

The using of new areas for free-ranging group of European bison (*Bison bonasus*) in European Russia

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Abstract Formation of free-ranging European bison populations is an important object in preserving this species. Such problems as using the area and space use when establishing new free-ranging groups deserve special attention as a part of creation free-ranging European bison population. This paper includes the results of European bison space use monitoring during establishing free-ranging group in Kaluzhskie Zaseki Nature Reserve, Russia. The analysis includes data collected during the period between 2004 and 2007. The main method of data acquisition is mapping of tracks and traces of vital activity along fixed routes. The herd under observation included 30 animals at the end of the research period. In 2001 the herd was let out in Orlovskoe Polesie National Park and came to Kaluzhskie Zaseki Nature Reserve. In 2004 European bison had occupied almost the entire woodland of southern part of the reserve. In snowy period the entire herd keeps close to the feeding site. In snowless period adult males separate from female part of the herd. Since 2005 groups of cows and calves have a well-defined seasonal cycle of space usage.

Key words: European bison; free-ranging group; settlement of new area; space use

Introduction

One of the priorities in preserving biodiversity in Russia is a restoration of free-living and self-sustaining population of the European bison (*Bison bonasus*). The first problem when establishing European bison population is a scantiness of landscape zones of the European part of Russia that are needed for the existence of the given species (Danilkin 2005). The European bison requires large, diverse complexes of deciduous and mixed forests to live in (Krasinska, Krasinski 2004). Thinned deciduous forests with clearings and open spaces give the best fit for the European bison according to zoologists' opinion (Flerov 1979). Edges of broad-leaved forests are good enough for the species too (Baskin, 1979). But there are no woodland in Central Russia large enough for the habitation of self-sustaining population of the European bison including no less than 1000 heads. Natural ecosystems within the historical habitat of the species are either destroyed or strongly used by humans (Belousova *et.al.* 2002). Nowadays the most part of lands available for European bison habitation

belong to specially guarded natural sites of Bryansk, Kaluga, Smolensk, Orel, Tula, Ryazan, Vladimir, Novgorod and Vologda regions (Pererva 1997), that are isolated forest ecosystems. In many of them the conditions fit the European bison that is why the bison were brought there. But unfortunately not all of the places appeared to be appropriate for the species.

In 1996 the series of practical measures began. Their aim was to create a self-sustaining wild-living population of the European bison in the West of European part of Russia according to WWF project and the interregional program for conservation of the Russian European bison. Realization of this project began in the guarded territories of Bryansk and Orel regions. Since year 1996 75 European bison have been brought to the region from breeding centers and zoological gardens of Russia and Western Europe. A group of 11 animals were brought to Bryansk region, but because to some reasons this efforts was ineffective (Sipko, Mizin 2007). Three separate groups were formed in the territory of the Orlovskoye Polesie National Park: Alekhinskaya, Avdeevskaya and Krasnikovskaya. An enclosure for adaptation and following release of the herd in the woody northern part of the national park was built in the forestry of Krasnikovskoe. But some basic breeding principles were ignored during this work. First, the enclosure was surrounded by large squares of non-arable field. These conditions resulted in animals getting used to habitats in coppices and outskirts of fields. Consequently when the animals were let out of the enclosure they began making their way to the North of Orel region along the agricultural lands instead of going deep into the forest (Pererva, Pererva 2003). Second, the sex ratio of the herd was wrong. Before releasing the number of bulls was twice larger than cows. One of the requirements for successful reproduction and population development is the opposite proportion. The given group including 5 cows and 10 bulls got to the territory of southern part of Kaluzhskie Zaseki National Reserve in December 2001.

Usually the European bison is a non-migratory animal attached to the region it was born or let out in. New space acquisition demand rarely results in emigration even in overstocked groups. But sometimes adult males and juveniles are inclined to migration. This is undoubtedly helpful for preservation of the species owing to genetic flow into unrelated herds (Danilkin 2005). The area used by European bison is always associated with social-demographic structure of the group. At the reproductive system rest period adult males keep away from adult females and calves. The range used by a group of females with calves is not large – between 45 sq. km and 97 sq. km in a snowless time. The range used by adult males which move separately, as a rule, is larger. It could be up to 152 sq. km (Krasinska *et.al.* 1999, cited by Danilkin 2005). After releasing the herd change its spatial structure due to population development and gaining of wild type behaviour. We don't have complete picture about the development of free-ranging group spatial structure of European bison under the given natural and climatic conditions because of the lack of experience in this field.

