AL-KAUNIYAH: Jurnal Biologi, 16(2), 2023, 434-443
Website: http://journal.uinjkt.ac.id/index.php/kauniyah
P-ISSN: 1978-3736, E-ISSN: 2502-6720

FEED MANAGEMENT AND NUTRITIONAL STATUS OF GIBBONS (*Symphalangus Syndactylus* Raffles, 1821) AT TEGAL ALUR ANIMAL RESCUE CENTER, JAKARTA

MANAJEMEN PAKAN DAN STATUS GIZI OWA JAWA (*Symphalangus Syndactylus* Raffles, 1821) DI PUSAT PENYELAMATAN SATWA TEGAL ALUR, JAKARTA

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Submitted: 7 July 2023; Revised: 10 September 2023; Accepted: 12 September 2023

Abstract

Gibbon (*Symphalangus syndactylus* Raffles, 1821) is an endangered species of black long-armed ape that is protected by national and international regulations. This study aims to analyze feeding behavior, feed management and nutritional status of gibbons in Tegal Alur Animal Rescue Center. The study was conducted in March-July 2020, using focal animal sampling and ad libitum sampling methods to 6 individual gibbons. Food management data collection includes information on feeding and the amount of feed, while nutritional status includes physical characteristics of the body, anthropometry, and analysis of feed composition. The results showed that the feeding schedule for gibbons was in accordance with the feeding times of gibbons in nature. Tegal Alur PPS provides food in the form of nine types of fruit, two types of vegetables and one type of leaves. Gibbons at Tegal Alur PPS Alur Animal Rescue Center has met the amount of feed consumption according to body weight. The nutritional status based on anthropometry shows that the body weight of the gibbon is not in accordance with its natural habitat. Morphological observations showed that the gibbon's teeth and eyes were healthy, while some gibbons had hair loss and depigmentation.

***Keywords*:** Feeding behavior; Gibbon; Nutritional status; Tegal Alur Animal Rescue Center

Abstrak

Owa (Symphalangus syndactylus Raffles, 1821) merupakan spesies kera hitam lengan panjang yang terancam punah dan dilindungi oleh peraturan nasional dan internasional. Penelitian bertujuan untuk menganalisis perilaku makan, pengelolaan pakan, dan status gizi owa di Pusat Penyelamatan Satwa (PPS) Tegal Alur. Penelitian dilakukan pada bulan Maret-Juli 2020, dengan metode focal animal sampling dan ad libitum sampling pada 6 individu owa. Pendataan pengelolaan pakan meliputi informasi pakan dan jumlah pakan, sedangkan status gizi meliputi ciri fisik tubuh, antropometri, dan analisis komposisi pakan. Hasil penelitian menunjukkan bahwa jadwal pemberian pakan owa sesuai dengan waktu pemberian pakan owa di alam. PPS Tegal Alur menyediakan makanan berupa sembilan jenis buah, dua jenis sayuran dan satu jenis daun-daunan. Owa di Pusat Penyelamatan Satwa Tegal Alur telah memenuhi jumlah konsumsi pakan sesuai dengan berat badan. Status gizi berdasarkan antropometri menunjukkan bahwa berat badan owa lebih rendah dengan berat badan Owa di habitat aslinya. Pengamatan morfologi menunjukkan bahwa gigi dan mata owa dalam keadaan sehat, sementara beberapa owa mengalami kerontokan rambut dan depigmentasi.

***Kata Kunci**: Owa; Pusat Penyelamatan Satwa Tegal Alur; Perilaku makan; Status gizi*

Permalink/DOI: http://dx.doi.org/10.15408/kauniyah.v16i2.33624

INTRODUCTION

The gibbon (*Symphalangus syndactylus*) is a species of long-armed black gibbon protected by the Government Regulation of the Republic of Indonesia concerning the Preservation of Wild Plants and Animals and a priority endangered species based on the Decree of the Directorate-General of Natural Resources and Ecosystem Conservation Number: SK 180/IV-KKH/2015 (Ministry of Energy and Mineral Resources Republic of Indonesia, 2015). At the international level, the gibbon is included in *Appendix I* based on the Convention on International Trade in Endangered Species of wild fauna and flora (CITES) and categorized as critical status (Endangered) based on the International Union for Conservation of Nature and Natural Resources Red List (IUCN) 2016.

