Trakia Journal of Sciences, No 3, pp 203-209, 2026
Available online at:
https://trakia-uni.bg

ISSN 1313-3551 (online) doi:10.15547/tjs.2026.03.002

Original Contribution

PREPARATION AND MAKING OF AN ANATOMICAL TROPHY FROM A EUROPEAN BISON HEAD (BISON BONASUS)

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ABSTRACT

PURPOSE: The European bison (Bison bonasus), is a large mammal of the order Artiodactyls. The anatomical object was obtained after an autopsy.

METHODS: The preparation and obtaining of the anatomical specimen and a trophy of the head skeleton went through eight stages.

RESULTS: The control and application of the procedures for degreasing and bleaching of the bison head skeleton led to results that represent the obtaining of bone material from a skull with preserved and original bone architecture. The preserved bone preparation from a European bison head is a complete anatomical and trophy preparation, suitable for various educational, scientific and museum applications.

CONCUSION: The resulting preserved biological object is presented in the collection of the Anatomy Museum at the Department of Veterinary Anatomy, Histology and Embryology, Faculty of Veterinary Medicine, Trakia University, Stara Zagora.

Keywords: anatomy, craniology, taxidermy, trophy.

INTRODUCTION

Taxidermy is a scientific discipline and a method of animal preservation that allows presenting specimens either in their natural form or prepared for scientific research. As such, taxidermy contributes to the study of evolution and natural history aiming to familiarize and display the morphological features of a number of animal species. It also requires an in-depth knowledge of the anatomy of various biological objects. One of the main results of taxidermy is obtaining trophies from entire biological specimens or parts of them (1-3). The resulting exhibits are a necessary tool in the training of a wide range of specialists.

The bison is a member of the *Bovidae* family and the largest mammal on the North American continent. There are two subspecies: Plains bison (*Bison bison bison*) and Woodland bison (*Bison bison athabascae*). Woodland bison live mainly in Canada and are larger than the plains bison. Bison are wild, territorial, and extremely strong animals. In early summer, they shed their winter coats. They use their massive heads to move through deep snow to reach food. They possess short, curved, hollow horns that are used for defense (4).

The North American bison is dark brown, with a relatively large head, high withers, massive shoulder areas with long fur on them, and on thoracic limbs. The bison's limbs are short and have rounded hooves. Its horns are short, curved medially in males, and upright in females. Males are relatively heavier and larger than females, reaching 1000 kg. The wood bison is taller than the plains bison. Bison live up to 40 years of age. Wild bison are found in forests and associated fields, feeding on herbaceous plants. Plains bison feed on herbaceous plants in the summer, and on moss, lichens, and dry grasses in winter. Bison drink fresh water, and snow in winter. Bison feed in the morning and the evening, spending most of the day resting and ruminating. Habits such as rubbing their heads, necks, and flanks on trees are often observed. Herds reach 15-25 animals, with the number of

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animals increasing during the breeding season to 400 bisons (5-8).

The European bison is the largest terrestrial mammal in Europe. It is smaller than the American bison, but has longer limbs. The bison is dark brown, with a relatively large head, a high hump, a large shoulder area, and long, thick, curly fur on the shoulders and the chest. Its horns are short and curved in males, and straight in females. Males are larger than females. Bison can live up to 40 years. The European bison inhabits deciduous or mixed forests and moist meadows. It feeds on herbaceous plants, leaves, shrubs, bark and lichens on trees. In winter, bison scavenge their food in the ground, digging it up with their hooves. They feed for a smaller part of the day, and rest and move around for the rest of the day. They are territorial animals, gathering in groups of females and calves, which can reach to 20 individuals. Males gather in small groups or remain alone (5-8).

The European bison has a relatively larger skull compared to other species of the *Bovini* tribe. Its significant morphological features form a wider frontal region and a laterally directed cornual process whose shape and size impact the variation of the skull shape. Male bison have larger skulls. It is assumed that these morphological features of the frontal region influence the development of the occipital region, maxilla and other facial bones. This study provides a basic hypothesis for future research on the ecological and evolutionary factors that may affect the variation in the morphology of the bison skull and can provide data regarding the conservation of this species (9-12).

The skull of the European bison and its morphological characteristics are of key importance for the species-specific anatomical features of ruminants. Variations in the shape of the skull and its structures reflect its potential to respond to different irritants and stimuli. The horns of male and female animals are a typical distinctive sex and species mark. The size of the horns is positively related to the body and age characteristics of the individual. The development of the skull in both bison sexes is intensive up to 5 years of age, after which the growth of the head skeleton slows down and the formation of the main cranial structures is completed. After the age of 5 years, there is no significant relationship between animal age and the size of the skull and the horn, suggesting that after a certain point in development, the growth of these features is independent of age. Larger skulls have larger transverse dimensions and a more rounded form, therefore the size of the skull is of great importance for the overall shape, regardless of other factors (9-12).

