STATUS OF REINTRODUCTIONS OF THREE LARGE HERBIVORES IN RUSSIA

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ABSTRACT: Reintroductions of muskoxen *(Ovibus moschatus)*, European bison (*Bison bonasus*), and moose (*Alces alces)* have occurred recently in Russia. Although the process of capturing and moving muskoxen was problematic in remote areas, the reintroduction of animals from Canada and the USA successfully restored this extirpated species, and the current population in northern Russia serves as a source for further transplants. European bison populations were stagnant and suffered from inbreeding in Russia prior to reintroduction of captive animals from throughout Europe. The population in Orlovskoye Polesie National Park has experienced population growth with improved genetic potential. Of concern is that reintroductions in other areas of Russia were unsuccessful and the global population of European bison is not improving. Moose from the Penzhina River area in Russia were successfully reintroduced to the Kamchatka Peninsula where they were absent for >400 years. The population is growing and dispersing across the peninsula from the transplant sites, and is among the largest physically in Eurasia.

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The primary goal of reintroducing large herbivores in Russia is to restore biological diversity in northern ecosystems. A secondary goal is to provide a dependable and renewable food supply for residents of northern Russia. In this paper I summarize reintroduction efforts with muskoxen *(Ovibus moschatus)*, European bison (*Bison bonasus*), and moose (*Alces alces*) that were undertaken for different ecological reasons and circumstances. Prior to the reintroduction efforts muskoxen were extirpated, the resident population of European bison was stagnant and suffered from inbreeding associated with a small founder population, and moose, although increasing in certain areas of Russia, were absent for centuries from the proposed reintroduction area. Shorter and earlier descriptions of these efforts can be found in "Re-Introduction News" a newsletter of the IUCN (Sipko et al. 2006, Sipko and Gruzdev 2006, Sipko and Mizin 2006).

REINTRODUCTION OF MUSKOXEN IN NORTHERN RUSSIA

Background and Approach

A considerable part of Russia's landmass borders the Arctic Ocean and has severe climatic conditions including long periods of cold temperatures. Remains of muskoxen discovered on the Taimyr Peninsula were 2000-4000 years old indicating that they inhabited the region within relatively recent geological time (Vereshagin and Barishnikov 1985). Previous research indicated that this region was capable of supporting >2 million muskoxen without damage to the fragile northern ecosystem. Reintroduction of muskoxen into suitable habitat was expected to have a positive impact on the ecological community because of increased utilization of vegetation resulting in faster turnover of energy at all trophic levels. Because Yakushkin (1998) found that immature male muskoxen dispersed up to 800 km from

their natal area, the plan called for herds to be reintroduced within 600-700 km of each other to encourage genetic interchange.

Sites along the shoreline of the Arctic Ocean were selected for the first reintroduction that occurred in 1974 when 10 animals were delivered from Canada (Banks Island) to the eastern part of the Taimyr Peninsula. It was successful and eventually muskoxen spread north, east, and south (Putorana Plato) of the Taimyr Peninsula. The population was estimated at 2,500 in 2002 (Sipko et al. 2003), and was nearly 4,000 by 2005. A second reintroduction on Vrangel Island in 1975 used 20 muskoxen obtained from the USA (Nunivak Island, Alaska). Population growth was slow because mortality was high in the initial acclimatization period. By 2003, the population was 750 animals (Gruzdev and Sipko 2003), and recent estimates indicate that the population has stabilized at 800-850.

Additional reintroductions were achieved by relocating muskoxen from the Vrangel Island and Taimyr Peinsula populations (Table 1). The objective was to capture and relocate muskoxen that were 0.3-3.5 years old, however, most captured animals were 0.5 years old. Vrangel Island is a nature preserve and only vehicles with low-pressure tires and snowmobiles are allowed. Once located, muskoxen were surrounded by people with dogs and selected animals were chemically immobilized with a dart gun. Sedated animals were isolated from the herd and placed into containers for transportation to a holding enclosure. After the capture quota was met, a helicopter transported them to another enclosure on the mainland where they were placed in individual containers, loaded onto an airplane, and transported to the reintroduction site or temporary holding enclosure with local transportation equipment. The methods of capture, handling, and containment on Taimyr Island were the same as at Vrangel Island. A helicopter was used to locate and deliver muskoxen either to a temporary holding enclosure or directly to the reintroduction site. They were usually kept in the temporary enclosure for a period before release.

