Reindeer herding and environmental change in the Oymyakon District, Sakha Republic

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Abstract

The aim of this study is to assess the influence of environmental change on reindeer herding in the Oymyakon District in the eastern part of the Sakha Republic. To investigate environmental change and its influence on reindeer herding, semi-structured interviews were conducted at two villages in the Oymyakon District, from February 24th to March 8th, 2013. As a result of the interview, meteorological, topographical, and ecological changes and their influence on general livelihood were evaluated by local residents to a greater or lesser degree. Part of the climatic changes felt by local residents was supported meteorological data set. Generally speaking, local reindeer herders and a manager of reindeer herding enterprise did not think these climatic, topographical and biological impacts were serious problems for reindeer herding. More serious problems, in their consideration, were social and economic difficulties. Judging from these results and the fluctuation of the number of domestic reindeer, even though meteorological variables are gradually changing, serious environmental changes have not generally been noted by local residents as yet. It can be concluded that the environmental changes do not appear to have exerted intense harmful influences on reindeer herding in Oymyakon District so far.

Key words: Semi-structured interview, local residents, climate change, Siberia, Russia

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Introduction

Climate change in northern areas that may be induced by global warming may affect not only a whole ecosystem, but also the ecology of individual animal and plant species. Reindeer (*Rangifer tarandus*), which may be the most important domestic animal among many northern indigenous peoples, is no exception from the rule. To estimate the influence of environmental changes on reindeer herding, a research was conducted through investigation of the perceptions of local residents, fluctuations of meteorological variables, and statistic processing of the number of domestic reindeer in the area of Oymyakon District.

Reindeer herding has been a way of life in the area for about 3 000 years (Vainshtein 1980). Recently, approximately 2.5 million reindeer are herded by nearly 100,000 people belonging to more than 20 ethnic groups in the 9 nations of the circumpolar region (Oskal et al. 2009). It is an important subsistence activity for indigenous peoples living in northern Eurasia, not only economically for meat production (Baskin 2000, Jernsletten et Klokov 2002, Klokov 2012) but also culturally. Reindeer herding helps indigenous people to preserve their traditional way of life (Ulvevadet et Klokov 2004, Muller-Wille et al. 2006, Oskal et al. 2009).

In recent years some concerns have arisen that global warming, related climate change, and the indirect effects of these would exert a harmful influence on the physical conditions and ecology of wild and domestic reindeer through changes in quality of pasture, availability of forage (Klein 1991, Weladji et al. 2002). Consequently, reindeer herding is also affected by these changes (ACIA 2004, Oskal 2008, Weladji et Holand 2006).

Reindeer herding is undertaken throughout the vast area of northern Eurasia, and several studies have been conducted dealing with the relationship between reindeer herding and environmental changes both broadly and locally (Rees et al. 2003, 2008, Baskin 2005, Forbes et Stammler 2009, Klokov 2012, Yoshida 2012). However, in eastern Siberia, such studies are scarce at the moment.

To fill the gap in general knowledge on the likely impact of ongoing environmental changes on reindeer herding, field research was conducted in the Oymyakon District, Sakha Republic in eastern Siberia. The aim of this paper was to estimate the influence of environmental change on reindeer herding through the perception of local residents, in reference to the fluctuation of climatic variables and statistical data on the numbers of domestic reindeer.

Material and Methods

Research was performed in Oymyakon District, situated in the eastern part of the Sakha Republic (Fig. 1). The gross area of the district is 92 000 km^2, and a greater part of the district is mountainous. The River Indigirka runs through its central part. Oymyakon District is well known for being severely cold in winter, having won the name "pole of coldness" (poljus kholoda). The coldest air temperatures ever recorded in the northern hemisphere occurred in this district; −71.2°C, mean air temperature is from −41 to −51°C in January and from +8 to +19°C in July, and mean annual precipitation is from approximately 150 mm – 200 mm in the valley region and approximately 600 mm in the mountain region (Government of Sakha Republic (Yakutia) and the Institute of Human Studies, Academy of Science, Sakha Republic (Yakutia) 2007). Vegetation cover of the Oymyakon District is

categorized as a mountainous stony desert, tundra and a near-tundra sparse wood types. Throughout the area, sparse forests of northern mountain taiga larch prevail, composed of *Larix cajanderi* and *L. gmelinii*, and, as the altitude increases, these forests are replaced by the shrubberies formed mainly by *Pinus pumila* and mountain tundra, stony and rubbly scree, and detritus (Kuznetsova et al. 2010).

