

FREE-RANGING BISON (*BISON BONASUS* L.) MANAGEMENT IN POLAND IN THE YEARS 1997-2000

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Abstract. The objective of the present study was to describe the management of free-ranging bison in Poland, on the basis of four populations of the lowland bison (Białowieża Primeval Forest, Borecka Primeval Forest, Knyszyńska Primeval Forest, Forest Division Walcz) and one population of the highland or Białowieża-Caucasus bison (Bieszczady Mountains). The analysis concerned their sex structure, herd size, and population dynamics in the years 1997-2000.

Key words: open bison breeding stations, herd, lowland bison, population parameters, habitat types

INTRODUCTION

In the 15th c. the bison's range covered almost all Western and Central Europe. In the 19th c. the last remaining bison herds existed only in protected hunting preserves in the Białowieża Primeval Forest and Caucasus [Kraśiński 1978]. The history of the Caucasus bison dates back to the 17th c. In the 19th and 20th c. their population consisted of about 1,000 animals. In 1910 this number dropped to 600, and ten years later only 50 Caucasus bison existed. They became extinct in 1927 [Kraśiński 1978, Pucek 1993] or 1926 [Olech 1998].

The lowland bison lived for the longest time under natural conditions in the Białowieża Primeval Forest. There were over 720 bison in this Forest before the First World War, but almost the entire herd became extinct during the War [Bereszyński 1995]. The last lowland bison was shot in Poland in 1919 [Bereszyński 1995, Kraśiński 1994, Pucek 1993]. However, this subspecies survived in the zoos and preserved in several European countries. According to Bereszyński [1995], Kraśiński [1978] and Olech [1998], a list of bison compiled in 1924 shows that only 66 animals survived in the zoos and private holdings in 7 countries. Only six of them survived in Poland,

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in Pszczyna and the Poznań Zoo. After the Second World War Polish forest complexes were divided into two zones: the lowlands were designed for the breeding and restitution of the pure Białowieża lineage, and the Bieszczady Mountains – of the hybrid Białowieża-Caucasus lineage.

Today free-ranging bison are managed in five geographical regions of Poland, i.e. the Białowieża Primeval Forest (reintroduction in 1952), the Borecka Primeval Forest (since 1962), the Bieszczady Mountains (since 1963), the Knyszyńska Primeval Forest (since 1973) and the Waleckie Forests in the former Piła Province (since 1980) [European Bison 2004].

The objective of the present study was to describe the management of free-ranging lowland and Białowieża-Caucasus bison in Poland, from 1997 to March 2000, and to characterize selected population parameters.

MATERIALS AND METHODS

The experimental materials comprised the populations of the lowland and Białowieża-Caucasus bison living in Poland. The data presented in the paper concern the period from 1997 to March 31, 2000, and were gathered at four (from among the five existing) open bison breeding stations. The location of free-ranging bison herds is shown in Figure 1. The information on free-ranging Białowieża-Caucasus bison was obtained from four Forest Inspectorates located in the Bieszczady Mountains (Baligród,

