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NUTRITION OF PROBOSCIS MONKEYS (NASALIS LARVATUS) FEED SOURCES AT BAKUT ISLAND NATURE PARK

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ABSTRACT

Proboscis monkey (*Nasalis larvatus*) is a type of primate that is selective for its food. They choose food sources according to the nutrients their bodies need. When food sources are running low, proboscis monkeys will look for other low-nutrient food sources to eat. This research aims to analyze the nutrition of proboscis monkey feed sources in Bakut Island Nature Park. The data collection technique used a test sampling method in the field in the form of plant parts eaten by proboscis monkeys. Then the sample material was brought to the laboratory for proximate analysis to determine the content of water, ash, crude protein, crude fat, crude fiber, and carbohydrates. The results showed that there were eight vegetations that became the source of proboscis monkey's food. The composition of the feed that consumed the most was leaf shoots with 80% and fruit with 20%. The proximate test results show that the water content is the parameter that has the highest value from the other parameters in the entire sample. Tambal Ulang has the highest water content, which is 78.05%. The highest carbohydrate content was found in banyan leaves at 42.88%, the highest protein content was in hibiscus leaves at 6.94%. Banyan leaves have the highest crude fiber content of 8.33%. The highest ash content was hibiscus leaves at 4.61%. Ketapang leaves have the highest fat content of 0.61%.

KEY WORDS

Proboscis monkey, nutrition, Bakut Island.

Proboscis monkeys since 2011 have been categorized as endangered by the International Union for Conservation of Nature and Natural Resources – IUCN, this species is listed as Appendix I in CITES (01/07/1975). Proboscis monkeys have experienced a 50-80% population decline in the last 36-40 years (Atmoko, 2012). One of the sources of the scarcity of proboscis monkeys is the continuous decrease of the proboscis monkey's natural habitat due to land clearing or conversion. As a result of this damage, the diversity of proboscis monkey feed sources is decreasing. To survive in the wild, proboscis monkeys require the availability of abundant feed in order to maintain their sustainability. In addition, the existence of proboscis monkeys is very dependent on the quality of the wetland ecosystem, especially mangroves and river border forests (Bismark, 2010).

Proboscis monkeys are a type of primate that is selective in their feed. The food source chosen by proboscis monkeys is according to the nutrients their bodies need (Matsuda et al., 2013). The part of the plant that proboscis monkeys consume the most is the leaf buds by



94%, while the flower and fruit parts are 3% each (Yokassye, 2019). When food sources are running low, proboscis monkeys will look for other low-nutrient food sources to eat. If the feed is not available or less than the required amount, there may be a shift to find new areas where there is a large amount of feed available. If the place to move is not possible for several reasons, proboscis monkeys will be forced to eat food that is limited in availability at that location. This will cause several consequences, namely declining health conditions, hunger which can cause disruption to the growth and reproduction of proboscis monkeys, death, population decline, and can even cause extinction.

This research has a goal to be achieved, namely to analyze the nutrition of proboscis monkey feed sources in Bakut Island Nature Tourism Park. Attention to primates, especially the proboscis monkey (*Nasalis larvatus*) in the Bakut Island Nature Park, which is relatively less encouraging for this research, given the conservation and ecological status of the proboscis monkey (*Nasalis larvatus*) which is highly dependent on its habitat and the availability of food in the form of leaves, fruit, flowers, shoots, seeds and bark, as well as diurnal (animals/plants that are active during the day) and arboreal (animals that live in trees) whose crowns coincide with the canopy of other trees.

METHODS OF RESEARCH

The research was conducted in October - December 2021. This research took place at the Bakut Island Nature Tourism Park, Anjir Muara District, Barito Kuala Regency. The time span of the research includes collecting literature references, requesting data to the BKSDA of South Kalimantan Province, field observations and taking test samples and testing test samples at the Animal Husbandry Laboratory, Faculty of Agriculture, Lambung Mangkurat University. The object of research is the nutrition of proboscis monkeys in the Bakut Island Nature Tourism Park (TWA). The equipment used during the study included binoculars, Global Positioning System (GPS), Camera, Compass, Plastic Bags, Label Paper, Laptop. The materials used are test samples/simplicia and chemicals for the proximate test.

The initial data source was obtained from the Natural Resources Conservation Center (BKSDA) of South Kalimantan Province regarding the number and types of vegetation as proboscis monkey feed sources. The data collection technique used a test sampling method in the field in the form of plant parts consumed by proboscis monkeys such as leaves, fruit, seeds, twigs on each sample tree to determine the nutritional content of each part eaten by proboscis monkeys. Then the feed samples were taken to the Agricultural Laboratory of Lambung Mangkurat University for proximate analysis to determine the content of water (moisture), ash, crude protein, crude fat (ether extract), and nitrogen free extract materials on the proboscis monkey (*Nasalis larvatus*) feed source.

