Received : 5 December 2021 Revised : 20 February 2022 Accepted: 30 May 2022
DOI: 10.29244/primatology.1.01 EISSN: 2964-5441

RESEARCH ARTICLE

INAJP
INDONESIAN JOURNAL OF PRIMATOLOGY

Food Preference of Long-tailed Macaques (*Macaca fascicularis* Raffles 1821) in IPB Dramaga Campus

Deddy Kurniawan Ritonga[1]*, Lin Nuriah Ginoga[2], and Agus Hikmat[2]

[1]Undergraduate Program of Natural Resources and Environmental Management, Department of Forest Resources Conservation, Faculty of Forestry and Environment, IPB University, Academic Ring Road, Campus IPB Dramaga, Bogor Indonesia 16680
[2]Department of Forest Resources Conservation and Ecotourism, Faculty of Forestry and Environment, IPB University, Academic Ring Road, Campus IPB Dramaga, Bogor Indonesia 16680

Abstract
Long-tailed macaques (*Macaca fascicularis*) will expand their daily home range to obtain good and plentiful food sources, thus often causing conflict. Identification of long-tailed macaque feed preferences needs to be done as a form of minimizing conflict. This research aims to identify the type of feed and feed preference, and also to analyze the daily activity of long-tailed macaques. The research was conducted by vegetation analysis and field observation of the daily activities of long-tailed macaques. The results of this research showed that there were 22 types of feed plants and 2 types of non-plant feeds. Long-tailed macaques are kind of fructivore animals but will be opportunistic omnivores if the availability of fruits decreases. Long-tailed macaques are more interested to eat fruit, especially Belimbing Bintang fruit (*Averrhoa carambola*), Matoa fruit (*Pometia pinnata*), and Jabon fruit (*Neolamarckia cadamba*).

Keywords: food preference, long-tailed macaques, sampling plot

1. Introduction

The long-tailed macaques (*Macaca fascicularis*) are mammals distributed in almost all types of land cover on the Dramaga IPB campus. Long-tailed macaques are believed to have native habitats in the Al-Hurriyah natural forest, the Information Resource Service (LSI) border, bamboo arboretum, and lecturer housing (Abdullah 2017; Sutrisno 2018). The population of long-tailed macaques on the Dramaga IPB campus every year tends to increase. In 2017, 2018, 2019, and 2020, the population size of long-tailed macaques reached 32 individuals, 39 individuals, 41 individuals, and 48 individuals, respectively (Abdullah 2017; Muchtiarsyah 2019; Sutrisno 2018). The wide distribution pattern and the increasing number of individuals can lead to potential conflicts for the survival of the community within the Dramaga IPB campus. Conflicts between long-tailed macaques and the community can occur due to competition for space and resources (Rahmawati *et al*. 2014). The pattern of use of space and resources by long-tailed macaques and the community simultaneously will certainly cause various disturbances, inconveniences, and threats.

The search for food sources is the main trigger that causes conflicts over overlapping long-tailed macaques habitats with community settlements. According to Sukri (2015), the existence of a population size of long-tailed macaques will be largely determined by the availability of abundant and quite diverse feed. Long-tailed macaques will change their home range, even to community settlements in order to find abundant food availability and obtain good food sources (Quinda *et al.* 2013). According to Widiyanti (2001), the behavior of long-tailed macaques will be more aggressive in finding food sources, by expanding their daily home range, disturbing the surrounding community settlements by stealing garden produce, stealing merchandise, jumping on community roofs, and showing resistance behavior in the form of biting. Oriza *et al*. (2019), explain that long-tailed macaques who take and steal community plantation products are caused by the availability of food that is less in their original habitat but the number of individual macaques continues to grow.

Long-tailed macaques eat various types of food, both plants, and small insects. Long-tailed macaques are also able to consume various types of feed in the wastelands if the availability of natural food sources

*Coresponding author
Email Address : deddykurniawan616@gmail.com

is limited (Putra *et al*. 2017). Therefore, it is important to study the feed preferences of long-tailed macaques at the Dramaga IPB campus in order to identify the abundance and feed preferences of long-tailed macaques. Identification of abundance and feeding preferences of long-tailed macaques is a benchmark as an effort to minimize conflicts that occur between long-tailed macaques and the community, as well as a follow-up effort to control the long-tailed macaques' population at the Dramaga campus of IPB. The objectives of this research are to identify the type of food and the feeding preferences of the long-tailed macaques (*Macaca fascicularis*).