The significantly larger skull of the European bison indicates a robust skeletal structure, which is consistent with both the animal's living conditions and its role as a large herbivore in Europe. The horn of the European bison shows a clear border with the frontal bone, by forming a thin base. The significant morphological features of the skull skeleton in the bison highlight the evolutionary changes that have occurred under environmental influences. Interpreting and presenting these morphological traits can provide valuable information about the evolution of the European bison and its ecological role in its respective environment. The morphological characteristics of ruminants are of particular importance for their phylogeny. Ruminants have evolved by undergoing numerous functional morphological adaptations related to feeding on abrasive foods. They have developed molars and hypsodont teeth to a greater extent, and the associated skull morphology (9-13).

Cleaned and preserved, a skull is a source of morphological information and aesthetic interest. It is an indicator of the animal's lifestyle. Information from the skull can be obtained about the animal's diet, the strength of its bite, and the degree of development of its sensory organs. A collection of skulls can be a wonderful addition to an educational process, art, and science (14).

The aim of this research paper is to present experimental data related to the preparation, processing and obtaining of an anatomical trophy from a European bison head which will serve in the teaching of veterinary anatomy and at the same time will be an exhibit in the collection of the anatomical museum at the Department of Veterinary Anatomy, Histology and Embryology.

MATERIALS AND METHODS

Material

The anatomical object was obtained after an autopsy procedure, autopsy protocol No. 19 dated 10.11.2025, concerning a single carcass of a European bison (*Bison bonasus*), coat color - typical, brown, age - three years, body weight - 250 kg, height - 1,60 m, sex - male, entire,

special features - no electronic transducer, ear tag or other means of identification. The animal is designated NA-2023-M1, clinical protocol No. 71372, property of the WIDER RHODOPE FOUNDATION based in office 114, 41 Bulgaria Blvd., Youth Center, Studen Kladenets Game Reserve, Haskovo.

Method

1. Removal of skin and muscle.

The skin is removed by making a longitudinal ventral median incision - from the caudal part of the mandibular region in a rostral direction, to the transverse plane, extending 2 cm caudally from the corner of the mouth. Then a transverse incision is made in a dorsal direction to the back of the nose, preserving the skin around the nostrils, upper and lower lips. A circular incision of the skin is made around the orbital rim and the base of the horns. The skin from the rest of the head is removed together with the auricles (15-17).

2. Maceration

The processed bone material from the head skeleton is placed in a container with water at room temperature for five days (15-17).

3. Boiling

The skeleton of the head is immersed in a container filled with water. If it has horn, it is immersed to the base of the horn. The horn capsule remains on the cornual process of the frontal bone itself. The boiling continues for 2 hours, with the addition of detergent or sodium bicarbonate, until the soft tissues begin to separate without effort (15-17).

4. Cooling

Cooling takes place in a cold water. In the absence of this stage of preparation, the soft tissues stick to the bones, being difficult to separate. The remaining skin around the nostrils is removed (15-17).

5. Mechanical processing

The residual soft tissues are detached from the surface of the bones. The nasal cavity is cleaned, preserving the integrity of the ethmoid labyrinth, the nasal septum and the conchal bones. The eyeballs with the optic nerve are discarded, preserving the relief and integrity of the bony orbit. The muscles and periosteum are removed from the lower jaw (15-17).

6. Degreasing

Degreasing of the bones before bleaching preserves the white color of the bones. In order to achieve this, the remaining bone fat is extracted. The bones are placed in an organic solvent (pure gasoline) to extract the fat. The appearance of fat drops in the solvent is an indicator of a completed degreasing process. Degreasing continues for 3 days (15-17).

7. Bleaching

The skull is washed twice with 30% hydrogen peroxide solution. Then, the skull skeleton is wrapped in gauze and placed in a suitable container (plastic) to continue the bleaching process. The skeleton is immersed in a 10% peroxide solution for a period of 24 hours. After the treatment is completed, the bleached skull is rinsed with water and then dried (15-17).

8. Further processing

The skeleton is dried and placed in a container with a 50% aqueous solution of wood glue. The solution covers the entire skeleton of the head. After 24 hours, the solution has penetrated the bones and replaced the lost bone matter (the bone pores are closed and dust cannot penetrate the bones) (15-17).