RESULTS AND DISCUSSION

The behavior of proboscis monkeys in TWA Bakut Island when eating is known to prefer young leaf shoots and small fruits such as fruit on wild trees and banyan trees. Proboscis monkeys start their meal first by eating the tops of the leaves and choosing young leaves as a priority. According to Anda et al (2018), it was found that the part that proboscis monkeys eat the most are the young leaves or shoots, followed by the old leaves. Proboscis monkeys consume the leaf shoots by first holding the stem and branch of the leaves, and pull 4-6 leaves using their hand (dominantly using the left hand) after that it is eaten and the stem or branch is removed. When the leaf shoots are thought to be sufficient, the proboscis monkey will choose fruits as a distraction option.

Based on Mawah et al (2015) explained that proboscis monkeys use all canopy strata (ground surface, bottom, middle, and top) of forage plants as a place for feeding activities, namely the canopy soil surface (herbs under 5 meters high), the bottom (plants below 5 meters in height), meters), the middle of the canopy (plants with a height of 5-10 m above ground level), and the upper part of the canopy (plants with a height of 10-15 m above



ground level). However, proboscis monkeys were more often seen in the middle tree canopy between 5 – 10 m while feeding on *Sonneratia caseolaris* trees.

Species diversity is a level characteristic within a community based on its biological organization, which can be used to express the community structure. A community is said to have high diversity if the community is composed of many species (types) with the same and almost the same species abundance. Conversely, if a community is composed of a few species and if only a few species are dominant, then the species diversity is low (Umar, 2013).



Image 1 – Eating Activity of Proboscis Monkey (*Nasalis larvatus*)

The diversity of plant species in animal habitats determines the potential and types of feed, including eating behavior which ultimately determines the population of these animals in nature. Bakut Island Nature Park with mangrove habitat in the south is dominated by *Sonneratia caseolaris* (Rambai Laut) and in the north is dominated by *Gluta velutina* (Rengas). The results of the research on vegetation structure found as species composition contained 23 families and 27 species, as shown in Table 1.

Table 1 – Composition of Vegetation Types in TWA Bakut Island

No.	Family	Species Name	Local Name	Amount
1.	Cyperaceae	<i>Scleria oblate</i>	Hiring-hiring	102
2.	Achantaceae	<i>Acanthus ilicifolius</i> L.	Jeruju	356
3.	Amaryllidaceae	<i>Hymenocallis littoralis</i>	Bakung Cirit	356
4.	Marantaceae	<i>Donax canniformis</i>	Bamban	33
5.	Verbenaceae	<i>Avicenna marina</i>	Api-api Putih	457
6.	Fabaceae	<i>Tamarindus indica</i>	Asam Kamal	17
7.	Araceae	<i>Caladium</i>	Keladi	23
8.	Pteridaceae	<i>Acrostichum aureum</i>	Paku Laut/Piai	185
9.	Myristicaceae	<i>Horsfieldia crassifolia</i>	Mandarahan	18
10.	Malvaceae	<i>Hibiscus tiliaceus</i> L.	Waru Laut	43
11.	Lythraceae	<i>Sonneratia alba</i>	Perepat	29
12.	Liliaceae	<i>Hymenocallis littoralis</i>	Bakung	53
13.	Pontederiaceae	<i>Eichhornia crassipes</i>	Eceng Gondok	2
14.	Combretaceae	<i>Lumnitzera racemosa</i>	Teruntum	59
15.	Rhizophoraceae	<i>Ceriops</i>	Tengar	24
16.	Euphorbiaceae	<i>Excoecaria agallocha</i>	Buta-but	12
17.	Verbenaceae	<i>Premna serratifolia</i> L.	Buas-buas	16
18.	Lecythidaceae	<i>Barringtonia acutangula</i>	Putat	7
19.	Apocynaceae	NN	Tambal Ulang	21
20.	Anacardiaceae	<i>Gluta velutina</i>	Rengas	434
21.	Moraceae	<i>Ficus benjamina</i>	Beringin	17
22.	Sonneratiaceae	<i>Sonneratia caseolaris</i>	Rambai	85
23.	Apocynaceae	<i>Cerbera manghas</i> L.	Bintaro	67
24.	Gentianaceae	<i>Fragraea retusa</i>	Kayu Bulan	31
25.	Combretaceae	<i>Terminalia catappa</i> L.	Ketapang	19
26.	Combretaceae	<i>Terminalia mantaly</i>	Ketapang Kencana	4
27.	Euphorbiaceae	<i>Hevea brasiliensis</i>	Karet	6
	Total			2476



After making observations, it can be concluded that of the 27 types of vegetation, 8 of them are sources of food consumed by proboscis monkeys. The food sources are in the form of trees and some are in the form of ferns. The vegetation species that are the source of proboscis monkeys' food and the parts they eat are described in Table 2.

