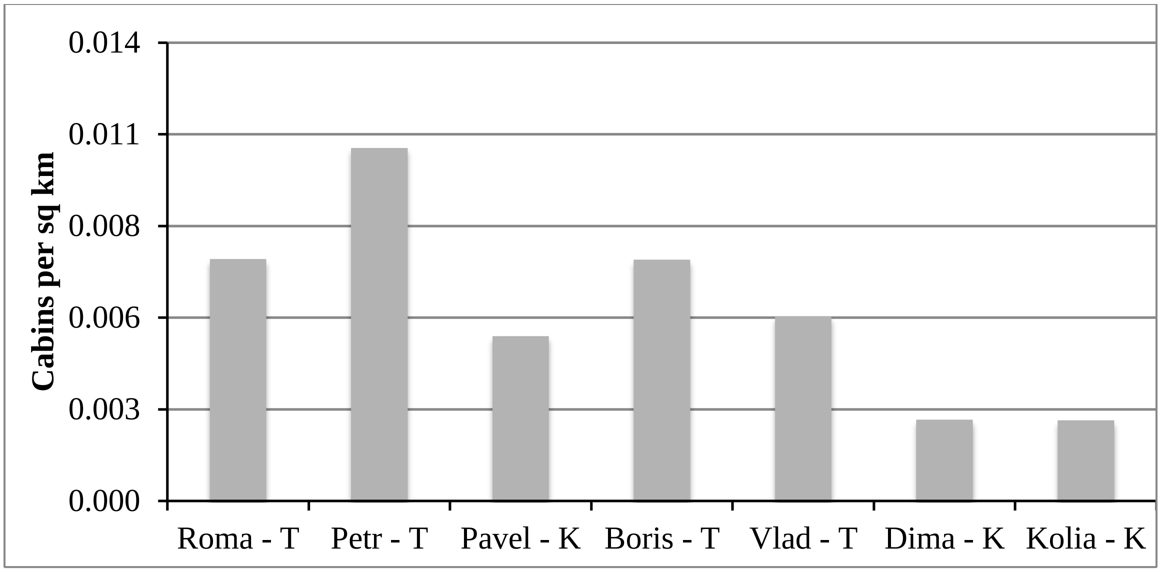



**Figure 6.11 Cabin Density**

The Khamakar Evenkis live perhaps 4-6 months of the year in the cabins on their hunting territories, living in the village or elsewhere for the remaining parts of the year. The Kochëma Evenkis live in their cabins during fall and winter, for perhaps 6-8 months. The number of cabins to territorial size does not account for the summer living sites of either group. Adding data on year round living sites might show a different pattern; particularly for the Kochëma Evenkis, who have a high number of summer living sites.

Historical and technological changes in architecture may also be a factor. Up to sometime during the Soviet period, both groups probably lived in tents (cf. Anderson 2006) for much of the year and afterwards began building and using cabins from the middle of the 20th century (Sirina 2006: 134-6). The Khamakar Evenkis have a higher density of cabins on smaller territories and, to my knowledge, they do not use tents. If one outcome of mobility is the need for more living sites, then using a tent gives the most freedom in mobility. In this regard it is possible that the Khamakar Evenkis have reached and equilibrium of sorts between their desired pattern of mobility and the locations and distances of living sites. The Kochëma Evenkis report moving frequently in the summer and having a high turnover rate of campsites. In this situation, having a readily movable shelter is preferable to a fixed and laborious to construct cabin. Adoption of the cabin as a seasonal or year round dwelling was probably a gradual process for both groups. Changes in the tools available for cabin building, specifically chainsaws, may be a factor as well. Chainsaws are discussed below with regard to building reindeer corrals.

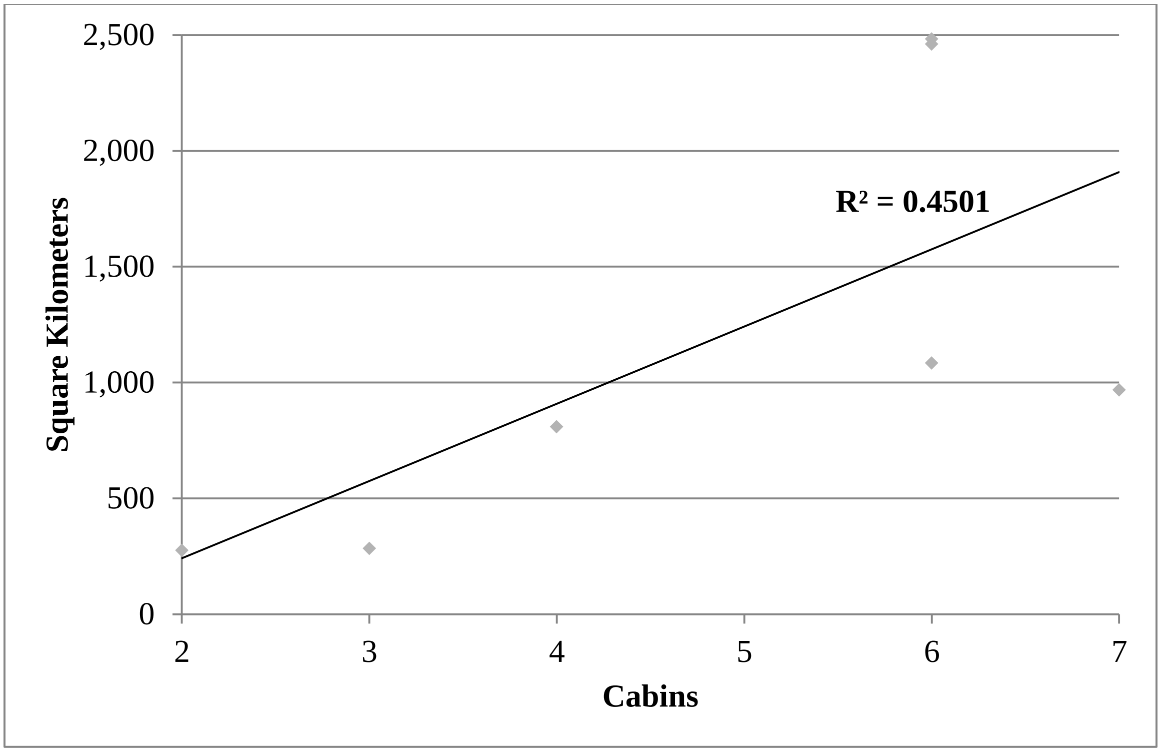



**Figure 6.12 Territorial Size and cabins**

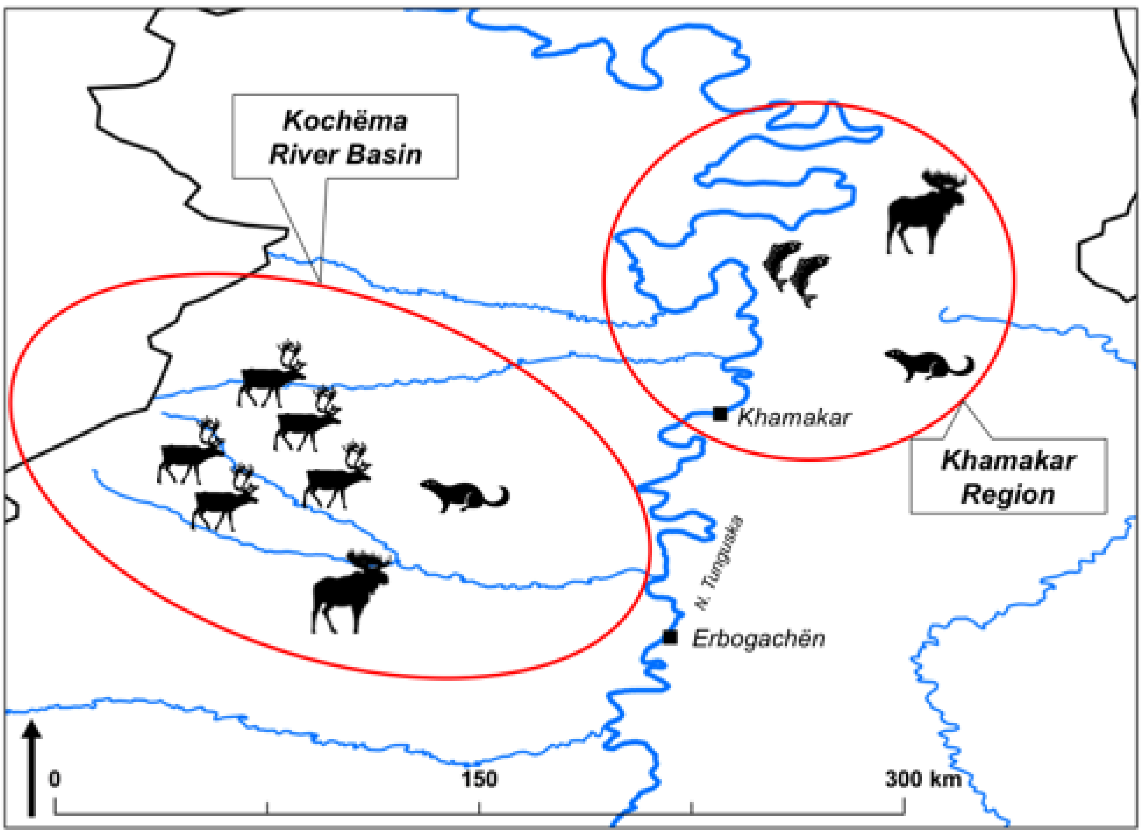
Just as with the density calculations above, there is a general positive relationship between territorial size and the number of cabins, but in Figure 6.12 territorial size is a moderate predictor of the number of cabins at this sample size.

## Economy

The Evenkis' economic production is based almost exclusively on the environments in which they live. The products they harvest from the land are either used directly, such as meat and fish, or exchanged for goods they cannot produce, in the case of sable furs sold for money used to purchase fuel and industrial supplies. This section describes how the Evenkis make a living on their territories and their techniques of production.

Territories

The Kochëma and Khamakar Evenkis have similar land-use patterns within their respective territories. Their economic activities on the group level differ in the emphasis on fishing and keeping reindeer.




**Map 6.2 Regional Resources**

The Khamakar region in the upper right of the map is located on the Tunguska River. The local environment supplies the population of approximately 100 people in Khamakar village with the bulk of their diet, the rest being supplied from the store-bought foods and vegetables from backyard gardens. The Tunguska River system and the many small lakes in the area are a rich source of fish. The Khamakar Evenkis net fish year round, more intensively in the warm months, but also in winter. The Kochëma Evenkis also fish, but the rivers in their region are smaller and fish are only an occasionally targeted resource. Both groups hunt moose and sable. Only the Kochëma Evenkis have domestic reindeer.

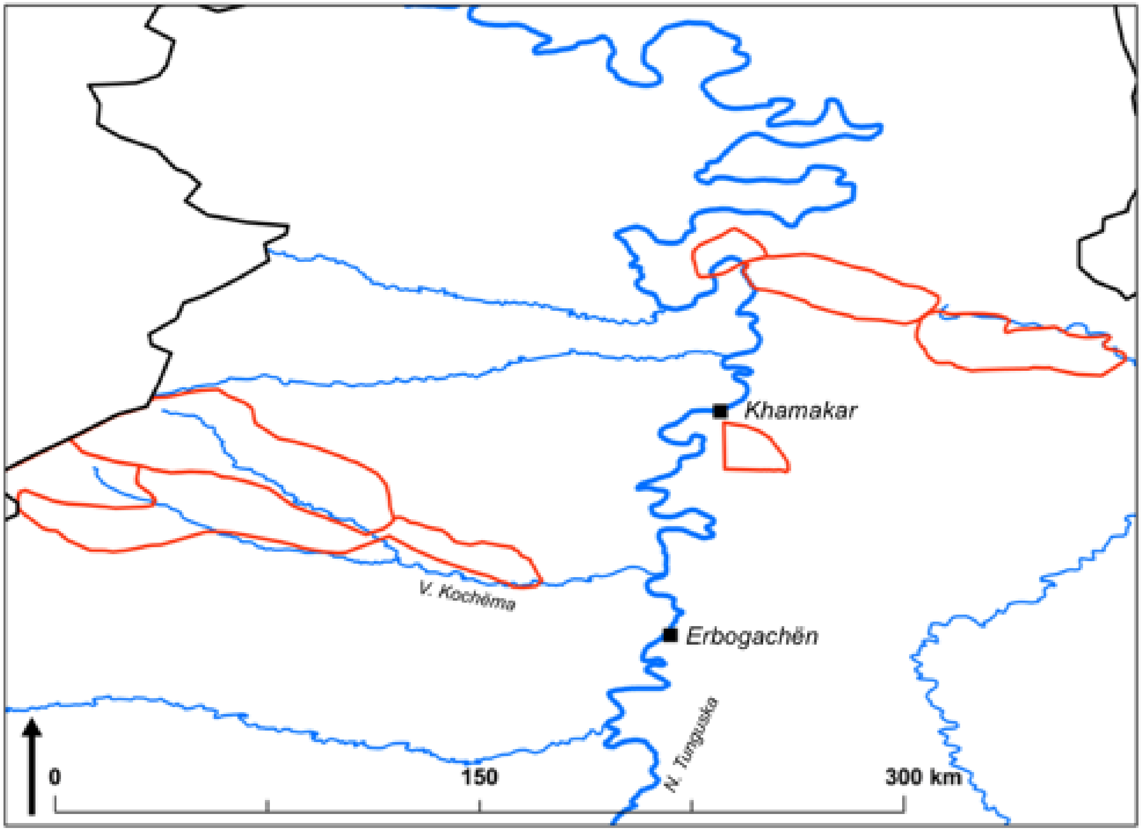
The territorial size of seven Evenkis in the Katanga region is in Table 6.4. Notably, the average size of the territories is smaller in the Khamakar region (654 $km^2$) than in the Kochëma region (1917 $km^2$). These area calculations are approximate, but probably the most accurate figures available; see Chapter Five: Maps for clarification.

**Table 6.4 Katanga Territorial Sizes**

| Name | Square Kilometers ($km^2$) | Group |
|---|---|---|
| Pëtr | 283 | Khamakar |
| Vlad | 1,083 | Khamakar |
| Boris | 967 | Khamakar |
| Roma | 276 | Khamakar |
| Dima | 2,461 | Kochëma |
| Pavel | 809 | Kochëma |
| Kolia | 2,482 | Kochëma |

Two of the four Khamakar Evenkis have territories that are small for particular reasons, and so they bring the average size down significantly. Without these two territories, the average size is 1029 $km^2$. The reasons these two territories are small is that one man's territory is a part of his father's territory and another territory is legally a general-use area but residents of Khamakar village recognize one person's right to use it.

The specifics of how each territory is used and its legal and social status are complicated issues for future study. The primary topic of interest here are territorial size and usage on a regional level.




**Map 6.3 Katanga Territories**

In the Katanga region, territorial sizes and locations are available for seven men, as shown on Map 6.3. Most of the region is subdivided into hunting territories[23], but I only have data for those shown on the map. The Khamakar territories are on the north east of the map and the Kochëma territories are to the west of the Tunguska River.

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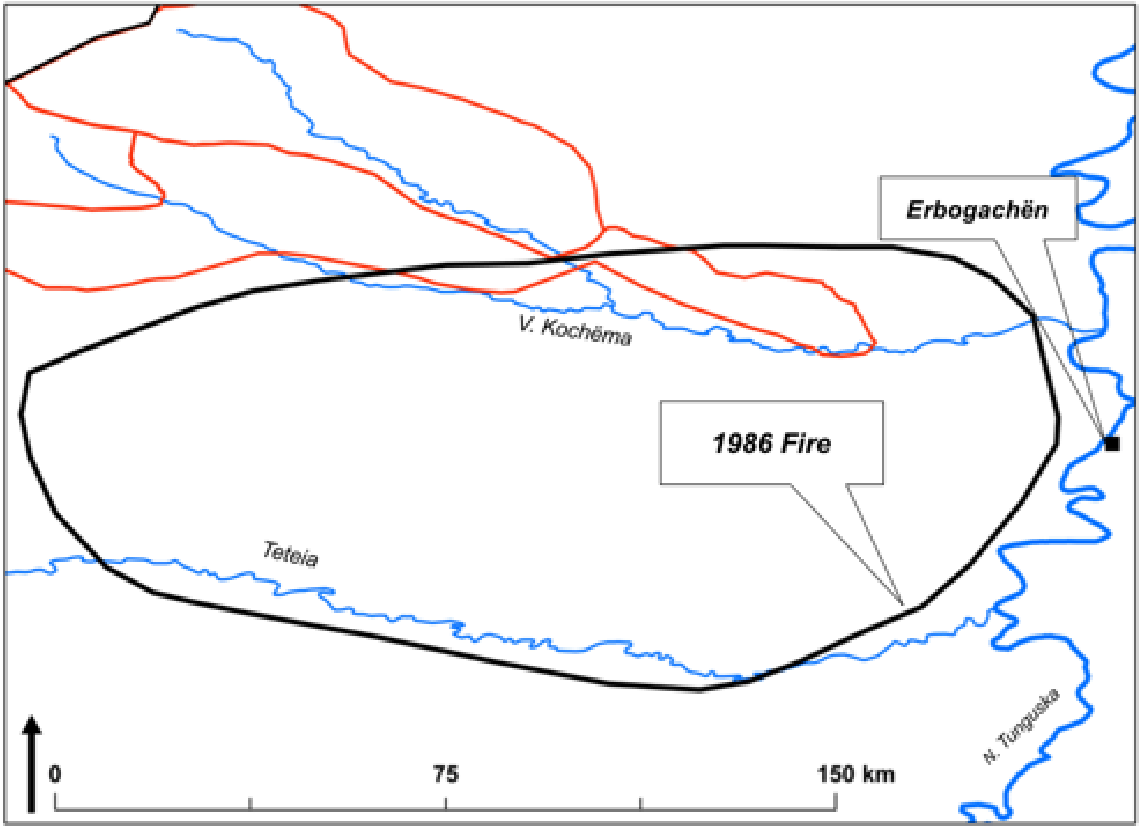
[23] Legally or based on community recognition.

Territorial size also differs by region. According to informants, in the Khamakar region, territorial sizes are generally smaller than in the Kochëma region. The figures in Table 6.4 bear this out as well. Territorial size is related to Soviet land policy, as in many cases the parcel a hunter applied for under the Post-Soviet land rights system is the same tract he used during the Soviet period (Sirina 2006: 39-46, 73-84, 192). The reasons for this are ecological and organizational. Reindeer herding disappeared in the Khamakar region around the 1980s (Sirina 2006: 58-9, 66) and the individual land use with the broadest spatial extent became the sable harvest. Moose hunting in the Khamakar region is done on individual territories but the meat is shared among family and friends in the village, therefore individual families depend directly on their territories for sable harvest, but indirectly for food. In contrast, the Kochëma region, there is no village and individual Evenki families herd reindeer and migrate, depending directly on their own territories for food, sable, and reindeer pasturage. The Kochëma Evenkis' territories are large enough for reindeer pasturage and other economic activities such as food production and sable trapping can easily be done within the same areas.

Fire history has a strong impact on the Kochëma Evenkis' livelihood. Prior to forest fires in 1985-1986 they lived and migrated farther to the south in a different river drainage (Landerer 2010: 18; Landerer 2009: 12; Sirina 2006: 77-78)**.** This destroyed much of the lichen pasture on their route to Erbogachën and for the same reason south eastern part of Kolia's territory is unusable for reindeer herding. The approximate spatial extent of this fire is shown in Map 6.4.




**Map 6.4 Kochëma Forest Fire 1986**

The issue of land rights is legally and politically complex. Research participants told me about the processes and many of these complications. For the purposes of this discussion, I concentrate on the ecological and practical factors of fixed territories and observations on how the Evenkis use the land.

In basic ecological terms, there is a positive relationship between land area and the amount of resources it contains. However, there are differences in the types of demand placed upon resources. With few exceptions, there are no benefits to harvesting more food resources (fish and meat) than can be consumed or stored. Therefore, given a particular density of food resources, a particular tract of land is sufficient. Sable is different in terms of demand because there is no diminishing marginal value for additional sable harvested when value is monetary. This issue will be discussed in more detail below. The different patterns of territorial size, population, and land use are related to social organization and land policy.

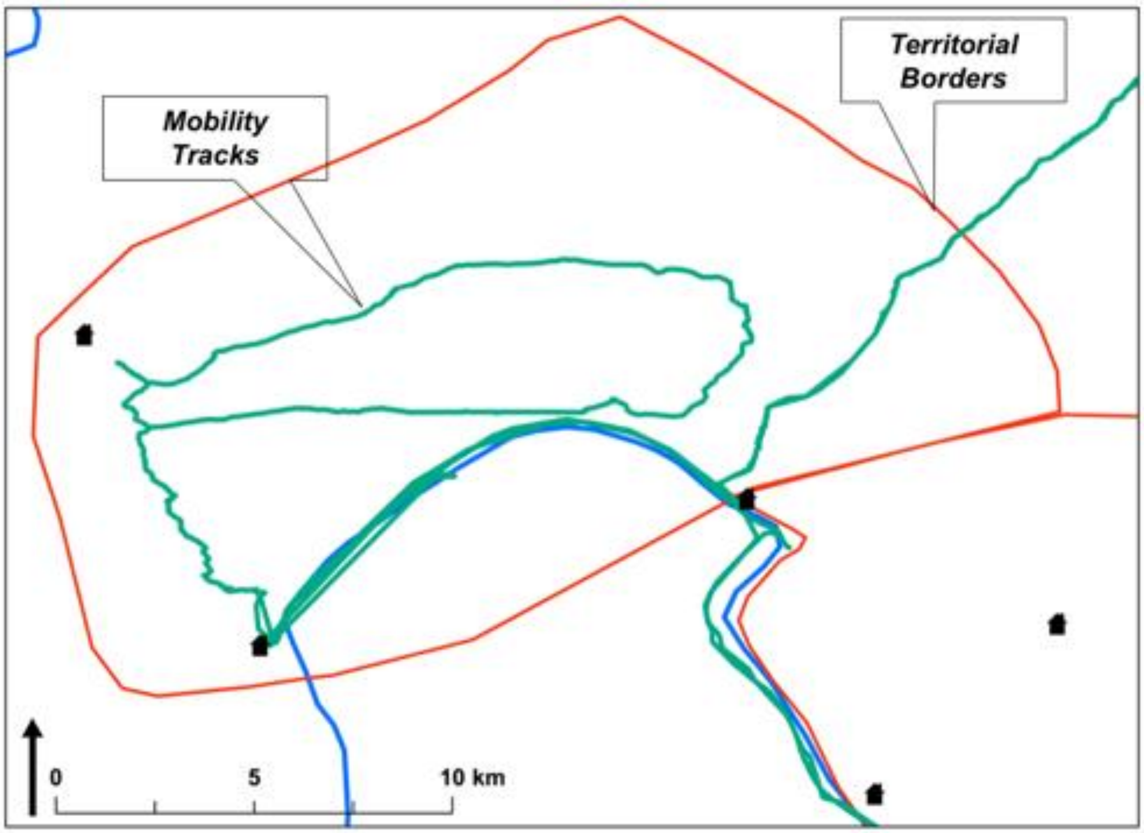
<u>Sable Harvest</u>

Methods of harvesting sable include hunting and trapping. Trapping is a passive method, allowing the individual to bait and check traps where and when desired. Hunting is an active method, taking time and effort only at the days and times allocated.

Sable trapping is a simple process, but there are a number of nuances that reflect individual methods, knowledge of the environment, and animal behavior. Traps are laid out along a system of trails throughout the territory. Traps are left in the same place from year to year and rarely moved; only when a trap is consistently empty is it relocated. Evenkis gave differing answers regarding when and how traps are relocated. Some said they move traps when they feel like it, when they see that sable are no longer coming into the trap, others said that if after a year or two sable do not fall into the trap it is relocated. None of the hunters were able to say who originally placed the traps on the territories they hunt. It is likely that lands have changed hands many times since steel traps were introduced.

There are a number of reasons why traps are usually left in the same place year after year. First, sables have regular routes within their own territories along which they move and traps are located on these trails. Insofar as sables move along paths, it makes sense to leave traps in the same places. Hunters described sable paths as passing through areas of cover from raptors, which prey on sable and many of the same species that sable hunt. Some areas in the environment provide fairly homogeneous cover, such as a stand of spruce or pine. Other areas have broken cover or no cover, such as a water body, tundra, marsh, or ridge line. In these and other locations, there are pinch points where sable trails become more regular because of environmental configuration. Another example is on the banks of a river or stream, where sables hunt many species that come near the water. Second, it is largely younger sables that fall into traps, mature sables generally have been caught and escaped and so know how to avoid them. Like wolves, sables are said to learn the smell of metal and avoid it. Dima said that along streams can be very good places to set traps and give higher than average catches. Third, leaving the traps in the taiga saves the trouble of placing them every year. This saves both labor and contamination of traps with human odor. Dima used a particular pair of mittens for handling traps.

During the fall 2011 season, three days over two trips were spent checking the trap lines and trails around Roma's territory. Roma and I went out for one day and Kesha, Roma, and I went out for an additional two days. Checking traps consists of putting the trap set in order, marking or remarking any trails, and removing brush as necessary. We could not reach one section of the trails because a stream was too high. One of the trips included an overnight in the taiga. We stopped for the evening about an hour before dark and made camp. We used spruce boughs piled for beds, and kept a long fire for keeping warm in the near zero temperatures, for roasting chunks of moose meat and boiling tea. With a breakfast of leftovers, we continued on the next morning. That afternoon, Kesha took approximately 10 traps off a shorter line trail and brought them back to the cabin for placement on the main trails where some traps had been lost or for new sets. Some traps are lost due to sable being taken away along with the trap by predators or sets being destroyed by wolverines or bear. A few sable traps had wolf traps positioned to the side to catch the head of the potential robber. The Evenkis say that bears will sometimes smash trap sets and drag traps away. Sometimes they can be found a few meters away from the set. The say that bears are “masters of the forest and do as they please,” just as a man sets his household in the order he chooses. These trips are shown in Figure 6.4.




**Map 6.5 Khamakar Trapping Trails**

The oval loop and the line running from the northeast corner of the map show these on foot trips. The trail to the north east leads to another hunter’s territory that we visited during the course of checking traps. Roma’s territory is centered on the map and Boris’ territory is on the lower right. This map also shows the trips between Roma and Boris’ cabins discussed in the section on cabin building below.

**Picture 6.5 Preparing trap set for sable**

Trap sets vary slightly in configuration. The trap itself is a typical single spring leg hold trap with a chain fastened to the leaf spring. The chain is wired to the end of a pole about two and a half meters long and the trap rests on the top surface of the pole, which has been flattened. The pole is leaned up against a tree trunk about a meter off the ground. This pole is held up by wood and brush piled alongside the pole for reinforcement against melting snow, small branches, and animals tugging at the pole and the trap attached to it. Sometimes traps are set on stumps, crooks, or other convenient locations. Bait is suspended above the trap; such as a fish or muskrat head, a bird wing – anything that looks and smells like food (cf. Sirina 2006: 68). When a sable sees or smells the bait, it runs up the pole and steps into the trap. Once a creature springs the trap, the trap and animal usually dangle by a chain from the pole. This keeps the sable suspended above the ground and relatively safe from mice, minimizes struggling, and damage to the fur. If the trap were fastened to the pole the sable would have traction and leverage to push against the jaws of the trap. Usually, the suspended sable is less exposed to sunlight but is not touching the snow, both of which can damage the fur. To keep the snow from building up under the set, the trapper sweeps a depression in the powdery snow with his foot. Roma's trap sets were largely out in the open with little tree cover above, in part because the area was burned in the past and an upper canopy has not yet developed. Many of Dima's trap sets have a small roof of pine branches to keep snow from covering the trap or caught sable. He said this helps to hide the bait and caught sable from birds, such as jays, ravens, and birds of prey. Occasionally, other animals fall into traps meant for sable, such as Siberian jays, magpies, ermine, and mink.[24]

[24] Boris mentioned that magpies only began appearing in the Khamakar region in the last decade, previously they only lived much farther to the south. Mink (*Neovison vison*) was introduced from North America.

**Picture 6.6 Setting a leg hold sable trap**

The schedule or rules of thumb for checking traps varied among Evenkis, some said every few weeks, others said 2-3 times during the season. Another rule mentioned was to check after a snowfall. Sable activity can briefly spike after a snowfall and traps spring less reliably if snow is allowed to collect on them. Pëtr pointed out that checking traps too often could depress catch rates because humans leave a scent trail and it takes time for this to dissipate.

Sable hunting takes place in the fall from the opening of the season in mid-October until deep snow accumulation, sometime in November. Hunting is most effective when a light layer of snow has fallen so that fresh tracks (less than a day old) can be easily distinguished. When the hunter finds a fresh track, he lets his dog(s) loose to find the animal. The dogs follow the track and the sable usually takes refuge in a tree. The hunter approaches and shoots the sable in the head to avoid damage to the fur. If the hunter is using a shotgun, he takes a position such that the body of the sable is behind the trunk of the tree and only the head is exposed, this way the pellets only strike the head, a non-valuable part of the fur. Sometimes the sable is partially or wholly hidden on top of a branch or in a crotch; striking the trunk with an axe or other object usually startles the sable, hopefully causing it to move into a better position to be shot. Sometimes, in thick forest, a sable escapes by jumping from tree to tree. Other times, a sable stays in the tree while the dogs bay. If a hunter approaches carefully while the dogs distract the sable, a shot can usually be made. Sables also hide in standing and fallen hollow trees. In these cases, there are two techniques for forcing a sable out into the open: chopping a hole in the side of the tree and kindling a small fire to fill the cavity with smoke or by using a long stick to force the sable to exit. In wintertime, sables often attempt to escape by diving and tunneling through the snow. Walking in a large circle around where the tracks disappear and spiraling inward can flush the sable.

