



Comparative Gross Morphological Studies on the Os-Coxae of Crested Serpent Eagle (*Spilornis cheela*) and Brown Wood Owl (*Strix leptogrammica*)

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ABSTRACT

The present study was conducted on os-coxae of crested serpent eagle and brown wood owl. The os-coxae consisted of three bones namely ilium, ischium and pubis. All the three bones were fused and the space between these bones was occupied by lumbo-sacral mass. Ventrally, the bones of os-coxae did not unite with each other leaving the pelvis open. Ilium was divided into pre-acetabular and post-acetabular parts. The dorsal surface of the pre-acetabular part was elongated and concave whereas post-acetabular part was small and convex in both the species. A very sharp and prominent crest was observed dorsally on either side of the lumbo-sacral mass. The renal fissure for the lodgement of the kidneys was observed in both species. The ischium was flat and somewhat triangular in shape. It formed a large sciatic foramen with the ilium and obturator foramen with pubis. The pubis was a thin rod-like elongated bone situated along the ventral border of the ischium and formed ischio-pubic incisures in brown wood owl but in crested serpent eagle, the pubis was completely fused with the ischium forming a flat plate-like structure. There was a small pectineal process at the anterior end of the pubis in the brown wood owl. The acetabulum was circular in outline and in the form of a foramen for articulation with the head of the femur.

Keywords: Os-coxae, crested serpent eagle, brown wood owl, obturator foramen, acetabulum.

The crested serpent eagle is a medium-sized bird of prey that is found in forested habitats across tropical Asia (Choudhary *et al.*, 2019). The brown wood owl is a resident breeder in south Asia from India, Bangladesh and Sri Lanka, east to western Indonesia, Taiwan, and South China (Choudhary *et al.*, 2018).

Avian os-coxae is large in order to provide a greater surface area for the insertion of muscles which bear the bulk of the body weight. Pelvic bones of birds have an arched shape and are fused with the synsacrum of the vertebral column. They fuse with the synsacrum to form a rigid structure fulfilling requirements for flight, locomotion and respiration. The large size of the pelvic girdle in these bird is related to the bipedal standing posture, also ventrally opened pelvis forms a roof-like covering for large parts of the body cavity and the organs contained in it (Mehta

et al., 2014). Literature pertaining to the os-coxae of the crested serpent eagle and brown wood owl is not available; hence, the present study was conducted.

MATERIALS AND METHODS

The specimen was procured from three crested serpent eagle and two brown wood owl, brought from the Aizawl Zoological Park, Aizawl for post-mortem examination to the Department of Veterinary Pathology, College of Veterinary Sciences and Animal Husbandry, Selesih, Aizawl, Mizoram. After post-mortem examination the collected specimen was macerated as per the standard technique (Choudhary *et al.*, 2015; Choudhary and Singh, 2015 & 2016) and utilized for gross anatomical studies in the Department of Veterinary Anatomy and Histology,

College of Veterinary Sciences and Animal Husbandry, Selesih, Aizawl, Mizoram and were compared with that of other flying birds.

RESULTS AND DISCUSSION

The os-coxae of crested serpent eagle and brown wood owl consisted of three bones namely the ilium, ischium and pubis (Fig. 1-3) as also reported in ostrich (Tamilselvan *et al.*, 2015) and peacock, peahen (Deshmukh *et al.*, 2016). The space between the pelvic bones was occupied by rhomboid shape lumbosacral mass (McLelland, 1990).