2. Materials and Methods

2.1. Time and Location

The study was carried out from April to May 2021. Observations of long-tailed macaques were carried out in the morning to evening (06.00-18.00 WIB). Data collection was carried out by walking slowly following the long-tailed macaques in the areas: (1) around the Al-Hurriyah forest to lecturer housing, (2) bamboo arboretum to tropical forest, (3) LSI lake border to dormitory C4.

2.2. Research Tools and Objects

The tools used in this research are stationary, Microsoft Word software, Microsoft Excel software, ArcGIS 10.5 software, calculator, camera, GPS, meter, binoculars, and tally sheet. The objects of this research include long-tailed macaques (*Macaca fascicularis*) and long-tailed macaques food plants.

2.3. Data Collection Method

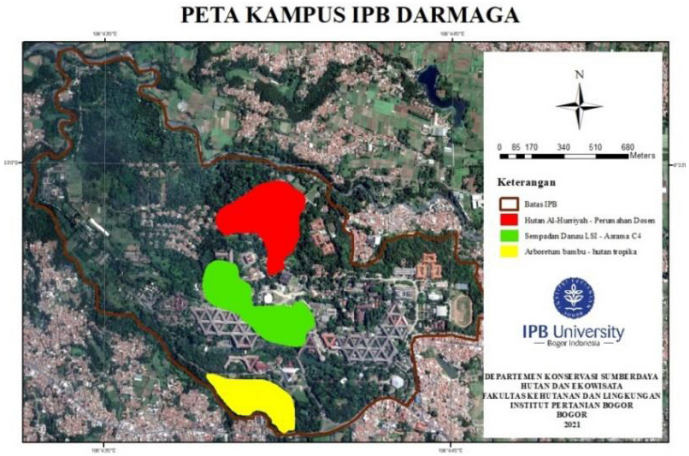


Figure 1. Map of research location

2.3.1. Field Observation

Field observations were carried out to observe the distribution and feeding activity of long-tailed macaques. Observation of the eating activity of long-tailed macaques was carried out on adult male individuals, adult females, and puppies. The number of repetitions carried out is three times. The observer will record the name of the type of plant that is eaten and the part of the particular plant that is eaten. The eating activity in question is the activity of eating natural food. During the field observation process, the observer walked slowly, following the movements of the long-tailed macaques, in the area believed to be the habitat of the long-tailed macaques. The area in question includes the Al-Hurriyah forest to lecturer housing, the bamboo arboretum to tropical forest, and the LSI lake border to the C4 dormitory. This is done in order to increase the chances of encounters with long-tailed macaques. The observation area was taken based on several literature sources, the interpretation board on the distribution of mammals on the Dramaga Campus of IPB, interviews with the community as well as the academic community around the campus, and a preliminary survey.

2.3.2. Vegetation Analysis

Vegetation analysis was carried out to determine the availability of vegetation types as food for long-tailed macaques. Vegetation analysis was carried out using a combination of lanes and plotted lines. The total size of the sampling plots is 80 mx 20 m. Vegetation analysis sampling plots were placed based on direct encounters with long-tailed macaques who were eating. Sampling plots are adapted to the designation of vegetation growth.

2.4. Data analysis method

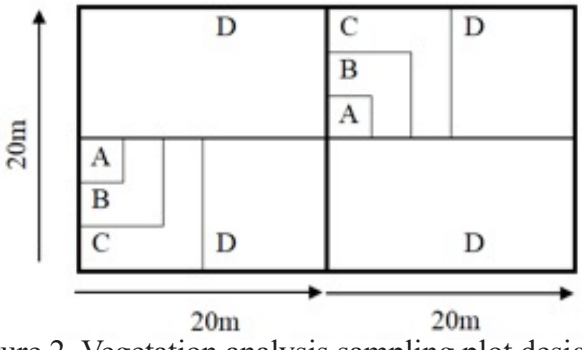


Figure 2. Vegetation analysis sampling plot design

2.4.1. Important Value Index

Important Value Index (INP) is used to determine the dominance of plant species in a forest stand or plant community. The equations used are:

$$\text{Species density (Ki)} = \frac{\text{The number of i individual}}{\text{Total area of sampling plot}}$$

$$\text{Relative density (KR)} = \frac{\text{Species density}}{\text{Total species density}} \times 100\%$$

$$\text{Species frequency (Fi)} = \frac{\text{The number of sampling plots where species i is found}}{\text{Total number of sampling plots}}$$

$$\text{Relative frequency (FR)} = \frac{\text{Species frequency}}{\text{Total species frequency}} \times 100\%$$

$$\text{Species dominance (Di)} = \frac{\text{Basal area of species i}}{\text{Total area of sampling plots}}$$

$$\text{Relative dominance (DR)} = \frac{\text{Species dominance}}{\text{Total species dominance}} \times 100\%$$

