

Changes of size and structure of world population of European bison in years 2000–2015

Wanda Olech¹, Kajetan Perzanowski²

¹ Department of Genetics and Animal Breeding, Faculty of Animal Sciences, Warsaw University of Life Sciences – SGGW, Poland

² Museum and Institute of Zoology PAS, Carpathian Wildlife Research Station, Ustrzyki Dolne, Poland

Abstract: Analysed were data on the number of individuals, a number of herds, and proportion of both genetic lines for the end of years 2000, 2005, 2010 and 2015, to verify the implementation of recommendations provided by the Action Plan on 2004. Observed was a dynamic increment of both: numbers of wisent herds (from 221 to 296), and population numbers (from 2793 to 6083). The proportion of individuals in captivity in relation to free ranging and semi free parts of the population dropped from over 41% in 2000 to only 27.5% in 2015. The percentage of wisents belonging to Lowland line in captivity grew up from 25.6 to 32.7% since the year 2000, and in free ranging and semi free herds, individuals belonging to the Lowland line constituted 56.6% in 2000, while now they exceed 61.5% of this part of world population. In that period, decreased by almost 6% the proportion of wisent groups counting <5 animals, and in similar rate increased the percentage of herds >20 individuals.

Key words: wisent, world population, population dynamics, population structure, captivity, free ranging

Introduction

The captive part of the population of European bison is kept in various types of enclosures like breeding centers, zoological gardens or specially created reserves.

In the year 2000, for which the analysis of the captive part of the world population, presented in the Action Plan for the Species (Pucek *et al.* 2004) was performed, indicated was a decrease of the number of centres maintaining wisents in captivity – only 191 (EBPB 2001). By the end of year 2000, only 27% of the world captive population lived in relatively large herds counting at least 25 individuals, but 59% of animals were kept in herds of up to 10 animals (EBPB 2001). Important was also that at that time, almost one fourth of enclosures (23%) kept just a single animal. Moreover, during the 90. a dramatic decrease in the numbers of captive population regarding both herds and animals has been observed (Pucek *et al.* 2004).

According to analyzed data from year 2000, captive herds of European bison were well distributed in 30 countries, but most of the herds kept the Lowland-Caucasian line (LC) animals (148 herds), 22 only the Lowland line (16 in Poland), and 21 were with animals representing both lines. In captivity, the proportion of Lardland (LB) line was then very low (25,6%). There were at that time only 295 animals of LB line and 858 representing LC line.

At the end of year 2000, there were 28 free living herds, and 2 semi-free in large enclosures (EBPB 2001). From those 30 populations, 14 belonged to Lowland line with 931 animals, and the rest consisted of LC line animals, 714 in total.

In the Action Plan of 2004, there were included certain recommendations, important to secure the future of the species. As very important was regarded an increment of the number of herds, as well as the total population size, through creation of free living semi-free or large captive herds.

For captive breeding, important are: (a) a separation between the existing breeding lines, i.e., between the pure Lowland bison and the Lowland-Caucasian line, which is particularly significant for preserving the genetic variability of the latter one, (b) an increment of the number of Lowland line animals in captivity.

For free living part of world population it is important to increase the number of Lowland-Caucasian herds and increase the genetic variability within free living herds, through releases of captive born animals, bearing genes of genetically important ancestors.

Material and methods

In this work, on the basis of records in European Bison Pedigree Book (EBPB 2001; 2006; 2011; 2016), analysed were data on the number of individuals, a number of herds, and proportion of both genetic lines for the end of years 2000, 2005, 2010 and 2015 to verify, whether recommendations provided by the Action Plan on 2004 are implemented.

Results

A number of wisent herds grew dynamically (by 50%) in last 15 years. Recently, established were many semi free herds (now there are 15 of them), requiring large fenced areas. Such conditions are comfortable for a gregarious animal like the wisent. Worth to notice, is the change in the percentage of captive herds that maintain simultaneously individuals representing both lines. In the year 2000 there were 21 such herds out of the total number 191 (11%), while already in 2005 their proportion was 9.6%, in 2010 6.4% and only 3.7% in the year 2015 (Tabl. 1). This is a result of implementation of practical recommendations for the breeding program, and dissemination of those information within the network of European Bison Conservation Center.

Table 1. A number of wisent herds (captive, semi free and free ranging) in years 2000, 2005, 2010 and 2015 (EBPB 2001; 2006; 2011; 2016)

Year/ Line	Captive				Semi free			Free ranging			Total
	LB	LC	mix	total	LB	LC	total	LB	LC	total	
2000	22	148	21	191	1	1	2	13	15	28	221
2005	32	154	20	208	1	1	2	13	17	30	240
2010	41	164	14	219	3	4	7	12	21	33	259
2015	64	169	9	242	6	9	15	13	26	39	296

Also the total number of individuals almost doubled between 2005 and 2015, with total numbers of world population exceeding now 6 thousand. Especially visible is an increment of wisent numbers in semi free herds (by fourfold), which perhaps reflects a chance for a compromise between the need to increase a number of herds, and actual possibilities to maintain wisents in anthropogenically transformed environment (Tabl. 2).

