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KOMPOSISI HABITAT PENCARIAN PAKAN KELELAWAR (*PTEROPODIDAE*) DI TIGA RUANG TERBUKA HIJAU KOTA TANGERANG SELATAN

THE COMPOSITION OF FORAGING HABITAT OF BATS (PTEROPODIDAE) IN THREE URBAN OPEN SPACES IN SOUTH TANGERANG CITY

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Abstrak

Kelelawar *Pteropodidae* memiliki peranan penting dalam penyebaran biji dan penyerbukan tanaman di kawasan perkotaan. Penelitian ini bertujuan untuk mengidentifikasi faktor mikroklimat dan fenologi tumbuhan pakan yang berpengaruh terhadap pemilihan habitat pencarian pakan kelelawar *Pteropodidae* di tiga RTH Kota Tangerang Selatan. Penelitian ini dilaksanakan pada bulan Januari hingga Maret 2016. Metode yang digunakan adalah metode survei. Penangkapan kelelawar *Pteropodidae* dilakukan dengan menggunakan jaring kabut yang diletakkan secara *purposive* yaitu dengan memperhatikan jalur lintas kelelawar *Pteropodidae* menuju habitat pencarian pakan di setiap lokasi penelitian dan dilakukan selama 3 malam dengan 2 jaring kabut. Dilakukan pengukuran faktor mikroklimat dan pencatatan fenologi tumbuhan. Analisis yang digunakan adalah *Canonical Correspondence Analysis* (CCA) menggunakan perangkat lunak Canoco versi 4.5. Hasilnya ditemukan 4 jenis kelelawar *Pteropodidae* yaitu *Cynopterus brachyotis, Cynopterus horsfieldii, Cynopterus titthaecheilus* dan *Macroglossus sobrinus*. Total teridentifikasi 28 jenis dari 18 famili tumbuhan yang berpotensi sebagai pakan kelelawar *Pteropodidae* di Kota Tangerang Selatan. Berdasarkan hasil analisis menggunakan *Canonical Correspondence Analysis* (CCA), faktor mikroklimat yang berpengaruh terhadap preferensi pencarian pakan adalah tingkat kebisingan dan terdapat 3 kelompok yang memiliki kecenderungan berbeda dalam memilih habitat pencarian pakan.

Kata kunci : Habitat pencarian pakan, Kota Tangerang Selatan, *Pteropodidae*

Abstract

Pteropodidae bats have an important role in seed dispersal and pollination of plants in urban areas. This study aimed to identify microclimate factors and phenology of feed plants that influenced the selection of foraging habitat Pteropodidae bats in three Urban Open Spaces, South Tangerang City. This research was conducted from January to March 2016. The method was a survey. Pteropodidae bats were caught by mist nets and were placed purposively based on the flyway of Pteropodidae bats in foraging habitat of each sampling location has been done for 3 nights with 2 mist nets in each sampling location. The measurement of microclimate factors and recording of plant phenology. Data were analyzed using Canonical Correspondence Analysis (CCA) by the Canoco software version 4.5. The results found that four species of Pteropodidae bats Cynopterus brachyotis, Cynopterus horsfieldii, Cynopterus titthaecheilus and Macroglossus sobrinus. A total of 28 species of 18 families of plants were identified as potential feed plants Pteropodidae bats in South Tangerang City. Based on the analysis using Canonical Correspondence Analysis (CCA), microclimate factors influencing foraging preferences was the noise level. There are three groups with different tendencies when selecting foraging habitats.

***Keywords**: Foraging habitat, Pteropodidae, South Tangerang City*

INTRODUCTION

Bats have a very important role in the ecosystem as pollinators, seed dispersers, guano producers, and insect pest controllers (Suyanto, 2001). Choiruzat's research (2013) reported that 18 plant species from 9 families are food sources for Pteropodidae bats in South Tangerang City. Ridho's (2009) research in Cengkareng reported that 13 families of plants commonly consumed or potentially pollinated by bats. In addition to the types of plants commonly consumed or potentially pollinated by Pteropodidae bats, it is suspected that there are other types of Pteropodidae bat food, however, the area of the food source is not yet known.