Important Value Index (INP) = KR + FR (seedlings and saplings)

Important Value Index (INP) = KR + FR + DR (poles and trees)

2.4.2. Parts of forage plants eaten

The part of the forage plant eaten is intended to calculate how often the consumption of a part of the forage plant is eaten by the long-tailed macaques (Safitri 2017). Calculation of the frequency of forage plant parts using the following equation (Fachrul 2008):

$$N_0 = \left(\frac{n_i}{N}\right) x\ 100\%$$

Information:

N_0 = Relative frequency of feed type

n_i = Frequency of one type of feed eaten

N = Frequency of all types of feed eaten

2.4.3. Food Preference

Food preferences of long-tailed macaques were analyzed using the Neu Index (preference index). It is assumed that the higher the frequency of a type of feed being eaten, the more favored that type of long-tailed macaques will be. Neu *et al*. (1974) in Aini (2011), explained that if the preference index value is more than 1 (w > 1), then the type of food is preferred by long-tailed macaques. Meanwhile, if the preference index value is less than 1 (w < 1), then the type of feed is not preferred. The determination of the preference index can be seen in Table 1.

3. Results

3.1. Types of Long-tailed Macaques Feed

The results of observations of the eating behavior of long-tailed macaques showed as many as 22 types of forage plants and 2 types of non-plant food. Several types of feed can be found in the different sampling plots, in other words, long-tailed macaques eat the same type of food. The type of feed recorded is a type of natural feed. The feed given by

Table 1. Criteria measured in determining the Neu. Index

Species Name	Availability		Use		Preference Index	
	a	p	n	r	W	B
1	a_1	p_1	n_1	r_1	W_1	B_1
2	a_2	$p2_{\_}$	$n2_{\_}$	r_2	$W2_{\_}$	$B2_{\_}$
…..	…..	…..	…..	…..	…..	…..
K	a_k	p_k	n_k	r_k	W_k	B_k
Amount	$a_{\_}$	$p_{\_}$	$n_{\_}$	$r_{\_}$	$W_{\_}$	$B_{\_}$

Information

a = Density of forage plants

p = Proportion of density of forage plant species (a_i / a)

n = Frequency of a plant species eaten

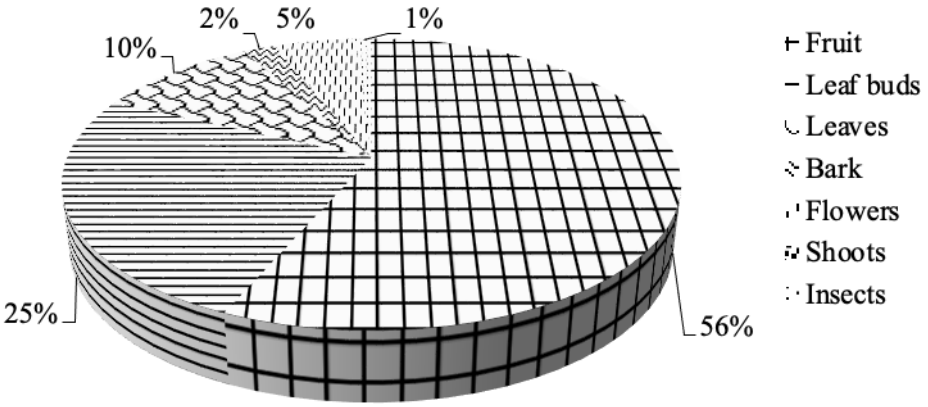
r = Proportion of frequency of a plant species eaten (n_i / n)

W = Preference index ($r_{i/} p_i$)

B = Standardized selection index (w_i/w)

