Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.2602

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (3):** 623-627 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Gross and Morphometrical Studies on Scapula of Blue bull (*Boselephus tragocamelus*)

Sanjay Kumar Bharti* **and Ishwer Singh**

Department of Veterinary Anatomy, College of Veterinary and Animal Science,
G.B. Pant University of Agriculture and Technology, Pantnagar-263 145

*Corresponding Author E-mail: drskbharti24@gmail.com

Received: 16.02.2017 | Revised: 27.02.2017 | Accepted: 2.03.2017

ABSTRACT

The present study has been done on the scapula of blue bull. The scapula was a flat triangular bone with two surfaces, three borders and three angles. The lateral surface was divided by the scapular spine into a small and elongated supra-spinous fossa and a much larger and triangular, infra-spinous fossa. The spine was wavy in outline. The acromian was pointed, tuber spine was indistinguishable and sub-scapular fossa was shallow. The tuber-scapulae were small and the coracoid process was ill developed. The glenoid cavity was almost circular and deep in outline a small glenoid notch was present over glenoid cavity.

Key words: *Blue bull, Morphometrical, Scapular spine, Scapula.*

INTRODUCTION

The Blue bull (*Baselephus tragocamelus*), sometimse called nilgau, is one of the largest Asiatic antelopes founded in the day open forests and sarannah The mature male appers ox-like and is also known as blue bull. A blue bull is called nil gai or nilgai in India, from neel meaning blue and a gai meaning bovine animal (literally 'caw') It is also present in parts of southern Nepal and eastern Pakistan. They show marked sexual dimorphism, with only the male having horns. Nilgai are in danger of extinction because people are hunting them for their meet and for 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 Baselaphus and the main threat to this species is the loss of habitat due to deforestation and human population growth. The aim of this study is to investigate scapula of blue bull, thereby making a contribution in filling the gap of knowledge in this field. As per knowledge, in many vetero-legal cases, one fails to identify the bones of this animal and confuse them with those of some other large ruminants. This investigation will be helpful to the field veterinarians as well as zoo veterinarians and for wild life expert.

Cite this article: Bharti, S.K. and Singh, I., Gross and Morphometrical Studies on Scapula of Blue bull (*Boselephus tragocamelus*), *Int. J. Pure App. Biosci.* **5(3):** 623-627 (2017). doi: http://dx.doi.org/10.18782/2320-7051.2602

MATERIALS AND METHODS

The present study was conducted on scapula of six adult blue bull of either sex. The 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 (PCCF) 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[10] (Raghavan, 1964). Subsequently, these osteological specimens were studies to record their gross morphological features. Different parameters of scapula were measured and subjected to routine statistical analysis[15] (Snedecor and Cochran, 1994). The following studies were conducted on the collected specimens.

a) Maximum breadth (Bm)
b) Maximum height (Hm)
c) Breadth of neck (Bn)
d) Maximum breadth of glenoid cavity (Bg)
e) Maximum breadth of supra-spinous fossa (Bs)
f) Maximum breadth of infra-spinous fossa (Bi)

Scapular index (SI) was calculated as the average ratio between the length and breadth of scapula.

SI = Maximum length/ Maximum breadth*100[7]

RESULTS AND DISCUSSION

The scapula (Fig. 1 & 2) was a flat triangular and relatively wider bone at the dorsal end and narrower at the ventral end, which was similar to the findings of Raghavan[10] in ox, Miller *et al*[7]., in dog, Getty[5] in horse and sheep Choudhary *et al*[2]., in chital and Choudhary[3] in black buck; however, Bordoloi *et al*[1]., found it to be less triangular but flat in Great Indian Rhino.

The lateral surface was divided by the scapular spine into a small supra-spinous fossa and a much larger infra-spinous fossa which was in agreement with Raghavan[10] in ox, Getty[5] in horse, Smuts and Bezuidenhout[14] in dromedary, Dalvi *et al*[4]., in herbivores, Siddiqui *et al*[13]., in Black Bengal goat, Choudhary *et al*[2]., in chital and Choudhary[3] in black buck but was in disagreement with Miller *et al*[7]., in dog, Bordoloi *et al*[1]., in Great Indian Rhino and Ozkan[8] in hedgehogs, who revealed that these two fossae were almost equal.

The ratio of average maximum lengths of supra-spinous fossa to infra-spinous fossa was 1: 2.97**,** while the ratio of area for the same was 1: 4 for ox[10], 48:46 for hedgehogs[8] and 1: 4.15 for chital[2] and for black buck 1: 3.21[3]).

