The interrelationship of sociodiversity and biodiversity: Experiences from a Post-Soviet Siberian village

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ABSTRACT
This paper investigates the extent and means by which Yakutian Cattle survived in three Siberian villages during the Russian transition from socialism to capitalism. The system of farming in these villages is a unique mixture of old traditions, Soviet remnants, and modern features. The production structure is widely diverse. An investigation of the process of privatization and structural changes in animal production led to the finding that sociodiversity facilitated the preservation of this single cattle breed and the recovery of animal production after the crises. Analysis of the interrelationship between diversity in society and diversity of domesticated animals suggests that sociodiversity is an important facilitator for biodiversity, even in a more general sense. Furthermore, to understand the connection of sociodiversity and biodiversity as a conceptual couple, one needs intermediary concepts, such as “ecosystem services.”

Keywords: Yakutian Cattle, Siberian village, biodiversity

INTRODUCTION
The Evenyo-Bytantay district is located in a mountainous region in Siberia, in the northern part of Sakha (Yakutia), a republic of the Russian Federation (Map 1). Even though the region is one of the coldest populated places on Earth, there is much cultural diversity. Moreover, the ecosystem sustains a wide diversity of domesticated animals, among which are the Yakutian Cattle, a rare breed found only in this distant region. Because the Russian transition from socialism to capitalism brought great difficulties to the region, the survival of the Yakutian Cattle was somewhat in doubt. Our research, however, indicated that in this area sociodiversity facilitated the preservation of this unusual cattle breed. This paper is an attempt to understand the interrelationship between sociodiversity and biodiversity and to open way to further research on a wider scale.

Our research project, which included several teams, was truly multidisciplinary. Members were drawn from animal genetics and agricultural engineering, anthropol-

1 The main results of the work are published in Granberg, Soini and Kantanen (2009). See also Kantanen and Osva in this volume.
logy and arts, cultural geography, history and sociology, among others. Each of the researchers was able to contribute important information from the perspective of a specific scientific context. However, such an approach, as interesting and useful as it was, raised many questions: for example, how to prepare better for a joint project, how to process collected data, and how to interpret information produced by one scientific discipline from the premises of another discipline.

Such deliberations led us to reflect on the interrelationship between diversity in society and the diversity of domesticated animals. The concept of biodiversity refers to the variety of plants, animals and micro-organisms; the concept socio-diversity, to the diversity of social, cultural and economic features of a social system.

**CONCEPTUAL PAIR**

Cross-disciplinary connections, such as the links between sociodiversity and biodiversity, may well open new opportunities for research. Two interpretations of the concepts of sociodiversity and biodiversity express an attempt to expand the area of scientific analysis beyond the narrow context of a particular discipline. The problem...
posed in these two cases may well be resolved by the use of a “conceptual pair,” as illustrated by data on Yakutian Cattle and other local domesticated animals.

**Biodiversity and Agricultural Biodiversity** What does the concept of biodiversity mean? According to the study on animal genetic resources for food and agriculture of the Food and Agriculture Organization (FAO), “…the world’s biodiversity [is] the variety of its plants, animals and micro-organisms, and of the ecosystems of which they form a part” (2007, 3).

This definition clearly attaches the concept to the natural sciences. On a genetic level, it means variation of inherited material among a certain group of species; on the level of species, it refers to the number of different animal or plant species in a certain region; and on the level of ecosystems, it describes the many different types of natural environments in a certain region (Heinonen and Veteläinen 2009, 14).

Agricultural biodiversity is something more than biodiversity, however. The FAO’s definition is as follows: “Agricultural biodiversity encompasses the diversity of the cultivated plants and domestic animals utilized by humankind for the production of food and other goods and services. More broadly, it includes the diversity of the agroecosystems on which this production depends. The capacity of agroecosystems to maintain and increase their productivity, and to adapt to changing circumstances, is vital to the food security of the world’s population” (2007, 3).