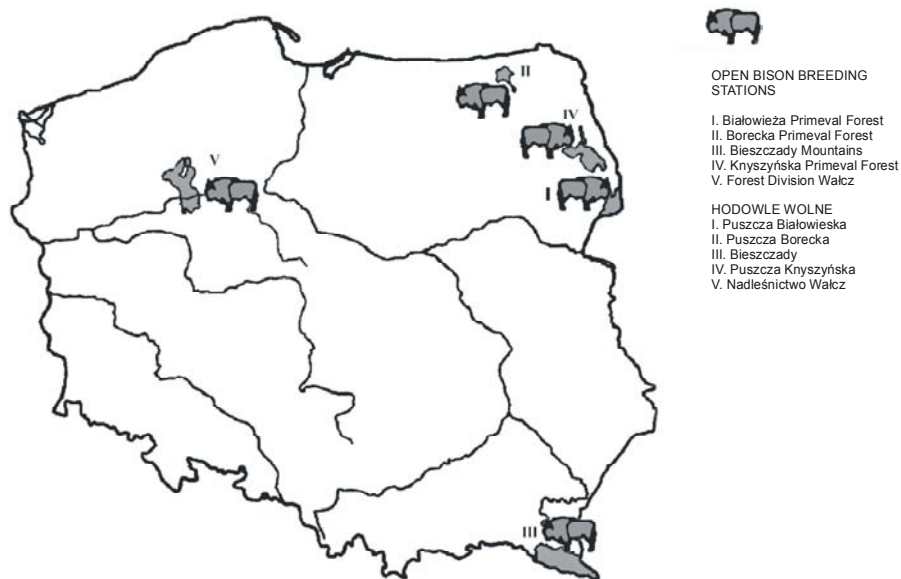


Fig. 1. Location of free-ranging bison herds in Poland
Rys. 1. Położenie wolnych hodowli żubra w Polsce

Brzegi Dolne, Lutowiska, Stuposiany). The material was gathered on the basis of questionnaires drawn up for five free-ranging bison herds. The questions concerned the number of bison and population dynamics at particular stations, age structure of herds, number of calvings per year, bison exchange between stations, mortality rates and causes. Apart from the above questionnaires, the information was also collected during interviews with the employees of the Forest Inspectorate Kruklanki in the Borecka Primeval Forest.

The numerical data concerning bison populations, number of calvings, bison exchange between stations, feeding system, number of bison shot and culled, number and size of bull and mixed groups, are given in a tabular form. The fertility rates for the herd living in the Białowieża Primeval Forest were determined separately for the years 1997, 1998 and 1999. They were not calculated for the other herds due to the lack of detailed information.

RESULTS AND DISCUSSION

Characteristics of free-ranging bison herds

Table 1 provides information on the geographical location and areas occupied by particular free-ranging bison herds, and on types of habitats and their percentages in the forest area. The Białowieża Primeval Forest covers the largest area among all open bison breeding stations in Poland, and the Forest Division Wałcz – the smallest. The lowland bison's range covers the following habitat types: mixed, fresh forest, mixed humid forest and mixed fresh coniferous forest. The Białowieża-Caucasus bison roam in woodland areas, with mountain forests as the dominant habitat.

Table 1. Geographical location, area and habitat types of Open Bison Breeding Stations in Poland
Tabela 1. Położenie geograficzne, powierzchnia wolnych hodowli żubrów w Polsce oraz typy siedliskowe na ich obszarach

Location Lokalizacja hodowli	Geographical position Położenie geograficzne	Area, km ² Powierzchnia, km ²	Percentages of habitat types in the forest area Procentowy udział typów siedliskowych w powierzchni leśnej
1	2	3	4
Białowieża Primeval Forest Puszcza Białowieska	north-eastern Poland, Podlasie Province; two rivers flow through the Polish part of the Białowieża Primeval Forest: Narewka and Lesna znajduje się w północno-wschodniej części Polski, w województwie podlaskim; przez polską część Puszczy przepływają dwie rzeki: Narewka i Leśna	area of the Polish part of the Białowieża Primeval Forest is 565 km ² , including 542 km ² of forests, 32 km ² of meadows and waters powierzchnia polskiej części puszczy wynosi 565 km ² , w tym: 542 km ² stanowią lasy, 32 km ² łąki i wody	LMśw and LMw – 54.5% BMśw – 42.5% BMw – 3.0%