The district has a population of 14 700, including populations of the following ethnic groups: Russian (56.8%), Sakha (22.8%), Ukrainian (10.2%), Even (2.7%), Evenki (0.4%), and others (7.1%) (Government of Sakha Republic (Yakutia) and the Institute of Human Studies, Academy of Science, Sakha Republic (Yakutia) 2007). There are 14 787 heads of domestic reindeer, 72 reindeer herders and 26 tent workers in the district (Osipova et al. 2010).

To investigate environmental change and its influence on reindeer herding, semi-structured interviews with local residents were conducted, using open-ended questions, at Uchugei and Sordnnokh (Orto-Balagan) Village in Oymyakon District from February 24th to March, 8th, 2013. The Uchugei settlement is situated in the southwestern part of the district and Sordnnokh is located approximately 100km east of it. Interviews addressed, among other things, background of interviewees, their subjective perceptions of changes in meteorological variables (air temperature, precipitation, and extreme events), topographical features (landslide, subsidence, flood, flow path), and fauna and flora, over about the last 20 years in the nearby area in particular. In addition, current problems of their general livelihoods, including subsistence activities besides reindeer herding such as hunting, fishing, and gathering were investigated as well.

Fig. 1. Map of the study site.

Furthermore, for supplementary work, two indicators were focused on, namely (1) fluctuations of meteorological variables and (2) statistical data of domestic reindeer numbers. These were examined individually, and relationships and interactions with interviews of inhabitants were considered.

Climate change was estimated by the fluctuations of meteorological variables (mean daily temperature and daily precipitation) in Oymyakon District from 1960 to 2010. Data sets were acquired from NOAA (the National Oceanic and Atmospheric Administration). From the data sets, annual and monthly averages were calculated for the period 1960–2010. Data were then surveyed and inspected transition according to season: spring (March, April, May), summer (June, July, August), autumn (September, October, November), and winter (December, January, February).

The fluctuation of numbers of domestic reindeer in the entire Sakha Republic and Oymyakon District from 1980 to 2010 (as presented by the Ministry of Agriculture of Sakha Republic, Osipova et al. 2010) were examined to confirm the trend and a degree of reindeer herding success in the district.

Results

Semi-structured Interviews

Six local residents were interviewed, being males from 25 to 68 years old (*see* Table 1). Four of them were of the Even ethnicity; the other were Sakha. Five were registered as residents of Uchugei, and three of them were reindeer herders (A, B, F), who spent most of their life time close to pasture with reindeer herds, away from the village center. The herders worked at a reindeer herding enterprise in Uchugei, and F also worked at a "clan-community", a small-scale organization formed by minority relatives. D was a manager of the reindeer herding enterprise, and basically a resident at the village center. E worked as a painter and a tour guide, usually staying at Uchugei in summer, and living in Yakutsk, the capital of the republic, in winter. C worked as a horse herder at Sordnnokh village, usually staying at an isolated cabin near pasture from April to September, and living at the center of the village in winter. The individual interview took from 30 minutes to 1 hour.

All interviewees were aware of environmental changes in the area to a greater or lesser extent. Recognition of changes in air temperature had been noted by four interviewees (B, D, E. F), who all recognized warming in summer; three of them (D, E, F) were also aware of cooling in winter. As to precipitation, two interviewees (B, D) said rain was increasing in summer; however E said precipitation was decreasing but that rain tended to be heavy when it occurred. Three interviewees (B, C, and F) said snow was tending to decrease in winter. Two (A, C) said there had been no climatic changes.

With regard to topographical features, five were aware of some kinds of change (all except C). Of them four (A, B, D, F) recognized increases in number of floods. Furthermore B added that the number of ponds and streams were increasing; B and D said there were many changes in flow paths, and D had also noticed increasing landslides. Meanwhile E perceived a reduction in the size of lakes.

	Age	Sex	Ethnicity	Residence	Occupation
A	25	M	Even	Uchugei	Reindeer Herder
B	56	M	Even	Uchugei	Reindeer Herder
C	57	M	Even	Sordnnokh	Horse Herder
D	49	M	Sakha	Uchugei	Manager of Reindeer Herding Enterprise
E	53	M	Sakha	Uchugei	Painter / Guide
F	68	M	Even	Uchugei	Reindeer Herder

Table 1. Interviewees for Semi-structured Interview.

As to fauna and flora, all interviewees perceived changes. Three (D, E, F) stated that numbers of wolves were increasing, and two of them (D, F) also noted an increase in numbers of bears. Five interviewees (all except F) noticed new bird species to the area (a species of gull, some species of duck, hazel grouse) and animals (minks, otters, and sables). F said that some fish, such as grayling and Dolly Varden trout, parasitic flies, and mosquitoes were decreasing. With regard to flora, E noticed that young trees were growing in formerly bare land.