Bats live in several habitat types: caves, primary forests, secondary forests, urban forests, and plantations. Habitat reduction and fragmentation are the two main threats to the existence of bats in urban areas. Research conducted by Kinjo et al. (2006) reported finding 12 species of bats in agricultural land and urban areas in West Java, and there were 8 species of Pteropodidae bats on the UI campus, Depok (Sheherazade, 2014). Based on the results of these previous studies, bats in urban areas are thought to be able to adapt to the urban environment.

Bats are nocturnal flying mammals that require specific habitat characteristics to detect their food sources. The selection of foraging habitat for Pteropodidae bats is not only based on the type of food that suits the physiological needs of bats. The characteristics of bats in searching for food at night, the high level of food needs, the location of flowers on tree branches that are easily accessible, bats' color-blind eyes, and sharp sense of smell affect the food chosen by bats (Graham et al., 2003; Soegiharto, 2009). Research by Rizkita (2013) reported that noise level (db), oxygen level (%), and air humidity (%) are factors that influence bats in choosing nests in South Tangerang City.

South Tangerang City is a buffer zone of the capital city that has several green open spaces. This study was conducted in three green open space locations that are assumed to represent the foraging habitat of Pteropodidae bats in South Tangerang City with different vegetation types and criteria, based on Permendagri No. 1 of 2007 concerning Green Open Space Arrangement in Urban Areas and Permenpu No. 5 of 2008 concerning Provision and Utilization of Green Open Space in Urban Areas. This study aims to identify microclimatic factors and forage plant phenology that influence the selection of foraging habitats for Pteropodidae bats in three green spaces in South Tangerang City.

MATERIALS AND METHODS

The research was conducted from January to March 2016. The research locations were in three green spaces in South Tangerang City, namely Kel. Bambu Apus with a type of green space for residential neighborhood parks and yards, Taman Kota 1 BSD Serpong with a type of green space for city parks, and Situ Gintung with a type of green space for situ boundaries.

Bat collection was conducted using the capture and release method using a mist net. The mist net was focused on capturing fruit-eating bats (Pteropodidae). Mist nets were installed along the path of the data collection location, namely the area suspected to be a bat track. Mist nets were installed by considering several factors, such as the path or close to fruiting and flowering trees with attention to canopy cover or above the river. Fog nets were set in the afternoon before sunset around 4:00 pm until the morning at 5:00 am. Traps were set for 3 nights using 2 mist nets per night at each sampling location. Captured bats were then weighed with digital scales and measured morphometrically with a push-piece. Microclimatic factor measurements consisted of air temperature with a thermometer, air humidity with a weather meter, wind speed with an anemometer, light intensity with a lux meter, and noise level with a sound level meter. Measurement of microclimatic factors was carried out 3 times every day in the morning, afternoon, and evening, and then the average was calculated.

Search and determination of bat foraging habitat using survey method. The center point of observation is the bat roost. A belt transect was established within a 100 m radius of the bat

roost which is the center point of the observation radius. Throughout the night on three different days, plants suspected of being food sources for bats were searched along the belt transect. The placement of belt transects was done purposively based on the frequency of Pteropodidae bats visiting their food source plants. Plants that are most often approached by bats as a source of food are then marked at night to record plant phenology with the categories of non-flowering, flowering, young fruit, and mature fruit during the day. Choiruzat's (2013) research was used as a reference to verify whether the plant is a food source for bats.

Data Analysis

Microclimatic parameters measured included air temperature, air humidity, light intensity, wind speed, and noise level. Responses of Pteropodidae bat species recovered from the study sit to microclimate factor parameters were tested by multivariate analysis of CCA (Canonical Correspondence Analysis) using Canoco (Canonical Community Ordination) software version 4.5. CCA was used with the forward selection method and tested using Monte Carlo Permutation with 199 random permutations. The use of the CCA method aims to determine the relationship in graphical form and expose the maximum information from a data matrix in the form of Pteropodidae bat species found with microclimate factors simultaneously (Koneri et al., 2010; Leps & Smilauer, 2003).

