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DIFFERENCES IN THE WEAR OF INCISORS IN THE EUROPEAN BISON LIVING UNDER NATURAL AND RESERVE CONDITIONS

RÓŻNICE W ŚCIERANIU SIĘ ZĘBÓW SIECZNYCH U ŻUBRÓW W WARUNKACH NATURALNYCH I REZERWATOWYCH

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Comparison was made of the way and rate of wear of incisors in European bison *Bison bonasus* (L i n n a e u s, 1768) living in freedom and under reserve conditions. Free-living European bison wear incisors more quickly. Excessive loss of of dentine took place on the biting surface, and the angle of the biting surface to the long axis of the tooth was inclined from the start vertically or almost vertically. In European bison living in reserves the crowns of incisors wore more slowly, no excessive loss of dentine occurred and the crown of incisors wore more slowly from the labial than from the lingual side.

While carrying out research on the morphology of teeth in *Bovinae* I had the opportunity of comparing the incisors of European bison, *Bison bonasus* (L i n n a e u s, 1798) living under natural conditions and in reserves. For this purpose I used European bison craniological material now in the collection of the Zoological Institute of the Soviet Academy of Sciences in Leningrad, originating mainly from animals shot during the period from 1880—1910 in the Białowieża Primaeval Forest and the Caucasus Mountains. The teeth of 36 European bison were examined, this number including 29 animals with partially worn permanent teeth and 7 animals with deciduous teeth.

The skulls of European bison obtained during recent ten-year periods from the reserves at Pszczyna, Niepołomice, Gorce and Białowieża were used for comparisons. Some of the individuals examined had spent part of their lives in zoological gardens. The comparative material consisted of 27 adult European bison with partially worn permanent teeth and 3 animals with deciduous teeth, all currently kept in the Department of Animal Anatomy, Warsaw Agricultural University.

The material originating from the period from 1880—1910 was obtained from free-living European bison which obtained available food by themselves, this being supplemented only to a very slight degree by man. The comparative material, on the other hand, was formed by European bison living in reserves, kept supplied with food for all 12 months of the year and independently obtaining only a small amount of food from the resources of the reserve. The differences in the way the incisors are worn in the two groups are very distinct and apply to: 1) rapidity of wear of the crowns, 2) excessive wear of dentine, 3) angle of inclination of the biting surface to the long axis of the tooth.

Animals living under natural conditions wear the incisors far more quickly than the premolars and molars. The crowns of premolars and molars were still very little worn when the crowns of the incisors were completely worn. In European bison from reserves incisors, premolars and molars usually exhibit the same degree of wear. This is particularly clearly evident in old individuals in which the degree of wear of the teeth is considerable. There are no grounds for assuming that the premolars and molars in European bison living under natural conditions were more slowly worn, and it would therefore appear that wear of the incisors in free-living European bison occurs more quickly than in animals living in reserves.

Table 1.

Frequency of occurrence of dentine loss on the bitting surfaces of incisors in European bison, living free and shot during the period 1880—1910 — group A, and kept in enclosures — group B.

	Group and locality	Dentine loss				No.
		None	Small	Medium	Large	
A	Białowieża (permanent teeth)	1	9	6	8	24
	Białowieża (deciduous teeth)	2	4		1	7
	Caucasus (permanent teeth)		2	2	1	5
B	permanent teeth	23		2	2	27
	deciduous teeth	3				3

Table 2.

Position of biting surface in relation to long axis of incisor.
A — group of free-living animals, B — animals kept in enclosures.

	Group and locality	Type of wear of incisors			No.
		chisel-shape	almost vertical	vertical	
A	Białowieża (permanent teeth)	1	9	14	24
	Białowieża (deciduous teeth)	1	3	3	7
	Caucasus (permanent teeth)	1	4		5
B	permanent teeth	12	9	6	27
	deciduous teeth	1	2		3

It was found that in free-living European bison there is excessive wear of dentine on the biting surface of the incisors, taking the form of depressions of different size (Photo 1). Such depressions occur as the result of more rapid wear of the dentine, which is less resistant than the enamel, which wears more slowly. The depth of these depressions was often as much as 2—3 mm in relation to the margin of enamel. Such losses were observed on deciduous incisors, but are chiefly found on permanent incisors, and begin to form after part of the crown is worn

down and exposes the dentine. Losses of dentine appear earliest on I_1, and as wear of the crowns continues depressions gradually form on the remaining incisors. The depressions observed are analogical to those found by Eidmann (1928) in *Cervus elaphus* Linnaeus, 1758. The depressions were found to disappear only in old individuals, after the crowns, or only their labial parts, had been completely worn away. The depressions are most distinct in individuals of medium age, and are found in all such individuals (Table 1). An exception to this was formed by one adult animal which had been kept for some time in a zoo and two juvenile individuals with deciduous teeth.

