The Indian Journal of Veterinary Sciences & Biotechnology *(2016) Volume 12, Issue 2, 37-40*
ISSN (Print) : 2394-0247 : ISSN (Print and online) : 2395-1176, abbreviated as IJVSBT
http://dx.doi.org/10.21887/ijvsbt.v12i2.3734

Submitted : 05-07-2016 ***Accepted : 21-08-2016*** ***Published : 15-10-2016***

Morphometric Studies on The Tarsal Bones of Blue Bull (*Boselaphus tragocamelus*)

Sanjay Kumar Bharti, Ishwer Singh, Balwinder Singh Dhote,
Om Prakash Choudhary and Meena Mrigesh

Department of Veterinary Anatomy,

College of Veterinary and Animal Sciences,

G.B. P U A Pantnagar-263145 (U.S. Nagar, Uttarakhand)

Corresponding Author : drskbharti24@gmail.com

Abstract

A study was carried out on the tarsal bones of blue bull. The tarsus of blue bull consisted of five bones i.e., tibial tarsal (Astragalus), fibular tarsal (Oscalcis), fused central and fourth tarsal (Scaphocuboid), first tarsal (Cunciformparvum) and second and third tarsal fused (Cuseiform magnum).The average height and breadth of tibial tarsal was 6.81±0.01 cm and 3.84±0.01 cm, respectively. The fibular tarsal was the longest, elongated bone of the tarsus and flattened from side to side with an average height and breadth 12.00±0.01 cm and 3.72±0.01 cm, respectively. The central and the fourth tarsalswere fused together to form a large single bone. The average height and breadth for central and fourth fused tarsal was 2.54±0.01 cm and 5.11±0.01 cm, respectively. The first tarsal was a quadrilateral piece of bone placed at the postero-internal part of the tarsus. The length and maximum breadth of first tarsal was 2.14±0.01 cm and 3.32±0.01 cm, respectively. The second and third fused tarsal was a small plate of bone having length and breadth of second and third fused tarsal 1.68±0.01 cm and 3.34±0.01 cm, respectively.

Key Words: Blue bull, Morphometry, Tarsal, Tibial, Fibular, Quadrilateral.

Introduction

The Blue bull (*Boselaphus tragocamelus*), sometime called nilgai (neel meaning blue and a gai meaning bovine animal - literally 'cow'), is one of the largest Asiatic antelopes found in open forests in the day time . The mature male appears ox-like and is also known as blue bull. It is also present in parts of southern Nepal and eastern Pakistan. They show marked sexual dimorphismwith only the male having horns. Nilgai now a day is in danger of extinction because people are hunting for its meet and skin etc. These animals are protected under International Union for Conservation of Nature and Natural Resources (IUCN) since 2003 and also protected under Schedule III of the Indian Wildlife Protection Act, 1972. The Nilgai has become extinct in Bangladesh, it is only member of genus *Boselaphus* and the main threat to this species is the loss of habitat due to deforestation and human population growth. In many Vetero-legal cases or postmortem diagnosis, one fails to identify the bones of this animal and confuse them with those of some other large ruminants.Hence in order to filling the gap of knowledge in this filed the present work was undertaken to study the

tarsal bone of blue bull.

Materials and Methods

The present study was conducted on tarsal bones of six adult blue bull of either sex. Permission for the specimen collection was sought from the Principal Chief Conservator of Forest (PCCF), Government of Rajasthan. The skeletons were collected from the Jodhpur zoo after official approvals from the Principal Chief Conservator of Forest vide letter no. F, 3 (04) Tech-II/CCF/2013/2326 dated 12.01.2015 and from The Deputy Conservator of Forest wildlife, Jodhpur s.n./sam/388-90 dated 22.01.2015. The skeletons were excavated out from the graveyards located in the premises of Jodhpur zoo and processed as per standard technique (Raghavan, 1964). Subsequently, these osteological specimens were studied to record their gross morphological features. Different parameters of tarsal were measured and subjected to routine statistical analysis (Snedecor and Cochran, 1994).

Results and Discussion

The tarsus (Fig. 1-4) consisted of five bones i.e., tibial tarsal (Astragalus), fibular tarsal (Oscalcis), fused central and fourth tarsal (Scaphocuboid), first tarsal (Cunciformparvum) and second and third fused tarsal (Cuseiform magnum). A typical pattern of seven tarsal bones arranged in two rows were reported in dog (Miller *et al.,* 1964) and in pigs (Akers and Denbow, 2008); whereas it was composed of six short bones in horse (Getty, 1975) and in dromedary (Smuts and Bezuidenhout, 1987), and seven tarsal bones in hedgehog (Ozkan, 2002).