Various efforts have been made to overcome the increasing number of animal extinction in the wild. One of them is the establishment of the Animal Rescue Center, (named *Pusat Penyelamat Satwa*, PPS) in Bogor in July 2000, which is the result of a workshop on handling protected wildlife. The main objective of the Animal Rescue Center is to manage confiscated animals or voluntary handovers from the community to be cared for and rehabilitated to be released back into the wild (Yayasan Gibbon Indonesia, 2006). In the management effort, animal welfare is an important principle that must be considered by creating conditions in which the animal's life needs are met in accordance with their natural habitat.

One of the determinants of wildlife survival that plays a key role in animal management in animal rescue centers is feed (Akbar, 2011). The success of this conservation effort is supported by information on feeding behavior that adapts to the animal behavior in nature. Several studies on the feeding behavior and nutritional content of the gibbon feed at ex-situ conservation sites have been carried out, but none has paid attention to the nutritional status of the gibbon from their physical and anthropometric health conditions.

The Animal Rescue Center (PPS) of Tegal Alur Jakarta is the only ex-situ conservation site under the Jakarta Natural Resources Conservation Center (BKSDA) that manages the gibbon. Most of the gibbons are obtained from the confiscation by PPS officers or voluntary handovers from the community. The current gibbon management relies on general information on all animals in the PPS. Research related to feeding behavior, feed management, and nutritional status of the gibbon in the PPS needs to be carried out in the hope of supporting the survival of the gibbon per their behavior and needs.

MATERIALS AND METHODS

The research was carried out for five months from March to July 2020. The research location was in Tegal Alur PPS, Jakarta, precisely in the gibbon enclosure area. Data collection activities were carried out in the first three months, and the next two months were used for data processing and analysis activities.

The objects of this research were five adult male gibbons (Sapri, Pixy, Gigih, Mency, and Patrick) and one adult female (Noni). The age of adult gibbon refers to Santosa et al. (2010), which is over six years old. The gibbons were confiscated by the BKSDA and handed over from the community. The feeding behavior observed in this study was the palatability of the feed, namely the observation of the order and type of feed that was consumed. The most preferred type of feed by the gibbon was indicated by the amount of consumption of the type of feed. The order of feed intake was observed by looking at the type of feed that was first consumed by the gibbon to the type of feed that was last consumed by the gibbon.

Determining indicators of nutritional status were observed from physical characteristics, anthropometry, and analysis of feed composition. The observed physical characteristics of primates included physical signs on the body, posture, hair, and eyes of the gibbon. Following that was anthropometry, which is a method of determining nutritional status by measuring body size that reflects changes due to growth (Thamaria, 2017). Anthropometric data are presented in the form of body weight and height of the gibbon. An analysis of feed composition was carried out simultaneously with an observation of feeding behavior. An observation of the feed composition was followed by an analysis of the nutritional value and consumption of the feed. The data were

analyzed based on the Indonesian food composition table (The Indonesian Nutrition Association, named Persatuan Ahli Gizi Indonesia, 2008) using the formula for the nutritional consumption of each type of feed. The nutritional consumption of feed assessed consisted of consumption of energy, protein, fat, carbohydrates, and water.

Feed management data were collected during observations, which included feed distribution; feeding time; feeding method; type of feed, which includes groups of fruits, vegetables, insects, and others; and the amount of feed given and consumed (weight of each feed). The weight of the feed given in a day was weighed for each type and the rest of the feed that was still in the enclosure the next day was collected and weighed per type of feed (Rahman, 2011).

Data collection of the enclosure environment included the condition of the cage and the physical factors of the area around the cage. The condition of the gibbon enclosure included the size, base, feeding place, and cage bars. Physical factors measured included measurements of temperature, humidity, light intensity, and noise. Physical factors were recorded in the morning at 7:00 Western Indonesia Time (WIB), at noon at 12:00 WIB, and in the afternoon at 15.00 WIB.

Data Analysis

Daily activity analysis was carried out by describing all forms of activity that appeared in a catalog in the form of an ethogram. The percentage of activity for each individual is as follows, % activity= $\frac{x}{y}\ x\ 100\%$. The average amount of feed consumed per day and the difference between before and after feeding were calculated during the observation. The amount of consumption of each type of feed was calculated as follows, K= g_0-g_1.

