



**Annual Review & Research in Biology**  
1(4): 111-116, 2011

SCIENCEDOMAIN *international*  
[www.sciencedomain.org](http://www.sciencedomain.org)



---

## **Gross Morphometrical Studies on Pectoral Limb of Pariah Kite (*Milvus migrans*)**

**Yogita Tiwari<sup>1\*</sup>, A. Pandey<sup>2</sup>, A. B. Shrivastav<sup>3</sup>, M. P. S. Tomar<sup>1</sup>  
and Rakhi Vaish<sup>1</sup>**

<sup>1</sup>*Department of Veterinary, Anatomy and Histology,  
College of Veterinary Science and Animal Husbandry, Jabalpur, M. P., India.*

<sup>2</sup>*Department of Animal Breeding and Genetics,  
College of Veterinary Science and Animal Husbandry, Jabalpur, M. P., India.*

<sup>3</sup>*Department of Wildlife Health and Management,  
College of Veterinary Science and Animal Husbandry, Jabalpur, M. P., India.*

**Research Article**

*Received 2<sup>nd</sup> May 2011*  
*Accepted 2<sup>nd</sup> June 2011*  
*Online Ready 25<sup>th</sup> June 2011*

---

### **ABSTRACT**

The fore limb or pectoral limb of Pariah kite (*Milvus migrans*) was studied for gross morphometry. It was procured from Department of Wildlife Health and Management, Veterinary College, Jabalpur, (M.P.), India. The pectoral limb of Pariah kite was comprised of following bones; Humerus, Radius and Ulna, Carpals, Carpometacarpus and Digits. Humerus was longest and largest of all bones of fore limb. The proximal extremity was larger and more flattened craniocaudally than distal extremity. The radius was smaller and thinner than the ulna. Both the bones were separated by wide interosseus space proximally and narrow space distally. The outer surface of the shaft had a series of small bony projections which represented points of attachment for secondary feathers of wing.

*Keywords: Morphometry; Milvus migrans; carpometacarpus; craniocaudally; projections;*

---

\*Corresponding author: Email: [tiwari.yogita@rediffmail.com](mailto:tiwari.yogita@rediffmail.com);

## **1. INTRODUCTION**

Capturing and poaching of wild birds is common for game purpose, flesh purpose, show purpose etc. The Pariah Kite is sacrificed in some mythological taboos. So the evidences of such killing are necessary to provide by a forensic anatomist. Bones can be used as the evidence even after biological decomposition of a carcass. Detailed information is available on whole skeleton of fowl (Bradley and Grahame, 1960; Getty, 1975 and King and McLelland, 1975). Some work has been reported on wild birds like Ostrich (Sathyamoorthy et al., 2001) and Vulture (Bokhde et al., 2006). But the information on pariah kite is meager. So the present work i.e., osteological study was carried out on different bones of pectoral limb of Pariah Kite.

## **2. OBJECTIVE**

- To identify the species on the basis of bones.
- To recognize the differentiating features between Pariah Kite and Domestic Fowl.

## **3. MATERIALS AND METHODS**

For the gross morphometry the carcass was procured from Department of Wildlife Health and Management, Veterinary College, Jabalpur, (M.P.), India.

After procurement of carcass the skeleton was taken out by maceration method. The morphological and morphometrical studies were conducted on humerus, radius, ulna, carpals, carpometacarpus and digits.

## **4. RESULTS AND DISCUSSION**

The fore limb is the part of the skeleton of the wings and consists of humerus, radius, ulna, carpals and carpometacarpus.

### **4.1 Humerus**

The humerus was the largest of the wing bones (Figure 1). It was stout and slightly curved. The humerus presented two extremities and a shaft. These observations were supported by Bradley and Grahame, (1960); Getty, (1975) and king and McLelland, (1975). The proximal extremity was larger and more flattened craniocaudally than distal extremity, while in fowl it was convex, as stated by Getty (1975).

The proximal extremity articulated with the coracoid by a ligament. It had transversely elongated, convex head and a tubercle. Tubercle of the proximal extremity of the humerus was smaller while it was larger and overhangs the pneumatic foramen in domestic fowl. The pneumatic foramen was placed medially just below the head (Bradley and Grahame, 1960). The shaft was long and semicylindrical in shape .On ventral surface thin elongated deltoid crest was present while in other domestic birds it was thicker, curved laterally and present only at the proximal extremity as reported by Bradley and Grahame, (1960); Getty, (1975) and King and McLelland, (1975). Distal extremity of the humerus articulated with the radius and ulna by two condyles. Distal extremity had concave olecranon fossa.



