

What next with Pless line of European bison from Pszczyna – a question on the 155th anniversary of restitution and breeding?

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Abstract: The paper presents the results of breeding and protection of European bison from the Pless (Pszczyna) line in the world until 2019 and in Pszczyna-Jankowice center, with particular emphasis on the years 1997–2019, i.e. during the implementation of the breeding program for captive herds in Poland (Olech 1997).

Despite the enormous historical, cultural and natural value of the Pszczyna line, the consistent elimination of animals belonging to this line from the world population is progressing. Until 2019, the European Bison Pedigree Book registered the birth of only 351 (185,166) wisent from the Pszczyna line, which constituted just 2.7% of all individuals recorded in the EBPB. In 2019, only 40 wisents of this line lived in Europe, which constituted 18.1% of individuals in Polish captive herds and 2.3% in the world.

In Pszczyna breeding center the proportion of animals from Pszczyna line in 2019 was only 48.7%. Thus, the breeding potential of the center in Pszczyna is not used to continue the tradition of Pszczyna line breeding, which was one of the aims of the national European bison breeding program (Olech 1997). Established in 2006, the enclosure for Pszczyna line animals does not play any significant role in the preservation of this line and has mainly an educational role. In the years 2006–2019, only 18 wisents of the Pszczyna line were born in this enclosure, which is 14.1% of the total number of animals born in Pszczyna.

The recommended preservation of the Pszczyna line to continue the breeding tradition of Pszczyna (Olech 1997) requires the development and implementation of a special program for saving the genetic diversity and preserving the genes of the Pszczyna line founders. The center in Pszczyna should play a leading role in this program, and all breeding centers and zoos in Silesia as well as selected centers in the country and abroad should participate.

Key words: Pszczyna European bison line, history of breeding and restitution, European bison, European bison breeding center in Pszczyna

Introduction

In autumn 2020, the 155th anniversary of bringing 4 (1.3) wisents from the Białowieśka Forest to Murcki in Upper Silesia has passed. The history of the species shows that this fact had fundamental importance for the protection

of the species and saving it from complete extinction (Parusel 1996; 2004; 2007a, b). To commemorate this anniversary, the results of the European bison breeding in Pszczyna-Jankowice were summarized, with particular emphasis on the Pless (Pszczyna) line. The results of breeding this line in Pszczyna after 1994 are disturbing (Parusel 2004; 2006; 2007; 2015a, b, c, d; 2020a, b).

The directions and rules of European bison breeding in Pszczyna have been defined by the International Society for the Protection of European Bison (Internationale Gesellschaft zur Erhaltung des Wisents). The decision of this Society was presented by Żabiński (1950). It is reflected in the most important document defining the principles of breeding and registration of E. bison, which is the European Bison Pedigree Book. In the first published book (Groeben 1932), 4 breeding lines were identified, including the Pless line. Basing the breeding on lines, among which animals of the Białowieża and Pless lines were considered purebred Lowland E. bison, had been developed earlier (Groeben 1927, 1929).

International and Polish documents regulating the directions and principles of European bison conservation are: the European bison protection strategy developed by the Bison Specialists Group SSC/IUCN (Pucek *et al.* 2004), the national breeding program for captive herds (Olech 1997) and the Strategy for European Bison Protection (*Bison bonasus*) in Poland (Ministerstwo Środowiska 2007).

The paper presents the results of breeding and protection of European bison belonging to Pless line until 2019, with particular emphasis on Pszczyna-Jankowice center and years 1997–2019, i.e. during the implementation of the breeding program for ex situ herds in Poland (Olech 1997).

European bison of Pless line in the world

The Pless (or Pszczyna) line of European bison (PL) is not a separate genetic line. It is a sister line, derived from the Lowland subspecies *Bison bonasus bonasus* (Pucek 1991). Recently, it was separated as its subline (Raczyński and Bołbot 2009, Olech 2015a). However, when the European Bison Pedigree Book was introduced in 1932, it was regarded as separate breeding line (Groeben 1932; Parusel 2015a, b, c). The founders of this line are F42 PLANTA and M45 PLEBEJER (Olech 1989). However, the separation of the Pszczyna line animals had been made earlier, in connection with the decision of the International Society for the Protection of European Bison to prohibit any import of animals to the Pszczyna center (Żabiński 1950). Pursuant to this decision, the Pszczyna nature reserve was recognized as an observation and experimental area for determining the possible degeneration of the European bison trans-

ferred from a free herd. These provisions were respected until 1954, when the foot-and-mouth disease epidemic contributed to the complete liquidation of the Pszczyna herd. The reconstruction of the European bison herd of the Pszczyna line took place in 1964, when 8 (2.6) animals of this line were brought from Białowieża. They were descendants of, among others, individuals from Pszczyna, taken there between 1947–1952 (M575 PLATO, F631 PLARKA, M789 PLAMIEC) (Parusel 1996, 2004).

The current European bison population originates from 17 individuals, whose genes are represented only by 12 founders (Slatis 1960; Olech 1989, 2009; Pucek 1991). Among these 17 individuals there were 8 animals of Pszczyna line (Pucek 1991), and among the founders were the following animals: F16 PLAVIA, F35 PLEWNA, F42 PLANTA, M45 PLEBEJER and F46 PLACIDA. PLEWNA and PLACIDA are represented only in the Lowland-Caucasian line (Olech 1989).