RESULTS

Based on the results of the study, it is known that 4 species of bats of the Pteropodidae family, namely *Cynopterus brachyotis*, *Cynopterus horsfieldii*, *Cynopterus titthaecheilus* and *Macroglossus sobrinus* are distributed in the South Tangerang City area (Table 1).

Table 1. Composition of Pteropodidae bat species in South Tangerang City and their protection status.

No.	Scientific Name	Local Name	Observation Location				Conservation Status	
			BA	SG	TK1	PP	IUCN	CITES
1	*Cynopterus brachyotis* (Muller, 1838)	Codot Krawar	9	16	13	-	LC	NA
2	*Cynopterus horsfieldii* (Gray, 1843)	Codot Horsfield	2	0	0	-	LC	NA
3	*Cynopterus titthaecheilus* (Temminck, 1827)	Codot Besar	1	0	0	-	LC	NA
4	*Macroglossus sobrinus* (Andersen, 1911)	Cecadu Pisang Besar	1	6	2	-	LC	NA

Note: LC = *Least Concern*, NA = *Non Appendix*, PP = PP No. 7 Tahun 1999; BA = Bambu Apus, SG = Situ Gintung, TK1 = Taman Kota 1 BSD

There are 28 species of plants that have the potential to feed Pteropodidae bats in the South Tangerang City area, 15 species are non-flowering (*Albizia saman*, *Artocarpus altilis*, *Averrhoa carambola*, *Baringtonia asiatica*, *Ficus lyrata*, *Hibiscus* sp., *Gnetum gnemon*, *Leucaena leucocephala*, *Moringa oleifera*, *Polyalthia longifolia*, *Pometia pinnata*, *Roystonea regia*, *Schefflera actinophylla*, *Tamarindus indica*, and *Tectona grandis*), 5 species in flowering stage (*Acacia auriculiformis*, *Carica papaya*, *Mangifera indica*, *Plumeria* sp., and *Syzygium aqueum*), 7 species in young fruiting stage (*Artocarpus heterophyllus*, *Cerbera manghas*, *Cocos nucifera*, *Dimocarpus longan*, *Musa* sp., *Prunus* sp., and *Psidium guajava*) and 1 mature fruiting species (*Nephelium lappaceum*) (Table 2).

Table 2. Phenology of potential food plant species of Pteropodidae bats in South Tangerang City area.

No.	Family	Scientific Name	Local Name	Location			
				Bambu Apus		Situ Gintung	Tamkot 1 BSD
1	*Anacardiaceae*	*Mangifera indica*	Mangga	TB, Bu			
2	*Annonaceae*	*Polyalthia longifolia*	Glodokan				TB
3	*Apocynaceae*	*Cerbera manghas*	Bintaro			Bmu, Bma	Bmu
4		*Plumeria* sp.	Kamboja			Bu	
5	*Araliaceae*	*Schefflera actinophylla*	Walisongo				TB
6	*Arecaceae*	*Cocos nucifera*	Kelapa	Bmu			
7		*Roystonea regia*	Palem Raja				TB
8	*Caricaceae*	*Carica papaya*	Pepaya	Bu			
9	*Fabaceae*	*Acacia auriculiformis*	Kormis			Bu, Bmu	
10		*Albizia saman*	Trembesi				TB
11		*Leucaena leucocephala*	Lamtoro			TB	
12		*Tamarindus indica*	Asam Jawa				TB
13	*Gnetaceae*	*Gnetum gnemon*	Melinjo				TB
14	*Lamiaceae*	*Tectona grandis*	Jati				TB
15	*Lecythidaceae*	*Baringtonia asiatica*	Keben				TB
16	*Malvaceae*	*Hibiscus* sp.	Waru				TB
17	*Moraceae*	*Ficus lyrata*	Biola Cantik				TB
18		*Artocarpus altilis*	Sukun			TB	
19		*Artocarpus heterophyllus*	Nangka	Bmu			
20	*Moringaceae*	*Moringa oleifera*	Kelor			TB	
21	*Musaceae*	*Musa* sp.	Pisang	TB, Bmu			
22	*Myrtaceae*	*Psidium guajava*	Jambu biji	Bmu			
23		*Syzygium aqueum*	Jambu air			Bu	
24	*Oxalidaceae*	*Averrhoa carambola*	Belimbing			TB	
25	*Rosaceae*	*Prunus* sp.	Ceri			Bu, Bmu	
26	*Sapindaceae*	*Dimocarpus longan*	Lengkeng	Bmu			
27		*Nephelium lappaceum*	Rambutan	TB, Bmu, Bma			
28		*Pometia pinnata*	Matoa				TB