As to general livelihood, two reindeer herders (A, B) and the manager of the reindeer herding enterprise (D) recognized several problems. Pastures were thought to have decreased due to floods (A) and changes of flow paths (B). B also stated that pastures were damaged because reindeer was habitually herded in same locations. D stated that there had been an increase of predation by wolves and bears. However, overall they did not recognize a serious impact from environmental changes on their general livelihood and reindeer herding at present. However, the serious challenges for reindeer herding as perceived by them were as follows: (1) a relatively low salary for herders (A, B), (2) the difficulty of the transportation of commodities to remote camp sites (B), and (3) a shortage of young workers for reindeer herding, as youth are moving to bigger cities (D). C, E, and F, however, stated that there were no serious challenges to their livelihoods.

Fluctuation of Meteorological Variables

Meteorological data sets indicated that in spite of the fact that annual and seasonal average temperatures fluctuated, the annual average temperature did not indicate transition of increase or decrease. Average seasonal temperatures have shown a tendency to increase in spring, summer, and autumn, but decrease in winter (Fig. 2). With regard to precipitation, annual and all seasonal averages gradually increasing in Oymyakon (Fig. 3).

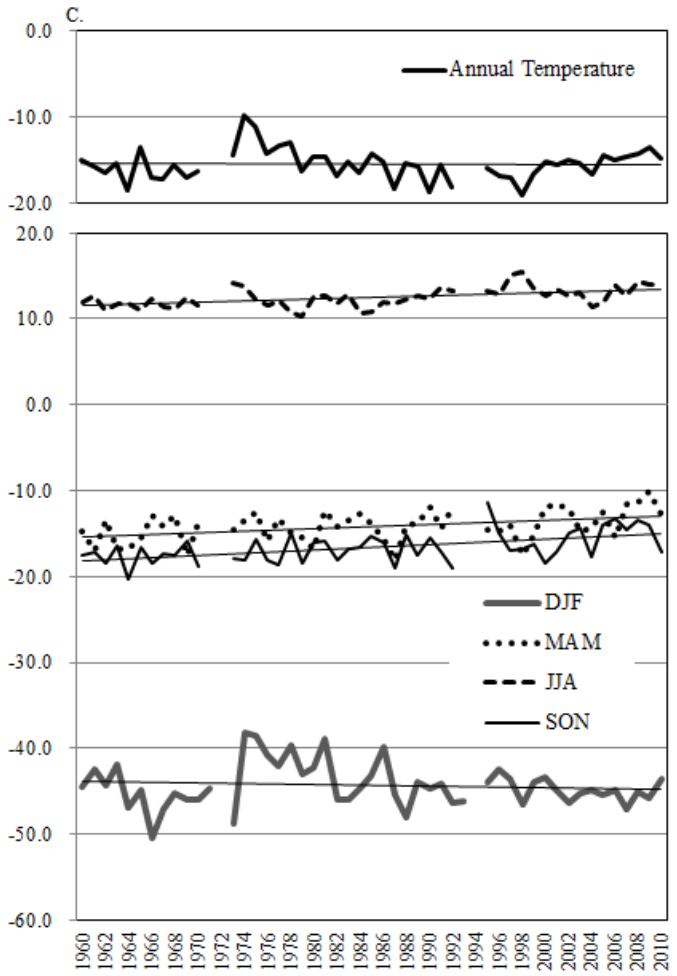

Fig. 2. Annual and Seasonal Variation of Average Temperature in Oymyakon District (1960-2010). *Source*: National Oceanic and Atmospheric Administration.

Number of Domestic Reindeer

Statistical data showed that numbers of domestic reindeer in Oymyakon District were relatively stable until 1994. The maximum number of domestic reindeer in this period was 19 684 heads in 1988. After this period, the number decreased sharply, reaching a minimum of 7 858 head in 2005 (*i.e.* 39.9% of maximum).

From 2006, the numbers steadily recovered, reaching 14 787 head in 2010 (75.1%) - Fig. 4. From this data, it seems that environmental changes have not had serious negative effects on reindeer herding in Oymyakon District, as in the entire Sakha Republic, at least in recent years.