The role and share of the European bison of the Pszczyna line is particularly visible in the founders contribution in the current species population, within the Lowland and Lowland-Caucasian lines. In 2000, the average contribution in gene pool of the Pszczyna line founders in the free roaming population in Białowieża Forest was as much as 80.32% (PLEBEJER – 41.00%, PLANTA – 32.99%, PLAVIA – 6.33%), and the value of the founder equivalent (fge) was 3.43. This value was higher in the Belarusian part of the Białowieża Forest – 85.20% (PLEBEJER – 48.20%, PLANTA – 33.60%, PLAVIA – 3.40%, fge – 2.47). For enclosures in Poland, this percentage exceeded 90% (PLEBEJER – 54.50%, PLANTA – 29.40%, PLAVIA – 5.50%, fge – 2.83). It should also be emphasized that among male descendants in Lowland line, only a copy of Plebejer's Y chromosome exists (Grzegorzówka *et al.* 2004, Pucek *et al.* 2004, Olech 2005). Studies on the founders contribution in the European bison population in years 1924–2000 (Slatis 1960, Olech 1989, Pucek *et al.* 2004) showed a loss of genetic diversity, irretrievable loss in Lowland line genes of two Pszczyna founders (PLEWNA, PLACIDA) and an increase of PLANTA and PLEBEJER percentage (Tabl. 1).

Despite such a large contribution to gene pool of the Pszczyna founders in the world population, which, as a consequence is responsible for high inbreeding level and loss of genetic variability, as well as the highest inbred rate of the animals belonging to Pszczyna line, the current genetic and veterinary studies on European bison from the Pszczyna line do not show a negative impact of homozygosity. For contemporary European bison of the Białowieża and Pszczyna lines, the influence of inbreeding upon mortality and life span was not confirmed (Olech 1998, 2003). The negative impact of PLANTA and PLEBEJER on the survival of European bison calves is the lowest

Table 1. The contribution of the Pszczyna founders in the world population of E. bison
Udział genów założycieli pszczyńskich w światowej populacji żubra

Pedigree number and the name of a wisent Numer rodowodowy i imię żubra	Sex Płeć	The contribution of founders' genes in the years (%) Udział genów założycieli w latach (%)						
		1924 ¹	1954 ²	1980–1984 ³	Lowland line Linia nizinna		Lowland-caucasian line Linia nizinno-kaukaska	
					Captivity 2000 ⁴ Hodowla zamknięta	Free living ⁴ Populacja wolna	Captivity 2000 ⁴ Hodowla zamknięta	Free living ⁴ Populacja wolna
16 PLAVIA	F	10,6	9,1	7,7	5,5	4,6	8,2	5,3
35 PLEWNA	F	7,0	2,7	3,2	0	0	3,2	0,1
42 PLANTA	F	2,8	18,8	19,3	29,4	36,3	18,3	24,5
45 PLEBEJER	M	2,8	26,4	27,0	54,5	44,8	22,9	31,6
46 PLACIDA	F	3,7	0,9	1,3	0	0	1,3	0

Explanations: F – female, M – male. Source of information: 1 – Olech (2009), 2 – Slatis (1960), 3 – Olech (1989), 4 – Pucek *et al.* (2004); free population at the time of formation.

Objaśnienia: F – samica, M – samiec. Źródło informacji: 1 – Olech (2009), 2 – Slatis (1960), 3 – Olech (1989), 4 – Pucek (2004) i in.; populacja wolna w czasie formowania.

among all 12 founders of the world population (Olech 2003). In males with epididymal cysts was observed a lower share of PLANTA contribution (28.7%) in comparison to males with no such changes (31.4%) and this difference was significant (Matuszewska *et al.* 2004). Therefore, for the sake of European bison protection, an appropriate share of the Pszczyna line animals should be maintained in contemporary population of the species (Parusel 2006).

The number of animals belonging to Pszczyna line within the current species population is very low (Fig. 1). The European Bison Pedigree Book recorded in years 1932–2019 only 351 (185,166) European bison of the Pszczyna line, what is only 2.7% of the total number listed in the book (12,831). During that time, 276 (149,127) European bison were born in Pszczyna (Tabl. 2).

In 2019, only 40 (18,22) animals of Pszczyna line lived in Europe, which constituted 18.1% of individuals in Polish enclosed reserves and 2.3% in whole *ex situ* population. The highest number of European bison of this line was kept in Pszczyna (21: 10M, 11F), Sycowice (7: 3M, 4F) and Pszczyna Park (6: 4M, 2F). In four Spanish centers there were 5 (1,4) individuals, and in Switzerland one female.