Sables are commonly solitary during this time of year, although occasionally two sables are found together. During the period of light snow cover in the fall, hunters make an effort to hunt as much as possible. Other than thin snow cover, the other main condition is daylight. Hunting involves walking long distances to intercept as many tracks as possible. Hunts are generally conducted during the day, returning at night to the cabin, although it is possible to make camp in the forest. The duration of the sable hunting period, from the legal opening of the hunting season until the snow is too deep, is approximately 30 days (Nadeev and Timofeev 1955: 177).

The Evenkis' ideas about sable populations have largely to do with regional variations because of migration. No one I spoke with mentioned that sable populations were in decline. They acknowledged that sable populations fluctuate from year to year and in their hunting territory might be lower than usual, but the cause of this is migration. Sable are thought to travel long distances to take advantage of berry crops, to feed both on the berries and on other species, such as mice, and grouse that also are attracted to this resource. Only Dima said he sees a positive trend in the sable population in his territory. Others acknowledged that there were good and bad years, luck and food supply related migration, rather than overall trends in population. Evenkis also discussed migration and behavior when distinguishing adolescent from mature sable. Adolescent sables are thought to fall into traps more frequently because they are hungry and naive. These sable search for their own territories and often have to travel long distances to find an area they can defend or push out the current occupant. A local sable is usually mature, has an established territory, and knows to avoid traps and the smell of steel because of previous encounters. Both mature and adolescent sable can be taken by hunting. Behavioral and age differences between local and migratory sables are also documented by Nadeev and Timofeev (1955: 124).

The Evenkis were forthcoming with information regarding their sable harvesting methods and returns. The Kochëma and Khamakar Evenkis used hunting and trapping to take sable, however they differed in the size of their harvests and success in using each basic method of hunting vs. trapping. Complete information is only available for some hunters.

There are a huge number of factors that can affect sable hunting and trapping success. Hunters discuss individual causes of variability such as weather, migration, food resources, and other factors in relation to their returns. Evenki hunters observe many of these variables, and think about and discuss them amongst themselves. While they are keen observers of the environment, their ability to predict or explain sable behavior and their harvest is incomplete. Some of the factors that do not change from year to year are territorial size and the number of traps each hunter uses.

The territorial size of each hunter to some extent determines the potential size of the harvest – the larger the territory, the larger the potential sable harvest. The sable population depends on food resources such as small mammals, birds, and berries. Some hunters noted that sable harvests were poorer in years when the berry crops were good because they were less attracted to the bait over traps. Evenkis have an idea of their average harvests for their territory. In cases where individuals did not have exact harvest numbers from 2011, they gave the most recent year or an average. The Kochëma Evenkis in particular gave a wide range in their harvest numbers from year to year of 100 (2011/2012) to 200 (2009/2010) sables. I opted to choose the most recent figure rather than an average. The sable harvests of seven Khamakar (T) and Kochëma (K) Evenkis are shown in Figure 6.13. The bag limit figures (Kuchmenko 2011: 290) are based on harvest density over the entire Irkutskia Oblast' (Kuchmenko 2011: 8), thereby including urban and agricultural areas and giving an underestimation of bag limits on the Evenkis' territories. Sable licenses are purchased after the season for the number of furs harvested and the total number of licenses available is limited. The predicted harvest figures are based on a multi-year average of the sable harvest in the Katanga region (Glavatskii 2008: 50). Please see Appendix B for further details.

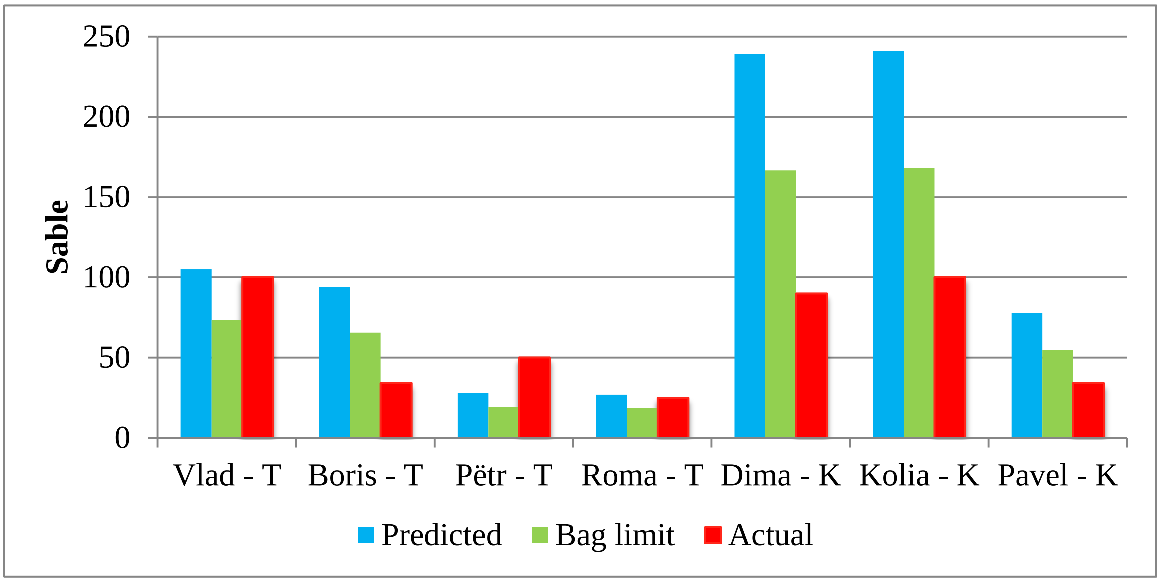



**Figure 6.13 Predicted, bag limit, and actual sable harvest**

The harvests of Boris from Khamakar and all of the Kochëma hunters are roughly one half to one third of the predicted amount, based on territorial size, the rest are very close to (Vlad, Roma) or above (Pëtr) the predicted harvest. The bag limit estimates are based on the total harvest limits for the entire Irkutskaia Oblast'. Since this includes urban areas and areas where sable are not found, these bag limits under predict the number of sables legal to take relative to the area of the Katanga Evenkis' territories.

Longitudinal data and more detailed interviews would be needed to make definitive statements on the sable population and hunting pressure. Three observations regarding harvest rates and predictions stand out. First, since Khamakar Evenkis' territories are smaller, their harvest effort is spread across a smaller area. In contrast, the

Kochëma Evenkis spread their harvest effort over a larger territory. The differing numbers of sable harvested is perhaps a reflection more of territorial size than other factors. Second, both groups of Evenkis are focused on hunting sable and meat in the fall, but the Kochëma Evenkis have the additional time expense of caring for their reindeer. The ways that reindeer are an asset in harvesting sable or compete for the Evenkis' time are open questions. Third, the observation that the Kochëma sable population is stable or increasing may be due to their less than predicted harvest rates. Some issues related to sable population size are covered in Appendix C.

The total sable harvest for each hunter by method of take, hunting or trapping, is shown in Figure 6.14. Information on method of take is only available for some hunters; unless otherwise noted, method of take was coded as trapped. Undoubtedly, this is an over simplification of the data, but shows the range of variation. Roma and Pavel did not take any sable by hunting in the most recent year, due to preferring trapping or having dogs that did not perform well in locating sable, respectively. Vlad and Dima were unspecific about method of take. Pëtr shows somewhat different results in both data sets, having a higher than predicted harvest and a larger proportion of total harvest from hunting.

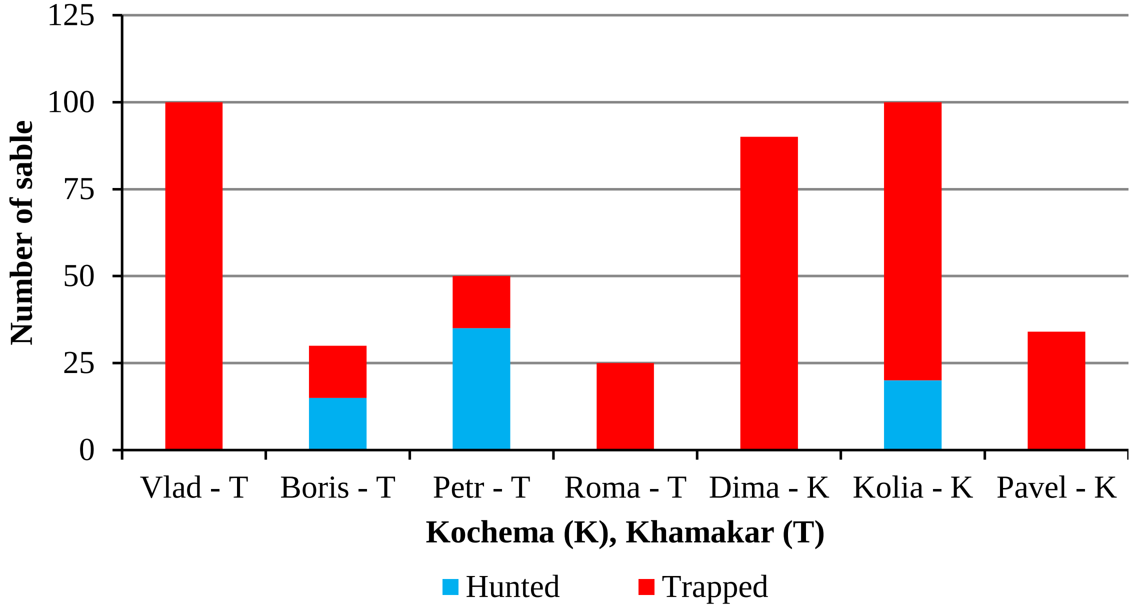



**Figure 6.14 Number of sable by method of take**

Aside from total hunting returns and success of using particular methods for taking sable, there is the question of the number of sable taken relative to the area that was hunted and trapped. Figure 6.15 below compares the density of the sable harvest per square kilometer between the Khamakar and Kochëma Evenkis. Measuring the sable harvest in this way normalizes the amount of sable taken between different size territories.

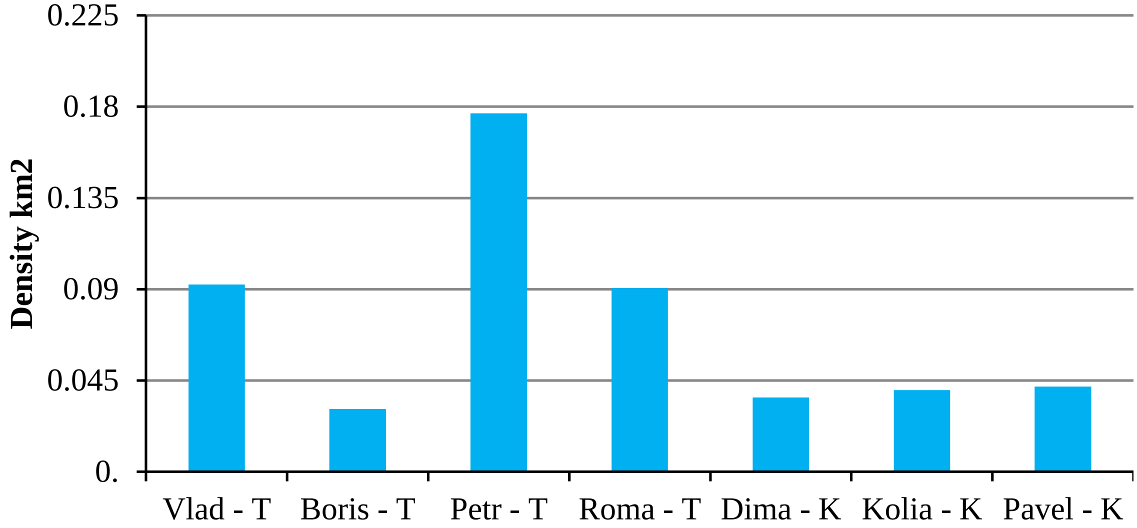



**Figure 6.15 Sable harvest density**

Among the Khamakar group, Pëtr has the highest density of harvest at almost .18 sables per square kilometer, with the closest densities of harvest being slightly over one half of this amount (Vlad and Roma). Several factors may explain why Pëtr stands out so distinctly from others in the sample. Pëtr has a particularly good dog for hunting and has a small territory; this may allow him to more effectively harvest sable (cf. Koster 2008).

**Picture 6.7 Trapped sable**

Another question regarding the sable harvest is the effectiveness of different methods. Aside from interview data, indicating that hunting can result in 0-3 sable for a day of hunting, I have no information on the effectiveness of hunting. Historical estimates indicate that it is possible to kill up to seven sables per day using dogs and firearms (Nadeev and Timofeev 1955: 177). The effectiveness of trapping can vary according to many factors, including location, checking schedule, place in the environment, scent contamination of trap sets, and many other variables. While Evenkis acknowledge that some traps more often and consistently catch sable, the efficacy of the method is averaged out among all traps. Evenkis also mentioned that the catch rate varies over the season but generally declines from the beginning of the season until midwinter and may increase slightly just before the end of the season.

Some Evenkis knew readily or could estimate the number of traps on their territories. The catch rate of each trap for the Evenkis for which I have data varied from .075-.45.

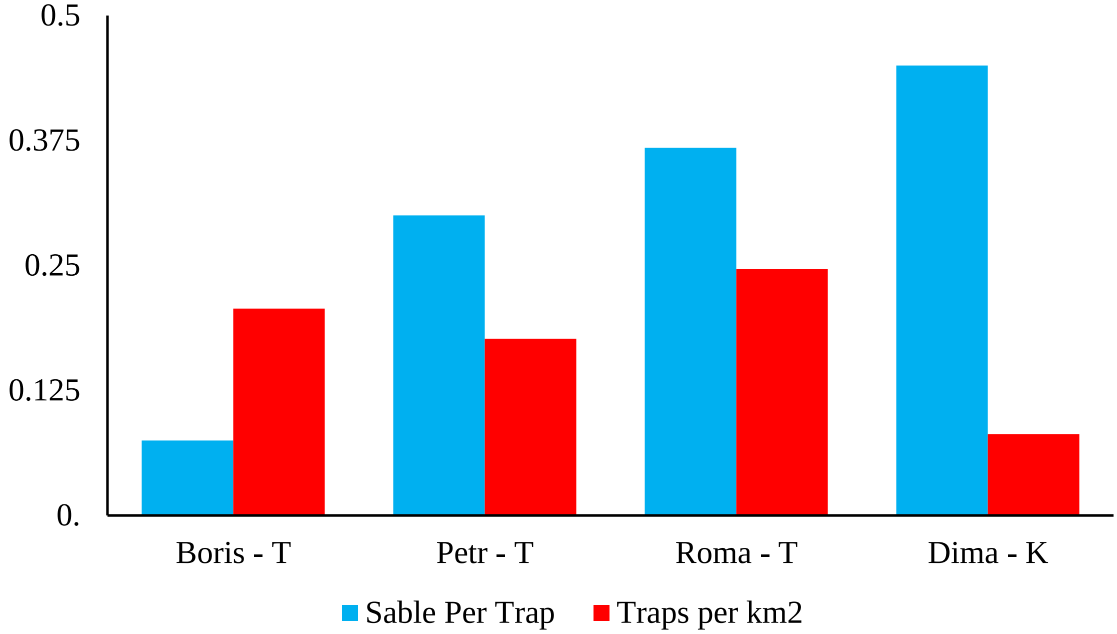



**Figure 6.16 Trap density and catch rates**

The data on trap catch rates and density is too sparse to make any hard assessments and is included for informational purposes. One would think that there is a relationship between trap density and the number of sable caught per trap. However, from this limited sample and the variables considered, no relationship is apparent.

**Picture 6.8 Sable furs dressed and prepared to sell**

Mobility connected with sable hunting differs somewhat by group and individual. The Khamakar Evenkis hunt sable only on foot, while the Kochëma Evenkis sometimes use reindeer in connection with sable hunting. When the snow is deep, everyone but Roma switches to skis for trap checking. Each cabin is roughly a day's travel apart, so it is a minor issue to bring a few days of food while traveling on skis. Roma simply prefers a snowmobile and uses skis only to check a few traps close to one cabin. Kochëma Evenkis check traps by reindeer sled, snowmobile, and occasionally skis. The table below shows the transport options available to each individual and the total harvest densities from Figure 6.15. Pëtr's trap and harvest density are identical because he has the same number of traps as the number of sable caught by hunting and trapping.

**Table 6.5 Sable Harvests and Vehicles**

| Name | Group | Vehicle options | Trap density km2 | Harvest Density km2 |
|---|---|---|---|---|
| **Pëtr** | Khamakar | Foot | .176 | .176 |
| **Vlad** | Khamakar | Foot, snowmobile | - | .092 |
| **Boris** | Khamakar | Foot | .206 | .031 |
| **Roma** | Khamakar | 1. Snowmobile, 2. Foot | .246 | .09 |
| **Dima** | Kochëma | 1. Reindeer, 2. Snowmobile, 3. Foot | .081 | .036 |
| **Pavel** | Kochëma | Reindeer, Foot | - | .042 |
| **Kolia** | Kochëma | Reindeer, Foot, Snowmobile | - | .04 |

The vehicle options listed are those each person owns and if known the preferred vehicles for checking traps are ranked in descending order. The Khamakar Evenkis live individually on their hunting territories, but may visit each other and borrow snowmobiles. In both groups, individuals without snowmobiles have close family members or partners that do own a snowmobile and live nearby or in the same household who may loan it out for a short time or specific task. The means of transport available to each individual seems to have no relationship to total harvest.

Moose Hunting

Moose hunting techniques differ by season as well as the hunter's skill and equipment. In the fall 2011 field season, Khamakar Evenkis shot three moose, during two hunting trips. I was not present for either of these trips, but obtained accounts directly from individuals who participated. Since the harvest numbers here are much smaller than sable harvest numbers, I will describe these hunts first and then discuss moose hunting more generally.

The first hunt took place on a territory about 9 km from where Boris, Roma, Vadim, and I were working. Vlad and Kesha were staying at Boris's cabin and shot a 5-year-old bull moose.  We heard the shots around mid-morning and wondered what they might mean. That afternoon, Roma and Vadim took the boat to visit this cabin and came back with several large pieces of moose meat[25] Vlad and Kesha had given our group. Vlad and Kesha then returned to Khamakar to process the rest of the meat.

[25] The head, minus tongue; 1 hind quarter; ½ liver; esophagus, lungs, and other offal for dog food; ½ pelvis; 1 kidney.

**Picture 6.9 Moose head and quarter**

The Vlad and Vadim went on the second hunt downstream on the Tunguska from Roma's territory about 30 kilometers. From there, they turned upstream into the Lower Kochëma River, which flows into the Tunguska. They arrived in the afternoon and moved gear into the cabin there. That evening they quietly trolled up stream. Vadim was in the aft of the boat and Vlad was in the rear, steering. When they spotted a cow and a yearling calf on the shore, Vlad accelerated the boat and gave Vadim the signal to fire before the moose got too spooked. Vadim fired a number of times at both moose. The cow was anchored on the shore and the yearling fled a short distance into the brush but they found it and finished it off. Over the course of several hours, they dressed out both moose, loaded them into the boat and went downstream to rest for a few hours in the early morning at the cabin. The next day they went back upstream of the Tunguska; Vadim unloaded his share of the meat and stayed at Roma's cabin and Vlad returned to Khamakar.

The meat from the first hunt was given based on several factors: first because of the general custom of meat sharing, but also because the moose was shot on Boris's hunting territory. These three men, Boris, Vlad, and Kesha, are all closely related as well. The meat from the second hunt was also given as result of the general custom of food sharing, but also because Vadim participated on the hunt.

On the Kochëma, Dima and Kolia each shot one moose in the fall but by midwinter this meat was gone and they each were forced to slaughter a domestic reindeer for meat. Dima went on one moose hunt during the field season, and kept an eye out for moose tracks during the whole period. He said that wolves had chased away the moose from their usual territories and so it was harder to predict where they might be. The hunt he went on is described in the section on stalking below.

Intercept

Intercept hunting involves locating a moose by sight or sound, most commonly near water or feeding areas, often in the mornings. However, moose are also found and shot in the course of other activities. During warm months while spending time in the taiga, firearms are kept nearby in case game or bears are encountered. The specific techniques used vary depending the animal's level of alarm, distance, and the capabilities of the hunter and the effective range of the firearm.

Roma commented many times that hunting moose with a shotgun is difficult because this firearm has a short effective range. While traveling on the river and while at hunting cabins along the shore, we constantly saw moose tracks. If a moose were spotted along the river, it is not likely that the hunter could approach within shotgun range before the animal reached dense cover and was lost. A rifle on the other hand, because of its greater range, can be used to effectively wound or anchor a moose before it reaches cover. Owning a rifle is subject to greater regulation and so many hunters do not own them. In the fall 2011 field season, Roma indicated that the absence of a rifle in the party was why they did not hunt moose more actively (see Appendix D).

A kind of intercept hunting is to simply float or troll along a river in the mornings and evenings. Moose may be encountered on the water virtually any time of the day but are more likely to be found in the mornings and evenings. On rivers with many bends, it is possible to come upon an animal very suddenly. On straighter rivers, a moose may spot or hear the approaching boat and head for cover.

Roma and Boris's lack of investment in moose hunting should also be seen in context of other factors. The primary activities for the group (Roma, Boris, and Vadim) at the time of observation were finishing Roma's cabin, checking the traps and trails on his territory, and fishing. On the same day the cabin was sufficiently finished to move in, Vlad and Kesha shot a moose and gave meat to Roma, Boris, and Vadim. Given the temperature at that time of the season, preserving the meat was a challenge. Some was salted down in a barrel. The rest was hung up to dry and some of the larger sections were lightly smoked to keep the bugs off. Insects were still active and the days were warm – around 15˚C during the day. With these measures, the meat was preserved somewhat, but Siberian jays were a persistent problem. They would come in ones and twos to peck at and steal chunks of meat where possible. Vadim fashioned a wrist rocket from a piece of inner tube and a forked stick, killing several. He hung one up as a scarecrow, but it was ineffectual. Hunting and preserving moose meat this early in the season would have diverted time and effort from building.

Up to that point, we had been eating provisions, a few ducks, and fish. While this food was sufficient in terms of supplying energy, it had become somewhat dull fare. In conversations around meals someone often mentioned how nice it would be if we had meat, specifically moose meat. Moose or reindeer meat is one of the most preferred and satisfying. Meat is real food; other things are merely something to eat.

In short, that Boris and Roma did not put more effort into moose hunting can be explained by several factors. First, their primary goals were finishing Roma's cabin, fishing, and checking the trapping trails. Second, because of the warm weather preserving any moose harvested presented something of a problem. Therefore, even from the amount they were given, a considerable portion was sent to relatives. Third, there were sufficient food supplies on hand. At the time they finished the cabin, a primary goal, they were given more moose meat than they could use at the time, in effect pre-empting the need to hunt moose and effectively store meat.

Hunting with Dogs

This method is essentially identical to how sables are hunted. A hunter looks for fresh moose sign or turns the dogs loose to search for moose. The hunter finds the moose by the sound of barking dogs. In the abstract, this is how things are supposed to work but depends much on the skill of the dogs. During the fall field season, Vadim, Vlad's son Vasia, and I went to hunt ducks at dusk where they usually settle in the evening at a slough. The dogs had been allowed to run around for the past few days and on the way back we heard them barking some distance away in the taiga. Vadim listened for a few minutes on the margin of the forest. Discussing with him afterwards, he said that a good dog would bark differently at a moose than at a grouse or squirrel. At first when listening, he would comment that it sounded like the dogs were barking at a moose, but after some time the dogs stopped barking as excitedly and we moved on. He said it was probably not a moose after all. On top of this, it was getting dark and so not the best condition for checking out whatever the dogs were barking at.

In discussing dogs and how they are used with different people, I heard contradictory information. Some said that if a dog that has the traits necessary for hunting then it is only good for hunting one kind of animal: sable, bear, or moose, but not all three. On the other hand, some dogs bark at anything from mice to rabbits to moose and do not discriminate between a fresh track and an old track and so hunting with such dogs is spotty to counterproductive. They will follow an old track and be gone for days, never finding the animal that passed by four days previously. A good dog on the other hand is a treasure about which all kinds of stories are told. At minimum, a dog should follow a track and bay at the animal, distracting and delaying it until the hunter arrives. A good dog is said to be very clever in how it hunts. It will follow a track but responds to the hunter’s movement by not approaching the animal too aggressively and driving it farther from the approaching hunter (see also Turov 2010: 33). Some dogs are even said to drive a moose in the direction of the approaching hunter. One dog in Khamakar is specially fed table scraps. Vadim pointed out that this dog has had a hard life and spent many years feeding the village. He said the rest of the dogs are useless and know only how to steal.

Training and care of dogs is a complicated subject. Roma began the hunting season with three dogs: a bitch that was a few years old and two yearlings. His pattern of training is to let the younger dogs learn from the older and see how they develop. After the season, Roma said that sable hunting with these dogs was not very successful. The older bitch treed a few sables but her performance was somewhat spotty. The younger dogs had little inclination toward hunting and ran away from a wounded, trapped sable he let go. He took pity on the older female, but the other two will not be used any more. From her spring litter of 2012, he kept two puppies but only one survived. He is hoping for better next year and has been asking around for puppies. A Russian acquaintance had a different take on training. He said simply that a hunting dog should be isolated from other dogs, and then it will develop a good hunting sense and not run wild around the woods. Roma allowed his dogs to run around some of the time but they got in the way during cabin construction and he tied them up so they would fatten before hunting season. They were fed every second day a boiled mixture that included flour and some combination of table scraps, fish guts, offal, poor cuts of meat and bone, and by-catch, chiefly perch and ide or pike found dead in the nets. Sable carcasses are also included in dog food. On the Kochëma, dogs were fed a similar boiled mixture of flour and some form of protein, the difference being that fish are not usually caught outside of the warm season for immediate consumption and so not included in dog food. They were fed nearly every day, as this was during the winter. As one would expect, dogs need more calories to keep warm in the cold, however one of the Kochëma Evenkis' neighbors did not feed his dogs for more than 10 days in mid-winter while away from his cabin and they survived. Due to the time of year, I observed no use of dogs on the Kochëma.

Winter Moose Hunting

In the winter time, there are three techniques of hunting that were discussed or practiced by research participants during the field season, hunting on the *mar'*, stalking on skis, and hunting on the snow crust in the late winter/early spring.

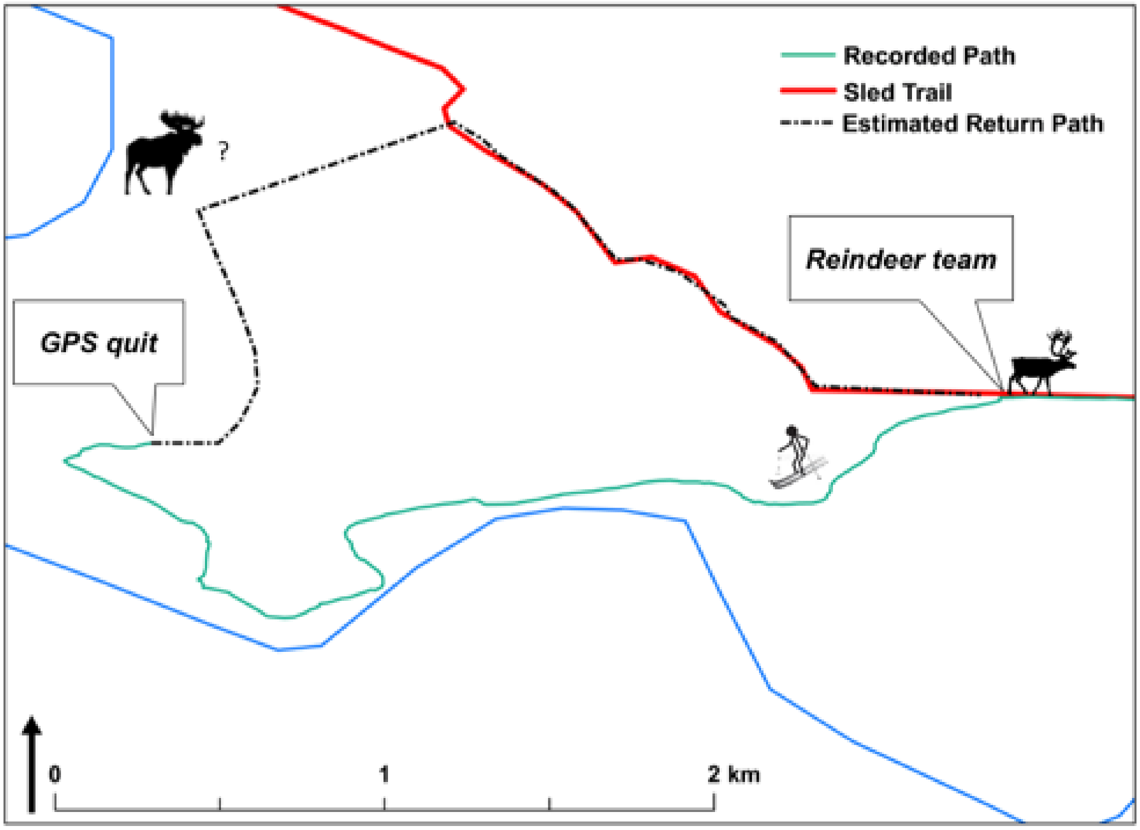
In midwinter, moose tend to feed in the *mar'* during the periods of deep cold common in midwinter. The *mar' is* a muskeg-like wetland named for a low brushy plant – *marnik*. The *mar'* usually has very little tree growth and considerable spatial extent, so moose can be spotted far away. Additionally, the deep snow and thick brush restricts somewhat the moose's ability to escape and reach cover quickly. One technique is to ride up quickly on a snowmobile and shoot from close range. Another, if a long-range rifle is available, is to find a place of cover at the edge of a *mar'* and wait for moose to come out to feed. Hunters use binoculars to spot and shoot at long range from a stable position. Roma said approaching by snowmobile is his favored method, which also suits the hunting tools he has available. Russians generally have better access to rifles and are known to shoot moose from long ranges, of several hundred meters. Dima specifically noted that hunting on the *mar'* is a particularly Russian practice. He also said that because of the warm winter this year moose did not feed as frequently on the *mar'* and so many Russians do not have meat this year. Something of a subtext to our conversations about hunting was that there are Russian ways of hunting – spot and shoot in open landscapes (*mar'* or on the river) and Evenki ways of hunting – stalking and hunting with dogs.