The spine (Fig. 1 & 2) of the scapula extended up to the neck of the bone as acromian process similar to the findings of Raghavan[10] in ox, Choudhary *et al*[2]., in chital Choudhary[3] in black buck and spine in this study was wavy in outline However, in contrast, it was stated by Getty[5] that the spine of the scapula subsides at the neck of the bone in horse and according to Bordoloi *et al*[1]., in Great Indian Rhino, the scapular spine diminished from the tuber spine to the distal part without forming the acromian process. Sarma *et al*[12]., revealed that the spine shows the uncinate process which was directed caudally in adult elephants of Assam; Kalita and Bhattacharya[6] investigated that the scapula had an additional spine which divided the supra-spinous fossa into cranial and caudal parts in sloth bear. Moreover, the acromian process was prominent and plate like as met-acromian process in dog[7].

The tuber spine (tuber spinae scapulae) was indistinguishable, which was in accordance with the findings of Smuts and Bezuidenhout[14] in dromedary and Pandya *et al*[9]., in Asiatic lion, Raghavan[10] in ox and Miller *et al*[7]., in dog; however, it was prominent in horse[5] and Great Indian Rhino[1].

The sub-scapular fossa was shallow which was agreement with the findings of Raghavan[10] in ox, while it was marked deep as reported by Getty[5] in horse, Pandya *et al*[9]., in Asiatic lion and Siddiqui *et al*[13]., in Black Bengal goat and Choudhary[3] in black buck; The medial surface of the supra-spinous fossa had an additional fossa which showed an appearance of two subscapular fossae in sloth bear[6].

The facies serrate consisted of a relatively large triangular cranial area and less extensive caudal linear area in blue bull similar to the findings of Raghavan[10] in ox and Choudhary[3] in black buck This finding was disagreement with Getty[5] in horse, where both the cranial and caudal areas were triangular.

The vertebral border was uniform in middle and was thickest at both cranial and caudal end while it was slightly convex in dromedary[14], markedly convex in the middle in Sambar deer and concave in Bakarwali goat[11] and was wavy in blackbuck[3]. The caudal border was thickest of all three borders, which was similar to dog[7] and Choudhary[3] in black buck.

The nutrient foramen was present at the distal third of the caudal border, which conformed with the findings of Raghavan[10] in ox, Getty[5] in horse[2] in chital and Choudhary[3] in black buck , but it was in disagreement with Miller *et al*[7]., who noted it to be located on the junction of the ventral border of spine and scapula properly in dog, Bordoloi *et al*[1]., in Great Indian Rhino, who reported that there were two distinct nutrient foramina, one at the distal end of the spine and the other at the distal extremity of the infra-spinatus fossa and Pandya *et al*[9]., who examined 4-5 nutrient foramina near the beginning of the spine in Asiatic lion.

The glenoid cavity was almost circular and deep in outline; whereas it was mostly circular and deep in Black Bengal goat[13], oval in outline in horse[5], shallow and circular in outline in ox[10], sheep[5] and in dromedary[14], very shallow in the dog[7], shallower in sambar deer, almost rectangular in elephants of Assam[11], shallow rounded in chital[2] shallow and shaped like heart of playing cards in blackbuck[3].

The tuber-scapulae or supra-glenoid tubercle was small (Fig.1), which was in accordance with the findings of Raghavan[10] in ox and Choudhary[3] in black buck , but disagreement with the findings of Miller *et al*[7]., in dog, Getty[5] in horse and Smuts and Bezuidenhout[14] in dromedary, who noted it to be a prominent one. Moreover, it was absent in Great Indian Rhino[1].

The coracoid process was ill-defined, which was more or less similar to the findings of Raghavan[10] in ox, Getty[5] in horse, Siddiqui *et al*[13]., in Black Bengal goat Bordoloi *et al*[1]., in Great Indian Rhino and Choudhary[3] in black buck ; while dissimilar to the observations of Sarma *et al*[11]., in adult elephants of Assam, where it was well developed. A small glenoid notch was present on the rim of the glenoid cavity, which was in accordance with Getty[5] in horse, Miller *et al*[7]., in dog and Choudhary[3] in black buck ; which was absent in sheep[5], however, undeveloped in ox[10].

The average maximum length and breadth of scapula in blue bull was 32.08 ± 0.02cm and 18.16 ± 0.01cm respectively; which was 13.94 ± 0.30 cm and 6.62 ± 0.11 cm in Black Bengal goat[13]; 18.28 ± 0.90 cm and 10.83 ± 0.36 cm in Asiatic lion[9]; 20.46 ± 0.03 cm and 11.94 ± 0.03 cm, in chital[2] respectively 14.07 ± 0.019 cm and 8.59 ± 0.016 cm in black buck[3].

