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The State of Studies on Hybridisation of European Bison and Domestic Cattle

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[With 2 Tables]

The authors gives the short review of studies on hybridisation of European bison and domestic cattle. Especially attention is paid to the recently studies in this field, carried out in the Mammals Research Institute at Białowieża. In this experiments the possibility of two sided crossing European bison and two breeds of cattle was tested. Observations were made on physical appearance and behaviour of hybrids, its fertility, inheritance of the length of gestation of females covered by male of different species and heterosis of growth.

I. INTRODUCTION

Crossing of the European bison with domestic cattle was attempted already at the beginning of XIX century (Ackerman, 1898). The only fairly precise and documented data concern hybrids of European bison and schwytz cattle obtained in 1847 to 1857 by a Pole, Walicki. He crossed a male bison with domestic cows and obtained three F_1 hybrids as well as 12 animals from the second generation (Karcov, 1903; Zablocki, 1956). The only F_1 bull was fertile.

Beginning in 1897 the work on this hybridisation was carried out in Russia in Askania Nova where the bisons were crossed with cows of a grey ukrainian breed. Between 1905 and 1928 twenty eight hybrids were obtained (Zablocki, 1939).

After a 100 year interruption these studies were resumed in Poland. In the Płock Zoological Garden four F_1 hybrids were produced from 1953 to 1963 (Taworski & Woliński, 1960; Taworski, personal comunication). In 1962 one hybrid was obtained at the Institute of Experimental Animal Breeding, Polish Academy of Sciences in Popielno (Zaniewski, 1967).

Systematic, large scale studies on hybrids of European bison and domestic cattle were started in Białowieża in 1958 thanks to the initia-

tive of Prof. A. Dehnel. Until 1966 ten F_1 and twelve backross animals were obtained (Dehnel, 1960, 1961; Krasińska, 1963, 1967).

II. BIAŁOWIEŻA EXPERIMENT

In our experiments there were until now three series of matings:

(1) Crossing European bison and polish red cattle; three F_1 hybrids were obtained from a cross: female bison × polish red bull and one hybrid from cross: polish red cow × male bison. It is of interest that the F_1 hybrid »Filon« born in 1960 was the first intergeneric hybrid ever obtained from a female European bison (Dehnel, 1961). Corresponding attempts of L. Walicki were unsuccesfull (Karcov, 1903).

(2) Crossing European bison with black-white lowland (bwl) cattle; one hybrid was obtained from cross: bwl bull x female bison and five hybrids from cross: male bison × bwl cow.

(3) Crossing F_1 hybrids with black-white lowland cattle; twelve animals were obtained of which one was stillborn and one died when 3 years old. The following results of the Białowieża experiment appear most the important:

1. Heterosis

It is well known that hybrids and especially interspecific hybrids exhibit heterosis (hybrid vigour). This was also observed in hybrids of European bison and domestic cattle. These hybrids had fast embryonic

Table 1.

Heterosis in the growth of hybrides between European bison and domestic cattle.

Index	Hybrids		bwl cattle [1])	
	European bison × bwl cow	European bison × bwl (or pr) cow	♂♂	♀♀
Body weight at birth (kg)	51—60 (56.3)	37.5—48 (42.0)	39.6	36.1
Body weight at the age of 6 month (kg)	250—300 (283.3)	223—234 (230.0)	214.0	179.6
Average daily gain during the first month of life	1.27	1.00	0.97	0.80

[1]) according to data of Skolasiński *et al.* (1966); *bwl* — black-white lowland, *pr* — polish red cattle.

development resulting in high weight at birth. They also had high rate of growth and development during the first year of postnatal life. The data given in table 1 indicate that this was true about sexes although to a different degree. In all cases the indexes of the growth of hybrids are considerably higher than those of the parental black-white lowland

breed. It seems worth mentioning that data on hybrids are not very precise because of the small number of animals and are somewhat lowered by half-wild raising of hybrids in large enclosures in the forest.

The existance of heterosis in the Białowieża hybrids was farther indicated by their disease resistance, strength and endurance of climatic conditions. Our hybrids do not require shelter in winter because similarly to the European bisons they sleep on the snow. During the six years of our experiment infectious diseases were never observed in the hybrids and all mechanical injuries were healing rapidly.