The nutritional content of gibbon feed was obtained through secondary data. Information on nutritional content was obtained from the results of the proximate analysis in previous studies conducted by Rahman (2011). Proximate analysis is a chemical analysis to determine the content of food substances contained in food ingredients. The amount of nutrient consumption for each type of feed was calculated as follows K= $\frac{a\ x\ \%BDD\ x\ b}{100}$. The data that had been analyzed quantitatively were then analyzed descriptively in the form of tables and graphs/diagrams. The results were then translated into a sentence that explains and concludes the research results.

RESULTS

General Condition

The Tegal Alur Animal Rescue Center (PPS) is located on Benda Raya Street, Kalideres District, West Jakarta. The location of the animal enclosures, including the gibbon's, is located approximately 120 m from the main road. Enclosures adjacent to other primates usually trigger noises because the primates yell at each other. Other noises are caused by the sound of passing motorized vehicles, especially large ones. The gibbon feed is sourced from the feed kitchen, which is located at the back of the PPS area with a distance to the gibbon cage of about 10 m.

External factors that affect the daily activities of the gibbon include air temperature, humidity, noise, and light intensity. When the air temperature is high and the humidity is low, the gibbon will reduce its activities while in the cage and rest more, or just clean its body parts (grooming). The results of measurements of physical factors in the enclosure environment during observations show that the average air temperature is 31.05 ± 0.17 °C (morning), 31.50 ± 0.08 °C (noon), and 30.22 ± 0.09 °C (afternoon), while the average humidity is 66.29 ± 0.51% (morning), 64.79 ± 0.1% (noon), and 67.21 ± 0.91% (afternoon) (Table 1).

Table 1. Environmental factors

Time (WIB)	Temperature (°C)	Humidity (%)	Noise (dB)	Light intensity (Lux)
07.00	31.05 ± 0.17	66.29 ± 0.51	48.32 ± 0.35	5,185.43 ± 2,025.08
13.00	31.50 ± 0.08	64.79 ± 0.1	45.38 ± 0.06	3,642.04 ± 1,298.21
16.00	30.22 ± 0.09	67.21 ± 0.91	46.28 ± 1.26	2,314.89 ± 1,630.84

In general, the location of the enclosures at Tegal Alur PPS is close to other animals, which affects the activities of other animals, especially the gibbon. The enclosure system in Tegal Alur

PPS is generally made to allow air to enter and leave the cage so that the air ventilation is adequate. The ventilated enclosure ensures a continuous flow of air through the cage and around the animals (Tillman et al., 1991).

The feed provided consisted of 12 different types, with more types of fruits than vegetables and leaves (Table 2). This is because the gibbon is a frugivorous animal and most likely plays an important role in the seed dispersal process in its natural habitat (Santosa et al., 2010). Feeding in the form of foliage, namely papaya leaves (*Carica papaya*), is carried out in the afternoon. Sometimes male and female gibbons were observed to eat small insects around the walls of the cage, such as wall spiders (*Parasteatoda* sp.). This is appropriate because primates are generally omnivores (Dunbar & Cowlishaw, 2000).

Table 2. The feed of gibbon at Tegal Alur PPS

Grups	Local name	Species
Fruit	Pepaya	*Carica papaya*
	Jeruk	*Citrus sinensis*
	Semangka	*Citrullus lanatus*
	Timun	*Cucumis sativus*
	Pisang Lampung	*Musa paradisiaca*
	Pisang Kepok	*Musa cuminata balbisiana*
	Jambu biji	*Psidium guajava*
	Salak	*Salacca zalacca*
	Kacang panjang	*Vigna unguiculata* ssp.
Vegetables	Sawi	*Brassica chinensis*
	Wortel	*Daucus corota*
Leaves	Daun pepaya	*Carica papaya*

Table 3. Feed palatability rating

Feed		Palatability rate
Local name	Species	
Pisang Lampung	*Musa paradisiaca*	1
Pisang Kepok	*Musa cuminata balbisiana*	4
Sawi	*Brassica chinensis*	5
Timun	*Cucumis sativus*	9
Salak	*Salacca zalacca*	3
Wortel	*Daucus corota*	6
Jeruk	*Citrus sinensis*	7
Kacang panjang	*Vigna unguiculata* ssp.	10
Pepaya	*Carica papaya*	2
Jambu	*Psidium guajava*	8
Semangka	*Citrullus lanatus*	11

