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Gross and Morphometrical Studies on Scapula of Barking Deer (*Muntiacus muntjak*)

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A B S T R A C T

The present study has been conducted on right and left scapulae of Indian barking deer. The scapular was triangular in outline. Medial surface presented deeper sub-scapular fossa with a distinct foramen at distal 3rd. The lateral surface was divided by a prominent scapular spine into a smaller supra-spinous fossa and a much larger infra-spinous fossa. The caudal border was the thickest of all the borders. Dorsal/vertebral border was notched towards cranial end. The outline of the caudal border in distal third was divided into two distinct ridges. The ventral angle presented the glenoid cavity which was cup-like and circular in outline. The tuber scapulae or supra-glenoid tubercle was small and coracoid process was well defined and projected as beak-like process. The scapular index was 54.36 and 55.21 for right and left scapulae, respectively. The ratio of supra-spinous to infra-spinous fossa was 1: 4.69 and 1: 4.72 for right and left scapulae, respectively.

Introduction

The Indian muntjac (*Muntiacus muntjak*), also called red muntjac and barking deer, is a common muntjac deer species in South and Southeast Asia. It is listed as Least Concern on the IUCN (International Union for Conservation of Nature) Red List.

It has soft, short, brownish or greyish hair, sometimes with creamy markings. It gives calls similar to barking, usually upon sensing a predator (hence the common name for all muntjacs of "barking deer"). Muntjac is one of the smallest deer species and can be distinguished by its short antlers which only branch out to a few points, the visible canines of males, and perhaps most notably the large postorbital scent glands they use to mark their territory. They have played a major role in Southern Asia, being hunted for sport and for their meat and skin. Often, these animals are hunted around the outskirts of agricultural areas, as they are considered a nuisance for damaging crops and ripping bark from trees. In literature, abundant information is available on gross anatomy of scapula of domestic animals (Raghavan, 1964). Literature is also available on scapula of Blue bull (Bharti and Singh, 2017), chital (Choudhary *et al.*, 2013) and blackbuck (Choudhary, 2015). Due to paucity of literature on the scapula of Indian barking deer, the present study has been planned. The outcome of this study will be

useful to the field veterinarians, zoo veterinarians and wildlife experts.

Materials and Methods

The present study was conducted on the right and left scapulae of an adult male barking deer. The bones were processed as per standard technique (Raghavan, 1964) and subsequently studied to record gross morphological and biometrical features. Different biometrical parameters were measured with the help of thread, meter scale and Vernier Calipers as follows:

Maximum length (cm): Along the scapular spine

Diagonal length (cm): From coracoid process to caudal angle of scapula

Width of scapula (cm) at three levels i.e. dorsal, middle and distal

Length of scapular spine (cm)

Height of scapular spine (cm) at three levels i.e. dorsal, middle and proacromion level

Length (cm) and height (cm) of the acromion process

Antero-posterior and transverse diameters (cm) of glenoid cavity

Circumference of glenoid cavity (cm)

Maximum width (cm) of supra-spinous and infra-spinous fossae

Scapular index (SI). It was calculated as the ratio between maximum length and maximum width of scapula (Bharti and Singh, 2017)

SI = (Maximum length/Maximum width) * 100

Results and Discussion

The scapula was flat, typically triangular in outline (Fig. 1). It was wider at dorsal end and narrower at ventral end which was similar to the findings of Raghavan, (1964) in ox, Getty, (1975) in horse, Choudhary *et al.,* (2013) in chital, Choudhary, (2015) in Indian blackbuck and Bharti and Singh, (2017) and Rohlan *et al.,* (2017) in Bluebull. The scapula presented two surfaces, three angles and three borders.

Medial surface presented deeper sub-scapular fossa (Fig. 2) as reported by Getty, (1975) in horse, Siddiqui *et al.,* (2008) in Black Bengal goat and Choudhary and Singh, (2016) in Indian Black Buck. A distinct foramen was seen on this surface at distal 3rd (Fig. 4).

The lateral surface was divided by a prominent scapular spine (Fig. 1) into a smaller supra-spinous fossa and a much larger infra-spinous fossa. Similar observations were noticed by Raghavan, (1964) in ox, Getty, (1975) in horse, Choudhary *et al.,* (2013) in chital, Choudhary, (2015) in Indian blackbuck, Bharti and Singh, (2017) and Rohlan *et al.,* (2017) in Bluebull. In contrast to this, Lahunta, (2013) in dog observed that these two fossae were almost equal.