**Fig. 1. Humerus of pariah kite**

#### **4.2 Radius and Ulna**

The radius was smaller (length: 13.20 cm) and thinner (circumference: 1.10 cm) than the ulna (Table 1; Figure 2). The proximal extremity of radius articulated with ulna and distal extremity of humerus. The proximal end of radius has an articular facet which articulated with smaller of the humeral condyle. Both the extremity was of same size. The distal extremity articulated with radial carpal and distal extremity of ulna with a facet. The shaft was flattened in its upper one fourth part and cylindrical below. Both the bones were separated by wide interosseus space proximally and narrow space distally. These finding were similar to Bradley and Grahame, (1960); Getty, (1975) and King and McLelland, (1975).

The ulna was considerable larger than radius but approximately of same length (Figure 2). The proximal extremity of the ulna articulated with radius and distal extremity of humerus. Proximal extremity was larger than distal of ulna. Proximal extremity of ulna had a concave surface for articulation with large condyle of humerus, and an extension called olecranon. The ulna had a nutrient foramen in lower part of upper one third of the shaft. The outer surface of the shaft had a series of small bony projections which represented points of attachment for secondary feathers of wing as stated by Getty, (1975). Distally ulna had two articular areas or facets for articulation with radial and ulnar carpal.



**Fig. 2. Radius of pariah kite**



**Fig. 3. Ulna of pariah kite**

#### **4.3 Carpals**

Carpals were two in number which were radial and ulnar in first row. Carpals of distal row were fused with metacarpus to form carpometacarpus as given by Bradley and Grahame, (1960); Getty, (1975) and King and McLelland, (1975).

#### **4.4 Carpometacarpus**

Carpometacarpus was comprised of three metacarpals as II, III, and IV (Figure 4). It was in the form of small projection on the radial side of the carpometacarpus. III and IV were long element which fused at their distal extremity and enclosed a large interosseous space between them. These observations were in accordance of Bradley and Grahame (1960); Getty (1975) and King and McLelland (1975).



**Fig. 4. Carpometacarpus and digits of pariah kite**

#### 4.5 Digits

Digits were three in number II, III, IV. III digit was largest and contained two phalanges, while II, IV contained one each.

**Table 1. Different measurements of bones of pectoral limb of pariah kite**

Bone	Length (cm.)	Circumference (cm.)		
		Proximal End	Middle part	Distal end
Humerus	12.20	4.50	2.30	3.90
Radius	13.20	1.40	1.10	1.30
Ulna	13.60	3.00	1.80	1.80

#### 5. CONCLUSION

By present study we found that forelimb of Pariah Kite can be identified easily by observing the thinner and flattened proximal extremity and elongated head and deltoid crest of humerus, thinner prismatic shaft of radius and semicylindrical shaft, and bony projections on outer surface of ulna.

It can also be differentiate with a domestic bird in veterolegal or wildlife forensic cases on the basis of following differential points:

- The proximal extremity presented flattened area laterally while in fowl it is convex.
- Deltoid crest was thinner and extended up to the one fourth of the shaft while in fowl it is thicker, curved laterally and present only at the proximal extremity.
- Head of humerus was narrow convex and transversally elongated while in fowl it is rounded and massive.
- Tubercle of the proximal extremity of the humerus was smaller while in fowl it is larger and overhangs the pneumatic foramen.
- The olecranon fossa of the distal extremity of the humerus was more concave or deeper than in humerus of fowl.
- Groove between the head and tubercle of humerus was shallower than fowl.
- The radius was thinner, longer, and shaft was twisted and cylindrical above and prismatic below while in fowl the upper one fourth part of shaft is flattened and rest is cylindrical.
- The shaft of ulna was semicylindrical while in fowl it is cylindrical.
- The outer surface of shaft of the ulna had small bony projections which are very faint in fowl.

#### REFERENCES

Bokhde, S.S. (2006). Gross anatomy of vulture. In: 20<sup>th</sup> Annual convention of IAVA and National symposium on recent advances in veterinary anatomy and their applications to improve livestock health production and reproduction.

- Bradley, O.C., Grahame, T. (1960). The structure of the fowl. 4<sup>th</sup> Edn., Publisher Oliver and Boyd., London. Pp. 5-15.
- Getty, R. (1975). Sisson and Grossman's the Anatomy of the Domestic Animals-II.5<sup>th</sup> edn. Publ., the Macmillan Co. of India Ltd., pp. 1790-1801.
- King, A.S., McLelland, J. (1975). Outlines of avian anatomy. Publ., Bailliere Tindall, London., pp: 15-29.
- Sathyamoorthy, O.R. (2001). Gross anatomy of the sternum of Ostrich. In. national symposium on animal structural dynamics to improve health and production 16<sup>th</sup> annual convention of IAVA.
- Shankhpal, V.D., Bhamburkar, V.R., Dalvi, R.S., Ladurkar, O.N., Banubakode, S.B. (2006). Osteometrical study on various bones of Emu (*Dromaius novaehollandiae*). In: 20<sup>th</sup> Annual Convention of IAVA and National symposium on recent advances in veterinary anatomy and their applications to improve livestock health production and reproduction.

---

© 2011 Tiwari et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.