

**Progress in Breeding European Bison and Domestic Cattle
Hybrids and Casuistics in Cases of Immobilization
and Pasteurelosis in Hybrids**

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Krasińska M., 1979: Progress in breeding European bison and domestic cattle hybrids and casuistics in cases of immobilization and pasteurelosis in hybrids. *Acta theriol.*, 24, 15: 201—210 [With 3 Tables].

The results of breeding studies obtained during the experiment on crossbreeding European bison with domestic cattle during the period from 1971—1976 are presented in this paper. A total of 15 B₂ hybrids and 7 B₃ hybrids were obtained during this period. In all, as from the start of our experiments, a total of 71 hybrids were obtained at Białowieża, as compared with a world total of 244 European bison hybrids over a period of 130 years. All B₁ cows were fertile, gestation lasting on an average 278.7 days, but of the 9 sexually mature B₂ cows only 5 produced young. Duration of gestation was on an average 275.3 days. B₂ generation heifers were sexually mature at the age of 11 months, that is, the earliest in comparison with cows of the other generations. 26 hybrids of different generations were shot for the purpose of morpho-physiological examination. A description is given of immobilization of a F₁ male hybrid with etorphine chloride (M99), and cases of a pasteurelosis enzooty in backcross hybrids.

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1. INTRODUCTION

In the final stage of studies on crossbreeding European bison and domestic cattle, breeding of backcross generation hybrids, mating F₁, B₁ and B₂ females with two bulls of the black and white lowland cattle was continued from 1971—1976. Breeding studies were carried in accordance with the same principles and under unchanged conditions from those in previous years (K r a s i ń s k a, 1967, 1971a).

Studies were continued on development of hybrids, their inheritance of morpho-physiological characteristics and fertility, and evaluation of their economic value (K r a s i ń s k a, 1971b, 1976; K r a s i ń s k a & P i l a r s k i, 1977; P y t e l *et al.*, 1977). A series of experiments was also carried out on the suitability of the preparation Rompun for immobilization of hybrids and one trial immobilization made using etorphine chloride (M99), castrating the hybrid at the same time.

Several cases of pasteurelosis were observed in the experimental reserve during the study period.

This report is the seventh¹ in turn and presents progress made in breeding studies and the course of experiments from the beginning of 1971 to the end of the experiments during the first half of 1976.

2. F₁ HYBRIDS

2.1. Breeding Results

Only three hybrids of the first generation (Figa, Filon, Facet) lived in the experimental reserve during the period from 1971—1976. The cow Figa, covered by a bull of the black and white lowland breed, produced 2 B₁ calves, and aborted at the end of gestation in May 1971 (Table 1). This cow was shot on 24 May 1976 in order to carry out morpho-physiological analyses.

Table 1

List of European bison and domestic cattle hybrids from Białowieża.
(An earlier list is to be found in the paper by Krasińska, 1971 a).

