COMPARATIVE MORPHOMETRICAL STUDY OF STERNUM IN BLUE ROCK PIGEON (*COLUMBA LIVIA*) AND POND BIRD (*BUBULCUS IBIS*)

Durga Chaurasia[1*], Seema Mandavi[2], Sharaddha Netty[3] and Nishma Singh[4]
Department of Veterinary Anatomy, College of Veterinary Science & A.H., Anjora (C.G.)
Chhattisgarh Kamdhenu Vishwavidyalaya, Anjora, Durg (C.G.)

Received on: 26.01.2018
Accepted on: 22.07.2018

ABSTRACT

Sternum of Blue Rock Pigeon (*Columba livia*) and Pond bird (*Bubulcus ibis*) was studied for comparative morphometry. The sternum was procured after death and prepared for the study by the maceration method. The sternum was quadrilateral in shape in Blue Rock pigeon and Pond bird both. Sternum of Blue Rock pigeon (*Columba livia*) had characteristic oval fenestrae indicative of efficient heat regulation. The craniolateral process was small, short and pointed in Blue Rock pigeon and comparatively large, long and rectangular in Pond Bird. Sternal notch was large, semi-circular S and inverted V shape in Blue Rock pigeon and Pond bird, respectively. Recorded parameters (length of sternum, width of sternum, surface area, keel length, keel height, surface area of keel) were more in Blue Rock pigeon than the Pond bird and was indicative of greater flying capacity in Blue Rock pigeon.

Key words: Sternum, keel, Blue rock pgeon, pond bird

Introduction

Sternum is one of the important bone involves in flight mechanism in avian species. Powerful down stroke of the wing is powered by the large pectoralis muscles attached to the sternal keel as well as supracoracoideus act as is the primary elevator of wing in the upstroke and is most important for take-off also attached to the sternum. Morphometrical feature of the sternum vary to support the habitat as well as flying activity of the birds (Rao *et al.*, 2017). Kaiser (2007), opined that sternum plays important role in heat regulatory mechanism. Scant information is available on the comparative mormphometrical study of Blue Rock pigeon (*Columba livia*) and Pond bird (*Bubulcus ibis*). Keeping the above facts in view the present study was undertaken to explore the comparative morphometrical parameters, biodynamics, flying capacity and heat regulatory mechanism in these two carinate species. This will form a basis for the forensic identification, physiological and aerodynamic studies.

Materials and Methods

Sternum of the birds (two Blue Rock pigeon and three Pond bird) were procured after death and prepared for the study by the maceration method. Following morphological and morphometrical parameters were recorded and correlated with biodynamic

1. Length of sternum
2. Width of sternum (anterior)
3. Width of sternum (posterior)
4. Distance between coracoid (cm) groove
5. Distance between base of cranio-lateral processes
6. Distance between base of caudo-lateral processes
7. Area of ventral surface of sternum
8. Keel length (anteroposterior length)
9. Keel height (dorsoventral diameter)
10. Length of keel curvature
11. Surface area of keel

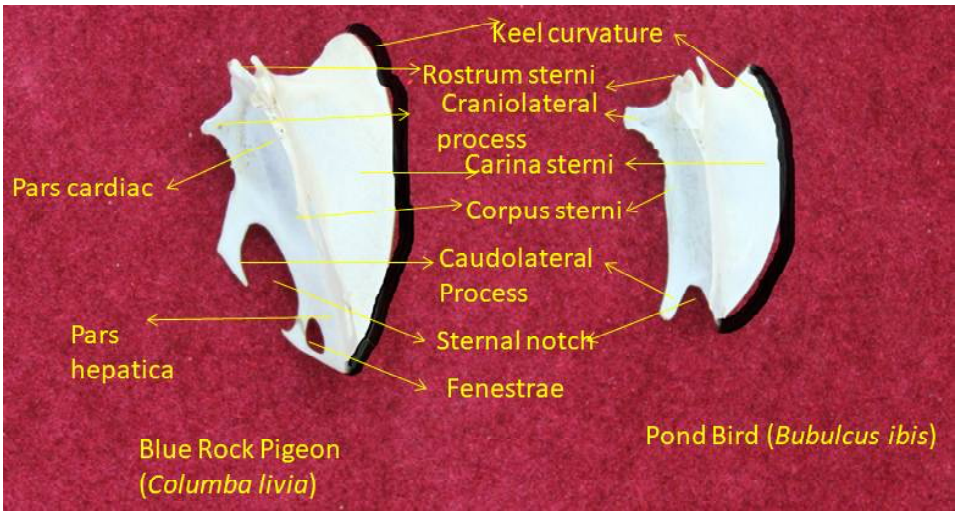

Fig. 1: Lateral surface of sternum

[1*]Associate Professor, email: durgavet2010@gmail.com; [2]M.V.Sc. Scholar; [3]Assistant Professor, Department of Pharmacology, [4]Assistant Professor, DRS, Chhattisgarh Kamdhenu Vishwavidyalaya, Anjora, Durg (C.G.)