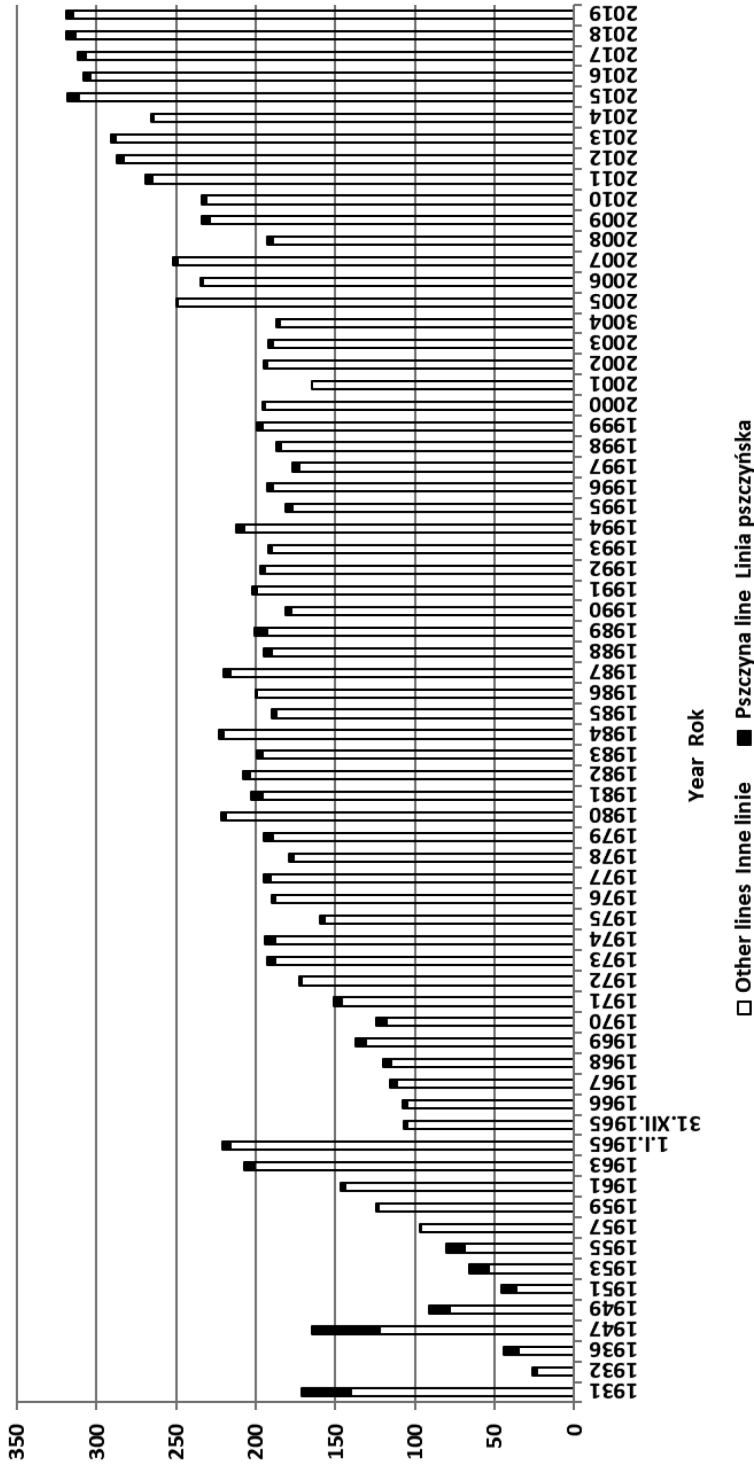


Fig. 1. The numbers of E. bison from the Pszczyna line registered in the European Bison Pedigree Book (1932–2019)
Liczebność żubrów linii pszczyńskiej zarejestrowanych w Księdze Rodowodowej Żubrów (1932–2019)

Table 2. E. bison of the Pszczyna line registered in the European Bison Pedigree Book (1932–2019)

Żubry linii pszczyńskiej zarejestrowane w Księdze Rodowodowej Żubrów (1932–2019)

Breeding centre Hodowla	Numbers of E. bison born Liczba urodzonych żubrów			Years of breeding ¹ Lata hodowli
	total ogółem	males samce	females samice	
Pszczyna	276	149	127	1881–2019
Zoo Leipzig (Germany)	3	3		1907–1926
Zoo Berlin (Germany)	1	1		1911–1925
Zoo Frankfurt/M. (Germany)	5	2	3	1911–1925
OHŻ Białowieża (Poland)	24	10	14	1948–1982
Białowieża III (obecnie/now Nacional'nyjj Park Belovezhskaja Pushha), (Belarus)	3	1	2	1949–1970
Sierpuchow (obecnie/now Prioksko-Terrasnyjj Zapovednik), (Russia)	5	3	2	1950–1969
Zoo Antwerpen (the Netherland)	2		2	1952–1969
Pforzheim Zoo (Germany)	1		1	1971–1972
Prioksko-Terrasnyjj Zapovednik (Russia)	14	6	8	1978–1999
Zoo Katowice (Poland)	1		1	1999–2001
Pszczyna Park (Poland)	10	7	3	2008–2019
Sycowice (Poland)	6	3	3	2012–2019
Razem/Total	351	185	166	1881–2019

¹ – the period from the year of birth of the first to the year of death of the last wisentin a given breeding centre or up to the year for the period under consideration

¹ – za lata hodowli przyjęto okres od roku urodzenia pierwszego do roku śmierci ostatniego żubra w danej hodowli lub do roku dla rozpatrywanego okresu czasu

European bison of the Pless line in Pszczyna

The history of European bison breeding in Pszczyna lasts for 155 years. In the fall of 1865, 4 (1,3) Lowland European bison were brought from Białowieża to Murcki, and a year later they were released into the large enclosure in Pszczyna Forest (Parusel 1996, 2004, 2015e). The breeding of European bison in the semi-free herd should be considered the world's first attempt to restitute this species to the forest ecosystem in modern times, which was done 110 years after the last wild-living European bison in Germany was killed in 1755 (Bär 1837). It happened 87 years earlier than the reintroduction in the Białowieża Forest (1952) (Parusel 2004). This restitution preceded by 58 years the plan of reintroducing the European bison to large forest complexes, included in the statute of the International Society for the Protection of European Bison announced in 1923 (Parusel 2015c).

