

## **Feeding Behavior of The Timor Deer (*Cervus Timorensis*) at The Tasikoki Wildlife Rescue Center, Bitung City, North Sulawesi**

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*Received: March 11, 2026*

*Revised: March 26, 2026*

*Accepted: March 30, 2026*

*Published: April 6, 2026*

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**Abstract:** The Timor deer is an endemic species of Indonesia that is classified as vulnerable according to the IUCN Red List. The Tasikoki Animal Rescue Center (PPST) in Bitung City, North Sulawesi, needs to understand feeding behavior in order to support management and breeding success. This study aims to analyze the feeding behavior of Timor deer, including foraging, picking up and putting food into the mouth, chewing, swallowing, and ruminating at various times at the PPST, as well as measuring the frequency and duration of feeding activities and the deer's response to the food provided. Data collection was carried out using the scan sampling method through direct observation in the field and CCTV monitoring. The study was conducted over 10 days with an observation duration of 12 hours per day (06.00–18.00 WITA) with recording intervals of every 10 minutes. Before observation, a 3-day habituation period was conducted to minimize disturbance to the deer's natural behavior. Data on feed types were obtained through the drop-in method and identification of the feed parts most preferred by deer. The data were then analyzed descriptively. The results showed that deer had preferences for certain feed types and parts. In terms of forage, deer preferred cassava leaves and stems (*Manihot esculenta*), green cabbage (*Brassica oleracea*), and castor bean (*Ricinus communis*), while only the leaves of gamal (*Gliricidia sepium*) were consumed and the leaves, flowers, and stems of lamtoro (*Leucaena leucocephala*) were eaten. Chewing is the dominant behavior in males, females, and juveniles, while swallowing has the lowest percentage. Differences in frequency between individuals reflect variations in energy requirements based on sex and age.

**Keywords:** Timor deer; feeding behavior; Timor deer feed; Scan sampling; PPST

### **Introduction**

The Timor deer (*Cervus timorensis*) is one of Indonesia's endemic deer species that plays an important role in maintaining vegetation balance in the ecosystem because it is herbivorous and eats various types of plants such as leaves and grass (Kayat et al., 2017). In addition, the Timor deer has the potential to be conserved and cultivated because it has economic value and a high ability to adapt to its environment (Toelle et al., 2015).

The current conservation status of the Timor deer is that it is a protected species in Indonesia and is categorized as vulnerable according to the International Union for Conservation of Nature (IUCN) Red List. The decline in the wild Timor deer population is mainly due to uncontrolled poaching and increasing habitat destruction (Riyadi et al., 2021).

Efforts to conserve Timor deer can be carried out through ex-situ conservation, which involves keeping animals outside their natural habitat through breeding programs or animal rescue centers. One of the institutions involved in these efforts is the Tasikoki Animal Rescue Center (PPST) in Bitung City, North Sulawesi. The success of animal management in captivity

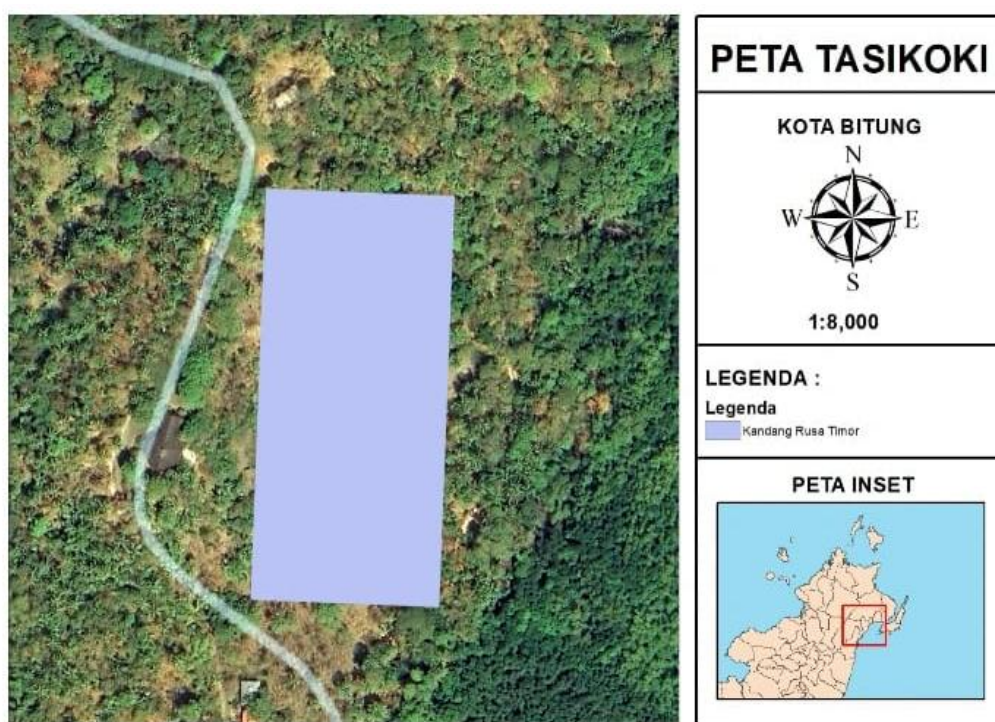
is greatly influenced by an understanding of the diet and feeding patterns of the animals being kept (Nurhayati et al., 2020).