No	Name & sex	Father	Mother	Born	Died *
Generation B ₁					
26	un M	bw	Fanny	24 VIII 1966	stillborn
27	un F	bw	Figa	17 V 1971	stillborn
28	Feeria F	bw	Figa	17 V 1972	20 XI 1972 *
29	Ferina F	bw	Figa	21 IV 1975	2 XII 1975
Generation B ₂					
10	un F	bw	Fewa	19 III 1971	24 III 1971
11	Fenol M	bw	Feska	29 VI 1971	25 XI 1975 *
12	Fenomen M	bw	Femina	13 VII 1971	28 X 1975 *
13	Fen II M	bw	Fera	24 VII 1971	18 XI 1975 *
14	Fela II F	bw	Felpa	29 VII 1971	11 XI 1975 *
15	Felga F	bw	Fenny	26 IX 1971	25 XI 1974 *
16	un M	bw	Fera	23 VII 1972	stillborn
17	un M	bw	Felpa	29 VII 1972	stillborn
18	Fetwa F	bw	Fewa	16 IV 1972	13 I 1975 *
19	Fedala F	bw	Feska	5 V 1972	8 X 1975 *
20	Fenyl M	bw	Fenny	13 IX 1972	4 XII 1974 *
21	Fenek M	bw	Fenny	11 VII 1974	11 XI 1975 *
22	un F	bw	Festynka	15 VIII 1974	stillborn
23	Fena F	bw	Fenny	6 V 1975	2 XII 1975 *
24	Feston M	bw	Festynka	30 VI 1975	18 XI 1975 *
Generation B ₃					
1	un F	bw	Fega	16 VII 1971	2 VIII 1971
2	Feda F	bw	Fedala	19 III 1974	11 V 1976 *
3	Feliks M	bw	Fela II	3 V 1974	8 IV 1976 *
4	Ferta F	bw	Festa	14 VIII 1974	9 XII 1975 *
5	un F	bw	Fetwa	6 XII 1974	stillborn
6	Fedra F	bw	Fedala	23 III 1975	30 III 1976 *
7	Felba F	bw	Fela II	30 III 1975	30 III 1976 *

Abb.: bw — black and white lowland cattle; B₁ — hybrid 1/4 European bison 3/4 cattle; B₂ — hybrids 1/8 European bison 7/8 cattle; B₃ — 1/16 European bison 15/16 cattle. * Slaughtered, un — unnamed.

¹ Earlier results of studies are contained in the following papers: Dehnel, 1960, 1961; Demiaszkiewicz, 1961; Krasińska, 1963, 1967, 1971a).

The two F₁ bulls, Filon and Facet, were mated several times with both domestic black and white lowland cows and hybrid cows of different generations, but failed to sire progeny.

In the summer of 1972 the bull Filon escaped from the reserve through a broken fence into the area of the Primeval Forest, where it lived for 7 months. As it proved impossible to drive it into the reserve it was shot in February 1973 for slaughter analysis.

2.2. Case of Immobilization of a F₁ Hybrid

The third hybrid of this generation, Facet, had caused considerable trouble within the breeding reserve for a long time. It was the most aggressive bull, particularly towards other males living in the reserve. Although it was infertile, it had an extremely strong sexual urge, and was particularly aggressive during the oestrus in cows. As its body weight (1200 kg) was very great during this period, this bull several times caused lasting injury in the cows it covered and in one case even injured the cow's spine. The bull also became dangerous to keepers. It was therefore decided to castrate the bull, immobilizing it with etorphine chloride (M 99), using a Paxarm gun. As the syringes projectil did not completely discharged their contents, the bull was only slightly stupefied and became even more excited. It was only 1½ hours later that we succeeded in shutting the bull up again and administering a full dose of 18 ml of etorphine M 99, after which the bull finally subsided into a lying position 2 hours after the start of immobilization, but even so it was not rendered completely immobile, and was therefore given an additional intramuscular injection of 500 mg of the preparation Rompun. After the bull became completely immobile, an epidural anaesthetic of 20 ml 2% polocainum was given and castration carried out within 10 minutes. The bull remained in a state of deep narcosis after the operation, but began to wake after one hour, first of all lifting its head. After 1½ hours it began to raise the fore part of its body several times, got to its feet after three hours and went out into the enclosure. Within a few minutes the hybrids from the neighbouring enclosure broke down the fence and approached the bull as it sauntered about after coming to from the narcosis. One of the B₁ hybrids, Fell, ran up to Facet and fought with it for 15 minutes, when Facet fell down. Markedly accelerated respiration was observed in Facet, followed by its sudden death. Autopsy revealed *hyperaemia pulmonum*, *oedema pulmonum*, *dilatatio cordis*, *myodegeneratio cordis*, *hydropericardium*, *degeneratio adiposa hepatis et infiltratio sanguineus multiplex subcutaneus*. The results of the autopsy justify the conclusion that this bull must have suffered for

some time from circulatory disturbance, leading to vasculostasis due to its considerable age (12.5 years) and its great body weight. The extraordinary effort due to excitement, and running over the 10 ha area of the enclosure for over 1½ hours in order to evade capture, exacerbated these disturbances and increased hyperaemia of the lungs. The lengthy narcosis and lying on one side for 3½ hours, followed by the fight, caused further deterioration in the animal's condition, leading to *oedema pulmonum* and death by suffocation.