The scapular spine was well developed and convex in outline (Fig. 6). It extended upto the neck of the bone and terminates as a pointed acromion process. In the middle of the spine was present a well-developed tuber spine (Fig. 1). In the distal half of the scapula, spine blends with the anterior border of the scapula.

Three borders were dorsal/vertebral, cranial and caudal. The caudal border was the thickest of all the borders which is also reported by Choudhary and Singh, (2016) in Indian Blackbuck and Sarma *et al.,* (2017) in civet cat.

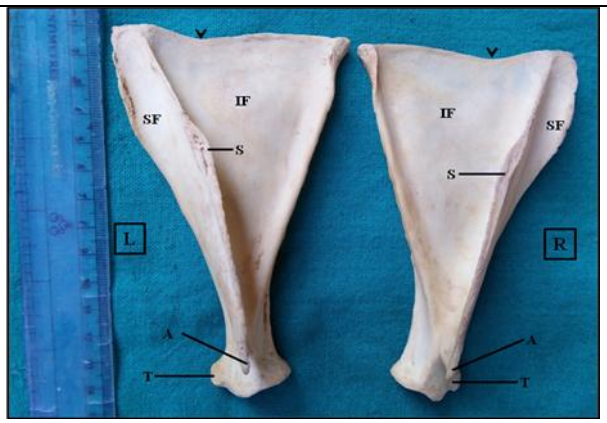

Fig.1 Lateral surface of right (R) and left (L) scapulae of barking deer showing supra-spinous fossa (SF), infra-spinous fossa (IF), tuber spine (S), notched dorsal border (arrow head), acromion process (A), tuber scapulae (T)

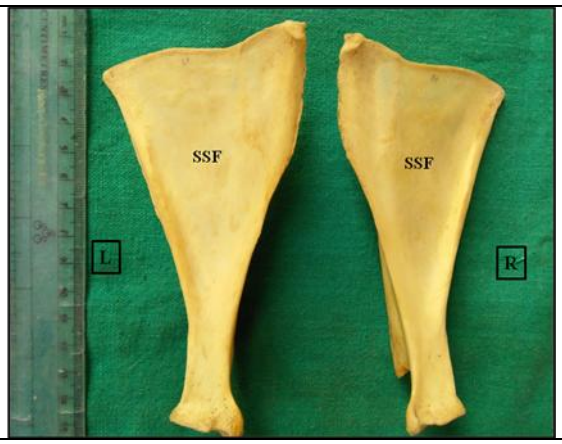

Fig.2 Medial surface of right (R) and left (L) scapulae of barking deer showing sub scapular fossa (SSF)

Fig.3 Distal extremity of scapula (lateral view) showing acromion process (A), tuber scapulae (T), glenoid cavity (GC) and posterior border showing two distinct ridges (arrow)

Fig.4 Distal extremity of scapula (medial view) showing a distinct foramen (arrow)

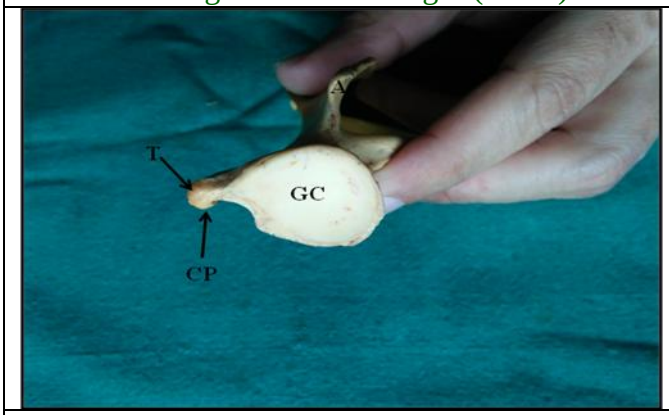

Fig.5 Ventral angle of scapula showing acromion process (A), tuber scapulae (T), glenoid cavity (GC), coracoid process (CP)

