



Maharashtra's' Largest Crossbreed Bovine- Gaja: Skeleton Characterization

Shilpa S. Modekar Salunke*

MVSc. Ph.D., Sectional Head, Department of Veterinary Anatomy and Histology,
KNPCVS, Shirwal (Maharashtra), India.

(Corresponding author: Shilpa S. Modekar Salunke*)

(Received: 25 January 2025; Revised: 05 March 2025; Accepted: 20 March 2025; Published online: 10 April 2025)
(Published by Research Trend)

DOI: <https://doi.org/10.65041/BiologicalForum.2025.17.4.8>

ABSTRACT: Cattle (*Bos taurus*) are large, domesticated, bovid ungulates widely kept as livestock. They are prominent modern members of the subfamily Bovinae. The skeletons are considered to serve as one of the didactic equipment's because of which, for or several years the skeletons of various animals are assembled and mounted for to make use of them in identification of animal's remains, in archaeological as well as forensic studies. The widely utility is for academic purposes *i.e.*, comparative studies and anatomical variations. Various educational institutions do undertake the skeleton preparation procedures by various methods, however to get a huge bovine, weighing a ton and with 06 ft tall height and had 10ft of body length, was itself a great opportunity and challenge as well for to decide about the maceration method to be adopted. Though nowadays burial maceration is not adopted on top priority, we however had to go by the same old method, and it took us almost get the bones macerated in 130 days for the maceration and 11 months 90 days and 22 hours for getting the skeleton mounted. Skeleton preparation will always have great importance in research, museum collections against various fields not only in veterinary anatomy but also in zoology and paleontology. This will serve as a basis for various advancements in preparation techniques and applications in forensic and archaeological studies.

Keywords: Bovine Anatomy, Skeleton, Largest Cross breed, Gaja bull Skeleton.

INTRODUCTION

Skeleton word itself means a framework of bones which support and protects the soft tissue of the body Gram (2006). It is pretty rare to have a legend getting same laurels after death as well when it gets assembled in the form of mounted skeleton having all bones intact. This was indeed the greatest opportunity and welcome able challenge for the department and for our institute to have Gaja bull. The main of aim of this research was to extract process and assemble the appendicular and axial skeleton of this huge crossbreed bovine, to bridge the gap of information on the skeletal preparation of the largest and tallest bull of the state and to determine the percentage time utilized in all the steps involved in the skeleton preparation and assembling. The findings of this research will serve as a guide in the skeleton preparation of a Bovine and contribute to the knowledge and museum of anatomy. Through anatomy (osteology), one learns about the bones in both an anatomical and physiological manner. In doing so, we can better understand related aspects about the body, we can understand better ways to treat the animals, find certain ways to mend and aid fractured or broken bones (Boyle, 2010). The skeleton of Gaja – the tallest crossbreed cattle of Maharashtra state who fetched laurels by getting his name placed in India book of records, passed away at the age of 10 yrs in July 2021.

As the said time of the years was one of the most tragic and unexpected years of several decades, due to the outbreak of the novel- covid virus, the said bull's skeleton preparation was almost an big achievement in given circumstances. Due to various restrictions and bindings, due to the Covid- 19 protocols, the major constraint was the man power. As the biggest task was to how to macerate the huge b and heavy body of this giant bull named Gaja as he had died at his, owners place named Miraj taluka, Sangli district, Kasbe-Digraj, Maharashtra State, which was 175 kms away from Krantisinh Nanan Patil College of Veterinary Sciences, Shirwal, Satara (Institute where the Skeleton was assembled). So, the immediate decisions was to be taken as it was even when we all were experiencing heavy rains. To make the huge 'Gaja' – its dead body travel/ transported to the location of the college was almost impossible. So, we decided to go for the burial method as there was no option left in the given circumstances. Due to the Rules and restrictions imposed over due to the Novel Corona outbreak. In addition the purpose of this research was that as, the skeleton gives students a hands-on method for learning the names of various bones their structure and modifications pertaining to the location and joints they form. Also play as a visual tool to relate bone and joints to muscle structure (Greene *et al.*, 1993). So, the modern skeleton system serves as didactic equipment in

educational institutions and as exhibits in museums, hunting trophies, and scientific research materials (Kempa *et al.*, 2016). Actual virtual experience plays an important role in understanding of biological phenomena. Moreover, the learning process strongly influences students' mental models of a biological phenomenon (Prokop *et al.*, 2007).