Table 2. Types of feed for long-tailed macaques

No	Local Name	Species name	Information	
			Edible Parts	Sampling Plots
1	Karet	*Hevea brasiliensis*	B	1,2,3
2	Sawit	*Elaeis guineensis*	A	1,3
3	Bambu	*Bambusa* sp.	B,D,F	1,2
4	Kelapa	*Cocos nucifera*	A	1,3
5	Lamtoro	*Leucaena leucocephala*	A, C	1,3
6	Trembesi	*Samanea saman*	A, C	1,2
7	Beringin	*Ficus benjamina*	B,D	1,2
8	Daun kupu-kupu	*Bauhinia purpurea*	E	1,3
9	Kincret	*Spathodea campanulata*	F	1,3
10	Belimbing bintang	*Averrhoa carambola*	A,B,E	2
11	Coklat	*Theobroma cacao*	A	1
12	Jabon	*Neolamarkia cadamba*	A	1
13	Benalu	*Macrosolen cochinchinensis*	C	1
14	Ara sungsang	*Asystasia gangetica*	C	2
15	Kayu afrika	*Maesopsis eminii*	A	2
16	Rumput	*Oplismenus undulanifolius*	C	2
17	Pulai	*Alstonia scholar*	A	3
18	Salam	*Syzygium polyanthum*	A	3
19	Bisbul	*Diospyros blancoi*	A	3
20	Agathis	*Agathis Dammara*	C	3
21	Matoa	*Pometia pinnata*	A	3
22	Ketapang	*Terminalia catappa*	B	3
23	Ants	*Dolichoderus* sp.	-	2
24	Termites	*Dicuspiditermes*	-	2



Description: (A) Fruit, (B) Leaf buds, (C) Leaves, (D) Bark (E) Flowers, (F) Shoots, (1) Al-Hurriyah Forest-lecturer housing, (2) Bamboo Arboretum – tropical forest, (3) LSI lake border – dormitory C4

Figure 3. Percentage of forage plant parts eaten by long-tailed macaques

Table 3. Preferences of long-tailed macaques forage

Local Name	Gender			Sampling Plots	Neu Index
	Adult Male	Mature Female	Saplings		
Belimbing bintang	v	v	v	2	60.05
Karet		v	v	2	8.54
Matoa	v	v		3	5.31
Jabon	v	v	v	1	4.21
Beringin			v	2	4.14
Lamtoro	v		v	1	2.34
Bambu	v	v	v	2	1.70
Beringin	v	v	v	1	1.56
Sawit	v	v	v	1	1.37
Sawit	v	v	v	3	1.17
Kelapa	v	v		3	0.97
Karet		v		1	0.73
Daun kupu-kupu	v			3	0.72
Lamtoro	v			3	0.48
Agathis		v		3	0.48
Karet	v	v	v	3	0.26
Rumput	v	v		2	0.14
Ara sungsang	v	v		2	0.09
Kiacret		v		1	0.07
Coklat	v			1	-
Trembesi	v			1	-
Benalu	v			1	-
Daun kupu-kupu		v		1	-
Kelapa	v			1	-
Bambu	v	v	v	1	-
Kayu afrika	v	v		2	-
Trembesi			v	2	-
Pulai			v	3	-
Salam			v	3	-
Bisbul	v	v		3	-
Ketapang	v			3	-
Kiacret	v			3	-

Description: (1) Al-Hurriyah Forest – lecturer housing, (2) Bamboo Arboretum – tropical forest, (3) LSI lake border – C4 dormitory

the community around the Dramaga IPB campus or the type of feed obtained from the garbage bin was not recorded.

3.2. Parts of Forage Plants Eaten

During the observation, it was known that the long-tailed macaques at the Dramaga IPB campus eat certain parts of forage plants, including fruit, leaf buds, leaves, bark, flowers, shoots, and also types of non-plant food including insects. The relative frequency of feeding long-tailed macaques is attached in Figure 3.

3.3. Long-tailed Macaques Feed Preference

Based on the results of the Neu index analysis, there were four types of favorite feed in the Al-Hurriyah forest sampling plot to lecturer housing, four types of favorite feed in the bamboo arboretum sampling plot to tropical forest, and two types of favorite feed in the LSI lake border sampling plot to hostel C4. Some types of forage plants cannot be analyzed for their preference index because they are outside the plot of vegetation analysis. The type of feed can only be observed but cannot be analyzed through a preference index. Feed preferences of long-tailed macaques are presented in Table 3.

4. Discussion

4.1. Types of Long-tailed Macaques Feed

Karet (*Hevea brasiliensis*) is a type of feed that can be found in each sampling plot. Several types of dominant feed that have a high feed frequency are plant species that dominate the area, in other words, the type of feed in question has a high INP (Safitri 2017). Karet is the vegetation that dominates the Dramaga IPB campus (Mulyani 1985) in Prinando (2011). IPB Dramaga campus is an educational area converted from a rubber plantation (Prijono 1998) in (Kurnia 2003). The karet leaf shoot is the part that is eaten by long-tailed macaques. Karet leaf shoots have a low sap content, so they can still be tolerated by the digestive system of long-tailed macaques. Ulfah *et al.* (2015), explained that the highest content of Karet latex can be found in Karet stems. Karet sap (*latex*) is only stored and produced by the vessels found in the bark.