Table 1: Measurements of sternum in Blue Rock Pigeon and Ponds Bird

Parameter	Blue Rock Pigeon	Pond bird
Length	6.10±0.08 cm	4.50±.01cm
Distance between coracoid groove	1.70±0.01 cm	1.40±.01 cm
Width of sternum (anterior)	1.50±0.02 cm	1.10±.01 cm
Width of sternum (posterior)	1.90±0.02 cm	1.62±.04 cm
Distance between base of cranio-lateral processes	2.50± 0.02 cm	1.60±.04 cm
Distance between base of caudo-lateral processes	2.80±0.01 cm	1.72±0.02 cm
Surface area of sternum (Ventral surface)	13.38 cm^2	10.78 cm^2
Length of keel curvature	6.2±0.02 cm	3.85±0.01 cm
Keel length (anteroposterior length)	5.50±0.01 cm	3.60±.02 cm
Keel height (maximum dorsoventral diameter)	2.1 ±0.03 cm	2.1 ±0.03 cm
Surface area of keel	11.90 ± 0.12cm^2	6.72 ±0.08cm^2

Results and Discussion

The sternum of these two carinate species has divided into three main parts the rostrum sterni, corpus sterni and carina sterni as described earlier in fowl by Getty (1975). Sternum of Blue Rock pigeon and Pond bird was in the form of quadri lateral plate with dorsal, concave surface and ventral convex surface as described earlier by Tomar *et al*. (2011) in Pariah Kite (*Milvus migrans*). Characteristic two oval fenestrae was present only in Sternum of Blue Rock pigeon indicative of greater heat regulating mechanism. The anteroposterior length of corpus sterni was 1.40 cm more in Blue Rock pigeon as compared to the Pond bird (Table 1). Rostrum sterni was triangular in shape with central small projection in Blue Rock pigeon. While, in Pond bird rostrumsterni was somewhat resemble to the english alphabet **m** with central semicircular depression (Fig. 1).

Corpus sterni has cranially the pars cardiac and caudally the pars hepatica in the dorsal surface. From the lateral border undivided craniolateral and caudolateral process were arise (Fig. 1). Costal articular facets were present in lateral border. The pars cardiac in dorsal surface of corpus sternum was comparatively more concave in the Blue Rock pigeon as compared to the Pond bird. In Blue Rock pigeon the craniolateral process was small, very short and pointed. Whereas, in the Pond bird it was large, long and rectangular. Undivided caudolateral process was arised from the middle of corpus sterni just behind the costal facet in Blue Rock pigeon. While, in Pond bird comparatively shorter caudolateral process was arised from the caudal part of the corpus sterni. In Blue Rock pigeon the apex of caudolateral process was pointed whereas in Pond bird it was blunt (Fig.1). The caudolateral process directed caudo-ventrally outward than take sharp turn vertically at the same level in the Blue Rock pigeon. While, in Pond bird the vertical sharp turn was absent. In Blue Rock pigeon large sternal notch was semi-circular in shape and was present among the, lateral border,caudolateral process and caudal part of corpus sterni. While, in the Pond bird the small sternal notch was inverted V shape and was formed between the caudal part of corpus sterni and caudolateral process. The sternum was wider anteriorly and posteriorly in the Blue Rock pigeon (Table 1). Distance between the base of craniolateral and caudolateral process was approximately 1.5 times more in the Blue Rock pigeon as compared to the Pond bird (Table 1). Surface area on the ventral surface of the corpus sterniwas comparatively more in the Blue Rock pigeon which indicated greater area for attachment of pectoralis muscle and greater flying capacity.

Morphologically the carina sterni was large triangular plate in both bird. These findings are in line with the Sathymoorthy *et al*. (2012) in Spot- Billed Pelican. Carina sterni was extended throughout the entire length of ventral surface and ventral border (keel curvature) of carina was curved and convex. Anterior border was concave and form blunt apex. The height of the keel reduced in antero-posterior direction in both carinate birds. Recorded length of keel curvature, keel length (anteroposterior length), keel height (maximum dorsoventral diameter) and surface area of keel was higher in the Blue Rock pigeon (Table 1) than the Ponds bird was indicative of greater development of flying muscle in Blue Rock pigeon.

References

Getty R (1975) *The Anatomy of the Domestic Animals*. 5th ed. W.B. Saunders Company, Philadelphia.

Kaiser GW (2007) *The Anatomy and Evolution.* UBC Press, Vancouver.

Rao NS, Charjan R, Rana J, Banubakode SB, Nandeshwar NC and Mainde UP (2017) Gross anatomical study on sternum of yellow footed green pegion *(Treron phoenicoptera),* Jungel babbler *(Turdoides striata),* Cattle erget *(Bubulcus ibis),* Barn owl *(Tyto alba),* Shikra *(Accipiter badicus)* and Black-shouldered kite *(Elanus axillaries). Souvenir of XXXII National Symposium and Annual Convention of IAVA*. 32.

Tomar MPS, Vaish R, Parmar ML, Shrivastav AB and Tiwari Y (2011) Gross morphometrical studies of sternum of Pariah kite (*Milvus migrans*). *Vet. World.* **4(4):** 171-172.

Sathymoorthy OR, Thirumurugan R, Senthil Kumar K and Jayathangaraj MG (2012) Gross anatomical studies on the sternum and clavical of Spot billed pelican *(Pelecanus philippenesis). Tamilnadu J. Vet. Anim. Sci.* **8(3)**: 166-170.