The tibial tarsal (Fig.1) was the medial bone of the proximal row. The average maximum height and breadth for tibial tarsal of blue bull was 6.81±0.01 cm and 3.84±0.01 cm, respectively. It has six surfaces. The proximal and dorsal surfaces were continuous; the dorsal surface was composed of two ridges. There was a deep synovial fossa occupying nearly the whole of its anterior aspect, and the lateral ridge was thicker than the medial, the lateral surface presented two facets .The distal surface was composed of two condyles separated by a groove. Our observation on tibial tarsal corroborate with the observations of Raghavan (1964) ,Miller *et al.,* (1964) and Akers and Denbow, (2008); in ox ,dog , pigs respectively. Whereas it was composed of six short bones in horse (Getty, 1975) and in dromedary (Smuts and Bezuidenhout, 1987), and seven tarsal bones in hedgehog (Ozkan, 2002).

The fibular tarsal (Fig. 2) was the largest bone of the tarsus. The average maximum height and breadth for fibular tarsal of blue bull was 12.00±0.01 cm and 3.72±0.01 cm, respectively, It was elongated and flattened from side to side. The medial surface of which was slightly concave and the lateral surface was convex , similar pattern was reported by Raghavan, (1964), Miller *et al.,* (1964) , Getty, (1975) and Smuts and Bezuidenhout, (1987) in ox, dog, horse and dromedary respectively. The anterior border was slightly concave, smooth and rounded. The inward projection on distal part of median surface was rugged and irregular, medially springs a strong blunt process, the sustentaculum tali as reported by above workers in ox, dog, horseand dromedary, and even in domestic mammals (Konig and Liebich, 2006). The distal and lateral parts of the body were prolonged to form a plate-like bone. The medial surface of this plate presents an upper and lower facet as revealed in all above animals.

The central and the fourth tarsal (Fig. 3) were fused together to form a large single bone, whereas in dogthe central tarsal bone lies in the medial part of the tarsus (Miller *et al. :*1964), and in horse the central tarsal bone was quadrilateral (Getty , 1975).The average height and breadth for central and fourth fused tarsal was 2.54±0.01 cm and 5.11±0.01 cm, respectively. The dorsal surface was concave and smooth, and was divided into two by an anterio-posterior ridge. The ventral surface was not uniform in level and there was a small, slightly convex facet on posterior to ventral surface. These findings concurred with earlier observations in ox, dog, horse and dromedary. The anterior and the medial surfaces were continuous, convex and rough. The lateral surface was encroached

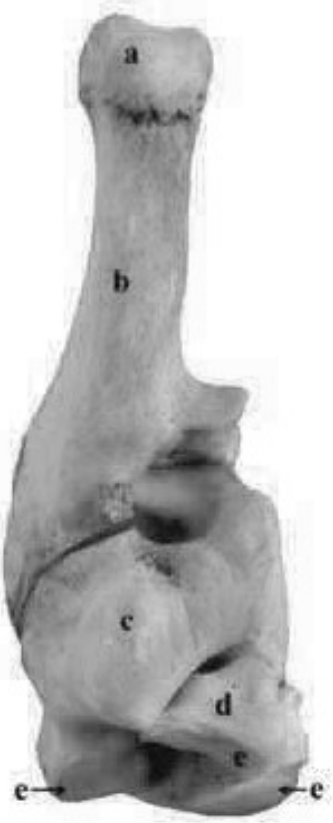

Fig. 1:Caudal view of the tarsus showing tubercalcis (a); fibular tarsal (b);tibial tarsal (c); second and third fused tarsal (d); articular facets for metatarsal (e).

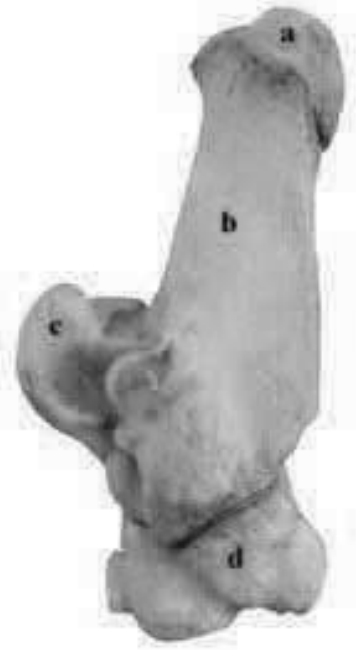

Fig. 2:Lateral view of the tarsus showing tuber calcis (a); fibular tarsal (b); tibial tarsal (c); central and fourth tarsal (d).

