MORPHOMETRIC CHARACTERISTICS OF THE SKULL OF AUROCHS (BOS PRIMIGENIUS BOJANUS 1827) FROM THE TUCHOLA FOREST

CHARAKTERYSTYKA MORFOMETRYCZNA CZASZKI TURA *(BOS PRIMIGENIUS BOJANUS 1827*) Z BORÓW TUCHOLSKICH

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ABSTRACT

The aurochs skull was found in Tuchola Forest (the Kujawy and Pomorze Province) in the vicinity of Tuchola. The skull analyzed has come from adult male aurochs, and it is almost complete, only deprived of small fragments of a single incisive bone and the jaw. The osteometric analysis following the method by Duerst [5] was performed. The observations made and measurements taken make it possible to develop our knowledge with further information concerning that extinct species as well as provide information on the occurrence and distribution of aurochs. The measurements made will also facilitate the confrontation of craniometric parameters in aurochs from the Tuchola Forest with the skulls originated from other parts of the country.

Keywords: auroch, morphometry, skull

ABSTRACT

Czaszkę tura znaleziono w Borach Tucholskich (woj. kujawsko-pomorskie) w okolicach Tucholi. Analizowana czaszka pochodziła od dorosłego samca tura holoceńskiego, i jest prawie kompletna, pozbawiona jedynie niewielkich fragmentów jednej kości międzyszczękowej i żuchwy. Poddano ją analizie osteometrycznej według metody Duersta [5]. Przeprowadzone obserwacje i wykonane pomiary pozwalają poszerzyć wiedzę o kolejne informacje dotyczące tego wymarłego gatunku, a także dostarczą informacji na temat występowania i rozmieszczenia tura.

Dokonane pomiary pozwolą także na konfrontację parametrów kraniometrycznych tura z Borów Tucholskich z czaszkami pochodzącymi z innych rejonów kraju.

Słowa kluczowe: tur, morfometria, czaszka

DETAILED ABSTRACT

Analizowany materiał stanowiła prawie kompletna czaszka tura, pozbawiona jedynie żuchwy i niewielkich fragmentów kości międzyszczękowej. Czaszkę wydobyto z pokładów torfu podczas eksploatacji torfowiska w okolicy Tucholi. Wieloletnie zaleganie w torfie nie spowodowało większych zniszczeń. Miejsce znaleziska sugeruje, że zwierzę prawdopodobnie utonęło w jeziorze lub bagnie, które występowało przed wiekami w miejscu znaleziska. Tur z Borów Tucholskich stanowi jeden z najlepiej zachowanych egzemplarzy czaszki tego wymarłego gatunku. Możliwość wykonania wielu pomiarów kraniometrycznych stanowi podstawę do porównań z czaszkami innych osobników. Całkowita długość czaszki tura z Borów Tucholskich wynosiła 670mm. Długość podstawy czaszki mózgowiowej wynosiła 283 mm, długość podstawy czaszki trzewiowej 233mm. Na uwagę zasługują parametry określające długość możdżeni u badanego osobnika. Długość krzywizny większej osiągała obustronnie po 650 mm, długość krzywizny mniejszej 460 mm po lewej stronie i 450 mm po prawej. Rozmiary czaszki, charakterystyczny kształt możdżeni, a w tym ich długość i obwód przy podstawie świadczą, że był to samiec. Stopień zużycia zębów wskazuje na zaawansowanym wiek zwierzęcia. Według Gedymin [8] parametr długości możdżeni mierzony po krzywiźnie dużej, u samców tura osiągał wartości w przedziale od 420 do 750mm. Tur z Borów Tucholskich pod względem tego parametru klasyfikował się wśród osobników o najpotężniejszych możdżeniach.

INTRODUCTION

Aurochs, as it is commonly believed, a wild ancestor of domestic cattle, occurred longest in Poland, which is confirmed by all the sources. The last female individual died in 1627 in Jaktorowska Primeval Forest in the vicinity of Sochaczew (Poland). The facts are reported by: Samsonowicz [17] referring to the note going back to 1630 placed in Lustracje Mazowieckie, Roskosz [16], discussing the history of aurochs on Polish soil.