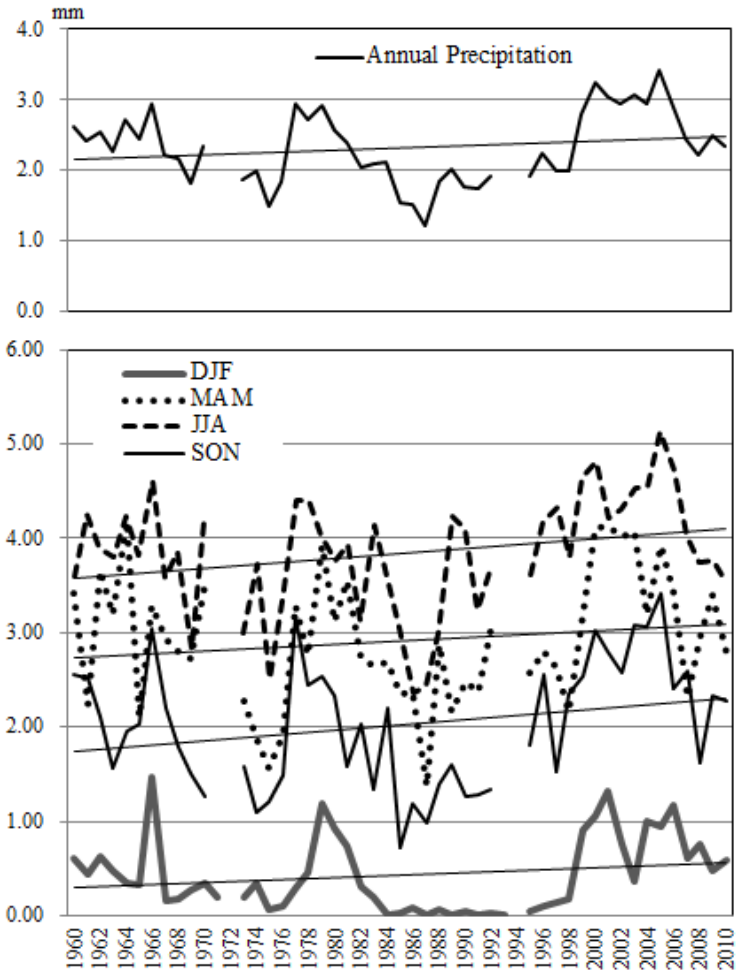

Fig. 3. Annual and Seasonal Variation of Average Precipitation in Oymyakon District (1960-2010). *Source*: National Oceanic and Atmospheric Administration.

Discussion

In this study, meteorological, topographical, ecological changes and their influence on the livelihood of local residents, especially the livelihood of reindeer herders, were examined in the Oymyakon District. Some of these changes have been recognized by local residents to a greater or lesser degree.

As to air temperature, four of the interviewees recognized warming in summer, and three of them noticed cooling in winter. Meteorological data showed that air temperature fluctuated, gradually increasing in spring, summer, and autumn but decreasing in winter over the past 50 years (1960 – 2010, *see* Fig. 2). Thus, the climatic changes felt by these local residents were supported by the meteorological data set.

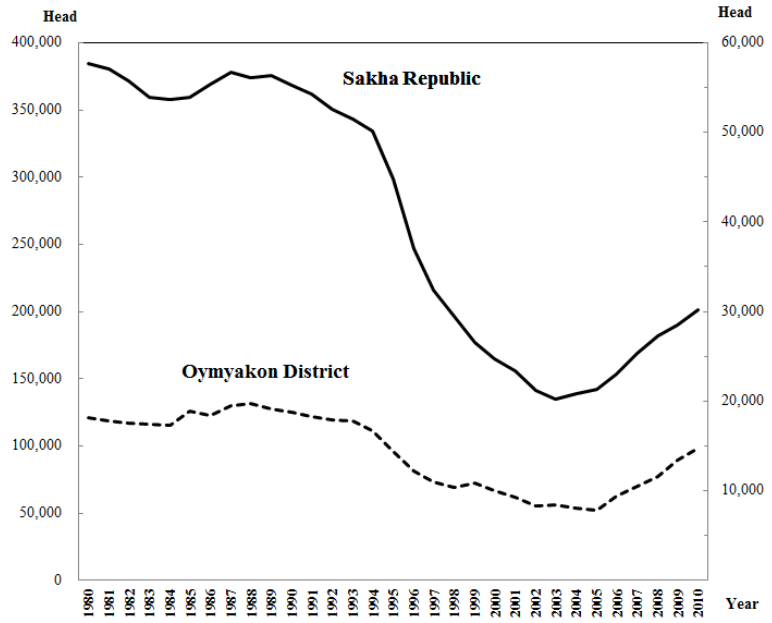

Fig. 4. Reindeer Number in Sakha Republic and Oymyakon District (1980-2010). *Source*: Ministry of Agriculture of Sakha Republic (Osipova *et al.* 2010).