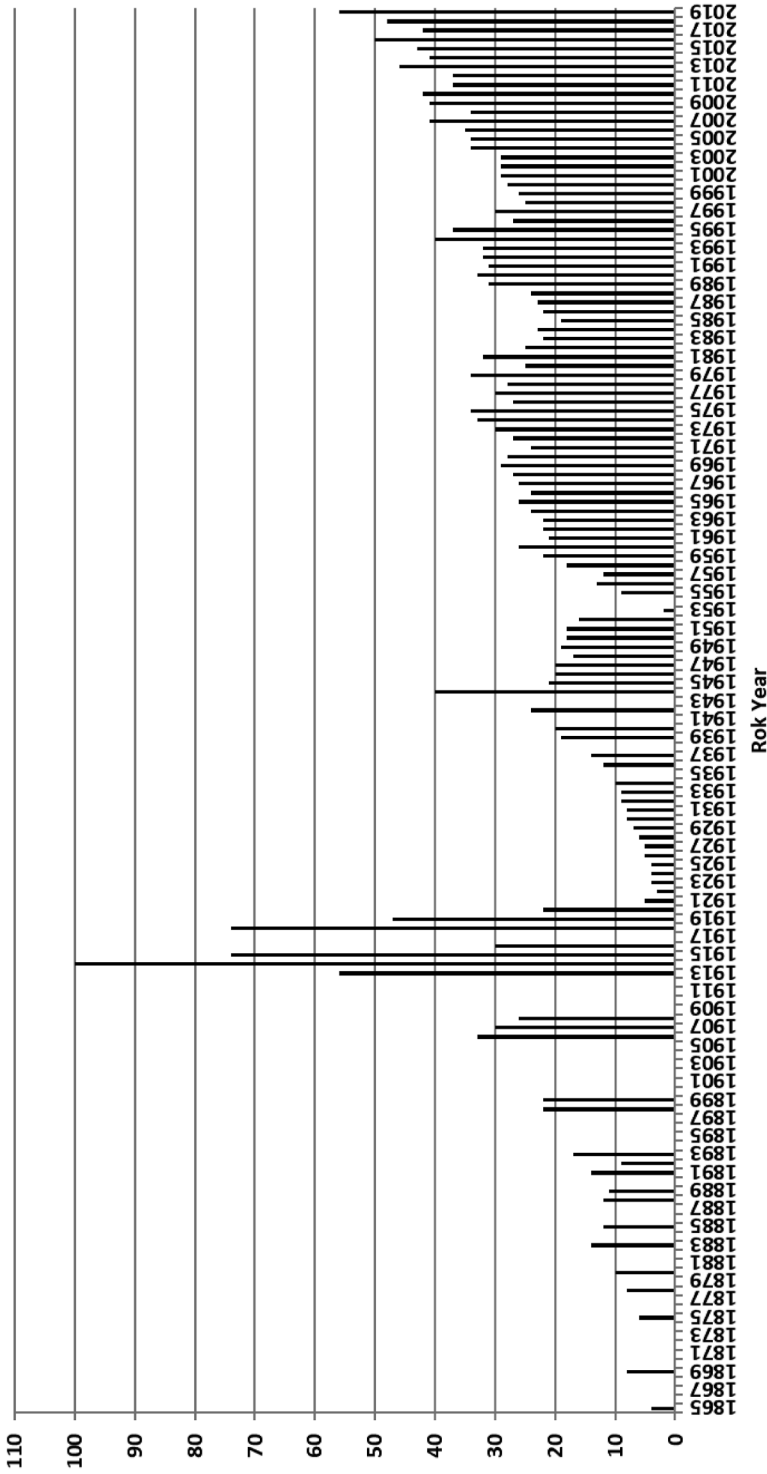


Fig. 2. The numbers of E. bison in Pszczyna in the years 1865–2019. Source: Parusel 1996, 2004, 2015a, 2020, European Bison Pedigree Book 1932–2019

Liczebność żubrów w Pszczynie w latach 1865–2019. Źródło: Parusel 1996, 2004, 2015a, 2020, Księga Rodowodowa Żubrów 1932–2019

The numbers of the European bison herd in Pszczyna during a long period of breeding were fluctuating (Fig. 2). It was dependent not only on the reproduction potential of the herd, but also on the socio-economic conditions in various years. The result of semi-free breeding for the years 1865–1945 is as follows: 267 (128,139) born, 14 (6,8) imported, 249 (111,138) dead and 12 (12,0) exported. At the end of 1945, there were 20 (11,9) animals in Pszczyna-Jankowice (Tabl. 3). The results of breeding in enclosure for the years 1946–2019 is as follows: 470 (236,234) born, 40 (18,22) imported, 139 (68,71) dead and 335 (175,160) exported. By the end of 2019, 56 (22,34) individuals were there (Tabl. 3).

The list of all European bison bred in Pszczyna, as well exported as imported, recorded in the pedigree book until 2019, divided according place of origin and breeding lines (Tabl. 4) shows that the most numerous were breeding lines: PL (48.5%) and PO (37.8%) and PU (13.3%). Compared to 1994 (Parusel 1996), the proportion of animals representing Pszczyna line decreased by 10.6%, and in the same time the share of PO (Białowieża) line increased by as much as 19.3%!

Table 3. Results of the restitution and breeding of European bison in Pszczyna in the years 1865–2019

Wyniki restytucji i hodowli żubrów w Pszczynie w latach 1865–2019

State Stan	Period Okres		Total Razem
	1865–1945	1946–2019	1865–2019
Initial state/Stan początkowy		20 (11,9)	
Born/Urodzone	267 (128,139)	470 (236,234)	737 (364,373)
Imported/Sprowadzone	14 (6,8)	40 (18,22)	54 (24,30)
Fallen/Padłe	249 (111,138)	139 (68,71)	388 (179,209)
Taken out/Wywiezione	12 (12,0)	335 (175,160)	347 (187,160) ¹
Final account/Stan końcowy	20 (11,9)	56 (22,34)	56 (22,34)

Source: Cenquier (1954) – for data for the period of 1865–1952, European Bison Pedigree Book (1932–2019) – for data for the period of 1953–2019.

¹ – the entries in the European Bison Pedigree Book show that in the period covered by the book, 352 E. bison were taken from Pszczyna (see Table 4), i.e. 5 individuals more than presented in this table. This fact suggests that the published quantitative data on the results of breeding before the establishment of the pedigree book may be erroneous; this is confirmed by various quantitative data provided by the authors for some years. It should also be remembered that only a part of E. bison bred in Pszczyna is registered in the European Bison Pedigree Book.

Źródło: Cenquier (1954) – dla danych za okres lat 1865–1952, Księga Rodowodowa Żubrów (1932–2019) – dla danych za okres lat 1953–2019.

¹ – z zapisów w Księdze Rodowodowej Żubrów wynika, że w okresie objętym przez księgę wywieziono z Pszczyny 352 żubry (por. tab. 4), a więc o 5 osobników więcej niż przedstawiono to w niniejszej tabeli. Fakt ten pozwala przypuszczać, że publikowane dane ilościowe o wynikach hodowli przed założeniem księgi rodowodowej mogą być obciążone błędem; potwierdzają to różne dane ilościowe podawane przez autorów dla niektórych lat. Należy także pamiętać, że w Księdze Rodowodowej Żubrów zapisana jest tylko część żubrów hodowanych w Pszczynie.