Agricultural biodiversity, in this definition, is somewhat distanced from the natural sciences. Agriculture is an outcome of the interaction between nature and humankind—between the ecosystem and the social system. Thus, agroecosystems are combinations of social systems and ecosystems. Therefore, the knowledge of social systems is fundamental to an understanding how agricultural ecosystems function and how biodiversity is impacted by agricultural ecosystems.

The following example illustrates the connections between sociodiversity and biodiversity in a modern, European industrial society. In Finland, the results of the rapid agricultural modernization in the 1960s and the 1970s were mechanized, market-oriented family farms, heavily reliant on agricultural chemicals. Such farms also rapidly moved to production of new plant varieties and animal breeds that had been recommended by agricultural consultants, the food industry, and scientists. This quest for the most productive seeds and animal breeds led to a loss of great proportion of existing genetic varieties. Nonetheless, a few small-scale farms succeeded in sustaining and transferring to present times some landraces on their fields and in their cowsheds. Additionally, household gardens preserved many non-commercial varieties of vegetables and fruits, which commercial farming had rejected (Heinonen 2009, 54).

A multidisciplinary approach to analyzing the relationship between society and agriculture, such as the Finnish example, poses many challenges. The language in social sciences differs from the language in natural sciences. The social sciences address different topics and employ different concepts. Of course, the analysis of values, institutions, social movements, and innovations may help to explain changes in biodiversity. Even so, the problem of how to develop cooperation between different disciplines remains.
The need for a common goal, an objective for cooperation, and a bridge between conceptual languages in different disciplines soon arises. A common goal might be a better understanding of some development in the material world, e.g., climate change or sustainable development. In addition, it is crucial to find concepts from the different disciplines which are somehow related to each other. Strength in analysis in one’s own discipline is crucial as well. Sociodiversity is a concept that embodies all these characteristics.

**Sociodiversity** Nowadays an increasing amount of research is devoted to examination of the relations between society and the environment. One of the first researchers to acknowledge sociodiversity was Brazilian scientist Walter Neves, who studied relationships between forms of social organization and ecodiversity on the basis of Amazonian empires. He describes social evolution in the Amazon region as co-evolution between natural environments and human societies, involving structural adjustments on both sides (Neves 1995, 108). Neves attributes this connection to the pioneering works of Conklin (1954, 1967; see Neves 1995) and Frake (1962; see Neves 1995), and to the work since the 1960s in such disciplines as applied anthropology, archaeology, ethno-biology, and ethnology.

Studying society and ecology as systems is an integral branch of mainstream sociology, developed by Talcott Parsons and continued by Niklas Luhmann. Luhmann brought ecology explicitly into his system theory (Luhman 1990). Today, attempts are made to integrate the social system and ecological system in scientific models, not least because of environmental impact assessments, which are becoming a kind of scientific industry (see Millennium Ecosystem Assessment 2005).

One of the early contributors to the issue of a conceptual pair was Sabine U. O’Hara. In response to work done by E. O. Wilson on biodiversity, O’Hara promoted the role of sociodiversity: “Biodiversity is our most valuable but least appreciated resource,” writes Wilson (1988, 1992, 281). The same can be said for sociodiversity” (O’Hara 1995, 45).

O’Hara utilized the concept of sociodiversity to criticize mainstream neoclassical economics for its inability to take into consideration links between economic and ecological systems. The reason for the shortcoming in neoclassical economics, according to O’Hara, was that “market activity forms only a small portion of economic activity (namely those activities which find expression in the market's price system), this in turn is only a small portion of human activity within the larger context of human ecosystems’ activity” (O’Hara 1995, 32).

O’Hara suggests expanding economic theory with five categories: context, participation, place, limits, and temporality. Her interesting and relevant rationale points up serious weaknesses in economics in the study of many acute societal and socio-ecological problems and developments. However, the question is whether economics is able to study these problems with its own conceptual arsenal. Perhaps the link between economic and ecological systems must be constructed in another way. Recognizing and accepting certain limitations in economic theory is a first step to join economics with other disciplines to solve scientific challenges of a socio-ecological nature. If sociodiversity is not an integral part of economics but a puzzle located in
the boundary area of different disciplines, it is a subject for multidisciplinary research.

