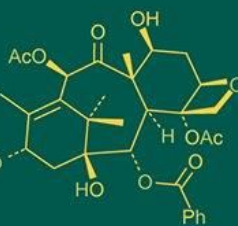
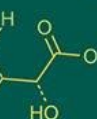


## International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693  
ISSN Online: 2617-4707  
IJABR 2024; SP-8(9): 1072-1074  
[www.biochemjournal.com](http://www.biochemjournal.com)  
Received: 18-06-2024  
Accepted: 21-07-2024

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## Gross anatomical study on bones of pectoral girdle in black swan (*Cygnus atratus*)

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DOI: <https://doi.org/10.33545/26174693.2024.v8.i9Sm.2304>

### Abstract

The pectoral girdle of black swan consists of scapula, clavicle and coracoid. The scapula was a sword shaped bone positioned lateral and parallel to the vertebral column and extended caudally to the pelvis. The cranial extremity consisted of lateral articular facet for articulation with the head of the humerus and a medial rounded process. The scapula joined with the clavicle craniomedially. Foramen triosseum was formed with clavicle and coracoid for the head of humerus. The clavicle was in the form of a sickle shaped bone. A pair of clavicles fused ventrally to form broad 'U' shaped furcula. The hypocleidium was absent. The coracoid was a thick rod-shaped and strongest bone of the pectoral girdle. The cranial extremity was characterized by the presence of humeral, scapular, and acrocoracoid tuberosities, acromial process and supracoracoid groove. The caudal extremity was quadrilateral and consisted of spatula shaped concave elongated facet for articulation with sternum.

**Keywords:** Black swan, clavicle, scapula, coracoid

### 1. Introduction

The black swan (*Cygnus atratus*) is a large water bird, a species of swan which breeds mainly in the southeast and southwest regions of Australia. It was introduced to various countries as an ornamental bird in the 1800s. They are black-feathered birds, with white flight feathers. The bill is bright red, with a pale bar and tip; and legs and feet are greyish-black. The pectoral girdle of black swan consists of scapula, clavicle and coracoid.

### 2. Materials and Methods

The gross anatomical study was conducted on six adult black swans procured from the postmortem laboratory of Department of Veterinary Pathology, College of Veterinary Science, Rajendranagar, Hyderabad. Wet method of maceration technique was used to separate the bones of pectoral girdle from the remaining body portion of the black swan. The bones of pectoral girdle were cleaned and utilized to observe the gross anatomical features.

### 3. Results and Discussion

The pectoral girdle forms the connection between the trunk and the forelimbs. The skeleton of the pectoral girdle consisted of fused clavicles (furcula), coracoid and the scapula as reported by Nickel *et al.* (1977) [6] and Dyce *et al.* (2010) [2] in domestic birds. The scapula was a sword shaped bone positioned lateral and parallel to the vertebral column and extended caudally to the pelvis (Fig. 1). It consisted of two surfaces viz., a costal surface and a dorsolateral surface. Both surfaces were convex cranially and caudally showed slight concave dorsolateral surface and nearly flat costal surface with blunt end. The cranial extremity consisted of lateral articular facet for articulation with the head of the humerus, furcular process and a medial rounded process for articulation with the coracoid as observed by Parvez *et al.* (2016) [7] in pigeon. The scapula joined with the clavicle craniomedially. A neck separated the cranial extremity from the body of the scapula.

The clavicle was in the form of thick sickle shaped bone (Fig. 2). These observations were in line with the findings of Chaurasia *et al.* (2018) [1] in domestic ducks whereas Nickle *et al.* (1977) [6] observed thin and slightly curved branches of clavicles in fowl and pigeon. A pair of clavicles fused ventrally to form a broad 'U' shaped furcula similar observations were

made by Indu *et al.* (2012) [5] in green-winged macaw, Shabir *et al.* (2013) [9] in the domestic geese and Parvez *et al.* (2016) [7] in pigeon. The hypocleidium was absent as observed by Indu *et al.* (2012) [5] in green-winged macaws whereas in crow the hypocleidium was in the form of flattened 'S' shaped sagittal plate as observed by Patki *et al.* 2010 [8] and in fowl it is in form of an oval thin plate (Getty, 1975) [4]. A lateral ridge was prominent throughout the length of furcular branches similar observations was made by Nickle *et al.* (1977) [6] and Chaurasia *et al.* (2018) [1] in domestic ducks. The proximal end of the clavicle had facet for coracoid as observed by Parvez *et al.* (2016) [7] in pigeon whereas in the domestic geese the proximal extremity had no facet but only a rough area for coracoid as observed by Shabir *et al.* (2013) [9]. The proximal ends of clavicle, coracoid and scapula articulated to form foramen triosseum similar observations were made by Nickle *et al.* (1977) [6] in fowl and Shabir *et al.* (2013) [9] in domestic geese.

The coracoid was a thick rod-shaped and strongest bone of the pectoral girdle which was directed downward and backwards. It consisted of two extremities and a shaft (Fig. 3). The cranial extremity was narrower than caudal extremity. The cranial extremity was characterized by the presence of humeral, scapular, acrocoracoid tuberosities and a shallow supracoracoid groove. The acrocoracoid process of coracoid bone was tuberos and presented a small pneumatic foramen medially however, coracoid bone of pigeon and owl lacked this foramen. The caudal extremity was quadrilateral and consisted of spatula shaped concave elongated facet crest to articulate with the sternum and few rough lines similar observations et al. reported were made by El-Ghazali *et al.* (2023) [3] in domestic ducks.