MATERIALS AND METHODS

The materials used for skeleton preparation were as,

1. Iron rods.
2. Drill bits of various thickness.
- 3) Hydrogen Peroxide,
- 4) Wire's of various gauges.
- 5) Sticking material.
- 6) Wooden platform.

The procedure adopted for preparation of the skeleton, of the huge bovine was based on the circumstances and best available resources on the given time. Step wise procedure adopted was as follows:

1. Burial of the Carcass.
2. Skinning of the Carcass
3. Collection of the bones.
4. Bone drying and cleaning.
5. Frame construction and Drilling and articulation of the bones
6. Bone varnishing.

After the postmortem was done, the process of skinning and de-fleshing was carried out. The bull was eviscerated (Thoracic, Abdominal and Pelvic) and the flesh was detached from the underlying skeleton manually with the help of knives. The burial of the entire carcass was done inside burial pit dug, which was specially made in accordance with the size of the carcass for maceration (decomposition) of the soft tissue.

Collection of bones after complete maceration of soft tissues was done. The bones were carefully picked in separate bags sorting them into axial skeleton and appendicular skeleton separately. The bones were soiled and carefully carried to the department and cleaning was carried out carefully.

Cleaning of the bones was done to remove the soil stucked and for which the bones were repeatedly washed to get rid of the adhered material. Then these were dipped in warm water containing NaOH solution (300gm pellet of NaOH dissolved 100 Liters of Water). Manual muscular scraping was done by using knife for to remove leftover muscular tissue. 30 percent Hydrogen peroxide solution was used to wash the bones thereafter to improve the overall appearance of the bones.

Drying of bones was carried out under the sun, during the pre-noon session, as it was a bit cloudy as it was monsoon going on. During these days as it was monsoon season going on, so even air drying- blow dryer was used to dry the bones and remove the moisture.

After proper drying the bones were properly varnished to enhance the longevity and appearance of the bones. Then the articulation of various bones was done in two manners (Axial part of Skeleton and Appendicular Part). The bones were drilled for holes of required dimensions and articulated as per sequence of the

bodily skeleton of the bovines' body. Proper dimensions were used to get the wired pass through the drilled aperture over the bones to keep their natural appearance intact (Atabo *et al.*, 2019).

As the bones were heavier in weight than the normal weight of the bovines as it was a huge size bull having record weight of 01 ton, so due care was taken during assembling of the skeleton. The platform used was of wooden over which the iron rods were fixed at the center first so that the heaviness of the bones and the skeleton could get assembled and stand over properly (Onwuama *et al.*, 2012).

RESULT AND DISCUSSION

Gaja bull whose skeleton was assembled had huge body due to which the bones size and strength was even higher as he himself weighed 01 Tons when alive. He was 06 feet tall and had length of body as 10 feet, adding to the massiveness of his body. So ultimately the allometry was even higher. Allometry is known as the relationship between body size and skeletal proportions (Boxenbaum, 1982). So, it is an important feature which made the maceration time getting increased by burial method as compared to the normal average size bull. The long bones were heavier and denser than average bulls which added to more utility of a skillful hand during drilling and fixing two bones in succession at the joint site. The axial skeleton was heavy as the size of skull, mandible and the vertebral column was higher than the average bulls from the same region of Maharashtra. The duration of skeleton preparation for this cross-breed bull, Gaja, in this study indicated that the entire procedure took 12 months 29 days and 19 hours which is much more as compared to the 18 days-2 hours both in pigeon and squirrel, 5 months-6 days-6 hours in deer, and 10 months-11 days-12 hours-30 as per (Mahapatara *et al.*, 2011). The difference in the methods of skeleton preparation as well as the huge size of the bull under study could be responsible for the differences in the preparation duration. A total number of 207 bones were extracted from the appendicular and axial skeleton, which are responsible for easing out in locomotion and protection of the brain, spinal cord and internal organs of the body as well. However, the time which was required for maceration of Gaja bull's skeleton was 130 days due to his huge body size, which was more than that compared to the report of Kyle (1998); Hill (1950) whose method involved burying of the dead animal for maceration for 60 days.



Fig. 1. Skeleton of Gaja getting unveiled in presence of Honorable Vice Chancellor MAFSU and other dignitaries.



Fig. 2. Gaja Bull-06 ft tall and 10ft of body length, weighed 01 Ton.



Fig. 3. Vertebral column being assembled in sequence.