The Challenge of Multidisciplinary Research Scientific disciplines have their own evolution, but they are tempted to expand their sphere of analysis and to recommend their methodology to other disciplines. The idea that economics should be expanded to study sociodiversity is the outcome of such a temptation. Proponents of multidisciplinary research claim that there is an alternative. Economic theory need not be broadened to encompass all the dimensions of context, participation, place, limits, and temporality. Attempts to do so will probably result in a loss of analytic strength.

In spite of the evident need for multidisciplinary work, it is difficult to envision the reality of such work: the different scientific concepts, the various traditions and methods, and the usual organizational structure of scientific work.

Biodiversity and Sociodiversity Biodiversity is dependent on the ecosystem where it exists, and in an analogous way, sociodiversity is dependent on the social system which produces and restricts it. Therefore, a related conceptual pair is the ecosystem and the social system.

The concept of biodiversity has sub-concepts and sub-groups, as does sociodiversity. Biodiversity can be analyzed among plants and among animals, both as biodiversity between species and as biodiversity inside of species. Our research studies focused on one subgroup, the biodiversity of domesticated animals, especially cattle. Although horses and reindeer are important production animals in the same district, their existence is not threatened to the same extent as that of Yakutian Cattle.

Sociodiversity can also be divided into smaller entities: cultural diversity, organizational diversity, and institutional diversity. They are not exact subgroups of sociodiversity because they partly overlap.
The concept of ecosystem goods and services\(^2\) (Figure 1) links products, such as water, air, and soil, to services, such as purifying air and water or protecting people from the sun’s harmful ultraviolet rays. The ecosystem supplies basic elements to facilitate human life, and different social systems find ways to benefit from the ecosystem. “Ecosystem functions refer variously to the habitat, biological or system properties or processes of ecosystems. Ecosystem goods (such as food) and services. (such as waste assimilation) represent the benefits human populations derive, directly or indirectly, from ecosystem functions” (Costanza et al. 1997, 253).

In summary, sociodiversity and biodiversity should be analyzed as a conceptual couple, binding together the different worlds of social sciences and natural sciences. To understand how they are related requires intermediary concepts, such as “ecosystem services.”

**Biodiversity among domesticated animals** Diversity includes the following: diversity of plants/animal varieties; diversity of breeds of domesticated animals; diversity of genetic material within a plant or animal variety; and diversity of genetic material within an animal breed.

Biological diversity has increased slowly over geological time, with occasional setbacks through mass global extinctions. Such a setback is presently taking place. The current crisis, the sixth known extinction, is a result of human activity. It is supposed to be the first time when not only animal diversity but also plant diversity is being lost (Wilson 1992, 304\(^3\)).

During recent decades, decreases of biodiversity in plants have been a consequence of increasing agricultural productivity, globalization of the agricultural market, and the homogenization of scientific applications. These factors have brought about displacement of traditional plants and animals because of their relatively smaller productivity. This development is evidenced both by the decreasing number of plant varieties that are grown and by the reduced genetic variation within different plant varieties (Heinonen and Veteläinen 2009, 14).

The present crisis is the first one to occur during human history and, therefore, during the time of domesticated animals. The variety of breeds of domesticated animals is being reduced, partly because of the extinction of locally-adapted cattle breeds. In 2006 the FAO listed 1,311 known cattle breeds from around the world and suggested that about 16 percent of them were already extinct and a further 16 percent were at various levels of risk. Only about 38 percent were not at risk\(^4\) (FAO 2007, 39).

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\(^1\) The concept seems to be unclear, especially, as far as capital stocks and their relationship to capital flows are concerned. Another question is whether capital should be a metaphor for an ecosystem at all because the objective of capital in economics is profit making. In any case, this concept describes an essential relationship between nature and society.