The range of occurrence of aurochs covered a vast territory, it occurred in northern Africa and in Eurasia. According to Gromowa following Bogolubski [2], the northern border of the range in Eurasia was constituted by 57-60 parallel, which has been confirmed by the osseous remains of aurochs found in those areas. Skulls of that species found in Africa have been described by many authors following Bogolubski [2], skulls aurochs originated from Tibet were described by Guangfu Zong [7].

The evidence of the occurrence of aurochs in Poland is offered by relatively numerous osseous remains, especially precious skull bones [7]. The author also provided information concerning craniometric characters in aurochs. She presented a

number of craniometric indices facilitating comparative studies of the skulls. Chrzanowska [4] describing the anatomy and craniometric characters paid attention to the measurements which could testify to the age and sex of the animal. A detailed catalogue of osseous findings aurochs from the area of Poland has been developed by Wyrost [19]. Changes in the skeleton morphology of aurochs from neolith to Middle Ages were described as well [12].

Many authors, describing the species morphology, refer to differences and similarities between the aurochs and domestic cattle: [3,11,18]

Over the recent years there has appeared, especially in hunting magazines, new information on the finding of other osseous remains of aurochs in the area of Poland: [1] in Pilica, [9] in the vicinity of Biłgoraj, [10] in the valley of the Łupia River in the vicinity of Skierniewice, [14] the Obrzyca River (Lubuskie), [5] at Warcino, [7] at Nowy Jaromierz (Lubuskie Province) and the skull from the Tuchola Forest covered by the present paper.

MATERIAL AND METHODS

The material analysed was made up of an almost complete skull aurochs, only deprived of the jaw and small fragments of incisive bone. The skull was excavated from peat deposits while exploiting peat bog in the vicinity of Tuchola. Long-term deposition in the peat did not cause greater damage. The place where it was found suggests that the animal must have drowned in the lake or bog which existed ages ago in the place of that finding. The research was launched starting from morphologic analysis with the visual method, paying attention to characteristic features of the skull. Skull measurements were taken according to Duerst [5], similarly as reported by Gedymin [8] who performed research on 22 skulls. A total of 29 measurements were taken, including 23 measurements on the skull and 6 on cornual processes. Cornual processes are an important element of the skull aurochs, and since it is most often preserved part of the skull they are often the basis for the comparison of the size of cornual processes themselves, skulls and even animals they were part of. The following cornual processes measurements were taken: the setting of cornual processes Ok.-Ok, length of the greater curvature of the cornual process, the length smaller curvature, chord of the cornual process, distance between cornual processes measured at their base, circumference of the base of cornual processes, the longest base diameter, the smallest base diameter. The measurements are given in Table. Skull indices were calculated. The metrical results were compared with data reported in literature. Photographic documentation was made.

RESULTS

The skull investigated was the skull of a fully-grown animal. The very good condition of the skull made it possible to take many craniometric measurements the values of which are given in Table 1.

Aurochs skull shows slender structure with clearly elongated visceral part. Frontal bones in the part caudal form a strong base for the base of cornual processes. Caudally against cornual processes of frontal bones and the entire skull get narrowed (the place visible in a form of profound arciform notches (Phot.1), to get wider again at the height of orbit forming vast fornix of orbits. The surface of frontal bones almost flat at the height of the back margin of orbital foramens forms a slight eminence. Supraorbital grooves - profound, at their bottom visible supraorbital foramens. Osseous plate caudally against grooves additionally perforated with a few foramens. The back place of the skull slightly arciform formed a huge intercornual protuberance, symmetrically transforming into the neck of cornual processes. (Phot.2)

Table 1. Values of skull measurements (mm) in aurochs.

No.	MeasurementPomiar	mm	
1	Total skull length Długość całkowita czaszki (Op-P)	670	
2	Skull base length Długość podstawy czaszki (B –P)	515	
3	Length of cerebral cranium (B-St) Długość podstawy czaszki mózgowiowej	283	
4	Length of visceral cranium base (St-P) Długość podstawy czaszki trzewiowej	233	
5	Location of orbits in the skull Zl-Op Położenie oczodołów w czaszce	L-325	R-350
6	Lateral length of viscerocranium Zl-P Boczna długość czaszki trzewiowej	L-370	R-350
7	Zygomatic width of cranium (Zy-Zy) Szerokość jarzmowa czaszki	255	

