Socio-ecological problems of reindeer protection and rational use in Taimyr and Evenkia

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Abstract. The original branch of nature management of the indigenous small-numbered peoples of the north is domestic reindeer herding. Despite all the natural prerequisites for the favourable development of this industry in the Arctic zone of the Krasnoyarsk Territory, reindeer husbandry is relatively poorly developed there. Historically, the fishing farms in Taimyr, for the production of wild reindeer of the largest Taimyr-Evenk population, are the main source of economic well-being of the indigenous population. Therefore, the study of the dynamics of this population and the ways of its rational use is a priority. This work is devoted to a review of the dynamics of the removal of wild reindeer of the Taimyr-Evenk population and the factors affecting it. In the context of the modern transformation of the Arctic ecosystems, a quite reasonable question arises: can commercial reindeer husbandry remain the guarantor of the economic stability of the indigenous and small-numbered peoples of Siberia as it was in the second half of the twentieth century?

1. Introduction

Reindeer is the foundation of the socio-economic well-being of all peoples living in the Arctic Circle. This is not only the food component of their life, but also the most important element of the social and ethnocultural significance of their way of life. In the Krasnoyarsk Territory, the total number of the indigenous small-numbered peoples of the north (SIM) is, according to the latest census, 16,222 people, represented by 8 ethnic groups: Dolgans, Nenets, Evenks, Evens, Nganasans, Kets, Selkups, Chulyms.

Despite the favourable natural conditions for the development of domestic reindeer husbandry in the region, this branch of the economy has not received wide development in the region. Historically, hunting for wild reindeer is a priority for the inhabitants of Taimyr and Evenkia. Today, the rational use of the resources of the Taimyr-Evenk population of wild reindeer depends not only on the level of socioeconomic well-being of the indigenous peoples of the North, but also on the very existence of the population under the conditions of the transformation of Arctic ecosystems.

The purpose of the study is to consider the removal of wild reindeer from the Taimyr-Evenk population and to assess the prospects for domestic reindeer husbandry.
2. Problem statement
At the end of the 50s of the XX century, the study of biology and ecology of wild deer in Taimyr expanded significantly due to the wider use of aviation. This made it possible to cover vast areas of Taimyr with observations in a short time, to identify and understand some of the regularities of the studied population. The research of the employees of the Research Institute of Agriculture of the Far North studied the number, some patterns of spatial distribution, the timing and routes of migration. In the 1960s, population census and tracking began to be carried out on a regular basis. Stationary and route observations have expanded in all seasons of the year [1].

The studies carried out made it possible to give scientifically grounded practical recommendations for the economic exploitation of wild deer and maintaining their productivity at a high level. However, the studies begun practically ceased after 1993. Since that time, aerial survey and ground surveys of the population began to be of an episodic nature.

According to E. E. Syroechkovsky [2], in the first half of the last century the number of tundra wild reindeer was more than 400 thousand, but the first objective estimation of the number using aviation was given in 1959. The number of wild reindeer was estimated at 110-120 thousand heads. However, with the increase in the number of wild reindeer, the damage caused to domestic reindeer husbandry as a result of pasture grazing and the removal of domestic reindeer by wild relatives during the migration period has sharply increased. As a result, the Administration of the Glavokhota of the RSFSR made a decision to stabilize the population of wild reindeer by removing the annual growth and sharing the resources of domestic and wild reindeer. To designate a qualitatively new form of using the resources of wild reindeer, E. E. Syroechko vsky [2] even introduced the term “commercial reindeer husbandry”, based on large-scale controlled deer hunting within the framework of a scientifically grounded quota that allows purposefully regulating the size of the population, its age and sex structure.

3. Materials and methods
The material used in this publication includes both previously published data on the abundance and commercial removal of reindeer, and personal research of the authors, carried out in 2014-2020. In addition, departmental archival materials of the State Hunting Supervision of the Krasnoyarsk Territory are involved in the work. To assess the level of removal of reindeer from the Taimyr-Evenk population, we analysed the data on the distribution of quotas for hunting reindeer in the region since 2012.

