THE ROLE OF EUROPEAN AUROCHS (*BOS PRIGEMINIUS BOJANUS*, 1827) IN EARLY CATTLE BREEDING IN CONTEXT OF AUROCHS REMAINS FROM CELTIC SETTLEMENT LIPTOVSKA MARA (NORTH SLOVAKIA)

Aleksander Chrószcz[1], Maciej Janeczek[1], Zora Miklikova[2]
[1]*Department of Biostructure and Animal Physiology, Faculty of Veterinary Medicine*
Wrocław University of Environmental and Life Sciences, ul. Kożuchowska 1/3, 51-631 Wrocław, Poland
E-mail: bjorn@onet.pl
[2]*Institute of Archaeology, Slovak Academy of Sciences, Akademická 2, 94921 Nitra, Slovakia*

Summary. The skeletal remains of auroch were identified in Liptovska Mara II bone assemblage dated back to La-Tene Period Celtic settlement. The auroch remains were 0.47% of all identified bones. Strong fragmentation indicates on postconsumptive character of animal artifacts. The finding proved auroch presence in mountain forests environment of North Slovakia. The horn, talus, calcaneus, and phalanxes were identified and measured. The size of auroch remains were significant (ca. 30%) larger than in domestic cattle. No intermediate bone forms were found. No signs for local domestication or crossbreeding between auroch and domestic cattle were stated. The marginal importance of meat supply for Celtic community from Liptovska Mara was proved. The symbolic or other cultural aspect of auroch hunting cannot be excluded.

Keywords: auroch, archaeozoology, animal breeding, cattle domestication.

EUROPINIŲ STUMBRŲ (*BOS PRIGEMINIUS BOJANUS*, 1827) ĮTAKA KARVIŲ VEISLĖMS PAGAL IŠKASTINES STUMBRŲ LIEKANAS KELTŲ GYVENVIETĖJE LIPTOVSKA MAROJE (ŠIAURĖS SLOVAKIJA)

Aleksander Chrószcz[1], Maciej Janeczek[1], Zora Miklikova[2]
[1]*Gyvulių fiziologijos ir biologijos katedra, Veterinarinės medicinos fakultetas*
Vroclavo ekologijos ir gyvybės mokslų universitetas, Kożuchowska 1/3, 51-631 Vroclavas, Lenkija
el. paštas: bjorn@onet.pl
[2]*Archeologijos institutas, Slovakijos mokslų akademija, Akademická 2, 94921 Nitra, Slovakija*

Santrauka. Liptovska Maros II kaulų kolekcijoje iš La-Tene periodo keltų gyvenvietės buvo identifikuotos stumbrų skeleto liekanos, kurios sudarė tik 0,47 proc. bendro rasto kaulų skaičiaus. Stumbrų kaulų fragmentai rodė gyvulių išsekimą ir galimas ligas. Atradimai patvirtino stumbrų egzistavimą Šiaurės Slovakijos kalnų miškuose. Stumbrų ragų, šokikaulių, kulnikaulių bei falangų kaulai buvo identifikuoti ir išmatuoti. Palyginti su analogiškais domestikuotų galvijų kaulais stumbrų kaulai buvo statistiškai ženkliai, t. y. apie 30 proc., didesni. Tarpinių tarp šių abiejų gyvulių rūšių formų kaulų identifikuota nebuvo. Mūsų rasti kaulų fragmentai patvirtino, kad Liptovska Maros II keltų gyvenvietėje La-Tene periodu stumbrų mėsa, nors ir negausiai, buvo vartojama maistui. Daroma prielaida, kad tais laikais buvo paplitusi simbolinė arba ritualinė stumbrų medžioklė.

Raktažodžiai: stumbrai, archeozoologija, gyvulių veisimas, galvijų domestikacija.