Stalking

Stalking moose on skis can be done after deep snow has accumulated until it begins to melt heavily. Locating a moose to stalk begins by looking for fresh tracks.

Although conceptually simple, stalking is a method of hunting that demands a high degree of skill and patience, as well as the right equipment and conditions. Dima was my primary informant on this method of hunting. Kolia is also skilled in this method and gave information that was substantively identical to Dima’s. While talking with both of them, they pointed out that while they can stalk, and conversations with others indicated that they are known and respected for this, their fathers and grandfathers were much more skilled. They told me an anecdote about two old men they knew who went hunting together and stalked a moose to its resting place. They stood whispering for a moment, disagreeing where the moose was exactly located, disagreeing whether it was behind a particular tree or hummock of snow. As they approached closer, it turned out that one of the men was off by only a meter. In follow up questions, something was still lost on me about the significance of this error or their disagreement. On rethinking this matter my conjecture is this. First, where the men stopped to discuss the location of the moose was probably quite distant, out of earshot from the moose itself. Second, while a moose is lying down in deep snow, very little if any of it may be visible from a distance. This hints that these men either had very keen eyesight or an ability to predict the location of the moose based on their knowledge of animal behavior and the landscape. Whatever nuances of the story may have been lost, their general point was that their ancestors were more skilled at this method than anyone in the region today (cf. Turov 2010: 44). A number of Evenkis said that they simply do not have the patience and skill for stalking.

The stalk begins by locating a fresh moose track. During the field season, Dima went on several short trips to look for fresh tracks, on skis or reindeer sled. One day he mentioned that the conditions were right and he harnessed two reindeer to a sled and brought his skis, rifle, and axe. He told me about the events of this hunt and I asked him about the process of stalking on several occasions.




**Map 6.6 Moose Stalk – Actual**

Map 6.6 shows the path of travel for a hunt for with a partial GPS record. Dima had said several days previously he wished to go look for moose tracks via reindeer sled if the weather conditions were right. On this particular day, the weather was good for hunting: somewhat warm with a light breeze. Mid-morning, he brought the herd back to the cabin. Next, he warmed up his hunting skis by the wood stove and heated the birch bark footpads, rubbing them with oil. He said this is to prevent snow squeaking between the foot and the ski. Snow does not stick to the birch bark footpad but snow compressed between the foot and the ski can make a high-pitched squeak. He then hitched two reindeer to a sled and took his skis, rifle, and a few other necessities, and traveled approximately 6 kilometers down the trail. He found a fresh track and parked the reindeer, tying them to a tree. After following the track on skis for some distance, he went up a stream channel, hoping to get closer to where the expected the moose to be. He spotted the moose, a female and yearling, across a clearing, some 300 meters away and as they were already getting nervous, took a potshot.[26] Apparently he missed, finding no hair or blood. The GPS unit turned off partway through the final stalk because of the cold. The estimated return path is based on his direction of travel at the point the GPS turned off, the local topography, and the time when he arrived back at the reindeer team and turned the GPS on again.

**Table 6.6 Moose Stalk**

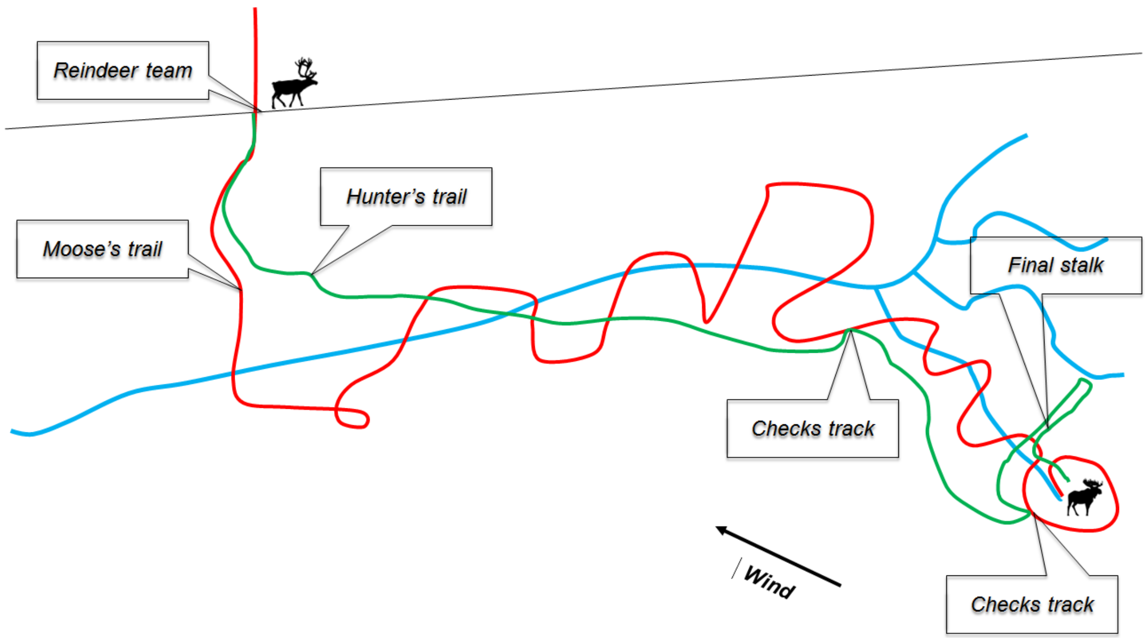
| From | To | KM | Time | Km/h | Source |
|---|---|---|---|---|---|
| Cabin | Moose track (reindeer team) | 6.2 | 0:43 | 8.7 | GPS |
| Moose track (reindeer team) | GPS quit | 2.5 | 1:12 | 2.1 | GPS |
| GPS quit | Reindeer Team | 2.5 | 1:09 | 2.2 | Estimated |

The total hunt took slightly over three hours. What I had hoped to document was Dima's changes in movement at all three stages of the hunt: finding the track, following the track, and the final stalk. The GPS documented parts of the first two stages, but shut off sometime before the third. Unlike in the ideal circumstances of a stalk, the moose were either moving or alerted to Dima's presence, forcing him to take a low probability shot.

[26] "*strelial na ugad*"

Stalking is facilitated by certain conditions. Warm, breezy days are best. The wind masks much of the noise of the hunter's movement, and in warm temperatures moose generally will bed down in mid-day to rest and chew their cud, giving the hunter time to slowly approach. A hunter searches for fresh tracks along sled trails and forest roads. Kolia explained and showed me in general terms how the age of a track in the snow is determined. When an animal passes through snow, its tracks harden or freeze. This gradual process occurs more quickly in cold temperatures than in warm temperatures. The sides of a fresh track are as soft as the surrounding snow, but the disturbed and compressed snow become harder with age. The edges of a two to three day old track will be crusty and compacted. A day old track will have some firmness to it but still be soft. Dima, Kolia, and Roma were all observed to test tracks by poking them with a stick or hand, or walking through them. The surface edges of older tracks are also more jagged, rather than cleanly cut like new tracks. Comparing three tracks of different ages, it is easy enough to tell that one is older or younger than the next, but aging a track based on all the variables of time and temperature is considerably more difficult. I attempted to clarify how tracks were aged from an animal one is actively tracking, where the tracks would have hours or minutes of difference in age. In response, Dima pointed out that caution, quiet movement, and knowledge of the landscape and animal behavior as being more relevant factors. Perhaps on a very short time scale tracks are difficult to accurately age.

The process of stalking was most thoroughly described by Dima, but comments by Kolia and other hunters were essentially identical. The following is a compilation of their descriptions and a hand drawing by Dima, which I stylized in depicting the path of travel and process of stalking in Map 6.7.




**Map 6.7 Moose Stalk - Conceptual**

When the hunter finds a fresh track, he stops and ties the reindeer team up if he is using them. Then he puts on wide, short hunting skis, the bottoms of which are lined with moose leg skin. The hunter follows the track somewhat to the side, perhaps a dozen meters, but periodically returns it, making sure he is moving in the right direction. While checking, the hunter makes an effort not to disturb the track. Animals often loop back on their own trail to look for predators while feeding and before bedding down. Avoiding disturbing the track minimizes the chances of the animal spotting the hunter and keeping the track undisturbed will allow the hunter to recheck the tracks if he is diverted by an old track or one from a different animal. While continuing to approach, the hunter continues to check the track periodically. When moose bed down, they typically make a loop and rest near their track, so that they are alerted to any predators who may be stalking them. Determining at what point and in which direction the animal has turned off to bed down is particularly critical. Wind direction is also very important. Following the loop will surely blow the hunter's scent to the resting moose. Instead of following the tracks around the loop, the hunter checks to either side of the main trail while keeping down wind. Dima said that moose prefer to bed down in the headwaters of small streams, which can be brushy above and below the snow. When the hunter has determined the approximate location of the moose, he removes his skis for the final stalk. Sometimes a branch will catch or slap against the ski. The final approach is made on foot to avoid snapping any branches or making other noises. The hunter can carefully step through the snow, feel with his feet, and avoid snapping or brushing against branches or twigs buried in the snow. In addition to their dark shape against the snow, moose can be sighted by two clues: the sounds of chewing cud - coughs, grunts and wheezing – and vapor clouds from exhaling. At this stage of the stalk, the ability of the hunter to listen and look for clues of the moose's location and control his own sounds and movements become extremely important. Snapping a twig above or below the snow or a branch brushing clothing can spook the moose on the final approach. Dima's technique when he has sighted a moose and is ready to fire is to whistle – the startled moose stands up and is shot. Dima said he prefers to shoot from a distance of about 30 meters.

A different type of stalk hunt takes place in the late winter and early spring. When the snow begins to melt, it forms a hard crust on top and becomes denser overall. If the crust is thick or the snow very deep, the moose tires quickly as it is chased. The hunter can chase the moose for some distance and approach close enough to kill it as it struggles through the snow.  This technique was not discussed in as much detail, but likely employs many of the same techniques as stalking during the colder months in searching for and testing tracks and approaching close enough to kill. Due to the warming temperatures and deep accumulation of snow, by late winter moose and reindeer struggle to move across areas they have not packed trails. Dima said the ideal condition for hunting on snow crust is to have a layer of powder over the crust, which makes skiing much quieter. When the crust is thick enough, it holds the hunter’s weight very well and he sinks down very little, if at all, in comparison to the deep powder conditions earlier in the winter. Wood skis are very noisy on crusty snow, fur skis are quiet but the sharp, icy snow causes a lot of wear. In the past, spring hunting skis were soled with wolverine fur, which made movement very quiet.

In response to my question, about which moose he chooses to kill, Dima said that he generally prefers to kill bulls, rather than cows, and preferably younger bulls because their meat is better. Cows, Dima explained, will typically live in one area year after year, if undisturbed. Bulls migrate during the rut searching for females and so killing them can be a better decision in the long run. Dima and Roma can determine the sex, domestic/wild origin, and approximate age of moose and reindeer tracks, allowing selective hunting and purposeful searching. For a more detailed description of tracking methods among another Evenki population, see Brandisauskas (2009: 102-125).

The methods of harvesting moose by stalking and hunting with dogs are also known among sub-arctic populations in North America (Nelson 1986: 102-6, Rogers and Smith 1978: 132-5).

Reindeer Herding

Currently, six families herd reindeer in the Katanga region. Two of these families live on the Kochëma River and the other four in the region of the Teteia River and village of the same name. From what I have been told, the Teteia Evenkis keep smaller herds of fewer than 30 head and migrate only in the summers, spending the winter in the village. For a period of about five weeks, I lived with both families on the Kochëma, approximately three weeks with Dima and two with Kolia. From February into March is one of the slower times of the year in terms of mobility and subsistence activity. Nonetheless, I was able to gather useful data on their activities during this period and discuss other times of year.

Caring for Reindeer Throughout the Year

The Kochëma Evenkis' daily and seasonal activities are structured around the needs of their reindeer. The rhythm and intensity of work varies throughout the year, but herding demands frequent interaction with reindeer regardless of the season. They keep reindeer for use as transport in migrations and subsistence activities. Although there is historical, regional, and organizational variation, reindeer husbandry in the taiga zone of Eurasia is generally for transport, whereas in the tundra zone it is generally for food and transport (Turov 2010: 57-61; Baskin 1986; Vasilevich 1969: 3-6, 72-80). Please refer to Table 6.2 above, which summarizes the Kochëma Evenkis' seasonal patterns of movement and care for reindeer discussed below.

The factors that motivate the Evenkis' behavior in relation to reindeer include the need for pasturage, care from pests and predators, tethering reindeer to the Evenkis and their living site, the use of reindeer for mobility and economic activities, and balancing care for reindeer with other activities. Reindeer biology and season involve different arrangements of these factors and the degree of influence they have on the Evenkis daily activities. In most parts of Eurasia, wild and domestic reindeer live in the same areas. Much of the human effort around keeping domestic reindeer involves controlling innate reindeer behavior and the intermixing of wild and domestic reindeer.

Domestication is based on both behavioral and genetic factors (Jenson 2014) and Evenkis understand both of these domains. They protect domestic cows from wild bulls and deal with wild/domestic offspring selectively. They also use a wide range of methods to control and condition the behavior of domestic reindeer. These include the use of corrals, salt feeding, smudges, and training reindeer for various purposes.

The Evenkis use a number of techniques for controlling and conditioning reindeer behavior.  The Evenkis feed their reindeer salt by hand or in a *karita*, a trough, as a means of habituating them to human contact and the dwelling site. Salt is one of a number of minerals that animals seek out where it occurs naturally (Poole et al. 2010) or is available from humans (Laurian et al. 2008).

**Picture 6.10    Feeding reindeer salt at cabin corral**

Based on my observations during the winter 2012 field season, reindeer react differently on an individual and spatial basis to the prospect of being fed salt. Between individuals there was considerable variation in how actively they seek salt. Most reindeer would rush the *karita* when the herder poured salt into it, but some were less interested. Interest in and access to salt could also be related to dominance hierarchies as well as a general craving. For instance, yearlings were pushed aside by larger reindeer, but after the larger reindeer left the *karita* some of the yearlings would search for salt in and around the feeder, while other reindeer were uninterested.

**Picture 6.11 Reindeer at *karita***

While the Evenkis were out with the herd in the forest, a few reindeer would approach in the hope of being fed salt, usually only approaching the herder when he came near. Even in these cases it was only a few individuals, perhaps two to four, who abandoned feeding or resting to be fed salt when the herder came within a few dozen meters. Generally, the herder gave a little salt to those who approached. More often the herder feeds salt to particular deer he wants to bridle.

Another way Evenkis control their reindeer is by using the herd structure and dominance patterns to their advantage. Outside of calving and mating seasons, reindeer forage freely in the landscape. One element of herd structure is that the older individuals, usually females, become *vozhaki*, herd leaders who keep alert for predators and lead the herd in movements. The Evenkis use this to their advantage by fitting bells to these reindeer so they are easily found in the landscape and feeding them salt by hand to associate this reward with human contact. Often the herd leaders are quite docile because they have been milked and handled by humans intensively. To move the herd, Evenkis simply locate and halter the herd leaders and lead them on a migration or back to the dwelling site.

Evenkis also use corrals to confine the herd for three basic purposes. First, during calving season, reindeer cows seem to prefer to give birth alone, away from the herd. While this may confer survival advantages for wild reindeer, for domestic reindeer it would splinter the herd and make it difficult for the herder to render aid or protect from predators. Bears in particular are a threat to reindeer in the spring because they have just emerged from hibernation (Zager and Beecham 2006). To keep the herd whole and easily monitored, the Evenkis confine their reindeer in a corral for approximately one month, from just before the onset of calving season until the start of the bug season, usually from late April to early June. The corral encompasses enough forage for the herd during the time they are confined, usually several square kilometers. Second, during the rut in the fall, wild bulls attempt to mate with and drive off domestic cows. To help ensure that only domestic bulls mate with domestic cows, they confine their herd for about one month, from late September to late October. In both spring and fall, Evenkis walk the perimeter of the corral to monitor the herd and make sure the fences are in good shape. Ideally, the corral encompasses enough pasture for the period of the calving or rut season.

In the event that more forage is needed, the Evenkis simply build an extension out into the forest and open the fence when the addition is complete (cf. Sirina 2006 98-9). The Evenkis keep multiple spring and fall corrals to allow the pastures to recover from year to year and provide convenient access from a variety of migration routes. Occasionally, new corrals are built but each corral is usable for a number of years before it must be allowed to rest and rejuvenate. Third and finally, the Evenkis use smaller corrals as needed for more specific purposes. Calves are also sometimes haltered and tied in camp during the warm months while the cows are out feeding. Cows are often milked inside of a small corral to prevent calves from getting in the way. Although not discussed specifically with research partners, a corral could also be useful for castration and trimming antlers. There are also corrals around cabins. Evenkis bring their reindeer back to the cabin and confine them inside the corral for a few hours every few days to habituate them to the new living site of their owners, to be fed salt, and to check on their physical condition. After a migration to a new cabin, some reindeer may return to the previous cabin in expectation of being fed salt. Confining reindeer in the corral and feeding them salt at the cabin every few days helps them to remember where to expect a salt reward.

During the summer, Evenkis have a method of controlling their reindeer that takes advantage of the reindeer’s natural pests and need to rest during the warmest times of the day (cf. Hagemoen and Reimers 2002). The sub-arctic is famous for huge quantities and varieties of biting insects and their utility for reindeer husbandry was rather succinctly explained by one Evenki: “[in the summer] the flies, the mosquitoes – they are the shepherds,” The Evenkis keep the insects off their reindeer by building smoky fires called *dimokur*, called smudges in North America, to keep insects away. In the warm months, reindeer feed at night when it is cooler and there are fewer insects. During the day when it is warm and the bugs come out, they return to camp where the herder lights smudges and they bed down to rest. The wood used for smudges is from dry standing pine trunks. Usually, three trunks are placed end to end to achieve a smoldering, smoky bed of coals. Dima said he uses 6-9 smudges, depending on the supply of wood and size of the herd. At the time we spoke, his herd was approximately 90 head. Since the best protection from insects is where the smoke is thickest, reindeer crowd around the smudge and jostle each other for the best position. Sometimes a reindeer steps in the coals and burn the soft tissue around the hoof. A pathogen develops in the wounds that cripples the individual and quickly spreads the infection to the whole herd.[27] Because of this, any individual injured in this way is culled immediately. To prevent reindeer from stepping in the smudge, Evenkis set up a cone of logs around and over the smudge to reduce the potential for injury.

The Evenkis also train their reindeer for a variety of purposes. This area of human-animal interaction is quite complex, but research partners provided some insightful information. The purposes reindeer are trained for include pulling sleds, riding, and carrying packs. These are particular tasks, but the most basic kind of training or conditioning is habituation to humans. This process starts soon after birth. As mentioned above, the herd is confined during the calving season. As part of the Evenkis' daily herd monitoring, they look for cows about to give birth. Handling begins after the cow bonds

[27] Reindeer are subject to a variety of hoof pathogens, one example is Necrobacillosis (Handeland et al. 2010) but the spread was linked to weather conditions rather than infection from wounds.

with the calf and continues as the calf matures. In addition, calves are haltered and tied during milking, both to keep them out of the way and to get them used to being handled and lose the fear response to being haltered.

When reindeer are older, they are trained for specific tasks. We did not discuss many details of the training process, but concentrated on the use of reindeer for transport.

Winter

Care for reindeer is somewhat less during winter than in other seasons. Reindeer are used to pull sledges in winter for a number of reasons: through February to check sable traps, for moose hunting – to take the hunter along trails looking for tracks, for moving household items when migrating to a new cabin, and to haul firewood or other cargo. If a moose is harvested, reindeer sledges are used to transport the meat.

The winter migrations are every two to three weeks, perhaps a month, and are done primarily to move on to new pastures. Kolia and Dima said that their households spend approximately the same amount of time at each of the cabins in the winter, but observation showed they spend a greater than average amount of time at their base cabins. Up to the start of the field season in midwinter, the Kochëma Evenkis' movements were toward their base cabins on the eastern edge of their territories, where they waited for a truck to bring fuel, groceries, and equipment. By the time the truck arrived, Dima had been living at his base cabin for close to six weeks.

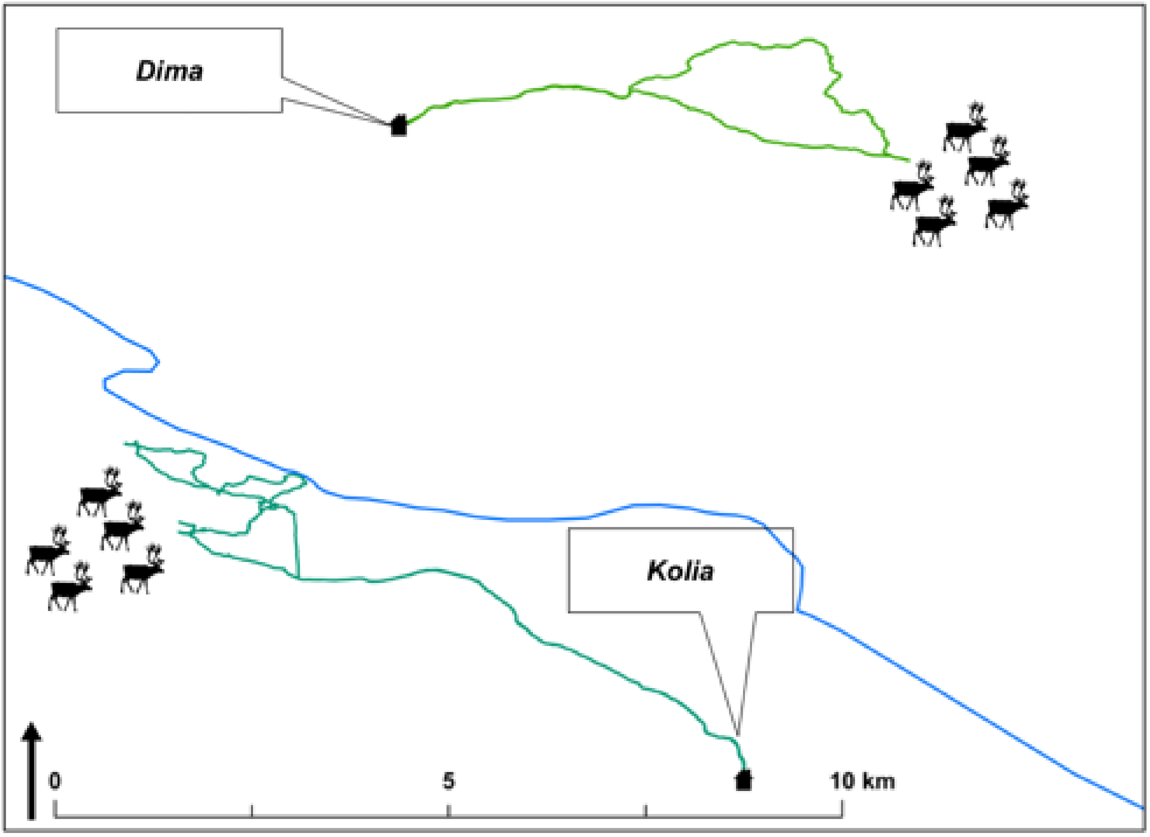
The reindeer diet in winter consists of lichen (esp. *Cladonia rangerferina*) found in the forest and in patches of tundra and the plants of grown over lakes – *kaltus* and occasionally tree lichen. Lichen is distinct as a food resource because it is particularly nutritious for reindeer in the winter but also very fragile and slow growing (Svihus and

Holand 2000, Klein 1990). Dima estimated that it might take 5-10 years for lichen to re-grow the few centimeters that reindeer crop off the top. He estimated that good lichen is about 5 cm thick; after it has been grazed, it is 2-3 cm thick, however this simple metric is not easily translatable to measures of growth or total amount of lichen (Herder et al. 2003, Sveinbjornsson 1990). Because the ground is frozen in the winter and the lichen is covered with a protective layer of snow, reindeer grazing has less negative impact on the lichen and plant resources than in the snowless months, when it is trampled in addition to being grazed, which is a problem with fall and spring corrals. Reindeer are also slightly omnivorous – they will dig up mice nests and avidly consume the inhabitants.

Feeding patterns were interesting. During one period of observation, reindeer would feed on the tundra for a little while, then take shelter in the woods for the night, feeding there and moving farther on the next day. Rather than consuming some percentage of the forage in one area, reindeer seemed to feed sparsely in one area and then move on, perhaps returning to the same place several days later. Some research shows that domestic female reindeer feeding patterns exhibit correspondence with the predictions of Levy walk patterns (Mårell et al. 2002) and that reindeer show a high degree of seasonal discrimination among the available forage based on dietary needs (Klein 1990). In the winter, Evenkis modify reindeer foraging and movement patterns by bringing them back to the dwelling site and encouraging them to return for salt. Outside of the nutritional benefits of salt and protective measures the herder might take in response to evidence of predator attack, the reindeer are encouraged to stay near the herders’ dwelling site for human convenience.

Controlling reindeer movement involves creation and maintenance of corridors. When we moved to the base cabin, Dima beat a path by snowmobile from the corral to the tundra and let the reindeer out only in this direction. To keep the reindeer from running down the sled trail leading away from his territory, he put up a scarecrow (a sack propped up on a stick) to prevent the deer from taking this path. He said reindeer will often follow a trail and wander long distances. He put the scarecrow up to frighten them into the woods and it seemed to work well – after he put it up there were no new tracks on the trail.  Past the tundra farther into the woods there was an old sledge trail and Dima commented that the reindeer tend to follow it; that they preferred to go to places they remembered (Wittmer et al. 2006). As the reindeer moved between the woods and the cabin, the trails they made became ever more forked. Only when leading the deer back home was there a direct trail, and this was at Dima's direction. On finding the herd one day at a *kaltus* several kilometers distant, he made a straight trail through the woods, a shortcut. This trail was more for his convenience; while feeding reindeer wander loosely in the same direction. Dima made efforts to direct the deer along certain paths and kept the gate leading to the previous cabin closed. Several kilometers down the trail in the direction of Kolia's territory, he closed a gate on the trail as well. He said sometimes out of habit deer will run back to a previous campsite. Kolia, on the other hand, seems to have made fewer of these attempts. When visiting him a few days after moving to the base cabin, all the gates to the corral surrounding the cabin were open. In succeeding days, deer wandered in from nearly all directions, more frequently through two adjacent gates. Subjectively, it seemed like Kolia went to check on the deer more often, but left them in the woods, even if they were far away. One particular time we set out to fetch the reindeer and Kolia expected them to be close by but they turned out to be considerably farther than he thought. However, he forgot to bring the bridles to catch the leaders and so the herd was left to roam. Dima seemed more likely to bring the herd back to the cabin and always carry bridles.

Finding the herd usually occupied a good portion of the day. Both herders seemed to set out in between 10 am and 12 pm. The whole time they would be gone varied from three to six hours. The herd was virtually always found on the same day. The exception was when Kolia had a guest and did not check the herd for approximately five days. In that time, the herd wandered off approximately fifteen kilometers. The bulk of the herd was found but an older bull and about ten other reindeer were missing for a few days. Eventually he found them and returned them to the main herd. The process of finding the herd involved following the freshest set of tracks, simple in theory, but rather complicated in process. As mentioned above, individual reindeer do not forage in single file, but move at their own leisure near the rest of the herd. In practical terms, this means that large areas are covered with tracks where reindeer have been milling about, feeding and resting. When they move to a new area, a number of deer do fall into line and make a more definite path. These lines are several, and there are tangential tracks that converge and diverge with these lines. Tracking reindeer to their current location involves reading of new tracks on top of old tracks to find where the trail breaks out into new snow. When tracking their deer, both Dima and Kolia consistently followed the proper track, taking us on a winding but sure path to where the reindeer were located.




**Map 6.8 Reindeer Search**

Two examples of the spatial extent of reindeer searches are shown in Map 6.8. In both cases, the herder had an approximate idea of where to find the reindeer but had to search via tracks, bell sounds, or other clues to determine the actual location of the herd.

When migrating during the winter, reindeer are harnessed in tandem to seven sleds: one is a riding sled, the rest are for cargo. A few days after arriving at the first cabin at the beginning of the field season, Dima and his household moved to their base cabin, about 9 km away. Pavel and I took the snowmobile and sled loaded with supplies and left first. About an hour later, the reindeer and sleds arrived. Dima had already packed the trail around the cabin by snowmobile several days earlier when we passed through. On arrival and successive days, the reindeer were locked in the corral to pack down the snow. This makes it easier to walk around the yard and habituates the deer to this location being home.

Spring

Calving season begins in late April through May. When females are about to give birth, they try to sneak off away from the herd. Bears have already come out of hibernation by this time so protecting vulnerable calves and cows is critical. For these reasons, the herd is kept in a large enclosure from before calving season until the young are strong enough to move. This allows the herder to keep a close watch on females, to provide assistance if needed, and to monitor and react quickly if bears or wolves attack. Another cause of calf mortality is exposure. In the early spring, temperature fluctuates considerably and a cold snap or snowfall can kill calves.

Several days after the calves are born and gain strength their training begins. A few days after birth, the calf is caught and rubbed all over by hand to get it used to being handled and controlled by humans.[28] Soon afterwards bridle training starts as well. A halter is fastened around the calf's neck and fastened to a tree. Dima showed me a video he had taken with his pocket digital camera of a calf tied to a post. It thrashed about and struggled, then stood panting. Presumably this continues until the calf learns to tolerate being restrained.  The mother is kept nearby but is also restrained. Along with this, cows are also milked; the calf is brought to nuzzle to get the milk flowing, and then is taken away while the doe is milked. Cows are kept in an enclosure while milked to keep the

[28] The biology of attachment and behavioral conditioning is quite complex. For a comparable description of contact with reindeer calves, see Turov 2010: 79. For biological and psychological work on these topics, see Numan 2015, and Hosey and Melfi 2014.

calves from interfering. Calves are allowed to nurse later in the day while the does are feeding. Milking continues throughout the summer.