The main aim of our research is to assess the nature of European bison use of space during a year. First of all we would like to make a database that would include the information on the space use of European bison in Kaluzhskie Zaseki National Reserve for the period of 2003–2007 with help of geographic information system (GIS).

Study area

Kaluzhskie Zaseki National Reserve is located in Ulyanovo district of Kaluga region (53, 57°N 35,70°E). On its eastern and southern boarder the reserve is adjacent to Orlovskoe Polesye National Park. The reserve consists of 2 parts that are separated 12 km from each other. Total area of the reserve is 185,33 sq. km, southern part is 117,84 sq. km and northern part is 67,49 sq. km. The reserve is located in Eastern European region of broad-leaved forests in north-western part of Central Russian Upland on the watershed of Oka river and Vytebet river (tributary of Zhizdra river). Altitudes of 150–250 m prevail, maximum altitude is 275 m. The relief of erosive type is hilly. It includes wide ravine and river net consisting of right tributaries of Vytebet river. Nowadays Kaluzhskie Zaseki National Reserve is the only Russian reserve located in eastern European region of broad-leaved forests area. The next types of plant communities may be found on the territory of the reserve: broad-leaved forests (oak forests), small-leaved forests (aspen and birch forests), pine forests, spruce forests, black alder forest and willow beds. Small part of the area consists of overrunning meadows and fields. Forest covers 178, 40 sq. km (96% of the reserve territory).

Materials and methods

Data collection on the territory of Kaluzhskie Zaseki Nature Reserve and its outskirts began in 2003 as a part of the yearly monitoring of large carnivores and ungulates.

To make the monitoring more complete we applied multi-component methodological complex including surveying of fixed routes, snow tracking, registration of traces of vital activity, mapping of animals tracks using GPS and GIS software, picture for identification animals in the feeding sites and employing IR digital camera traps for detection of moments of animals being in certain places. Surveying of fixed routes is basic way of data collection.

When the received data we started to analyze we add two basic methods in addition to mapping marks traces of European bison vital activity: 1. Determination of animal locations probability using kernel analysis (Worton 1989). The most probable animal locations are depicted as closed contours approximating two-dimensional distribution of animal locations. 2. To determine the total area used by European bison during the year the minimal convex polygon method had been used. Software used: Ozi Explorer 3.95.4q, MapInfo 7.8, ArcView 3.2.

Table 1. Sex-age structure of free-ranging group of European bison in Kaluzhskie Zaseki Nature Reserve

Year	Adult		2–3 year old	Calves under 1 year	Total
	male	females			
2001	8	4	3	–	15
2002	8	4	3	–	15
2003	7	5	–	4	16
2004	7	5	4	1	17
2005	3	5	5	4	17
2006	3	9	5	7	24
2007	3	10	11	6	30

Results and discussion

Demographic structure of studied European bison group has changed greatly since 2001 (Table 1). At the end of 2007 the herd consisted of 30 animals: 3 adult bulls, 10 adult cows, 11 immature individuals (4 males and 7 females) and 6 calves born in 2007 (4 males and 2 females). 22 calves were born on the territory of the reserve.

According to data for years 2001–2002 European bison were roaming only with southern and south-western area of the southern part of the reserve. They were also found very often in the fields of Orel region. In 2003 we noted sudden expansion to the North. By 2004 European bison had occupied the entire territory of southern part of the reserve except few isolated forest patches in the north-east. Area of the territory occupied by European bison was the largest in 2004 (119 sq. km) because the animals actively travelled out of the reserve to the area of Orel region (Fig. 1). In 2007 the area occupied by the animals was 95 sq. km. The reason of this reduction is that the animals didn't visit the southern part of Orel region. The European bison moved rather towards Kaluga region: single bulls began crossing northern border of the southern part of the reserve in 2006.