1	2	3	4
Borecka Primeval Forest Puszcza Borecka	north-eastern Poland, Elk Lakeland, Warmia and Mazury Province położona w północno-wschodniej Polsce na obszarze Pojezierza Elckiego, w województwie warmińsko-mazurskim	total area of the Borecka Primeval Forest is 220 km ² , including 170 km ² of forests ogólna powierzchnia Puszczy wynosi 220 km ² , w tym 170 km ² stanowią lasy	LMśw – 90% BMśw and Lł – 10%
Knyszyńska Primeval Forest Puszcza Knyszyńska	north-east of the city of Białystok; two rivers flow through the Knyszyńska Primeval Forest: Supraśl and its tributary Sokołda położona na północny-wschód od Białegostoku; przez Puszcę przepływa rzeka Supraśl i jej dopływ Sokołda	120 km ² zajmuje obszar 120 km ²	BMśw – 60% LMśw – 10% Lw, Lśw, LMw – 30%
Forest Division Wałcz Nadleśnictwo Wałcz	Wielkopolska Province, former Piła Province, west of the city of Piła położone w województwie wielkopolskim, w byłym województwie pilskim, na zachód od Piły	89 km ² , including 82 km ² of forests powierzchnia 89 km ² , w tym 82 km ² stanowią lasy	Bśw – 40%, BMśw – 33%, BMw, Bmb – 3%, LMśw – 15%, Lśw, Lł – 3%, LMw, Lmb, Lw – 2%, Ols, OIj – 4%
Bieszczady Mountains – Bieszczady			
Forest Division Baligród Nadleśnictwo Baligród	Podkarpacie Province województwo podkarpackie	5 200 ha, including 4 500 ha of forests, 700 ha of fields and 2 ha of waters powierzchnia 5 200 ha, w tym lasy – 4 500 ha, pola – 700 ha, wody – 2 ha	LG – 99% Lł – 1%
Forest Division Brzegi Dolne Nadleśnictwo Brzegi Dolne	Podkarpacie Province województwo podkarpackie	7 560 ha, including 4 990 ha of forests, and 2 570 ha of fields powierzchnia 7 560 ha, w tym: lasy – 4 990 ha, pola – 2 570 ha	LG – 100%
Forest Division Lutowska Nadleśnictwo Lutowska	Podkarpacie Province województwo podkarpackie	5 100 ha powierzchnia 5 100 ha	LG – 85% Lł – 15%
Forest Division Stuposiany Nadleśnictwo Stuposiany	Podkarpacie Province województwo podkarpackie	9558 ha, including 9153 ha of forests, 405 ha of fields powierzchnia 9558 ha, w tym: lasy – 9153 ha, pola – 405 ha	LG – 99% Lł – 1%

Note: habitat types as in the forest management specification.
Uwaga: typy siedliskowe lasu przyjęte w operatach urzędzeniowych.

Bison population dynamics in the years 1997-2000

The precise number of animals, as well as their age and sex structure, are difficult to determine for free-ranging bison, because they usually form several groups wandering over the area [Kraśński 1978]. The population size was estimated on the basis of annual observations (the Bieszczady Mountains, the Knyszyńska Primeval Forest and Forest Division Wałcz), or direct counting in winter or spring, when bison gather around feeding racks (the Białowieża Primeval Forest and the Bieszczady Mountains). In the Borecka Primeval Forest the animals are counted twice a year: in March and October.

The number of sex structure of free-ranging bison are given in Table 2. Due to the lack of necessary data, it was impossible to determine the precise number of bison, with division into males and females, in the years 1997, 1998 and 1999. However, the data obtained indicated a constant population growth over the experimental period.

Table 2. Number and sex structure of free-ranging bison herds
Tabela 2. Liczba żubrów z podziałem na płeć w hodowlach otwartych

Location Lokalizacja hodowli	Number, animals – Liczebność, szt.											
	1997			1998			1999			2000 (31.03)		
	r-m total	♂	♀	r-m total	♂	♀	r-m total	♂	♀	r-m total	♂	♀
Białowieża Primeval Forest Puszcza Białowieża	290	117	173	298	117	181	311	123	188	311	123	188
		1♂ : 1.48♀			1♂ : 1.55♀			1♂ : 1.53♀			1♂ : 1.53♀	
Borecka Primeval Forest Puszcza Borecka	58	24	34	57	27	30	40	19	21	48	24	24
		1♂ : 1.42♀			1♂ : 1.11♀			1♂ : 1.11♀			1♂ : 1♀	
Knyszyńska Primeval Forest Puszcza Knyszyńska	14	*	*	*	*	*	*	*	*	14	6	8
Forest Division Wałcz Nadleśnictwo Wałcz	13	*	*	*	*	*	25	*	*	25	*	*
Bieszczady Mountains – Bieszczady												
Forest Division Baligród Nadleśnictwo Baligród	26	*	*	36	*	*	42	*	*	49	21	28
Forest Division Brzegi Dolne Nadleśnictwo Brzegi Dolne	19	8	11	24	9	15	27	10	17	16	4	12
Forest Division Lutowska Nadleśnictwo Lutowska	42	*	*	58	*	*	70	*	*	69	*	*
Forest Division Stuposiany Nadleśnictwo Stuposiany	16	6	10	30	9	21	35	10	25	28	7	21
Total Razem	478	155	228	503	162	247	522	162	251	560	185	281
		1♂ : 1.47♀			1♂ : 1.52♀			1♂ : 1.55♀			1♂ : 1.52♀	