Spring enclosures vary in size and are used for several years. The first year the enclosure is small. As the herd consumes the available forage, the Evenkis increase the size of the enclosure by constructing new sections of fence farther in the taiga. After a few years, forage quality declines from trampling and grazing and the fences fall into general disrepair. Firewood availability may also locally decline. At this point, a new enclosure is constructed in a different area.

In the past, fences and other wood constructions were built using only axes and maybe a cross-cut saw. From the 1950s the Russian manufactured "*Druzhba 2"* was available with a chainsaw attachment, however they are heavy and impractical to carry. From the early 2000s, European chainsaws by brands such as Stihl and Husqvarna have become widely available and are favored for use as they are much lighter, more efficient, and more reliable than Russian produced types. Typically, two men spend most of a week preparing a new campsite and enclosure. They set out from the previous camp carrying their equipment and supplies.

Summer

With the onset of warmer temperatures, insects hatch and begin to torment man and animal. Summer time is composed of frequent migrations, every three to five days. Although frequent, migrations are usually short, about 5-15 km, and very rarely 20 km. The goal during summer is to fatten the reindeer for the coming winter and Evenkis have found that making frequent moves to new pastures is the best way to do this. However, they must balance the benefit of moving to new pastures with the availability of water, firewood for smudges, the effort of migration, and any non-reindeer related activities. Availability of pasture is not really an issue as compared to winter because of the much greater variety and abundance of edible plants. The constraints for this time of year have primarily to do with supplies of firewood, wood for smudges, and water.

**Picture 6.12 Reindeer by *dimokur* (Credit: Dima)**

Because of the swarms of insects, the reindeer take on a nocturnal pattern of behavior in the summer. At night, the reindeer leave camp to feed. The temperatures are cooler and insects less active. During the night, the reindeer may travel considerable distances from camp. In the morning, they return without any prompting or assistance from the herder. Into late summer and early fall, mushrooms become especially plentiful. Reindeer find fungi especially delicious and drive each other onward, fighting to reach the next mushroom patch.

During migrations, the families' possessions and supplies are packed on about 14 reindeer. Others are used for mounts. Hunting of big game is done in summer but the benefits of acquiring this food source must be balanced with the labor of preventing spoilage, processing, and storing. Other than meat fresh or dried meat the diet consists mostly of milk and milk products, small game, bread, and fish.

Fall

The rut begins in late August and into September. The herd is also kept in an enclosure during this time. Domestic and wild reindeer bulls become more aggressive. While antlers are still in the velvet stage earlier in the summer, the Evenkis trim antlers to take off the most dangerous points and reduce the possibility that any member of the herd sustains serious injury (see also Gron 2011). As in the spring, a fall enclosure is periodically enlarged to encompass more forage for the reindeer. Considerable damage is done to lichen simply by being trampled. Reindeer mill about, tussle, bed down, and graze on lichen and other plants. Dima said that lichen does "spring back" to a degree but this damage relative to grazing is unknown.

One of the more important factors during the rutting season enclosure is the availability of water. By this time of year, the water level of rivers and streams have dropped and many springs have dried up. Just this past year, when checking out the fall enclosure before migrating, Dima discovered that the local water source had dried up. Instead, Dima and Kolia constructed a new enclosure and campsite at a different location with access to water. After a few days of construction, they brought their families and the herd to the new spot.

Other than keeping the herd inside the enclosure, no effort is made to interfere in breeding: stud bulls are allowed to breed with any of the cows. The herder does no selective breeding. Frequent walks are made around the perimeter to make sure the fence is in good order; repairs are made and escaped reindeer are caught as needed. Also on these walks, the herder checks for signs that wild bulls have broken in or predators are about. Attracted by domestic females, a wild bull will often jump or break through the fence, attempt to breed with the cows, fight the domestic bulls, and chase domestic reindeer into his harem. Domestic bulls with trimmed antlers are at something of a disadvantage in fighting with wild bucks, and so can be easily injured. When found in or around the enclosure, wild bulls are shot and provide a supplement to the families' diet. Reproduction is discussed in more detail below.

Soon after the rut, hunting and trapping seasons begin. Migration resumes and the controlling factors become preparation for trapping and hunting. During this time, traps are opened and the sable hunt begins. While making a tour of their territory, they hunt sable with dogs, covering most of the area around camp and opening the traps before moving on to a new area. Unlike mobility in most other seasons that takes place along established trails, hunting sable may start out on a trail but following the next fresh track may lead farther away from the trail. When sable hunting, it is important to know one's territory well, to be able to make an educated guess as to where sable might be found, and to find one's way home at the end of the day; see Appendix A for a description of navigation techniques.

During the fall, Kochëma Evenkis try to harvest a meat supply for the fall and into spring, preferably two moose or several wild reindeer. Domestic reindeer are used to pack out harvested wild reindeer or moose. Hunting moose on foot can draw the hunter across the landscape for a considerable distance. A successful hunt involves transporting the moose carcass in reindeer sleds or packs, back to the living site. Usually moose hunts take place within perhaps 10-15 km of the living site. On rare occasions, the hunt may conclude 25-30 km away. At this distance, packing out a moose would include an overnight stay on the trail, because the round trip would be up to 60 km. This distance of a successful hunt from the living site determines the amount of time and difficulty of retrieving the carcass. Within the closer radius, it is possible to retrieve the carcass within a day. The larger radius would probably demand at least a full day and probably an overnight on the trail. Depending on the time of year and other activities, part of the meat may be cached at or near the kill or a living site, to be retrieved in a later trip or future migration. The number of reindeer needed to move a moose carcass varies by the size of the moose, approximately 7-12 head. A two year old moose can be packed out by seven reindeer, a mid-size moose by nine reindeer and a mature bull in the 250 kg[29] range by twelve reindeer. The Kochëma Evenkis generally transport the entire animal; the parts that may be left behind if the circumstances dictate are the skin or the head of a large bull if the antlers could not be sawn off.

The fall into early winter period is probably the busiest time of the year and includes a variety of economic tasks: care for reindeer during the rut, finding pasturage,

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[29] Dima gave me this figure; it is probably dressed weight, after the viscera and skin have been removed. Dressed weight is roughly 60% of live weight for moose (ADFG 2015, see also Turov 2010: 29)

sable hunting and trapping, and moose hunting. All these tasks compete for the Evenkis time and attention.

Herd Size and Composition

Herd dynamics are difficult to address due to the limited time spent with the herds and the reluctance of Evenkis to discuss reindeer in quantitative terms. They were willing to discuss many aspects of reindeer herding and usage, but were hesitant to engage in discussions that involved quantifying the number of reindeer. My observations of herd size are a starting point for addressing these topics.

Herd size calculations are my own and based on counting the number of reindeer inside the corral or that passed through the gate. While counting would seem to be a sure measure of herd size, the movement of reindeer within the corral and the splintering of the herd into smaller groups, not all of which may have been gathered from the taiga to the home corral, made developing reliable herd size figures difficult. The numbers presented in Figure 6.17 are essentially best estimates, based on my own counts of herd sizes and whether herders were willing to affirm that all reindeer were present, and the case of loss figures, the Evenkis' comments and hearsay. The two Kochëma reindeer herds were 95 head and 60 head in late winter 2012. Herd size of course fluctuates throughout the year due to loss and births. The approximate number of calves in each herd was 10 and 11 head, indicating a similar number of breeding age females. The number of losses due to predation was a difficult subject to discuss. On first asking, Dima and Kolia would discuss predation generally, but not the number of reindeer killed. Upon revisiting the question of wolves, Dima volunteered that ten of his herd had been killed in winter 2011/2012 and five in 2010/2011. Through discussions with other Evenkis, the number of reindeer lost by the other Kochëma herd over the past year was twenty head. This may not be the full number for either group, include other kinds of loss such as sickness, injury, exposure, or include calves. The general view Evenkis seem to have on herd size was that more is better and all members of the herd are valuable. While we were discussing herd sizes, Dima commented "*teliat eto – schitaetsia melochei" – "calves are small potatoes.*" This I took to mean that a higher rate of mortality among the young is to be expected (Adams et al. 1995, Stuart-Smith et al. 1997).

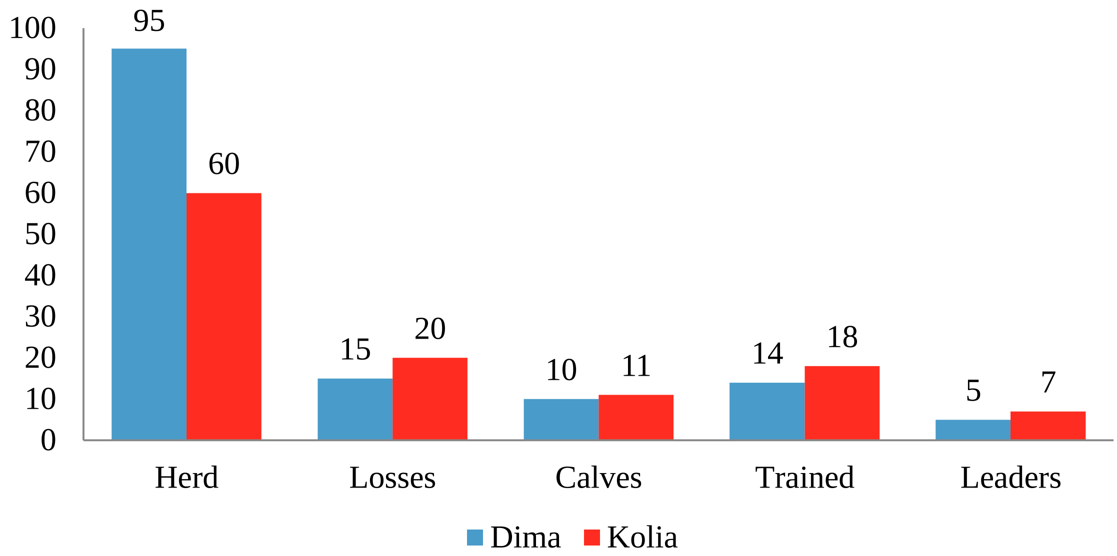


**Figure 6.17 Herd Composition**

The number of trained reindeer in each herd is comparable. The numbers presented are from conversations, the numbers of reindeer used during migrations, or discussion of hauling tasks we discussed such as packing meat. The definition of a "trained" reindeer is problematic, since reindeer are trained for particular tasks but most or perhaps the entire herd is trained to accept human contact and some degree of control. Kolia stated that he has 18 trained reindeer and Dima's is estimated at more than 14.

Given the difficulties related to accurate counting of reindeer, these numbers should be taken as approximate and indicative of herd size and structure at a particular time.

Talking with Evenkis about reindeer is sometimes difficult because of the values they have regarding reindeer. Every deer is known by sight and many are named, certainly all the working animals, and herders claim to have a good idea of which bulls have sired which offspring. This is contrasted by their hesitance to discuss the numbers of reindeer they own. Simply put, it is considered bad luck. Why the Evenkis think this is a more complicated question. In general, hunters will freely discuss the number of sable they harvest from year to year and harvest methods. Reindeer are a different matter and their reticence may have something to do with the inevitable fluctuation that occurs in the herd. Every year calves are born, some survive, and some do not. Wolves and bears attack, reindeer get lost, are injured, or die of old age, and occasionally domestic reindeer are taken for meat.[30] Although perhaps infrequent, there are a number of reasons that reindeer may die. Giving a number to the size of the herd is presumptuous. These are my inferences; Evenkis talked about putting a number to the herd as bad luck and gave the impression that it is a private matter. Although thought about somewhat in terms of wealth, reindeer, unlike money or sable, are not casually parted with. When some Russians were visiting an Evenki household, they started asking questions about how many reindeer they had and how they live. The Evenkis replied to their question on herd size that it was bad luck to count and one observed that if they were guests of the

[30] Slaughter of domestic reindeer in systems of transport reindeer herding is a controversial matter in the literature (Turov 2010: 58-9) and in discussion with the Kochëma Evenkis – who gave answers that differ from Turov's historical explanation.

Russians they would not ask how much money the Russians had and where it is kept. Another Russian asked if he could buy a reindeer and how much it would cost – the head of the household gave them to understand that reindeer are not for sale.[31]

If estimating herd size is difficult, then looking at composition is even more so. In this case, my counts varied too widely to be reliable. Kolia seemed to have a higher percentage of males than Dima. Asking Kolia about this, he said this is a reflection of how reindeer are used. A large percentage of the herd consists of castrated males because they are needed for packing and riding in the warm months. Dima's herd has a higher percentage of females, perhaps in part because of its overall larger size. Both Kolia and Dima said that about 14 reindeer are needed for summer and winter travel. Castrated males are used most often for packing and riding, because they are the strongest. Cows are often used for pulling sledges. When migrating, both Kolia and Dima use 7 sleds for carrying household supplies and equipment, each with two reindeer.

Since the question of actual herd numbers was problematic, I asked Dima some hypothetical questions. First, I asked him how many reindeer would be difficult to manage and care for and he replied about a hundred. Seventy is a good amount for one herder to manage. Second, I asked how many reindeer he considered a minimum for his needs and he said about thirty. While it may be possible to make a living with this number of reindeer, there are probably some good reasons to keep a larger herd. Given the exigencies of life in the taiga, at the minimum herd size it is more important to make

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[31] The Evenkis' reluctance to discuss the size of reindeer herds could also be related to historical government policy (cf. Sirina 2006: 41-6).

each member of the herd productive in terms of reproduction and utility and to make sure that mortality factors are controlled as much as possible. Speaking broadly, Kolia once said: *"Do you know what the black day is?*" It can be forest fires, injury, disease, predators, weather, lost reindeer, and other hazards. The Evenkis keep caches, multiple living sites and larger than needed herds because of the threats they face in order to have the best chance to solve problems and live independently.

<u>Control of Reproduction</u>

The Evenkis' control of herd reproduction has several aspects: choosing stud bulls, confinement during the rut, and necessity culling. The Evenkis select males with the best characteristics to be stud bulls, the rest of the males are castrated and used for packing and riding. During mating season, bulls vie for females among themselves, which can cause injuries. To avoid this, Evenkis trim the sharp points off the bulls' antlers, but also those of riding deer and any others that prove too aggressive. Other than choosing which bulls to leave intact, the Kochëma Evenkis stated that they make no effort to influence or control reproduction through restricting access between males and females. Sirina notes that they choose bulls based on the earliest date they lose velvet (2006: 71). Dima said that the rut for wild reindeer begins about a week earlier than for domestic reindeer. Confinement during the rut is purposed to keep domestic reindeer from splintering and to restrict the access of wild bulls to mate with domestic females and injuring domestic bulls in fights. Domestic bulls are at a disadvantage in fights because of their trimmed antlers. When wild bulls are successful in breeding with domestic cows, these offspring are problematic. The first generation (half wild, half domestic) is usually intractable and not likely to be trainable to a useful extent, however subsequent generations have much of the vigor and endurance of wild reindeer and the trainability of domestic reindeer. After maturity, these first generation “hybrid” reindeer may try to drive off a part of the herd. It is usually necessary to destroy these individuals after several years. The second and subsequent generations of offspring can be particularly valuable as stud bulls since they possess the vitality of wild stock, the docility of domestic, and can pass these traits more quickly through the herd than cows. Mixing wild and domestic bloodlines is something the Kochëma Evenkis avoid, but when it does occur the results can be beneficial.

Culling

Necessity culling involves taking a domestic reindeer for meat due to running out of wild sourced meat. It is done based primarily on need rather than to control reproduction per se. This year Dima and Kolia were each forced to take a domestic reindeer for meat. Each was successful in harvesting a moose in the fall, but each household needs two moose for a supply of meat through the spring. During the winter, wolves came through their territories, attacking domestic reindeer, and driving the moose out of the area. Since then moose sign they observed was either too old or simply absent across the areas the checked. Both Kochëma Evenkis stated that they only choose to kill domestic reindeer if absolutely needed, and then choose an individual who is the “least useful.” On further questioning, this criterion of “least useful” did not equate to the older members of the herd. Dima explained that the older members of the herd are among the most valuable because they were the best trained or had done their job for many years and are now “retired.” Likewise, the younger members of the herd may prove to be useful in the future. Those “least useful” tended to be deemed so based on individual characteristics. One day I pointed out a reindeer with a particularly sleek coat to Dima, who commented "*she doesn't like salt but is probably better off for it, is a bit wild and only has had one calf."* While not discussed in the context of need based culling, it is possible that a deer such as this, who had not proven to be trainable or reproduced according to norms would be chosen. Even in herds the size of the Kochëma Evenkis', reindeer that are mature but not useful may be very few. Even fewer are those that would not be useful in the future, because a low-producing female may have calves and a reindeer resistant to training could mellow. The first generation of hybrid wild/domestic deer may also be more likely to be chosen for culling, depending on the characteristics of the individual and the decisions of the herder.

<u>Pastures</u>

Dima gave some general responses regarding the relationships between mobility, the duration of residence, and regeneration of pastures. His responses are summarized in Table 6.2. At first when asking him about how and when the decision to move to a different living site is made, he replied the reindeer decide by moving farther and farther from camp. After a point, it becomes more worthwhile to move to a different place, where reindeer feed closer to camp. The total potential migration area is the whole of each household's territory, although Dima said that the yearly migration does not usually cover the entirety of his territory. An interesting comparison is the range of four woodland caribou herds in Saskatchewan, with seasonal ranges from ~50-450 km$^2$, with a season-to-season range overlap of 50-70% (Rettie and Messier 2001: 1937). The two Kochëma herds migrate over territories of approximately 2,461 and 2,482 km$^2$ and may share or partially migrate through the third territory of 809 km$^2$ (Table 6.4). At the largest seasonal range for woodland Canadian caribou of 450 $km^2$, each of the Kochëma herds could migrate in non-overlapping ranges for approximately 5.5 years. The sizes of the Saskatchewan caribou herds were not mentioned, but the study population was 40 adult females tracked for three years (Rettie and Messier 2001: 1935). On the Evenkis' territories, the total amount of forage is shared between wild and domestic reindeer herds. The Evenkis use of salt, corrals, and smudges disrupt reindeer range and feeding patterns that would otherwise primarily be subject to non-human variables (predators, snow depth, forage availability, weather, etc.). The degree to which the Evenkis' migration patterns are comparable to those of wild reindeer and cover their territories on a seasonal and yearly basis are open questions.

In response to questions of overall pasture quality and whether there have been any changes in over the years, Dima's responses were a little more tenuous. He has not noticed any big shifts in pasture quality over the years but does try to vary his migration routes to use different areas of his territory. Dima has observed that reindeer gain weight more quickly when feeding in an area that has not been used for many years.

Uses of Reindeer

In talking with Dima and Kolia, they have several categories of reindeer. Riding reindeer – *uchag* – are generally castrated males, among the most highly trained, and have the strength to carry a human over distance. The herd leaders are *vozhaki* (plural, singular: *vozhak*), may be male or females, and are also highly trained to accept human contact and control. Stud bulls – *proizvoditeli* – are the only mature males with their reproductive organs intact. Pack reindeer are used in the warm months, but no specific name was given. Male or female deer are used for pulling sleds, depending on the task and traits needed. Male deer are larger and stronger, whereas female deer have less strength, but more endurance and tend to be used for long distance trips. Any particular reindeer may fall into one or more of these categories. In addition to shaping herd reproduction, castration causes muscle development (Wiklund et al. 2008), important for male riding and pack reindeer. When reindeer are being trained to pull the sledge, an older experienced deer is paired with the trainee. For summer migrations, reindeer are tied nose to tail in strings of several animals, which restrains the disruptive antics of any particular individual.

While talking with some of the herders from Teteia who came to Erbogachën for a holiday, I noticed that all of their harness deer were female. Asking about this, they explained that females run quicker and have more endurance. The Teteia Evenkis usually come to Erbogachën once a year for the Reindeer Herder and Hunter's[32] holiday in the late winter. This trip takes about 3 days to cover about 100 km. Kochëma Evenkis used to come to Erbogachën on reindeer one or more times a year for supplies and the holiday, however, the forest fires in the '70s and '80s wiped out the forage on the route for their reindeer; see Map 6.4.

Predation

Specific information about predation and herd loss was difficult to elicit. When asked directly, the Evenkis' comments tended to be generic and anecdotal. Both Kochëma Evenki families experienced wolf attacks in the past year. To clarify, they were

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[32] *Den' olenevoda i ohotnika*, held in the late winter, originally a Soviet holiday, now it is an opportunity to celebrate indigenous culture.

comfortable with discussing wolf attacks generally, but were reluctant to give specific information. The two predators responsible for most attacks on reindeer are wolf and bear.

Bears are primarily a threat outside of hibernation season, although there are uncommon cases of bears that do not hibernate. In the winter of 2011/2012, in the Teteia region, a reindeer herder killed one such bear that had been breaking into cabins and killed several dogs. One possible reason a bear does not hibernate is due to failure of the *Pinus siberica* nut crop and lack of alternative food resources (Vaisfeld and Chestin 1993: 299). When these conditions become severe enough, a regional bear population can become extremely aggressive and a high proportion of attacks on domestic animals occur in the August to September period (in 1983 there were 130 attacks in one region of Buriatia) and attacks on people are the highest (1915-1987: 64%) in the November – December period (Vaisfeld and Chestin 1993: 300). This data is from the Lake Baikal region to the south and east of the Katanga. Outside of these cases of resource scarcity, bears are a threat only during the warm season. Evenkis indicated that bears are most likely to attack in the spring when they have just woken up from hibernation and other food sources are not yet available, and also in the fall just before hibernation when they are looking to fatten before winter (cf. Milakovic and Parker 2013). During both of these periods, Evenkis corral their reindeer for calving and mating seasons, respectively. Generally, at this time, herders are armed and go out as a group to check on their reindeer and inspect the fences.

Wolves are migratory and can attack year round. During the Soviet period, wolf populations were controlled through hunting, trapping, and poisoning (Bibikov in Pimlott

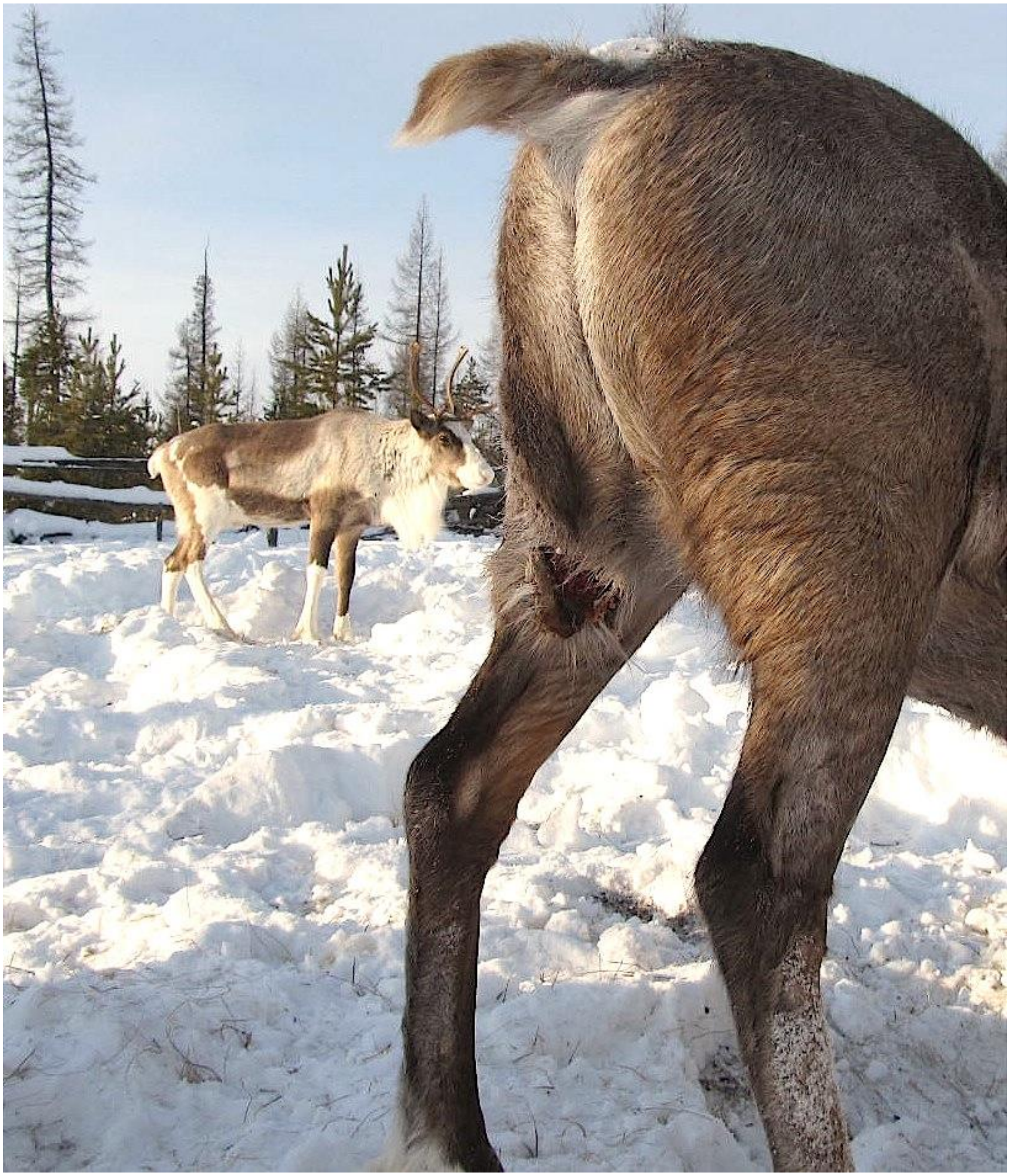
1975: 29). Since those programs have ceased, wolf populations are rebounding and probably exposing domestic herds, wild reindeer, and moose to unaccustomed levels of predation (cf. Hayes et al. 2003). Currently, wolf control programs in Russia are elementary, with little basis in ecology and population dynamics, and motivated by protection for wild and domestic animals, but as structured now they may have little effect toward this goal (Suvorov and Petrenko 2007: 1-2). The population of wolves throughout the region was up to three times the goal set by the government in 2012, and unlike some neighboring regions, Irkutskaia Oblast' had no bounty (Dement'eva 2012). In the Katanga region, the wolf hunting season is from June to July and by 2015 the methods of harvest were expanded, and harvest limit rose (SOIZHMIO 2015).

The Evenkis perception of wolves was not a primary topic of inquiry, but the comments they made about wolves killing of domestic reindeer and chasing wild reindeer and moose indicate that wolves have a negative impact on their livelihood. The larger questions of population numbers and human perceptions of the role that wolves play in an ecosystem are in need of further study.

The scope of predation by both wolves and bears is difficult to describe. The information I was able to obtain indicated that for the Kochëma Evenkis, problems with wolves began most acutely in 2008 or 2009. That year Dima lost ten reindeer. In 2011/2012, he lost five to wolves. Even for the Evenkis themselves it may be difficult to know the specific cause of reindeer loss. Possible reasons for reindeer loss include injury, predation, exposure (particularly in the case of young calves), contact with wild reindeer, and sickness. During the field season, herders often discussed the presence or absence of particular deer, observed and habitual feeding locations, sub groups of reindeer that tended to feed and forage together, and other observations of the herd as a whole and individuals. Through discussion and observation, it is quite evident that the Evenkis keep track not only of the herd as a whole, but individuals as well, and will often look for a particular absent reindeer when feasible.

The Evenkis deal with predation in a variety of ways. First, they monitor the herd and individuals throughout the year. During open pasturage seasons, Evenki herders are in contact with the herd at least every few days. They take notice of whether any individuals are missing or if the herd has split up. If a group seems to have split off and has not returned within a few days, they search until it is found or other activities become more pressing. Determining the whereabouts of individuals or groups can allow them to infer whether the absence is caused by predation or other causes. Second, in monitoring the herd at the living site or out in the forest, they look for injuries and agitation that indicate the herd may have been attacked recently. Just before meeting up with the Kochëma Evenkis in winter 2012, they suffered attacks by wolves. In response, they migrated to a different area. Often, quick migration to a different area will throw off wolves, both summer and winter. When looking over the herd in the corral around the cabin one day, I noticed that a reindeer with a wound on the inner thigh above the hock (Picture 6.13). Mentioning this to Dima, he said that this was from a recent wolf attack and is one of the things they look for when they are in the contact with the herd. Third and finally, they take active measures against predation. During the spring and fall corral seasons, they carry a firearm to ward off potential attacks. However, during the winter they did not carry a firearm while checking on the herd feeding in the taiga. The chances of interrupting an attack outside of the corral seasons may be small. When possible, they kill any wolves they can by trapping or hunting. Dima said that it is possible to actively hunt and trap wolves, but it requires a lot of skill and time. For a full-time reindeer herder, it would be difficult to take time away to hunt wolves. Roma and Dima each have 3-4 steel wolf traps[33] set near sable traps or in storage. According to Dima, wolf traps must be very well hidden and free from human scent and the smell of iron. Trapping wolves is usually done in winter because their tracks and habitual pathes of travel are more easily identifiable. Poison is hard to find and dangerous to use because it persists in the tissues of the poisoned wolf and the other animals that consume the carcass. One Evenki was successful in poisoning a wolf and left it out in the snow, hoping other wolves would come eat it; after passing by the place again, he was concerned about how to dispose of the carcass.

[33] This is the total number of wolf traps, not number of wolf traps per sable set.

