

GROSS ANATOMICAL AND MORPHOMETRICAL STUDY ON SCAPULA OF THE LEOPARD (*Panthera pardus*)

DEVENDRA PODHADE ^{1*}, R. VAISH ², YOGITA PANDAY ² AND RANJEET HARNE

¹Wildlife Health and Management, School of Wildlife Forensic and Health, N.D.V.S.U., Jabalpur - 482 001(M.P.)

²Department of Veterinary Anatomy and Histology, College of Veterinary Science and Animal Husbandry, N.D.V.S.U., Jabalpur - 482 001(M.P.)

e-mail: drdevendrapodhade@rediffmail.com

KEYWORDS

Leopard
Morphology
Morphometry
Scapula

Received on :

24.01.2018

Accepted on :

04.01.2019

*Corresponding author

ABSTRACT

Leopard is listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Poaching of wild animals, particularly of leopard for bone trade has been increased and prescribed as substitutes for Tiger body parts to use to prepare Chinese Traditional Medicine (CTM). Literature regarding the gross morphological and morphometrical features are scanty. Hence, gross morphological and morphometric study conducted on scapulae of 4 adult leopards. The information gathered by the study will be of academic importance. Scapular spine divided the surface into two equal fossa. The costal surface was wide and the cranial part of the surface was deeply concave, whereas caudal part was flattened. The mean length and height of scapular spine were 15.32 ± 0.95 cm and 2.4 ± 0.10 cm, respectively. Distance between glenoid cavity and acromion process was 1.32 ± 0.7 cm.

INTRODUCTION

India is blessed with the rich biodiversity with a variety of fascinating wild flora and fauna. The Leopard is found throughout India with the exception of deserts and the Sundarban mangroves, it has a wide altitudinal range and occurs all along the Himalayas with the exception of high-altitude deserts Bordoloi *et al.* (1998) and Kait *et al.* (2008) and it is the most common and widely distributed species among large carnivores in India Panday *et al.* (2004). Within India, the trade of live or dead Leopard or its body parts and derivatives has been prohibited since the implementation of the Wildlife Protection Act (WLPA) in 1972.

In Chinese Myth, these bones are used to manufacture Chinese Traditional Medicine (CTM) for treating various ailments. Unfortunately, these species are at the verge of extinction. Morphological and anatomical differences in hairs of some wild mammals have been recorded by Kait, *et al.* (2008). Osteometry on the scapula of tiger was done by Taluja *et al.* (2001) and Mahapatra *et al.* (2016). Gross anatomical studies (Sreeranjini *et al.*, 2008) and comparative anatomical studies on scapula of Bengal tiger and Indian Leopard (Sarma *et al.*, 2013) are available. However, systematic morphometrical study on scapula of leopard was needed. Therefore, the present work has been undertaken.

MATERIALS AND METHODS

Gross morphological and morphometric study was carried out on scapulae of 4 adult leopards and various parameters