Table 2 – Types of Proboscis Monkey Feed Sources in TWA Bakut Island

Type of Feed			
No	Local Name	Species	Parts Consumed
1	Rambai Laut	<i>Soneratia caseolaris</i>	Leaf Shoot
2	Ketapang Kencana	<i>Terminalia mantaly</i>	Leaf Shoot
3	Rengas Pendek	<i>Gluta velutina</i>	Leaf Shoot
4	Tambal Ulang	NN	Leaf Shoot
5	Piai/Paku Laut	<i>Acrostichum aureum</i>	Leaf Shoot
6	Waru	<i>Hibiscus tiliaceus</i>	Leaf Shoot
7	Buas-Buas	<i>Premna foetida</i>	Leaf Shoot and Fruit
8	Beringin	<i>Ficus benjamina</i>	Leaf Shoot and Fruit
Total			Leaf Shoot = 8 (Percentage = 80%) Fruit = 2 (Percentage = 20%)

The largest composition of the feed consumed by proboscis monkeys is the top of the leaf by 80%. The young shoots or leaves consumed by proboscis monkeys include Rambai, Ketapang Kencana, Rengas Pendek, Tambal Ulang, Piai/Sea Nails, Waru, Buas-buas and Banyan. As for fruits, proboscis monkeys consume fruit from the Buas-buas and Banyan trees with a composition of 20%. While other parts such as tree bark, stems and flowers are not consumed by proboscis monkeys. As stated by Zainudin and Rezeki (2016) the young leaves or shoots are the most preferred part by proboscis monkeys, this is because the young leaves or shoots contain more protein than other parts. The composition of proboscis monkey feed is influenced by the availability of food sources and the type of habitat they live in. The following is a comparison of the composition of proboscis monkey feed with different habitats in several studies presented in Table 3.

Table 3 – Comparison of Proboscis Monkey Feed Composition in Several Habitats

Feed Type	Peat Swamp Habitat (Yeager, 1989)	Mangrove Habitat (Bismark, 1994)	Rubber Forest Habitat (Soendjoto, 2005)	Bakut Island Mangrove Habitat (Pribadi, 2021)
Leaf	51.94%	81.4%	80.9%	80%
Fruit	6.80%	8.38%	6.80%	20%
Flower	11.68%	7.68%	11.30%	0%
Tree bark, Bugs, etc	2.80%	2.0%	0.95%	0%

Among the 8 proboscis monkeys (Table 3), the most preferred main food source for proboscis monkeys is Rambai Laut (*Soneratia caseolaris*). The Bakut Island Nature Park is dominated by Rambai plants along the outskirts of the island. The presence of a rambai tree increases the welfare of the proboscis monkey because that is where the proboscis monkey can find food sources and make it a sleeping tree. Proboscis monkeys choose the rambai tree as their sleeping tree because of their characteristics that grow taller than other surrounding vegetation to protect themselves from predators and humans.

Conducive habitat conditions are able to provide a source of food to meet the needs of both the quantity and quality of nutrients needed by proboscis monkeys and there is no illegal hunting in this location (BKSDA, 2018). It is necessary to review the nutrition of feed sources in TWA Bakut Island to evaluate whether the nutritional needs of proboscis monkeys have been met with the available feed source vegetation. The following are the results of a proximate test of the nutritional content of proboscis monkey feed sources in TWA Bakut Island:

There were 10 samples in total taken for testing the nutritional content, 8 of which were fresh leaf shoots and 2 were fresh fruit. This Proximate Test Parameter uses the AOAC



(2003) method. The analytical parameters obtained include moisture content, dry weight content, ash content, protein content, fat content, crude fiber content and carbohydrates.

Table 4 – Nutrient Content of Proboscis Monkey Feed Sources in TWA Bakut Island

Sample Code	Parts Taken	Analysis Perimeter						Carbohydrate Content (%)
		Water Content (%)	Dry Weight Content (%)	Ash Content (%)	Protein Content (%)	Fat Content (%)	Crude Fiber Content (%)	
Tambal Ulang	Leaf	78.05	21.95	1.71	3.64	0.21	4.47	16.39
Piai/Paku Laut	Leaf	76.46	23.54	2.68	6.02	0.45	4.46	14.39
Rengas Pendek	Leaf	58.34	41.66	1.85	6.51	0.35	5.19	32.95
Ketapang	Leaf	51.92	48.08	2.74	6.42	0.61	7.29	38.31
Rambai Laut	Leaf	51.69	48.31	4.57	3.19	0.23	5.24	40.32
Beringin	Leaf	48.50	51.50	3.84	4.53	0.25	8.33	42.88
Buas-buas	Leaf	52.58	47.42	2.74	6.43	0.31	6.29	37.94
Waru	Leaf	58.90	41.10	4.61	6.94	0.32	7.47	29.23
Buas-buas	Fruit	65.59	34.41	1.59	1.98	0.21	5.23	30.63
Beringin	Fruit	56.71	43.29	3.27	2.76	0.35	6.70	36.91