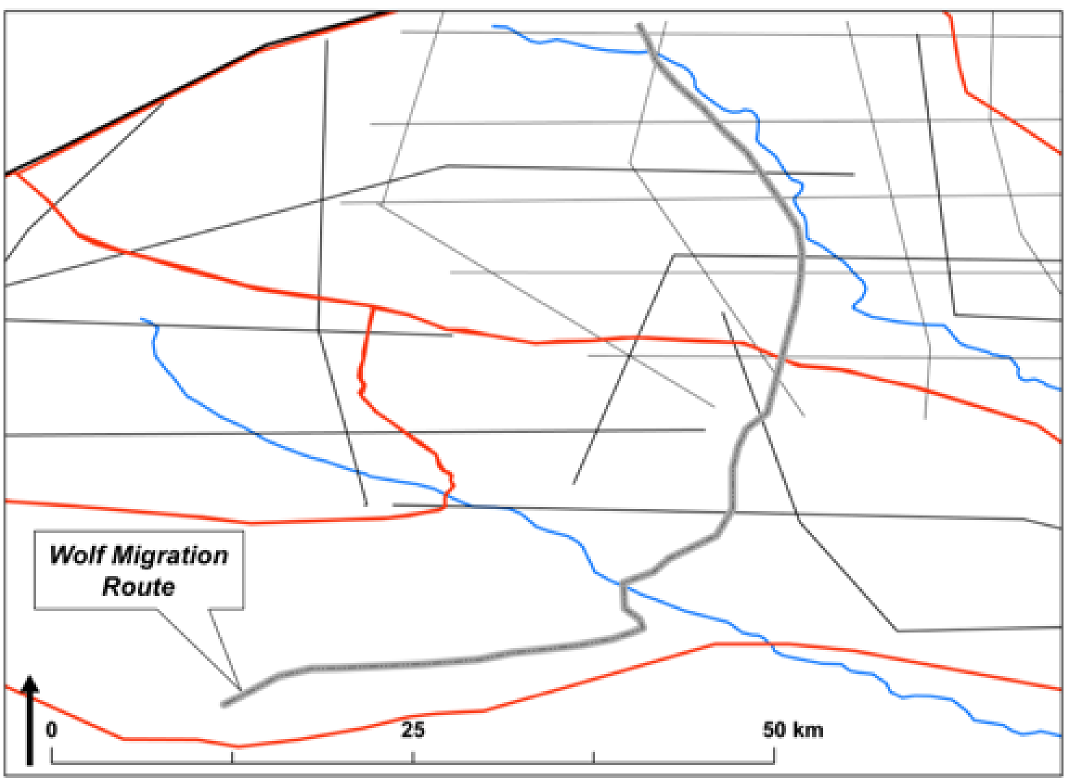


**Picture 6.13    Wolf bite on reindeer**

One interesting method of frightening wolves away is to tie strips of red fabric around the antlers of reindeer. Kolia uses these ribbons on some of his reindeer, but Dima does not. How well ribbons work to deter predator attacks is unknown.

Throughout the winter field season, wolves were mentioned as a problem in increasing and maintaining herd size, driving away moose and wild reindeer, and sometimes robbing sable traps.

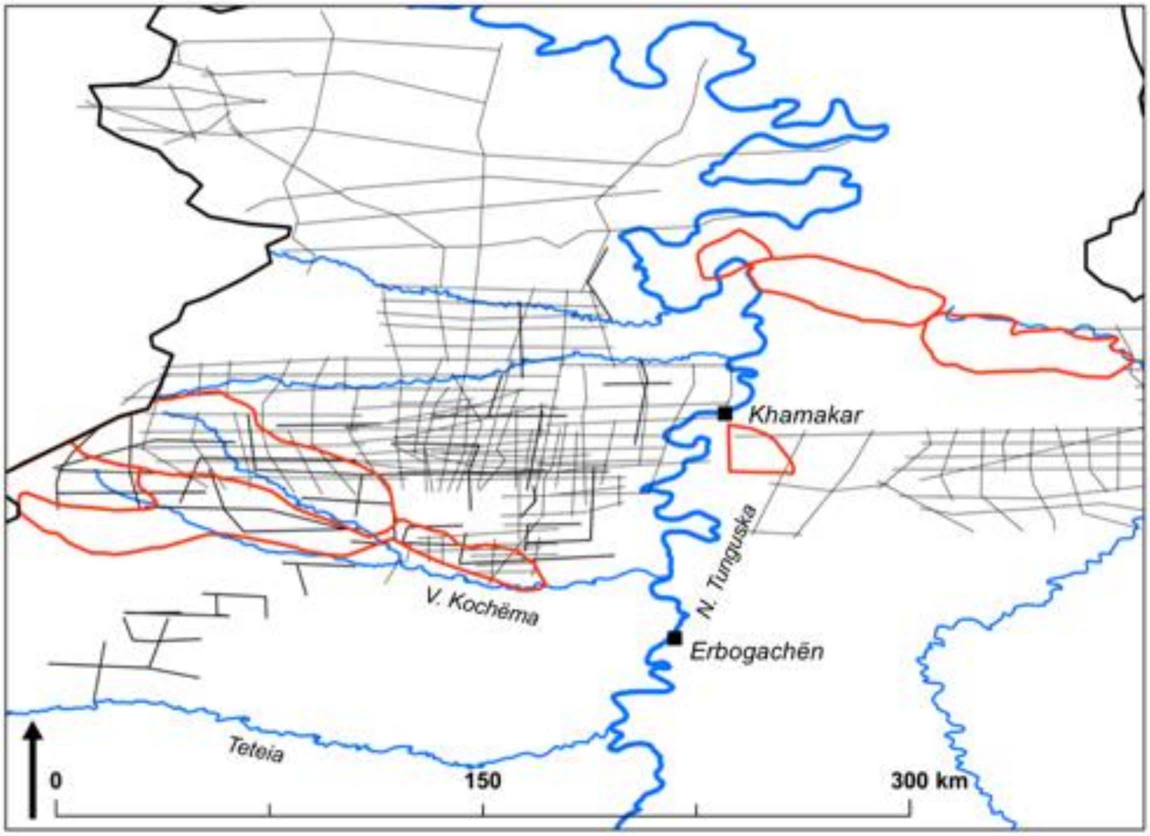
Interestingly, Kochëma and Khamakar Evenkis noted that predator density, of bear in particular, is higher around major rivers, such as the Tunguska, because there is a greater density and variety of food sources. It is their impression that there is a greater density of bears in the Khamakar region (on the shores of the Tunguska River) compared to the Kochëma region (~100 km from the Tunguska). Dima's territory consists mostly of headwaters and small streams and he has observed that in the interior, away from the Tunguska, the density of predators is lower. However, he identified a route along which wolf packs seem to consistently travel through his territory. The location of this corridor is shown in Map 6.9.




**Map 6.9 Wolf Migration Route**

The wolf migration route crosses both Dima and Kolia’s territories. It does not follow the forest roads precisely. This could be because of misalignment between the hand-drawn wolf migration route and image tracing of the forest roads, or the migration route following forest roads completed after the reference map I used was published. It is also possible that there is an actual mismatch between Dima’s observation of wolf migrations and the forest roads. The end points of the migration route simply indicate Dima’s knowledge of the wolves’ route; it likely extends beyond the Evenkis’ territorial borders.

Since wolves also hunt moose and wild reindeer, simply moving away if they are encountered can result in the wolves pursuing prey other than domestic reindeer. Dima and Kolia mentioned that the completion of a forest road between the Teteia and Kochëma regions as a significant factor in the increased wolf predation. Since this was completed, Kochëma Evenkis have noticed a large influx of wolves onto their territories, making problems for both their domestic herds and the species that they hunt, moose and wild reindeer.




**Map 6.10 Seismic Lines 2008**

The forest roads (seismic lines) cleared by resource companies up until 2008 are shown in Map 6.10 (seismic line data from Trondin 2008). The Kochëma Evenkis' territories are on the west central portion of the map and the Khamakar Evenkis' territories are on the east central section of the map. This map does not show the particular forest road from the Teteia region that Dima and Kolia mentioned as being a problem, because it was completed sometime between 2008 and 2011. Up until 2008, the Kochëma region had been the site of more intense forest road construction, although during a helicopter flight I have seen that more forest roads have been cut in the Khamakar region since this map was published (Trondin 2008). There are strong lines of evidence that linear environments created by roads, power lines, and logging have a negative impact on reindeer pasture (Kumpula et al. 2007) and increase encounters between ungulates and wolves (James and Stuart-Smith 2000, Whittington et al. 2011). Human activity can also have long-term impacts on ungulate behavior and migration patterns (Vistness and Nellemann 2008).

Domestic reindeer also have natural defenses against predators. First, their senses of smell, hearing, and sight can alert them to predators. Second, they have behavioral responses: kicking, running away, and using their antlers. Kochëma Evenkis said the usual way reindeer respond to something that frightens them is by running away or startling. However, in this response, they differ from wild reindeer. According to them, when a herd of wild reindeer is attacked or spooked, it will run non-stop for a longer distance and sometimes scatter in smaller groups. Domestic reindeer will run a shorter distance and then stop and look around, often at this point they fall victim to predators. In addition, they tend to be more trusting and not spook as easily. This information matches well with research done on wild reindeer with varying degrees of domestic ancestry showing that predator defense traits such as response distance and vigilance behaviors are greater among individuals with higher proportions of wild ancestry (Nieminen 2013, Reimers et al. 2012).

Evenkis indicated that reindeer also have organizational defenses against predators. The older members of the herd tend to bear most of the responsibility for predator detection. They are usually positioned near the edge of the feeding area and they visually scan and raise their heads up to listen more often than other members of the herd. In the event they are spooked, most other reindeer respond to their movement and signals and follow these herd leaders. This feature of ungulate behavior, that the herd follows the behavior and movement of older members, is what Evenkis use to move the whole herd.

Reindeer also tend to choose bedding areas that are in denser cover and at a distance from feeding areas.

While reindeer are out on open pasture, one of their tasks, other than searching for food or resting, is determining if other living creatures are a threat or not. The environment is full of sounds and movement, for reindeer it is important to figure out whether these stimuli represent a threat or not. With this context in mind, how the reindeer herder approaches is of note. When checking on reindeer in the winter, Dima and Kolia would sometimes call out once they were approaching the herd. Usually they approached slowly, sometimes pausing within view of the herd to give the reindeer time to see that a human was approaching. One time when we were checking on the herd in the winter, I was wearing a white overcoat and Dima was wearing his usual brown wool coat. As we approached the herd, he noticed that they were becoming nervous and asked me to stay behind as he approached the herd, because the white coat was making the herd nervous. After he caught one herd leader, he indicated that I should approach and he continued to halter the others.

Firewood Production

For both groups of Evenkis, producing firewood is an essential task. Throughout the seasons they use a considerable amount of firewood for cooking and heating. Both groups seemed to have a strong preference for dry dead standing larch, although it was not exclusively used it does have some better properties in comparison to other woods. Perhaps the most important of these is that it is very dense for a conifer and so gives off a more even heat by volume than other conifers. Birch, alder, aspen, and willow are the main deciduous species in the area, but they generally do not grow to sufficient size and stand density to be worthwhile for use as firewood. When larch dies, it usually does not rot as quickly or have many bug holes, unlike some other conifers. When harvesting firewood with Kolia, he would scavenge the tops of firewood trees and fell mostly rotten trees to gather the less rotten sections for cooking dog food outside. There are other advantages of larch in comparison to other species but these were the ones pointed out by research participants.

During the fall research period with the Khamakar Evenkis, firewood was cut as needed, perhaps having a day or two in reserve. When traveling down river from Erbogachën to reach the hunting territory, many of the cabins we stayed at or passed had ample supplies of cut wood, and we simply used this wood without replacement. On reaching Boris and Roma's territories, we quickly used up what little wood had been prepared. We cut near the cabins and carried by hand. Several times we cut wood by the riverbank and carried it by boat back to the cabin. This was done in connection with our daily commute between two cabins. For the first period of building Roma's new cabin, we slept at Boris's cabin a few kilometers up river from the building site. Boris's cabin is tucked up against a hill but is fairly close to the shore. On several occasions during trips back from the work site we felled a large dry tree near the shore and brought back the largest rounds. Since we were making the trip, it saved walking up and down the hill near his cabin. Once we moved into Roma's cabin, we had a lot of wood that was left over or rejected from construction and so had to cut little firewood. When firewood was needed, walking a few dozen meters in any direction provided plenty of candidates, even though the woods were markedly thinned by cabin construction. During this period, we usually cooked outside and only fired the cabin stove on cold nights. For outside cooking fires, scrap wood and branches were used, rather than split wood.

**Picture 6.14 Hauling wood by reindeer sled**

On the Kochëma River in winter 2012 with Dima and Kolia, preparing firewood was a more frequent activity. The stove was fired, very approximately, with three to four armloads a day. Large stacks of firewood were kept by the stove and both Maria and Daria seemed to consider it a point of housekeeping that the large pile near the stove be in constant danger of falling over. Except at night and in the late afternoon, the stove was stoked frequently. We used the stove for cooking two to three meals a day. When stoked to maximum, especially when frying, the cabin quickly becomes unbearably hot, and the cabin door was opened all or part way to keep those indoors from sweating profusely.

Firewood is cut and stacked as rounds about 50 cm long and then split into sections about 10 cm wide. Usually, rounds are stacked between trees and the split wood stacked in a woodshed. While living with both families, my main chore became splitting wood. Before I fully took on this task, Dima would split enough to have a day or two surplus, and Maria would carry wood inside throughout the day; more rarely Dima or I would carry an armload. Cutting firewood was a periodic activity with both families. Wood was cut in both cases about a kilometer or less from the cabin, although Kolia commented that every year he has to go farther. Dima said that for both winter and summer use they make an effort to cut wood in advance. For his summer campsites, he makes an effort to cut wood in the winter because it is much easier to move by snowmobile. In a good stand of dry wood, it takes little time to put up a considerable amount of wood. A sled load, which is approximately 2 meters long by a meter high, takes about 30 to 45 minutes from a standing tree to stacked by the cabin. Over the course of two days, we put up about 15 sled loads; Kolia, Dima, and I working one day and Dima and I working the other. There were several other times when Dima felled and hauled firewood to cabins, for periods from one half hour to perhaps three hours.

Storage

Seasonal and year round residence in the taiga involves acquisition and storage of equipment, clothing, fuel, and food. Both the Kochëma and Khamakar Evenki use industrial goods to make their livelihoods comfortable and efficient. Although both groups subsist on local resources for many of their needs, long gone are the days of complete, local self-sufficiency. Instead, the Evenkis are self-sufficient for long periods during the year and only participate in cash markets during short trips to sell and acquire goods, chiefly to Erbogachën, although Khamakar can be another point. The supplies and equipment they acquire from the local environment and industrial sources must be stored for future use.

The issues a storage system must address are: access, capacity, and redundancy. Access concerns having supplies and equipment at the time and place of use. Capacity is having the means to transport and store the needed or desired equipment and supplies. Redundancy is having multiple places where equipment and supplies are stored so that in the case of consumption or damage (due to pests, spoilage or forest fires) at one or more sites, there will be other points where supplies and equipment can be obtained. The Khamakar and Kochëma Evenkis address these issues in similar ways. For both groups, cabins are a good indicator of storage sites (Figures 6.11-12), but the Kochëma Evenkis have larger numbers of non-cabin storage sites and more living sites when summer living sites are included.

One half of access to resources is obtaining resources from their points of origin. This part of the process is addressed in the sections above dealing with mobility and obtaining equipment and supplies from Erbogachën and resources from the environment. The other half of access to resources is availability at the point of use. For both groups of Evenkis, the point of use can be during a trip or at a living site. Resources needed during a trip must be a part of the cargo. As described above, a significant amount of the Evenkis' mobility is strictly logistical: moving resources to where they will be used in the future. In any economy, mobility and storage are fundamental elements of productive capacity. The kinds of things the Evenkis habitually take with them and the kinds of things they store near the point of use bear brief discussion. Generally, tools and equipment (wood processing, mechanical, kitchen, hunting), seasonally appropriate clothing, and vehicles were transported between living sites, whereas supplies (firewood, staple foods, off season or extra clothing) were left at living sites. In discussions and observations, meat storage practices varied. Fresh meat is sometimes cached at the kill site to be picked up later. During the winter, the meat supply was transported between living sites. Evenkis also preserve meat by smoking and drying. Regarding food storage, staple foods have a longer shelf life if well protected from pests and moisture. Meat can spoil in the warm season and at times constitutes a smaller proportion of the total amount of the food supply than staple foods. Petrol storage remains an open question in many respects. It is easiest to move via motor vehicle. The Kochëma Evenkis have little need for petrol in the summer other than for use in chainsaws. In the winter, they move petrol between living sites via snowmobile and store it at several living sites with the largest supplies probably at their cabins closest to Erbogachën. The Khamakar Evenkis store petrol in the village as well as at territories during the hunting season.

Storage capacity differed between the two groups in terms of scale and format. The primary storage locations for both groups were in or near cabins. The Kochëma Evenkis have considerably larger territories and lower cabin densities than the Khamakar Evenkis. The Khamakar Evenkis seemed to store smaller amounts food at their hunting cabins. Each cabin has a small amount of food and utensils, but very few, if any outbuildings. The Kochëma Evenkis had a variety of outbuildings besides cabins. At all but one of the approximately ten cabins I was at there were: one or more garages, one or more elevated caches (*labaz*), and sometimes ground caches and bath houses – *bania* (cf. Sirina 2006 for illustrations). According to my observations and discussions, summer campsites are usually located near cabins, and have small storage caches onsite. The Based on limited observations, the Kochëma Evenkis have far greater storage capacity than the Khamakar Evenkis, who seem to have many fewer storage structures. This difference may have to do with the demands of keeping reindeer and residential pattern. The Khamakar Evenkis with whom I most closely worked are within perhaps 30 kilometers of the village if they need supplies and may be able to borrow from hunters in neighboring territories; they also occupy their territories for a much shorter period during the year. The Kochëma Evenkis must keep in close contact with their reindeer and they have neighbors in the surrounding territories who are only present for part of the year. The relative isolation of the Kochëma Evenkis may also explain why they keep more supplies. Within their relatively larger territories, they have lower cabin densities but these storage sites contain a fuller compliment of supplies.

**Picture 6.15 *Labaz* located about 20 meters from a cabin**

Redundancy of supplies and equipment was also an area of difference between the two groups. The reasons for redundancy are simple. There are a number of threats to the integrity of stored items: chimney or wild fires, bears, pests, environmental damage, and spoilage. The Kochëma Evenkis try to keep staples in storage at all their living sites; minimally this includes a large bag of flour, and smaller bags of salt and sugar. Other items like rice, macaroni, and tea may be added as well, although they are typically stored in an elevated labaz, rather than in the cabin itself. This cache is elevated to limit access to pests and reduce moisture problems, compared to a structure on the ground. In Picture 6.15, there are dimly visible bands of tin around the supporting posts to prevent mice, squirrel, and wolverine from climbing the posts. However, Dima said that a large and determined bear may be able to knock over the posts to break into the cache. The Khamakar Evenkis also keep these things, but in cabins and typically in smaller quantities, consistent with single occupancy, rather than 3-4 people.

Another element of redundancy is that the value of some supplies and equipment is circumstantial and variable. In an urban industrial economy, goods are available from a variety of sources in close proximity to the consumer. The Evenkis face time and distance barriers to accessing markets; therefore, they must forecast and store goods for their future needs. Efforts to plan for future needs were evident in many of the Evenkis' behaviors. One of the Kochëma Evenkis made a 70 km round trip to deliver a bag of flour to a distant cabin and empty cooking pots there that had been left full of liquid. Flour was running low at this cabin and if not emptied the pots might have cracked in a cold snap. My impression of their stored and used supplies is that they plan for future use, and carry and store redundant supplies and equipment when possible.

Hunters with snowmobiles can easily make it back to Khamakar at least if they need or want to resupply at some point or ask via radio that others who are passing through bring them something. In February 2012, when traveling with Roma the fan belt for the snowmobile broke and the spare turned out to be in poor condition. He was able to radio a friend who brought a replacement while passing by. Although travel around these hunters' territories was limited, I did not see any *labazi* at their cabins. While they would talk sometimes about caching supplies with the verb form of this word *labazit'*, my understanding was that this simply meant storing things in the cabin itself.

Provisioning on the Kochëma is quite different in a number of respects. For the last decade or so and perhaps longer, the provisioning strategy has been to have supplies delivered via truck in the spring to Kolia's cabin, a dozen kilometers from the main forest road. Up until 2011, the resource companies maintained the forest road leading to his cabin. There is talk that the main forest road will stop being maintained from 2012 onward. Over the last decades the network of forest roads has been maintained in connection with underground surveying (Map 6.10). For how long and under what circumstances resource companies will continue to maintain these roads is unclear, however there is some talk of asking the local municipality to do some maintenance. In any case, in 2012 they had barrels of petrol, staples, and other supplies delivered by truck.

Fishing

Both groups practice fishing but only the Khamakar Evenki were observed to fish during the field season. In part this is likely to do with both the locally available resources in their respective areas and their economic orientations.

The Kochëma Evenkis live on the headwaters where the stream size is very small and so the quantity of fish available is much less than in the Tunguska. Their households are primarily oriented toward reindeer herding and hunting. Fishing was not discussed with Kolia. Dima does do some fishing in the spring and summer, but this is chiefly for immediate consumption using nets and a rod. He has a boat and motor, but the rivers are only safe to navigate from spring to midsummer when the water is high. To the north about 20 km on the Ternakanovskaia Umotka River, there are a number of springs and richer fish populations. In the winter, he was thinking about going there to fish and check on some distant cabins but his snowmobile was unavailable at the time. He mentioned that the past two years there has been hard, lasting ice cover, and many fish died off. This is because when the ice covers the water the exchange of oxygen is cut off and fish die from asphyxiation. Spring activity tends to keep the water open and so attracts many fish to these areas where they become concentrated and easy to catch. Dima mentioned that fish vary in their hardiness and tolerance for low oxygen conditions in the water. Dima gave an approximate order of least to most hardy species: 1) whitefish and grayling, 2) dace, 3) perch and burbot, and 4) pike.

The Khamakar Evenki by comparison fish quite intensively using a variety of methods. In fall 2011, one of the main activities was catching fish in advance of the hunting season. On arrival at Boris's hunting territory, Vadim set nets for Crucian carp in a lake about a kilometer from the cabin. Returning the next day, he kept only about 30 of the 80 caught. We ate some of the fish and the rest fed to the dogs. These nets were taken down and we moved fishing activity to Roma's territory a few kilometers away. There, Boris set nets near the mouth of a small stream on a backwater of the Tunguska. They primarily caught pike using 5 to 7 nets. The by-catch and guts were used for dog food. The heads were saved for baiting sable traps. The upper organs were table fare. Vadim and Boris checked the nets daily, sometimes once, sometimes both morning and evening. Sometimes one or the other would check the nets and Roma would clean the catch. Mobility connected with fishing was primarily connected with checking nets.

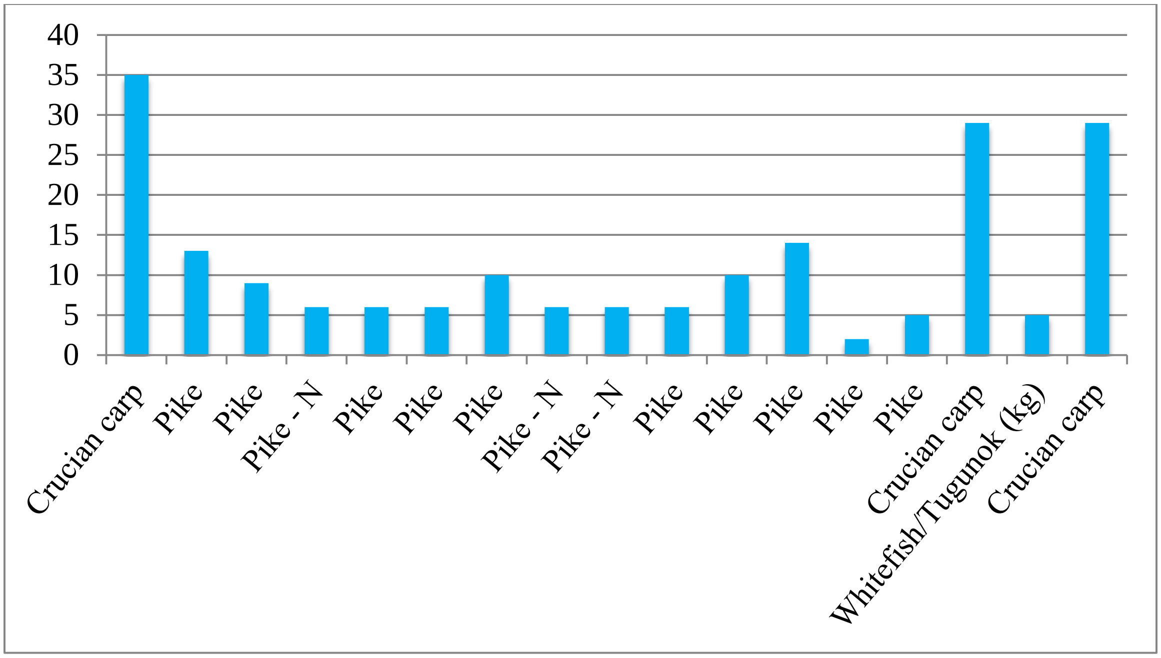



**Figure 6.18 Fish catches Sep 7-27, 2011**

The fish catches were recorded by number of fish, except for the whitefish/tugunok for which an estimated weight is given. This is not ideal and weight figures for all species would have been preferable. The Crucian carp were netted in small lakes near the Tunguska. The nets were left overnight and one half of the catch was returned to the lake and the other half brought back along with the nets. Some were eaten immediately and the rest were used as dog food. Roma said that Crucian carp do not preserve well. The pike were caught in small backwaters of the Tunguska and the majority was salted down in barrels. The salted fish were sent to Khamakar and one barrel was sent as payment for a barrel of petrol in Erbogachën. The pike with the "N" suffix indicate these were used for dog food because they were found dead in the net. The whitefish were caught with a seine net and the quantity indicated is estimated weight. Tugunok are a smaller variety of white fish.

**Picture 6.16 Checking nets using a *pogonka***

When I asked the Khamakar Evenkis why they caught particular species of fish, they said that it primarily has to do with habitat, population and, seasonality. The fishnets I saw were mostly around the mouths of streams flowing into the Tunguska and caught primarily pike. They said that pike are one of the most populous fish and can be harvested intensely with generally positive impact on other fish species, since pike are predators. The gill size of the nets they used was also chosen to catch pike. Habitat is also a factor; Crucian carp occur in large numbers in many of the small inland lakes near the Tunguska. Both times they set nets for carp, they caught a large number overnight, whereas pike were caught in much smaller numbers. Whitefish are highly seasonal and the small quantity we caught was from 4-5 passes with a seine net. Vadim and Vlad said that this is because whitefish were not running at that time and place on the river.

Cabin Building

One of the main tasks that Roma arrived at his hunting territory to accomplish and the reason he enlisted the help of Boris and Vadim was finishing a new main cabin. This cabin had exterior dimensions of approximately 4x4 meters, giving interior dimensions of approximately 3x3 meters and containing three bunks, a table, and stove. The old cabin is sinking into the ground and has a low ceiling, is damp, and has air and water leaks. This cabin is also only about 15 meters from the high water mark and only a meter or two higher in elevation. Roma decided that renovating this cabin was not worthwhile and chose to build a new one farther away from the river. Last spring, they built the four main walls over a period of about two weeks, what remained was the finishing work: flooring, windows, door, ceiling, roof, insulating the perimeter and foundation, and furnishing the interior (stove, bunks, table).

**Picture 6.17 Ripping boards with a Stihl 660 chainsaw**

Working at moderate intensity, we were able to finish these tasks in about a week; see Figure 6.2. We installed a temporary roof: a low ridge-pole supporting boards with a tarp stretched over and fastened to the top logs.

**Picture 6.18 Finished cabin, loading snowmobile sled**

A proper roof will be installed in the spring. Aside from local transport of construction materials, the main significance of the cabin in terms of mobility is as a logistical and residential center to support foraging activity in the surrounding environment.

## Conclusion

This chapter described the patterns of activity and mobility and the economy of the Khamakar and Kochëma Evenkis. Each of these groups was studied at different times of the year, but I interviewed them about many topics I did not directly observe. Time allocation charts quantified the Evenkis' daily patterns of activity and charts summarized their seasonal activities, patterns of residence and economic goals. Charts quantified the Evenkis' patterns of mobility according to means and purpose, and description explained the characteristics of their vehicles and conditions of use. Finally, I described the Evenkis economic activities, with a particular emphasis on mobility and ecological factors. There are limitations to the data presented here, based on the small size of the study population, the limited periods of observation and the lack of details on some topics. However, the strength of the information presented lies in the behavioral, technological, and ecological processes and the quantification of time use and mobility that are so commonly discussed in broad qualitative terms or entirely glossed over.

Many readers will note that distance and speed were often left out of the quantification of mobility. While I recorded this information, I experienced technical challenges in processing it into a usable form. As a result, I first explored the data based on time and the results were more than interesting enough to publish. Information on speed and distance will be published in the future. Time and distance have economic as well as ecological components.

Another aspect of mobility that was present in the Evenkis behavior, but absent in the data presented here, is sociality. There are several reasons for this. First, the primary domain of behavior I was studying was economic in nature. Second, I did not ignore sociality as a factor in mobility but found that in my observation and coding of the data it was very rarely an unambiguous reason for mobility. Rather, I found social behavior to be embedded in economic activities, meetings en route, and a large part of the Evenkis' time allocation at residences (Figures 6.2-3).

# CHAPTER SEVEN: ANALYSIS

The preceding chapter described the Evenkis patterns of time use, mobility, and production, showing that ecological and economic factors are involved in the observed patterns of behavior. The first chapter explained how mobility is a means of achieving particular goals and is subject to economic and structural factors. Additionally, mobility consists of physical resources (fuel, vehicles) and behavior (vehicle choice, techniques of use).