Feed Palatability

Based on the feed palatability rating, the gibbons in Tegal Alur PPS were very fond of lampung bananas, followed by papaya and salak, while watermelons were at the lowest level of preference. Most of the feed given in the morning and afternoon was finished by the gibbons. Sometimes the rest of the feed that fell under the cage was taken by the gibbons and then consumed again. In general, the gibbons at the research site seemed to like ripe fruits, followed by some types of vegetables (Table 3).

The Amount of Feed Consumption

The gibbon in Tegal Alur PPS consumed an average of 559.63 g per day with the remaining feed around 21.86 g (Table 4). During the observation, male gibbons consumed more feed than their

female counterpart. In general, male gibbons consume more food than female ones (Masy'ud & Ginoga, 2016).

Nutritional Status

Based on the observations, the gibbons in Tegal Alur PPS were about seven to nine years old. Male individuals had a heavier body weight than the female individual the physical data and posture of the gibbons during observation are presented in Table 5.

Table 4. Food consumption

Day-	Food weight (g)	Leftovers(g)	Weight eaten (g)	Consumption-percentage (%)
1	524.67	17.83	507.83	96.79
2	532.50	24.83	506.67	95.15
3	573.67	19.50	553.67	96.51
4	622.00	25.50	596.33	95.87
5	527.17	13.33	513.17	97.34
6	535.67	16.17	522.00	97.45
7	705.00	23.17	681.83	96.71
8	621.17	13.83	607.33	97.77
9	481.50	19.33	462.17	95.98
10	571.83	36.50	535.33	93.62
11	519.50	22.33	497.17	95.70
12	503.50	13.83	489.67	97.25
13	699.17	32.33	666.83	95.38
14	722.33	27.50	694.83	96.19
Total	8139.67	306.00	7834.83	1347.73
Average	581.40	21.86	559.63	96.27
Sd	76.99	6.78	73.93	1.03

Tabel 5. The physical data and posture of the gibbons

The physical data and posture	Gibbon's name Noni ♀	Sapri ♂	Pixy ♂	Gigih ♂	Mency ♂	Patrick ♂	
Placement year	2017	2016	2009	2009	2009	2016	
Age	9	7	7	8	8	7	(*adult*): >6]
Antropometri							
Hight (cm)	90	110	85	100	90	85	100 cm [2] 80–90 cm [3]
Body weight (kg)	5	6	5	6	6	5.5	Man adult min 6.8 kg. max 19.4 kg; female adult min 6.8 kg. max 15.7 kg [1] In the wild: man adult (11.9 kg); female adult (10.7 kg) [2] Ex-situ: man adult (12.8 kg); female adult (10.5 kg) [3]
Physical							
Eyes	Brown sclera. brownish black iris	Brown sclera. brownish black iris	Brown sclera. brownish black iris	Brown sclera. brownish black iris	Brown sclera. brownish black iris	Brown sclera. brownish black iris	Most primates have a brown or black screla [6]
Teeth	White & complete	White & complete	White & complete	Dull & complete	White & complete	White & complete	arrangement of teeth 2/2. 1/1. 2/2. 3/3:32 [4]
Hair	Black. depigmented. fall off and rarely	Black. thick	Black. depigmented	Black.thick	Black.thick	Black.thick	Hair grows: glossy black; Facial hair: brown [3]
Scar	-	-	On the head. left hand. left leg. right hip	-	On the right eye	On the right eye	No scars found [5]
Abnormal posture							
Rest	-	-	-	-	-	-	Hands, feet, and long fingers allow the gibbon to reach the cage cells and to make free swinging movements in nature/cage [5]
Brachiasi	Tremor of hands and feet	-	-	-	-	-	
Move	Tremor of hands and feet	-	-	-	-	-	

Reference: National Research Council (2003); Kuswanda et al. (2019); Gron (2008); Myers et al. (2000); NIDirect (2014a & b); Than (2006); Santosa et al. (2010)