Based on the results of the vegetation analysis, Sawit could be found in every sampling plot, but only in the sampling plots of the bamboo arboretum to tropical forest, Sawit fruit was not used as food for long-tailed macaques. Prinando (2011), explained that Sawit is one of the invasive alien plant species on the Dramaga IPB campus. Sawit is called an invasive plant because of its uniform distribution and clustering across all types of land cover, the distribution of which is assisted by wildlife such as the coconut squirrel (*Callosciurus notatus*), are able to survive and grow back after being cut, are tolerant as a sapling, and tolerant as an adult (Hikmat *et al.* 2014; Pahan 2008). Sawit fruit is one type of long-tailed macaques feed. The fruit layer (*mesocarp*) in Sawit fruit has high-fat content. That is why long-tailed macaques like Sawit fruit as a source of food (Abdullah 2017).

Long-tailed macaques have also been found eating ants (*Dolichoderus* sp.) and termites (*Dicus piditermes*). Long-tailed macaques are fruit-eating animals (*frugivores*) and are very selective in the choice of food (Risdiyansyah *et al.* 2014). However, long-tailed macaques will adapt and become opportunistic omnivores if the availability of fruit is reduced. The changing pattern of eating behavior of long-tailed macaques can be caused by the lack of food availability in their natural habitat (Putra *et al.* 2017). Limited fruit availability triggers long-tailed macaques to eat non-plant foods (Crockett and Wilson 1980). Most primates in meeting their protein needs will eat insects (Karyawati 2012). Insects contain more than 20% dry weight of protein. Long-tailed macaques are one of the animals that are useful as insect population controllers by preying on them (Sembiring *et al.* 2016).

4.2. Parts of Forage Plants Eaten

The fruit was the part of the forage plant that was most often eaten by long-tailed macaques in each sampling plot. This is in line with the statement of Risdiyansyah *et al.* (2014), which stated that long-tailed macaques are fruit-eating primates (frugivores). Adult male long-tailed macaques were found to eat fruit more often than other age-class long-tailed macaques. Long-tailed macaques are animals with a strong hierarchical level, of course, adult male long-tailed macaques can choose fruit first compared to other age-class long-tailed macaques. High-hierarchical individuals have priority in the selection of females to be fertilized, food, and

bedding (Sajuthi *et al*. 2016). *Alpha male* individuals are adult male individuals who have priority or often take precedence in various aspects. Rizaldy *et al.* (2016), explained that in obtaining food sources, long-tailed macaques will fight each other. If an adult male individual wants to get food, the adult female long-tailed macaques, sub-adults, and juveniles will be expelled immediately. Likewise, if an alpha male wants the food, the adult male long-tailed macaques will be expelled.

Leaf buds are the second most commonly eaten part of forage plants after fruit. Iwamoto (1988) explained that the nutritional composition of natural food for long-tailed macaques can generally be found in leaves that contain a lot of structural cellulose and high lipid content. Leaf shoots have higher protein content, less fiber, and fewer toxins than old leaves. Long-tailed macaques have an affinity for eating leaf shoots. The stomach of long-tailed macaques are able to digest fiber in young leaves well. The ability of the stomach to digest the fiber of young leaves is the reason long-tailed macaques juveniles prefer leaf shoots as their food. Long-tailed macaque juveniles take longer to eat if they eat food other than leaf buds. Farida *et al.* (2010), stated that adult individuals require relatively less time or duration of eating than young and juvenile individuals.

The high leaf consumption in the bamboo arboretum sampling plots in tropical forests was caused by the low diversity of feed types. In this sampling plot, long-tailed macaques were also found eating Rumput leaves (*Oplismenus undulatifolius*) and Ara Sungsang leaves (*Asystasia gangetica*). The lack of feed availability affects the aggressive nature of long-tailed macaques, long-tailed macaques often fight to get food sources (Wahyu *et al.* 2014). Adult male and female long-tailed macaques will descend from the bamboo grove to the bamboo arboretum floor, silently eating Rumput and Ara Sungsang leaves. The availability of water sources forces long-tailed macaques to descend to the bamboo arboretum floor. There is a small stream located not far from where the long-tailed macaques was found eating Rumput and Ara Sungsang leaves. Long-tailed macaques will use water sources for drinking needs.