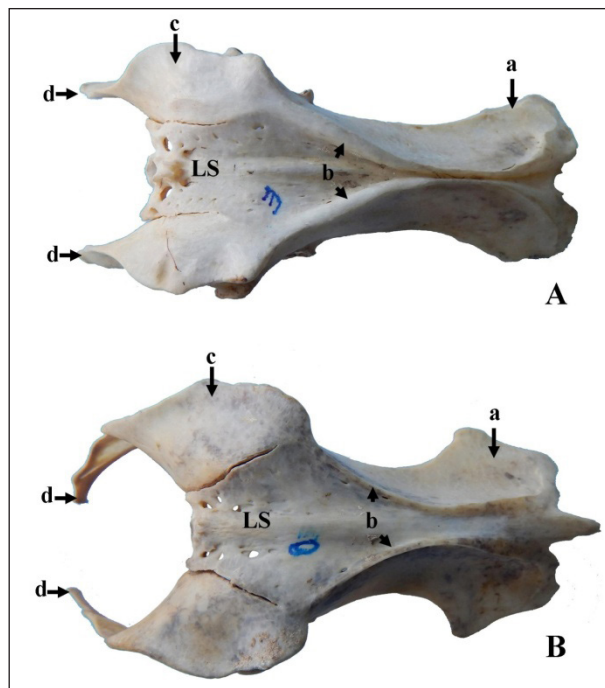


Fig. 1: Dorsal view of the os-coxae of crested serpent eagle (A) and brown wood owl (B) showing pre-acetabular part of the ilium (a), dorsal iliac crest (b), ischium (c), pubis (d) and lumbosacral mass (LS)

Ilium

In crested serpent eagle and brown wood owl, the ilium (Fig. 1-2) was elongated in shape and divided into pre-acetabular and post-acetabular and both parts were joined with lumbosacral mass which was also observed in Japanese quail (Mehta *et al.*, 2014), ostrich (Tamilselvan *et al.*, 2015), guinea fowl and pigeon (Lavanya *et al.*, 2017) and Indian eagle owl (Sarma *et al.*, 2018). The pre-

acetabular part was much longer than the post-acetabular part in both the species as described in peahen (Sreeranjini *et al.*, 2011) and Indian eagle owl (Sarma *et al.*, 2018). Cranially, the pre-acetabular part was completely fused with the dorsal spinous processes of the lumbosacral mass. The dorsal surface of the pre-acetabular part was concave whereas the post-acetabular part was convex in both species as described in the barn owl (Kumar *et al.*, 2016), Indian eagle owl (Sarma *et al.*, 2018), guinea fowl and pigeon (Lavanya *et al.*, 2017). The pre-acetabular and post-acetabular parts were clearly demarcated by a very sharp and prominent crest on the dorsal surface in both the species. Anteriorly, crests of both sides were very close to each other in crested serpent eagle but were not too close to each other in brown wood owl. Posteriorly, the crests widened apart in both the species. The crest of pre-acetabular part continued as the lateral border of the post-acetabular part as also described in Indian eagle owl (Sarma *et al.*, 2018). The ventral surface of the ilium was flat and fused with transverse processes of lumbosacral mass anteriorly. At this part, four large foramina were observed on either side of the median plane for the passage of spinal nerves in brown wood owl as also reported in Indian eagle owl (Sarma *et al.*, 2018). In crested serpent eagle, five large foramina were observed on either side of the median plane on the ventral surface of the ilium. Posteriorly, it presented a depression, the renal fossa for the lodgement of the kidneys.

Ischium

The ischium was flat and situated below the post-acetabular part of the ilium in both the species (Fig. 2). It was directed downwards, backward and completely fused with pubis in crested serpent eagle, however, in brown wood owl, the ischium had pointed end which was directed posteriorly. The ventral border of ischium anteriorly joined with dorsal border of pubis forming the obturator foramen in both species and continued behind as a fissure, ischio-pubic incisure in brown wood owl which was also observed in domestic fowl and duck (Nickel *et al.*, 1977), Indian Eagle owl (Sarma *et al.*, 2018) and guinea fowl and pigeon (Lavanya *et al.*, 2017). However, in crested serpent eagle, the ventral border of the ischium and dorsal border of pubis was completely fused together forming a flat plate-like structure. The posterior angle of the ischium was seen as a sharp process in brown wood

owl as reported in the pigeon (Lavanya *et al.*, 2017) and Indian eagle owl (Sarma *et al.*, 2018). In crested serpent eagle, it was blunt ended and was also described by in guinea fowl (Lavanya *et al.*, 2017).

Pubis

In brown wood owl, pubis was a thin rod-like elongated bone (Fig. 2-3) situated along the ventral border of the ischium and formed ischio-pubic incisure (Fig. 2). Similar findings were observed in guinea fowl and pigeon (Lavanya *et al.*, 2017) and Indian eagle owl (Sarma *et al.*, 2018). The pubis of crested serpent eagle was completely fused with the ischium. A very small pectineal process was noticed at the anterior end of the pubis below the level of the acetabulum in brown wood owl as also reported in peahen (Sreeranjini *et al.*, 2011), domestic fowl (Nickel *et al.*, 1977) and guinea fowl (Lavanya *et al.*, 2017). However, it was absent in crested serpent eagle as also mentioned in Japanese quail (Mehta *et al.*, 2014), pigeon (Lavanya *et al.*, 2017) and Indian eagle owl (Sarma *et al.*, 2018).