**Fig 1:** Scapula of Black swan.  
CP: Coracoid process  
FP: Furcular process

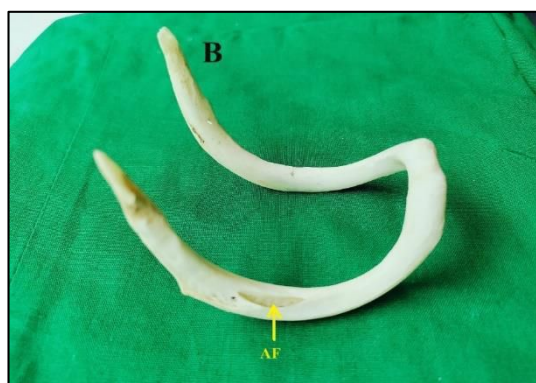


**Fig 2:** Clavicle of Black swan.  
AF: Articular Facet

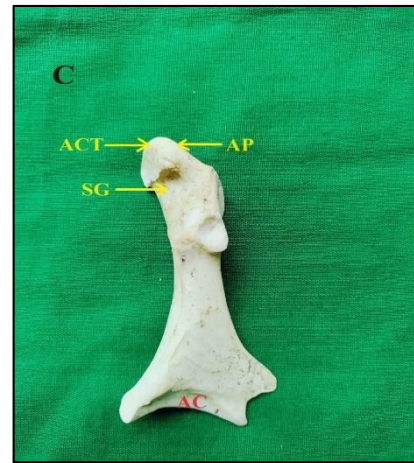


**Fig 3:** Coracoid of Black swan.  
ACT: Acrocoracoid Tuberosity  
AP: Articular Process  
SG: Supracoracoid Groove  
AC: Articular Crest

#### 4. Conclusion

The black swan (*Cygnus atratus*) is a large waterbird, a species of swan which breeds mainly in the southeast and southwest regions of Australia. It was introduced to various countries as an ornamental bird. Wet method of maceration technique was used to separate the bones of pectoral girdle from the remaining body portion of black swan. The pectoral girdle of black swan consists of scapula, clavicle and coracoid. The scapula was a sword shaped bone positioned lateral and parallel to the vertebral column and extended caudally to the pelvis. Foramen triosseum was formed with clavicle and coracoid for the head of humerus. The clavicle was in the form of a sickle shaped bone. A pair of clavicles fused ventrally to form broad 'U' shaped furcula. The hypocleidium was absent. The coracoid was a thick rod-shaped and strongest bone of the pectoral girdle.

#### 5. Acknowledgement

We sincerely thank department of Veterinary Anatomy, C.V.Sc Rajendranagar, Hyderabad for having provided the necessary facilities for carrying out this work.

#### 6. References

1. Chaurasia D, Ingole SP, Deshmukh SK, Netty S, Mandavi S. Comparative gross morphometrical study on appendicular skeleton of duck and fowl. Indian Journal of Veterinary Anatomy. 2018;30(2).
2. Dyce KM, Sack WO, Wensing CJG. Textbook of Veterinary Anatomy. 4th ed. Saunders Elsevier; c2010.
3. El-Ghazali HM, Abdelbaset-Ismail A, Goda NI, Aref M. Morphological, radiographic, three-dimensional computed tomographic, and histological features of the primary upstroke and downstroke muscles and bones in the domestic duck (*Anas platyrhynchos domesticus*) and the cattle egret (*Bubulcus ibis*, Linnaeus, 1758), reflecting the evolutionary transition towards the irreversible flightlessness. BMC Veterinary Research. 2023;19(1):133.
4. Getty R. Sisson and Grossman's the Anatomy of Domestic Animals. 5th ed. Philadelphia: W.B. Saunders Co.; 1975. p. 1790-1801.
5. Indu VR, Lucy KM, Sreeranjini AR, Maya S, Ashok N, Sayam KV. A comparative study on the pectoral girdle

- of green-winged macaw and pea hen. Journal of Veterinary and Animal Sciences. 2012;43:56-58.
6. Nickel R, Schummer A, Seiferle E. Anatomy of the Domestic Birds. Berlin, Hamburg: Verlag Paul Parey; c1977. p. 14.
  7. Parvez MNH, Akter M, Gofur M, Sarder M. Gross morphometry of pectoral girdle of domestic pigeon (*Columba livia*). International Journal of Livestock Research. 2016;6(6):32-38.
  8. Patki HS, Lucky KM, Maya S, Harshan KR, Chungath JJ. Gross and radiographic anatomy of pectoral girdle of Indian crow. In: Proceedings of the 10th Indian Veterinary Congress and 17th Annual Conference of IAAVR on Newer Challenges in Veterinary Research and Education; Jabalpur, India; c2010.
  9. Shabir M, Hamadani H, Khan M, Baba MA, Khan A. Gross morphometry of pectoral girdle of domestic geese (*Anser anser domesticus*). Indian Journal of Poultry Science. 2013;48(2):273-275.
  10. Yakkundi RC, Matapathi N, Talawar V. A review of bone preparation techniques for anatomical studies. Journal of Ayurveda and Integrated Medical Sciences. 2023;8(10):112-117.