Table 4. Quantitative list of European bison born and bred in Pszczyna, as well exported as imported, including the breeding lines recorded in the European Bison Pedigree Book until 2019

Zestawienie ilościowe żubrów urodzonych i hodowanych w Pszczynie oraz wyeksportowanych i importowanych z uwzględnieniem linii hodowlanych zapisanych w Księdze Rodowodowej Żubrów do roku 2019

The origin of E. bison Pochodzenie żubrów	Sex Płeć		Breeding line Linia hodowlana				Total Razem
	M	F	PL	PO	PU	KA'	
Born and bred in Pszczyna Urodzone i hodowane w Pszczynie	98	124	128 (56,72)	84 (35,49)*	10 (7,3)		222 (98, 124)
Born in Pszczyna and exported Urodzone w Pszczynie i wyeksportowane	180	142	148 (93,55)	129 (66,63)	45 (21,24)		322 (180,142)
Imported to Pszczyna Importowane do Pszczyny	9	4	5 (3,2)	3 (3,0)	5 (3,2)		13 (9,4)
Imported to Pszczyna and exported Importowane do Pszczyny i wyeksportowane	12	18	5 (1,4)	4 (4,0)	19 (7,12)	2 (0,2)	30 (12,18)
Total Ogółem	299	288	286 (153,133)	220 (108,112)	79 (38,41)	2 (0,2)	587 (299,288)

Source: European Bison Pedigree Book (1932–2019). M – males. F – females. Breeding line: PL – Pszczyna. PO – lowland (Białowieża), PU – Białowieża-Caucasian, KA' – bison of the Białowieża line from free breeding in the Białowieża Forest.

Note: * in 2019, there were 11 E. bison entries in the European Bison Pedigree Book, for which mothers were unidentified. The paternity of these animals was thus assigned to M 12185 Plunto and *Bison bonasus* females, they were also assigned to the PO line, although females of the PL line could as well take part in this reproduction, since on this year there were four such females able for breeding in the reserve.

Źródło: Księga Rodowodowa Żubrów (1932–2019). M – samce. F – samice. Linia hodowlana: PL – pszczyńska, PO – nizinna (białowieńska), PU – białowiesko-kaucka, KA' – żubry linii białowieskiej z hodowli wolnej w Puszczy Białowieskiej. Uwaga: * w roku 2019 w Księdze Rodowodowej Żubrów zostało zapisanych 11 żubrów, dla których nie zidentyfikowano matek. Ojcostwo tych żubrów zostało więc przypisane M 12185 Plunto i samicom *Bison bonasus*, przyporządkowano je także do linii PO, choć w rozrodzie mogły brać także samice linii PL, których zdolnych do rozrodu w tym roku było w rezerwacie 4.

The balance of European bison from the Pless line breeding in Pszczyna until 2019 is as follows:

- wisents born and bred in Pszczyna: 128 (56,72) (46,4% of the number of wisents from the Pszczyna line; 21,8% of the total number recorded in the pedigree book),
- wisents born in Pszczyna and exported: 148 (93,55) [53,6%; 25,2%],
- wisents imported to Pszczyna: 5 (3,2) [1,8%; 0,8%],
- wisents imported to Pszczyna and exported: 5 (1,4) [1,8%; 0,8%],
- European bison of the Pszczyna line in total: 286 (153,134) [48,7%].

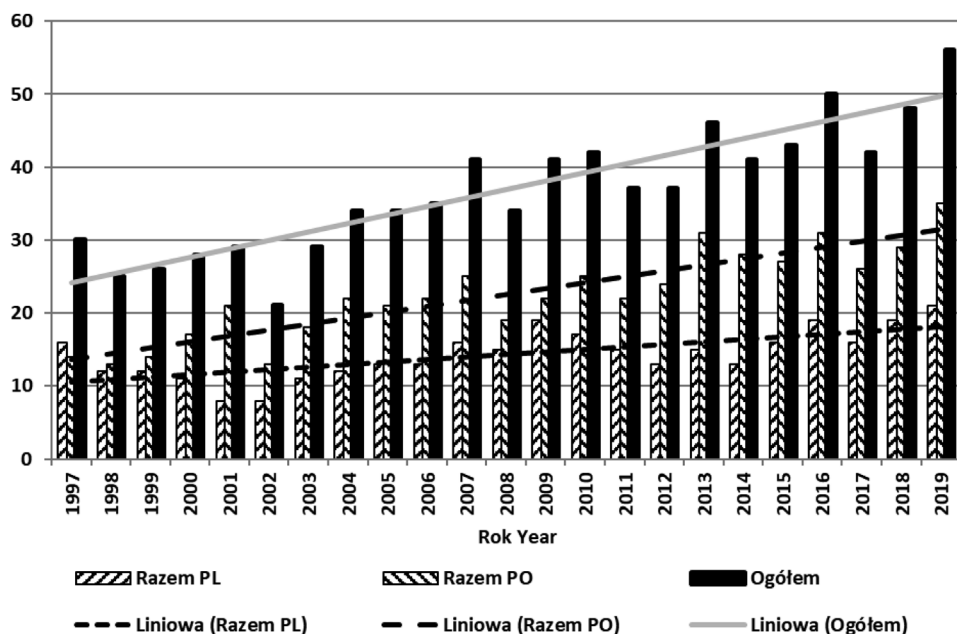


Fig. 3. The numbers of E. bison of Pszczyna and Białowieża lines in 1997–2019 in the center in Pszczyna-Jankowice

Source: European Bison Pedigree Book 1997–2019. Explanations: PL – Pszczyna line, PO – Białowieża line, liniowa – linear trend, ogółem – total

Liczebność żubrów linii pszczyńskiej i białowieskiej w latach 1997–2019 w ośrodku w Pszczynie-Jankowicach