The feeding behavior of Timor deer is an important aspect that needs to be studied because it is related to energy requirements, environmental adaptation, and the physiological condition of individuals. Feeding behavior can vary based on age, sex, and environmental conditions, with adult male deer tending to rest more, while young deer are more active in feeding activities (Romansah et al., 2024). Therefore, research on the feeding behavior of Timor deer in the PPST is important to obtain scientific information that can support the management and conservation efforts of this species.

## Method

### *Time and Place of Research*

This research was conducted in October 2025 at the Tasikoki Animal Rescue Center in Bitung City, North Sulawesi Province (**Figure 1**).



**Figure 1. Research location**

### *Tools and Materials*

The tools and materials used in this study were: writing instruments, Camera, CCTV, Telescope

### *Research procedures*

#### Research Subjects

The subjects of this study were male Timor deer, female Timor deer, and juvenile Timor deer.

### Techniques for collecting data on Timor deer feeding activities

The method used to observe feeding behavior was scan sampling, which is a technique for observing animal behavior by recording the most frequently occurring activities within a specified time period (Sofyan et al., 2018). The variables related to feeding activity that were observed and recorded included selecting food, picking up and putting food into the mouth, chewing, swallowing, and ruminating, as described by Aminullah et al. (2022). The study was conducted over 10 days of observation, for 12 hours starting at 06.00-18.00 WITA, recording the frequency and duration at 10-minute intervals. Habituation was carried out for 3 days by the researchers with Timor deer to prevent changes in deer behavior during observation (Putra et al., 2017).

### Data Collection Techniques for Timor Deer Feed at PPST

Data obtained from Timor deer feed at PPST is sourced from the type of feed provided on a drop-in basis and the parts most preferred or selected by Timor deer (*Cervus timorensis*) at PPST. This data is analyzed descriptively (Sari et al., 2022).

### Data analysis

Quantitative data obtained through analysis of Timor deer feeding behavior, such as feed selection, picking up and putting feed into the mouth, chewing, swallowing, and rumination, as well as the duration of each type of deer feeding behavior during observation (Putri et al., 2023). Behavioral data categorized based on observation time (morning, afternoon, and evening) conducted over 12 hours. The results of the calculations are presented in graphs and tables (Withaningsih et al., 2020). The percentage of Timor deer feeding behavior per individual can be calculated using the Martin and Bateson (1988) formula:

$$\% \text{ Behavior} = \frac{\text{Frequency of Behavior (X)}}{\text{Total Frequency of Behavior (Y)}} \times 100\%$$

The duration of Timor deer feeding activities was calculated by multiplying the frequency of each behavior by the 10-minute observation interval. This method was used to estimate the total time allocated by Timor deer to each type of feeding activity, thereby obtaining an analysis of behavior patterns based on the division of time into morning, afternoon, and evening.

## Results and Discussions

### Results Frequency and duration of Timor deer feeding activity

The results shown in **Table 1** below provide information on the frequency and duration in minutes of Timor deer feeding behavior at various times (morning, afternoon, evening) during 10 days of observation. Observations were conducted from 06:00 to 10:00 in the morning, 10:10 to 14:00 in the afternoon, and 14:10 to 18:00 in the evening.

