GROSS ANATOMICAL STUDIES ON THE CRANIUM OF BARRED JUNGLE OWLET *(Glaucidium radiatum malabaricum)*

K. B. Sumena [1], N. S. Sunilkumar [2], K. M. Lucy [3], S. Maya [4], V. R. Indu [5] and A. R. Sreeranjini [6]
Department of Veterinary Anatomy & Histology
College of Veterinary and Animal Sciences,
Mannuthy -680 651

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Abstract

Present study was conducted with the aim to understand the morphological features of skull of barred jungle owlet.The head of the owletwascollected from the specimen brought for post-mortem, processed and morphological studies were conducted.Frontal bones were the largest and were convex and smooth.Temporal fossae were deep. Characteristic feature of the skull was that the bony orbits were located anteriorly, relatively large and were incomplete anteriorly.The supraorbital process was narrow, triangular and pointed.Thisprocess may prevent the rotation of sclerotic tube and fix its position which might be the reason why owlets cannot move their eye ball freely. The fronto-nasal hinge joint helped in the mobility of upper beak and anterior to this joint, the nasal bones presented adeep depression in the midline. Occipital bone showed well-developedexternal occipital protuberance and a vertically grooved occipital condylewhich helped the birds to swivel its head and neck. The ex-occipital and basi-occipital bones were broad. The foramen magnum was situated basally and ventrally. This assistedthe upright posture of the head in this species.

Key Words:*Barred jungle owlet, neurocranium, splanchnocranium*

Skull of birds arehighly specialised because of the fusion of the major components and due to the extent of pneumatisation. The pneumatisation of skull may occur by the epithelial extensions of air sacs into many areas making the skull very light. There are 200 species of owls worldwide which come under the order *Stringiformes*.The barred jungle owlet *(Glaucidium radiatum malabaricum)* is a small owl measuring 20cm in length and88-114 g in weight (Lewis, 2016). They have large, broad head and sharp binocular vision.Their feathers are adopted for silent flight. They have dimmer light sensitive rod cells in their retinathat help in night vision tohunt a variety of prey ranging from large insects to small birds.

Materials and Methods

The head of the owletwas collected from the specimen brought for post-mortem and processed as per the technique given by Young (1980). The morphological and morphometrical parameters were recorded.

1. Assistant Professor and corresponding author (e mail: sumena@kvasu.ac.in; Mob. 9447614778)
2, 5,6 Assistant Professors
3. Controller of Examinations, KVASU
4. Professor and Head

Results and Discussion

The skull of owletwas composed of neurocranium and splanchnocranium. The junction between neurocranium and splanchnocraniumwas demarcated by extra-large orbital cavities. Neurocranium consisted of occipital, sphenoid, parietal, frontal and temporal bones. The large orbital cavity displaced the ethmoid bone anteriorly and was situated between the neurocranium and splanchnocranium. As the individual bones underwent very early fusion, most of the sutures were not visible.

Frontal bones, largest among the cranial bones were smooth, convex and very thin. The paired frontal bones formed the roof of the neurocranium (Fig.1). It consisted of frontal part, orbital part and nasal part. Frontal part continued caudally by the parietal bone. Orbital part sprung forward and downward and formed the medial and upper part of orbital wall. Nasal part continued downwards and forwards and measured 0.8cm in width near the frontonasal joint. From the lateral border of the nasal part, a narrow, triangular and pointed supra orbital process projected which was about 1.2cm caudal to the frontonasal joint (Fig.1). This process may prevent the rotation of sclerotic tube and fix its position which might be the reason why owlets cannot move their eye ball freely.The orbital cavities were relatively large and this helps to hold the eye in the sclerotic tube (Bharathkumar*et al.,* 2016). As the eyes of owletare relatively immobile, for viewing clearly, they swivel their head around the pivot joint up to 270º(Lewis, 2016).The fronto-nasal hinge joint helped in the mobility of upper beak and anterior to this joint, the nasal bones presented a deep depression in the midline.

Paired parietal bones formed the base of the cranial cavity and were inserted as an arch between the frontal and supra occipital bones. Laterally it was continued as squamous temporal bone.