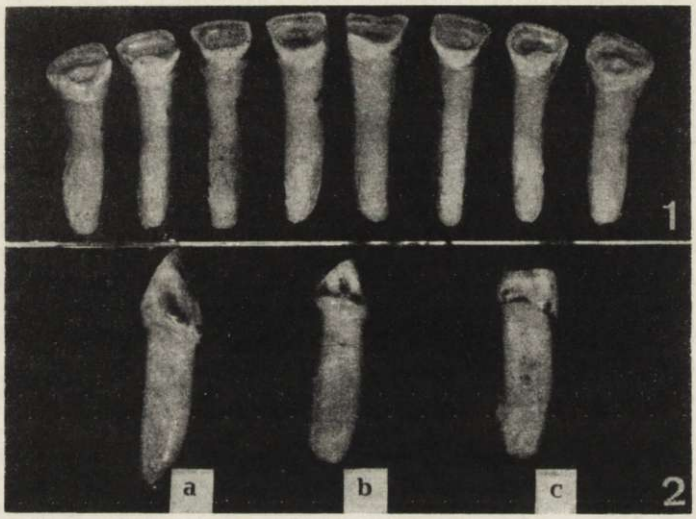

Photo 1. Excessive loss of dentine forming cup-like depressions on the chewing surface of the incisors.

Photo 2. Angle of inclination of the biting surface to the long axis of incisor. Type of wear: *a* — chisel-like, *b* — almost vertical, *c* — vertical.

The incisors of European bison in reserves do not exhibit excessive wear of dentine, an exception being formed by four adult European bison (Table 1) in which distinct depressions were observed. Three of them (»Puszcza« no. 673, »Pura« no. 627 and »Purchawka« no. 714) had spent many years in the reserve at Niepołomice and had a certain amount of Caucasus blood (Empel, 1962).

Differences in the position of the biting surface of incisor crowns are also characteristic. With a few exceptions the biting surfaces of incisors in free-living European bison are situated from the beginning in a plane almost vertical to the long axis of the tooth (Photo 2b, Table 2). This is due to the simultaneous wear of both the lingual and labial sides of the crown. As the excessive losses in the dentine are formed, the layer of enamel protruding on the labial side becomes very liable to break off, which accelerates wear of the labial part of the incisor crown. As a result, in older individuals the biting surface is usually situated completely vertically to the long axis of the tooth (Photo 2c, Table 2).

After the crown has been completely worn the labial side of the root is observed to wear very rapidly in these bison, as pointed out by Wróblewski (1927). The biting surface thus inclines towards the lip.

In European bison from reserves the biting surface of incisors is situated completely differently. As the result of the far slower wear of the labial side of the crown, the incisors in young individuals are chisel-shaped, with a sharp labial edge (Photo 2a). The rubbing surface forms an acute angle with the labial surface of the incisor crown. This is a type of wear similar to that observed in domestic cattle. It is not until individuals about 8 years old or more are examined that the rubbing surface of the incisors is found to begin inclining in a plane vertical to the long axis of the tooth.

The differences described in the way in which the crowns of incisors are worn are due chiefly to the different conditions under which the animals obtain food and partly also to changes in the composition of their food. European bison under natural conditions obtain their food in forests, feeding on grass, leaves and the shoots and bark of trees. The particularly difficult conditions under which European bison obtain food during the winter obliges them to eat dry and woody parts of plants. This is probably food which does not completely satisfy the requirements of their organism and causes partial decalcification of the dentine. On the other hand the food is sufficiently hard to cause mechanical excessive wear of dentine. The way in which the animals obtain their food, in particular stripping bark from, trees, results in quicker wear of the labial side of the incisor crown, especially when the labial edge of the enamel breaks off. This in turn leads to a more vertical positioning of the biting surface in relation to the long axis of the tooth.

European bison kept in closed reserves are supplied with more nutritive food, which they supplement only to a small extent, by natural food. The role of the incisore in obtaining food is thus lessened and in consequence the rate of wear is slower. The more suitable composition of the food of European bison in reserves perhaps causes more intensive mineralization of the dentine. Exceptions to this rule observed in European bison in Niepołomice reserve may point to these animals making greater use of natural food there. An abundant food supply breaks European bison, at least to a certain degree, of the habit of stripping bark from trees, which, in turn, retards the rate of wear of the labial edge of the incisor crown.

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