**Table 1.** Timor deer male feeding behavior data

Behavior	Morning			Midday			Afternoon		
	Freq	Dur. (min)	%	Freq	Dur. (min)	%	Freq	Dur. (min)	%
Selecting feed	58	580	36,25 %	46	460	21,20%	36	36	20%
Inserting feed into mouth	5	50	3,13%	41	410%	18,89%	6	60	3,33%
Chewing	24	240	15%	127	1270	58,53%	47	47	26,11%
Swallowing	1	10	0,63%	3	30	1,38%	0	0	0%
Ruminating	72	710	45%	0	0	0%	91	910	50,56%

Based on the results in **Table 2**, the feeding activity of male Timor deer showed clear variations in frequency and duration between observation times. In the morning, rumination had the highest frequency of 72 times with a duration of 710 minutes and a percentage of 45%, followed by foraging 58 times with a duration of 580 minutes and a percentage of 36.25%. This indicates that in the morning, male Timor deer tend to ruminate during the early stages of active feeding. In the afternoon, chewing behavior became the dominant activity with a frequency of 127 times, a duration of 1270 minutes, and a percentage of 58.53%, while rumination behavior was not observed.

**Table 2.** Timor deer female feeding behavior data

Behavior	Morning			Midday			Afternoon		
	Freq	Dur. (min)	%	Freq	Dur. (min)	%	Freq	Dur. (min)	%
Selecting feed	55	550	32,35%	50	500	24,39%	51	510	28,65%
Inserting feed into mouth	17	170	10%	37	370	18,05%	17	170	9,55%
Chewing	48	480	28,24%	94	940	45,85%	73	730	41,01%
Swallowing	0	0	0%	5	50	2,44%	4	40	2,25%
Ruminating	50	500	29,41%	19	190	9,27%	33	330	18,54%

Female Timor deer show relatively more consistent feeding activity compared to male deer. In the morning, the main activities are browsing, with a frequency of 50 times, a duration of 500 minutes, and a percentage of 29.41%, and chewing, with a frequency of 48 times, a duration of 480 minutes, and a percentage of 28.24%. At noon, chewing behavior dominated with a frequency of 94 times, a duration of 940 minutes, and a percentage of 45.85%, followed by foraging behavior with a frequency of 50 times, a duration of 500 minutes, and a percentage of 24.39%. This indicates an increase in active feeding activity during the afternoon. In the afternoon, chewing behavior continued to dominate with a frequency of 73 times, a duration of 730 minutes, and a percentage of 41.01%, while rumination had a moderate frequency of 33 times, a duration of 330 minutes, and a percentage of 18.54%.

**Table 3.** Timor deer juvenile feeding behavior data

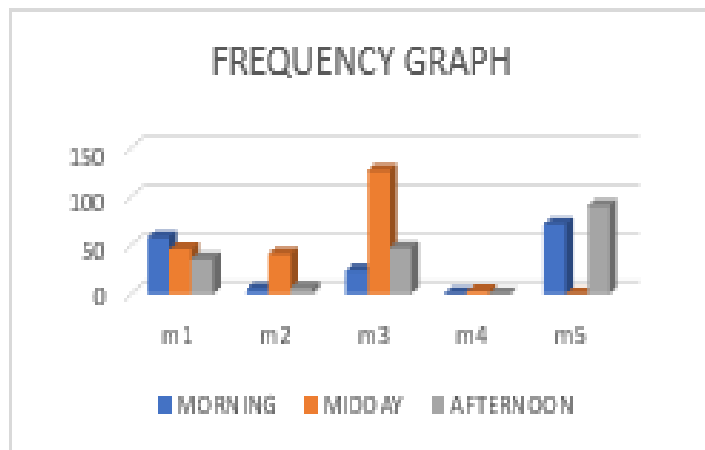
Behavior	Morning			Midday			Afternoon		
	Freq	Dur. (min)	%	Freq	Dur. (min)	%	Freq	Dur. (min)	%
Selecting feed	62	620	36.05%	49	490	24.02%	50	500	28.90%
Inserting feed into mouth	16	160	9.30%	40	400	19.61%	24	240	13.87%
Chewing	62	620	36.05%	87	870	42.65%	74	740	42.77%
Swallowing	1	10	0.58%	3	30	1.47%	0	0	0%
Ruminating	31	31	18.02%	25	250	12.25%	25	250	14.45%