\(^2\) Page number refers to Finnish version of the book.

\(^3\) This calculation is complicated by the unknown status of a large number of cattle breeds, which represent 30 percent of the total. Risk status includes four subgroups: critical, critical-maintained, endangered and endangered-maintained. Yakutian Cattle are “endangered-maintained”; they are endangered because of the small number of cows and bulls, but, on the other hand, they are maintained due to official acknowledgement of their existence and active programs to assist their survival.
Cattle breeds can become extinct for various reasons. Urbanization and modernization create a general pressure towards extinction; more concretely, migration from rural to urban areas hinders the continuity of breeding using traditional methods. Changes in production technology have similar effects. The economic and political demands for maximum milk production per cow and the trend towards high input and output agricultural systems do not favor local or regional breeds, which are naturally multipurpose and less productive than commercial breeds. Applications of animal breeding methods, such as artificial insemination and embryo technology, promote rapid loss of many local breeds (Granberg, Soini, Kantanen 2009, 9–11).

Yakutian Cattle (Yakutsky Skot/Sakha Ynaga), low productivity Siberian cattle, provide a good illustration. Once displaced by European cattle breeds, they now survive in a small geographical area.

CATTLE AND HUMANS

Yakutian Cattle live in the Evenyo-Bytantay district, where the farming system is a unique mixture of Yakutian traditions, Soviet remnants and modern features. The migration trail of the Yakuts is still shrouded in uncertainty. The most common theory is that the people and their cattle came from southwestern Asia or Mongolia and stayed by Lake Baikal for some time. It is also supposed that the Yakuts migrated in several waves to the central Yakutian regions after the 9th century, with their horses and cows, introducing the tradition of raising cattle in these northern areas. The Eveny moved to the region earlier. References include Crate (2006a, 43–48), Forsyth (1992, 21, 55–57), Jordan and Jordan-Bychov (2001), Jordan, Bychov (2002), Kopoteva and Partanen (2009), and Takakura (2003, 2002a and b, 2004).

For the Yakuts, cattle production determined much of the order of everyday life during migration and after it. Though not exactly nomads, the Yakuts moved from winter dwellings to summer pastures to accommodate the needs of their cattle. They also shared their houses with cattle. Horses were then and are still semi-wild, moving freely around the pastures in the summer and in the winter. According to Basharin (1962), the numbers of cattle were already so high in the 19th century that the cows had to have been an important part of the Yakutian livelihood. Men, horses and cows were dependent on each other during the whole migration, and all were essential to Yakutian livelihoods in the far north. The Yakuts shared their fate with cattle, living in a symbiotic relationship with the animals.

THE YAKUTS, THE EVENY, AND OTHERS

Other people living in the region are the Eveny. In the early 20th century the Eveny population led a nomadic life with reindeer. They travelled along mountain ridges and did not have permanent settlements before the 1930s. At that time, as part of the

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5 According to Forsyth, the Yakuts could be viewed as one of the indigenous peoples of the territory. The Yakuts are of Turkish and Mongolian origin and have adopted several features of different peoples both in language and habits. They have absorbed some hunter-gatherer tribes and expanded their territory in the course of time (Forsyth 1992, 21, 55–57).

6 Murdoch describes the human-animal relationship in similar cases as “co-constitution and co-construction of achievements by human and non-human” (Murdoch 2008, 188); see also Owa in this volume.
Soviet policy towards the numerous minorities in Siberia, the nomadic peoples were organized into associations in national districts with limited self-governance. An autonomous region for the Eveny was created within the Yakut Autonomous Soviet Socialist Republic (ASSR).

The Yakut population was organized in villages, where the Eveny were also to live temporarily. Schools, public services, health care, and other features of modern life became a part of life for the local populations. In addition to the Eveny and Yakuts, these villages also included people from different European regions of the Soviet Union who were there to work in industrial plants or in professional capacities, such as teachers or medical doctors (Slezkine 1994, 168–170; Kopoteva and Partanen 2009, 79–96).