The study used a set of methodological techniques. For remote observation of animals, specialized collars with radio beacons of the Argos satellite system manufactured by ES-PAS LLC (Moscow) were used. As part of the work carried out in 2015-2020, data on 65 such collars were used.

4. Results and discussion
Despite the active development of commercial farms in the Taimyr Peninsula in the 1970s and 1980s, there was no destructive effect on the state of the population (figure 1). So, for example, the state industrial farm "Taimyrsky" focused on hunting for wild reindeer, in the period from 1971 to 1981 at least 500 thousand reindeers were harvested [1].

Moreover, the period 1972-1988 is characterized by a positive correlation between the logarithm of the number and the volume of harvested reindeer (figure 2). Therefore, despite the high rate of withdrawal in 1975, the population growth was up to 23.8% [3].

The collapse of the organizational and production structure of hunting and fishing farms in the North of Siberia in the 1990s led to a sharp decrease in the intensity of hunting, which was reflected in the number of wild deer. In the period 1999-2015, an average of 26.5 ± 5.2 thousand individuals were hunted at Cv = 64.7%. Already by 2000, according to aerial surveys, the number of deer had increased to 1 million individuals [1]. In subsequent years, there was a decline in the number to the level of 500-600 thousand heads. Apparently, a "population explosion" took place in the 2000s. This assumption is based on the fact that with the disappearance of a strong limiting factor - hunting on an industrial scale, the population began to uncontrollably rapidly increase its number, which inevitably led to a decrease in the reindeer capacity of pastures, an increase in internal competition and, as a consequence, a natural decline.
in the number in subsequent years. The decrease in the number of deer observed since 2001 and to the present day, thus, may well be a reaction to the "population explosion", which launched the processes of self-regulation of the number to normal limits.

Figure 1. Relationship between the volume of withdrawals in year (i-1) and the size of the Taimyr-Evenk population in year i.

Figure 2. Relationship between the volume of withdrawals in year (i-1) and the size of the Taimyr-Evenk population in year i.

In 2017, employees of the Taimyr Nature Reserves conducted a summer aerial survey in the main habitats of the species [4]. As a result, in the six surveyed regions, the number of wild reindeer was estimated at 384.4 thousand individuals. At the same time, the area covered by the counts amounted to 32% of the total area of the peninsula and about 50% of the summer habitats of the species. As a result of the incomplete coverage of the territory by counts, as the authors themselves note, the underestimation could be from 5 to 15% of the total number of counted deer, i.e. the number of deer, according to the minimum estimate, should have amounted to 404-442 thousand individuals.

Speaking about the withdrawal, it is important to note that according to official data on the territory of the Taimyr Dolgan-Nenets municipal district, the quota for the production of wild reindeer was realized in 2012-2019 not in full (figure 3 A).

Over the past few years, the underutilization of the quota in Taimyr was about 30%. In our opinion, this is primarily due to the change in the timing of the beginning of summer-autumn migration, as well as to the spatial and territorial displacement of the migration routes of wild reindeer. For example, in
2020, the reindeer migration began two weeks earlier than usual. The peak of migration fell on the period from July 27 to August 04. The hunters of the village of Khatanga failed to make use of most of the licenses for deer hunting.

This is also explained by the fact that during the traditional fishing period - October-November, most of the Upper Taimyr group of deer did not come to the vicinity of the villages of Kresty - Khatanga - Zhdanikha. According to our aerial surveys of the Kheta-Khatanga River valley in October-November and the analysis of tracks obtained from tagged deer with collars with radio beacons, in 2020 migration flows shifted to the area of the Volochanka, Katryk and Kheta villages. The mixing of the timing of migration and, as a consequence, the effectiveness of fishing is clearly illustrated by the implementation of the allocated quota on the territory of the Evenki municipal district (figure 3B).

![Figure 3](image1.png)  
**Figure 3.** Dynamics of the established quotas (1), their implementation (2) and the volume of legal hunting (3) of wild reindeer in the Taimyr Dolgan-Nenets (A) and Evenk (B) municipal districts.