*No detailed information.

*Brak dokładnych informacji.

The results of analysis show that on March 31, 2000, the population of free-ranging bison consisted of 560 animals. The largest herds live in the Białowieża Primeval Forest (311 bison), Bieszczady Mountains (162 bison) and Borecka Primeval Forest (48 bison). The bison of these herds usually form several groups in summer. The numbers of mixed and bull groups are changing throughout the season [Kraśiński and Kraśińska 1994]. According to the information collected, the average size of mixed groups is 13 animals, and of bull groups – 2 only. The employees of the Forest Inspectorates Borki-Walisko and Czerwony Dwór in the Borecka Primeval Forest had no detailed information on herd structure in summer. According to their observations, in spring mostly bulls occupy the Forest Division Czerwony Dwór. In March 2000 it was one herd, consisting of about 15 animals.

The Białowieża-Caucasus bison are managed separately and kept isolated from the lowland bison. They live in the Bieszczady Mountains, in the following Forest Divisions: Baligród (where they migrated from the Forest Division Komancza), Brzegi Dolne, Lutowiska and Stuposiany. They can be also periodically found in the Bieszczady National Park. The herds in the Bieszczady Mountains form several groups, often met also in the neighboring forest divisions. The bison are counted in particular forest divisions once a year only (usually in March), but due to their frequent migrations their numbers vary considerably from year to year. Therefore, it is difficult to determine the precise number of calvings, age and sex structure or size of mixed and bull groups. Despite these problems we managed to gather some data on the number and size of particular groups (Table 3). Cows were present in larger groups (4 to 18 animals), and bulls – in smaller ones (2 to 10 animals). These observations were made in the Forest Divisions Baligród and Brzegi Dolne.

Table 3. Number of mixed and bull groups in the Bieszczady Mountains

Tabela 3. Liczebność grup mieszanych i grup byków w Bieszczadach

Forest Division Nadleśnictwo	Number and size of mixed groups, animals Liczba i wielkość grup mieszanych, szt.				Number and size of bull groups, animals Liczba i wielkość grup byków, szt.			
	1997	1998	1999	until 31.03 2000	1997	1998	1999	until 31.03 2000
Baligród	***	***	***	I* – 4** II – 17 III – 18	***	***	***	I – 10
Brzegi Dolne	***	I – 16	I – 12 II – 6 III – 8	I – 12	***	I – 5	I – 2	I – 2 II – 2
Lutowiska	***	***	***	***	***	***	***	***
Stuposiany	***	***	***	***	***	***	***	***

*I-III – groups.

**1-18 – group size, animals.

***No detailed information.

*I-III – poszczególne grupy.

**1-18 – wielkość grup, szt.

***Brak dokładnych informacji.

The bison in the Piła Forests [Bereszyński 2004 a, b] formed, over the period analyzed, one herd migrating between two Forest Divisions: Wałcz and Mirosławiec. Until autumn 1999, only 14 animals of this herd wandered over the Forest Division Wałcz, and in March 2000 the whole herd (25 animals) was observed in this region (Table 2). The reasons why bison usually come back to their home area, especially in winter, are systematic supplemental feeding and calving period.