The territory in question is still a rural area occupied in traditional Eveny and Yakut activities: reindeer herding, horse and cattle breeding, fishing, and hunting. During the Soviet era there was stable growth in reindeer herding and horse breeding (see Table 1). Cattle breeding declined at first and then recovered (Kopoteva & Partanen 2009, 102).

Preserving such a special local breed as Yakutian Cattle is an important, practical act to strengthen biodiversity. Some Soviet scientists had already become interested in Yakutian Cattle by the 1950s. In addition, a few of the Soviet Union’s political programs and international agreements supported conservation of Yakutian Cattle. Ironically, at the same time, planned crossbreeding of the last of the Yakutian Cattle increased the risk of losing all the purebred Yakutian Cattle. For example, in the 1970s frozen semen of a few Jersey bulls of British origin was used to inseminate some Yakutian Cattle (Partanen & Kantanen 2009, 148–155). A local expert recounted the details of this experiment and the decision of local participants to put an end to it.

In 1975–1976, and even in 1974–1975, there was an experiment. They inseminated a little with the semen of English Jersey Cattle. This is also a breed producing high-fat milk. In 1980 we found one cow named Eureka, which had an antigen of a Jersey cow. But we detected all her progeny and culled them (Interview 1).

Because people recognized the uniqueness of the Yakutian Cattle, they opposed the crossbreeding. The opposition was also endorsed by the scientific community in Leningrad. The local initiative for culling came from the researcher P.A. Romanov.

Table 1. Numbers of reindeer, horses and cattle in Sakkyryr (2005 approximation from the Eveny-Bytantay district)

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<tr>
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<tbody>
<tr>
<td>Reindeer</td>
<td>14,803</td>
<td>10,203</td>
<td>21,285</td>
<td>10,030</td>
</tr>
<tr>
<td>Horses</td>
<td>1,154</td>
<td>1,752</td>
<td>1,950</td>
<td>1,535</td>
</tr>
<tr>
<td>Cattle</td>
<td>794</td>
<td>668</td>
<td>862</td>
<td>890</td>
</tr>
</tbody>
</table>

Sources: Archive of Eveny-Bytantay District; Goskomstat RF, 2005

Federal and Local Action to Protect Yakutian Cattle
(Partanen and Kantanen 2009, 152), and the crossbred animals were destroyed.

Another kind of risk for biodiversity arose when the Soviet Union became Russia, changing the context for sociodiversity in the system of animal production.

**Sociodiversity in Animal Production**

Sociodiversity refers to the diversity of cultural and social life. In farming it includes the socio-economic organizational forms of animal production. The farming system in the Eveny-Bytantay District is a unique mixture of traditions, Soviet remnants, and modern features. The production structure is widely diversified. State farms, registered farmers, private families and reindeer herders all keep cattle. Production is diversified among different kinds of production unit, and different ethnic groups have differing traditions. The Eveny are reindeer people and the Yakuts are cattle and horse people. However, in both cases, hunting and fishing, as well as picking and eating mushrooms and berries, have also been part of their lives.

**The Transition from Socialism to Capitalism** In Soviet times diversity decreased. In the latter part of the Soviet era, one state farm (Sovkhoz) dominated animal production in all three villages of the district. During the 1990s this farm closed its branch in the smallest village, Dzhargalakh, and reorganized reindeer herding and horse rearing into a separate enterprise, Leninsky, with headquarters in the main village, Batagay-Alyta. Privatization proceeded gradually. Cattle production was first divided between two independent farms affiliated with the two villages, Batagay-Alyta and Kustur. However, the two were eventually reunited into one farm, called Yakutsy Skot. One outcome was a decrease in the number of cattle on the state farm, which was followed by a decrease in the number of employees. At the same time, many private households increased their cattle numbers, mostly by one or two cows. However, some families became medium-sized cattle keepers, and some of them registered their farms and became family farmers (fermer). Reindeer owners established so-called tribal communities (rodovaya obshchina), and some of them also started to keep cows. (Granberg & Kopoteva 2009, 117–121).