The scapular index was 56.60 for blue bull which was 82.05 for tiger, 72.82 for leopard, 67.34 for Sambar, 65.83 for sheep, 62.43 for buffalo, 57.51 for deer, 55.74 for pig, 52.59 for ox, 45.86 for horse, 45.45 for Nilgai and 43.62 for goat as per calculations of Dalvi *et al*[4]., 59.40 and 58.35 for Asiatic lion and chital as calculated by Pandya *et al*[9]., and Choudhary *et al*[2]., 61.05 for blackbuck respectively[3].

The average maximum length of spine, breadth of the neck and breadth of glenoid cavity in blackbuck was 29.12.±0.03 cm, 4.47±0.01 and 5.36±0.02cm**,** respectively.

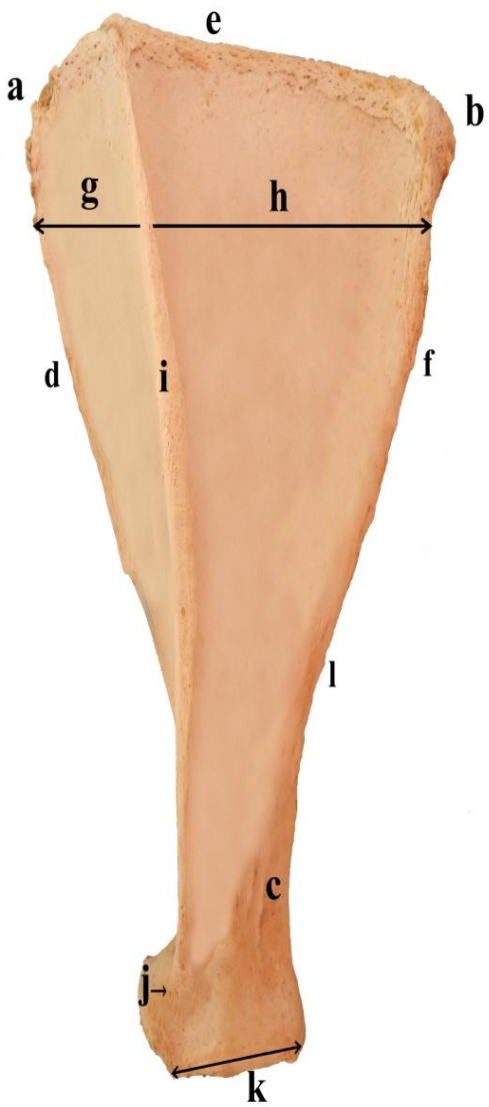

Fig. 1: Lateral view of the scapula showing cranial angle (a); caudal angle (b); ventral angle (c); cranial border (d); vertebral border (e); caudal border (f); supra-spinatus fossa (g); infra-spinatus fossa (h); scapular spine (i); acromian process (j); glenoid cavity (k); nutrient foramen (l).

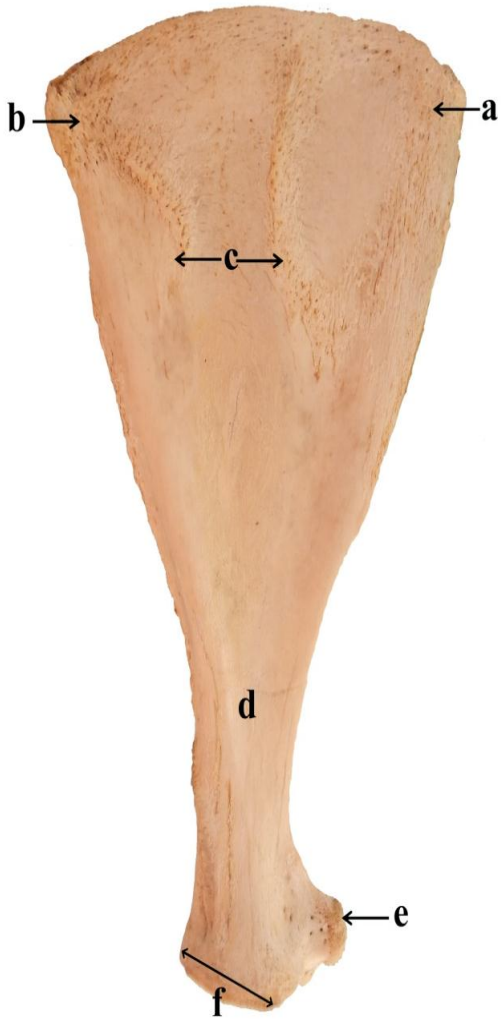

Fig. 2: Medial view of the scapula showing cranial part of facies serrate (a); caudal part of facies serrate (b); subscapular fossa (c); neck (d); tuber scapulae (e); glenoid cavity (f).

