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## Lingual Gland Morphology of the Female Swiftlet (*Collocalia linchi*) During Productive and Nesting Periods

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**Keywords:** *Collocalia linchi*, lingual gland, nesting and productive periods

### INTRODUCTION

Cave swiftlet or linchi swiftlet, *Collocalia linchi*, belongs to the swift family of Apodidae and is one of endemic birds in Indonesia. The bird has economic importance as it is among the swift that produce edible nest for delicacy Chinese bird's nest dishes as well as food supplement for human health. The nest is among potential export commodities of Indonesia.

The swift species is usually classified by body size, feather colors and the material used to build the nest. There are two species of edible nest swiftlet that commonly found in Indonesia, *Collocalia fuciphaga* and *Collocalia linchi*. Compared to those of *C. fuciphaga*, the nest produced by *C. linchi* is actually not purely made from the gummy saliva, but it is mixed with other materials like twigs, feathers and straw.

Saliva is the main secretory product of salivary gland. It functions to moisten and lubricate the ingested food, also in the building of nest. In the swiftlet, the salivary glands developed very well in the adult birds. Both sexes take part in the nesting process. The present study aimed to know the morphology of the lingual glands of the female cave swiftlet, *C. linchi* during productive and nesting period.

### MATERIALS AND METHODS

Twentyfour adult cave swiftlet (*C. linchi*) were used in this study. The birds were euthanised after an anaesthesia using chloroform. The lingual glands were exposed and observed macroscopically. Tissue samples of certain portions of the glands were taken and fixed in Bouin fluid and processed routinely for embedding in paraffin. Paraffin sections were cut serially at 5 µm of thickness and stained with haematoxylin eosin, alcian blue (AB, pH2.5), and periodic acid Schiff (PAS).

### RESULTS

The lingual gland consists of anterior and posterior lingual glands. Macroscopically, the lingual gland morphometry in productive period was smaller than the lingual gland in nesting period. Microscopically, the anterior lingual gland was consist of simple mucous tubular gland and the posterior lingual gland was complex mucous tubular gland. The lingual gland lumen in productive period was narrower than the lingual gland lumen in nesting period. By using histochemistry method AB pH 2.5 and PAS, the lingual gland was detected containing of acid carbohydrate and netral carbohydrate in the anterior and posterior lingual glands, cytoplasm, andalso secret of mucous cell. The lingual gland containing carbohydrates intensity in productive period was weaker than in the nesting periods (Table 1 and 2).

Tabel 1 Staining pattern of AB pH 2.5 - PAS stained in the lingual gland of the *Collocalia linchi* during productive period

Part of lingual gland		Month											
		January		February		March		April		May		June	
		AB	PAS	AB	PAS	AB	PAS	AB	PAS	AB	PAS	AB	PAS
Ant	Cytoplasma	+	+	+	+	++	+	+++	+	+++	+	+++	++
	Secrete	+	+	+	+	++	+	+++	+	+++	+	+++	++
	Lumen	+	+	+	+	++	+	+++	+	+++	+	+++	++
Post	Cytoplasma	+	+	+	+	++	+	+++	+	+++	+	+++	++
	Secrete	+	+	+	+	++	+	+++	+	+++	+	+++	++
	Lumen	+	+	+	+	++	+	+++	+	+++	+	+++	++

- : negative; +:weak, ++: moderate, +++: strong

Tabel 2 Staining pattern of AB pH 2.5 - PAS stained in the lingual gland of the *Collocalia linchi* during nesting period

Part of lingual gland		Month											
		July		August		September		October		November		December	
		AB	PAS	AB	PAS	AB	PAS	AB	PAS	AB	PAS	AB	PAS
Ant	Cytoplasma	+	+	+	+	++	+	+++	+	+++	+	+++	++
	Secrete	+	+	+	+	++	+	+++	+	+++	+	+++	++
	Lumen	+	+	+	+	++	+	+++	+	+++	+	+++	++
Post	Cytoplasma	+	+	+	+	++	+	+++	+	+++	+	+++	++
	Secrete	+	+	+	+	++	+	+++	+	+++	+	+++	++
	Lumen	+	+	+	+	++	+	+++	+	+++	+	+++	++

-: negative; +:weak, ++: moderate, +++: strong

## DISCUSSION

The breeding season of the female linchi swiftlets is in January to June and the nesting period is in July to December (Novelina *et al.* 2010). At the time of breeding season, morphometry of the lingual glands are small because the lingual gland activity producing less saliva, whereas in the nesting period morphometry of the lingual glands are larger because the lingual gland activity to meet the needs of a lot of saliva production.

Classification of the anterior and posterior lingual glands in the form of a tubular mucous glands of simple and complex related to the amount of mucus cells as individual elements on which to base the formation of tubular branches (Almansour, 2007). The number of mucous cells in the anterior lingual gland is less than the number of mucous cells in the posterior lingual glands. In addition, tubular branches in the anterior lingual gland is simpler than in the posterior lingual gland. Therefore, the anterior lingual gland is classified into simple tubular mucous gland and posterior lingual gland is classified into complex tubular mucous gland.

In HE staining, acidic organelles stained clearly. At the time of breeding season, narrow lumen and rounded mucus cells occurs on the lingual gland is because of the need to produce less saliva. In the nesting period, the expansion of the lumen and flat form of the mucus cells occurs on the lingual gland because of the need to produce a lot of saliva.

Liman *et al* (2001) states that the carbohydrate content of the lingual glands varies at each age level. In immature animals, there are no acid and neutral carbohydrates on the lingual glands. Acid and neutral carbohydrates play a role in the metabolic activity of cell function. In the breeding season, the metabolic activity of the mucous cells are slightly due to the need to produce less saliva, so that the intensity of the carbohydrate content of acid and neutral carbohydrates are weak. In the nesting period, the metabolic activity of the mucous cells are more active because of the need to produce a lot of saliva, so that the intensity of the carbohydrate content of acid and neutral carbohydrates are strong.

## CONCLUSION

Female linchi swiftlets have anterior lingual glands which are simple tubular mucous glands

and posterior lingual glands which are complex tubular mucous glands. Cytoplasm and secreta of the mucous cell contain acid and neutral carbohydrates. The morphology, intensity of the carbohydrate content and distribution on the lingual glands have differences, which are waned with weak intensity during the breeding season and growing with strong intensity in the nesting period due to differences in the activity of the lingual glands in producing saliva.

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