Notes: TB: No Flowering, Bu: Flowering, Bmu: Young Fruiting, Bma: Ripe Fruit

The results of CCA (Canonical Correspondence Analysis) analysis with 5 parameters of microclimate factors (air temperature, air humidity, light intensity, wind speed, noise level) are presented in Table 3.

Table 3. Order of microclimatic factor parameters that influence foraging habitat selection of Pteropodidae bats in South Tangerang City

Microclimate Parameters (code)	Order	F	λ	P-value
Noise level (db) (TK)	1	4,37	0,2027	0,0200*
Wind Speed (m/s) (KA)	2	0,94	0,0441	0,4500
Light Intensity (Lux) (IC)	3	0,43	0,0261	0,6900
Air Temperature (°C) (SU)	4	0,41	0,0225	0,7050

Air Humidity (%) (KU)	5	0,39	0,0197	0,7400

Notes: F = F ratio, λ = eigenvalue, * = significantly different ($p < 0.05$). Data were obtained by the forward selection analysis method and tested using Monte Carlo permutation with 199 random permutations.

The results of the CCA analysis using the forward selection method showed that there was one microclimate parameter that influenced the selection of foraging habitat for Pteropodidae bats from the five parameters tested, namely noise level with the highest eigenvalue (λ = 0.2027 and P-value = 0.0200) (Table 3). The results of CCA are presented in graphical form in Figure 1. The figure shows the relationship between bat species and microclimate parameters of foraging habitat. The results of the CCA analysis showed three groups of Pteropodidae bats based on the tendency of their foraging habitat selection patterns.

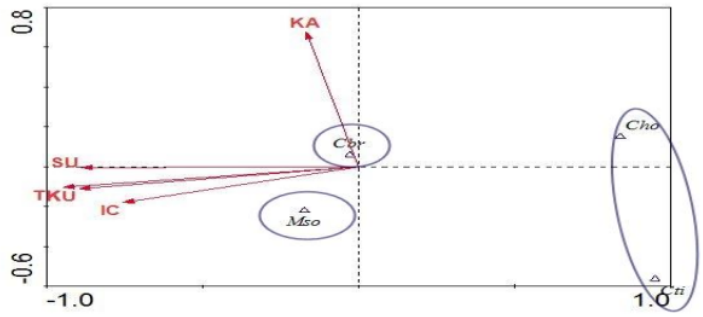

Figure 1. Canonical Correspondence Analysis (CCA) graph of bat species based on microclimate factor conditions. SU = Air Temperature; KU = Air Humidity; IC = Light Intensity; KA = Wind Speed; TK = Noise Level; Cbr = C. brachyotis; Cho = C. horsfieldii; Cti = C. titthaecheilus; Mso = M. sobrinus

DISCUSSION

Plants that are often visited by Pteropodidae bats in the observation location are plants that consist of phases of non-flowering, flowering, and fruiting. This is in accordance with the research of Maryati et al. (2008) that plants that are a source of food for bats are flowering and seed plants, the location for foraging and the composition of bat food is influenced by the flowering and fruiting season of trees that are a source of food. Some bat species perform seasonal migrations, following the fruiting season of certain plant species (Altringham, 2011). Sudhakaran & Doss (2012) reported that 37 plant species have the potential to feed Pteropodidae bats in Tirunelveli and Tuticorin Districts, India. Sheherazade (2014) reported that 26 plant species are food trees for fruit-eating bats at the UI Depok campus.