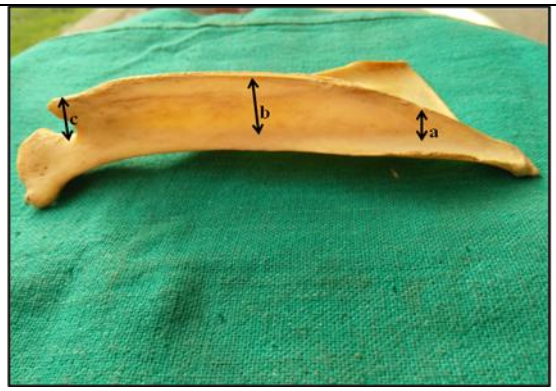

Fig.6 Lateral view of scapula showing height of scapular spine at different levels: dorsal (a), middle (b) and distal (c)

Table.1 Biometry of scapula of adult Barking deer

S. No.	Parameters	Right side	Left side
1.	Maximum length	14 cm	13.9 cm
2.	Diagonal length	13.8 cm	13.8 cm
3.	Width of scapula a. Dorsal b. Middle c. Distal	 7.61 cm 5.31 cm 1.54 cm	 7.73 cm 5.18 cm 1.57 cm
4.	Length of scapular spine	12.41 cm	12.24 cm
5.	Height of scapular spine a. Dorsal b. Middle c. Proacromion level	 0.8 cm 1.4 cm 1.3 cm	 1.0 cm 1.7 cm 1.5 cm
6.	Length of acromion process	0.6 cm	0.6 cm
7.	Height of acromion process	1.2 cm	1.2 cm
8.	Circumference of glenoid cavity	6.1 cm	6.4 cm
9.	Antero-posterior diameter of glenoid cavity	1.93 cm	2.11 cm
10.	Transverse diameter of glenoid cavity	1.73 cm	1.82 cm
11.	Scapular index	54.36	55.21
12.	Maximum width of supra-spinous fossa	1.3 cm	1.25 cm
13.	Maximum width of infra-spinous fossa	6.1 cm	5.9 cm
14.	Ratio of maximum width of supra-spinous to infra-spinous fossa	1 : 4.69	1 : 4.72

Dorsal/vertebral border was thickest at both cranial and caudal ends and was notched towards cranial end (Fig. 1). The caudal border was much thicker than the cranial border. The outline of the caudal border in distal third was divided into two distinct ridges (Fig. 3). The lateral ridge meets postero-lateral part of the rim of the glenoid cavity whereas the other meets the posterior rim of glenoid cavity. Between these two ridges there was a distinct fossa.

Both cranial and caudal angles were well developed. The ventral angle presented the glenoid cavity which was cup-like and circular in outline (Fig. 5) as compared to shallow and circular in ox (Raghavan, 1964), oval in horse (Getty, 1975), circular and deep in Black Bengal goat (Siddique *et al.*, 2008), shaped like heart of playing cards in Indian Blackbuck (Choudhary and Singh, 2016), deep and circular in Blue bull (Bharti and Singh, 2017) and elliptically elongated in outline in civet cat (Sarma *et al.*, 2017).

The tuber scapulae or supra-glenoid tubercle was small which was in accordance with the findings of Raghavan, (1964) in ox, Choudhary and Singh, (2016) in Indian Blackbuck and Bharti and Singh, (2017) in Bluebull; but it was in contrast to the findings of Getty, (1975) in horse. The coracoid process was well defined and projected as beak-like process (Fig. 5) medially from the anterior margin of the glenoid cavity. It was bent caudally. A small glenoid notch was present on the rim of the glenoid cavity.

The biometrical values of right and left scapulae of adult barking deer have been

presented in Table 1. The maximum length of scapula along the spine (without scapular cartilage) was 14 cm for right scapula and 13.9 cm for the left one. The diagonal length was 13.8 cm for both scapulae. The width of scapula was measured at three levels. For right side, it was 7.61 cm at dorsal, 5.31 cm at middle and 1.54 cm at distal level. The decrease in width from dorsal to middle part was 30.22 % whereas it was 71 % from middle to distal part. The overall decrease in width from dorsal to distal part was 79.76 %. For left scapula, width was 7.73 cm, 5.18 cm and 1.57 cm at dorsal, middle and distal parts, respectively. The overall decrease in width from dorsal to distal part was 79.69 %. The decrease was 32.99 % from dorsal to middle part and 69.69 % from middle to distal part.