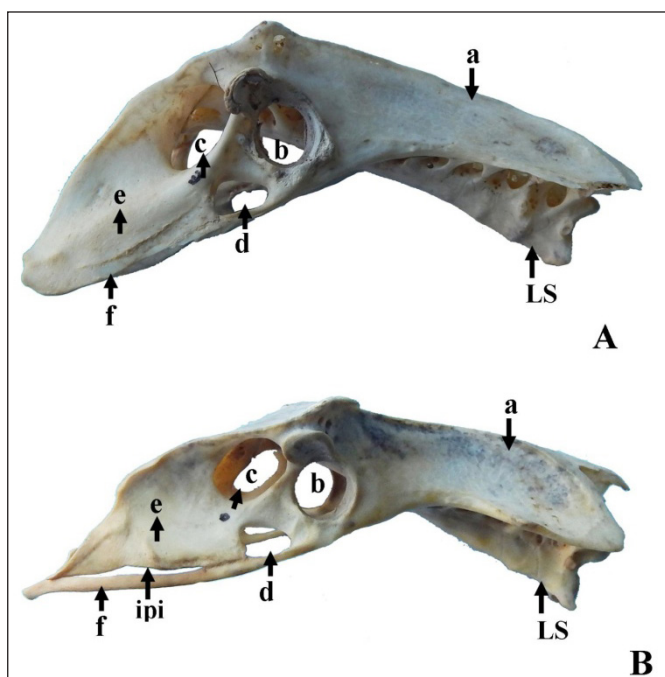


Fig. 2: Lateral view of the os-coxae of crested serpent eagle (A) and brown wood owl (B) showing pre-acetabular part of the ilium (a), acetabulum (b), ilio-ischiatic foramen (c), obturator foramen (d), ilium (e), pubis (f), Ischio-pubic incisure (ipi) and lumbo-sacral mass (LS).

Acetabulum

In both the species, the acetabulum was perforated and circular in outline for articulation with the head of the femur. Similar features of the acetabulum were reported in peacock and peahen (Deshmukh *et al.*, 2016). A large triangular shaped anti-trochanter was observed in the dorso-caudal aspect of the acetabulum with its pointed apex in both the species as also described in Indian eagle owl (Sarma *et al.*, 2018). The facet noticed on the anti-trochanter is for articulation with trochanter major of the femur as mentioned in cattle egret (Resk, 2015), spot-billed pelicans (Sathyamoorthy *et al.*, 2012), guinea fowl and pigeon (Lavanya *et al.*, 2017).

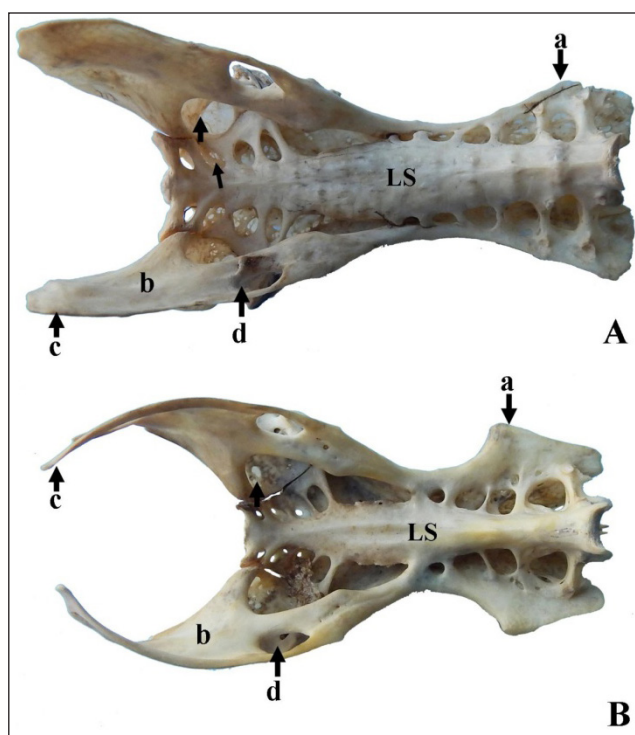


Fig. 3: Ventral view of the os-coxae of crested serpent eagle (A) and brown wood owl (B) showing pre-acetabular part of the ilium (a), ischium (b), posterior extremity of pubis (c), Obturator foramen (d) and lumbo-sacral mass (LS).