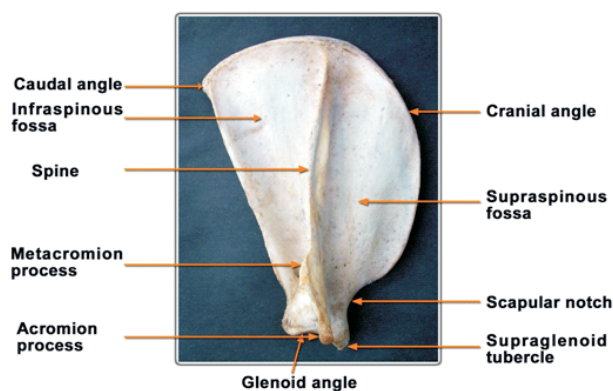
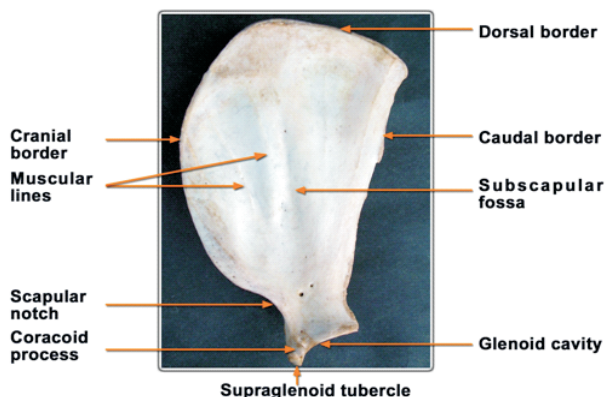
were recorded with the help of vernier caliper, thread, and scale in centimeter. These were adapted by Pandey *et al.* (2015). The data obtained were analyzed for mean and standard error as per the standard procedure of Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Scapula was the flat bone of shoulder region had lateral and costal surfaces. The lateral surface had well developed scapular spine, which divided the surface into 2 equal areas. Supraspinous fossa had undulating surface, whereas infraspinous fossa was triangular and slightly concave at its lower third (Fig.1). The nutrient foramen was observed, at its lower part. Maximum width of supraspinous fossa and infraspinous fossa was 4.92 ± 0.37 cm and 6.25 ± 0.26 cm respectively, which was slightly less than in lion (5.38 ± 0.06 cm and 6.45 ± 0.18 cm), respectively as reported by Panday *et al.* (2004). Scapular spine was thin at its middle and thicker towards the extremities. The mean height of scapular spine was 2.4 ± 0.10 cm which is lesser than that of tiger (2.69 ± 0.11 cm) and lion (4.20 cm) as recorded by Pandit (1994) and Panday *et al.* (2004). The mean length of scapular spine was 15.32 ± 0.95 cm while in case of lion it was 14.85 ± 0.97 cm (Panday *et al.*, 2004). The distal end of the spine presented acromion process, which was blunt and overhanged the glenoid cavity. The mean distance between glenoid cavity and acromion process was 1.20 ± 0.10 cm. The metacromion process was also directed caudally (Fig.1), this finding is in accordance with the Bordoloi *et al.* (1998) and Panday *et al.* (2004). It was just above the acromion process in case of

Table 1: Mean and S.E. of different parameters of scapula

S. No.	Parameters	Mean \pm S.E.
1	Weight (gm)	49.20 \pm 0.90
2	Length (cm)	
	• cranial border	15.57 \pm 0.71
	• caudal border	14.42 \pm 0.60
	• dorsal border	7.50 \pm 0.10
	• scapular spine	15.32 \pm 0.95
	• glenoid cavity	3.45 \pm 0.12
3	Width (cm)	
	• supraspinous fossa	4.92 \pm 0.37
	• infraspinous fossa	6.25 \pm 0.26
	• glenoid cavity	2.50 \pm 0.17
4	Height of scapular spine (cm)	2.40 \pm 0.10
5	Distance between glenoid cavity and acromion process (cm)	1.32 \pm 0.75

**Fig 1: Scapula (lateral surface) of the Leopard****Fig 2: Scapula (medial surface) of the Leopard**

leopard whereas in dog, it was about 2.80 cm behind the acromion process (Raghvan, 1964).

Cranial border was thin and convex with wavy course. The mean length of cranial, caudal and dorsal border was 15.57 \pm 0.71 cm, 14.42 \pm 0.60 cm, 7.50 \pm 0.10 cm, respectively (Table.1). These dimension were more in lion (18.43 \pm 0.50 cm, 15.88 \pm 0.82 cm and 10.91 \pm 0.22cm respectively) as recorded by Panday *et al.* (2004) indicates bigger size of bone. The caudal border was straight and thicker than the cranial border. Dorsal border was convex, thick, and rough. The

present observations was similar to the finding of Bordoloi *et al.* (1998) in Bengal tiger. Borders of scapula of leopard resembles with that of dog except caudal one, which was straight and thick in dog (Sisson, 1977).