Formation of a “multi-structural rural economy” (mnogoukladnaya selskaya ekonomika) was part of the rural reform, which started in Russia at the beginning of the 1990s. In Eveny-Bytantay the reform made possible the following types of production units (Granberg & Kopoteva 2009, 121):

- Large-scale enterprises
  - GP (state enterprise) Bytantay (formerly Yakutsy Skot). It specialized in cattle production.
  - GUSP Leninsky (state unitary agricultural enterprise). It specialized in reindeer herding and horse rearing.
- Farmers. They are officially registered as farmers and specialize in either cattle husbandry or horse rearing. Only six farmers were registered in the district in 2005.
- Private households. They are non-registered producers, who may also sell or exchange products at the market. Many families in the villages belong to this group and keep some animals, renting grasslands and taking care of small greenhouses.
• Tribal communities. They are family associations, which uphold the traditions of reindeer herding. Some of the working brigades of the state farms were reorganized to continue as tribal communities. They are made up of relatives who engage in reindeer herding and other additional activities. Tribal communities also keep horses and cattle. Sixteen tribal communities were registered in the district in 2003.

Local Struggle for Sociodiversity of Production Units  Kustur is the northernmost village. In spite of its Arctic location, it is the true center of cattle breeding in this district. There is a long tradition of dairy farming, which goes back to the times before the Soviet era. When the Sovkhoze was privatized, the state farm comprised about 80 percent of the cattle.

The process of privatization began in Kustur when the farm became independent and many positive developments started to come about (Interview with a villager; see Granberg & Kopoteva 2009, 123–124). Soon, however, the process of privatization threatened the future of farm and animal production in the village as a whole. In this situation many question arose. What kind of production units would be allowed? Which of them would be carried on in the village in the future? A villager described the turbulent situation in the village:

In 1989 the state farm was established in this village. Before that the farm was a department of the Leninsky state farm with headquarters in Sakkyryr … [at that time] all the money was transferred via Sakkyryr … nothing was built here. Then, before the state farm collapsed [1993–1995], it was already decentralized, and the new farms were formed… .

And then from 1993 to 1995 the state farm collapsed. They started to ruin the state farm by giving orders from above. People didn’t want that. Because people don’t live separately from one another in the north, they live in communities. Individuals don’t hold out for a long time.

They started to divide the farm into shares, starting with reindeer in 1994 to 1995. People lost the feeling of responsibility, and there was no discipline, no salaries …. First they divided reindeer among shareholders, then horses. It became clear that as soon as the reindeer were divided, none of them were left alive. They divided horses and again, none of them were left.

They wanted to divide everything. The head of the district really wanted to divide everything, including cows; but people objected at a meeting. Still there were some elderly men who wanted to get their share, arguing they would work by themselves.

(Question) How did all this happen?

When people entered the cooperative farm, each of them received a legal share. Then the system started to collapse from within. Ruining the state farms had not been brought to an end, and now they started ruining the cooperative farms. They started to establish family farms. People, mainly young people, wanted neither to listen nor to attend meetings. Only old people gathered together and furiously began to suggest dividing up everything.
And the main reason for this was that the longer a person had worked, the more he would get for himself. This was the main motivation for their behavior. They didn’t think about others who would have no job and no cattle after division. This took place in 1996.

These kinds of stories could be told from many other Sovkhozes and Kolhozes in Russia around that time. What is special is that the fate of the Yakutian Cattle depended on these local decisions during the period of transition. The cattle population at that time was so small that it might well have disappeared because of some unsuccessful solutions and unhappy accidents7. When the people made their decision, they also had to consider the fate of “their”78 cattle. Despite the attempt to privatize the state farm, it survived. However, it was smaller in size and continued to undergo several transformations during the following years. Because the state farm was not closed, the Yakutian Cattle also survived.