CONCLUSION

In conclusion, the comparative gross anatomy of os-coxae of crested serpent eagle and brown wood owl revealed that the os-coxae was formed by the ilium, ischium and pubis. These bones of os-coxae showed minor differences



between both the species. The differences in osteological features of os-coxae in both species may be due to their flying and terrestrial habits.

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REFERENCES

- Choudhary, O.P. and Singh, I. 2015. Morphometrical studies on the skull of Indian blackbuck (*Antelope cervicapra*). *Int. J. Morphol.*, **33**(3): 868-876.
- Choudhary, O.P. and Singh, I. 2016. Morphological and radiographic studies on the skull of Indian blackbuck (*Antelope cervicapra*). *Int. J. Morphol.*, **34**(2): 788-796.
- Choudhary, O.P., Debroy, S., Keneisenuo, Kalita, P.C., Doley, P.J., Kalita, A., Rajkhowa, T.K. and Arya, R.S. 2018. Gross anatomical studies on the sternum of brown wood owl (*Strix leptogrammica*). *Ind. J. Vet. Anat.*, **30**(2): 139-140.
- Choudhary, O.P., Kalita, P.C., Rajkhowa, T.K., Arya, R.S., Kalita, A. and Doley, P.J. 2019. Gross morphological studies on the sternum of crested serpent eagle (*Spilornis cheela*). *Ind. J. Anim. Res.*, DOI:10.18805/ijar.B-3699.
- Choudhary, O.P., Singh, I., Bharti, S.K., Khan, I.M., Sathapathy, S. and Mrigesh, M. 2015. Gross and morphometrical studies on mandible of blackbuck (*Antelope cervicapra*). *Int. J. Morphol.*, **33**(2): 428-432.
- Deshmukh, S.K., Karmore, S.K., Gupta, S.K., Kodape, S. and Prakash, R. 2016. Comparative biometrical studies on the os-coxae and synsacrum of peacock and peahen. *Vet. Pract.*, **17**(1): 41-42.
- Kumar, M.L.B., Lakshmi, M.S. and Kumar, D.P. 2016. Gross anatomy of different bones in the barn owl (*Tyto alba*). *Int. J. Sci. Env. Tech.*, **5**(4): 1893-1896.
- Lavanya, C., Jayachitra, S., Iniyah, K. and Balasundaram, K. 2017. Comparative anatomy of oscoxae in guinea fowl and pigeon. *Int. J. Curr. Microbiol. App. Sci.*, **6**(9): 3655-3659.
- McLelland, J. 1990. A Colour Atlas of Avian Anatomy. Wolf Publishing Ltd., London, England.
- Mehta, S., Guha, K., Shalini, S. and Kumar, C. 2014. Gross anatomical studies on the os coxae and synsacrum of Japanese quail. *Ind. J. Vet. Anat.*, **26**(2): 126-127.
- Nickel, R., Schumer, A. and Seiferle, E. 1977. Anatomy of domestic birds. Berlin: Hamburg, Germany.
- Resk, H.M. 2015. Anatomical investigation on the appendicular skeleton of the cattle egret (*Bubulcus ibis*). *J. Exp. Clin. Anat.*, **14**(1): 5-12.
- Sarma, K., Suri, S. and Sasan, J.S. 2018. Gross anatomical studies on os coxae of Indian Eagle owl (*Bubo bengalensis*). *Explor. Anim. Med. Res.*, **8**(2): 208-210.
- Sathyamoorthy, O.R., Thirumurugan, R., Kumar, K.S. and Jayathangaraj, M.G. 2012. Gross morphological studies on the pelvic girdle of spot-billed pelicans (*Pelecanus philippensis*). *Ind. J. Vet. Anat.*, **24**: 109-110.
- Sreeranjini, A.R., Ashok, N., Indu, V.R., Lucy, K.M., Syam, K.V., Chungath, J.J. and Harshan, K.R. 2011. Morphological studies on the pelvic girdle of a peahen. *J. Ind. Vet. Assoc. Kerala*, **9**(3): 46-48.
- Tamilselvan, S., Iniyah, K., Jayachitra, S., Sivagnanam, S., Balasundaram, K. and Lavanya, C. 2015. Gross anatomy of os coxae of ostrich (*Struthio camellus*). *Int. J. Curr. Microbiol. App. Sci.*, **4**(4): 201-205.