This chapter attempts to explain some reasons for the Evenkis' patterns of activity, mobility, and economic structure. The format of analysis differs between each section: patterns of activity are discussed in relation to opportunity costs, patterns of mobility are discussed in terms of economic and structural factors in addition to specific topics, and economy discussed in specific topics.

## Patterns of Activity

The time allocation data presented in the previous chapter quantify how the Evenkis use their time. I wish to discuss two topics about these data: opportunity costs and ecological aspects of time.

### Opportunity Costs of Time Allocation

Opportunity cost is a basic economic question regarding how individuals use their time. In the case of the Evenkis, the incentives to engage in certain kinds of activity fluctuate throughout the year based on the biology seasonal and weather factors. Above, in the results chapter, the Evenkis' stated goals coincided with the time allocation data.

The broader implication of this finding is that the Evenkis behavior was prompted by seasonal and environmental factors. These factors are evident in how the Evenkis used their time during the observation period.

Khamakar Evenkis' Patterns of Activity

The three largest uses of time in the Fall 2011 field season were: manufacture – 26%, transport – 25%, and personal – 24%. The remaining 25% of time was allocated to miscellaneous activities and daily needs, such food preparation and consumption.

The manufacture time was spent on finishing a cabin on the hunting territory for residence during current and future seasons. The conditions that make spending time in this activity during this period particularly beneficial are legal constraint, seasonal conditions, and availability of labor. The legal constraint is that the hunting seasons for moose and sable had not yet begun. These species are near their prime at this time of year but the benefit of illegal hunting would probably be very marginal. Hypothetically, under conditions of significant competition for harvesting these species and no legal, geographic, or social boundaries, hunting out of season would not be advantageous because the period of prime physical condition for prey species is roughly the same as the legally established seasons. Prime condition for the species the Evenkis' targeted species is related to seasonal conditions and prey biology. For food species, prime condition is reached right before mating season when fat stores that have built up over the summer are at their highest level. Ungulates build up fat stores for mating (males) or gestation (females) as well as to have an energy reserve going into winter (Chan-McLeod et al. 1999). While the Kochëma Evenkis do not currently use them as a food source, bears are also in prime condition during the fall before hibernation. Sables come into prime condition starting with the onset of cold weather. Seasonal conditions underlie the biological evolution of the Evenkis prey species and bring them into peak physical condition. Summer is a period of abundant food resources for these species. Significantly, prey species differ in their period of optimal physical condition. Food species generally decline in physical condition over the winter as they use stored energy and nutrient reserves to supplement lower-quality winter food sources and maintain thermoregulation. Sable decline in quality more slowly because their condition is based on physical wear on their coats, which are damaged by abrasion and injury. Up through the end of sable trapping season, it is common to harvest marketable sable, although the proportion of lower quality, less valuable furs roughly increases with time. An additional factor that works against harvesting food animals early is seasonal temperature. The start of the hunting season in late October coincides with the beginning of significantly dropping temperatures and the start of freeze up. Before this period, nighttime temperatures can be around, but are not consistently below, freezing. Under these conditions, it is difficult to keep meat from spoiling. The Khamakar Evenkis have cellars in the village where meat can be stored in this transitional period, but at the hunting territories the usual strategy to preserve meat is simply to let the meat cool and to keep it covered. Makeshift cellars can be dug, but this is very difficult work and permafrost depth varies throughout the region. Unless the carcass is transported quickly to the village, preserving meat even in the early hunting season can be problematic. The change of season also lowers insect populations while daytime temperatures are still warm, but not uncomfortable for the heavy work of cabin building; unlike in the summer, with higher temperatures and greater density and variety of insects. The problem of legal hunting season, prey condition, meat storage, and good working conditions made working on the cabin a sensible time allocation.

The labor to work on the cabin was available because the hunting season had not yet started. Hunting is largely an individual activity, but sometimes involves cooperation between individuals. Once the season has started, each hunter is engaged separately in activities on individual territories. Diverting effort from hunting and preparations to manufacture would run up against time, distance, and energy constraints.

Transport was the next largest time allocation. There were two primary purposes of transport: travel to the hunting territory and preparing trap line for the season. Travel to the hunting territory had two main blocks of activity; one was traveling from Erbogachën by river to the territory and the other was commuting between the cabin construction site at one hunting territory and sleeping at the cabin on a neighboring territory. Travel to the territory had the purpose of access to resources and arriving early enough to complete the preparatory activities. The travel between the cabins was primarily for reasons of comfort and convenience. Traveling around the trapping trails was with the purpose of marking and clearing trails and taking inventory of the traps in advance of the fur harvesting season.

The next largest use of time was for personal activities. This category overlaps somewhat with the social and both would qualify as leisure in the broader sense. The activities included in this category include conversation, watching films, and reading. Within the past decade, Evenkis have acquired small, gas powered electrical generators to power lights, DVD players, televisions, and other devices at their hunting camps. While it is tempting to examine the factors related to audio-visual media, I will leave that topic for a more in-depth study. For the purposes here, I will simply consider the leisure aspect of this time allocation. With few exceptions, these leisure activities were during the evening and usually after dark. Given that the number of hours of darkness is greater than the number of hours needed for sleep, there was a period of several hours each day that were unallocated to directly productive (foraging, manufacture, repair, food preparation) or regenerative activities (sleep, eating). While not mandatory in all cases, good lighting conditions are a great help to many productive activities. During the field season, most of the productive activities were outdoors, and working by artificial light would be impractical in most cases. Given the constraints on the type of work that would be practical, and the desire for rest after a day of carrying, hewing, and setting logs, and the fact that there were no pressing time constraints on completion of the cabin; rest was both energy conservation and recuperation.

The Khamakar Evenkis time allocation during Fall 2011 shows a pattern of balancing competing goals based on human and environmental variables. The purposes of mobility included preparation and comfort. These goals and behaviors are usually studied in isolation in such disciplines as economics and human biology. Manufacture occupied a considerable portion of the day and the product of this labor, the hunter's cabin, will be a hub of foraging activity into the future. Leisure in the form of personal and social time was almost an identical proportion of time allocation as manufacture and transport. A strictly economic view of time allocation would view non-productive time as a forgone opportunity for further economic productivity. This omits the possibility for complicating factors such as the impracticality and danger of working in the dark, the demands of physical recovery, and the benefits of energy conservation.

Kochëma Evenkis’ Patterns of Activity

During the field season of winter 2012, the Kochëma Evenkis’ three largest time allocations were personal 33%, social 15%, and subsistence 10%. The smaller percentages of time were more varied as compared to the Khamakar Evenkis, which may be due to methodological issues and differences in household composition.

The largest percentages of time allocation were personal and social, and I will deal with them together because they are both restful non-sleep activity. In contrast to the Khamakar Evenkis, who made major time contributions to two specific goals, cabin construction and mobility to and around the hunting territory, the Kochëma Evenkis time was spent across a wider range of activities and goals. The context of rest being a large portion of time allocation is based on three factors: the preceding months’ activity patterns, seasonal factors, and the benefits of rest and energy conservation. Migration over large parts of the territory for sable and moose hunting occupied previous months. The migration cycle in this period is based on travel throughout the territory to open sable traps that are placed along trails, and on foot or ski hunting of sable and moose. Sable harvest is accomplished through hunting and trapping. Hunting success is predicated on searching out and harvesting game around the living site and moving on. The mobility patterns for the hunting season were difficult to clarify through interviews, but what is clear is that it is a period of intense mobility. The field season began toward the end of this period when sable trapping had slowed down considerably and moose hunting was a minor activity because so few tracks had been found. That the purpose of this rest was partly to recuperate after the previous months’ intense activity is a partial explanation. As Dunbar et al (2009: 415) point out, time allocation to rest has two measureable components: unallocated time that has the potential to be allocated to other activities and rest time forced “by thermoregulatory or digestive constraints.” To this list could be added many biological processes, such as sleep.

The time allocated to rest by the Evenkis was sizable for both groups: Khamakar 30% (personal: 24%; social 6%) and Kochëma 48% (personal: 33%; social: 15%). The Kochëma Evenkis allocated 18% more time to rest compared to the Khamakar Evenkis. These data come from two different groups at different times of year with somewhat different economic foci. Given this amount of resting time, it is probably safe to assume that the Evenkis of both groups have a surplus of free resting time. The broader question is why do the Evenkis have so much rest time. The answers are somewhat different for each season and group. For the Khamakar Evenkis, resting time as noted above, is probably some combination of forced resting time needed after heavy work and free resting time made possible because of a lack of other productive activities possible during nighttime hours. For the Kochëma Evenkis, who had 18% greater total resting time, the reasons are probably more complex. The peak hunting and foraging period was past, so additional time allocated would probably not be productive. Sable trapping season was ending and is a largely passive activity. Leaving the dwelling site to check sable traps or look for moose tracks in outlying areas means journeying for several days, during which the reindeer near the main living site go unsupervised. There was one period during the field season that we did go on such a journey, but this is a continuous time allocation, rather than additional hours per day allocated. There is a tradeoff between keeping the herd under frequent observation and leaving the herd unsupervised to go on a short trip to check tracks and traps using a small number of reindeer or a snowmobile. Time allocation is not just an issue of balancing multiple goals throughout the day but balancing potential costs and benefits over time and caused by patterned but uncontrolled factors such as weather and animal behavior. Discussion with the Kochëma Evenkis brought up checking sable traps as a desirable activity, but they also voiced concern over leaving reindeer unattended. The time spent in rest is partially reflective of this general goal of supervising reindeer, which took little time each day but precluded taking several days away from reindeer to check traps. Some amount of the overall time allocation to rest was probably a by-product of choosing reindeer supervision as a goal and not having additional and compatible activities to occupy free resting time.

The Kochëma firewood production was not a part of the time allocation data because it did not fall on sample days (Chapter 5: Time Allocation). There were approximately two full days and several shorter periods of up to 2 hours when they cut and hauled firewood to cabins.

In Sahlin's (1972) landmark analysis of hunter-gatherer economies he collected widespread accounts of ample leisure time and ample food supplies resulting from an economic orientation that emphasized economic production for immediate need. The accounts he collected were chiefly from populations in temperate climates who did not practice food storage because they had an expectation to succeed in foraging (Sahlins 1972: 28). The Evenkis of both groups do use storage and transport their belongings during migrations, unlike many of the groups Sahlins describes (1972: 1-39). Additionally, high latitude foragers seem to organize their mobility and food procurement using a logistical model that emphasizes transport and storage of supplies and equipment, in contrast to foragers in the mid to low latitudes (Binford 1977, 1980). The reasons why storage may be prominent among high latitude foragers include:

- ecological and climatic factors favoring large body sizes among many prey species (Winderhalder 1977: 97-125),
- the need for extensive material goods (seasonal clothing and shelter; cooking, hunting and firewood production equipment; vehicles: sleds, boats) and
- the need to store food for long periods due to highly punctuated periods of availability (prey migration, fish runs, difficulty of harvest).

Although difficult to directly compare, the Evenkis leisure time and active forging seem considerably less than examples Sahlins cites (1972: 15-21). The Evenkis also heat their dwellings with wood, which helps to offset the need for body heat production through calories (see Thermoregulation below), but creates an additional demand for labor that lower latitude foragers would have to a lesser degree.

The economies of foraging and pastoral populations are often viewed as self-sufficient, with minimal integration into regional, state, or global economies. The fur trade, historically and up through the present has allowed the Evenkis to participate in the market economy while continuing their historical, independent and culturally significant pastoral and foraging modes of production (Turov 2010: 9-23, 39-44; Sirina 2006: 63-68, 178-188). Other market economy activities, that have received some attention, are cargo hauling, guiding, provisioning, and other jobs for surveyors, resource extraction enterprises, and other travelers (Anderson et al. 2011, Turov 2010, Sirina 2006: 46-50). These economic activities also involved the use of reindeer, but there are no known opportunities now or in the recent past in these areas.

The Kochëma Evenkis' resting time could be viewed in part as a means of caloric conservation. As noted above, meat supplies consisted of a partial reindeer carcass. The moose harvested earlier in the year had been consumed and by midwinter wolves had chased away most of the moose population. The need for meat may have motivated tracking and taking a low probability shot at a cow moose and her calf. Shooting cow moose is generally not favored because they contribute more to population replacement and increase while attracting bull moose from other areas. These conditions of protein scarcity may have motivated both the high levels of free rest as a means of conserving stored meat. Rubin et al. (1986) recorded similar responses where resting time was increased among populations with smaller food supplies. Conceptually, stored calories can be used over a long period or consumed to support efforts to acquire more food.

Conclusion

The time allocation of both groups was spread across activities that vary little by season, such as food preparation, eating, care for reindeer, and sleeping; and activities that are highly seasonal, such as foraging. Broadly, time allocation decisions are based on variables with different time sensitivity and economic results. The data presented here are only a glimpse of time allocation of a few individuals over parts of the yearly economic cycle. The results of time allocation to particular activities are often displaced. Firewood is cut months or years in advance of use and game is harvested over hours and consumed over months.

The Evenkis’ time allocation to rest was the result of several factors. For the Khamakar Evenki, these were the number of daylight hours and the need for rest. The relationships between physical activity and the need for rest are presumed to be important but a complicating factor is the use of power generation for artificial light and video players at cabins and how these may affect time allocation decisions. For the Kochëma

Evenki, who had an 18% greater daily amount of time spent in rest, the reasons are probably related to seasonal factors, reindeer supervision, and possibly low meat supplies.

The Evenkis primary activities were based on both seasonal and geographical factors. The Khamakar Evenkis time allocation to mobility is a response to geographic separation of living sites and economic activity sites based on seasonal dynamics of targeted resources or working conditions. The Kochëma Evenkis' overall economic activity during the field season was partially masked by the representation of the sampling days and the large proportion of personal and resting time. Their economic activity also crossed multiple categories and was more punctuated. For example, a full day of firewood production was preceded and followed by days consisting mostly of rest or minor tasks.

Time allocation is an important data set for analysis of activity patterns throughout the year and between different groups and individuals. Additionally, time is an important factor in relationships throughout the Evenkis' environment. Dunbar et al. note time is the filter for biological processes, including the availability of nutrients (2009: 426). To this list could be added ecological cycles of productivity, digestion and many other factors. Time and distance are implicit variables in ecology. The Evenkis' economy is dependent on biological processes over time for the growth and maturation of the plant and animal resources they depend on and mobility as a process of expending time and energy to access these resources.

# Patterns of Mobility

The primary goal of this research is to elucidate the processes and purposes of mobility in the Evenkis' economy. In the first chapter, I discussed how mobility, which I have variously called transport, travel, movement, and other terms throughout the text, is a facilitative process for achieving a specific purpose. Mobility is a cost of achieving other goals, but as a process is subject to economic and qualitative variables. The previous chapter describes the Evenkis' means, patterns, and purposes of mobility. In this chapter, I will analyze the Evenkis means of transportation using the economic variables of costs and benefits and the qualitative variables of constraints and opportunities.

The Evenkis' means of mobility are vehicles, from feet to watercraft to reindeer. The casual observer will notice that these are vastly different means of transportation, with different capabilities and characteristics. Some of these are obvious, but the reasons why the Evenkis use vehicles in certain ways are not always obvious.

Below I will analyze the basic differences between motorized and non-motorized transport and the specific economic and characteristic factors of each vehicle the Evenkis commonly use.

## Economic and Characteristic Domains of Vehicles

In examining the economic and characteristics domains of vehicles, I found the greatest area of difference is between motorized and non-motorized forms of transportation. Each of the five means of transport (snowmobile, motorboat, pedestrian, reindeer, canoe) has its own particular traits that have been covered in the results section or I will point out here.  The five domains I will examine are: energy source, repair, payload, speed, and sound according to economic and characteristic properties. The variables in question fall into several categories: inherent to the vehicle itself, significant in comparison to a near substitute, or important because of environmental factors. In analyzing these variables, I have taken a pragmatic view in choosing the domains and which aspects are important. The domains are both categorical and continual, but in many cases I have chosen to focus only on one aspect. For instance, I have chosen to emphasize the type of energy source (biophysical and petrol) and the dynamics of use, and have left a quantitative comparison for further exploration. Please refer to Table 6.3 for estimates of vehicle capabilities.

Motorized Transport

Motorized transport includes boats and snowmobiles. The configurations of these vehicles are suited to the above and below freezing conditions of transportation routes: water travel by boats in the warm months and across the frozen, snowy landscape by snowmobile in the winter. Snowmobile trails require work to pack and clear brush from, whereas boats restricted by seasonal water level, ice cover conditions, and the network of navigable rivers.

The Evenkis use snowmobiles for many purposes, from hauling cargo to checking traps to regional travel. The long duration of the winter season, freedom to travel across frozen rivers and trails across the landscape, and moderate costs of ownership make snowmobiles one of the most widely owned vehicles. Most individuals from both Evenki groups have access to one or more snowmobiles, although they were not always available due to breakdowns and being out on loan. Each of the Kochëma households own one or more snowmobiles and the Khamakar Evenki males either own snowmobiles or have close associates willing to share.

The Khamakar Evenkis were the only group observed using motorboats. The Kochëma Evenkis do have a boat and access to a seasonally navigable river but use it only infrequently. Khamakar Evenkis use motorboats to travel between the villages along the Tunguska River and their hunting territories. Khamakar village receives some supply shipments, but fuel for personal use and many supplies are transported on private boats. Products in the local store are often poor quality and over-priced, so supplies are often privately purchased and transported from Erbogachën. These boats are also used to haul equipment and supplies for the hunting season.

**Picture 7.1 Sewing tear in snowmobile track with hot nail and wire**

The monetary costs of motorized vehicles are repair parts and petrol, both of which require participation in the cash economy. The Evenkis acquire cash through either selling sable skins, wage work, or through relatives. Aside from monetary barriers, there are time and availability problems with seasonal petrol shortages in Erbogachën, which may not align with the Evenkis' season of need, and the ordering and shipment of spare parts into the region, which may take weeks for delivery. Acquiring repair parts and petrol can involve borrowing money, calling in favors for delivery, and other complications. The proportion of time spent in use vs. repair was much higher for motorized vehicles than for non-motorized vehicles (Figure 6.6). There were breakdowns of boat and snowmobile motors. Given the size and relative remoteness of the Kochëma Evenkis' territories, using a mix of motorized and non-motorized vehicles may be a strategy to mitigate the downsides of maintaining only one type of vehicle. The snowmobile has a high payload, speed, and convenience factor, but it can be difficult to repair and source fuel. Reindeer source energy from the environment and have modest payloads, but they are reliable, if time consuming. For similar observations on motorized and non-motorized means of transport and how they are used, see Binford (1977: 24) and Pelto (1987: 67-9, 77-94).

The most beneficial aspects of motorized transportation are high payload and high speed. Some of the things a snowmobile sled can haul are: a moose carcass, fuel and cargo for a journey of several hundred kilometers, firewood or passenger(s), and cargo for a job or trip. Snowmobile use for both Evenki groups is largely in two categories: long distance travel and cargo hauling. Long distance travel includes trips within individual hunting territories and between a territory and Erbogachën. Cargo hauling can include hauling firewood from the area to be stored at a living site or bringing fuel and supplies from Erbogachën. The two groups differ somewhat in how they use snowmobiles. Khamakar Evenkis seem to park the snowmobile at the main cabin on the territory using it only for trips and errands, and check traps on skis. The Kochëma Evenkis are nomadic during the winter, so they move the snowmobile along with migrations and while they may use it incidentally to check sable traps while on logistical trips they stated a preference to use reindeer for many tasks.

**Picture 7.2 Snowmobile, sled, cargo, fuel barrel**

Motorboats can also be used for hunting. During the Fall 2011 field season, Khamakar Evenkis from a neighboring hunting territory shot two moose while traveling upstream on a winding river. The basic technique is to move slowly along the river and hope to come upon moose feeding along the shore, typically during mornings and evenings. One person pilots the boat either drifting with the motor off or at a low idle and the other holds the gun at the ready and watches for moose. A winding river helps significantly with this technique for several reasons. The bends minimize the line of sight for the moose and shooting distance for the hunter as the boat moves around each turn. The curves in the bank, vegetation, and potentially water noise muffle and distort the sound of the motor. Boat motors have a lower frequency sound than do snowmobile motors, which may also affect how animals perceive these sounds.

**Table 7.1 Motorized Transport**

| | Cost | Benefit | Constraints | Opportunities |
|---|---|---|---|---|
| **Energy Source** | Petrol, Monetary | Storable, very powerful | Tethered to Petrol sources | No rest needed |
| **Repair (mechanical)** | Monetary | N/A | Cause of problems difficult to observe/infer, some parts fragile, parts difficult to improvise | Quick return of performance |
| **Payload** | Fuel must be part of cargo | High payload | Vehicle power, trail conditions | Movement of large quantities of cargo |
| **Speed** | Power vs. torque, dictated by conditions/load | 1-4 times greater than walking | Observation of Environment | Travel long distances, hunting |
| **Sound** | Loud Noise (hearing damage) | N/A | Less likely to encounter game | Can hear at distance |

The snowmobile has some serious disadvantages for use in hunting. First, motor sounds carry a long way and animals associate this with humans. The Kochëma Evenkis prefer travel by reindeer for foraging trips. Sound from reindeer and sleds through the snow is much quieter and so they are much likely to encounter game. The sounds domestic reindeer make are familiar and non-threatening to moose and wild reindeer. Second, snowmobiles are difficult to maneuver while using a firearm, since both demand the use of both hands for the most effective use. The Khamakar Evenkis mentioned that ungulates and wolves could be hunted by snowmobile. The technique depends on catching the animal in an open area and having enough speed and distance to overtake the animal and shoot it before it reaches cover. However, this depends highly on the landscape and luck in happening upon the animal at these places, quickly un-hitching the sled and hitting a moving target while maneuvering the snowmobile at high speed. It may be possible to refine this technique but two factors would make this difficult: operating the snowmobile in conjunction with aiming and predicting when and where game would enter the open area. Regardless, the Evenkis mentioned this as an opportunistic, rather than planned and practiced technique. Notably, some hunters, Evenki and Russian, habitually travel with a firearm slung around the handlebars of the snowmobile or easily accessible in some other fashion. This is because game animals are sometimes encountered near trails and having a firearm ready to hand increases the speed of getting a shot off before they are too far away or enter cover, rather than being ready to engage in snowmobile pursuit hunting as such.

The design of snowmobiles also effects how they can be used. There are three design elements that affect the operation of snowmobiles: hauling capacity, maneuverability, and speed. Hauling capacity and speed are functions of the power of the drive system and the surface area of the tracks. There are two common designs for working snowmobiles: two skis in front and one track in the rear (common in north America and Europe) and one ski in front and two tracks in the rear (common in Russia). The former design is slowly becoming available in Russia, but is only known through pictures and a very few examples in the Katanga region. No research partners have had access to this type of snowmobile, but some were very curious about the design and functional characteristics of both snowmobiles. Based on my experience with both types of snowmobiles and discussion with the Khamakar Evenkis, these design differences have important consequences for how the snowmobile can be used. The shape that a snowmobile presents to the travel surface is essentially triangular. For ease of reference, I will refer to the snowmobiles as the mono or twin ski type. Mono ski snowmobiles present the tip of the triangle forward with the ski at the front and the two tracks to the rear.  Any obstacles encountered, whether brush or saplings above or below the snow or varying densities and depths of snow push against the center of the snowmobile through the ski. This point forward design can be useful for traveling through areas of close but light brush, such as wetlands, where the single ski parts vegetation on either side of the snowmobile. They tend to be stable at low speeds because deflection can be countered through maneuvering or the weight shift of the rider. At high speeds, they deflect more easily and quickly go from stable to unstable and the driver is unable to react quickly enough to maneuver in the desired direction. This was particularly apparent to me while driving across a packed trail little more than the width of the snowmobile. On a packed trail, if the snowmobile is given slight under or over steering corrections it tends to veer off trail in to the unsolidified powder. During one particular trip, Evenkis repeatedly fell off the packed trail and into powder, tipping the snowmobile and sometimes the sled onto its side. With a proper weight shift and maneuvering it is possible to maneuver the snowmobile through the powder and back onto the packed trail. Twin ski snowmobiles present a triangle with the base oriented forward, the skis positioned at the two front corners and the single, long track at the rear. This layout is more stable and consistent at all speeds, however the skis have a greater tendency to catch and snag on brush. Tall vegetation poking up above the snow, such as is usually encountered in wetlands or other areas, tends to accumulate around the skis and front suspension system. Light vegetation is a nuisance but when traveling through the forest, whether on or off trail, hooking a sapling can catch the skis and damage the suspension and steering systems. In terms of pursuit hunting, the twin ski snowmobile is probably a better vehicle, however it must be longer for the same hauling power, which increases turning radius, an important attribute in the forest, and does not plow through brush nearly as well as a mono ski snowmobile. Elements of skill and vehicle design contribute to pursuit hunting success on a snowmobile.

The energy source for motorized vehicles has both constraints and opportunities. A significant constraint is that petrol is available only from one source in Erbogachën. Typically, Evenkis and others going out onto the land purchase petrol in advance and store it in 30-200 liter drums. While motorized vehicles have the payload to carry enough fuel for some period of sustainment, the limited supply points, storage, and transportation requirements are significant constraints.

An ancillary benefit of snowmobiles is that they are used to pack the snow on winter trails for repeated use but also travel by reindeer sleds and foot travel. Packed snow increases the speed and fuel economy and reduces the difficulty of travel, compared to unpacked snow.

Non-Motorized Transport

Non-motorized vehicles include reindeer, pedestrian, and canoe. The energy source for these vehicles is locally renewable (pasture, fish, and game). Reindeer are adapted to the same environments in which the Evenkis' now use them. Unlike other draught animals, such as horses, which require stored forage and shelter, reindeer essentially care for themselves in this regard. There are many other ways that the reindeer's adaptation to the boreal forest environment is advantageous in economic terms. That reindeer forage for themselves and need very little if any human intervention in providing for their physical needs is a significant economic advantage as well over motorized vehicles and their energy source, which must be purchased and transported. The energy source for humans is meat, fish, wild edibles, and store-bought foods. With the exception of the last, all these can be acquired from the environment.

Repair concerns equipment for reindeer (saddles, sleds harnesses), the canoe itself and pedestrian equipment (skis, boots). The repair and manufacture of such equipment can be accomplished using locally available materials. The failure rate of this type of equipment in comparison to motorized equipment is low based on data gathered, but this is a very limited sample. The research period was in the cold season, whereas woodworking is primarily done in the spring and summer with green wood, thus any repairs were likely completed before the field season. Kochëma Evenkis said that reindeer sleds in particular last a number of years and that they do only incidental repairs because the point at which material failures begin to occur is usually when the whole sled has begun to fail and is due for replacement. Presumably saddles and other wood items have a similar pattern of failure. In terms of care in the off-season, one of the Kochëma Evenki households has an outbuilding at one of their cabins where they store sleds and other equipment. Another option is simply to lean the sled up against a building or tree, to keep moisture running off the wood, particularly the runners. Most other kinds of equipment for non-motorized transport are stored in cabins or caches. The two types of equipment the Evenkis use that are not available from the environment but must be purchased are wood working tools (axes, knives) and some kinds of footwear (rubber and felt boots).

In broad terms, sickness could be considered a kind of repair process. This is a more complicated topic, exposing the fundamental differences between living creatures and mechanical devices. The little information I have indicates that in some cases sick or injured reindeer are destroyed, in others Evenkis may take special care of sick individuals or reindeer are simply allowed to heal on their own. More data on this topic would be helpful for making a comparison to other types of transportation. Humans have a variety of methods for coping with sickness as well.

The payload of non-motorized transport varies. The payload of reindeer and humans as a type of transportation is comparable on an individual basis. The estimates in Table 6.3 are approximate. A reindeer can probably haul a 40 kg load on a packsaddle longer and faster than a human can on a backpack or other device. The Evenkis told me anecdotes about the men of older generations carrying heavy loads well in excess of 40 kg over distance. The difference is that with reindeer the number of trained animals available limits the total payload, whereas with humans the limitation is the number and strength of people in the household. The payload of canoes is comparable to backpacks or packsaddles, with the difference is the operator is part of the hauling capacity and that payload is limited by the size and floatation of the canoe.

**Picture 7.3 Hauling wood with two sleds and four reindeer**

Obviously, the economic tradeoffs of these different options vary considerably. The advantages of reindeer are that in most respects they take care of themselves, provide the ability to haul loads long distances, and can be used in all seasons, but not all conditions.

**Table 7.2 Non-motorized Transport**

| | Cost | Benefit | Constraints | Opportunities |
|---|---|---|---|---|
| **Energy Source** | Calories – Pasture, foraging or store bought | Locally replenishing | Rest required | Mobility throughout the environment and seasons |
| **Repair (sleds, skis, boots)** | Manufacture time | Materials locally available | Seasonally variable materials | Infrequently required |
| **Payload** | High: reindeer<br>Low: canoe, pedestrian | N/A | Strength vs. weight, trail conditions | Versatile |
| **Speed** | High: reindeer (must find)<br>Low: pedestrian, canoe | N/A | 0-3 times greater than walking | Observation of environment |
| **Sound** | N/A | Harvesting game more likely | Skill and control | Foraging |

The speed of reindeer transport is comparable to that of snowmobiles (Table 6.3). Under load, snowmobiles are only a few kilometers per hour faster than reindeer. However, speed as a criterion does not account for how reindeer and snowmobiles are controlled. The difference is that reindeer carry load in a group of roughly 1-14 individuals, each of which must be harnessed individually and managed in multiple pack strings or teams. While trained, reindeer are temperamental and can frustrate steady progress. Snowmobiles function until they run out of fuel or mechanically fail. The speed of reindeer transport must also include preparation for a trip. A snowmobile sits wherever it was parked, but reindeer roam around the landscape and must be gathered, harnessed, and loaded before the trip can begin. The speed of human mobility is slower but this is often because of activities done during travel (removing fish from nets, setting traps, stalking, etc.). In practical terms, speed of non-motorized travel is limited by strength, conditioning, and the condition of the route.