Juvenile Timor deer show a tendency toward higher active feeding activity (**Table 3**). In the morning, foraging and chewing behaviors occur at the same high frequency of 62 times, with a duration of 620 minutes each and a percentage of 36.05%. In the afternoon, chewing behavior became dominant with a frequency of 87 times, a duration of 870 minutes, and a percentage of 42.65%, followed by feeding behavior with a frequency of 40 times, a duration of 400 minutes, and a percentage of 19.61%. Meanwhile, in the afternoon, chewing behavior remained dominant with a frequency of 74 times, a duration of 740 minutes, and a percentage of 42.77%. The rumination behavior of juvenile deer had a lower frequency and percentage

compared to males and females, which may be related to the growth phase that requires more intensive direct feeding activities.

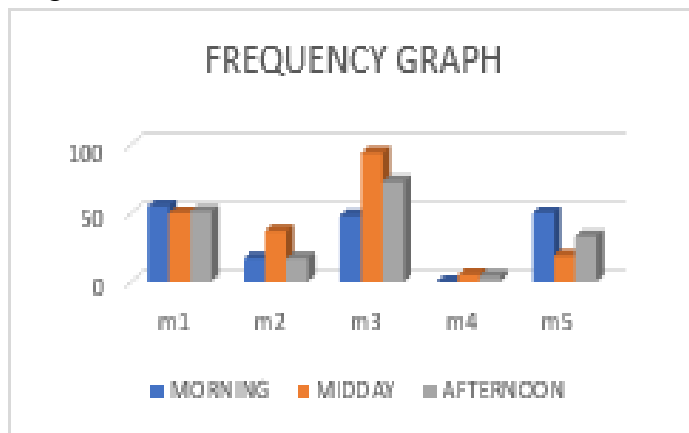
*Frequency of Timor deer feeding behavior*

The frequency of Timor deer feeding behavior was divided based on observation times at various times (morning, afternoon, and evening).



**Figure 2.** Frequency Graph of Male Deer Feeding Behavior

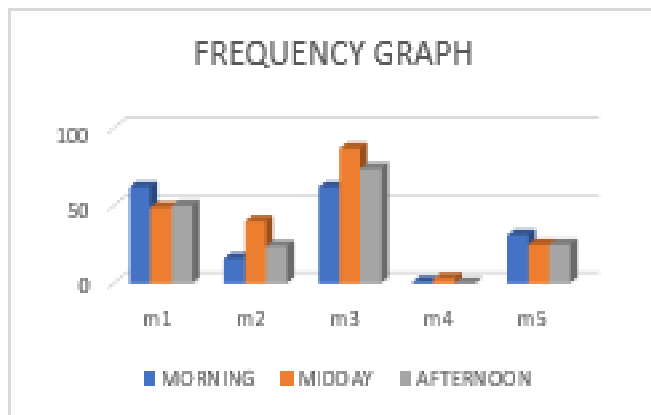
Male Timor deer have the highest frequency of foraging behavior in the morning and a lower frequency in the afternoon (**Figure 2**). The behavior of picking up and putting food into the mouth has a high frequency during the day, while in the morning and afternoon it has a low frequency. Chewing behavior has the highest frequency during the day and a low frequency in the morning, while in the afternoon the frequency is moderate. Swallowing behavior has the lowest frequency among all feeding behaviors. And the frequency of rumination is highest in the afternoon and morning.



**Figure 3.** Frequency Graph of Female Deer Feeding Behavior

The frequency of feeding in female Timor deer is high in the morning, but there is no significant difference in frequency during the afternoon and evening (**Figure 3**). The behavior of picking up and putting food into the mouth has a high frequency during the day, while in the morning and evening it is low but has the same frequency. Chewing in females has the highest frequency compared to other behavioral frequencies. Chewing has a high frequency during the day, a moderate frequency in the evening, and a lower frequency in the morning than in the evening. Swallowing frequency is the lowest among all feeding behaviors, but swallowing

frequency is observed in the afternoon and evening with low frequency. Regurgitation in females has the highest frequency in the morning, moderate frequency in the evening, and the lowest frequency in the afternoon.

