

Formation of the free-ranging population of European bison (*Bison bonasus*) "Volozhinskaya"

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Abstract: The process of formation of free-ranging population of the European bison "Volozhinskaya" has been analyzed. Its numbers has grown from 15 to 79 in 17 years, an average annual growth is 10.7%, the home range in winter is 70 sq. km, in summer it increases to 400 sq. km and covers almost all forest area of Nalibokskaya Pushcha. The available habitat consists of flood plains overgrown with sedges in birch woods, alder and mixed spruce-deciduous forests, and especially hay meadows mainly situated along rivers: Volka, Sivichanka, Kamenka and Izled. Woody vegetation (pine, birch, buckthorn and spruce) dominates in the diet during snowy winters (over 64%). Hay, grains and root plants are used for supplemental feeding.

Key words: European bison, quantity, growth, habitat, nutrition

Introduction

European bison belong to the rarest mammal species. It is listed in the IUCN Red List and Red Books of the countries where these animals live. There were in total 2956 E. bison in 2001 in the world, which lived in 37 countries of Europe, Asia and America (Raczyński 2001). Belarus has made an important contribution to E. bison breeding, an increase of species' numbers, and extension of its home range. The first stage of "The program for conservation, distribution and management of European bison in Belarus" was realized in 1994–2000 (Kozlo 1999). Six new centers for free-ranging herds were created. Due to legislative rules, depending on habitat, bison populations have binary status – species' main (insurance) gene pool for populations living in reserves and national parks and reserve gene pool – for populations living within unprotected areas. These measures assured a stable growth of E. bison population in Belarus – from 347 in 1994 to 934 individuals in 2010. Several years ago, Belarus took the second place (after Poland) in the world regarding E. bison numbers in the country.

Current numbers of E. bison allow to switch the focus from an increment of population size towards formation of its quality. Such direction requires an

application of complex technology allowing for purposeful selection. In such way should be possible to reach stable size of present populations, an optimisation of their demographical and sex structure, and to obtain maximal reproductive potential. According to Kozlo and Bunevich (2009), some 60% of annual increment could be eliminated from fully formed populations, that are ecologically balanced and have reached economically desired numbers.

In February 1994, following scientific recommendation, 15 E. bison were brought from "Belovezhskaya Pushcha" national park to the territory of Nalibokskaya Pushcha. This initial group included 5 males at the age of 1.5–6 years and 10 females at the age of 2–8 years.

Study area

The study was performed in a large continuous forest – Nalibokskaya Pushcha (54°00'N, 26°30'E) on its population of E. bison. Nalibokskaya Pushcha is situated in the basin of right confluent of river Neman – Berezina and Usa. Its area is about 1400 sq. km within eastern-most parts of Verchneniomanskaya plain. The terrain is rolling with dune and starved hills and waterlogged depressions. Forests consist mainly of coniferous species (70% of whole area), 30% of them are a young forest. Dominating are pines (48%), spruce (22%), and birch (20%), alder forests are respectively rare. Aspen make some 3% of stands and oak about 1%. Forests stands are intensively managed and with quite rich and diverse ground flora and undergrowth.

As a result of drainage of the forest developed in 1971–1975, former wetlands became accessible for ungulates. Peat was exploited in the 1970s at the area of 5 sq. km. At present, herbage is well developed at this territory, the process of overgrowing by lignose and bush vegetation takes place. Considerable proportion of this area is used as natural hayfields willingly visited by the bison.

Materials and methods

Data collection at the territory of Nalibokskaya Pushcha began in 2002, as a part of the annual monitoring of ungulates. Estimated were numbers, reproductive and death rates, home range snowless and snowy periods of the year for Volozhinskaya population of E. bison. Data collected in the field was supplemented and verified by the information received from the foresters.

To study of the European bison diet during snowy period tracking method was used. This method is a standard and is widely used in studies on ungulates (Dunin, Kozlo 1992). During tracking a direction of animals' movements and distance were determined. All measurements were made with GPS-receiver. In this way, the length of trails covered daily by animals during movements and foraging, a quantity and species of damaged trees and shrubs, traces of

consumed other plant species, quantity of excrements, frequency of urinations and number of resting places, were recorded. During the evaluation of the diet, over 540 plants were found to be damaged by the bison. Digitalised data were processed with software packages Ozi Explorer, MapInfo, Statistica.