4.3. Food Preference

Based on the value of the preference index, Belimbing Bintang (*Averrhoa carambola*) is the most preferred type of feed for long-tailed macaques, with a value of 60.05. Belimbing Bintang is only found in the sampling plots of bamboo arboretums to tropical forests. Fruits, leaf buds, and flowers are the parts that are eaten by long-tailed macaques. Belimbing Bintang that is being eaten is mostly that has been ripe. Ripe Belimbing Bintang is bright yellow with faint green on the star side. Long-tailed macaques will usually select the fruit they eat based on color, smell, fruit weight, and nutritional content. Characteristics of Belimbing Bintang is a fruit that stands out among other fruit categories found in this sampling plot. In addition, referring to the USDA Nutrient Database (2010) in Pasagi (2014), it is explained that there is 34.4 mg of vitamin C in 100 grams of Belimbing Bintang. The dose of vitamin C is in accordance with the nutritional needs of long-tailed macaques. The need for vitamin C in long-tailed macaques ranges from 10-250 mg per day (National Research Council 2003) in (Sari 2009). Water content and high vitamin C content, as well as striking fruit color are the main factors that make long-tailed macaques like Belimbing Bintang as their food.

Matoa (*Pometia pinnata*) is the favorite food of long-tailed macaques that can only be found in the sampling plots of the LSI lake border to the C4 dormitory. Matoa is a plant from the Sapindaceae family with chewy flesh characteristics. Hajar *et al*. (2021), explained that Matoa fruit stores as much as 0.09 kcal of energy in it. Matoa fruit on average has a higher nutritional content than lime, spirulina, and carrots. During the observation, many long-tailed macaques were silent while eating Matoa fruit. Long-tailed macaques will discard the immature Matoa fruit and only choose the ripe Matoa fruit. Matoa trees will generally start flowering in July to October and fruit will ripen in February to May (Hajar *et al.* 2021).

In the sampling plots of Al-Hurriyah forest to lecturer housing, Jabon fruit (*Neolamarckia cadamba*) is the preferred type of feed for long-tailed macaques with a preference index value of 3.41. Jabon trees are known to start flowering from March to June and produce ripe fruit from June to August (Mansur and Tuheteru 2010). The fruit eaten is the fruit that is not fully ripe. Long-tailed macaques only eat the outside of the fruit flesh (*mesocarp*), because the Jabon fruit has many small seeds inside. Long-tailed macaques will tend to get and retain as much food as possible,

although not necessarily able to spend it (Quinda *et al.* 2013). During the observation, many Jabon fruits were seen lying on the ground, with bite marks on only a few sides, this also shows the greedy nature of the long-tailed macaques. The fallen fruit has a hard texture, not so soft, indicating that the fruit eaten is not ripe. During observation, you will clearly smell the fragrance under the Jabon tree. Mansur and Tuheteru (2010), explained that pollination of flowers generally occurs in the morning.

Acknowledgments

1. The authors thank the supervisors, Ir. Lin Nuriah Ginoga, M.Si, and Dr. Ir. Agus Hikmat, M.Sc.F.Trop who has guided and provided many suggestions.
2. The author›s appreciation goes to the Center for Primate Studies (PSSP) of IPB which has provided research direction, Teh Hana Intishar Sawitri, Disa Sita Adisti, Dwi Nur Romadhoni, and Wanda Astuti Dirmansyah who have assisted during data collection.
3. Expressions of gratitude were also conveyed to the father (late) Marasati Ritonga, mother Farida Yanti, and the eldest sister of Septia Anggreani Ritonga who had provided support, prayers, and love.
4. The authors would like to thank the friends who have provided input, accompanied the author, as well as good role models for the author, namely M. Kanoe Alghifari, Inee Tiassika, Hanrinia Leony Putrie, Dwi Eka Rahmayanti, Arif Satrio Budiman, Haris Nursafira Sri Utami, Fikri Kurniawan, and Enggi Lestari Rizeki who have helped the author during his studies.

References

Abdullah, Z. 2017. Pendugaan Parameter Demografi dan Sebaran Jenis Tumbuhan Pakan Monyet Ekor Panjang (*Macaca fascicularis*) di Kampus IPB Dramaga Bogor [Unpublished Mini-Thesis]. Institut Pertanian Bogor, Bogor.