Table 2. Numbers of individuals in three types of wisent herds (captive, semi free and free ranging) in years 2000, 2005, 2010 i 2015 (EBPB 2001; 2006; 2011; 2016)

Year/ Line	Captive			Semi free			Free ranging			Total
	LB	LC	total	LB	LC	total	LB	LC	total	
2000	295	858	1153	15	11	26	916	703	1619	2798
2005	322	979	1301	37	14	51	1279	832	2111	3463
2010	403	1071	1474	98	89	187	1782	994	2776	4437
2015	547	1127	1674	172	228	400	2543	1466	4009	6083

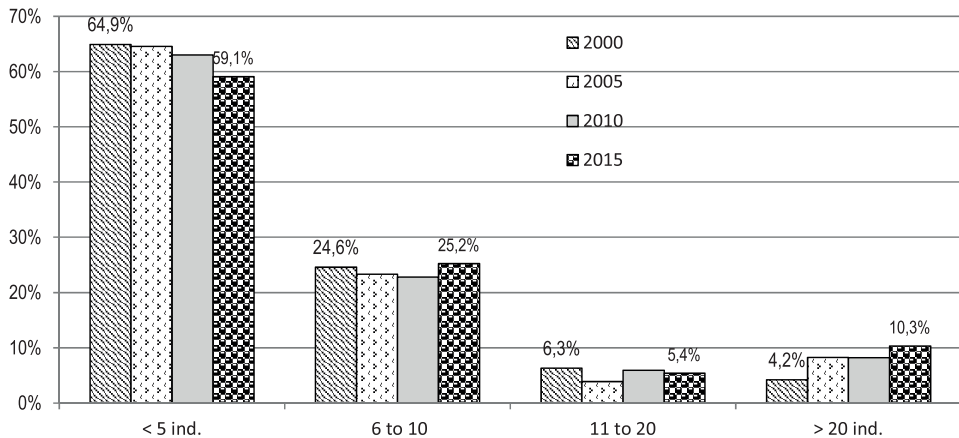
The rate of population growth was different in both lines bred in captivity. Between the year 2000 and 2015, the numbers of Lowland line grew by 185% while the Lowland – Caucasian line by 131%. Also the number of herds where both lines were kept simultaneously, dropped down from 21 to 9. This indicates that isolation of both lines was maintained (Olech *et al.* 2008), and followed was the recommendation regarding an increase of the Lowland line in captivity (Tabl. 2).

Free ranging populations increased in a different way. In the year 2000, they existed only in five countries i.e. Belarus, Lithuania, Poland, Russia and Ukraine. By 2015, additional herds were established in Germany, Slovakia and Romania, so now there are eight European countries with free ranging wisents (Kraśnińska *et al.* 2014). An increment of the Lowland line in freedom during those 15 years equalled to 278%, while the Lowland – Caucasian line to 208% (Tabl. 2).

Table 3. The number of herds and numbers of animals in particular size categories of captive wisent herds.

Size of captive herd							
< 5 individuals		6 to 10 individuals		11 to 20 individuals		> 20 individuals	
herds	animals	herds	animals	herds	animals	herds	animals
124	346	47	340	12	156	8	311
133	397	48	344	8	104	17	456
138	420	50	366	13	165	18	523
143	398	61	452	13	163	25	661

During analysed period (2000–2015) noticeable is very positive decrease of the proportion of the number of small herds that maintain up to 5 animals (from 64.9 to 59.1%), and over twofold increase of the percentage of relatively large herds (>20 animals) from 4.2 to 10.3% (Fig. 1; Tabl. 3).

**Figure 1.** Changes in the size of wisent groups maintained in captivity between years 2000 and 2015

Not only the number of small herds dwindled over those 15 analysed years, but as well the number of animals in such small herds became significantly lower, while the number of individuals forming relatively large herds is now considerably larger (Fig. 2). However the average size – 2.7 individuals, of the smallest herds (up to 5 individuals) has remained stable over this period of time (Tabl. 3).