The cranial angle was rounded is in accordance with the Sreenajani *et al.* (2008). The ventral angle had glenoid cavity that articulated with the head of humerus. The mean length and width of glenoid cavity were 3.45 \pm 0.12 cm and 2.5 \pm 0.17 cm, respectively. The present observation is in line with the report of Sarma *et al.* (2013). They recorded the mean length and width of glenoid cavity as 3.36 \pm 0.18 cm and 2.30 \pm 0.14 cm respectively. Cranially, it possessed the supraglenoid tubercle. Medially, supraglenoid tubercle presented tubercular coracoid process. The subscapular fossa of the scapula of the leopard was undulating whereas in of lion, it was more deep near the glenoid cavity (Panday *et al.*, 2004).

The scapula of leopard differs from that of dog by its undulating supraspinous fossa. The costal surface was wide and the cranial part of the surface was deeply concave, whereas caudal part was flattened. The cranial concave area had a line that started from the upper part of cranial border runs caudally and fades out in the middle of the cranial part. Another line present on the caudal part started from the caudal angle runs straight and terminated above the glenoid cavity (Fig.2).

The mensurations like length and height of scapular spine, length of acromion process, cranial border, caudal border, dorsal border and distance between glenoid cavity and acromion process are mentioned in Table 1. Average weight of scapula was 49.20 \pm 0.90 gm while in case of lion and tiger it was (90.00 \pm 9.49) gm and 220.0 gm, respectively. Distance between glenoid cavity and acromion process was 1.32 \pm 0.75 cm in the tiger this distance was 3.20 cm reported by Taluja *et al.* (2001).

ACKNOWLEDGEMENT

Authors are thankful to Vice-Chancellor, Nanaji Deshmukh Veterinary Science University, Jabalpur and PCCF (Wildlife) Bhopal for providing the necessary facilities to carry out the research work.

REFERENCES

- Bordoloi, C. C., Borthakur, S. and Kalite, S. N. 1998. Scapula of the tiger (*Panthera tigris bengalensis*). *Indian Vet. J.* 75(1): 1048-1049.
- Kait, R., Kumar, S. and Sahi, D. N. 2008. Morphological and anatomical differences in hairs of some wild mammals of district Jammu (J&K). *The Bioscan.* 3(1): 83-87.
- Pandey, Y., Vaish, R., Pandey, A. and Podhade, D. 2017. Gross morphological studies on cranial bones in tiger. *The Bioscan.* 12(2): 811-814
- Panday, S., Bhayani, D. M. and Vyas, Y. L. 2004. Gross anatomical study on the scapula of Asiatic Lion (*Panthera persica*). *Indian J. Vet. Anatomy.* 16(1&2): 53-56.
- Pandit, R. V. 1994. Osteology of Indian tiger (*Panthera tigris*). Technical Bulletin No.VI., Conservator of Forest and Director, Project Tiger, Melghat, Amravati. p. 29-30.
- Raghvan, D. 1964. Anatomy of the Ox. Publ. Indian Council of Agricultural Research New Delhi. p. 100.
- Sisson, R. 1975. Sisson and Grossman's the Anatomy of the Domestic

Animals-II. 5th edn. Publ., The Macmillan Co. of India Ltd. PP. 1427-1483.

Snedecor, C. W. and Cochran, W. G. 1994. Statistical Methods 6th edn. Oxford and IBH Publishing Co., Bombay. p. 593.

Taluja, J. S., Malik, M. R. and Parmar, M. L. 2001. Osteometry of the scapula in tiger. *Indian J. Anim. Sci.* **71(3)**: 237-238.

Sarma, M., Kalita, S. N., Sarma, K. K., Sarma, K., Choudary, K. B. and Pathak, H. 2013. Comparative anatomical studies on the scapulae

of Bengal tiger and Indian leopard. *Indian J. Anim. Sci.* **83(11)**: 1177-1178.

Sreeranjini, A. R., Raj, Indu V., Ashok, N. and Harshan, K. R. 2008. Gross anatomical studies of the scapula in leopard (*Panthera pardus*). *J. Vet. Anim. Sci.* **39**: 47-48.

Mahapatra, A., Pathak, S.K., Amarpal and Pawde, A.M. 2016. Morphological and Certain Morphometrical Study of Scapula of Indian Tiger. *Indian J. Veterinary Anatomy.* **28(2)**:77-79.