Table 5 – Nutritional Content of Proboscis Feeding Plants in TWA Bakut Island in Several Other Studies

No.	Feeding Plant Type	Testing Type					Source
		Water (%)	Ash (%)	Protein (%)	Fat (%)	Crude Fiber (%)	
1.	<i>Sonneratia caseolaris</i> (fruit)	84.76	8.40	9.21	4.82	-	3
2.	<i>Hibiscus tiliaceus</i> (leaf)	10.54	8.96	12.33	2.92	34.41	1
3.	<i>Centrosema molle</i> (leaf)	9.54	13.47	18.19	3.64	21.45	1
4.	<i>Cyperus malaccensis</i> (leaf)	11.42	10.67	9.84	0.71	30.83	1
5.	<i>Acrostichum aureum</i> (leaf)	11.88	8.77	14.25	0.79	25.37	1
6.	<i>Acanthus ilicifolius</i> (leaf)	72.32	5.03	43.83	0.58	44.72	2
7.	<i>Gluta renghas</i> (leaf)	9.27	4.68	3.66	1.18	23.85	1
8.	<i>Crinum asiaticum</i> (leaf)	8.75	4.85	9.91	1.32	28.30	1

Note: 1. Dharma & Styaningsih (2020); 2. Siagian (2018); 3. Manalu et al (2013).

The results of the proximate test showed that the highest carbohydrate content was found in banyan leaves at 42.88%. While the smallest carbohydrate content contained in Piai leaves is 14.39%. Protein is also an important nutrient for proboscis monkey growth. Among the proboscis monkey feed sources in Bakut Island which has the highest protein content is hibiscus (waru) leaf (6.94%). The smallest protein content is found in buas-buas fruit, which is only 1.98%. Moisture content is a parameter that has the highest value from other parameters in all samples. The water content contained in banyan leaves is at least 48.50%. Meanwhile, the water content in the tambal ulang leaves was the highest at 78.05%. The proboscis monkey chose a feed source with a large water content in order to meet the water needs of the proboscis monkey's body because during the observations it was not found that the proboscis monkey went down to the river to drink water.

The dry weight content of tambal ulang leaves was the smallest at 21.95% and the banyan leaf was the largest at 51.50%. The ash content of each sample was different from the least, namely buas-buas fruit at 1.59% and the most being hibiscus leaves at 4.61%. Meanwhile, the lowest fat content, namely tambal ulang leaves and buas-buas fruit, had the same content of 0.21% and Ketapang leaves had the highest fat content of 0.61%. Banyan leaf has the highest crude fiber content of 8.33%, while the lowest is piai leaf, which is 4.46%.

According to the test results, proboscis monkeys in TWA Bakut Island with mangrove habitats choose feed sources with high water and carbohydrate content. The results of research by Dharma & Setyaningsih (2020), Siagian (2018), and Manalu et al. (2013) showed that proboscis monkeys choose feed sources with high water and crude fiber content. The results of the research can be seen in Table 5.

Observations show that proboscis monkeys like to eat leaves from various types of plants, both tall plants (eg rambai) and understorey plants (eg piai) in accordance with Atomoko's (2012) statement. Eating a variety of plants is the proboscis monkey's effort to



maintain its nutritional needs. Proboscis monkeys have a digestive system that can absorb nutrients from the leaves as their main food supply. Inside the stomach are passages full of bacteria that digest cellulose. These bacteria help digest leaves and neutralize toxins in certain leaves.

CONCLUSION AND SUGGESTIONS

The proboscis monkey feed source in TWA Bakut Island contains nutrients with a high percentage of water and carbohydrates and is in accordance with the needs of proboscis monkeys. The most dominant plants consumed by proboscis monkeys are the leaves or young shoots of the rambai tree (*Sonneratia caseolaris*). Based on the test results, the shoots of rambai have a water content of 51.69%; carbohydrates 40.32%; 3.19% protein and 0.23% fat which means good.

Further research on the health, growth and reproduction of proboscis monkeys in TWA Bakut Island needs to be carried out to support the suitability of nutrition for feed sources with the needs of proboscis monkeys. Furthermore, for the Bakut Island TWA manager, it is hoped that they can maintain the abundance of food sources so that the proboscis monkeys feel comfortable living in their habitat, thereby reducing the risk of proboscis monkeys moving to other places that cause conflict with the community and reducing the risk of population decline due to the death of proboscis monkeys.

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