The conservation of the Yakutian Cattle reached a new phase when the Sakha Republic enacted a law on the conservation and use of the cattle in 2001. Probably the only law of its kind in the world, it elevates Yakutian Cattle to the status of an endangered breed (Partanen & Kantanen, 2009, 164–166). This law also included economic support for cattle production and the establishment of an experimental farm and research laboratory9, under the auspices of the Ministry of Agriculture. The farm guaranteed the genetic diversity of Yakutian Cattle. Nowadays, bulls are rotated between private and public producers and among the three villages.

The distribution of animals to different types of owners in 2004 is presented in the Table 2. Ownership was diversified to four different categories. Interestingly, exceptions from the traditional division of labor have begun to emerge; some of reindeer herders’ communities now also keep cattle. Sociodiversity is a reality in this small

<table>
<thead>
<tr>
<th>Organization</th>
<th>Cattle</th>
<th>Horse</th>
<th>Reindeer</th>
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<tbody>
<tr>
<td>State enterprises</td>
<td>22.6</td>
<td>22.4</td>
<td>40.7</td>
</tr>
<tr>
<td>Family farms</td>
<td>1.4</td>
<td>3.3</td>
<td>-</td>
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<tr>
<td>Private households</td>
<td>70.0</td>
<td>41.2</td>
<td>21.4</td>
</tr>
<tr>
<td>Tribal communities</td>
<td>5.9</td>
<td>33.0</td>
<td>37.4</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>N=930</td>
<td>N=1472</td>
<td>N=8935</td>
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</table>

Source: Program (2004).

7 Such a process probably took place, for example, for Rhodope Cattle in Bulgaria. These cattle were also kept in a state-controlled cowshed before the system collapsed and the farm was bankrupted.

8 The Yakut population especially is proud of these cattle, which are so special compared with all other existing cattle and which played a crucial role in the history of the Yakuts.

9 The state farm units became the 2005 Departments of the new state institute, which maintained its headquarters in Yakutsk. This institute acts under the authority of the Research Institute of Animal Production, an institute of the Russian Academy of Sciences. In this phase a third village in central Yakutia was connected to the enterprise, Uluu-Syhy in Gorny district. The Research Institute has a special laboratory to study issues connected with Yakutian Cattle.
The privatization process took place through local and national conflicts. The solution that was adopted, was modified by actions of the local people, i.e., workers in the state farm, in cooperation with the leaders of the local administration. Connections to academic researchers and national experts, as well as to influential politicians in Yakutsk, enriched the process. The action for Yakutian Cattle, which paralleled the movement of the Eveny autonomous region, was also in keeping with identity construction in the Republic of Sakha. Construction of national identity was part of post-Soviet development; politicians in Sakha, along with many other regions, aimed to achieve a stronger regional autonomy inside of the Russian Federation. The symbols of the national past were useful in creating this identity, and the image of Yakutian Cattle as a national breed was in line with this trend.

Rearrangements of animal production during privatization had strong negative effects on the numbers of animals (Table 3, see Granberg & Kopoteva 2009, 122). The decrease in reindeer numbers was particularly severe (see Vitebsky 2005). The government’s aim already in 2005, however, was to rebuild reindeer stocks, and the number of reindeer started to increase by about 10 percent a year. In a similar way, horse rearing collapsed, but the number of horses started to increase again after 2000. The number of cows decreased by a third between 1994 and 2000—from 450 to 309—but stabilized after 2000. The decrease in other livestock was not so rapid.

