

A multivariate microscopical investigation of *Collocalia fuciphaga* oro-pharyngeal apparatus

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Introduction

Nature has blessed Malaysia with a rich legacy of biodiverse natural products, where some are classified as a national heritage treasure. These natural sources varied from aquatic and botanical extracts to the edible avian nest. The insectivorous avian *Collocalia* (Glenister, 1971), known as the 'Edible – Nest Swiftlets' is believed to have capabilities to construct edible nest with glutinous strands of starched like salivary secretions and without any incorporation of other materials such as vegetation or feathers. Variation in nest composition has been used to discriminate and authenticate swiftlets taxonomy and to infer evolutionary relationships. However, nest structure may be environmentally plastic, raising questions about the utility of nest characters in swiftlets taxonomy. Despite these, works are still being conducted to reveal the true potential of the edible nest, however there are very few attempts taken to study the anatomical morphology of the *Collocalia fuciphaga* (one of the three swiftlets species with nest building prowess) and authenticate the powerhouse of the salivary glue. Surprisingly, little is known of its oral pharyngeal apparatus features under the highresolution electron microscopy.

Results and discussion

The histological and electron microscopical inspection of its thin glossy translucent tongue revealed important distinctive characteristic that may relate to the *Collocalia* nest-building prowess. There seems to be inconclusive evidence for the presence of parotid and submandibular gland per se in these species. The dominant acini were located at its buccal mucosa and the sub-epithelial lingual glands probably a specific characterization feature of these species. No taste buds and papilla was observed on its anterior dorsal surface. EFTEM revealed a significant distribution of secretory granules (serous, mucous) and the mineralized chondroid presence. There is also presence of tonsils.

The avian tongue can be regard as the powerhouse organ that contributes to enormous salivary secretion pertaining to nest building of the *Collocalia* species. The evolutionary changes in the *Collocalia* tongue are thought to be the foundation for the abundant muciginous salivary in the nest and high thiocynate present. Histo-morphological features of the *Collocalia* tongues may be a reflection of differences among the insectivorous avian. This may suggest an important adaptation role for the tongue structure to nest building

1. A. G. Glenister (1971). Family 37. Apodidae (Swifts, Swiftlets). In: The Birds of the Malay Peninsula: Singapore and Penang. Oxford University Press, Kuala Lumpur. p58.
2. S. Sankaran, J. Biological Conservation **97** (2001) p283.



Figure 1. Digital photograph of Collocalia's and its dissected lower jaw with dorsal surface of the tongue. The tongue has a characteristic shape of a sharp spear head but glossy translucent: With its lateral borders slightly elevated to form a V – shaped furrow. No clear demarcation of anterior or posterior borders as observed in mammals.

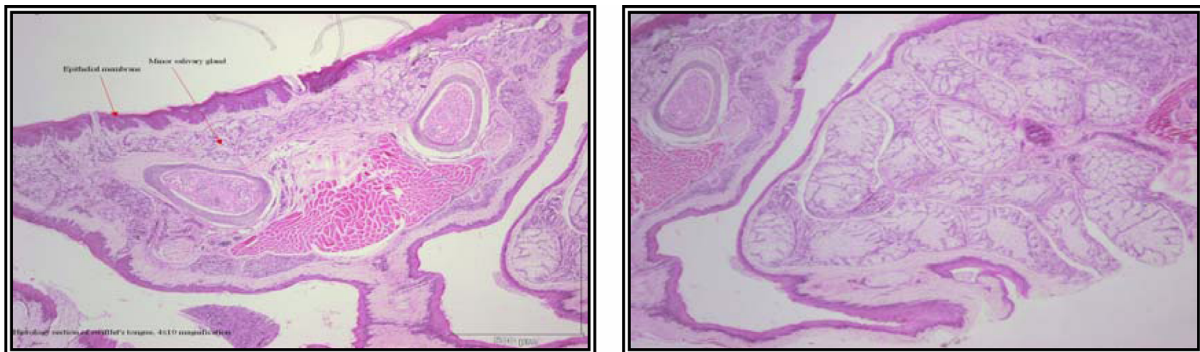


Figure 2. The histology of the Collocalia's tongue and buccal mucosa, stained using haematoxylin and eosin, revealed significant present and distribution of :(i) muciginous secreting salivary asinus (ii) chondroid-like oval shaped structures situated on both lateral borders of the tongue, (iii) intrinsic muscle in solitary plane; transverse orientation intrinsic muscle is observed present deep and infiltrating in the tongue and (iv) no significant presence of papilla or taste bud. The whole tongue is penducalated and is attached to the floor of the oral cavity via a connective tissue matrix frenulum with a lining epithelium. Well defined large lobulated acini on its buccal region were also observed.

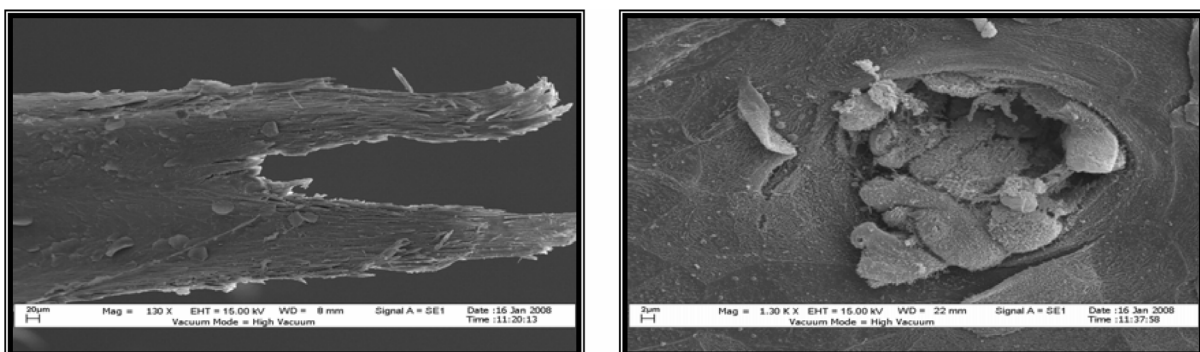


Figure 3. Left; VPSEM photomicrograph of the anterior dorsal tip of the tongue. The tip is separated as two prominent horns. Peeling off of its epithelial cells is also observed. Right; orifice of a putative taste bud isolated at the posterior dorsal surface. No such structures were observed on its anterior dorsal surface.