Spatial distribution of European bison should be considered in two periods: with snow cover and without. This division is due to the fact of additional feeding in a specially equipped feeding site given to animals in time of cold weather and snow cover. The results for 2005–2007 showed that the spatial distribution of the bison group didn't change between the seasons, but rather depended on weather conditions.

Snowy period. With the appearance of snow cover and cold weather the entire herd move to the artificial feeding site. But in 2006 adult males began to ignore feeding site. In warm winter with low snow cover all animals widely

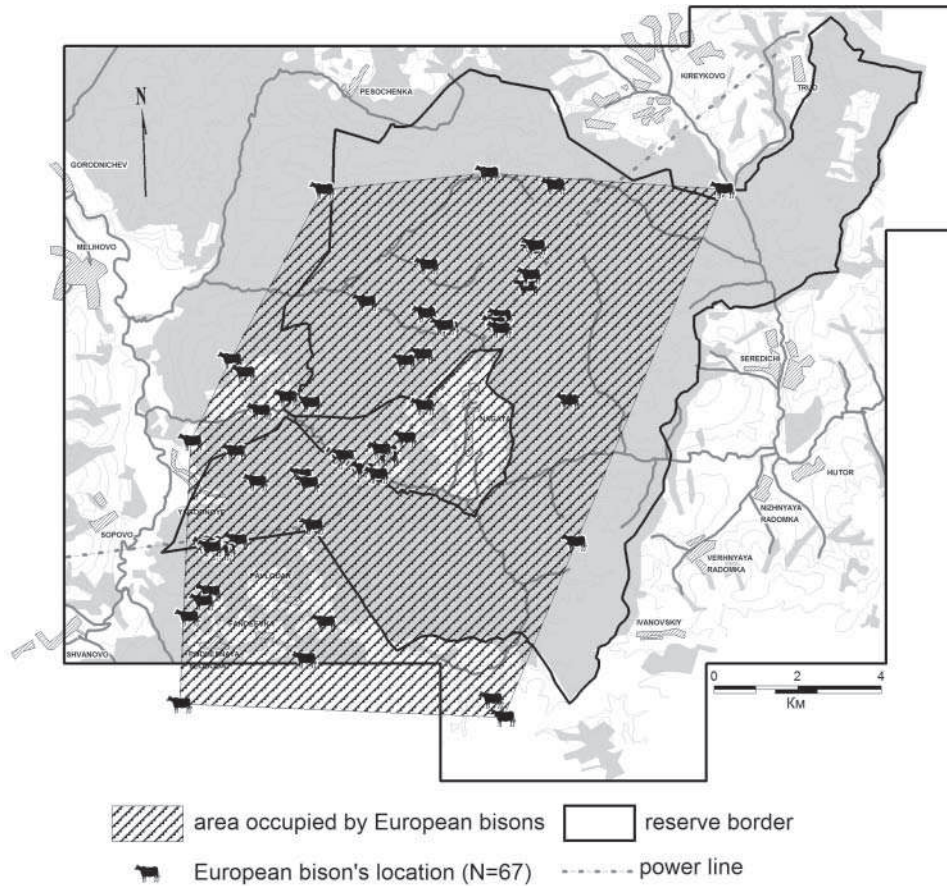


Figure 1. Area occupied by European bison during 2004

used the whole territory. In winter European bison moved along river valleys and ravine systems around the artificial feeding site. The preference for this type of area is probably connected with easy accession of the willow and euonymus.

Snowless period. In snowless period adult and immature males kept away from the female part of the herd and moved randomly over southern part of the reserve. It has been found that dynamics of spatial distribution of mixed groups during the last three years. After snow melting in spring European bison crossed the southern border of the reserve and went to the fields in Orel region. It seems to be due to an early vegetation in this area. When summer comes all animals go back to the woodland of the reserve (Fig. 2). The reason for such moving is the wider spectrum of suitable food resources in broad-leaved forests and in flood-lands. Furthermore animals can save themselves from sanguivorous insects there. But the main reason is the