The result of this immobilization leads to the following remarks and conclusions in relation to the use of the M 99 preparation for ungulates with very great body weight and of considerable age. It is essential to use a reliable gun loaded with syringes projectile of the greatest capacity. Every endeavour must be made not to over-excite the animal during capture operations. An antidote must be administered immediately the operation is completed, and if possible the animal should be isolated from other members of the group after immobilization. Aggressive behaviour towards immobilized animals has been observed in several cases in deer (Scanlon *et al.*, 1977), although it had never taken place in our reserve, in which hybrids and European bison had frequently been immobilized by means of the preparation Rompun, after which the animals failed to return to normal activity for some considerable time.

3. BACKCROSS HYBRIDS

3.1. Breeding Results

During the period under discussion there were 10 (1, 9) B₁ hybrids (¼ European bison, ¾ cattle) in the Białowieża reserve. Eight animals of this generation were shot for the purpose of morpho-physiological analysis (Table 2).

Table 2

Losses of European bison and domestic cattle hybrids in the experimental reserve from 1971 to 1976. Number of animals (males, females) is shown.

Generation	Shot for analysis	Deaths or stillborn calves	Total
F ₁	2 (1, 1)	1 (1, 0)	3 (2, 1)
B ₁	8 (0, 8)	3 (1, 2)	11 (1, 10)
B ₂	11 (6, 5)	7 (3, 4)	18 (9, 9)
B ₃	5 (1, 4)	1 (0, 1)	6 (1, 5)
Total	26 (8, 18)	12 (5, 7)	38 (13, 25)

At the same time there were a further 17 (7, 10) B₂ hybrids (⅓ European bison, ⅔ cattle) there — Table 1. In October 1971 one of the cows of this generation, Fenicja, was killed by a falling tree. In July

1973 it proved necessary to kill the bull Fenig, which had a permanently damaged leg owing to injuries sustained during a fight. Eleven B₂ hybrids were slaughtered (Table 2).

In 1972 there was a year's interval in reproduction of backcross generation hybrids, on account of the change of the domestic bull.

B₁ cows became sexually mature at the average age of 13.4 months, and oestrus was observed in them throughout the whole year. All sexually mature cows of this generation were fertile and produced 15 (8, 7) B₂ calves during this period, three of which were stillborn, and one died during the first week of life. The mortality index was therefore 27%. Length of gestation in these cows was on an average 278.7 days (average deviation 2.7), that is, was slightly shorter than the average given for domestic cattle (Asdell, 1964).

B₂ cows became sexually mature later than B₁, that is, on an average at the age of 15.9 months, and oestrus occurred in them, similarly to B₁ cows, throughout the whole year. Of the 9 sexually mature cows of this generation four were infertile, and the remaining five produced 7 B₃ calves during this time, one calf being stillborn and the heifer calf dying during the second week of life. Limitation of fertility in hybrid European bison and domestic cows in the identical generation also occurred at Askania Nova (Zablockij, 1939). Length of gestation in B₂ cows was on an average 275.3 days (average deviation — 3.6) and therefore was shorter than the average data given for domestic cattle and B₁.

Five animals (1, 4) of generation B₃ (¹/₁₆ European bison and ¹⁵/₁₆ cattle) were included in the experiment (Table 1). Observations were made of the development of these animals, but the fertility of the heifers was not tested as the experiments came to an end. The heifers of this generation attained sexual maturity earlier, at the age of 11 months. A two-year old bull of this generation, like all bulls of other backcross generations, was mated with hybrid cows, but calves were never obtained from such matings.