8	The greatest width of brain skull (Eu-Eu) Największa szerokość czaszki mózgowiowej	230
9	Visceral part height (St-N) Wysokość części trzewiowej	180
10	Height of the occipital triangle (A-B) Wysokość potylicy	153
11	The smallest occipital width Najmniejsza szerokość potylicy	170
12	The largest occipital width Największa szerokość potylicy	282
13	Width of frontal bones on the edges of orbits Szerokość kości czołowych na krawędziach oczodołów	280
14	Length of frontal bones in sagittal plane Długość kości czołowych w płaszczyźnie strzałkowej	315
15	Dental series length (P1-M3) (Pm-Pd) Długość szeregu zębowego	143
16	Location of molars Mol-PUmieszczenie zębów trzonowych	205
17	Length of the nasal bone in sagittal plane Długość kości nosowej w płaszczyźnie strzałkowej	242
18	The largest width of nasal bones Największa szerokość kości nosowych	48
19	Orbit diameter (vertical) Średnica oczodołu (pozioma)	66
20	Orbit diameter (horizontal) Średnica oczodołu (pionowa)	78
21	Height of the foramen magnum Wysokość otworu oczodołowego wielkiego	45

22	Maximum width of the foramen magnum Maksymalna szerokość otworu oczodołowego wielkiego	46	
23	Distance between the tips of cornual processes Ok.-Ok Odległość między wierzchołkami możdżeni Ok.-Ok	522	
24	The largest distance between curvatures of cornual processes Największa odległość między krzywiznami możdżeni	800	
25	Smallest width between bony core bases Odległość między możdżeniami mierzona u ich podstawy	250	
	Bone core - Możdżenie	left	right
26	Length of greater curvature Długość krzywizny większej	650	650
27	Smaller curvature length Długość krzywizny mniejszej	460	450
28	Chord of cornual processes Cięciwa możdżeni	330	350
29	Base circumference Obwód podstawy możdżeni	315	310
30	Greatest diameter of base Największa średnica możdżeni	110	110
31	Smallest diameter of base Najmniejsza średnica możdżeni	83	82

Bases of cornual processes demonstrated pearls, and their planes were covered with grooves. Initially Cornual processes were going laterally, and then upwards, finally assuming characteristic lyre-like shape.

In the individual described there was found a slight asymmetry in the shape of cornual processes. Convex orbital fornix as compared to the coronal plane. Plate of the back of the neck against the base of the skull forms an obtuse angle; hence the differences between the total skull length and the skull base length, in the individual described is 155 mm. Parietal bones located above the squamous part of the occipital bone form symmetrical groove-like depression (Phot.3). On the plate of the

Phot.1 Aurochs skull:
view from the top.
Fot. 1 Czaszka tura widok z góry.

Phot.2 Lateral projection of aurochs skull, shape of cornual processes.
Fot.2 Czaszka tura projekcja boczna, charakterystyczny kształt możdżeni.

Phot.3. Aurochs skull - occiput region.
Fot.3. Czaszka tura- region potylicy.

Phot.4. Base of the skull, grand muscular tubercles.
Fot. 4. Podstawa czaszki, okazałe guzki mięśniowe.

back of the neck both the occipital bone and the caudal plane of intercornual protuberance have uneven surface with numerous osseous borders. They must have formed strong insertions for neck muscles.

A relatively short body of the occipital bone. On the base of the skull – very protruding muscular tubercles irregular in shape (Phot.4).

Deep temporal fossa, poorly developed zygomatic arch. Vast orbits, elongated oval, orbit diameter measured in vertical plane is 78 mm, whereas in horizontal plane 66 mm. Nasal bones strongly set in viscerocranium. Relatively short incisive bone.

Phot.5. Orbit, uneven borders and numerous vascular foramens.
Fot.5. Oczodół, nierówne krawędzie i liczne otwory naczyniowe.

Phot.6. Hard palate and molar teeth in aurochs
Fot. 6. Podniebienie twarde i zęby policzkowe tura.

Table 2.Values of skull indices in aurochs.
Tabela 2.Wartości indeksów czaszkowych tura.

