



Short Communication

Determining the Colugo Sexes by Gliding Motion Photographs

Dzulhelmi M. N.^{1*} and Suriyanti S. N. P.²

¹*Institute of Biological Science, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia*

²*School of Environmental and Natural Resource Sciences, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia*

ABSTRACT

The Colugo is a nocturnal arboreal mammal that inhabits the tropical rainforest in South East Asia. Photographs of the Colugo in gliding motion were taken using Digital SLR camera with the aid of speed light and flashlight to determine the Colugo sexes. These photographs technique could be used to determine the Colugo sexes without the need to capture the animal. It may also be a useful technique to determine the sexes of other gliding mammals and help in assisting the conservation effort of the mammal species.

Keywords: Colugo, Dermoptera, *Galeopterus variegatus*, gliding motion, photograph method, sexes

INTRODUCTION

Colugo (*Galeopterus variegatus*) is a nocturnal arboreal mammal from the Order Dermoptera (Stafford, 2005). *G. variegatus* is widely distributed in the tropical rainforest in South East Asia within various habitats, while *Cynocephalus volans* is strictly found in the southern parts of the Philippines (Stafford, 2005). Previous studies revealed

that the Colugo does not retreat when detected by human unless if it is directly disturbed (Dzulhelmi, 2011). Capturing the Colugo, using the capturing techniques described by Wischusen and Richmond (1989) have been used for field studies (Wischusen, 1990; Byrnes *et al.*, 2011) and can directly determine the Colugo sexes. However, capturing the animal alive and unharmed is rather challenging (Wischusen, 1990; Byrnes *et al.*, 2011).

Meanwhile, field research had also been conducted without capturing the Colugo. This includes the study on the population estimation (Lim, 2004; Agoramoorthy *et*

ARTICLE INFO

Article history:

Received: 18 August 2011

Accepted: 17 May 2012

E-mail addresses:

dzul_3my@yahoo.com (Dzulhelmi M. N.),

sue_0586@yahoo.com.my (Suriyanti S. N. P.)

* Corresponding author

al., 2006; Lim & Ng, 2010), diet preferences (Lim, 2004; Agoramoorthy *et al.*, 2006; Dzulhelmi & Abdullah, 2009b), activity patterns (Dzulhelmi & Abdullah, 2009a; Byrnes *et al.*, 2011) and roosting sites (Dzulhelmi, 2011). This research constraints have posed some degree of difficulties, especially in sex determination, which may affect the outcomes and the analyses of the study. For example, although Agoramoorthy *et al.* (2006) determined the sexes of the Colugo through his field survey, they did not mention any specific method (e.g. fur colouration) used to determine the male and female Colugo. Previously, Chasen and Kloss (1929) determined the Colugo sexes by fur colouration. Dzulhelmi and Abdullah (2009a) also distinguished the Colugo individuals based on fur colouration and carried infant (if any).

However, Lim (2004) stated that fur colouration might not be reliable to determine the Colugo sexes. Besides determining the Colugo sexes by fur colouration, there is no other available technique to determine the Colugo sexes without capturing it. Due to this constraint, Lim (2004) issued a need for a reliable tool to investigate the sexes of the Colugo without the need for capturing these animals. The present paper presents the use of Digital SLR camera to determine the Colugo sexes by photographing the Colugos ventral view while in gliding motion.

MATERIALS AND METHOD

The photographs of the Colugos in its free ranging habitat were captured at Bako National Park (Sarawak) in June 2011 and

Pulau Langkawi (Kedah) in October 2011. All the Colugo photographs were taken during the Colugos active period (Dzulhelmi & Abdullah, 2009). The photographs were taken using Nikon D90 aided with a zoom lens (AF Nikkor 70-300mm), a speed light (Nissin Di866) and a flashlight. The camera mode was set to exposure control, with shutter-priority auto, shooting mode: continuous high shooting mode, image size (pixel): 4288x2848, ISO: 200 and shuttle speed: 1/4000 seconds. The speed light was set to multi-flash mode. The Colugo was manually focused on using the zoom lens with the aid of the low intense flashlight.

Once the Colugo jumped off the tree and expanding its patagium to glide, multiple photographs of the Colugos ventral view were captured in a gliding motion. The sexes of the Colugo were examined by identifying the presence and absence of the testicles and any carried infant using a Picasa photo viewer (Fig.1 to Fig.3).

RESULTS AND DISCUSSION

This technique successfully captured the Colugo in a gliding motion and both were from the Bako National Park (<10 photographs) and Pulau Langkawi, respectively (<20 photographs). The photo evidence identified that the Colugos comprised of a male, female, and a female carrying an infant (Figures 1-3). The Colugo glides at an average of 4-29 times per night which is less than 1% of its total activity (Byrnes *et al.*, 2011). The habitat structure and the Colugo population were the crucial factors for obtaining the photographs of the

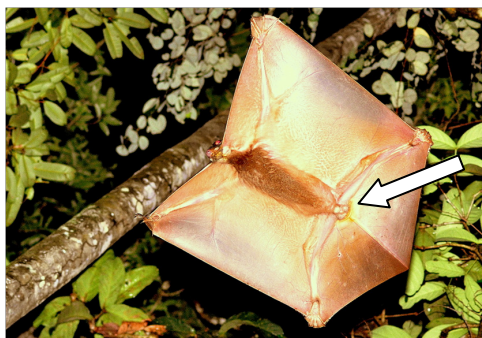


Fig.1: The presence of testicles can be visibly observed and identified on a male Colugo