DISCUSSION

The initial reintroduction of muskoxen to northern Russia in the 1970s proved to be successful, and set the stage for further reintroductions in other parts of Russia (Sipko et al. 2007). In addition to those captured for subsequent reintroductions, 81 muskoxen were also captured for zoological parks and domes-

Table 1. A summary of the location, history, and status of reintroduced herds of muskoxen in northern Russia.

Location	Region	Year	Number	1st Breeding	2008 Population
East Taimyr peninsula	Krasnoyarsk	1974, 1975	30	1975	~6500
Wrangel island	Chukotka	1975	20	1977	~ 800
Bulun	Yakutia	1996	24	1999	>300
Anabar	Yakutia	1997, 2000	41	2000	>150
Begichev island	Yakutia	2001, 2002	25	2003	>50
Allaikhov	Yakutai	2000	11	2004	64
Taas-Yrach	Yakutai	2001-2003	18	2004	12
Tamma	Yakutai	2002, 2003	22	2004	0
Polar Ural	Yamal	1997, 1998, 2001, 2003	63	1999	108
Kolima	Magadan	2004	22	None	20
Total			284		>8000

tication experiments. Regular surveillance of muskoxen is hampered by the remoteness of the reintroduction areas. Surveys conducted in Yakutia in 2005 indicated that 347 muskoxen were in 4 reintroduction areas, a >3x population increase in 10 years. The fastest growth rate occurred in the Allaikhov herd where 18 calves were produced in 3 years. The muskoxen population in the Bulun region split into 2 nearly equal sized herds; one herd dispersed 120 km west to the delta of the Lena River where it resides currently.

Reintroductions of muskoxen in northern Russia are problematic. Difficult working conditions, remote locations, and numerous animal transfers with different modes of transportation meant that animals needed skilled animal care specialists to accompany them. The overall mortality rate was 10-15% during the process of capture and containment prior to release.

Muskoxen from the Taimyr Peninsula adapted well to relocation sites in central Siberia, and those from Vrangel Island established viable herds in eastern Russia. Presumably, the introduction of muskoxen from 2 separate populations will have a positive impact on genetic variability that influences survival, productivity, and stability of new herds. A program for additional introductions is underway, and plans are in development to introduce muskoxen to the mountain ranges of northern Asia.

REINTRODUCTION OF EUROPEAN BISON IN CENTRAL RUSSIA

Background and Approach

The global population of European bison has not expanded in the past 15 years, remaining at approximately 3,000. Small herds scattered in free-roaming populations and captive-rearing facilities typically consisted of 5-7 ancestors from the 12 original animals that were founders of all contemporary bison (Belousova 1993). These circumstances caused high inbreeding coefficients in the Lowland populations (44%) and moderate coefficients (26%) in the Lowland-Caucasian line (Olech 1998). Recent studies indicated that inbreeding occurred over a much longer period of time, thus, the actual inbreeding coefficient is probably much higher. As a result, phenotypic expressions of inbreeding depression are evident in certain populations (Sipko 2002).

It is estimated that an effective population size of 500 individuals is required to preserve genetic polymorphism that enables a population to adapt and evolve in a constantly changing environment to prevent extinction (Soule and Wilcox 1980). An effective population must have an adequate sex ratio and sufficient mature and sexually active animals that comprise 25-35% of the population. Thus, establishing a population of 1,500-2,000 should ensure long-term viability and survival of a species. However, at least 2 geographically isolated populations are deemed necessary to reduce the risk of disease or unforeseen events that might decimate a population. Russia has sufficient geographical area of suitable habitat to accommodate multiple distinct populations of European bison. Two areas of appropriate size and ecological conditions were selected for the reintroductions; importantly, they also offered protection as designated wildlife reserves.