Introduction. The investigation were carried out on material coming from Liptovska Mara II. It was a Celtic village dating back to la-Tene period. Liptovska Mara is one of the largest Celtic settlement complex in this part of Europe (Pieta 1996, 2008). It is already clear, auroch is the ancestor of all domestic cattle breed (Clutton-Brock 1999, Bradley and Magee 2006). In prehistoric time it lived in a large area of Asia, Africa and Europe, too. (Clutton-Brock 1999). Although it was very large, strong and dangerous animal, the aurochs were haunted by humans in every times. Julius Gaius Caesar described the German haunting on aurochs in *"De bello Galico"* (Kysely 2008). Later, in the Middle Ages, it was haunted by nobility and Kings, for example Charles the Great. The last individual died in 1627 in Jaktorow near Warsaw in Kingdom of Poland. It is already important, aurochs were in Poland under special king's protection, in this time. The king Sigismund III Wasa in 1597 sent out an order as special aurochs protection act (Lasota-Moskalewska 2005). Auroch's skeletal remains had been investigated many times in relation to this species ancestor's role in cattle domestication and general morphology (Bökönyi 1962, Degerbøl and Fredskild 1970, Krysiak and Lasota A. 1971, Driesch and Boessneck 1976, Kobryń and Lasota-Moskalewska 1989, Lasota-Moskalewska and Kobryń 1989, Baxter 2002, Tekkouk and Guintard 2007).

The results presented in this study will provide useful information for a better understanding cattle domestication process and auroch habitat. The aim of this study was the morphological description and morphometry of the auroch remains and the role of auroch definition in Celtic community from Liptovska Mara. In this paper the aurochs remains investigations are presented and in this context are theories about European wild aurochs domestication and crossbreeding between aurochs and domestic cattle disputed.

Material and methods. Auroch's skeletal remains were discovered in archaeological site - Liptovska Mara II (la Tene period). The animal remains were identified with visual-comparative method. The phalanx I (Fig. 1), talus and calcaneus bones (Fig. 2.) of aurochs and cattle were measured, because only this bones were well preserved and were measureable. The measurements were taken with electronic slide-caliper and metric tape. Additionally the auroch's horn was measured (Fig. 3). The following measurements were taken: Greatest abaxial length (GLpe), Greatest width proximal (Bp), Greatest width distal (Bd) and minimal width of diaphysis (KD) for phalanx proximal. Greatest lateral length (GLl), Greatest medial length (GLm), Distal width (Bd), Greatest lateral thickness (Tl), Greatest medial thickness (Tm) for talus and Total length (GL), Greatest width (GB) for calcaneus (Driesch von 1976). The mean value and standard deviation were calculated. The variation severity for measurements of proximal phalanx was analyzed using t-Student (Prisim®). The dimension along curvatures and horn base circumference were measured.

Fig. 1. **Phalanxes of ruminants.** 1, 2- auroch; 3- domestic cattle; 4- sheep

Fig. 2. **Calcaneus of the auroch**

Fig. 3. **The horn of the auroch**

Results. On the base of the epiphysial cartilages fusion in humerus, phalanx I and calcaneus, the adult age of aurochs was proved. The typical signs of human activity was stated on humerus bones, metacarpus and axis. The strong bone remains fragmentation did not allow for measurements. These findings indicate clearly on post-consumptive character of artifacts and maximal utilization of bones for meat and bone marrow. The same bones condition was observed in all animals remains from Liptovska Mara II (Janeczek et al. 2009). Only horn, phalanges I, calcaneus and talus were measureable. The aurochs remains were 0,47% and cattle 52,62% of all identified animal bones (Janeczek et al. 2009). All measurements values were significant greater in aurochs than in domestic cattle. The results are in table 1, 2 and 3. The talus mean value GLl in cattle was 34% smaller than in aurochs, GLm 33,56%, BD 35,77%, TL 29,11% and TM 42,05% (table 1). In calcaneus mean value of GL in cattle was 29,94% smaller than in aurochs and GB 13,16% (table 2). In phalanx proximal the mean value of GLpe in cattle was 31%, Gp 30%, Gb 33% and KD 31,5% smaller than in aurochs. All mean values of phalanx proximal measurements of aurochs and domestic cattle were significant different ($p \leq 0,05$). The dimension along greater curvature was 51, 3 cm, the dimension along lesser curvature was 40,5 cm and horn base circumference was 30,6 cm. No pathological changes were observed on aurochs bones, but the number of artifacts does not allow for any animal condition and health status divagation. The analysis of skeletal frequency was not done because of a small number of auroch remains.