Regarding precipitation, two interviewees perceived increasing rain in summer, and three stated they had noted decreasing snow in winter. According to meteorological records precipitation actually increased in all seasons over the past 50 years (*see* Fig. 3). However, as per data limited to a recent decade (2001–2010), precipitation during all seasons has been decreasing. This recent tendency might have affected the impression of the interviewees of reduced snowfall. As snow, different from rain, remains on the surface of the land and accumulates from autumn to spring, the impression of snowfall might be more vivid than that of rain.

As to topographic changes, four of the interviewees perceived an increase in floods, and two of them expressed a perception of another change in water cycle as well, namely an increase in the number of ponds and streams, changes of flow paths, and reduction of lake sizes. There is some possibility that these changes have been caused by increasing precipitation however, a cause-effect approach cannot be applied because more detailed climatic and hydrological data are missing.

Some faunal and floral changes were also recognized. As three interviewees said that numbers of wolves increased, the cause seems to be a decrease in the amount of time to rid of wolves, as some of interviewees stated. However, this and other faunal and floral changes may be influenced by environmental change as well. For example, American mink seems to be ordinarily distributed in the southwestern part of the Sakha republic (Sidorov 2014). If it inhabits parts of the Oymyakon District, its distribution might change to eastward.

As to current general challenges to livelihood, reindeer herders and a manager of the enterprise recognized several challenges for reindeer herding. However, judging from the fluctuation of the numbers of domestic reindeer, reindeer herding in the Oymyakon District seems to be managed successfully, at least in recent years.

Two herders have recognized damage to pastures from floods, change of flow paths, and overgrazing in fixed areas. In addition, an increase in number of ponds and streams may have caused a reduction of pasture area and, consequently, changes in migration routes between pastures. However, since the actual number of reindeer (14 787 heads) is slightly less than the full capacity of Oymyakon District (15 300 heads) (Osipova et al. 2010), shortages of pasture seem not to have developed as a serious problem for reindeer herding in the district. However, since a herder stated that some pasture has been damaged by overgrazing in fixed areas, good pasture may become insufficient in the future.

Generally speaking, it seems that local reindeer herders and a herding-enterprise manager did not see the above-specified environmental impacts as serious difficulties for reindeer herding. They considered that more serious challenges were posed by social and economic difficulties, such as the low salaries of reindeer herders, the difficulty of transportation to remote camp sites, and the shortage of young workers. According to available data, and the fact that meteorological variables have gradually been changing, serious environmental impacts have not generally been recognized by local residents. The interviewees also have not exerted an intense harmful influence on reindeer herding in the Oymyakon District.

A possible cause of this seems to be the extremely cold climate in this region. Ice layers formed in the snow may limit and/or block an access to winter food for grazing reindeer. Therefore, they are reported to be a major difficulty for reindeer herding (Oskal 2008, Oskal et al. 2009). However, in the Oymyakon District, air temperature has not been increasing in winter, remaining around or below -40°C. It seems, as a result, that ice layers do not tend to form in the snow in the district.

It has been pointed out that the overwhelming influence of social and economic circumstances may prevail slight changes in the natural environment perceived by indigenous people. Previous studies indicated that socioeconomic circumstances have played an important role in reindeer herding in northern Europe and Russia (Tyler et al. 2007, Rees et al. 2008, Forbes et Stammler 2009, Klokov 2012). In the case of Russia, reindeer herding passed dramatic changes after the foundation of the USSR in the early 1930-ies. At that time, a large-scale collectivization of private livestock into public ownership was underway and many domestic reindeer were lost in this process. The number of domestic reindeer has increased after this time, it reached a maximum from 1960 to 1990. In the period from 1990 to and 2000, the number of domestic reindeer decreased dramatically thanks to collapse of Soviet regime, and consequent social and economic changes. After the development of the market economy and the resumption of support, the number of reindeer has been gradually recovering. Similarly, in this study, although local reindeer herders and the manager felt some impact of environmental changes on reindeer herding, they consider that social and economic challenges have been more serious.

However, in contradiction to the results of this study, it seems that environmental changes exert a harmful influence on reindeer herding in a general way, even at Kobyai District in the central part of Sakha Republic (Yoshida 2012). To evaluate the influence of environmental variables and other factors on reindeer herding, and examine different situations in different are-

as, however, more comprehensive and detailed studies in this district and comparative studies in different areas are required.

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