One area was in the European broadleaf forest of the Bryansk-Oryol-Kaluga region in the European (i.e., central) part of Russia. It was a large, contiguous forest tract extending from the boundary of Ukraine along the Desna River (Black Sea basin) northeast to the Oka River (Caspian Sea basin), and had few natural or artificial barriers to impede bison movement; railways and highways bisected the region in only one location. The forest was 30-50 km wide and stretched >400 km. The eastern section was known as the Oka Defense Line of the State of Moscow during the 14th-17th centuries. These types of frontier forests acted as a line of defense

until the middle of the 18th century and were strictly protected from harvesting and use by people. As a result, this tract of contiguous broadleaf forest was one of only a few areas that remained largely intact in its natural state, and is a protected natural area.

Designated sections that contributed to this forest tract included 1) the Desnaynsko-Starogutsky National Park (Ukraine) with 162 km^2 area situated on the boundary of Ukraine and Russia, 2) the Bryansky Les Biosphere Reserve with 1230 km^2 in the Bryansk region of Russia, and 3) the adjacent protected areas of the Oryol and Kaluga regions in the north including Orlovskoye Polesie National Park (777 km^2), Kaluzhskie Zaseki State Nature Reserve (185 km^2), and Ugra National Park and Biosphere Reserve (986 km^2).

The second area used to reintroduce bison was the Ust-Kubenskoye Hunting Facility and surrounding region located about 400 km north of Moscow in the Vologda region (Vologodskai oblast) on the 59^0 N latitude parallel. The landscape is a series of raised terrace plains at 110-200 m elevation within the Severnai Dvina River drainage; 64% was forest dominated by conifers (55%, mostly *Abies spp.)*. The Ust-Kubenskoye Hunting Facility is 260 km^2 with the Russkii Sever National Park (1664 km^2) at the western boundary. The southern border begins at the shore of Lake Kubenskoe, and the northern and western boundaries adjoin 8,000 km^2 of federal forest lands. This area was considered optimal because European bison have survived there long-term without human support. Further, resident animals have shown evidence of twinning that is uncommon in bison, suggesting high habitat quality. Logging has produced large areas of second-growth forest with a shrub-layer suitable for foraging, and most agricultural areas were abandoned and these regenerating lands also provide rich food resources for bison.

Bison used in the reintroduction were from captive breeding centers in Russia and West Europe (Table 2) to potentially enhance their future genetic viability. Their gene pools were quite distinct because bison from Russia and West Europe have been isolated for almost 100 years. Bison were transported in group or individual containers to temporary enclosures and released 1-2 months later.

Table 2. A summary of the location, history, and status of reintroduced herds of European bison in northern Russia.

Location	Region	Year	Number	2008 Population	Comments
Cherga Mountains	Altay	1982-1984	12	34	
Orlovskoye Pollesye National Park (OPNP)	Oryol	1996-2001, 2006	75	143	Successful
Kaluzhskie Zaseki State Nature Reserve	Kaluga	2001	0	NA	Dispersal from OPNP
Petrovskoe Hunting Facility	Kaluga	2,007	9	9	
Ust-Kubenskoye Hunting Facility	Vologda	1991, 1994	5	24	
Vilikoozerskoe Hunting Facility	Vladimir	1989, 1994, 2002, 2004, 2007	25	15	4 bison present at 2nd transplant
Muromskij sanctuary	Vladimir	2001-2004	13	16	
Sknjatinskoe Hunting Facility	Tver	1986, 1991	33	3	Unsuccessful
Branskij Les State Nature Reserve	Bryansk	1999-2000	11	0	Unsuccessful
Total			183	>225	

DISCUSSION

Our method of transporting bison over long distances in individual containers proved successful. Based on our experience, using large containers containing several animals, as done with cattle, was problematic and should be avoided if possible. Bison often injured each other during group transport, resulting in high injury and mortality rates during the reintroduction effort.

The bison population in the Orlovskoye Polesie National Park has the greatest genetic potential compared to other bison groups in the world (Table 3). The population is growing rapidly with 20 calves born in 2005. Animals have dispersed to areas adjacent to the park and regularly appear in the Kaluzhskie Zaseki State Nature Reserve. It appears that 3 separate herds have formed from the original population. Additional releases into these areas are needed in order to quickly establish optimally sized populations.