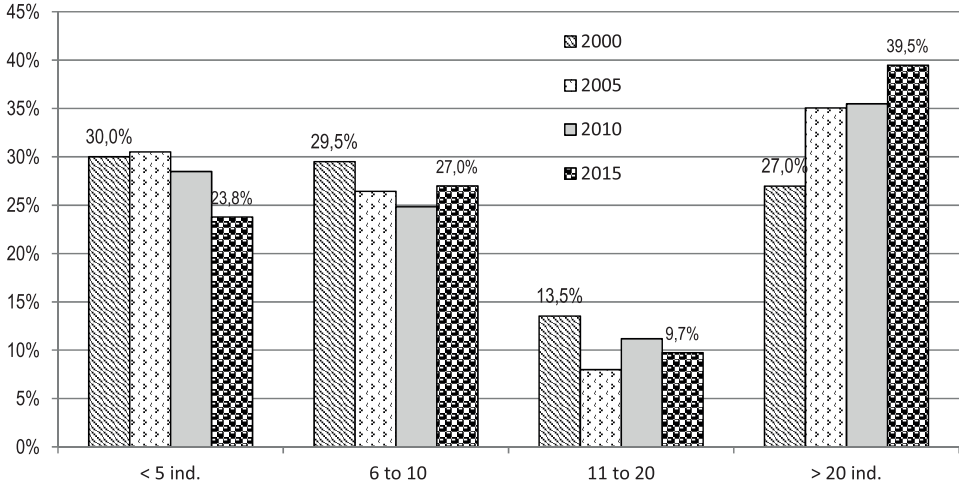


Figure 2. Changes in the numbers of animals forming four various size categories of wisent herds over the period: 2000–2015.

Conclusions

World population of wisents grows dynamically, and by 2015 it exceeded 6 thousand of individuals. Simultaneously, decreased the proportion of individuals in captivity in relation to free ranging and semi free parts of the population. In the year 2000, this proportion was over 41%, while in 2015 it dwindled to only 27.5%. This is very positive trend indicating the development of the population towards large herds in free ranging and semi free herds. Wisents being gregarious animals, have a tendency for forming herds of even 40 individuals. Therefore in captivity, preferable are herds exceeding 20 wisents, which fulfil all social requirements of that species. Changed became also the proportion between numbers of wisents belonging to Lowland and Lowland-Caucasian line. Especially in captivity it grew up from 25.6 to 32.7% since the year 2000. At the same time, there were changes in that proportion in free ranging and semi free ranging herds. In 2000, individuals belonging to the Lowland line constituted 56.6%, while now they exceed 61.5% of this part of world population. The trend of those changes does not follow recommendations of the Action Plan, though it is an effect of active protection of wisents in Poland and Belarus. In both those countries, a population of Lowland line wisents in freedom, grows up every year.

References

- Krasińska M., Krasiński Z., Olech W., Perzanowski K. 2014. European bison. In: Ecology, evolution and behaviour of wild cattle: implications for conservation (ed. M. Meletti, J. Burton) Cambridge University Press: 115–173.
- Olech W., Bielecki W., Bołbot A., Bukowczyk I., Dackiewicz J., Dymnicka M., Hławiczka M., Krasiński Z., Nowak Z., Perzanowski K., Raczyński J., Tęšiorowski W., Wyrobek K. 2008. Hodowla żubrów – poradnik utrzymania w niewoli. Stowarzyszenie Miłośników Żubrów, pp: 1–100.
- Olech W., Perzanowski K. (eds) 2014. Podręcznik najlepszych praktyk ochrony żubra. Centrum Koordynacji Projektów Środowiskowych, Warszawa, pp. 1–98.
- Pucek Z. (ed), Belousova I.P., Krasińska M., Krasiński Z.A., Olech W. 2004. European bison. Status Survey and Conservation Action Plan. IUCN Gland, Switzerland and Cambridge, UK: 1–55.
- Raczyński J., Bołbot M. 2001. European Bison Pedigree Book 2000. Białowieża National Park, Białowieża, pp.1–59.
- Raczyński J., Bołbot M. 2006. European Bison Pedigree Book 2005. Białowieża National Park, Białowieża, pp.1–63.
- Raczyński J., Bołbot M. 2011. European Bison Pedigree Book 2010. Białowieża National Park, Białowieża, pp.1–71.
- Raczyński J., Bołbot M. 2016. European Bison Pedigree Book 2015. Białowieża National Park, Białowieża, pp.1–78

Zmiany wielkości i struktury światowej populacji żubra w latach 2000–2015

Streszczenie: Przeanalizowano dane o liczbie i rodzaju stad żubra, ich liczebności oraz proporcji osobników należących do dwóch linii genetycznych w latach 2000–2015, w celu zweryfikowania w jakim stopniu wdrożone zostały rekomendacje zawarte w Planie Działań dla gatunku, wydanym przez Międzynarodową Unię Ochrony Przyrody w 2004 roku. W badanym okresie obserwowany jest stały wzrost liczby stad (od 221 do 296) oraz wielkości populacji gatunku (od 2793 do 6083). Proporcja żubrów utrzymywanych w niewoli w stosunku do populacji wolnych lub półwolnych zmniejszyła się od ponad 41% do jedynie 27,5% w roku 2015. Udział żubrów linii nizinnej w stadach w niewoli wzrósł od roku 2000 z 25,6 do 32,7% zgodnie z zaleceniami. Jednocześnie udział tej linii genetycznej w populacjach wolnych i półwolnych również uległ zwiększeniu od 56,6% w 2000 roku do 61,5 na koniec 2015 roku, pomimo przeciwnych rekomendacji. W tym okresie udział stad małych, liczących do 5 osobników, zmniejszył się o około 6%, przy czym stada duże, w których utrzymywane jest ponad 20 żubrów zwiększyły swój udział.