The scapular index was 54.36 and 55.21 for right and left scapulae, respectively. The same was 56.60 for blue bull (Bharti and Singh, 2017), 65.83 for sheep, 62.43 for buffalo, 57.51 for deer, 52.59 for ox, 45.45 for Nilgai and 43.62 for goat as recorded by Dalvi *et al.*, (1997).

The total length of scapular spine was 12.41 cm and 12.24 cm for right and left scapulae, respectively. The height of scapular spine was measured at three levels. For right scapula, it was 0.8 at dorsal, 1.4 cm at middle and 1.3 cm at the level of acromion process. The same was 1 cm, 1.7 cm and 1.5 cm for left scapula. The spine thus showed an increase in height till middle (75 % for right scapula and 70 % for left scapula) followed by a slight decrease (7.14 % for right scapula and 11.76 % for left scapula). The ratio of length of scapular spine to its maximum height was 8.86 for right and 7.2 for left scapula. The length of acromion process (0.6 cm) and its height (1.2 cm) was same for both right and left scapulae.

For right scapula, the maximum width of supra-spinous fossa was 1.3 cm and infra-spinous fossa was 6.1 cm. The ratio was 1: 4.69. For left scapula, the maximum width of supra-spinous fossa was 1.25 cm and infra-spinous fossa was 5.9 cm. The ratio was 1: 4.72. It was 1: 2.97 in blue bull (Bharti and Singh, 2017), 1: 4.15 in chital (Choudhary *et al.*, 2013) and 1: 3.21 in black buck (Choudhary, 2015).

The glenoid cavity had a circumference of 6.1 cm and 6.4 cm for right and left scapulae. For right bone, the antero-posterior diameter was 1.93 cm and transverse diameter was 1.73 cm. The same was 2.11 cm and 1.82 cm for left scapula.

References

Bharti, S.K. and Singh, I. 2017. Gross and Morphometrical Studies on Scapula of Blue bull (*Boselephus tragocamelus*), *Int. J. Pure and App. Bio.* 5(3): 623-627.

Choudhary, O.P and Singh, I. 2016. Morphometrical studies on scapula of Indian Blackbuck (*Antelope cervicapra*). *Ind. Vet. J.* 93 (01): 64-67.

Choudhary, O.P. 2015. Osteo-morphological studies of skull and appendicular skeleton of Indian Blackbuck (*Antilope cervicapra*). G.B.P.A.T. Pantnagar, India.

Choudhary, O.P., Mathur, R., Joshi, S., Beniwal, G. and Dangi, A. 2013. Gross and Biometrical studies on scapula of chital (*Axis axis*). *Veterinary Practitioner* 14(2): 224-227.

Dalvi, R.S., Bhamburkar, V.R., Ladukar, O.N. and Banubakode, S.B. 1997. Morphometric Study on Scapulae of Some Domestic and Wild Animals. Tech. Bul. XII Convention and National Symposium of IAVA, pp: 43.

Getty, R. 1975. *Sisson and Grossman's The Anatomy of the Domestic Animals.* 5th edn. Volume I. WB Saunders Company,

Philadelphia, USA, pp: 273-296.

Lahunta, E.D. 2013. *Miller's Anatomy of the dog.* 4th edn. Elsevier Saunders, pp: 127-132.

Raghavan, D. 1964. *Anatomy of ox.* Indian Council of Agricultural Research, New Delhi, pp: 97-117.

Rohlan, K., Mathur, R. and Shringi, N. 2017. Morphometrical studies on scapula of Bluebull (*Boselaphus tragocamelus*). *Journal of Wildlife Research* 05(02): 16-19.

Sarma, K., Sasan, J.S. and Suri, S. 2017. Gross and Morphometrical Studies on Scapula of Civet Cat (*Viverricula indica*). *Int. J. Pure and App. Bio.* 5(6): 80-85. doi: http://dx.doi.org/10.18782/2320-7051.5370

Siddiqui, M.S.I., M.Z.I. Khan, M. Sarma, M.N. Islam and M.R. Jahan (2008). Macro-anatomy of the bones of the limb of Black Bengal Goat (*Capra hircus*). *Bangladesh Journal of Veterinary Medicine* 6(1): 59-66.

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