Results and discussion

In 1994, introduced bison were kept for two months in an enclosure. The main part of the herd stayed nearby after the release. Gradually, single individuals and small groups moved away from the enclosure. By 2004, the area penetrated by bison was about 300 sq. km, i.e. the major part of Rumskoeye, Pershajskoeye, Ivenetskoeye and Kamenskoye forest areas of Volozhynsky forestry.

Nowadays (2011) the area of winter home range is about 70 sq. km, and in vegetative season – 400 sq. km (Fig. 1). Population density is 1,1 and 0,2 individuals per sq. km respectively. Some places of bison concentration could be determined during snowy season. The main division of the herd into 2 groups took place in 2000.

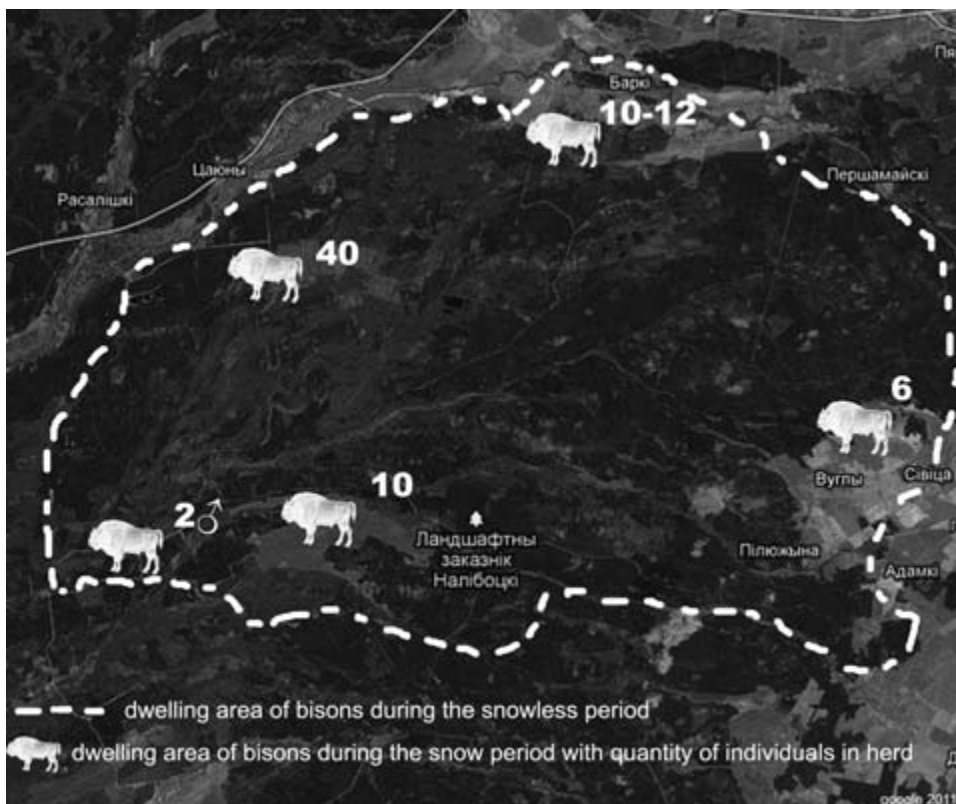


Figure 1. Home ranges of Volozhynskaya population of E. bison in vegetative and winter seasons

Table 1. Numbers and population dynamics in Volozhinskaya population of European bison.

Year	Total numbers	Calves below 1 year	Increment [%]	Birth rate [%]
1994	15	6		20,0
1995	17	3	13,3	17,6
1996	19	6	11,8	31,6
1997	24	5	26,3	20,8
1998	28	7	16,7	25,0
1999	37	6	32,1	16,2
2000	39	5	5,4	12,8
2001	44	8	12,8	18,2
2002	46	6	4,5	15,2
2003	46	7	0,0	13,0
2004	53	8	15,2	15,1
2005	56	5	5,7	8,9
2006	54	7	-3,6	13,0
2007	60	7	11,1	11,7
2008	67	7	11,7	10,4
2009	63	5	-6,0	7,9
2010	76	13	20,6	17,1
2011	79	4	3,9	5,1