Aini, F. 2011. Preferensi dan Kandungan Nutrisi Pakan Orangutan Sumatera (*Pongo abelii* Lesson, 1827) di Stasiun Penelitian Hutan Lindung Batang Toru, Tapanuli Tengah, Sumatera Utara [Unpublished Mini-Thesis]. Institut Pertanian Bogor, Bogor.

Crockett, C.M., Wilson, W.L. 1980. The Ecological Separation of *Macaca nemestrina* and *M. fascicularis* in Sumatera. In D.G. Liburg (ed.), *The Macaque: Study in Ecology, Behaviour, and Evolution*. New York: Van Nostrad Reinhold Primate Behavior and Development Series.

Fachrul, M.F. 2008. *Metode Sampling Bioekologi*. Jakarta: Bumi Aksara.

Farida, H., Fajarallah, D.P., Tjitrosoedirdjo, S.S. 2010. Aktivitas makan monyet ekor panjang (*Macaca fascicularis*) di Bumi Perkemahan Pramuka, Cibubur, Jakarta. *Biota*. 15(1), 24-30.

Hajar, S., Rahmah, W., Putri, E.M., Ressandy, S.S., Hamzah, H. 2021. Potensi ekstrak buah Matoa (*Pometia pinnata*) sebagai sumber antioksidan: literature review. *Jurnal Farmasi Sains dan Praktis,* 7(1), 59-66.

Hikmat, A., Zuhud, E.A.M., Prinando, M. 2014. Ancaman kelapa sawit (*Elaeis guineensis* Jacq.) sebagai spesies asing di hutan konservasi: studi kasus di Kampus IPB Dramaga, Bogor. *Media Konservasi,* 19(2), 113-116.

Iwamoto, T. 1988. Food and Energetics of Provisioned Wild Japanese Macaques *(Macaca fuscata)*. In: J.E. Fa & C.H. Southwick (eds.), *Ecology and Behavior of Food-Enchanced Primate Groups* (pp. 79-94). New York: Alan R. Liss.

Karyawati, A.M. 2012. Tinjauan umum tingkah laku makan pada hewan primata. *Jurnal Penelitian Sains,* 15(1), 44-47.

Kurnia, I. 2003. Studi Keanekaragaman Jenis Burung untuk Pengembangan Wisata *Birdwatching* di Kampus IPB Dramaga [Unpublished Mini-Thesis]. Institut Pertanian Bogor, Bogor.

Mansur, I., & Tuheteru F.D. 2010. *Kayu Jabon*. Jakarta: Penebar Swadaya.

Muchtiarsyah, D.M. 2019. Distribusi, Populasi, dan Gangguan Monyet Ekor Panjang (*Macaca fascicularis,* Raffles 1821) di Kampus IPB Dramaga [Unpublished Mini-Thesis]. Institut Pertanian Bogor, Bogor.

Mulyani, Y.A. 1985. Studi Keanekaragaman Jenis Burung di Lingkungan Kampus IPB Dramaga [Unpublished Mini-Thesis]. Institut Pertanian Bogor, Bogor.

Neu, C.W., Byers, R., Peek, J.M. 1974. A technique for analysis of utilization-availability data. *The Journal of Wildlife Management*, 38(3), 541-545.

Oriza, O., Setyawati, T.R., Riyandi. 2019. Gangguan monyet ekor oanjang (*Macaca fascicularis*) sekitar pemukiman di Desa Tumuk Manggis dan Desa Tanjung Mekar, Kecamatan Sambas, Kalimamtan Barat. *Jurnal Protobiont,* 8(1), 27-31.

Pahan, I. 2008. *Kelapa Sawit: Manajemen Agribisnis dari Hulu hingga Hilir*. Jakarta: Penebar Swadaya.

Pasagi, J.R. 2014. Analisis Hubungan Kekerabatan pada Belimbing (*Averrhoa carambola* L.) Melalui Pendekatan Morfologi [Unpublished Mini-Thesis]. Universitas Airlangga, Surabaya.

Prinando, M. 2011. Keanekaragaman Spesies Tumbuhan Asing Invasif di Kampus IPB Dramaga, Bogor [Unpublished Mini-Thesis]. Institut Pertanian Bogor, Bogor.

Putra, A.R.A., Lelana, R.P.A., Darusman, H.S. 2017. Kajian one health: perilaku makan dan preferensi pakan monyet ekor panjang (*Macaca fascicularis*) di hamparan sampah pasar Ciampea Bogor sebagai potensi penyebaran zoonosis. *Jurnal Primatologi Indonesia,* 14(2), 8-14.