The Figure 2 summarizes the development of animal production. Animal numbers are compared with the total number of human residents since the 1960s to show the animal-per-capita relationship. This relationship illustrates how dramatic privatization was for reindeer herding and horse rearing. Cattle production did not experience a similar decrease because households undertook responsibility to keep cattle in their simple cowsheds and because collective production continued to some degree. The traditional methods for keeping cattle were in some use all through the

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**Table 3.** Number of cattle, horses and reindeer in the Eveny-Bytantay district in 1990-2007

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<tbody>
<tr>
<td>Cattle</td>
<td>936</td>
<td>1,135</td>
<td>1,075</td>
<td>1,006</td>
<td>899</td>
<td>863</td>
<td>963</td>
<td>890</td>
<td>894</td>
</tr>
<tr>
<td>Cows</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horses</td>
<td>2,028</td>
<td>1,961</td>
<td>1,000</td>
<td>1,125</td>
<td>1,425</td>
<td>1,339</td>
<td>1,420</td>
<td>1,535</td>
<td>1,590</td>
</tr>
<tr>
<td>Reindeer</td>
<td>21,203</td>
<td>21,769</td>
<td>15,484</td>
<td>12,052</td>
<td>11,908</td>
<td>9,932</td>
<td>8,490</td>
<td>10,030</td>
<td>12,440</td>
</tr>
</tbody>
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*Along with Yakuts’ horses and Eveny’s reindeer*
Soviet era and thus were rapidly revived and adapted by private households in the villages. On a limited scale, there was continuity of sociodiversity from Socialist to post-Socialist society.

It sounds, certainly, like a paradox to say that the state farm was needed in post-Soviet Russia to preserve Yakutian Cattle. Indeed, state farms had systematically eliminated the remaining stocks of Yakutian Cattle all over Siberia for decades. Nonetheless, the larger farm was necessary to assure sufficient genetic diversity and to guarantee long-term continuity in the breeding of these rare cattle. Furthermore, a combination of different cattle breeding organizations, e.g., state farm and private farms, creates a safer situation for the breed than the concentration of the total production on one form of organization or another.

Intentional or not, sociodiversity facilitated the local livelihood during the deep crises of transition from socialism to capitalism in the small villages in Russia, which have been studied, and sociodiversity assisted the recovery of animal production after the crises.

CONCLUSION

In summary, an interrelationship exists between sociodiversity, a concept from social sciences, and biodiversity, a concept from natural sciences that describes characteristics of ecosystem. An intermediating concept between these systems is ecosystem services, which means producing and supplying goods for society, regulating the living environment of humans, and offering services for various cultural needs.

This is one example of transdisciplinary conceptual connections. The methodological reason for this consideration is that finding a link between such concepts might open new opportunities for multidisciplinary research work. The main argument in this paper is that sociodiversity is an important precondition to sustain biodiversity, that is, to maintain ecological sustainability.

An ecological system supplies services to any social system, and different social systems have different capacities to receive these services. This capacity depends on the way a society is organized; in other words, it depends on the sociodiversity of the particular society. A social system not only receives but also processes ecosystem services and produce outputs, which move, in turn, from the social to the ecological system. Through these outputs each social system has an impact on biodiversity. The quality and intensity of the impact depends on the quality of sociodiversity in the social system. Finally, changing biodiversity also has consequences and will in the long run change the capacity of the ecosystem to produce services for the social system.

Co-evolution in the Amazon (by Neves), Finland’s modern plant production system (by Heinonen et al), as well as the case of Siberian Cattle support the argument that sociodiversity has consequences for biodiversity. A higher level of sociodiversity can keep biodiversity richer than a lower level of sociodiversity, e.g., monocultural. Naturally, this data is too restricted for any final conclusions. An additional difficulty is that the effects of sociodiversity on biodiversity can only be studied indirectly because biodiversity is connected to a certain spatially organized ecosystem and sociodiversity is connected to a certain, often non-spatial social system. They only
partly overlap. However, sociodiversity in farming appears to offer better promise for supporting and promoting biodiversity than exclusionary small-scale farming, as seen in the Russian rural transition, or than modern family farming, as seen in the Finnish agricultural system. In short, large-scale farming is efficient and small-scale farming is beautiful, but sociodiversity offers such flexibility and multi-faceted benefits to the social system that no other solution can offer.

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Good to Eat, Good to Live with: Nomads and Animals in Northern Eurasia and Africa

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