DISCUSSION

The population of gibbon in Tegal Alur PPS was seven, consisting of six males and one female. Six gibbons were used in this study, namely five adult male gibbons (Sapri, Pixy, Gigih, Mency, and Patrick), one adult female gibbon (Noni). Several gibbons were suffering from diarrhea and were still in healing conditions. The condition for the gibbons to be the object of research was a healthy gibbon aged more than six years old. The healthy condition of the gibbon reduces the fear of disease transmission to the researchers and makes it easier for the researchers to see their daily activities. The health of the gibbon can be indicated by its normal daily activities, which means the gibbon will eat when it feels hungry, drink when it feels thirsty, urinate when it wants to urinate, and so on.

Some of the requirements needed in the maintenance of primates include good quality enclosures, specialist veterinary services, environmental enrichment, and various kinds of food and supplements (NIDirect, 2014a). One of the efforts made by the PPS managers in maintaining the welfare of the gibbon is to pay attention to the condition of the animals with routine check-ups every day (daily check-ups) and two times a year (periodic check-ups) by veterinarians and keepers. Daily check-ups are carried out by monitoring animals in the morning and afternoon, while periodic check-ups are carried out by measuring the physical health of the gibbons, analyzing their feces, and checking their blood. According to NIDirect (2014b), primates are good at hiding physical signs. Therefore, recognizing a good physical condition and normal behavior when they are healthy will help find early signs of abnormal behavior that worsen their physical health so that necessary actions can be taken.

The aspect of animal health is one of the things that was observed in the research of Yohanna et al. (2014) on the Javan gibbon, which is a family of the gibbon at the *Javan Gibbon Center* (JGC). Some of the observed aspects of the health management of the Javan gibbon include at least the inspection of feces, wounds, vaccinations, cleanliness of enclosures, and prevention of disease transmission to animal managers. The JGC did not schedule routine checks on the feces of the Javan gibbons, but it was mentioned that some gibbons' health conditions were known through their feces.

The main feed for the gibbon at Tegal Alur PPS is given three times a day at 07:00 WIB, 13:00 WIB, and 15:00 WIB. Feeding by the PPS manager is following the timing of gibbon feeding at the International Center for Gibbon Studies, California, which is three times a day around 07:00, 10:30, and 14:30 (Mootnick, 1997). Animal feed supply at PPS is carried out twice a day with various variations of feed. All feed supplies for the animals are placed in the feed pantry and storage boxes for meat-type feed. The provision of water in drinking bottles is only carried out on the female gibbon individuals by ad libitum so that water is always available. Feed for gibbon in the morning and at noon is given in a permanent feeder right in front of the cage, while the feed in the afternoon is placed on top of the cage in the form of leaves. Placing feed above the cage has supported the gibbon to carry out its feeding activities as in its natural habitat, while the location of the permanent feeder position under the cage sometimes prevents the gibbon from eating according to its natural behavior. According to Rosyid (2007), as an arboreal animal, the gibbon eats their food in trees.

The level of feed palatability was influenced by the texture, aroma, color, and taste of the given feed. Based on observations, the fruits that the gibbons liked had a variety of colors and flavors, such as bananas and papayas. This is in accordance with Rosyid (2007) that the main food preferred by the gibbon in nature is ripe fruit. The fruits that are fully consumed by the gibbon generally have an attractive color and a fairly good taste, are sweet, sour, and pulpy (Atmanto et al., 2014).

All gibbons have a fairly high appetite. which is indicated by the average consumption percentage value above 90%. A high appetite indicates good health in gibbons because according to Masy'ud and Ginoga (2016), the animal's health condition is influenced by the amount of feed consumption. Based on the bodyweight of the gibbons in Tegal Alur PPS which ranged from 4–6 kg, the amount of food consumption meets at least 10% of the bodyweight, which is 400–600 g.