Fig. 4. Skeleton of Gaja bull being assembled over the platform and students learning the placement of digits.

CONCLUSIONS

It is concluded that the size of any animal dictates the strength and structure of its skeleton, that is why they have strong bones to support body weight and to withstand the forces, which is one of the reasons for thicker denser bones. Therefore the maceration and assembling (or preparing skeletons) of this heavy weighted and huge sized bull even takes more time due to the increased size and complexity of the tissues and bones involved. So even if some methods are old and outdated in terms, many a times there are incidences where we have to go for the old school ones'. The animal under this study and the skeleton assembled is one of its own kind. This stand as the first one to get recognition as, the one who marked his name in India

book of record- as heaviest and tallest bovine during life getting assembled post death – the pride of Maharashtra, prepared with all its bones intact, in a record time of 11 months 90 days and 22 hours.

FUTURE SCOPE

The study of skeleton remains an essential tool in teaching as well as understanding animal anatomy, osteology and arthrology which aid the learners in grasping the location, arrangement of bones and the pattern of joints in the body. These even serve as crucial in understanding the animal evolution, adaptation, and the relationships between different species. Way the given skeleton of this huge crossbred bovine was assembled, will even provide an insight about being flexible in using combination of old and modern techniques as per need of the given moment and condition. Skeleton preparation will always have great importance in research, museum collections against various fields not only in veterinary anatomy but also in zoology and paleontology. This will serve as a basis for various advancements in preparation techniques and applications in forensic and archaeological studies.

Acknowledgement. The author express her sincere gratitude to the Ex- Associate Dean's of KNPCVS, Shirwal Dr. V.D. Aher and Dr. M.D. Meshram for giving an opportunity and the trust shown, encouragement and support for to get this task completed in best way. I even thank Dr. Yadav G.B, Assistant Professor and Dr. Kachve, C.D (Lab Tech) for extending the helping hand. Thanks are even due for retired clerk of department of Veterinary anatomy, Mr. Teli. B.M. for his breath taking efforts during the entire procedure of mounting the skeleton.

Conflict of Interest. None.

REFERENCES

- Atabo, S. M., Hena, S. A., Jaji, A. Z. and Bodinga, A. H. (2019). Bovine skeleton preparation using hot water technique for anatomical studies. *Asian Journal of Research in Animal and Veterinary Sciences*, 4(3), 1-7.
- Boxenbaum, H. (1982). Interspecies scaling, allometry, physiological time, and the ground plan of pharmacokinetics. *J. Pharmacokinetic. Biopharm.*, 10, 201-227.
- Boyle, C. (2010). Maceration and preparation of mammal skeleton for long-term curation. Univ. Indianapolis Archaeol Forensic Lab.
- Gram, C. O. (2006). Vertebrate Skeletons: Preparation and Storage National Park Service. pp 7-11.
- Greene, E. A., Smith, K. R., Pendergraft, J. S., Raub, R. H. and Arns, M. J. (1993). Equine skeletal preservation techniques to enhance teaching effectiveness. *Journal of animal science*, 71(8), 2270- 2274.
- Hill, A. V. (1950). The dimensions of animals and their muscular dynamics. *Sci. Prog.*, 38, 209-230.
- Kempa, K., Kulawik, M., Bartyzel, B. J., Jakubowski, M., Skubis, J. and Koczon, P. (2016). Characterization of selected techniques of maceration bones of Gallus gallus domesticus. Folia Pomeranae Universitatis Technologiae Stetinensis. *Agricultura, Alimentaria, Piscariaet Zootechnica*, 328(39)3.
- Kyle, M. (1998) An Articulated phytosaur skeleton: Preparation techniques from field to exhibit. MA Thesis, Texas Tech. Univ. 120.

Onwuama, K. T., Salami, S. O., Ali, M. and Nzalak, J. O. (2012). Effect of different methods of bone preparation on the skeleton of the African giant pouched rat (*Cricetomys gambianus*). *Int. J. Morphol.*, 30, 425-427.

Prokop, P. A., Prokop M. A., Tunnicliffe, S. D. and Diran (2007). Children's ideas of animals' internal structures. *Journal of Biological Education*, 41(2), 62-67.

How to cite this article: Shilpa S. Modekar Salunke (2025). Maharashtra's' Largest Crossbreed Bovine- Gaja: Skeleton Characterization. *Biological Forum*, 17(4): 50-53.