B₃ hybrids were shot for the purpose of slaughter analysis in the final phase of the experiment.

3.2. Pasteurelosis Enzooty in Backcross Generation Hybrids

An outbreak of pasteurelosis was observed in the group of hybrids in 1975. During the heatwave in July 1975 the hybrid B₁ bull Fell was observed to have a swelling in the *regio compedis*, rapidly enlarging in the direction of the *articulatio coxae*, with simultaneous rise in temperature and accelerated respiration. The bull died in the evening of the

same day, and the next case, the cow Fanny, became ill three days later. In this case the animal appeared morose, had a high temperature and swelling in the neck region. The cow died within 3 hours with symptoms of intensive dyspnoea. Swelling of the foreleg was next observed in another cow, Festa, and moroseness and symptoms of tympany in the four-month old heifer Fedra. Bacteriological examination made of the two dead animals confirmed the diagnosis of pasteurelosis. Two days after the outbreak of the enzooty all animals in the reserve were immunized against pasteurelosis with the serum Polisepsin. Immunization was repeated a week later, and all shelters for the animals and enclosures disinfected. After the treatment given the condition of the two ill animals improved and no new cases of illness were observed. This was the second infectious disease within the 17 year period of breeding hybrids, after the outbreak of rabies observed in F_1 generation animals in 1968 (K r a s i ń s k a, 1971).

4. DISCUSSION

The experiments made at Białowieża from 1958—1976 provided material consisting of 71 (31, 40) hybrids with differing percentages of European bison and domestic cattle blood. This material formed 29% of the total number of hybrids obtained throughout the world from 1847—1977 (Table 3). As from the time the first hybrids were born in 1960 we carried out observations of the growth and development of hybrids of different generations (K r a s i ń s k a, 1969, 1971b, 1978). A total of 51 hybrids were killed for dressing percentage usefulness (S z u l c *et al.*, 1971; K r a s i ń s k a, 1976). When making this analysis we also examined the morphology of the internal organs of hybrids, while the skeletons were prepared for further osteological examination. In addition histological examination was made of the reproductive system in F_1 and B_1 male hybrids (F e d y k & K r a s i ń s k a, 1971), and at the present time the material obtained from the remaining backcross males is being elaborated in order to discover the causes of the animals' infertility.

The material at our disposal enabled us to complete the zoological part of the Białowieża experiment by the middle of 1976. The results obtained provided confirmation for our opinion that it would be worthwhile continuing the experiments under breeding farm conditions. We considered that a realistic evaluation of the economic profitability of hybrid production could be made under such conditions and that supplementary experiments could be carried out on such questions as perfecting techniques for obtaining semen from European bison for artificial

Table 3

Numbers of hybrids of the European bison and domestic cattle obtained during 1847—1977 all over the world.
Numbers of males and females are given in parentheses.

Generation	Białowieża (incl. Białowieża)	Poland	Other countries	Total	References
F ₁	11 (5, 6)	124 (46, 78)	11 (5, 6)	135 (51, 84)	(1), (2), (3), (4), (5), (6),
7/8 European bison 1/8 cattle	—	—	2 (0, 2)	2 (0, 2)	(7)
5/8 European bison 3/8 cattle	—	—	1 (0, 1)	1 (0, 1)	(5)
3/8 European bison 5/8 cattle	—	—	3 (1, 2)	3 (1, 2)	(7)
3/4 European bison 1/4 cattle	—	10 (6, 4)	13 (8, 5)	23 (14, 9)	(3), (4), (5), (7)
B ₁ — 1/4 European bison 3/4 cattle	29 (15, 14)	41 (21, 20)	7 (5, 2)	48 (26, 22)	(1), (5)
B ₂ — 1/8 European bison 7/8 cattle	24 (10, 14)	24 (10, 14)	—	24 (10, 14)	(1)
B ₃ — 1/16 European bison 15/16 cattle	7 (1, 6)	7 (1, 6)	—	7 (1, 6)	(1)
3/16 European bison 13/16 cattle	—	—	1 (1, 0)	1 (1, 0)	(8)
Total	71 (31, 40)	206 (84, 122)	38 (20, 19)	244 (104, 140)	