There is no information on the number and size of mixed and bull groups in the Knyszyńska Primeval Forest in the years 1997-2000.

Over the experimental period the mean male to female ratio was 1:1.5, and varied from 1:1.16 (Borecka Primeval Forest) to 1:1.52 (Białowieża Primeval Forest). At closed bison breedings stations this ratio ranged between 1:2.07 and 1:2.39 [Zalewski et al. 2005 a].

The number of calvings was at a stable level in all free-ranging herds during the years analyzed, and the percentages of male and female calves were similar (Table 4). The most calvings were recorded in the Białowieża Primeval Forest (60, 41 and 52 calves were born there in the years 1997, 1998 and 1999 respectively). The number of breeding bison was also the highest in this area, i.e. 193 animals (70♂ and 123♀) in 1997, 192 animals (68♂ and 124♀) in 1998, and 190 animals (64♂ and 126♀) in 1999.

Table 4. Number of calvings in free-ranging bison herds

Tabela 4. Liczba wycieleń w hodowlach otwartych żubra

Open breeding station Hodowla	1997 animals – szt.			1998 animals – szt.			1999 animals – szt.		
	r-m total	♂	♀	r-m total	♂	♀	r-m total	♂	♀
Białowieża Primeval Forest Puszcza Białowieska	60	31	29	41	20	21	52	24	28
Borecka Primeval Forest Puszcza Borecka	10	5	5	9	5	4	7	4	3
Knyszyńska Primeval Forest Puszcza Knyszyńska	*	*	*	*	*	*	1	*	*
Forest Division Wałcz Nadleśnictwo Wałcz	*	*	*	*	*	*	*	*	*
Bieszczady Mountains – Bieszczady									
Forest Division Baligród Nadleśnictwo Baligród	9	*	*	6	*	*	6	*	*
Forest Division Brzegi Dolne Nadleśnictwo Brzegi Dolne	3	1	2	4	2	2	2	1	1
Forest Division Lutowska Nadleśnictwo Lutowska	*	*	*	*	*	*	*	*	*
Forest Division Stuposiany Nadleśnictwo Stuposiany	10	5	5	9	4	5	9	4	5

*No detailed information.

*Brak dokładnych informacji.

Figure 2 shows the numbers of calves and breeding cows in the Białowieża Primeval Forest in the years 1997-1999. The fertility rates (the ratio between the number of calves born and the number of breeding cows) [Kraśiński and Kraśińska 1994] in the Białowieża Primeval Forest in the years 1997-1999 were quite high, except the year 1998: 48.8% in 1997, 31.1% in 1998, and 41.3% in 1999. In the bison population originating from the Białowieża Primeval Forest mean fertility rate was 50.8% for over 30 years (until 1993) [Kraśiński et al. 1994], and in the years 1992-2001 decreased from 45% to 42% [Daleszczyk and Kraśiński 2004]. In the bison herd living in the Borecka Primeval Forest it was low in 1992 and 1993 – 31.5% and 33.5% respectively [Kraśiński and Kraśińska 1994].

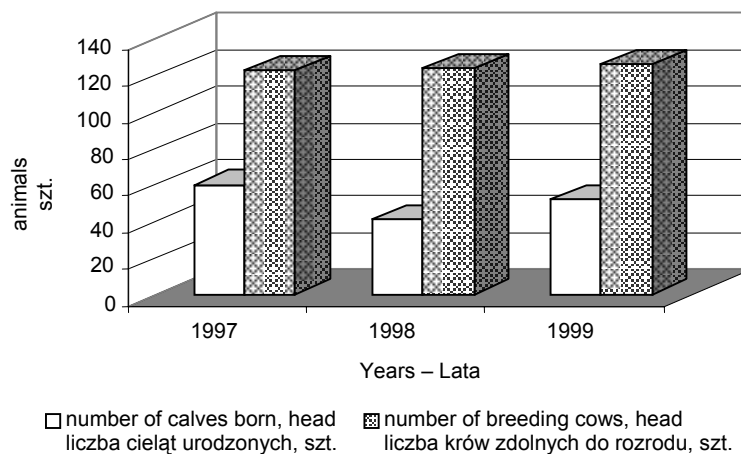


Fig. 2. Numbers of breeding cows and calves born in the Białowieża Primeval Forest in the years 1997-1999
 Rys. 2. Liczba krów zdolnych do rozrodu oraz urodzonych cieląt w Puszczy Białowieskiej w latach 1997-1999