The main herd (about 40 individuals) remains not far from introduction site, and additional feeding place at hayfields in Tyakovo tract. Herd consisting of 10–12 animals including sexually mature females and juvenile males, which separated from one of the two herds existing in 2003, lives at the meadows, bordering the forest complex not far from villages Belokorets and Borki. Six adult males live at fields between villages Sivitsa and Ugly. About 15 bison stay at hayfields near farm Kozliky. Some single individuals, mainly males at the age of 10 years or more, which from time to time separate from main herds, are observed in clear cuts and in undergrowth, where there is sufficient amount of browse. Bison home range enlarges in summer season to river Izled from the south, river Isloch from the west and the north and up to the end of the forest complex – Nalibokskaya Pushcha from the east. The farthest distance from the enclosure, where bison are provided with supplemental food is about 15 km.

As a result of monitoring the Volozhinskaya population it was found, that 72 calves were born during 1994–2005 (Tabl. 1). Calving takes place mainly in May. Calves were born in the enclosure on May 19th, 23th, 24th and 26th 1994.

Average annual recruitment during that time was 6.5 calves, the maximum (8) was recorded in 2001 and 2004. Reproductive rate expressed as the proportion of calves to the population number was on average 16.5% and fertility rate (a ratio of calves born to fertile females) in changed between 27% and 46.6%. These numbers are little higher than in source population of Belovezhskaya Pushcha, but lower than in the Polish population (Kraśiński, Bunevich, Kraśińska 1994; Krasochko et al. 2004). Including natural mortality and elimination of defective (old, sick, injured) bison, annual growth of this population changed between 0–32% (10.7% on average).

Until 2005, losses of animals for Volozhynskaya population amounted to 33 individuals. For example, in December 1994, 3-year old male has been killed by poachers, and in September 2 adult males emigrated in a direction of Lithuania. In 1996, 2 new adult males coming from the north were recorded. In February 1997, one of those males has been mortally injured. Else, under the available data, one late born (on November 22nd) calf at the age of 5 days, 7 males at the age from 2 – 5 years and 2 females have died of various illnesses. The reasons of mortality were: disease of respiratory system, severe cold, poaching, emigration. Eliminated were 17 individuals considered to be unsuitable for reproduction.

Since spring to midsummer, basic habitats used for foraging were cultivated hay meadows situated close to the forest, while in the autumn and in the winter – tree stands with lush undergrowth and underbrush, situated at the perimeter of home range. During the autumn period bison make use of natural forages growing in fresh and moist types of the forest, where their quality remains longer than at open spaces. The basic habitats for bison foraging were however open grounds – the cultivated hay meadows on the area of about 4 sq. km in natural boundary "Tjakovo" and hay meadows along the rivers: Wolf, Sivichanka, Kamenka and Izled. Also important as foraging grounds for bison were birch forests, alder and mixed spruce-deciduous woods.

During the snow period the basic diet of bison consists of browse. On average it makes 64% of consumed food. The most frequently eaten are: pine, birch, buckthorn and spruce. Supplemental food provided to the bison includes hay, grains and root plants.

Highly heterogenic spatial structure of various types of woods, low variability of terrain, and a mosaic of forests and openings, create good cover for bison and adequately secure their food requirements.

Data presented above allow to conclude that efforts towards re-acclimatization of the bison and creation of free ranging Volozhynskaya population were successful. The number of animals in this population has reached an optimal level in relatively short time. Condition of the individuals in this population is good. It allows to change the general direction of management from maximization of population growth towards formation of its qualitative traits. This will require an introduction of proper selection of individuals.

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Utworzenie wolnej populacji żubra "Volozhinskaya"

Streszczenie: Proces kształtowania się wolnej populacji żubra „Volozhinskaya” był obiektem oceny. Populacja wzrosła od 15 osobników do 79 w ciągu 17 lat, a średni przyrost zrealizowany wynosił 10,7%, zajmowany areal zimą to 70 km², latem wzrasta do 400 km² i pokrywa się niemal całkowicie z powierzchnią Puszczy Nalibokskaya. Dostępne siedlisko zawiera zalewowe tereny porośnięte turzycą z drzewostanem złożonym z brzozy, olchy i świerkowo-liściastym, oraz łąki na siano głównie położone wzdłuż rzek: Volka, Sivichanka, Kamenka and Izled. Żer pędowy (sosna, brzoza, kruszyna i świerk) dominuje w diecie zimowej (ponad 64%). Siano, zboże i okopowe są stosowane do dokarmiania.