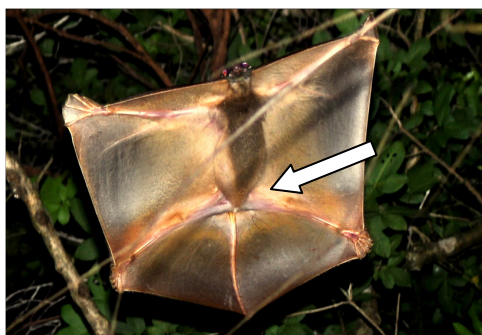


Fig.2: The absence of the testicles can be observed and this is identified as a female Colugo



Fig.3: An infant can be evidently noticed on the female Colugo and this differentiated between the two female Colugo individuals (Fig.2)

Fig.1-3: The male (Fig.1), female (Fig.2) and female with an infant (Fig.3) Colugos in a gliding motion.

Colugo in gliding motion. Others such as the photographic techniques, assistance, time, locations and weather should also be taken into consideration.

To date, the population and the ratio of the male to female Colugos are still unknown. As the ratio of the male and female Colugo in a particular area is one male to four or five females (1:4) (personal observation), prediction on the Colugo population could be made. Thus, for field survey (e.g. line transects survey), identifying the male Colugo would be a priority.

A combination of the field observations with the aid of Digital SLR camera would facilitate in the future research for the Dermopteran. The images of the Colugo ventral view during gliding could be a very useful and reliable tool to determine the Colugo sexes, while the presence of the carried infant would also assist in individual identification without the need to capture and mark the Colugo. The photographs may also enhance the understanding on the existence of the territorial behaviour portrayed between the male Colugos and also to verify the postulation that the male

Colugo takes over the maternal nature of carrying infant. This photograph technique could enhance the study of other gliding mammals such as the Colugo and the Flying Squirrel in other part of the tropical rainforest and therefore could assist the wildlife management in the conservation effort on these species.

ACKNOWLEDGEMENTS

We would like to acknowledge the Faculty of Resource Science and Technology, Universiti Malaysia Sarawak (UNIMAS), Sarawak Forestry Department and Sarawak Forestry Corporation for the permits, logistics support and useful information throughout the period of this study. We are also grateful to Encik Zailan Hassan for showing the Colugos in Pulau Langkawi, and Encik Firdaus Ibrahim for providing useful information in the photography. Dzulhelmi Nasir would like to thank his parents for funding the Nikon D90 Digital SLR camera with the AF Nikkor 70-300 lens and Nissin Di866 speed light.

REFERENCES

- Agoramoorthy, G., Sha, C. M., & Hsu, M. J. (2006). Population, diet and conservation of malayan flying lemurs in altered and fragmented habitats in Singapore. *Biodiversity and Conservation*, 15, 2177-2185.
- Byrnes, G., Lim, N. T. L., Yeong, C., & Spence, A. J. (2011). Sex differences in the locomotor ecology of a gliding mammal, the Malayan Colugo (*Galeopterus variegatus*). *Journal of Mammalogy*, 92(2), 444-451.
- Chasen, F. N., & Kloss, C. B. (1929). Notes on flying lemurs (*Galeopterus*). *Bulletin of the Raffles Museum*, 2, 12-22.
- Dzulhelmi, M. N., & Abdullah, M. T. (2009a). An ethogram construction for the Malayan flying lemur (*Galeopterus variegatus*) in Bako National Park, Sarawak, Malaysia. *Journal of Tropical Biology and Conservation*, 5(1), 31-42.
- Dzulhelmi, M. N., & Abdullah, M. T. (2009b). The foraging ecology of the Sunda Colugo (*Galeopterus variegatus*) in Bako National Park, Sarawak, Malaysia. *Malayan Nature Journal*, 61(4), 285-294.
- Dzulhelmi M. N. (2011). *Behavioural ecology of the Sunda Colugo Galeopterus variegatus (Mammalia: Dermoptera) in Bako National Park, Sarawak, Malaysia* (MSc. Dissertations). Universiti Malaysia Sarawak, Kota Samarahan.
- Lim, N. T. L. (2004). *Autecology and a preliminary population census of the malayan flying lemur Cynocephalus variegatus in Singapore* (BSc. Final Year Project). National University of Singapore. Singapore.
- Lim, N. T. L., & Ng, P. K. L. (2010). Population assessment methods for the Sunda Colugo *Galeopterus variegatus* (Mammalia: Dermoptera) in tropical forests and their viability in Singapore. *The Raffles Bulletin of Zoology*, 58(1), 157-164.
- Stafford, B. J. (2005). Order Dermoptera. In Wilson, D. E., & Reeder, D. M. (Eds), *Mammals species of the world, taxonomic and geographic reference, 3rd Edition* (p. 110). Washington D.C.: Smithsonian Institution Press.
- Wischusen, E. W. (1990). *The foraging ecology and natural history of the Philippine flying lemur (Cynocephalus volans)* (PhD Thesis dissertation). Ithaca: Cornell University.
- Wischusen, E. W., & Richmond, M. E. (1989). Techniques for capturing and marking the Philippines flying lemurs (*Cynocephalus volans*). *Malayan Nature Journal*, 43, 100-105.