Źródło: Księga Rodowodowa Żubrów 1997–2019. Objaśnienia: PL – linia pszczyńska, PO – linia białowieska, liniowa – trend

The analysis of the breeding results in Pszczyna since 1994 shows a very unfavorable balance for Pless line (Parusel 2004; 2006; 2007a, b; 2015a, b, c, d, e; 2020a, b). The results of this breeding are in contradiction with the provisions of the national breeding program for ex situ herds in Poland (Olech 1997). According to this program, the Pszczyna center was recognized as a unique one and cultivating the tradition of breeding the Pszczyna line. The balance of breeding the European bison belonging to Pszczyna line in Pszczyna for the years 1997–2019 allows to conclude that the program for this center is not respected at all. The share of European bison from the Pszczyna line in Pszczyna for the years 1997–2019 was on average 45.5% for males, 35.3% for females and 39.2% for both sexes. In comparison in 1997 this share was 53.3%. The average annual number of animals representing the Pszczyna line was 14.3 individuals, while the number of E. bison of the Białowieża line was 22.6 individuals; the predominance of females of this

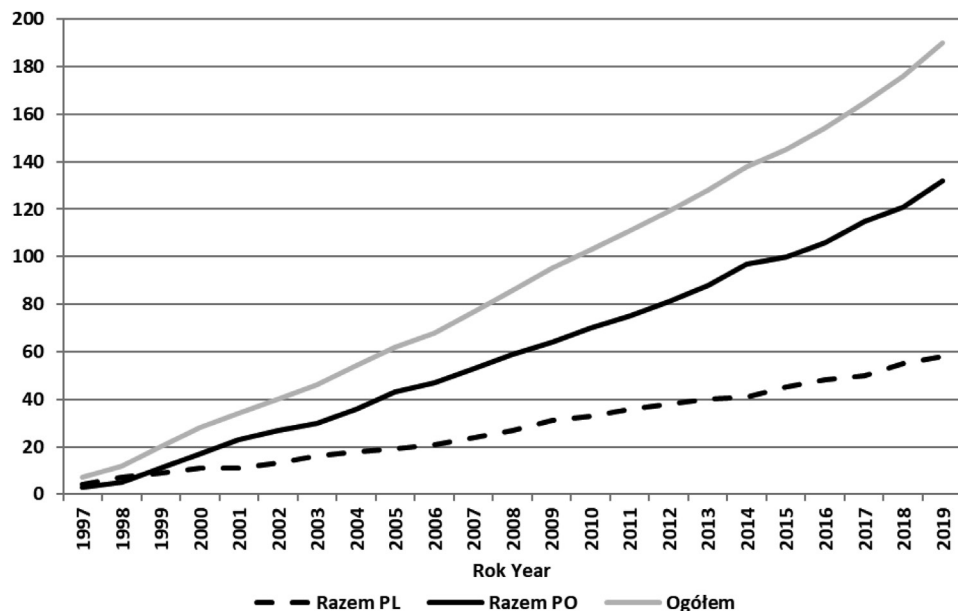


Fig. 4. Reproduction (cumulative) of E. bison from Pszczyna and Białowieża lines in 1997–2019 in the center in Pszczyna-Jankowice.

Source: European Bison Pedigree Book 1997–2019 and data of Kobiór Forest Inspectorate.

Explanations: PL – Pszczyna line, PO – Białowieża line, ogółem – total

Reprodukcja (kumulowana) żubrów linii pszczyńskiej i białowiejskiej w latach 1997–2019 w ośrodku w Pszczynie-Jankowicach.

Źródło: Księga Rodowodowa Żubrów 1997–2019 oraz dane Nadleśnictwa Kobiór

Objaśnienia: PL – linia pszczyńska, PO – linia białowiejska

line is noticeable. The trends of numbers of both analyzed breeding lines are presented in Fig. 3. Also, the reproduction of European bison from the Białowieża line is much higher (Fig. 4). In the analyzed period, a total of 58 (32,26) E. bison from the Pszczyna line and as many as 132 (65,67) of the Białowieża line were born.

In 2006, a 10 ha enclosure for European bison of Pszczyna line has been opened in Jankowice, which through isolation of these animals is supposed to preserve this line from extinction (Pigan 2006). Assumed aims of the enclosure and its area indicate that the enclosure only at minimal level contributes to the protection of the European bison of the Pszczyna line. Taking into account the recommended area for one animal (1.5–2 ha with 0.5 ha of pastures or meadows) (Olech *et al.* 2008), in this enclosure can be kept no more than 6–7 animals. This enclosure also does not have the recommended area of the open pasture (3–3.5 ha). The results of breeding the European bison of the

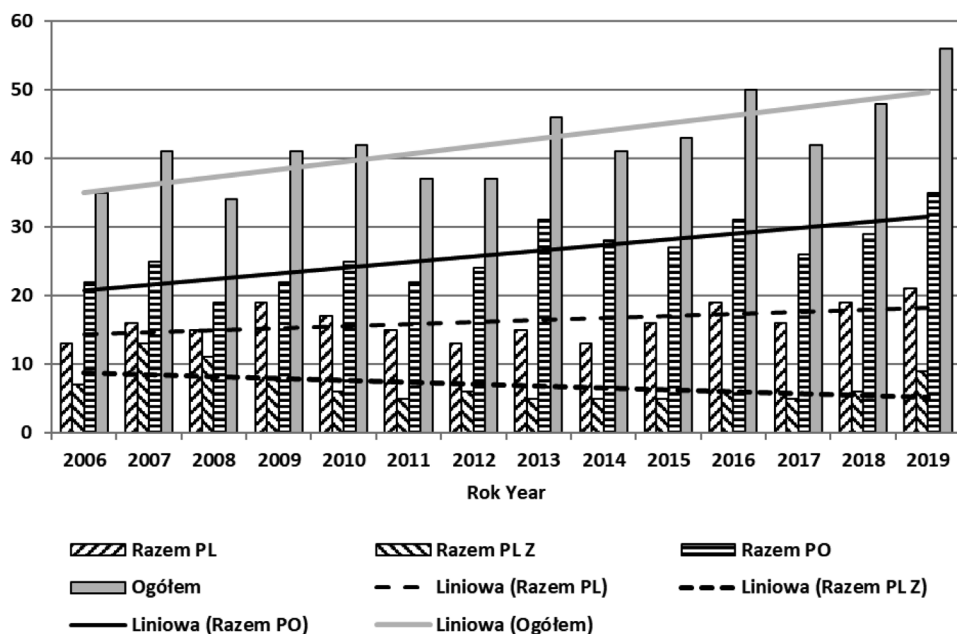


Fig. 5. Numbers of E. bison in the enclosure of the Pszczyna line and in the center in Pszczyna-Jankowice in 2006–2019