RESULTS AND DISCUSSION

The careful control and implementation of the procedures for preparing the skeleton of the bison head led to obtaining of bone material from a skull with genuine and original bone architecture **(Figure 4 and Figure 5).**

The mechanical integrity of the bone material is completely preserved, as evidenced by the illustration by the presented figures. An experimental and successful approach to the processing and obtaining of a bone specimen suitable for educational and museum purposes is presented. The results of the study lead to an interpretation of the efficacy of the applied method for the conservation of a skull from a large ruminant (bison), through which the preservation of the bone shape and architectonics is achieved **(Figure 1 and Figure 5).**

The mechanical characteristics of bones are of crucial importance for the choice of a method for their preservation and the assessment of the obtained results. The bone structure is a perfect biomechanical product, which is of interest not only for the obtaining of individual bones or bone fragments, but also for the making of complete preserved bone objects (3, 18, 19).

The applied method for obtaining original identical bone material is a good screening marker for the assessment of the original bone macrostructure. The obtained results are a

suitable model for assessing the preservation of the bone structure after applying the preservation method. Therefore, they are important for the interpretation and presentation of the outcomes as a reliable marker for assessing the authenticity of the obtained bone objects. The latter are applicable both when studying the anatomical features of the skeleton of the head of the European bison, and when a bone preclinical model is needed for the study of pathological changes in this area. At the same time, this bone model is well suited to the preparation of judicial veterinary expertise on parts of the skeleton of the head of this animal species **(Figure 1, Figure 2 and Figure 3).**

The research method does not affect nor change the mechanical characteristics of the cranial bones and peripheral soft tissues, as a result of which the bone relief is completely preserved. The obtained preserved bone object is a good preclinical model, suitable for assessing the overall exterior mechanical and aesthetic bone structure. The bone morphology is comprehensively visualized, identifying even small bone objects (dimples, growths, cuts, grooves, etc.) from the skeleton of the head. The heterogeneity of the bone surface is completely preserved and authentic. By using the conservation method, our knowledge of the identification of normal from pathological exterior changes in bone objects can be improved **(Figure 3 and Figure 4).**

Bone volume and mass, geometry and properties of bone tissue are of extremely great importance for the structural integrity of the bone (8, 18, 19).

The morphological features of bones are determined by the quality of bone tissue. In view of the latter, the bone object obtained by us is completely identical to a normal anatomical object, which is the result of the controlled and successful application of the abovementioned algorithm for the preservation of bone material **(Figure 1 and Figure 5).**

Bone quality is determined by all spatial and tissue factors characteristic of this biological object (7, 18, 19).

Spatial factors include volume, relief and microscopic factors. Preservation of bone quality, when using conservation techniques, is a primary goal and the results obtained are a sign of the successful achievement of obtaining an original anatomical and trophy object **(Figure 4 and Figure 5).**

Due to the wide variety of shapes and sizes of the skull bones of large ruminants, the choice of our research biological object has been motivated by the dimensions of the head skeleton, the clear bone relief, the well-developed formations and the exotic origin of this skeleton. Our experimental design is consistent with strict scientific and educational principles.

Conserving the bone object relies on preparation techniques and materials science to obtain a complete skeleton of a European bison head so that an anatomical specimen and a bone trophy can be generated (20). Therefore, the obtained result is a complete three-dimensional original model, which will contribute to the completion of the osteological collection of the Anatomy Museum within the Department of Veterinary Anatomy, Histology and Embryology of Faculty of Veterinary Medicine at Trakia University, Stara Zagora. The obtained specimen is a suitable animal model for the training of veterinary medical students in the field of native anatomy of the head in large ruminants. The ultimate success of this bone model will find clinical application in the training of students in veterinary orthopedics and traumatology.

The obtained preserved bone object from the European bison head would serve as a normal morphological basis for the orthopedic reconstruction of bone objects in the craniofacial region in wild and captive large ruminants caused by a number of pathological processes.

While in small ruminants, a large part of the small bone formations of the head skeleton are difficult to distinguish, we managed to identify those in our object.

Our study, which aimed at obtaining a macroscopic morphological preparation and a trophy from an animal object, would be a good basis for orthopedic developments in the field of the cranial skeleton in animals. The use of relevant live animal models is a difficult process to implement (due to animal welfare restrictions), therefore our research setting is fully suitable for this goal. Our result is an original, authentic analogue that would be of interest to scholars alike.

In conclusion, the obtained preserved bone object from the European bison head is a completely comprehensive anatomical and trophy preparation, suitable for educational,

scientific and museum applications. Future research will focus on obtaining better and species-diverse conservation models from different parts of the skeleton of domestic mammals with the aim for comprehensive application in our environment.

Figure 1. Native European bison head.

Figure 2. Separation and removal of skin from a European bison head.

Figure 3. Head of a European bison after separation and removal of the skin, while preserving the horns.

Figure 4. The resulting preserved bone preparation from a European bison head (dorsolateral view).

Figure 5. The resulting preserved bone preparation from a European bison head (dorsocranial view).

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