Population Genetic study of Edible Nest Swiftlet (*Aerodramus fuciphagus)* from Sabah

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Figure 1: Edible-Bird Nest Swiftlet (*Aerodramus fuciphagus*).

ABSTRACT

Aerodramus fuciphagus is commonly known as the Edible-Bird Nest (EBN) swiftlet which belongs to family Apodidae. In Malaysia, EBN swiftlet is one of economically important species for bird nest industry, and the industry is rapidly expanding. However, this bird does not migrate. It usually remains in one cave or other nesting sites, and has fragmented population distribution. Hence, this bird may have isolated genetic pattern. In addition, the current visual identification (using morphological features) method for identifying sex in EBN swiftlet is hard to practice, due to EBN swiftlet is a non-sexual dimorphism species. Hence, understanding the sex-linked genetics, ecology, physiology and behavior of this bird is difficult. Therefore, in this study, microsatellites will be used to assess the genetic pattern of EBN swiftlet from Sabah. Due to only limited microsatellites are available for EBN swiftlet (i.e. only eight microsatellites), new primers will be developed using RAMS technique and cloning. The newly developed microsatellites will be screened for their polymorphism. Later, the genetic pattern of EBN swiftlet from Sabah will be assessed from man-made and wild populations. In conclusion, information from this study can be used for improving management, breeding, conservation, and product quality and quantity of the bird in Sabah. Hence, ensuring the sustainability of EBN swiftlet industry in Malaysia.

Keywords: *Aerodramus fuciphagus*; edible-nest swiftlet; genetic pattern; microsatellites; population genetics

OBJECTIVES

i. To design microsatellite panel for population genetic evaluation of the EBN swiftlet.
ii. To evaluate genetic variation among man-made and wild populations of EBN swiftlets from Sabah.

INTRODUCTION

- *A. fuciphagus*, EBN swiftlet (Figure 1) lives in large colony across Southeast Asia including Malaysia (Chantler and Driessens, 2000). It is an economically important species for bird nest industry in Malaysia, and the industry is rapidly expanding (Lim and Cranbrook, 2002).
- This avian built it nest in limestone caves at the coastal areas (Viruhpintu et al., 2002; Choi et al., 2009).
- This bird does not migrate and it is a colonial nester (Lim and Cranbrook, 2002). It usually remains in one cave or nesting site. Hence, it has fragment population distribution (Lim and Cranbrook, 2002), as well as high possibility of genetic divergence between populations.
- To study genetic divergence between populations, microsatellite is a marker of choice because it is highly polymorphic and it can detect high mutation rate.
- However, there are limited microsatellite primers which is specifically designed for this species (Aowphol et al., 2008). There are only eight known microsatellite loci for EBN swiftlet which were used for studying genetic homogeneity among colonies in Thailand (Aowphol et al., 2008).
- Hence, new microsatellite primers will be developed by using RAMS technique and cloning to increase the number of available microsatellite markers for this species.
- By using these techniques, inexpensive cost and high amount of polymorphic microsatellite primers can be developed.

MATERIALS AND METHODS

Collection of tissue samples
- 30 feathers/ carcasses of EBN swiflets (Figure 2 & 3) from each wild and man-made colonies (a total of 15 colonies: 13 houses & 2 caves; Figure 4) were collected from Sabah (Tawau & Sandakan).

DNA extraction & verification
- DNA was extracted using Qiagen Dneasy Blood and Tissue kit.
- The quality and suitable volume of DNA for PCR were verified using 0.8% agarose gel electrophoresis.

Development of Microsatellite primers
- Four Random Amplified Microsatellites (RAMS) primers were screened to design microsatellite primers and sent for sequencing.
- Cloning will be conducted and the positive clones will be send for sequencing.

Population Genetic Study
- Newly designed microsatellite primers will be screened for polymorphism and highly polymorphic primers will be selected for population genetic study.
- Genotyping results will be validated using Micro-checker ver 2.2.3 (Oosterhout et al., 2004) and analyzed using Popgene software (Yeh, Rong-Cai and Boyle, 1998) to calculate genetic diversity.

Figure 2: Carcass sample of a swiftlet.

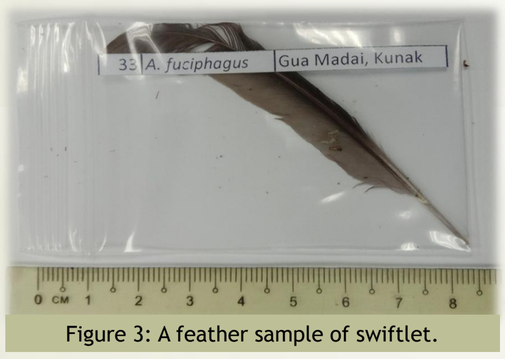

Figure 3: A feather sample of swiftlet.

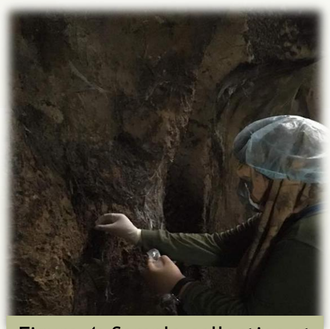

Figure 4: Sample collection at Gua Gomantong, Sabah.

RESULTS & DISCUSSION

- Two RAMS were successfully amplified by the DNA of EBN swiflets with repeat motifs. This shows that the RAMS method can be used to develop new polymorphic microsatellite primers for *A. fuciphagus*.
- Heterozygosity and genetic diversity levels can be compared between colonies (man-made colonies *c.f.* wild colonies) of EBN swiftlet from Sabah using newly designed polymorphic microsatellite primers.

CONCLUSION

New microsatellite panel can be developed for population genetic study of EBN swiftlet, and genetic diversity of EBN swiftlet can be assessed for further understanding about the genetic diversity of this species in Sabah.

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