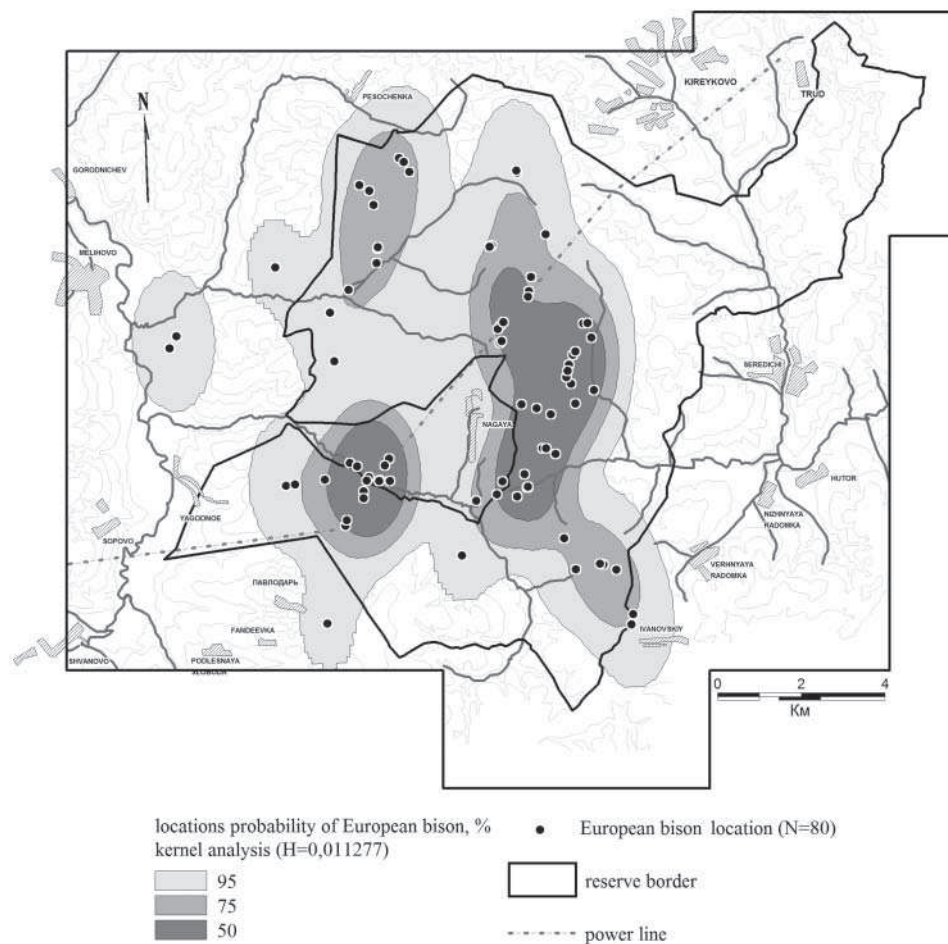


Figure 2. Spatial distribution of European bison in snowless period of 2006

availability of places suitable for calving. During summer cows with calves move along ravines in the eastern part of the southern area of the reserve to the north and then to the west. In autumn European bison (both cows and bulls) cross the western border of the reserve and move to the flood-lands of Vytebet river and its right tributary Dubenka river. Vegetation period is longer there. When the cold weather comes the cows with calves spend the most part of their time in the flood-lands of Dubenka river adjacent to the artificial feeding site. Thus the group of European bison that lives in Kaluzhskie Zaseki Nature Reserve has a well-defined seasonal cycle of space usage.

With the increase population size up to 30 animals the female part of the herd showed tendency to divide into two subgroups during snowless period of 2007. Two subgroups used different wide ravine systems during the period between May and September. The two subgroups joined in the end of

September on the area of the flood-lands of Dubenka river not far from the artificial feeding site. The split of the herd that occurred when size of the group came to 30 corresponds with cited studies (Kashtalyan, Medvedev 2007).

Conclusion

When forming a free-ranging group of European bison in Kaluzhskie Zaseki Nature Reserve the following features of using the area can be derived.

1. The frequency of visits to the agricultural lands decreases gradually.
2. In snowless period adult bulls and cows with cubs live separately.
3. Single adult males undertake long distance migrations far away from the group range.
4. Space use of cows and calves has a cyclic character.
5. When population increases the female part of the herd splits in snowless period.

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