Discussion. As known, the cattle was domesticated in the Near East. The mitochondrial DNA analysis of present and ancient material showed directly Near East origin of domestic cattle and absolutely does not indicate a domestication of European aurochs (Troy et al. 2001, Bollongino et al. 2006, Edwards et al. 2007, Scheu et al. 2008). The domestic cattle to appear in Europe came with the first agriculturists as a part Neolithic migration about 6500-6800 BC (Bradley and Magee 2006, Edwards et al. 2007). The one of the earlier examples in Europe was described in north Greece (Boessneck 1961). As already mentioned, the European aurochs population did not have any significant influence on domestic cattle breeding. Only Bökönyi (1974), Műller (1964) and Döhle (1990)

suggest the local domestication. This theories are based on findings of intermediate sized bones. This kind of bones, coming from Eneolithic, were founded in Kutna Hora-Denemark in Czech Republic, too. The crossbreeding of introduced domestic cattle and wild aurochs was also taken into consideration in above mentioned study (Kysely 2008). The differentiation between large examples of domestic male and wild aurochs females is very problematic. The intermediate bones can come from large examples of cattle or small aurochs cows (Driesch von and Boessneck 1976, Kysely 2008). The results of castration should be considered, too. The castration important influence on body size in ruminants was proved (Davis 2000). In fact, objective indications for local domestication in Europe are rather missing (except mentioned). The very brave theories about massive domestication in some places in Poland during Neolith are not documented in fact (Piątkowska-Małecka 2006). The large numbers of aurochs bones in the same site is not a proof for domestication, but rather a result of intensive hunting activity. The crossbreeding between domestic cattle and wild aurochs is very problematic. The sexual dimorphism in the aurochs was very significant. There are differences in shoulder height between aurochs populations coming from various regions too, but it is clear, in every situation, the aurochs bull was much bigger than domestic cow (Janeczek et al. 2009, Lasota-Moskalewska and Kobryń 1990). Probably the small female cattle could not maintain body weight of the large male aurochs. It was estimated, the cattle in Liptovska Mara were about 102-113 cm heigh (Janeczek et al. 2009).The same problem exists today by the crossing milk and meet cattle types. Today, the insemination is the routine medical procedure, but is rather impossible, the massive insemination manipulations would have existed in Neolithic Poland, even if it had been known in Ancient Rome. If the coition between female domesic cattle and wild aurochs had been successful, the partus gravis would have occurred resulting the cow or newborn death. On the other hand, the male aurochs had been probably too large for the small domestic cow and impotentia coeundi would have occurred. Only a few number of these "medical experiments" could have a chance for success. From breeding point of view, crossbreeding was only an experiment and the influence this procedure on domestic cattle population was marginal, if it existed in fact. Some mtRNA investigation results on material from Italy, perhaps indicate this incidentally situations (Beja-Pereira et al. 2006). According to Vergil, the insemination was known in Ancient Rome and it was possible to use the male aurochs to fertilize female cow with this method, but specific roman experience was not typical for other European cultures (Kysely 2008).

Table 1. **The measurements of the aurochs and cattle talus. For cattle the average value of measurements and in aurochs individual values are presented**

	Auroch (n-3)			Cattle (n-50)
GLl	7,37	8,22	7,46	5,064 (max-5,82; min-4,21) SD- 0,37
GLM	6,89	7,41	7,05-	4,75 (max-5,63;min-4,06) SD- 0,4
Bd	5,17	5,15	4,03	3,05 (max- 3,61; min-3,36) SD- 0,3
Tl	3,95	4,26	3,71	2,63 (max-3,14; min-2,25) SD- 0,2
Tm	4,47	-	-	2,59 (max-3,08; min- 2,06)