Source: European Bison Pedigree Book 2006–2019 and data of Kobiór Forest Inspectorate

Explanations: PL – Pszczyna line, PO – Białowieża line, Z – the endosure of the Pszczyna line, liniowa – linear trend, razem, ogółem – total

Liczebność żubrów w zagrodzie żubrów linii pszczyńskiej i w ośrodku w Pszczynie-Jankowicach w latach 2006–2019

Źródło: Księga Rodowodowa Żubrów 2006–2019 oraz dane Nadleśnictwa Kobiór

Objaśnienia: PL – linia pszczyńska, PO – linia białowieńska, Z – zagroda żubrów linii pszczyńskiej, liniowa – trend

Pszczyna line in the enclosure indicate that its main role is demonstration. However, such enclosure does not protect the Pszczyna line from extinction and it not secures a significant genetic reserve for the entire line, which was assumed when creating this facility (Pigan 2006).

The average number of the Pszczyna line animals in the enclosure for the years 2006–2019 was 7 (3,4). In the same period, the number of European bison from the Pszczyna line in the entire center was on average 16 (7,9) individuals per year, while 26 (8,18) animals were of the Białowieża line (Fig. 5). The average proportion of animals kept in the enclosure comparing to whole group of the Pszczyna line was equal to 37.2% for males, 47.1% for females and 43.3% for both sexes per year. Only in the years 2006–2008 this percentage was higher than 50%. This proportion in relation to the total herd was respectively: 17.1%, 16.2% and 16.8%. The share of animals kept in the enclo-

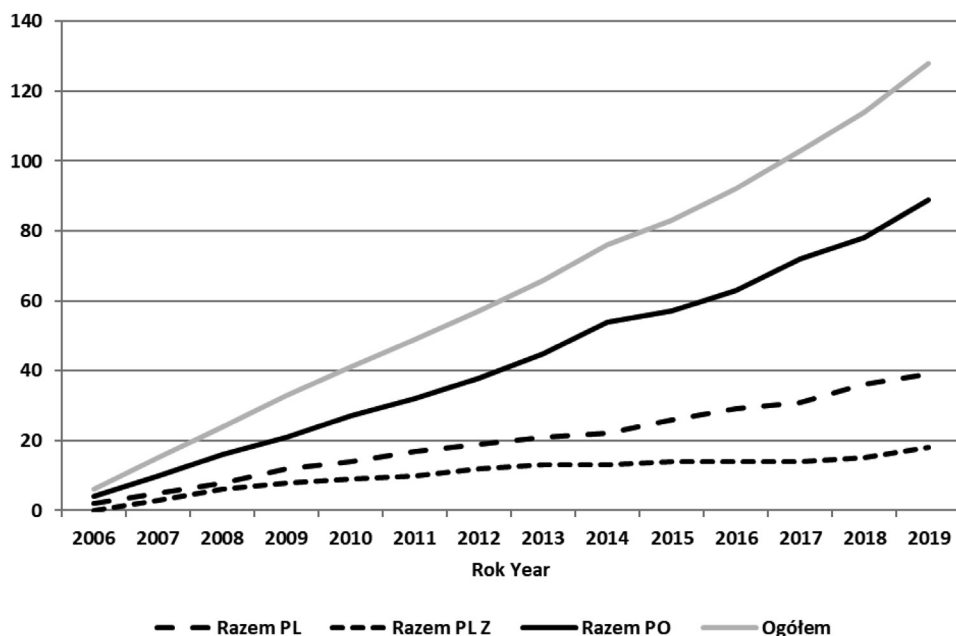


Fig. 6. Reproduction (cumulative) of E. bison from the Pszczyna line in the enclosure of the Pszczyna line and in the Center Pszczyna-Jankowice in 2006–2019.

Source: European Bison Pedigree Book 2006–2019 and data of Kobiór Forest Inspectorate

Explanations: PL – Pszczyna line, PO – Białowieża line, Z – the enclosure of Pszczyna line, razem, ogółem – total

Reprodukcja (kumulowana) żubrów linii pszczyńskiej w zagrodzie żubrów linii pszczyńskiej i w ośrodku w Pszczynie-Jankowicach w latach 2006–2019

Źródło: Księga Rodowodowa Żubrów 2006–2019 oraz dane Nadleśnictwa Kobiór

Objaśnienia: PL – linia pszczyńska, PO – linia białowieża, Z – zagroda żubrów linii pszczyńskiej

sure did not exceed 33% in the analyzed period. Also, the reproduction level (cumulative) in the enclosure is much lower than average for all Pszczyna line animals as well as the whole herd (Fig. 6). In the analyzed period, only 18 European bison of the Pszczyna line were born in the enclosure (14.1% of the total number born in the entire center) while the number of newborn of the Pszczyna line in the entire center was equal to 39 (30.5%), and the Białowieża line 89 (69.5%).