Plants that are in the condition of young fruit or ripe fruit provide a source of energy for Pteropodidae bats. Based on observations of cherry plants (*Prunus* sp.) that are flowering and bearing young fruit are often visited by Pteropodidae bats. The selection of fruit conditions consumed by Pteropodidae bats is influenced by several factors, according to Hodgikson et al. (2007), some fruits are difficult to detect visually by fruit-eating bats with the same leaf color, to be able to distinguish young or ripe fruit bats rely on their sensory abilities. Rambutan (*N. lappaceum*) fruits that were in the ripe fruit phase were also observed to be visited by Pteropodidae bats. Pteropodidae bats' foraging preferences are mainly based on morphological characteristics and fruit palatability (Corlett, 1996; Sudhakaran & Doss, 2012).

Based on observations at each location, Pteropodidae bats do not only consume ripe and unripe fruits. Bats that eat pollen from some flowers such as banana plants are also utilized. Banana plants (*Musa* sp.) were observed to be frequented by *Macroglossus sobrinus* bats

during the study. Research by Saridan (2010) reported that the crown factor for male *M. sobrinus* is strongly influenced by the shape of the crown of butterfly (papilionaceus), tube (tubulus), and star (stellatus). The pollen eaten by bats can also help the pollination process of these plants. Marshall (1985) reported that bats tend to pollinate 31 genera of flowering plants and are thought to disperse the majority of fruit seeds consumed. Plant-eating bats eat a variety of non-commercial and commercial fruiting plants including figs, kapok, pepper, mango, banana, peach, and even young coconut and cocoa pods. There are 188 species from 64 genera pollinated by the family Pteropodidae. In tropical forests, trees that bear fruit throughout the year, and are well distributed, provide a constant food supply for bats. The food supply available throughout the year, both temporally and spatially, and the foraging habits of bats are shaped by the types of plants that bats feed on (Altringham, 2011).

Plants that were not flowering or fruiting during the study were *Albizia saman*, *Artocarpus altilis*, *Averrhoa carambola*, *Baringtonia asiatica*, *Ficus lyrata*, *Hibiscus* sp., *Gnetum gnemon*, *Leucaena leucocephala*, *Moringa oleifera*, *Polyalthia longifolia*, *Pometia pinnata*, *Roystonea regia*, *Schefflera actinophylla*, *Tamarindus indica* and *Tectona grandis* (Table 2). During the observation of foraging habitat of Pteropodidae bats in Taman Kota 1 BSD, plants that were in the non-flowering phase, namely the Javanese Asem plant (*Tamarindus indica*) were also utilized by Pteropodidae bats as temporary roosts before looking for plants that were flowering or fruiting. During the observation, many plants that were in the phase of not yet flowering or fruiting, namely King Palm (*Roystonea regia*) in Taman Kota 1 BSD, became bat nesting sites or temporary roosting sites after bats obtained fruit from other locations.

The large variety of plants and their different phenology in each observation location increases the diversity of bats in determining the food needed every day. Research by Tan et al. (2000) explained that the consumption of fruits that are available throughout the year or seasonal fruits is thought to be an important factor in maintaining the population stability of *C. brachyotis* bats. Differences in seasonal phenology between congeneric plant taxa (*Ficus* spp. and *Eugenia* spp.) lead to stable fruit production throughout the year.

Noise level is a microclimate parameter that is significantly correlated with foraging habitat selection of Pteropodidae bats. High noise levels are thought to affect Pteropodidae bats in their search for food sources. Based on Boonman et al. (2014) reported that two species of noncolocating bats (*Eonycteris spelaea* and *Cynopterus brachyotis*) use click-like sounds produced from their wings to detect and distinguish objects in pitch-dark conditions.

The influence of microclimate parameters on bat species can be seen from the length and direction of the arrows. The distance between the tip of the arrow and the bat species points indicates how much influence the microclimate parameter has relative to the bat species. The direction of the arrow shows the correlation between vegetation parameters and bat species. The length of the arrow indicates the strength of the correlation between the variables. Variables with the same arrow direction are positively correlated, opposite arrow directions are negatively correlated and arrow directions perpendicular to the variable are not correlated. The value of the angle between two arrows describes the correlation of the two variables. The narrower the angle made between two variables, the higher the positive correlation. Meanwhile, if the angle is obtuse (opposite direction), the correlation is negative (Leps & Smilauer, 2003).