The region situated between the Volga and Oka Rivers contains a large bison population. However, the region has much industry and transport and communication lines and this lowland area has little coniferous forest. The Vilikoozerskoe Hunting Facility, Muromskijj Sanctuary, and the Sknjatinskoe Hunting Facility located here have insufficient area for further expansion of the population. Slow population growth and numerous mortalities are evident, and further reintroductions are not considered worthwhile.

Table 3. Origin of European bison transplanted in the Orlovskoye Pollesye National Park, Russia.

Country	Source	Number
Russia	Prioksko-Terrasnyjj zapovednik	21
	Okskijj zapovednik	24
	Zoo Rostov na Donu	1
	Zoo St. Peterburg	1
Belarus	Belovezhskaja pushha	2
Netherlands	Natuurpark Lelystad	14
Germany	Springe	
	Zoo Dortmund	6
	Tierpark Chemnitz	
Switzerland	Tierpark Dahlholzly	4
	Wildpark Langenberg	
Finland	Zoo Helsinki	1
Belgium	Han-Sur Lesse	1
Total		75

The release of bison into the Bryansky Les State Nature Reserve proved to be unsuccessful. Long migration patterns and poaching in the Russia-Ukraine border areas resulted in their demise. There is need to supplement the bison population in the Ust-Kubenskoye Hunting Facility. Also, the introduction of captive bison from the Netherlands into the Bukovina population in East Carpathian had limited success. The introduced males were unable to compete during the rut with local bulls native to the rugged mountain conditions. It is concerning that European bison numbers are not increasing worldwide. The European bison pedigree book (2002) noted that overall growth was weak with 172 births and 112 deaths overall. Arguably, there are insufficient animals to successfully establish new viable populations (Sipko and Kazmin 2004).

A new reintroduction effort in Yakutia will focus on a captive breeding and release program. In 2006, 30 wood bison were donated and transported from Alberta, Canada and relocated in a fenced enclosure 120 km from the city of Yakutsk. Successful births occurred in 2008 (6) and 2009 (7); 4 of the original animals have died. The long term plan is to establish a free-ranging population in Yakutia through gradual release of young bison.

REINTRODUCTION OF MOOSE TO THE KAMCHATKA PENINSULA

Background and Approach

The Kamchatka Peninsula has been occupied and developed by Russians since the 17th century with no evidence of moose

inhabiting this region during that time. The wildlife of Kamchatka is low in diversity when compared to the mainland and both lynx *(Felis lynx)* and squirrel *(Sciurus vulgaris)* appeared only in the 20th century (Valentsev and Mosolov 2004). However, archeological evidence indicates that moose were present during the 11th-16th centuries in southern and eastern areas of the peninsula (Vereschsgin and Nikolaev 1979); this information lead to the interest of reintroducing moose on the Kamchatka Peninsula.

Moose have continuously inhabited northeastern mainland Russia, but populations have been low in recent centuries. Growth of these populations has been documented only since the mid-20th century. The human population has been localized in small settlements leaving vast tracts of land without hunting or poaching pressure. Further, the whole region was involved in a wolf extermination (poisoning) program. As a consequence, the moose population in the mountain taiga sector of the Penzhina River Basin expanded to 2000 animals by 1974 (Fil 1975), thus was considered a suitable donor population for the reintroduction.

After explorating the peninsula, the Kamchatka River valley was considered most suitable for moose. To the east, west, and south were mountain ranges that protected this area from deep snow, and food resources in the valley appeared adequate for moose. Although the southern Kamchatka region had considerable food resources for moose, deep snow and high risk of poaching were considered problematic. Snow depth frequently reaches 120 cm but is not uniform throughout the region because of the local effect of wind. Because many rivers do not freeze due to frequent thaw cycles and volcanic heat sources, the southern area of the Kamchatka Peninsula was considered to have highest potential as moose habitat.