Intensive bison exchange between particular areas was not recorded in free-ranging herds, in contrast to closed breeding stations, where planned breeding policy is pursued. Over the period analyzed not a single animal was transported to or from the Białowieża Primeval Forest, Knyszyńska Primeval Forest, Forest Division Wałcz and Bieszczady Mountains. An exception was the Borecka Primeval Forest, where bison were regularly exchanged, most often brought into from closed breeding stations [Kraśiński and Kraśińska 1994]. In the years 1997-2000 16 animals were transported to the Borecka Primeval Forest:

- 10 (9♂, 1♀) in 1998 from the Bison Breeding Station in Pszczyna,
- 2 (1♂, 1♀) in 1999 from the ZOO in Białystok,
- 2 (2♀) in 1999 from the Bison Breeding Station in Pszczyna,
- 2 (2♂) in 1999 from the Forest Culture Center in Goluchow [Zalewski et al. in press, b].

The bison brought there were in most cases former breeding bulls or animals considered unsuitable for further breeding due to some genetic reasons or individual features. The majority of them were designed for shooting, usually by foreign hunters, as

regulated by law in 1975. Herd size reduction by hunting is currently carried out also in the Forest Division Wałcz [Bereszyński 2004 b]. A total of approx. 130 free-ranging bison were shot in the years 1997-1999 [Zalewski et al. in press].

CONCLUSIONS

The materials collected and analyses made allow to formulate the following conclusions:

1. The Białowieża Primeval Forest covers the largest area among all open bison breeding stations in Poland (a total area of the Polish part of this Forest is 565 km²), and the Forest Division Wałcz – the smallest (89 km²).

2. The number and sex structure of free-ranging bison over the period examined were as follows:

1997 – 383 animals (155♂, 228♀ – i.e. 1♂:1.47♀),

1998 – 409 animals (162♂, 247♀ – i.e. 1♂:1.52♀),

1999 – 413 animals (162♂, 251♀ – i.e. 1♂:1.55♀),

2000 – 466 animals (185♂, 281♀ – i.e. 1♂:1.52♀).

Over the period analyzed, the mean annual number of bison was 417.75, and the mean male to female ratio – 1:1.52.

3. In the Bieszczady Mountains the size of mixed groups was 4 to 18 animals, and of bulls groups – 2 to 10 animals.

4. The fertility rates in the Białowieża Primeval Forest were as follows: 1997 – 48.8%, 1998 – 31.1%, 1999 – 41.3%.

5. Intensive bison exchange between particular areas is not recorded in free-ranging herds, in contrast to closed breeding stations.

6. Herd size reduction by hunting was conducted in the Białowieża Primeval Forest (sanitation shooting) and in the Borecka Primeval Forest (culling), and on a small scale – as reported by Bereszyński [2004 b] – in the Wałcz Forests (sanitation shooting and culling).

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HODOWLE OTWARTE ŻUBRA (*BISON BONASUS* L.) W POLSCE W LATACH 1997-2000

Streszczenie. W niniejszym opracowaniu przedstawiono całościowo hodowlę otwartą żubra w Polsce. Omówiono ją na podstawie czterech populacji żubra nizinnego (Puszcza Białowieska, Puszcza Borecka, Puszcza Knyszyńska, Nadleśnictwo Wałcz) i jednej żubra górskiego, tj. białowiesko-kaukaskiego (Bieszczady). Analizowano strukturę płciową, wielkość grup żubrów i dynamikę liczebności stad żubrów w latach 1997-2000.

Słowa kluczowe: hodowla otwarta, stado, żubr nizinny, wskaźniki populacyjne, typy siedlisk

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