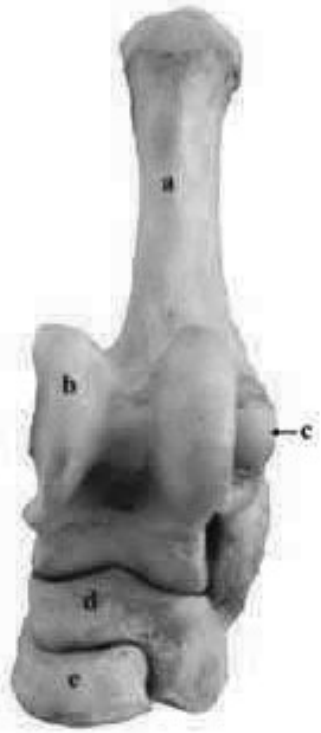

Fig. 3:Cranial view of the tarsus showing fibular tarsal (a); tibial tarsal (b); sustentaculum tali (c); central and fourth fused tarsal (d); second and third fused tarsal (e).

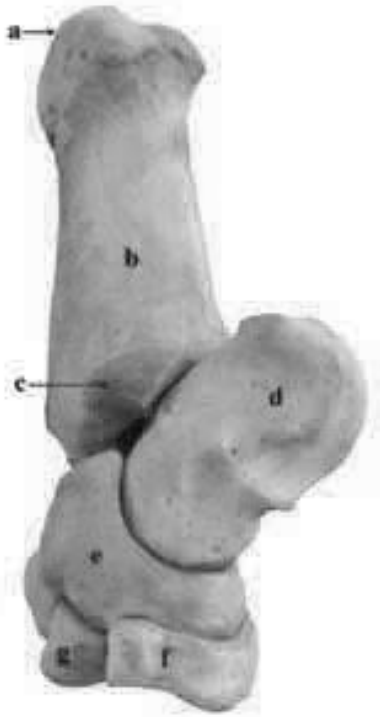

Fig. 4:Medial view of the tarsus showing tuber calcis (a); fibular tarsal (b); sustentaculum tali (c); tibial tarsal (d); central and fourth fused tarsal (e); second and third fused tarsal (f); first tarsal (g).

upon by the dorsal surface and was very uneven and rough.

The first tarsal (Fig. 4) was a quadrilateral piece of bone placed at the postero-internal part of the tarsus. The length and breadth of first tarsal of blue bull was 2.14±0.01 cm and 3.32±0.01 cm, respectively. It was in disagreement with Miller *et al.* (1964) in dog, where the first tarsal bone was fused with the distally lying first metatarsal bone, and in horse the first and second tarsal bones were usually fused.The first tarsal was located just below the central and 4th fused tarsal and above the large metatarsal.

The second and third fused tarsal (Fig. 4) was a small plate of bone.The length and breadth of second and third fused tarsal in blue bull measured was 1.68±0.01 cm and 3.34±0.01 cm, respectively. The dorsal surface was concavo-convex and the ventral surface was convexo-concave, but it was different in dog where the second tarsal bone was the smallest of the tarsal bones and the third tarsal bone was nearly three times larger than the second tarsal bone (Miller *et al.,* 1964). In horse (Getty, 1975) and dromedary (Smuts and Bezuidenhout, 1987) also the third tarsal bone was triangular in outline.

Acknowledgement

Sincere thanks are due to the Principal Chief Conservator of Forests (PCCF), Government of Rajasthan for granting permission to take up this study. The senior author is also thankful to ICAR, New Delhi for providing financial assistance in respect of Senior Research Fellowship for Ph.D. work.

Conflict of Interest: All authors declare no conflict of interest.

References :

Akers, R.M. and Denbow, M. (2008).*Anatomy and Physiology of Domestic Animals*.1stedn., *Blackwell Publishing*, Ames, Iowa, pp 152-160.

Frandson, R.D.; Wilke, W.L. and Fails, A.D. 2009. *Anatomy and Physiology of Farm Animals*.7thedn.Willey-Blackwell, Ames, Iowa. pp: 71-74, 133-135.

Getty, R. (1975). Sisson and Grossman's.*The Anatomy of the Domesticated Animals*.Vol.I, 5thedn. W.B. Saunders Co. Philadelphia, pp 296-317.

Miller, M.E., Christensen, G.C. and Evans, H.E. (1964).*Anatomy of the Dog*. WB Saunders Company, Philadelphia, USA, pp79-92.

Ozkan, Z.E. (2002).Macro-anatomical Investigations on the Hind Limb Skeletons of Hedgehag (*Erinaceus Europaeusl*) II, Ossa Membri Pelvini.*Veterinarski Arhiv*. **72**(4): 213-220.

Raghavan, D. (1964). *Anatomy of Ox*. Indian Council of Agricultural Research, New Delhi, pp 118-137.

Smuts, M. and Bezuidenhout, A.J. (1987).*Anatomy of the Dromedary*. Clarendon Press, Oxford, UK, pp 34-47.

Snedecor, G.W. and Cochran, W.G. (1994).*Statistical Methods*.8thedn.Iowa State University Press, Ames, Iowa, USA, pp 26-37.

❑