According to Elly et al. (2013). the need for animal feed is 10% of their body weight. Alikodra (1990) added that the level of consumption of wild animal feed can be determined from the value of its bodyweight since they require food of around 10–20% of its body weight every day. According to Santosa et al. (2010) the male gibbon's body weight is indeed physically greater than that of the female. The age of all gibbons was presented as an adult group in the growth phase. Starting from infancy at birth to 2–3 years old. then childhood (juvenile-1) at the age of approximately 2–4 years old, young (juvenile-2) at the age of approximately 4–6 years old, sub-adult starting at the age of 6 years old, and adults past the age of six years old. The bodyweight of gibbons in Tegal Alur PPS ranged from 5–6 kg. Anthropometric standards for assessing the nutritional status of primates currently do not exist. Therefore, an approach was taken by comparing the body weight and height of the gibbon based on the literature. Some adult male gibbons in the wild are known to weigh an average of 11.9 kg and 10.7 kg for females (Kuswanda et al., 2019). The results of the survey in captivity showed that the average weight of adult males is 12.8 kg and the average weight of the females is 10.5 kg (Gron, 2008). The bodyweight of the gibbons at the study site had a difference of about 5–6 kg compared to samples in nature and captivity.

Self-grooming is a normal primate behavior characterized by self-cleaning activities such as scratching and hair-licking. Excessive self-care can cause stress, which can make primate hair fall out and cause skin injuries. Thick black hair color is a sign of a healthy and normal gibbon. The gibbon's hair is black and slightly dark gray between its chin and mouth (Palombit, 1997). Based on this statement Sapri, Gigih, Mency, and Patrick showed normal hair conditions. While Noni and Pixy had slightly different hair conditions, namely depigmentation and hair loss. Hair loss can reduce the function of the hair itself, namely as a protector from external attacks and body warmers. Gibbons with hair loss and depigmentation could be under stress or have certain diseases such as achromotrichia. According to National Research Council (2003), achromotrichia in several types of mammals is caused by an excess of zinc causing Cu deficiency. Gron (2008) added that hair loss in capuchin monkeys (*Cebus albifron*s) is caused by a lack of vitamin B6.

Morphological observations showed that the gibbons in Tegal Alur PPS had a complete set of teeth. which were 32 and appeared to be clean. The gibbon has a tooth arrangement of 2/2, 1/1, 2/2, 3/3= 32 (Myers et al., 2000) with the basic function of collecting and chewing food (Karyawati, 2012). In addition, healthy eyes are a sign of physical health in primates. Healthy vision in the gibbon's eyes at the study site was indicated by the response of the eyes when there was movement in front of the enclosure, such as the passing of a keeper or a researcher. Based on morphological observations, the eyes of all gibbons had brown sclera and black-brown irises. This is in accordance with Than (2006), that most primates have a uniform brown or black scleral coloration, so it is quite difficult to determine the direction they see from their own eyes.

Physical discomfort in primates can be seen from abnormal signs. such as loss of appetite. Unresponsiveness, self-harm, and unusual posture. The results in Table 5, show that there was an unusual body posture in the female gibbon (Noni). During the observation, Noni's posture while eating, hanging, and standing showed shaking hands and feet. The condition experienced by Noni is thought to be due to her old age and long placement at Tegal Alur PPS. The long structure of the arms, legs, and fingers should allow the gibbon to reach the cage cells for swinging movements similar to those performed in tree crowns (NIDirect, 2014). They continued, primates that are aging and have problems with movement may suffer from arthritis or as a result of aging (NIDirect, 2014).

CONCLUSION AND SUGGESTIONS

The gibbons in Tegal Alur PPS are fed three times a day, approximately at 07:00 WIB, 13:00 WIB, and 15.00 WIB. Tegal Alur PPS provides feed in the form of nine types of fruit, two types of vegetables, and one type of foliage. The feed is given sliced and in whole and then placed in the gibbon's permanent feed. Vitamins are given once a week. The gibbons in Tegal Alur PPS have fulfilled the amount of feed consumption according to their body weight. The nutritional status based on anthropometry shows that the bodyweight of the gibbon is not in accordance with its

natural habitat. Morphological observations show that the teeth and eyes of the gibbons are healthy, while some gibbons have hair loss and depigmentation. Consumption of nutrients in the form of protein and fat in all gibbons has not met the standard requirements.

Need to add insects and types of leaves in the food of gibbons at the Tegal Alur Animal Rescue Center. Profiles and Animal physical health needs to be carried out periodically to find abnormal behavior that worsens physical health.

ACKNOWLEDGEMENTS

We gratitude to Tegal Alur Animal Rescue Center for facilitating this research.

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