The level and kind of sound associated with non-motorized transport has particular advantages for foraging in comparison to many other means of transportation. The sound of reindeer movement is quiet, if prey animals do hear it there is less of a probability that they would associate it with a threat. The Kochëma Evenkis noted this as a significant advantage of traveling by reindeer in contrast to snowmobiles. When moving in a particular gait, the tendon and bone of a reindeer's leg make a distinctive, audible clicking sound.  More subtly, the pattern of sounds reindeer make as they move through packed or unpacked snow is probably distinct from wolves. The Evenkis said that they are more likely to encounter game when traveling by reindeer than by snowmobile, but that sometimes sled runners scrape the snow and this sound is out of place compared to non-anthropogenic environmental sounds. This sound is much quieter than a snowmobile though, making approaching game to a closer range more likely. In the case of foot travel, stalking relies heavily on low levels of sound to be successful. The canoe also has low levels of sound, which is useful for hunting waterfowl. Although not observed or discussed, the canoe could be used for hunting moose along rivers and streams. The importance of sound type or level is particular to hunting.

The energy source of motor and human powered vehicles is a direct cost to the Evenkis in time and effort (hunting, fishing) or money (petrol). The energy source reindeer use (pasture) has no direct cost to the Evenkis. The cost is rather in the time and effort to care for their reindeer throughout the year, quantified during the field season in

Figures 6.2-5. For motor vehicles the cost is monetary, for initial purchase and ongoing fuel and parts, with sable harvesting being a significant source of income. Time investment in this area was shown in a non-peak period in Figures 6.1-2. The seasonal returns from sable trapping are shown in Figures 6.13-16.

In summary, there are two basic types of transport the Evenkis use. First, high payload, high-speed means of transport allow movement of supplies and equipment across the landscape. This type of mobility includes motorized vehicles and reindeer. A simple economic model of logistics predicts that resources or the living site will be moved to the location of the other dependent on which is the lower cost option (Binford 1980: 15). The bulk and weight of equipment (seasonal clothing, shelter, household items, tools, stored food) is a significant factor (Binford 1980: 17) in the Evenkis' means of logistical mobility having high payload (boats, snowmobiles, reindeer) and their extensive storage capacity (2-7 cabins per territory, similar to higher numbers of caches for the Kochëma Evenkis). Second, high dexterity, high environmental observation means of transport (pedestrian, canoe, reindeer to some extent) allow foraging in environments where it would be difficult otherwise (canoe: netting fish, hunting on inland water bodies), to facilitate foraging techniques, and avoid alarming game, and to search for reindeer. A major trade off non-motorized vs. motorized transport is the cost and origin of the energy source.

There are several authors that make comparisons on the use and effects of different means of transport among foraging-pastoral arctic populations. For the use of dogs and snowmobiles as transport see Nelson (1986: 177-182) and Binford (1977). For horses and reindeer see Brandisauskas (2009: 68). For reindeer and snowmobiles, see Pelto (1987).

Thermoregulation and Mobility

The power sources for different vehicles have broadly similar dynamics in how they source and consume energy. Humans, reindeer, and motors consume energy, create heat as a byproduct, and are subject to failure.

Energy source and use differs markedly between organisms and motors. Organisms acquire and process energy from the environment. The economic costs of energy expended are, assuming availability of food sources, offset by energy acquired. Thermoregulation has biological and behavioral components for humans and reindeer (Shibasaki and Crandall 2011: 685; Aas-Hanson et al. 2000, Soppela et al. 1986). Adjustment to ambient temperature for humans is related to metabolism, use of clothing and potentially genetics (Galloway et al. 2000, Leonard et al. 2005). The problem of thermoregulation for humans in the winter is particularly complicated and discussed more in depth in the next section. For reindeer, I presume thermoregulation is largely an inherent process, however this was not a specific point in my discussions with Evenkis. Thermoregulation of motors is a design feature or mechanical process. The user simply has to make sure these systems are functioning and operate the vehicle with consideration for overheating.

Mobility powered by human, reindeer, or motors results in heat generation. All these power sources must manage output and resulting heat output and environmental conditions. Thermoregulation as a component of mobility places particular constraints on each of these power sources. Briefly, I will explain the thermoregulation processes of each means of mobility and describe how this influenced their function during the field season.

Motors have two basic types of thermoregulation systems: air or water-cooling. The snowmobiles use air-cooling through a shroud and pulley driven fan system to force an increased volume of air to flow around the combustion chambers, where the most heat is generated. The cooling system is always in operation because at all normal atmospheric temperatures the engine must be cooled.

There were two aspects of motor thermoregulation observed to impact mobility processes: preheating in cold weather and cooling system failure. The cooling fan is operated by a rubber belt and pulley system driven by the engine’s crankshaft. In cold weather or through age, this belt becomes stiff and loses its frictional qualities, and as a result the belt slips and fails to drive the fan. The friction of the pulleys rubbing against the belt can sometimes cause it to heat up and begin to grip and turn the fan or to heat up and disintegrate. In the first few seconds of starting up a snowmobile, it is good practice to check for airflow coming from the fan cooling system. During the winter field season, the Khamakar Evenkis experienced a cooling system failure on a snowmobile during a trip. This was inferred based on the abnormally low power output from an engine that otherwise seemed to be running normally, but consumed a large amount of fuel. The fan belt at the time of diagnosis seemed to be driving the fan, but this apparently was after the damage had already been done. The likely sequence of events was a fan belt stiff from the cold failed to drive the cooling fan during warm up and operation that led to a spike in engine temperatures and damage to the piston rings, resulting in a partial loss of compression. A spare fan belt is usually part of the spare parts kit but this is largely to address a catastrophic fan belt failure, which is noisy or to replace a fan belt that is improperly tensioned. Replacement of the fan belt does not fix damage from an overheating event; it merely repairs the cooling system.

There are two additional temperature-related practices during deep cold. First, when the temperature is expected to be lower than perhaps -30˚ C while the snowmobile is parked, such as overnight or between activities during the day, it was common for both the Khamakar and Kochëma Evenkis to remove the rubber drive belt and metal clutch assembly. The drive belt is removed because it is likely to crack when stressed at low temperatures. The rubber drive belt is much larger and thicker than the fan belt and placed under greater loads, because of this it is more likely to crack rather than the fan belt, which is not habitually removed. Second, the starting procedure during deep cold includes preheating the engine block with a blowtorch or other heat source before the starting sequence. In the cold, lubricants on the internal bearing surfaces of the engine thicken and make turning the engine over difficult and reduces the likelihood that one or two ignitions of fuel will be sufficient to light off a firing cycle that will keep the engine running. It is possible to start a snowmobile in the deep cold without preheating the engine block, but the ignition and fuel systems must be in proper tune. Preheating the engine makes starting easier and more reliable.

Boat motors are less problematic in terms of thermoregulation. They can only be used around and above freezing temperatures, so preheating measures do not apply and they use a transmission rather than belt drive system so the daily removal and replacement of a rubber belt do not apply either. The cooling system uses water from the river or lake and directs it through the engine block, exhaust, and heat sinks, depending on the design. The problems with the cooling system would probably involve blockage or mechanical failure. While the Khamakar Evenkis did encounter problems with their boat motors, this was related to mechanical issues rather than cooling problems.

Reindeer thermoregulate during exertion through panting (Aas-Hanson et al. 2000, Soppela et al. 1986), which I observed on a few occasions during the field season. The Kochëma Evenkis did not specifically mention thermoregulation in regard to how they use their reindeer but did mention that they prefer females for pulling sleds longer distances and that wild reindeer can run faster and longer than domestic reindeer. The reasons Evenkis usually choose female reindeer for a long trip are that they are faster and have more endurance. This may be connected to their smaller body mass, which would probably also aid in losing heat as compared to males, which have greater body mass. The greater speed and endurance of wild reindeer may reflect conditioning or genetic traits rather than a thermoregulatory trait.

Human thermoregulation is a complicated topic, but the Evenkis' behavior and comments brought up several points. Human thermoregulation is part biophysical (i.e. metabolism and perspiration) and part behavioral (i.e. control of activity intensity; use of clothing, shelter, and heat sources). Perspiration is one of the main ways the body tries to cool itself, but this is only effective if the skin is exposed (Shibasaki and Crandall 2011: 685). During the months when the temperature is above freezing, perspiration is less of a concern because the dew point is higher and the difference between air and body temperatures is smaller, making rapid cooling of the body and hypothermia less of a concern. During the winter field season, the Kochëma Evenkis advised that I should dress lightly when we went to search for the reindeer. This involved walking on hard snow paths, through deep powdery snow and skiing, moderate to high intensity activities. In simple terms, heat is a byproduct of activity, but it is also a result of basal metabolism. Excess heat production, if not carefully managed, can lead to heavy perspiration that compromises the heat retention properties of clothing, eventually resulting in rapid cooling of the body and, if unchecked, hypothermia. Since the dew point is low at winter temperatures and the skin is not exposed, perspiration wicks into clothing as droplets or gas. If the rate of perspiration is greater than the rate of transfer through clothing into the atmosphere, then moisture gathers within clothing or at the skin.

For skiing, walking, and chores around the living site, the usual pattern of dress in the winter was a medium and light weight layer. This allows the body to cool by radiating heat into the atmosphere, minimizing the activity-related increase in perspiration and the distance of perspiration to evaporate into the air. When traveling over long distances by snowmobile, we wore the most insulating clothes available to prevent heat loss and protect against wind-chill. Snowmobile travel is a low intensity activity compared to walking or skiing. The goals of dressing for each type of activity are almost opposite; for movement: have the minimum amount of clothing to keep warm; and for stationary: have the maximum amount of clothing to retain warmth. Another important element is to have the ability to adjust clothing for warmth and cooling as needed, usually around the head, neck, and hands.

The behavioral component of thermoregulation involves both adjusting clothing and level of activity. Clothing adjustment while on foot usually consisted of loosening scarves and collars and removing hats and mittens. While searching for reindeer, the Kochëma Evenkis sometimes took breaks to cool down and rest. Timing, distance, and daylight also are important factors in thermoregulation. Before the reindeer were found, sometimes we took short breaks to cool down and rest. Other times we took no breaks and kept walking after perspiration had started to saturate our clothing, however this was when we were fairly close to the living site and it was getting dark. In these circumstances, expectations of how long we would need our clothing to keep us warm were balanced with managing perspiration and the risk of becoming chilled.

Cooling the body through evaporation is complicated by the layers of clothing worn for warmth in the winter. There is a balance between keeping the activity level below the point of intense sweating and intense enough for heat generated to warm the body. The problems with moisture in the winter are several. First, perspiration as a cooling mechanism operates through evaporation, which is dependent on airflow and convection, which depends on temperature difference. Warm clothing blocks airflow to make a bubble of trapped air around the body. Shedding layers makes this bubble smaller, but usually it is not possible or advisable to attempt to cool the body through evaporation of moisture from the skin into the air. Second, the dew point at below freezing temperatures is so low that evaporation takes place very slowly. Instead, perspiration is cooled through convection, rather than evaporation. Perspiration can evaporate into the atmosphere in low levels, but beads of sweat exposed to the cold ambient air results in rapid cooling. Third, the operation of insulating layers, blocking the movement of air close to the body, also blocks cooling through convection.

Notably, there is some evidence that Evenkis have elevated basal metabolic rate in comparison to Russian populations (Galloway et al. 2000, Leonard et al. 2005), which would help in coping with the subarctic environment and mitigate the need for insulating layers.

In severely cold climates, the opportunity to safely and efficiently cool the body through evaporation is constrained through the use of insulating clothing; sharply contrasting the safety and effectiveness of perspiration in warm climates, where few or no insulating layers are warn. The Evenki use a combination of store-bought and homemade clothing. There is some evidence to suggest that properly constructed animal skin clothing is superior in its breathability and comfort range in comparison to synthetic factory-produced clothing while stationary in deep cold (Oakes et al. 1995) and there are anecdotes of natural fibers being superior to synthetic fibers in some respects (Conover and Conover 2006: 76-89). During the winter field season, the Kochëma Evenkis used three articles of fur clothing: reindeer or dog skin overcoats, fur hats, and boots made from moose and reindeer leg skin. Additionally, they also wore wool pants and jackets. The Khamakar Evenki use factory-produced clothing and Russian felt boots (*valenki*). Clothing selection was not a subject of intensive investigation but came up a number of times during casual conversation. The Kochëma Evenki use reindeer or moose leg skin boots (*khamchuri*) during the deep dry cold, lasting basically from late fall through mid-winter. Although they must be patched from time to time (Figure 6.6), they are preferred to *valenki* because of their lighter weight and greater freedom of movement of the lower leg and foot. During the late winter field season, the Kochëma Evenki tended to use rubber boots with felt liners, because of the wet snow conditions. The Khamakar Evenki use *valenki* or manufactured rubber boots. While they are familiar with and presumably can produce skin boots, they have easier access to stores and seem to sell most of the reindeer and moose leg skins they acquire for cash. Although one informant noted that an advantage of *valenki* is that they never need to be re-sewn, the choice of *valenki* as footwear may have more to do with acculturation and economics. During the fall field season with the Khamakar Evenkis, I asked to be shown how the raw leg skin is turned into leather but they would only describe the general process and said that while some people in the village know how, they are old and their hands hurt too much to work the skin. In economic terms, there is also a tradeoff. A pair of *khamchuri* use 8-10 moose leg skins or 12-14 reindeer leg skins. Each moose or reindeer leg skin can be sold to a buyer in the village for 300-500 rubles. A pair of *valenki* costs about 500 rubles. Purely in terms of cost, *valenki* are a superior option[34]. However, they are stiff and do not allow free, efficient movement of the ankle, like leg skin boots. The basic problem with *valenki* is that they do not allow the ankle and feet joints to flex naturally during the stride. The feet tend to move inside these boots, pressing against the inherent stiffness of the felt. Over time and distance, this can cause various kinds of sores and aches of the feet. The Kochëma Evenkis do have *valenki* but only use them for chores around the cabin, not walking long distances. The leg skin boots are more flexible and comfortable for walking and skiing. Since many subsistence activities take place in winter and involve movement across the landscape, behavior and clothing are important responses to these conditions.

[34] If a pair of *khamchuri* takes 10 moose leg skins, the market value of these skins is at minimum 3,000 rubles or six pairs of *valenki* at the time of field research in 2011.

## Environment and Economy

The two populations of Evenkis in the Katanga region have slightly different economies in slightly different environments. In the context of foraging, an economy is a strategy to acquire and process the resources available in a given environment. The structure and variability of the natural world exposes constraints and opportunities for specific activities or entire strategies. The two groups of Evenkis vary in the kinds and degree of usage of different resources and means of mobility they use.

### Residential Pattern and Seasonal Tasks

Evenkis in the Katanga region have developed residential patterns that allow rational geographic and seasonal access to resources and distribution of tasks. Several factors shape how Katanga Evenkis structure their residence patterns.

First, seasonally available resources such as fur, fish, and meat have particular periods of abundance, ease of harvest, and quality. Typically, animals taken for their meat are harvested in the fall and early winter. They are taken at other times of the year as well, but generally they are in peak condition in this period (cf. Monteith et al. 2013). Similarly, fur animals come into their prime condition in the late fall into early winter (Timofeev and Nadeev 1955: 104-5). Fish quality and availability varies greatly by season, species, method of take, and environmental concentration (stream mouths, springs, sand bars, springs, underwater vegetation, etc.). The Evenkis residence patterns respond to these resources. The Khamakar Evenkis move to individual territories for the peak period of hunting in the fall and winter where game harvest is largely restricted to individuals. They also catch fish on individual and communal territory. The Kochëma Evenkis live year round in the same territories they harvest resources. Their residence pattern varies in response to the resources targeted and when resource availability declines in one area they move onto another. Of the resources both groups target, sable harvesting may be the most frequent cause of seasonal and daily mobility.

Second, domestic reindeer require intense care at particular times of the year and periodic migration to new pastures. These tasks can complicate, preclude, or enable other economic activities. The needs of reindeer in terms of reproduction and need for pasturage are among the primary reasons the Kochëma Evenkis migrate throughout the year. Seasonally available resources are another cause of migration, but meat and fur harvesting is concentrated in the fall. f the Kochëma Evenkis did not have reindeer, their residence pattern might be similar to the Khamakar Evenkis in terms of having a bilocal or seasonally migratory pattern of residence.

Third, provisioning and preparation of food sources, fuel, and industrial supplies vary in ease of access and availability in terms of natural availability, shipment schedules, and condition of transportation routes. Since provisioning is generally a secondary priority to the tasks above, it is generally done when these tasks are less pressing. While both groups of Evenkis are a similar distance from Erbogachën, the primary source of fuel and industrial supplies, they differ in the ease of transport between this village and their homes. The Khamakar Evenkis can autonomously transport the supplies they need using boats on the Tunguska River for the ice-free season if water levels permit. The Kochëma Evenkis' river access is less reliable and more problematic and they seem to more frequently transport supplies via snowmobile, which have much smaller payloads than boats, or arrange delivery, which can also be problematic.

Fourth, there are miscellaneous tasks that are tied to particular places or times: such as education, healthcare, and bureaucracy. These are almost exclusively in settlements: Khamakar, Erbogachën, or other cities. Khamakar has very limited education and healthcare facilities. The Kochëma region has none.

Territorial Size, Reindeer, and the Sable Harvest

The factors of economy, mobility, and environment change over time and according to individual choices and market trends. The Katanga Evenkis have been studied by many anthropologists, most prominently Sirina (2006) and Turov (2010). This study of the Kochëma and Khamakar Evenkis' mobility and economy is most comparable with Turov's work. He described the subsistence, reindeer husbandry, and economy of the Evenkis based on his field research during the 1970s and 1980s in the Chuna and Katanga regions of Irkutskaia Oblast' (Turov 2010: 4). While the economy of the Evenkis in different regions most likely had broad similarities, he used ethnographic research to generalize about reindeer husbandry, fur harvesting, and mobility of Evenkis in the late 19$^{th}$ to early 20$^{th}$ century (Turov 2010: 57-66, 116). Although unclear in many cases, the period which he seems to focus on is up to 1930s (Turov 2010: 7, 58, 59, 61-65) and he uses specific references from his ethnographic work to discuss behavior that has no reference to time period (Turov 2010: 59, 63, 64-5) or distinctions between historical Evenki behavior and that observed during field research. In particular, he notes that squirrel was the focus of the Evenkis' fur harvest efforts because sable populations had declined so significantly (Turov 2010: 40, 65). Given that sable harvesting was reopened in the Katanga region for 1940/41 due to rebounding populations and reintroduction efforts (Nadeev and Timofeev 1955: 167-70, 177-8), it seems likely that the fur harvesting practices of the Evenkis changed between then and 1987, the latest date of Turov's field research for this work (Turov 2010: 4). Turov's research and analysis of the Evenkis' economy and mobility are well constructed and the information presented here shows that there are broad similarities in the Evenkis' foraging, reindeer husbandry and mobility patterns that have continued in the 24 years since his fieldwork. However, there have been a number of changes in the Katanga Evenkis' mobility, land tenure, targeted fur species, and household structure since the time of Turov's field and archival research. Some of these changes are summarized in Table 7.3 and discussed below with a view to describing the changes in behavior, technology, environment, and economy between the two periods.

The fur species the Evenkis harvested differ between the two periods. Up to the 1930s, sable populations were in decline (Nadeev and Timofeev 1955: 167-70). In practical terms, this meant that Evenkis had to search for sables over areas of low density or move long distances to areas of greater sable population density. In describing the Evenkis' economy and mobility, Turov notes that because sable had such low population in this period and information on mobility related to harvesting sable was sparse, he focused his attention on the squirrel harvest as a motivating factor for mobility in the 19th century (Turov 2010: 40). Squirrel populations fluctuated greatly depending on food sources, primarily Siberian pine nuts, but also spruce nuts (Turov 2010: 40). The Evenkis' fur harvesting mobility during this period was oriented toward movement between distant but high-density populations of squirrels located in Siberian pine groves (Turov 2010: 40). Currently, the only easily marketable furs are from sable and populations seem to be stable (Kuchmenko 2011: 75). During the Soviet period, a wider variety of furs were accepted in Erbogachën. Roma mentioned that he used to harvest muskrat in large numbers and sell the furs, but they have undergone massive declines in population, possibly because of disease or climate conditions (cf. Sirina 2006: 66, 101). Being more interested in current activities, I did not ask about historically targeted fur species or the processes of harvesting; however, in retrospect, since the Evenkis currently use muskrat as sable bait, muskrat trapping must be a part of their current activity patterns. Sable population density differs widely between sources and periods (Appendix C) and harvests vary across individual Evenkis' territories (Figure 6.15). Over the past several years, sable fur prices and thus harvesting pressure have been low and this has contributed to population stability and increase (Kuchmenko 2011: 76). Given that sable are omnivorous, territorial, and usually solitary (Nadeev and Timofeev 1955: 116), sable density would probably be more uniform across the landscape than squirrel, which are restricted to the stands of specific tree species. The practical consequence for mobility as means to access fur species is that for squirrel, movement is *between* distant population concentrations (Turov 2010: 41-2, 66), whereas sable has more uniform density and so movement is *across* the landscape to hunt or check traps. Thus, the *between* movement of squirrel harvesting involved long distance travel of "up to 400 km" for the season and a frequency of moves and duration of residence that depended on the density of the population, but generally emphasized short duration of residence and high speed/long distance of movement (Turov 2010: 42-43). Observations of the Kochëma Evenkis' and conversations with both groups indicated that sable trapping involves repeated trips through the same areas to check and remove sable from traps (cf. Figure 6.7) at intervals varying from days to a month. Whereas hunting involves rapid movement between areas to harvest as many sables as possible in between the start of the season and the onset of heavy snow, a period typically lasting less than 30 days (Nadeev and Timofeev 1955: 177). In my limited reading of the literature, I have found no references to trapping as a method of harvest for squirrels among the Evenkis and in fact Turov specifically relates reindeer mobility to the choice or persistence of passive vs. active harvest methods (Turov 2010: 63, 154), but does not differentiate between trap type, employment, and bait between different species. Further, the different food sources of sable and squirrel may in part dictate the suitability of different harvest methods. Hypothetically, using conifer nuts as bait for a squirrel presents a food resource that may already be abundant in the canopy or fallen on the ground. Squirrels and other herbivores can be harvested using traps and snares (USASM 1991: 7-26-7) but these are set along the animals' habitual paths of travel rather than by using bait. The Evenkis of both groups snare or net hares when populations are large enough to make setting the hares' trails worthwhile. Sables are attracted to the sight and smell of bait from animals they would otherwise have to search for and kill (Chapter 6: Sable Harvest), extending harvest potential to a distance around the trap. The differences in harvest method should also be considered as an important factor in mobility patterns (Sirina 2006: 67-69). Hunting effort will only pay off during the duration of the hunt, whereas traps have constant potential, regardless of time or animal density.

The demand for sable furs is different as well. In the past, it was based on established quotas (*iasak* or the Soviet economic plans). Whereas now, it is regulated according to a licensure system and demand is based partly on market factors.

In Table 7.3 below I chose 1941 as the latest date to which Turov's analysis of mobility related to the fur harvest seems to apply for several reasons. While his fieldwork took place in the 1970s and 1980s, his use of information gathered during that time "was to reconstruct… the culture…of the Evenkis…at the turn of the 20th century" (Turov 2010: 116). It would be possible to determine some of the dynamics of the change from squirrel to sable as the primary fur species through further investigation. In 1942, the year after the sable season was reopened (Nadeev and Timofeev 1955: 167-70, 177-8) Sirina cites archival records showing a large number of squirrels but no sables harvested by Evenkis at Inarigda, in the north of the Katanga region, but by "the mid 20th century, sable has once again become the most important provider of pelts" (Sirina 2006: 63, 68). What seems clear is that at least up until 1942, squirrels were the dominant fur species and sable became the dominant fur species some time before 2011.

**Table 7.3 Comparison of the Evenkis' Economy circa 1941 and 2011/12**

| **Group<br>Element** | **Evenki economy as described by Turov circa 1941** | **Katanga Evenki Economy 2011/2012** |
|---|---|---|
| **Targeted fur species** | Primary: Squirrel – population located at a high density in pine groves separated by long distances<br><br>Secondary: Sable locally extinct, low density | Sable – stable/increasing population, harvested at .031-.176 sable per km2<br><br>No secondary species |
| **Territorial size (km2)** | 1,500 to 2,500 | 276 to 2,482 |
| **Land tenure** | Evenki: community recognition of individual family rights to fur harvesting grounds<br><br>Non-Evenki: unclear to first come, first serve | Legally codified rights to a specific territory, community recognition of rights may extend to areas that are legally open use |
| **Migration extent (km)** | 150-400 | 25-250 |
| **Means of mobility** | Reindeer, pedestrian, boats | Reindeer, pedestrian, motor boats and snowmobiles |

| | | |
|---|---|---|
| **Number of households** | >8 households, ~5 members each (circa 1987)[35] | Kochëma: 2 households, 3 members each<br><br>Khamakar: ~90 individuals, only males occupy hunting territories; the heads of 3 households were a significant part of the study, an additional 4 participated for short periods |
| **Reindeer herd size (if present)** | <30 | 60-95 |

The size of territories currently among the Katanga Evenki population is somewhat lower than historical estimates given by Turov (2010). In discussing ungulate hunting, Turov notes that Evenkis traveled an area of 1,500-2,250 sq. km (2010: 30). Notably, this estimation of square kilometers of area covered by travel is not equivalent to contemporary forms of land tenure, since in this period it was based on the Soviet land policy or historical, socially negotiated systems of land use in place when Turov conducted research in the 1970s and 1980s (Turov 2010: 4-5; Sirina 2006: 38-46, 73-85, 192). The Khamakar Evenki average territorial size of 654 sq. km is based on a small, incomplete sample. A more accurate figure is probably ~1,000 sq. km, given that two individuals in the sample have significantly smaller territories for particular reasons and two individuals have territories close to this size without special conditions. The Kochëma Evenkis have an average territorial size of 1917 sq. km, a complete sample for the fully nomadic population of the Katanga region. There are other hunting territories on the Kochëma but they are only occupied seasonally or by non-Evenkis. The broader

[35] Sirina summarized archival records from 1942 showing eight production artels consisting of 15-34 households and 69-668 head of reindeer in each artel (Sirina 2006: 45).

importance of this comparison is that the amount of land Evenkis who have reindeer use has remained roughly the same with changes in social structure, technology, and government administration. However, land tenure issues are much more complicated than have been presented here and there continue to be shifts and barriers in the Evenkis' access to land in the late 20th and early 21st century (Sirina 2006: 173-184).

The means of mobility differ significantly between the two periods. While snowmobiles and motorized boats may have been in use during Turov's field research, he makes no mention of these vehicles, instead focusing on non-motorized boat, pedestrian, and, most frequently, reindeer mobility (Turov 2010: 42, 49, 57-72). During the period Turov focused on, domestic reindeer allowed the use of larger territories than possible on foot due to the ability to transport of game, shelter, equipment, and people between campsites (Turov 2010: 67-72, 85). In the absence of reindeer, some Evenkis were sedentary and used sleds and backpacks for transporting game (Turov 2010: 63, 85-7). Currently, motorized and non-motorized transport is wide spread among the Khamakar and Kochëma Evenkis. The use of reindeer as described by Turov is largely consistent with that described here, but my interpretation of reindeer use during the fur harvest is slightly different. Turov finds that "insufficient numbers of transport reindeer…must have been a factor in preserving on foot hunting methods" (Turov 2010: 85). My interpretation is that reindeer are a means of searching for the tracks of animals to hunt and minimizing disturbing sound signatures leading up to an on foot hunt, rather than as a replacement of pedestrian travel with saddle or sledge travel. Exceptions to this interpretation that Evenkis do not harvest animals from a reindeer sled or saddle would be:

- if the Evenkis were found to use reindeer transport for direct pursuit of game, such as is documented for reindeer sled use in the Tundra zone (Simchenko 1976: 95-6),
- they had patterns of use similar to horses (Olsen et al 2006),
- or somewhat differently in the case of using domestic decoy reindeer to harvest wild reindeer historically known among Evenkis of other regions (Simchenko 1976: 100).

Given that reindeer require the use of hands to control the reins and a high degree of balance in the case of saddle use, I assume that they have similar if not greater complications for use in direct pursuit as motorboats and snowmobiles, especially considering the use of firearms and potential of training reindeer out of the startle response to gunshots. However, this is conjecture, since my questioning was insufficiently detailed on the exact patterns of use for reindeer in sable and ungulate hunting.

The extent of migrations has changed significantly as well, probably related to the land tenure systems and settlement patterns in place at these different periods. Turov describes the Evenkis' extent of mobility in connection with reindeer pasturage and different kinds of hunting as 150-400 km (Turov 2010: 42, 95, 102), which I take to mean the distances between the farthest points of residence in a given year, rather a cumulative measurement. The distances for trips away from the living site were up to perhaps 40-60 km (Turov 2010: 98), consistent with Dima's estimation of how far he might travel round trip in pursuit of a moose (Chapter 6: Moose Hunting). Currently, the Katanga Evenkis have two different territorial size ranges, complicating the definition of migration extent. For the Kochëma Evenkis, if the migration extent is considered to be the two farthest points this could be the western edge of their territory to the eastern edge at ~200 km or to Erbogachën at ~250 km (Map 6.3). For the Khamakar Evenkis, the migration extent could be considered to be from the village to the farthest edge of their territories ranging from 25-150 km (Map 6.3). These are straight-line distances. A more accurate, if more complex, measurement of the Evenkis yearly migration expanse is given by Turov as “an elongated ellipsoid, with long and short axes of 150-250 km and 25-30 km in length, respectively” (Turov 2010: 95). Such an ellipsoid, adjusted for size based on each individual’s territorial size would encompass the migration expanse in various directions better than the most distant points. Dima mentioned that his migrations do not cover the entirety of his territory in a given year. An oval shape of approximately 150 by 30 km fits well over Dima or Kolia’s territorial boundaries, which are demarcated by the basins of streams and rivers in their own knowledge of the landscape and in legal documents, rather than the imaginary borders shown in Map 6.3 that give a more concise visual representation.