The reintroduction occurred in 2 stages, each with unique characteristics. The first stage was in 1977-1988 when 63 moose were captured along the tributaries of the Penzhina and Belaya Rivers (Pavlov 1999) and subsequently moved to the Kamchatka River valley in the central part of the peninsula.

Captures were selective for 9-month old calves that were caught with the aid of a helicopter; they were pushed toward the treeless part of the bottomland and immobilized by darting from the helicopter. They were transported by helicopter to an enclosure where they remained 5-7 days, after which they were immobilized and placed in individual containers and transported by helicopter to the release site; transport took approximately 9 h. Moose were kept in an enclosure at the release site for 15 days to allow them to recover and acclimatize to the local environment; they were released immediately if snow depth exceeded 60 cm. The first birth was documented in 1979.

The second stage of the reintroduction occurred in March and April, 2004-2005 (Table 4) when 26 moose were captured, transported, and released in the southern part of the Kamchatka Peninsula. Most were 11 months old; 4 animals were 2 years of age. Captures occurred in the Kamchatka River basin where tall forest cover reduced the effectiveness of the helicopter. When moose were detected, the helicopter drove them towards openings in the forest where snowmobiles were used to overtake the animals. They were immobilized, hobbled, and transported by sled to an individual holding container where they remained until fully recovered (1-3 h), then loaded into the helicopter and transported to the reintroduction site; transportation time was 5-6 h. They were immediately released in the Golygina and Udochka River valleys. Most moose were released on thermal terrain that was snow-free during winter because of volcanic heat. A cow moose with accompanying calf was observed in autumn 2005.

DISCUSSION

A stable moose population appears to be established and a few animals have even

Table 4. A summary of the location, history, and status of moose reintroductions on Kamchatka Peninsula, Russia.

Source	Year	Release Area	Number of Moose		2008 Population
			Total	Female	
Penjinskii: Palmatkina, Essoveem, Chichill, and Belaya (White) Rivers					
	1977	Milkovskii	4	3	
	1978	Milkovskii	9	5	
	1979	Milkovskii	12	5	
	1980	Milkovskii	12	4	
	1981	Milkovskii	26	14	
	1982	Milkovskii and Elizovskii			~2000
Chukotka: Anadyr River valley					
	1988	Smirnihovskii: Sakhalin Island region	10	7	10-15
Kamchatka Peninsula: Milkovskii area					
	2004	Ust'-Bolsheretskii	11	6	
	2005	Ust'-Bolsheretskii	15	7	>45

dispersed to the western coast of Kamchatka. A census conducted in the central Kamchatka region in 2004 estimated the population at 1698-1775 animals (Sipko et al. 2004). Deep snow exceeding 150 cm in winter 2004-2005 caused considerable concern about winter mortality of released moose. However, they overwintered successfully with only a single mortality to a bear (*Ursus arctos*) the following spring. This successful reintroduction of moose is important for developing tourism and hunting on the Kamchatka peninsula.

Steady population growth has been realized in the southern area of the peninsula where twinning predominates. Physical measurements of 32 moose indicate that individuals are realizing larger growth than their donor population from central Kamchatka. It is presumed that there is optimal forage production and availability on the volcanic substrate, and that moose are using accessible marine grass (seaweed). However, deep snow is of concern relative to selective and heavy browsing pressure during winter.

Moose inhabiting the Kamchatka Peninsula are among the largest of all Eurasian specimens, and this seems characteristic of the local population. Body weight of large bull moose ranges from 600-750 kg, outside spread of antlers are 161.5-181 cm (n = 6; the largest bull was killed in 2002 in Ust-Kamchatskyi district), and 11 month-old calves weigh 220-325 kg (n = 10). The large size of these animals posed problems during immobilization, handling, and transport. Increased drug volumes created considerable difficulty during recovery from drug-induced shock, and their large size caused handling problems during translocations by helicopter. Moose appeared to be more sensitive to capture and transportation problems than muskoxen and European bison; much time and effort was spent in recovering them to a normal physical state. One important factor lending success to the second stage of the reintroduction was that the moose had improved resistance to capture and handling stress. In previous efforts capture mortality often exceeded 50%, whereas mortality was insignificant in the second stage of the reintroduction.

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