CONCLUSION

The scapula was a flat triangular bone with two surfaces, three borders and three angles. The lateral surface was divided by the scapular spine into a small and elongated supra-spinous fossa and a much larger and triangular, infra-spinous fossa. The acromian was pointed, tuber spine was in-distinguishable and sub-scapular fossa was shallow. The glenoid cavity was almost circular and deep in outline and a small glenoid notch was present over glenoid cavity.

Acknowledgements

Sincere thanks are due to the Principle Chief Conservator of Forests (PCCF), Government of Rajasthan and The Deputy Conservator of Forest wildlife Jodhpur. Author is also thankful to Indian Council of Agricultural Research (ICAR), New Delhi for providing financial help in aspect of Senior Research fellowship during his doctoral degree.

REFERENCES

1. Bordoloi, C.C., Kalita, H.C., Kalita, S.N. and Baishya, G., Scapula of the Great

Indian rhino (*Rhinoceros unicornis*). *Indian Vet. J.*, **70*:*** 540-542(1993)**.**

2. Choudhary, O.P., Mathur, R., Joshi, S., Beniwal, G. and Dangi A., Gross and Biometrical studies on scapula of chital *(Axis axis)*. *Veterinary Practitioner,* **14(2):** 224-227 (2013).
3. Choudhary, O.P., "Osteo-morpholgical studies of skull and appendicular skeleton of Indian Blackbuck(*Antilope cervicapra*)" G.B.P.A.T.Pantnagar, India. (2015).
4. Dalvi, R.S., Bhamburkar, V.R., Ladukar O.N. and Banubakode, S.B., Morphometric Study on Scapulae of Some Domestic and Wild Animals. *Tech. Bul. XII Convention and National Symposium of IAVA*, pp: 43 (1997).
5. Getty, R., *Sisson and Grossman's The Anatomy of the Domestic Animals*. 5th edn. Volume 1. W.B. Saunders Co. Philadelphia. pp: 273-296 (1975).
6. Kalita, P.C. and Bhattacharya, R., Macro-anatomy of the scapula of sloth bear (*Melursus ursinus*). *Indian J. Vet. Anat*., **14:** 77-79 (2002).
7. Miller, M.E. *et al.*, *Anatomy of the Dog*. 3rd ed. W.B. Saunders Co., Philadelphia, USA, pp: 64-78 (1964).
8. Ozkan, Z.E., Macro-Anatomical Investigations on the Hedgehog Skeleton (*Erinaceus europaeus*) I- Ossa Membri Thoracici. *Turk. J. Vet. Anim. Sci.*, **28:** 271-274 (2004).
9. Pandya, S.P., Bhayani, D.M. and Vyas, Y.L., Gross anatomical study on the scapula of Asiatic lion (*Panthera leo persica*). *Indian J. Vet. Anat*., **16(1&2):** 53-56 (2004).
10. Raghavan, D., *Anatomy of ox*. Indian Council of Agricultural Research, New Delhi, pp: 97-117 (1964).
11. Sarma, K., Kalita, A., Suri, S. and Zama, M.M.S., Comparative anatomical studies on the scapula of Bakarwali goat and Sambar deer. *Indian J. Anim. Health*., **43(1):** 15-18 (2004).
12. Sarma, M., Kalita, S.N. and Choudhary, K.B.D., Passive locomotor system of adult elephants of Assam. *Indian Vet. J*., **84(11):** 1187-1189 (2007).
13. Siddiqui, M.S.I., Khan, M.Z.I., Sarma, M., Islam, M.N. and Jahan, M.R., Macro-anatomy of the bones of the limb of Black Bengal Goat (*Capra hircus*). *Bangladesh J. Vet. Med*., **6(1):** 59–66 (2008).
14. Smuts, M. and Bezuidenhout, A.J., *Anatomy of the Dromedary*. Clarendon Press, Oxford, UK. pp: 24-34 (1987).
15. Snedecor, G.W. and Cochran, W.G., *Statistical method*s. 8th edn. Iowa State University Press, Ames, Iowa. pp: 26-37 (1994).