Occipital bone was composed of supra occipital, ex occipital and basi occipital parts. Supra occipital presented an external occipital protuberance just above the foramen magnum. Occipital condyle was placed in the middle of inferior margin of foramen magnum. The condyle was grooved vertically. Basilar tubercles were less prominent and were placed wide apart. Exoccipital formed the lateral boundary of foramen magnum and contributed in the formation of single occipital condyle as in the case of domestic fowl (Getty, 1975).

Sphenoid bone was situated anterior to the basi-occipital bone and composed of basisphenoidal and presphenoidal parts. Sphenoid formed the part of floor of the cranial cavity. Basisphenoid possessed a body and temporal wing which continued laterally as squamous temporal. Lateral border of basisphenoid formed part of external auditory meatus and posterior wall of ear capsule. Muscular processes were present on basisphenoid for the proper positioning of head. The body of presphenoid presented two oval articular facets laterally for the palatine bones. It also extended an orbital wing. The orbital wing of presphenoid on each side joined medially to form a thin bony plate. This formed interorbital bony septum along with ethmoid bone.

Fig. 1 Skull of barred jungle owlet *(Glaucidium radiatum malabaricum)*

1. Supraorbital process, 2. Frontal bone
3. Nasal bone, 4. Jugal, 5. Fronto nasal joint
6. Nasal opening, 7. Orbit

The temporal bone consisted of the ear capsule and squamous temporal. The ear capsule was placed inside the cranium between the lateral part of occipital, parietal and basisphenoid. Slight asymmetry of external acoustic meatus position noted was an adaptation of owls to localise its pray by sound (Smith and Smith, 1991). The squamous temporal bone possessed sphenotic process and orbital process as reported by Nickel *et al.* (1977), in domestic fowl. Post orbital process of squamous temporal was very thin and wide dorsally and pointed ventrally. Splanchnocranium of barred jungle owlet was demarcated from neurocranium by two large orbital cavities. Ethmoid was placed in the midway of neurocranium and splanchnocranium. The fronto nasal articulation was a movable joint that allows movement of upper beak.

Nasal, lacrimal, zygomatic, palatine, pterygoid, vomer, quadrate and mandible bones constituted the splanchnocranium. Lacrimal bone fused with the frontal bone lateral to fronto nasal articulation and presented the lacrimal bulla caudally on the dorsomedial aspect of orbital cavity.The upper beak was formed by nasal, maxilla and premaxilla bones (Fig.1). Nasal opening or nares were oval with a maximum diameter of 1cm. Nasal bone possessed a maxillary process and intermaxillary process (incisive process). The articulationwith frontal bone was a hinge joint, which allowed the movement of upper beak.

Premaxilla/incisive bone formed the major portion of upper beak. The upper bill length was found smaller than cranial length (Table.1). The shape, size and colour of upper beak vary in different species of birds. In the barred jungle owlet, beak was equilateral triangular in shape to assist them in precise preying. Incisive bone possessed three processes namely frontal process, palatine process and nasal process. All these together formed the walls of the nares. Maxilla was a small bone placed at the base of upper beak. This was fused with nasal, premaxilla, palatine and zygomatic bones.

Quadrate bone acted as the joining plate between skull and mandible and helped in the cranial kinesis of the lower jaw. Palatine bone was wider caudally and elongated to a rod shaped one rostrally. Caudally, it articulated with presphenoid and rostrally to the maxilla. Zygomatic bone was rod shaped osseous structures with a jugal process of maxilla, jugal and quadratojugal portions. Pterygoid bone was well developed and articulated with basilar tubercle. Vomer was rudimentary. Mandible formed the lower jaw. It was formed of dental bone, angular bone, articular bone and supra angular bone. It carried a large pneumatic foramen.

Table 1. Morphometry of skull of barred jungle owlet (*Glaucidium radiatum malabaricum*)

Parameters	Value in cm
Cranial length (CL)	3.1
Cranial width (CW)	3.2
Skull length (SL)	4.3
Upper beak length	1.2
Upper beak width	1.1
Upper beak height	0.9
Lower beak length	3.1
Lower beak width	2.2
Lower beak height	0.4
Inter orbital width	1.2
Diameter of foramen Magnum	1.0
Long diameter x small diameter of external nares	1.0 x 0.5
Long diameter x small diameter of mandibular foramen	1.0 x 0.3
Nasofrontal hinge width	0.8

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