References: (1) Krasinska, 1976, (2) Malecka & Sumiński, 1976, (3) Sumiński pers. communication, (4) Taworski & Woliński, 1960, (5) Zablockij, 1956, (6) Zaniewski, 1967, (7) Rubcova, 1976, (8) Rubcova, pers. communication.

insemination, and also an evaluation of fodder consumption. Studies of this type could not be made in large forest enclosures. In April 1973 on the State Farm at Łęko (Poznań voivodship) work was begun on obtaining hybrids of European bison mated with cows of the black and white lowland and red Polish breeds, and hybrids of black and white lowland \times charolaise (Małecka & Sumiński, 1976). Up to April 1977 a total of 114 (42, 72) hybrids had been obtained there (Sumiński, pers. comm.) — Table 3. The aim of this state farm was to produce young hybrids weighing from 350—500 kg, pastured on farm wasteland. By 1976 year 147 cows had been inseminated with frozen European bison semen. Hybrid cows of the black and white lowland and charolaise breeds to have the highest fertility index with this type of insemination (96%). It was found that only two out of the seven male European bison tested were capable of producing semen throughout the whole year and that such semen was suitable for freezing. This semen was obtained throughout the whole year by the appropriate means and by choice of fodder (Małecka *et al.*, 1977).

The successful development of the experiment on European bison hybrids achieved at Łęko gives grounds for concluding that it will prove possible in the future to put the results of our studies into effect in practice. At the same time very successful results were obtained in the breeding of European bison, which makes it possible to ensure correct choice of breeding material essential to the production of hybrids.

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POSTĘP HODOWLI HYBRYDÓW ŻUBRA Z BYDŁEM DOMOWYM
ORAZ KAZUISTYKA PRZYPADKÓW IMMOBILIZACJI
I PASTERELOZY U HYBRYDÓW

Streszczenie

W pracy przedstawiono wyniki hodowlane uzyskane w doświadczeniu nad krzyżowaniem żubrów z bydłem domowym w okresie 1971—76. W okresie tym uzyskano 15 mieszańców pokolenia B₂ (7/8 bydło, 1/8 żubr) oraz 7 sztuk pokolenia B₃ (15/16 bydło, 1/16 żubr) — Tabela 1. Natomiast padło lub odstrzelono do analizy rzeźnej i morfo-fizjologicznej 38 hybrydów różnych pokoleń (Tabela 2). Łącznie

uzyskano w Białowieży 71 hybrydów różnych pokoleń, przy 244 hybrydach żubra uzyskanych w okresie 130 lat na świecie (Tabela 3).

Wszystkie krowy pokolenia B₁ były płodne, długość ciąży wynosiła u nich średnio 278,7 dni. Natomiast z 9 dojrzałych płciowo krow B₂ tylko 5 dało potomstwo. Długość ciąży wynosiła u nich średnio 275,3 dni, była więc krótsza od średnich danych dla krow B₁ i domowych. Jałówki B₃ dojrzały płciowo najwcześniej z krow pozostałych pokoleń, bo w wieku 11 miesięcy.

Opisano przypadek immobilizacji samca hybryda F₁ preparatem etorphine chloride oraz przebieg enzootii pasterelozy u hybrydów pokoleń wstecznych.

W dyskusji, w związku z zakończeniem białowieskiego eksperymentu, przedstawiono zakres dotychczas opracowanych zagadnień w Białowieży oraz wyniki kontynuacji eksperymentu w warunkach fermy hodowlanej w Państwowym Gospodarstwie Rolnym Łęko województwo poznańskie.