2. Appearance

Białowieża F_1 hybrids had mostly intermediate characters but resembled domestic cattle more closely then bisons. The coat was rich but uniform similarly to cattle. Only on the lower fringe of the neck they had a strand of longer sparce hair. The coat colour of hybrids of polish red cattle was dark brown, while the hybrids of black-white lowland cattle were black with white areas on the tail the limbs and the head. The bulls had a slight hunch. The voice of the hybrids was similar to that of cattle but lower and more coarse.

3. The inheritance of the length of pregnancy

It is known from literature that pregnancy is much shorter in the European bison than in different races of domestic cattle (Asdell, 1964). In our experiment the length of gestation was markedly influen-

Table 2.

Inheritance of the length of pregnancy (in days).

Species	n	Min. — Max.	Avg.	Author
Bison bonasus	52	260 — 270	265.0	Jaczewski, 1958
	94	258 — 275	265.8	Krasiński & Raczyński, 1967
Hybrids fathered by bison	7	258 — 268	264.2	Krasińska, 1967
Bos taurus dom.	—	277 — 290	—	Asdell, 1964
Hybrids fathered by domestic bull	4	283 — 302	292.5	Krasińska, 1967

ced by paternal species (Table 2). Cows covered by European bison had a shortened pregnancy falling within the range of this period in *Bison bonasus* while female bisons covered by domestic bull had longer gestation corresponding to that of *Bos taurus dom.* (cf. Dehnel, 1961; Krasińska, 1963; 1967).

4. Reproduction of hybrids

All F_1 males were sterile. They developed sexual drive when 14 to 15 months old but spermatozoa were never present.

On the contrary, 100% of the F_1 females were fertile when mated with a domestic bull. The rate of their sexual maturation indicates influence of paternal species on sexual maturation of progeny. The daughters of a male European bison mature when approximately 2 years old, similarly to female bisons, while the daughters of a domestic bull mature only slightly later than domestic heifers, i.e., when 11 to 13 months old. In the majority of the F_1 females the sexual cycle was seasonal and corresponding to the seasonal rhythm of reproduction in European bison (Krasińska, 1967). The length of gestation in F_1 females was intermediate between the corresponding ranges of bisons and cattle (Avg. = 274 days).

III. CONCLUSION

The described experiment has both theoretical and practical aspects. First of all, the possibility of crossing European bison and domestic cattle was tested. Fully controlled experiments confirmed earlier results and allowed new observations.

Data were collected on fertility of the hybrids, inheritance of physical appearance and behaviour and on the length of gestation in females covered by a male of a different species. Reciprocal crosses (bison × cattle and cattle × bison) were produced using two diffrent races of cattle. The majority of the results obtained to date were published in the above quoted papers.

It was observed that hybrids gained weight rapidly and calves were developing fast, both in utero and after birth. This allows discussing practical aspects of this experiment, namely the possibility of using heterosis of hybrids for production of animals with a large mass of meat and relatively thick skin. This problem requires further experimentation. It would be necessary to increase the per cent of conception in natural matings of cows with European bison, possibly to develop a technique of artificial insemination of cows with bison semen and most important, to calculate the economic profit of raising F_1 hybrids as slaughter animals.

On the basis of our results it seems justifiable to expect that the protected European bison can have practical significance when crossed with domestic cattle.

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STAN BADAŃ NAD HYBRYDYZACJĄ ŻUBRA Z BYDŁEM DOMOWYM

Streszczenie

Autorzy dokonali krótkiego przeglądu badań nad hybrydyzacją żubra z bydłem, bardziej szczegółowo omawiając wyniki uzyskane w Zakładzie Badania Ssaków PAN w Białowieży. W doświadczeniu tym wykazano możliwość obustronnych krzyżówek żubra z dwoma rasami bydła (czerwonym polskim i nizinnym czarno-białym). Najważniejsze kierunki badań to: dziedziczenie cech eksterieru, zachowanie się mieszańców, płodność mieszańców obu płci, dziedziczenie długości ciąży samic krytych samcami obcego gatunku (Tabela 2), heterozja wzrostu hybrydów. Autorzy sugerują możliwość praktycznego wykorzystania mieszańców żubra z bydłem dla celów produkcyjnych.