The land tenure system during the earlier period seems to have been mixed to unclear: from first come, first serve access (Nadeev and Timofeev 1955: 8-10) to socially recognized rights to trap sable in certain areas (Turov 2010: 93-94). Historically, indigenous Siberians also had to compete with the state licensed fur harvesters known as the *promyshlenniks* and their decedents who constitute much of the *starozhili* - old settler population (Bychkov and Jacobs 1994: 75-77, 82; Sirina 2006: 31-36). These migrants, many of whom were from northern Russia, had an intensive, industrial approach to harvesting sable and other furs and they were part of a village-based economy that supplied them with food and equipment (Bychkov and Jacobs 1994: 77-8). The Evenkis’ relationship with old settlers was characterized by exchange of alcohol for furs at inequitable rates and land seizures for settlements and fields but also friendship and mutual acculturation (Sirina 2006: 31-36). Currently, land rights are formalized for all users and extend to the harvest of all animals. In the Katanga region, Evenkis, old settlers (*starozhili*), and more recent migrants to the region hunt and trap under a system of land use, which is socially, legally, and politically complex (Sirina 2006: 73-78, 173-188). Despite these factors, the current legal codification and precision of land use boundaries are significant enough to distinguish this land tenure system from earlier periods when land tenure was too vague or difficult to enforce through local action or government intervention (Bychkov and Jacobs 1994: 77-8) or based on Soviet land policy that is no longer in force (Sirina 2006: 39-45, 180-189).

At the time of Turov's research, there were at least eight nomadic, reindeer herding households in the Katanga region, perhaps consisting of around five members each (Turov 2010: 5, 139; Sirina 2006: 58-9). Since then, there have been sharp demographic shifts in the population and a reduction in the number of domestic reindeer in the region (Sirina 2006: 50-62, 173-180), while the availability of snowmobiles has increased, replacing reindeer mobility for many Evenkis. Currently, there are two fully nomadic reindeer herding households in the Kochëma region and four semi-nomadic reindeer herding households in the Teteia region, but I have little information on the latter. The household size has important consequences for subsistence activities. In the period Turov studied, there were probably larger household sizes (cf. Turov 2010: 139), allowing hunting, trapping, and herding chores to be shared between more people. Currently, the Kochëma households have three members each and Dima noted that it can be difficult to accomplish all of the tasks necessary during the high intensity periods of the year. The Khamakar Evenkis are village based and it seems that most travel and occupation of hunting territories is by men, chiefly by heads of households, but with family members and friends visiting and sometimes using each other's territories. The general pattern for sable harvesting seems to be primary use by a male head of household, who may allow younger relatives (son, nephew, in-law) to use part of the territory on an informal basis. Some of the labor involved in cabin building, fishing, moose hunting, and probably other activities is shared among individuals. The Kochëma Evenki households live apart for most of the year, but for several weeks during the late winter they live at their farthest east cabins, which are located approximately 9 kilometers apart. This seems to be a reoccurring pattern of residential proximity related to resupply from Erbogachën and results in visiting and assistance between households. There are probably meetings at other times of the year, arranged via CB radio, but these are more variable. For the summer of 2009 both Kochëma households migrated together on Kolia's territory because he needed Dima's help in fixing and building, but this was an exception to the normal pattern. Outside of the short period of proximity in the winter, the Kochëma households are normally independent and distant. While they have larger household sizes than the Khamakar Evenkis while in the taiga, their relative isolation from neighbors and additional, year round demand of caring for reindeer leads to a different pattern of labor and less potential for assistance and cooperation on a task or emergency basis.

The changes in reindeer herd size has economic, reproductive, and ecological aspects. Based on fieldwork and research, Turov found that "by the end of the mid-19$^{th}$ century, with the development of commercial fur hunting and subsequent depletion of the fur bearing animal population and resulting expansion of hunting territories, the majority of mobile Evenkis in Central Siberia were indeed forced into more intensive reindeer husbandry" (Turov 2010: 62). Turov identifies pressure to increase fur-hunting returns and the declining sable density during the Czarist and Soviet periods as a causal factor in increasing herd sizes from a maximum of perhaps 10 head in previous centuries to 20-25 head by the 1930s (2010: 61-62). In the 1990s, herd sizes in the Katanga region ranged from 5-80, with smaller herds uniting at different times of year and there were eight reindeer keeping households (Sirina 2006: 59, 89). Today, reindeer herds among the Kochëma Evenkis range from 60-95 head and household sizes are smaller, with 2-3 individuals. The limits on herd sizes are several. Teteia Evenkis keep smaller herds because their individual territories are smaller. There are labor concerns; Dima said that it is difficult for one herder to take care of more than about 70 head of reindeer. Some of the most laborious tasks of caring for reindeer including cutting wood for smudge fires in the summer and building corrals in the fall and spring (Sirina 2006: 97). Additionally, there are the constant tasks of keeping track of where they pasture, bringing them to the living site and feeding them salt. All these activities compete for time with other tasks. At the time of research, Dima had 95 head and noted that a partner would help greatly in looking after the herd. Turov noted that keeping large numbers of reindeer relative to household size could detract from the fur hunt (Turov 2010: 61, 95) and a similar trend was detected in the Kochëma Evenkis large time investments in reindeer care (Figure 6.2), stated preference for sable trapping, and low harvest numbers from sable hunting (Figure 6.14).

The actual number of reindeer the Kochëma Evenkis use at a given time is 1-14 head, which is slightly more than the historical figure Turov gives of "5-10 reindeer per family was clearly more than enough to meet all possible transportation needs related to hunting and nomadizing" (Turov 2010: 61), however this was before the advent of intensive fur production. A herd size in the mid to low teens is, from the point of reinforcement of recessive traits, insufficient for long-term viability, let alone economic productivity. In this regard, the actual breeding pool of reindeer historically was probably spread among the herds of many households through seasonal gatherings or gifting of reindeer (Turov 2010: 5; Sirina 2006: 71). The Kochëma Evenkis noted that genetic viability is a concern and regional administrators periodically discuss arranging an exchange of reindeer stock between the Katanga herds and those in the neighboring region of Evenkiiskii Avtonomnyi Okrug in Krasnoiarskii Krai, but nothing has yet come of these proposals.

The minimum number of reindeer has not changed given Dima's statement that 30 reindeer would be sufficient for his needs (Turov 2010: 59, 61), independent of the long-term reproductive viability of his herd. The larger herd sizes now common among Kochëma Evenkis allow them to choose reindeer best suited to the task, such as using females for pulling sleds and castrated males for riding and pulling sleds. Finally, a strong reason to maintain a larger herd size is to mitigate the effects of loss (predation, exposure, sickness, etc.) on the productivity of the household and reproduction of the herd (cf. Turov 2010: 59). At predation rates close to replacement rates maintaining herd size could be very difficult. This in part may explain the Evenkis concern over rebounding wolf populations and factors, such as forest roads, that seem to increase predation rates. However, given the short time scale and limited reliability of herd composition data and the Evenkis' reluctance to discuss predation, it is difficult to make a more definitive statement.

In summary, changes in the Katanga Evenkis economy and mobility since Turov's period of coverage include: an emphasis on sable rather than squirrel as the primary fur species, the widespread adoption of motorized vehicles in addition to or instead of reindeer transport, and changes in the residence patterns, land tenure, herd size, and demographics of the region. It is my view that the Kochëma Evenkis' increased herd sizes have more to do with maintaining a viable breeding population and having a surplus of reindeer to counter loss factors (predation, exposure, etc.) rather than a need for increased transport capacity.

Trail Condition and the Properties of Snow

The behavior of snow in all conditions is incredibly complex but avalanche conditions have been the primary area of research (Shapiro et al. 1997: 1). There is a broad literature on the properties of snow, but general laws describing the behavior of snow are many years away (Shapiro et al. 1997). To rejoin the discussion in Chapter 6 regarding winter vehicles, my interest is to evaluate whether my and the Evenkis' observations regarding the properties of snow are comparable to those investigators of snow mechanics. In limited reading of the literature of snow mechanics, I stumbled upon Mellor's review of snow mechanics (Mellor 1975). While the descriptions may be outdated with respect to current understanding of snow mechanics, I found that more recent sources used highly technical terms to describe the properties of snow. Shapiro et al's extensive use of Mellor's review indicates that this was a respected source as a review and description of snow properties (ex. Shapiro et al. 1997: 8-9, 32-35).

Rather than attempt to conform my descriptions to standards of technical description, I simply wish to point out the properties of snow the Evenkis are impacted by or take advantage of. Below I cite Mellor's description of the property and note how it affects the Evenkis.

Snow is irreversibly compressible (Mellor 1975: 253). Once snow has been compressed it does not return to its former shape. This applies to tracking animals and packing travel corridors through snow.

The history of loading, pressure, and temperature are critical in developing the structure of snow (Mellor 1975: 258, 267-9). This applies to aging tracks according to the temperature and time during and since the passage of an animal.

Powder snow acts like a fluid when set in motion (Mellor 1975: 253, 286-7). This applies to snowmobile maneuvering differences in deep powder, less traction/reduced payloads, greater fuel consumption because track speed is much higher than ground speed or travel over a packed trail.

Snow has low friction at common temperatures (ski, snowmobile, sled travel), but friction increases dramatically at low temperatures (Mellor 1975: 287). This is the mechanism of why sleds and skis are widely used, particularly for hauling heavy loads. Increased friction at low temperatures is possibly related to contra-indication of travel below -30˚ C.

The properties of snow are highly unstable at different temperatures (Mellor 1975: 251). This relates to freeze thaw conditions encountered in the fall and spring.

The density properties of snow are highly complex (Mellor 1975: 254-263). As a low density material, it is logical that loads distributed over a larger area will lead to less compression. This relates to the surface area of snow vehicles. I did not find or, perhaps more accurately, recognize the relevant sections of Mellor's' description on this issue. In practical terms, I have noticed that force vectors and angle of attack while skiing or snowmobiling may be relevant factors as well, but this is speculation.

# CHAPTER EIGHT: CONCLUSION

This research is one of the first applications of several methodologies: a time allocation study of sub-arctic foragers, a quantitative and qualitative study of forager mobility, and an economic study of two subpopulations of the same ethnic group in the same area. Below I will briefly summarize the conclusions of this research and improvements to research design for future studies.

In Chapter One, I explained that mobility is a facultative process for achieving goals. The economic/characteristic of vehicles (Tables 7.1-2) and the mobility data (Figures 6.4-9, Table 6.3) explain for what purposes vehicles are chosen and what properties they possess to fit these applications. In conclusion, I would like to summarize the general problems the Evenkis face in mobility.

Perhaps the most basic problem is having an effective means of mobility in different environments and seasons. For movement across aquatic environments, the Evenkis use motorboats and canoes. For movements across land in the warm season, they use reindeer and foot travel. For movement in the cold season, they use vehicles with a high surface area to weight ratio: reindeer sleds, skis, and snowmobiles.

The second problem is having an effective vehicle for particular purposes. In the sub-arctic, moving equipment and supplies across the landscape is extremely important and accounts for a large amount of the Evenkis' mobility. For this, they use vehicles with a high payload: reindeer, boats, and snowmobiles. During the period of study, among purposes for mobility, one of the least visible was foraging. However, Evenkis explained many of their foraging techniques and why they chose particular vehicles. I found that there were two qualities important for using vehicles in foraging. First, vehicles used in foraging allow a high degree of dexterity and spatial manipulation. Typically, only human powered vehicles (skis, canoe, boots) allow hands-free operation or a high degree of dexterity to hold, move, carry, touch, and otherwise manipulate objects and space around the body. In addition, muscular control over these vehicles allows very precise movement, which is important for many foraging techniques. Motor vehicles are usable many of in the same situations as human powered vehicles, but spatial manipulation usually involves stopping and dismounting, such as when using a snowmobile to check sable traps, or control by another person, such as using a motorboat to set and check fishnets. Obviously, a small motorboat could be as controllable as a canoe, but this is simply technical refinement. Second, vehicles used in foraging must have the characteristics necessary to exploit the vulnerability of the game animal. This is essentially the goal of harvesting techniques – to exploit behavioral, spatial, and perceptive vulnerabilities of prey. These characteristics vary considerably between vehicles; low sound or non-alarming sound signature is common (hunting skis, reindeer sled, canoe, trolling motorboat), but speed is also a factor (snowmobile pursuit hunting, river hunting). As above, this includes access or suitability for foraging in some environments, such as using a canoe carried over land to hunt or fish on inland waterways or using high floatation hunting skis to stalk ungulates.

There are other factors influencing mobility in specific ways. Aside from seasonal, environmental, and task-appropriate vehicle choice, there are variables that affect the economy and safety of mobility. The condition of the trail (packed vs.

unpacked snow, upstream vs. downstream) has an impact on the energy needed to move across the landscape. A larger data set and better recording methods would have helped address issues around fuel consumption. The floatation surface area to weight calculations in Figure 6.8 indicate that there should be differences in the energy required to move across the snow using different vehicles. Personal experience using skis in different snow conditions also supports this assertion. Formenti et al. (2005) present figures for the energetic costs of using skis with varying weights and surface area, but these figures do not represent non-laboratory use because they used a prepared, solidified snow surface, thereby measuring only the energy used to move the ski, rather than the skis' performance in snow of realistic depth and density. Based on the physics involved there is a solid basis to infer that better methodology and data gathering would be useful in addressing this issue. The safety of mobility largely has to do with weather (temperature, precipitation, daylight) and natural hazards (ice thickness, snow depth, overflow, submerged sandbars, and rocks), but also the skill and aptitude of the operator. Based on interview data, weather does have an influence on when to move (daylight: all vehicles; day or night: snowmobiles; temperature <-30˚C: avoid travel – snowmobiles) and particular activities (warm, breezy weather: stalking moose). For future analysis of the current data set, local weather records can be used to see if there are any patterns. Natural hazards are less easy to quantify, given that they have very specific conditions of development.

The energy source of motorized and non-motorized vehicles is another area of fundamental difference. Motorized vehicles are dependent on an industrial supply chain and participation in the cash economy (Pelto 1987: 166-8). The primary cash income for both groups of Evenkis is from harvesting sable furs. Part of this income is used to purchase snowmobiles, motorboats, and parts and fuel for them. Non-motorized vehicles can obtain energy from the environment where the Evenkis live in the form of meat, fish, and pasture. As both types of vehicles are used, they incur wear and fatigue. Motorized and non-motorized vehicles have very different modes of failure and means of repair. Motor vehicles will function as long as they have fuel, operating parts are within wear specifications, and repair is accomplished by replacement or adjustment of components. Non-motorized vehicles repair dynamics are distinguished by their power source (human, animal) and the vehicle itself (ski, sled, boat). The vehicle is subject to fatigue and damage but once breakages occur, it is usually time to construct a completely new vehicle. The human and animal power sources regain their potential to do work through rest, and repair in the sense of sickness and injury is usually a self-regulating process. During the period of observation, repair was much higher for motor vehicles (Figure 6.6).

While the information presented here on foraging and reindeer herding in principal is not too different from other sources on the Evenkis over the last century, the context in which I examined their activities is somewhat different. The analyses I presented attempt to connect goals, environmental factors, and design characteristics with the observed patterns of behavior using interviews and quantitative data. While there is more work to be done, I wish to point out several of these connections.

For the Kochëma Evenkis, summer migration distance and intervals have the purpose of providing reindeer access to the highest quality pastures to rapidly build up energy reserves. Summer migration locations are based primarily on the availability of water and secondarily on the availability of wood. Winter migration intervals and locations are purposed to allow reindeer sufficient forage but also protect delicate lichen from over-grazing.

The behavioral and biological factors in reindeer pastoralism include:

- using sodium and relief from insects to incentivize reindeer behavior,
- using physical control to restrict reindeer movement and reproduction with wild reindeer,
- using selective castration and possibly selective culling to promote genetic traits, using castration to develop desirable characteristics,
- influencing development by perinatal contact with calves,
- training reindeer for specific tasks (sled, saddle)
- and taking advantage of herd behavior by controlling specially trained herd leaders.

For both Evenki groups, potential resource harvest is proportional to resource productivity and access. For fish, this is access to larger water bodies, species characteristics, and seasonal conditions such as ice cover. For sable, this is based on territorial size and variable based on population dynamics, food supplies, and migration. The relationship between territorial size and moose harvest is probably complicated by these same factors and also regional wolf activity.

Based on comments by virtually all of my research partners, skill and perception are very important factors in foraging success. The information presented here makes this apparent particularly in the case of moose stalking. Given the huge number of variables in foraging, distinguishing these very personal differences in overall success may be difficult.

All of these topics are extremely complex in and of themselves. My goal in studying the Evenkis' mobility and economy has been to identify important factors in the observed patterns of human behavior and relate them to technology, environmental conditions, and animal behavior. Since mobility is a facultative process, studying it inevitably includes conditions and results.

## Future Research

The research presented here opens up more detailed questions about the Evenkis mobility and economy and has many areas that need further factual support. There are three changes to design and methods that I would incorporate into my future research.

First, a longer period of field study covering all or most of the hunting and trapping seasons would allow mobility to be studied in the context of results. If the population has reindeer, study throughout the year would be most beneficial. Studying with different individuals/households would be beneficial as well. In the present study of the Kochëma and Khamakar Evenkis, working with them during different seasons allowed for interesting comparisons and some opportunities to generalize about behavior regionally.

Second, in preparing and refining research goals, I skimmed through anthropology and ecology texts looking for methods of studying mobility. Many of these addressed questions other than those I became interested in or were inapplicable. As a result, I developed some of the concepts and questions discussed here during or after I was in the field. Given the connections I have made between mobility and environment, examining these sources and choosing more discrete questions and methods would be most desirable. As indicated above, studying specific elements of biology and ecology would be helpful as well, since the Evenkis' economy is part of the ecosystem on multiple levels, including primary productivity (forest and pastures) and population dynamics (fish, game, predators).

Third and finally, I would expand quantitative data gathering on a variety of topics. Given the apparently strong impacts of weather, technology, forest fires, forest road construction, predator and prey populations, having the ability to gather contextual data on these topics would be helpful. In this study, I have done some of this using GPS data and research. Since leaving the field, several additional, simple methods to address some of these topics have occurred to me. This includes the use of technology, such as GPS devices and a pocket weather meter. The utility of such devices is broad and their size and cost are compatible with field study. Unexpectedly, the Evenkis had power generation at their territories and this would have easily allowed some data processing in the field. Using radio or GPS trackers on domestic reindeer would also help to address questions regarding the search costs of reindeer herding, feeding, and mobility patterns and potential behavioral differences from wild reindeer. A weather meter would allow gathering accurate, local data on conditions that may affect activity patterns such as hunting, travel, and outdoor work.

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APPENDIX A

# Navigational Techniques

**Navigational Techniques**

Hunting and trapping involves traveling long distances by river and in the taiga. Although many of those I spoke with have been moving around the landscape from a young age and have a good memory for the places and trails they most frequently use, navigation is not always simple. The landscape is always changing in minor and major ways through fires, weather, and seasons. Navigation to familiar and unfamiliar places under highly variable conditions demands a set of skills and techniques developed through experience. Information on this topic comes primarily from Roma, who put into abstract terms these processes of habit and on-the-spot calculation.

To begin, Roma said that Evenkis distinguish between getting lost and being disoriented. Being lost – having no idea of one's location – very rarely occurs. Being disoriented happens to everyone who spends enough time in the taiga. This means that one's general location and relationship to other known points is generally known but the exact direction to take is not. There are a number of clues and techniques one can use to orient oneself. At minimum one can usually retrace steps back to a known point.

Usually people travel along marked forest trails. From my observation, these trails follow topography to a significant degree, in that they traverse areas of the landscape where there are minimal obstructions, such as ridgelines, the margins of forests, and wetlands that have short vegetation. Trails are maintained by cutting saplings and underbrush that grow in the trail, and marked by cutting a patch of bark off a tree to expose the light colored wood to create blazes. The distance between these blazes varies depending on the terrain and visibility, but ideally, the next blaze is always visible from the one that precedes it. During the 2011 field season, Roma and I spent approximately 4 days walking along the trails of his territory and into those of his neighbor. On this trip, he refreshed old and made new blazes.

Sometimes, the landscape itself can give clues that may be useful. In general, branches are longer and grow thicker on the southern face of a tree compared to the northern face, however this is also affected by aspect and potentially wind. The growth of moss can also be used in this way. Areas that have streams and hills are easy to navigate because they form something of a grid system. If someone is disoriented, they can follow streams to reach larger rivers and known areas. If the landscape is sufficiently open, it is possible to walk in straight lines between landmarks, or at minimum, on bearings based on landmarks. However, if the destination is not visible, it is very difficult to move around and through obstacles such as streams, hills, and forest without significantly disrupting one's conception of where the destination should be.  This is in part because usually one leg is dominant, causing the line of walking to veer to the left or right. Over long distances, this leads to large errors in navigation.[36] Knowing which leg is dominant and compensating for this before covering ground where landmarks are not visible can minimize errors.

Navigating in any environment without specialized tools is dependent on perception and memory. Aside from staying on marked trails and knowing the lay of the land from observation, frequently looking on one's back trail is an effective method of remembering the landscape in order to be able to retrace one's footsteps.

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[36] This point is supported by scientific research showing that muscle development is not perfectly symmetrical and this influences strength and movement (Demura 2011)

Knowledge of the landscape can be very helpful when navigating in areas where one has been before, but have changed significantly in appearance. While Kesha was showing Roma around the territory, there were a number of times when the original trail was lost in the new growth. When Kesha trapped in this area, parts of it were covered with low, post-fire brush. When he returned later with Roma and I, this formerly open landscape was densely covered in saplings. Additionally, the rut that distinguished his trapping trail had become part of a network of animal trails and the blazes and cut branches had been covered by the new growth. In places, Kesha would pause to cut back the growth and expose the old trail, at other times he would overshoot or take a false turn and would come back a dozen paces, returning to the old trail or placing the new trail where it should be. When the trail was obscured by dense growth, he would pause, examining the surroundings and attempt to identify signs of the trail. If that was unsuccessful, he simply walked in a large circle through the brush until the trail was found. There were times when all three of us would hack through yards of saplings and come upon an old tree with a blaze on it, which would have been invisible more than a few feet away. Other times, making a loop exposed the old trail and although overgrown it was easily identifiable because of the density and patterning of secondary growth.

APPENDIX B

# Surface Pressure of Snow Vehicles

**Table B.1 Reference for Figure 6.8 Surface pressure of snow vehicles**

| **Vehicle** | **Dimensions** | **Weight** | **Grams/cm$^2$** |
|---|---|---|---|
| **Reindeer sled (two runners)** | 2 x 190 x 12 cm | 70 kg human,<br>25 kg sled | 21 |
| **Evenki hunting ski** | 1 x 135 x 25 cm | 70 kg human,<br>6 kg skis and equipment | 23 |
| **Evenki plain ski** | 1 x 135 x 18 cm | 70 kg human,<br>5 kg skis and equipment | 31 |
| **Buran Buran AD (long track)**<br><br>**(*Russkaia mekhanika* 2014)** | Ski: 100 x 25 cm; Tracks: 2 x 368.5 (L) x38 (W) cm | 310 kg dry weight, 28 liters petrol (.77 kg/l), human 70 kg | 29 |
| **Buran A (regular track)**<br><br>**(*Russkaia mekhanika* 2014)** | Ski: 100 x 25 cm; Tracks: 2 x 287.8 (L) x38 (W) cm | 285 kg dry weight,<br>28 liters petrol (.77 kg/l), human 70 kg | 33 |
| **Formenti et al (2005: 1562) Modern Ski (DS)** | 1x 201 x 4.6 cm | 70 kg human,<br>2.2 kg skis and equipment | 78 |
| **Finnish Domestic Reindeer Female Nieminen (1990: 253)** | 2-3 feet on ground, complex gait | 76.2 kg | 178 |
| **Winter boots** | 1 x 26 x 12 cm | 70 kg human | 228 |

<u>Snowmobiles</u>

The manufacturer's published track length is the inner circumference of the track. The actual amount of the track that is in contact with the ground is roughly 40%, but varies with snow compaction and density and also the design and articulation of the suspension.

Skis and Boots

Only the surface area of one ski or boot was included because the entire weight is put on one foot in the walking or skiing stride.

Reindeer

Reindeer place all their weight on 2-3 feet while walking and the front and rear hooves are different sizes. Nieminen gives static $g/cm^2$ figures for all possible foot loads (calculation of area for the whole surface contacting the ground: hoof, foot, and dew claws) with 1-4 feet on the ground. Since reindeer have 2-3 feet on the ground while walking (Nieminen 1990: 251), I averaged the foot loads for all possible combinations (5) of 2-3 front and rear feet to derive a comparable figure for human strides. Finnish domestic reindeer have different foot area (Nieminen 1990: 252) and body proportions (Nieminen and Helle 1980) than Finnish wild forest reindeer and probably have lower loads on the ground compared to domestic reindeer (Nieminen 1990: 251). I presume the ground loads of Evenki domestic reindeer are probably closer to that of Finnish wild forest reindeer, having lower ground loads to move better over powdery snow, however the only reliable ground pressure calculations I could find were for domestic reindeer by Nieminen (1990) and I include these for the sake of comparison.

APPENDIX C

# Sable Population Density

## Sable Population Density

Sable population densities vary widely by definition, time scale, and sources. There are three sources that I have available that give harvest information: harvest limits for Irkutsk Oblast' (Kuchmenko 2011: 290) and multi-year averages for the Katanga Region (Glavatskii 2008: 54) and a range of the harvest size in 1986 (Sirina 2006: 68).

The pre-season, harvest, and post-season figures are given as individual per km2 (any errors are my own).

The Kuchmenko (2011) data are based on the whole of Irkutskaia Oblast', and so give artificially low density because this includes urban areas and environments where sables are not found. The bag limits in Figure 6.13 are based on the total area of Irkutskaia Oblast' divided by the harvest limit.

The Turov (2010), and Nadeev and Timofeev (1955) population data are from the preseason or an unreferenced period, when the size and health of sable populations were probably different from the past decade. The authors Turov most likely consulted are in his references (2010: 126, 129, 134) and listed in the year column below.

The harvest projections in Figure 6.13 are based on multi-year averages from Glavatskii (2008: 54-5).

**Table C.1 Reference for Figure 6.13 Predicted, bag limit and actual harvest**

| **Source** | **Year** | **Region (km2)** | **Pre-Season** | **Harvest** | **Post-Season 2010** |
|---|---|---|---|---|---|
| Kuchmenko (2011: 8, 75, 76, 290) | 2011 | Irkutsk (767,900) | - | . 068 | .221 |
| Glavatskii multi-year average (2008: 54-5) | <2008 | Katanga (139,043) | .389- .9 | .149 | - |
| Sirina (2006: 68) | 1986 | Katanga (139,043) | - | .02-.024 | - |
| Figure 6.15 | <2011 | Katanga (139,043) | - | .031-.176 | - |
| Turov (2010: 39, 126, 129, 134) .2-.5 sable per 10 km2 | Dorogstaiskii 1925, Kopylov 1940, Sokolov 1979 | - | .02-.05 | - | - |
| Nadeev and Timofeev (1955:116-9) | <1955 | - | .083-.1 | - | - |

A quick glance shows that the harvest density range of Figure 6.15 at .031-.176 sables in <2010 is considerably higher than harvest density range of .02-.024 sables per km2 in 1987 (Sirina 2006: 68). The overall population densities in the early to mid-20th century densities of .02-.1 sables per km2 (Turov 2010: 39; Nadeev and Timofeev 1955: 116-9) make it clear that the range of harvest densities at high <2011 levels could have led to extinction. However, the range of harvest densities shows that local conditions in sable population dynamics (e.g., food sources, migration, breeding population) and probably harvest efforts, as shown by Evenkis' varying investment in different harvest methods (e.g., trap density, time spent hunting, preferences for trapping) are critical to assess in order to make a meaningful analysis of local and regional trends. The highest harvest density in <2011 was from an individual who used a higher proportion of hunting than trapping compared to the rest of the sample (Figure 6.14). Since trapping may disproportionately select young, naïve sables whereas hunting is indiscriminate, the proportion of investment in these methods may have serious consequences for long-term population viability that would not be detectable in aggregate harvest numbers.

APPENDIX D

# Effective Range of Firearms

## Effective Range of Firearms

There are many elements that determine a firearm’s effective range: including ballistics, ammunition, operator aptitude, situational factors and sighting system. Rather than discuss these minutia, I will give crude estimations based on the distance an average shooter can consistently hit the necessary size target at the farthest range. The Evenkis use two basic types of firearms for hunting: shotguns and rifles. Shotguns cartridges are of two types: firing multiple projectiles, used for sable and birds; and firing single projectiles used for large game – moose, reindeer and bear. With a single projectile loading, shotguns have a maximum range of 50-70 meters. Rifles are of two types, small caliber rifles suitable for small game (grouse, squirrels, sable) and medium caliber rifles for larger game (bear, moose, reindeer). Medium caliber rifles have an effective range of up to 500 meters depending on a number of factors.

The effective range of a firearm is in some cases a significant determinant in the kinds of hunting methods of large game that are attempted and most likely to be successful. While the differences in effective range between firearms is less extreme, comparisons of the shotgun and traditional projectile weapons in hunting provide examples of how technology changes foraging (Hames 1979, Yost and Kelly 1983). The method of operation may also be a factor; self-loading firearms generally allow shots to be fired more rapidly, but whether they hit the target is largely a function of skill. See also Turov (2010: 44-7) for a discussion of the range of firearms and usage characteristics in comparison to the bow.