Quinda, B., Kanedi, M., Nurcahyani, N., Panjaitan, R.H.P. 2013. Studi tumbuhan sumber pakan monyet ekor panjang (*Macaca fascicularis*) di Kawasan *Youth Camp* Taman Hutan Raya Wan Abdul Rachman Lampung. *Jurnal Ilmiah: Biologi Eksperimen dan Keanekaragaman Hayati,* 1(1), 44-47.

Rahmawati, I., Basyir, I.H., Tiarasari, U.P., Octifani, L., Choirunnisa, A. 2014. Potensi Gangguan Monyet Ekor Panjang (*Macaca fascicularis*) Ditengah Upaya Pelestarian Satwa pada Habitat yang Didominasi Manusia [Unpublished Report]. Institut Pertanian Bogor, Bogor.

Risdiyansyah, Harianto S.P., Nurcahyani, N. 2014. Studi populasi monyet ekor panjang (*Macaca fascicularis*) di Pulau Condong Darat Desa Rangai Kecamatan Ketibung Kabupaten Lampung Selatan. *Jurnal Sylva Lestari,* 2(1), 41-48.

Rizaldy, M.R., Haryono, T., Faizah, U. 2016. Aktivitas makan monyet ekor panjang (*Macaca fascicularis*) di Hutan Nepa Kabupaten Sampang Madura. *LenteraBio: Berkala Ilmiah Biologi*, 5(1), 66-73.

Safitri, S. 2017. Keanekaragaman Jenis Pakan dan Populasi Monyet Ekor Panjang (*Macaca fascicularis* Raffles, 1821) di Kawasan Suaka Margasatwa Muara Angke dan Hutan Lindung Angke Kapuk [Unpublished Mini-Thesis]. Institut Pertanian Bogor, Bogor.

Sajuthi, D., Astuti D.A., Perwitasari, D., Iskandar, E., Sulistiawati, E., Suparto, I.H., Kyes, R.C. 2016. Kajian Populasi, Tingkah Laku, Status Nutrien, dan Nutrisi untuk Model Penyakit. Di dalam: D. Sajuhti & D.A. Astuti (Eds.), *Hewan Model Satwa Primata Volume 1 Macaca fascicularis* Bogor: IPB Press.

Sari, D.D. 2009. Profil Darah Monyet Ekor Panjang (*Macaca fascicularis*) yang Diberi Pakan Berenergi Tinggi pada Periode Obesitas Empat Bulan Kedua [Unpublished Mini-Thesis]. Institut Pertanian Bogor, Bogor.

Sembiring, R.P, Setiawan, A, Darmawan, A. 2016. Penyebaran dan kelimpahan populasi monyet ekor panjang (*Macaca fascicularis*) di Cagar Alam Sibolangit. *Jurnal SylvaLestari.* 4(3), 47-58.

Sukri M. 2015. Populasi dan Habitat Monyet Ekor Panjang (*Macaca fascicularis*) di Cagar Alam Dungus Iwul Kabupaten Bogor [Unpublished Mini-Thesis]. Institut Pertanian Bogor, Bogor.

Sutrisno Y. 2018. Kondisi Populasi dan Aktivitas Harian Monyet Ekor Panjang (*Macaca fascicularis* Raffles, 1821) di Kampus IPB Dramaga [Unpublished Mini-Thesis]. Institut Pertanian Bogor, Bogor.

Ulfah, D, Thamrin, A.R., Natanel, T.W. 2015. Pengaruh waktu penyadapan dan umur tanaman karet terhadap produksi getah (lateks). *Jurnal Hutan Tropis*. 3(3), 247-252.

Wahyu, K.G.W., Watiniasih, N.L., Ginantra, I.K. 2014. Aktivitas harian kera ekor panjang (*Macaca fascicularis*) di Raman Wisata Alam Sangeh, Kabupaten Badung, Bali. *Jurnal Biologi.* 18(1), 14-18.

Widiyanti, D.R. 2001. Aktivitas Harian Monyet Ekor Panjang (*Macaca fascicularis*) dan Pengaruhnya Terhadap Pengelolaan Lahan Hutan Rakyat, Studi Kasus di Dusun Nyemani, Desa Sidoharjo, Kabupaten Kulon Progo, Yogyakarta [Unpublished Mini-Thesis]. Institut Pertanian Bogor, Bogor.