It is not possible to give an objective assessment of the illegal removal of deer from the population on the territory of Taimyr and Evenkia in modern conditions. The material and technical base and the staff of the hunting supervision does not allow covering a huge territory. Therefore, there is currently no objective assessment of damage from poaching.

In recent decades, market mechanisms in the region and the socio-cultural transformation of the indigenous small-numbered peoples of the north have led to significant changes in domestic reindeer husbandry in Taimyr. The abandonment of traditional types of nature management and a nomadic way of life led to the decline of reindeer husbandry. But the first blow to domestic reindeer husbandry in central and eastern Taimyr came from the decision to eliminate reindeer husbandry and replace it with commercial farms in the 70s of the last century. This measure was aimed at resolving the conflict between domestic reindeer husbandry and wild reindeer. This led to the complete loss of reindeer husbandry by the Nganasans and most of the Dolgans.

In the post-Soviet era, domestic reindeer husbandry in the Krasnoyarsk Territory has experienced large-scale changes, which were influenced and continues to be influenced by a combination of economic, social, natural and other factors. The transition from a planned economy to a market economy was also decisive. The remoteness of the markets for the sale of reindeer products, a decrease in the
intensity of production, as well as the socio-cultural processes of development of the indigenous peoples of the North have led to a reduction in domestic reindeer husbandry in the region.

According to the administration of the Taimyr Dolgan-Nenets Municipal District, in 2020 the total livestock of domesticated reindeer was about 120 thousand individuals. Reindeer husbandry centres in the region are concentrated: in the eastern part of Taimyr - on the right bank of the Khatanga River in the villages of Syndasskoye, Popigai, Novorybnaya and in the western part of Taimyr - on the right bank of the Yenisei River, in the villages of Tukhard and Nosok.

In the taiga reindeer husbandry on the territory of the Evenk region, the number of domesticated reindeer does not exceed 2500 heads. Basically, their herds are concentrated in the interfluve of Podkamennaya Tunguska and Nizhnaya Tunguska (Surinda village).

5. Conclusion
Analysis of the materials shows that in recent years, the removal of wild reindeer in Taimyr does not exceed the scientifically grounded limits, and in some hunting farms the harvest is 30% less than the allocated quotas. Due to the change in the timing of summer-autumn migrations and a shift in migration routes, as well as a decrease in the total number of the Taimyr-Evenk population of wild reindeer, the effectiveness of traditional hunting is steadily declining and, as a result, cannot always guarantee the sustainable development of socio-economic aspects of life SIPN. Many local residents, traditionally engaged in deer hunting, talk about the need to develop domestic reindeer husbandry.

However, despite government support for the reindeer herding industry in the region, the number of domesticated reindeer is not increasing. To improve the situation, fundamentally new approaches to domestic reindeer husbandry are needed. The creation of a system for processing and marketing of finished products, the integration of producers and processors with the preservation of state support will not only increase the efficiency of reindeer farms and preserve the traditional way of life of the indigenous peoples of the north, but also reduce the operational load on the Taimyr-Evenk population of wild reindeer. However, we must not forget that such an economic form as domestic reindeer herding puts a high pressure on natural resources, the restoration of which in Arctic conditions takes a long time. Therefore, the calculation of the productivity of pastures and their rational use should be priority tasks in a well-functioning monitoring system.

To prevent the removal of domesticated reindeer from herds by wild reindeer, it is necessary to monitor the movements of both wild and domestic individuals. The most effective way to monitor reindeer migrations in real time is to use collars with satellite transmitters [5].

In conclusion, it should be noted that in the current conditions of active development of the Arctic zone of the Russian Federation, the question of introducing a scientific approach to solving the issue of food supply for the inhabitants of the Arctic is especially urgent. This will allow not only to successfully fulfil the tasks set by the state in the industrial development of the Arctic, but also to preserve the traditional way of life of the indigenous peoples of the north.

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