Nr	Index Indeks	Index value Wartość indeksu
1	Skull base length x 100 Total skull length Długość podstawy czaszki x 100 Długość całkowita czaszki	76.9
2	Zygomatic width of the skull x 100 Total skull length Szerokość jarzmowa czaszki x 100 Długość całkowita czaszki	38.1
3	The biggest forehead width x100 Forehead length Największa szerokość czoła x100 Długość czoła	88.9
4	The biggest width of nasal bones Nasal bones length Największa szerokość kości nosowych Długość kości nosowych	19.8

5	Base circumference x100 length of greater curvature obwód nasady możdżeni x100 długość po krzywiźnie większej	Left lewa 48.5	Righ prawa 47.8
6	smallest diameter of base x100 greatest diameter of base najmniejsza średnica podstawy możdżenia x100 największa średnica podstawy możdżenia	Left lewa 75.7	Right prawa 74.5

Facial tuberosity of the jaw bone not quite strongly developed. The plane of the facial lamina of the jaw bone between the zygomatic bone, and facial tuberosity with numerous groves and rough plane constituted a strong insertion for masseter.

Orbital borders have numerous osseous tubercles and vascular foramens (Phot.5)

Horizontal lamina of the palatine bone is wide, perforated with two foramens. Rostral border of both palatine bones, goes slightly backwards and towards molars. At the height of the anterior plane of the last molar it bends caudally and it goes further in parallel to dental series (Phot. 6).

Table 2 gives calculated skull indices which will facilitate the comparison of the sizes and proportions of the skull described with the information concerning other skulls in aurochs reported by different authors.

DISCUSSION

Aurochs from the Tuchola Forest is one of the best preserved skull samples of that extinct species. The possibility of taking many craniometric measurements is a springboard for comparisons with the skulls of other individuals. The asymmetrically preserved incisive bone makes it possible to determine the length of the entire skull and the skull and the skull base length. The total skull length in aurochs from the Tuchola Forest was 670 mm. The length of the base of brain skull was 283 mm, the length of viscerocranium base 233 mm. The aurochs skulls described so far were heavily damaged and incomplete. In most cases neurocranium part was preserved, usually including the base of cornual processes. The circumference of cornual processes is the parameter which is most often mentioned in publications and it is a reference for comparisons. According to Gedymin [8], Ekstrom [6], the circumference of cornual processes in aurochs ranged from 313 mm to 380 mm. In aurochs from Nowy Jaromierz described by Frąckowiak [9] the circumference of the left base of the cornual process was 315 mm, and the right one - 320 mm. Aurochs from the Tuchola Forest reached, respectively, 315 mm and 310. The value of that parameter was similar to the skull in aurochs from Nowy Jaromierz. Kobryń, Lasota–Moskalewska

[12] suggest that the range of that parameter in aurochs was greater: 180 - 410 mm. The parameters defining the length of cornual processes in the individual investigated are noteworthy; the length of greater curvature was reached symmetrically after 650 mm, the length of the smaller curvature – 460 mm on the left and 450 mm on the right. The size of the skull, a characteristic shape of cornual processes, including their length and circumference at the base show that it was male and it was older. That hypothesis is confirmed by advanced craniosynostosis and the degree of teeth wear. A comparison of the described skull with the skull of the recently described aurochs from Nowy Jaromierz in which the length of the cornual process behind the greater curvature was 460 mm. One can conclude that the individual from the Tuchola Forest in respect of the size of cornual processes demonstrated a great advantage. The parameter of the length of cornual processes measured behind great curvature, in aurochs males reached the values ranging from 420 to 750 mm [7]. As for that parameter, aurochs from the Tuchola Forest got classified among individuals of the largest cornual processes. In Bovidae representatives there is defined the distance between the tips of cornual processes. The individual examined reaching the value of 522 mm fell within the numerical range (530-570 mm) reported by Gedymin [8] for males of that species. Drawing on the fact that cornual processes were complete, there was measured the greatest distance of external points of cornual processes; in the individual studied it was 800 mm. The parameter in males fell within the range of 558-885 mm, while in females it reached the value of 690 mm [8]. The aurochs skull described constitutes the so-called loose finding and such type of findings triggers the problem of locating them in time. In the case of complete or minimally disassembled parts of the skeleton, applying the osteometric and comparative methods, as well as documenting the material investigated with photographs, further information is provided, concerning anatomy and osteometric characteristics in aurochs. Each finding of that type develops our knowledge on the aurochs distribution in Poland. Osseous remains of that extinct species stored in regional museums show that aurochs were abundant in the Kujawy and Pomorze Region, especially in the area of today's Tuchola Forest.

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