Scanning Electron Microscopic Study of the Tongue in the Jungle Nightjar (*Caprimulgus indicus*)

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Summary: The dorsal lingual surfaces of adult Jungle Nightjar (*Caprimulgus indicus*) were examined by scanning electron microscopy. Macroscopically, the tongue of the Jungle Nightjar had a spearhead-like shape. Three parts were distinguished in the dorsal surface of the tongue: the apex, body, and root of the tongue. The tip of the tongue was round shape and a median groove is not observed. The dorsal surface of the lingual apex presented a smooth aspect and desquamation of the epithelial cells was observed on the surface of the lingual apex. Small and large conical papillae were observed on the lateral side of the lingual body. There were the giant conical papillae on the lateral side of the lingual body. The conical papillae of the lingual body were inclined toward the posterior of the tongue on the posterior end. Some openings of the lingual glands existed in the lingual root.

Materials and Methods

The tongue of an adult Jungle Nightjar (*Caprimulgus indicus*) of the family Caprimulgidae was used in this study. The tongue was fixed in 10% formalin. The specimen was washed in distilled water and post-fixed in 1% osmium tetroxide for 1 h, dehydrated in a series of acetone dilutions, and then critical-point dried. The specimen was sputtered with Pt-Pd alloy before being examined under SEM (Hitachi S-3500N, Tokyo, Japan) at an accelerating voltage of 15 kV.

Results

Macroscopically, the tongue of the Jungle Nightjar has a spearhead-like shape (Fig. 1). Three parts are distinguished in the dorsal surface of the tongue: the apex, body, and root of the tongue (Fig. 1).

The tip of the tongue is round shape and a median groove is not observed (Fig. 2a). The dorsal surface of the lingual apex presents a smooth aspect and desquamation of the epithelial cells is observed (Fig. 2a). Small and large conical papillae are observed on the lateral side of the lingual body (Fig. 2b). There are the giant conical...
papillae on the lateral side of the lingual body (Fig. 2c). The conical papillae of the lingual body are inclined toward the posterior of the tongue on the posterior end (Fig. 2c). Some openings of the lingual glands exist in the lingual root (Fig. 2d).

Discussion

All birds adapted to their environment with respect to food sources. Corresponding to their lifestyles they have different feeding habits, with corresponding differences in the structures of their bills and tongues.

The tongues of the white-tailed eagle, black kite, and Northern Goshawk which feed on fish or small animals were elongated with a sharp-ended apex (Jackowiak and Godynicki, 2005; Emura 2008a; Emura et al., 2008c). The characteristic morphological features observed on the tongue included a distinct median groove dividing the mucosa into two symmetrical, convex lateral parts and a single crest of large conical papillae in the posterior part of the lingual body, extending over the surface of the flat root of the tongue (Jackowiak and Godynicki, 2005; Emura, 2008a; Emura et al., 2008c).

The tongues of the Middendorf’s bean goose, swans and spot-billed duck which feed on seeds of water plants or water plants were elongated with a sharp-ended apex (Iwasaki et al., 1997; Emura, 2008c; Emura, 2009a). Those tongues were elongated in the anteroposterior direction, and the apical regions of the tongues were round (Iwasaki et al., 1997; Emura, 2008c; Emura, 2009a). The lingual body had a distinct median groove. On both the lateral sides of the lingual body lingual hairs were compactly distributed and small numbers of cylindrical papillae were arranged between these hairs (Iwasaki et al., 1997; Emura, 2008c; Emura, 2009a).

The tongues of the chicken and common pheasant which feeds on grains appeared as an elongated triangle with a pointed tip (Iwasaki and Kobayashi, 1986; Emura, 2008b). The dorsal surfaces of the tongues were flat, but differences in structure were distinguishable between the anterior tongue and posterior tongue, and a median groove was not observed in the tongue (Iwasaki and Kobayashi, 1986; Emura, 2008b).

The tongue of the brown-eared bulbul which feeds on nectars had a spear-like shape (Emura, 2009b). The characteristic morphological features observed on the tongue included many conical processes in the tip of the tongue (Emura, 2009b).

The tongue of the Japanese Pygmy Woodpecker which feeds on insects had a toothpick-like shape (Emura et al., 2009b). On both the lateral sides of the anterior lingual apex, some conical processes were observed (Emura et al., 2009b).

The tongues of the Little Egret, black-crowned night heron, and green-backed heron which feeds on fish and frogs were needle-like or had a spearhead-like shape (Emura, 2009c). The surfaces of the lingual apex and body were smooth in adult Little Egret, but exfoliation of several epithelial cells was observed in the lingual surfaces of infant back-crowned night heron and young green-blacked heron. A pair of mantle-shaped giant conical papillae was inclined toward the posterior of the tongue on the lateral side of the lingual body (Emura, 2009c).

In this study, the tongue of the Jungle Nightjar which feeds on insects showed a spearhead-like shape. Small and large conical papillae were observed on the lateral side of the lingual body. There were the giant conical papillae on the lateral side of the lingual body. The morphological characteristics of the tongue in the Jungle Nightjar were small and large conical papillae on the lateral side of the lingual body. In the both lateral sides of the lingual apex of the Japanese Pygmy Woodpecker some conical processes were observed. In the lingual body of the owls many conical processes were observed (Emura and Chen, 2008; Emura et al., 2009a). However, until date the conical processes in the lingual body of the Jungle Nightjar have not been reported. The conical processes were present in the lingual body possibly due to the different style of food intake. Thus, the differences in the structures of the tongues in animals might be due to the differences in feeding habits.
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References


Fig. 2. Scanning electron micrographs of the surfaces of the lingual apex. (a) The dorsal surface of the lingual apex presents a smooth aspect and desquamation of the epithelial cells is observed. (b) Small and large conical papillae (arrows) are observed on the lateral side of the lingual body. (c) There are the giant conical papillae (arrows) on the lateral side of the lingual body (B). (d) Some openings (arrows) of the lingual glands exist in the lingual root. R = lingual root.