GLl- Greatest lateral length; GLm- Greatest medial length; Bd- Distal width; Tl- Greatest lateral thickness; Tm- Greatest medial thickness

Table 2. **The measurements of the aurochs and cattle calcaneus. For cattle the average value of measurements and in aurochs individual values are presented**

	Auroch (n-1)	Cattle (n-25)
GL	16,03	11,23 (max-13,03; min- 10, 03) SD- 0,34
GB	3,95	3,43 (max-3,83; min-2,98) SD- 0,35

GL- Total length; GB-Greatest width

Table 3. **The average value of aurochs and cattle phalanx proximal measurements**

	Aurochs (n-7)	Cattle (n-80)
GLpe	81,11 (max-83,02; min-79,68); SD- 1,28	55,75 (max- 60,11; min- 51,05); SD-
Bp	37,03 (max-39,5; min-36,6); SD- 1,07	26,67 (max- 30,02; min-23,38) SD- 2,31
Bd	37,76 (max-38,45; min- 36,6); SD- 1,98	24,63(max- 28,03; min- 22,93); SD- 1,65
KD	32,07 (max-33,52; min-29,5); SD- 1,43	21,99 (max- 24,47; min- 19,37); SD- 1,76)

GLpe- Greatest abaxial length; Bp- Greatest width proximal; (Bd) Greatest width distal; KD- minimal width od diaphysis

In the Liptovska Mara II, the typical bones of domestic cattle and wild aurochs were identified. Greatest lateral length value of the auroch talus in our study was 7,37-8,22 cm. The mean value of these parameter was 8,42 cm. in Hungary, 8,56 cm. in Denmark, 8,35 cm. in Portugal (Bökönyi 1962, Degerbøl and Fredskild 1970). According to Degerbøl and Fredskild (1970), the greatest length of the calcaneus in aurochs from Portugal was 10,5-18,6 cm and 16,1-19,6 cm from Denmark. The same dimension in our study was 16,03 cm. Bökönyi (1962) presented the range values of greatest length of calcaneus (14,6-19,1 cm.) in Hungary. In our study the mean value of the greatest width proximal of the proximal phalanx was 81, 11 cm and the mean value of the greatest width distal of the proximal phalanx was 37,76 cm. Mentioned values are similar to other authors results (Ambros 1968, Degerbøl and Fredskild 1970, Lasota-Moskalewska and Kobryń 1990). The morphometric results presented in this study are similar to values acquired for aurochs coming from various regions of Europe. The aurochs remains are usually a small bone assemblage in archeological sites (Fabiš 2002). Similar situation was observed in our study. The animals remains were fragmented and only a few bones were measureable. There is a significant size disproportion between wild and domestic forms. The investigated bones of cattle were ca 30% smaller then bones of aurochs. The "intermediate" sized bones were not found. What is clear, because these anatomical forms should be found rather in Neolithic sites (Kysely 2008). In the Celtic Liptovska Mara the aurochs were the haunting objects. The number of bones suggests, it was very rare proud, but of course very reach. The wild animal remains was about 4,49% of all identified bones in Liptovska Mara (Janeczek et al. 2009). It is typical for agricultural communities, in which the domestic animal were most important meat source. It is already becoming clear, the aurochs lived in mountains forests in North Slovakia during the la-Tene period. Difficult environmental conditions suggest widespread biological potential of successful aurochs accommodation. These abilities result large variability of aurochs existence in Eurasia. The importance of aurochs haunting for local community food supplementation was marginal, like others wild species, but it could have a symbolic importance, perhaps even large.

Conclusions.

1. North Slovakian aurochs morphometric results are within the range values estimated by other authors.
2. The lack of intermediate bone morphotype within Liptovska Mara aurochs remains proved no evidences for local auroch's domestication.
3. The small number of auroch bone remains in archaeozoological assemblages is typical and similar to other papers results.
4. The accessible results have proven the aurochs existence in mountain forest environment.
5. Auroch's role in Celtic communities dated back to la-Tene period was marginal.
6. Aurochs hunting and ritual consumption importance in Celtic culture can be disputed.

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