The first group is the Pteropodidae bat species whose foraging habitat selection pattern is influenced by wind speed. *Cynopterus brachyotis* is a bat whose presence is influenced by wind speed. Based on the results of observations, this species is the most common species found with 38 individuals from the three observation locations. This indicates that the condition of the foraging environment with wind speed is a desirable condition for these bats to forage in urban areas.

The second group is the Pteropodidae bat species whose presence is influenced by light intensity, air humidity, noise level, and air temperature. Based on Figure 1, air temperature is positively correlated with noise level, air humidity, and light intensity. The bat species found was *Macroglossus sobrinus* with a total of 9 individuals found in all three observation locations (Table 1). Based on this, *M. sobrinus* bats tend to want environmental conditions in foraging habitats that are cold, noisy, humid, and bright. So far there has been no research that explains the foraging habitat selection tendencies of Pteropodidae bats in urban areas.

The third group is Pteropodidae bats whose presence in foraging habitat selection is not influenced by the five microclimate factors. Based on Figure 1, the bats *Cynopterus horsfieldii* and *Cynopterus titthaecheilus* are far from the direction of the microclimate factor variable arrows. The results of this study explain that the variables of air temperature, air humidity, light intensity, wind speed, and noise level do not have a significant effect on the selection of bat foraging habitat, so it is suspected that several other variables determine Pteropodidae bats in choosing their foraging habitat. Roost location, night flying activity, and roaming power are thought to be one of the factors of *C. horsfieldii* bats searching for food. Funakoshi & Zubaid (1997) explained that the daily roost sites of *C. horsfieldii* are sparsely distributed and found mainly in palm plants. Flight activity for foraging begins 2 hours after sunset and then gradually decreases during the night and then increases again three hours before sunrise. *C. horsfieldii* forages throughout the year in plantation areas and secondary habitats near forest edges (Campbell & Kunz, 2006).

CONCLUSIONS

Characteristics of foraging habitat of Pteropodidae bats in three green spaces in South Tangerang City based on plant phenology there are 28 types of plants from 18 families that have the potential as food for Pteropodidae bats, 15 types of non-flowering, 5 types of flowering, 7 types of young fruit and 1 type of mature fruit. Based on the results of analysis using Canonical Correspondence Analysis (CCA), the noise level is the most influential microclimate parameter on the selection of foraging habitat for Pteropodidae bats and 3 groups of bats have different tendencies in choosing foraging habitat.

REFERENCE

Altringham, J.D. 2011. *Bats From Evolution to Conservation*. Oxford University Press Inc. New York, USA.

Boonman, A., S, Bumrungsri dan Y, Yovei. 2014. Nonecholocating Fruit Bats Produce Biosonar Clicks with Their Wings. *Current Biology*. 24(24): 1-6.

Campbell, P & T.H, Kunz. 2006. *Cynopterus horsfieldii*. *American Society of Mammalogists*. 802:1-5.

Choiruzat, D.I. 2013. Identifikasi Polen Tumbuhan yang terdapat dalam Saluran Pencernaan Kelelawar Subordo Megachiroptera di Kota Tangerang Selatan. *Skripsi*. UIN Syarif Hidayatullah Jakarta.

Corlett, R.T. 1996. Characteristic of Vertebrate-Dispersed Fruits in Hong Kong. *Journal of Tropical Ecology*. 12: 819-823.

Funakoshi, K & A, Zubaid. 1997. Behavioural and Reproductive Ecology *Cynopterus brachyotis* and *C. horsfieldii* in A Malaysian Forest. *Mammal Study*. 22: 95-108.

Graham, L.E, J.M, Graham & L.W, Wilcox. 2003. *Plant Biology*. Pearson and Prentice Hall.

Hodgikson, R., M, Ayasse., E.KV, Vanko., C, Haberlein., S, Schutz., W.A.W, Musthapa., A, Zubaid & T.H, Kunz. 2007. Checimal Ecology of Fruit Bat Foraging Behavior in Relation to the Fruit Odors of Two Species of Paleotropical Bat-Dispersed Figs (*Ficus hispida* and *Ficus scortechnii*). *Journal of Chemical Ecology*. 33: 2097-2110.