Discussion

The history of the restitution and breeding of European bison in the Pszczyna region is already 155 years old, and Pszczyna is the oldest breeding center for this species in the world. The animals of the Pszczyna line are a unique

example of highly inbred group among mammals (Olech & Perzanowski 2014) with the highest inbreeding coefficient among all Polish breeding centers (Kobryńczuk 1985; Olech 1987, 1989), unprecedented even in farm animals (Olech 2015b). The Pszczyna wisents saved the species from extinction, and their genes are among the most valuable in the entire population. Despite the enormous historical, cultural and natural value of this line, the consistent elimination of the pure Pszczyna line animals from the world population is progressing. Until 2019, the European Bison Pedigree Book registered the birth of only 351 (185,166) wisents from the Pszczyna line, which constituted only 2.7% of the total recorded individuals. In 2019, only 40 wisents of this line were alive in Europe, which constituted 18.1% of Polish captive population and 2.3% in Europe. This number is definitely too small to maintain a demographically safe and genetically diverse population (Pucek *et al.* 1996). Taking into account the rules of the effective population size given by Shaffer, it is necessary to increase the number of European bison from the Pszczyna line to at least 50 individuals (Parusel 2015b, c).

In the historical site of breeding the Pless line animals, the share of E. bison from this line in 2019 amounted to only 48.7% of all animals raised in this place, while the number of individuals from the Białowieża line was already 37.8%! Thus, the breeding potential of the center in Pszczyna is not used to cultivate the tradition of breeding the E. bison from the Pszczyna line, which was one of the assumptions of the Polish bison breeding program (Olech 1997). Established in 2006, the enclosure for animals from the Pszczyna line does not play any significant role in preserving this line and primarily serves for education. In the years 2006–2019, only 18 E. bison from the Pszczyna line were born in this enclosure, which constituted 14.1% of the number of all wisents born at that time in the entire center.

The presented unfavorable results of Pszczyna line European bison breeding are connected with low genetic diversity and high level of inbreeding within this line. The founders PLEWNA and PLACIDA genes are irretrievably lost within the lowland wisents. The contribution of PLANTA and PLEBEJER in the lowland line has increased. The inbreeding coefficient of European bison from the Pszczyna line increased from 25.0% for animals born in 1928 to 71.8% in 2014 and will continue to increase because the line is closed without possibility to find unrelated individuals (Olech 2015b).

The demographic and genetic results of Pszczyna line breeding indicate that for this particular line the aims of the European bison protection strategy developed by Bison Specialist Group IUCN (Pucek *et al.* 2004) are not fulfilled. Its aims were towards making the founders contribution more

equal, maintain the genetic diversity of the species and individual herds, and increase the proportion of lowland European bison in captivity.

The recommended continuation of the European bison Pszczyna line breeding tradition (Olech 1997) requires the development and implementation of a special breeding program to save maximum genetic diversity and preserve the founders genes of the Pszczyna line in all genetic lines. The breeding center in Pszczyna should play a leading role in this program, and all breeding centers and zoos in Silesia as well as selected centers in the country and abroad should participate (Parusel 2015 b, c). The biological material of all Pszczyna founders should be deposited at the European Bison Gene Bank as soon as possible. It is also necessary to change the strategic documents (Pucek *et al.* 2004, Ministerstwo Środowiska 2007) by separating the Pszczyna subline within the lowland (Białowieża) line and developing appropriate measures to protect this line.

Let's protect the Pszczyna wisents!

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Co dalej z żubrami linii pszczyńskiej w Pszczynie – pytanie w 155 rocznicę restytucji i hodowli?

Streszczenie: W pracy przedstawiono wyniki hodowli i ochrony żubrów linii pszczyńskiej na świecie do roku 2019 oraz w Pszczynie-Jankowicach ze szczególnym uwzględnieniem lat 1997–2019, czyli w okresie realizowania programu hodowlanego dla hodowli zamkniętej w Polsce (Olech 1997).

Mimo ogromnej wartości historycznej, kulturowej i przyrodniczej pszczyńskiej linii żubrów, postępuje konsekwentna eliminacja żubrów pszczyńskich z populacji światowej żubrów. Księga Rodowodowa Żubrów zarejestrowała do roku 2019 narodziny zaledwie 351 (185.166) żubrów linii pszczyńskiej, co stanowiło jedynie 2,7% osobników ogółem zapisanych w księdze. W roku 2019 w Europie żyło tylko 40 żubrów tej linii, co stanowiło 18,1% osobników w polskich hodowlach zamkniętych i 2,3% w tych hodowlach na całym świecie.

W historycznym miejscu hodowli żubrów linii pszczyńskiej udział żubrów tej linii w roku 2019 stanowił łącznie zaledwie 48,7% wszystkich żubrów hodowanych w tym miejscu, natomiast liczba żubrów linii białowieskiej stanowiła już aż 37,8%! Tak więc potencjał hodowlany ośrodka w Pszczynie nie jest wykorzystywany dla kultywowania tradycji hodowli żubrów linii pszczyńskiej, co było jednym z założeń ogólnopolskiego programu hodowli żubra (Olech 1997). Założona w roku 2006 zagroda dla żubrów linii pszczyńskiej nie spełnia żadnej istotnej roli w zachowaniu tej linii i pełni przede wszystkim funkcję dydaktyczną. W latach 2006–2019 urodziło się w tej zagrodzie zaledwie 18 żubrów linii pszczyńskiej, co stanowiło 14,1% liczby wszystkich żubrów urodzonych w tym czasie w całym ośrodku.

Postulowane kultywowanie tradycji hodowli żubrów linii pszczyńskiej (Olech 1997) wymaga opracowania i wdrożenia specjalnego programu hodowlanego, zapewniającego maksymalne zróżnicowanie genetyczne i zachowanie udziału wszystkich przodków – założycieli linii pszczyńskiej, zarówno w linii nizinnej, jak i nizinno-kaukaskiej. W programie tym wiodącą rolę powinien spełniać ośrodek w Pszczynie, a uczestniczyć w nim powinny wszystkie ośrodki hodowlane i ogrody zoologiczne na Śląsku oraz wybrane ośrodki w kraju i zagranicą.