Kinjo, K, A. Nakamoto, M, Izawa, M, Baba, T, Doi & Boeadi. 2006. Bats Surveys in an Agricultural Field and an Urban Area in West Java, Indonesia. Bull. Kitakyushu *Mus. Nat. Hist. Ser. A.* (4):115-119.

Koneri, R., D.D, Solihin., D, Buchori & R, Tarumingkeng. 2010. Keanekaragaman Kumbang Lucanid (Coleoptera: Lucanidae) pada berbagai Ketinggian Tempat di Hutan Konsensi Unocal Gunung Salak, Jawa Barat. *Jurnal Matematika dan Sains*. 15(2): 77-84.

Leps, J. & P. Smilauer. 2003. *Multivaraite Analysis of Ecological Data Using CANOCO*. Cambridge University Press. New York.

Marshall, A.G. 1985. Old World Phytophagus Bats (Megachiroptera) and their Food Plants: A survey. *Zoological Journal of the Linnaeus Society*. 83: 351-369.

Maryati. 2008. Identifikasi Sumber Pakan Kelelawar Pemakan Buah dan Nektar Subordo Megachiroptera Berdasarkan Analisis Polen di Kawasan Taman Nasional Gung Ciremai. *Skripsi*. Departemen Konservasi Sumberdaya Hutan dan Ekowisata Fakultas Kehutanan, Institut Pertanian Bogor: Bogor.

Peraturan Menteri Dalam Negeri No. 1 Tahun 2007 Tentang Penataan Ruang Terbuka Hijau Kawasan Perkotaan.

Peraturan Menteri Pekerjaan Umum No. 5 Tahun 2008 Tentang Pedoman Penyediaan dan Pemanfaatab Ruang Terbuka Hijau di Kawasan Perkotaan.

Ridho, 2009. Identifikasi Serbuk Sari Pada Saluran Pencernaan Kelelawar Buah di Area Perkebunan Daerah Cengkareng. *Skripsi*. UIN Syarif Hidayatullah Jakarta.

Rizkita, M. 2013. Keanekaragaman Jenis dan Pemilihan Sarang Kelelawar (Ordo: Chiroptera) di Kota Tangerang Selatan. *Skripsi*. UIN Syarif Hidayatullah Jakarta.

Saridan, A. 2010. Jenis dan Preferensi Polen Sebagai Pakan Kelelawar Pemakan Buah dan Nektar. *Jurnal Penelitian Hutan dan Konservasi Alam*. 7(3): 241-256.

Sheherazade. 2014. Distribusi Kelelawar Pemakan Buah (Chiroptera, Pteropodidae) di Kampus Universitas Indonesia, Depok, Jawa Barat. *Skripsi*. Universitas Indonesia: Depok.

Soegiharto, S. 2009. Identifikasi Jenis Tumbuhan Pakan Dalam Upaya Konservasi Kelelawar Pemakan Buah dan Nektar di Daerah Perkotaan. Studi Kasus Kelelawar di kebun Raya Bogor. *Tesis*. Sekolah Pascasarjana. Institut Pertanaian Bogor: Bogor.

Sudhakaran, M.R & P.S, Doss. 2012. Food and Foraging Preferences of Three Pteropodid Bats In Southern India. *Journal of Threatened Taxa*. 4(1): 2295-2303.

Suyanto, A. 2001. *Seri Panduan lapangan kelelawar di Indonesia*. Puslitbang-LIPI. Bogor.

Tan, K.H, A, Zubaid dan T.H, Kunz. 2000. Fruit Dispersal by the Lesser Dog-faced Fruit Bat, *Cnynopterus brachyotis* (Muller) (Chiroptera: Pteropodidae). *Malayan Nature Journal*. 56(1): 57-62.

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Confused You have used **were** in this sentence. You may need to use **we're** instead.

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Missing "?" Remember to use a question mark at the end of a question.

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Possessive You may need to use an apostrophe to show possession.

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Proofread This part of the sentence contains a grammatical error or misspelled word that makes your meaning unclear.

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