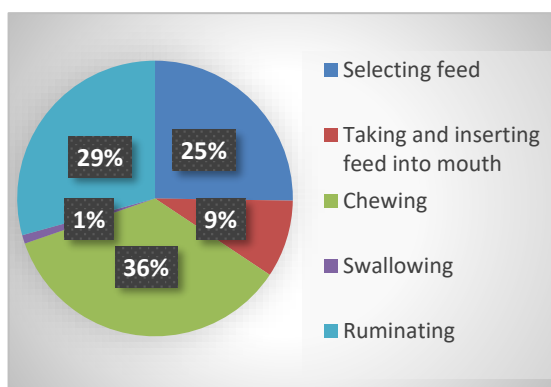


**Figure 4.** Frequency Graph of juvenile Deer Feeding Behavior

The frequency of selecting food is highest in the morning, while it is the same in the afternoon and evening. The frequency of picking up and putting food into the mouth is high in the afternoon, low in the evening, and low in the morning. The frequency of chewing is the highest compared to other feeding behaviors. This frequency is high at noon, while it is moderate in the morning and evening. The frequency of swallowing is observed at noon, while it is not observed in the morning and evening. The frequency of rumination is highest in the morning, while it is moderate at noon and in the evening.

*Overall percentage of female deer feeding behavior*

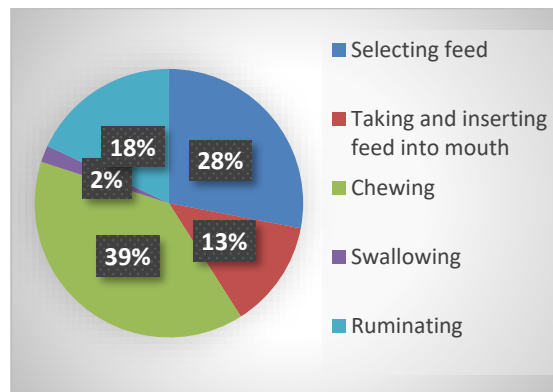
Overall frequency percentage over 10 days of Timor deer feeding behavior at PPST (**Figure 5-7**), includes activities such as selecting food, picking it up and putting it in the mouth, chewing, and swallowing.



**Figure 5.** Overall percentage of male deer feeding behavior

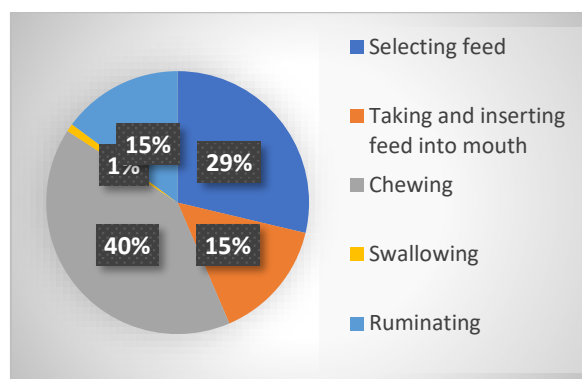
The feeding behavior of male Timor deer is dominated by chewing activity (36%), which is related to their ruminant nature in digesting fibrous feed (Aminullah et al., 2022). Browsing behavior ranks second with the highest percentage among the three individuals (29%), indicating a tendency for males to rest more while processing feed to improve digestive efficiency. Feed selection behavior was recorded at 25% and feed intake at 9%, both of which

serve as early indicators of active feeding behavior. Meanwhile, swallowing behavior had the lowest percentage (1%) due to its very short duration, which is rarely recorded by the scan sampling method.



**Figure 6.** Overall percentage of Female deer feeding behavior

The feeding behavior of female Timor deer is also dominated by chewing (39%), reflecting the physiological need of females to maintain energy balance and physical condition as ruminants. Rumination is recorded (18%), generally performed when deer are calm or resting after active feeding. Feed selection behavior (28%) and feed intake (13%) reflect the females' selectivity towards palatable feed, as well as being the initial indicator of active feeding. Swallowing behavior has the lowest percentage (2%), not because it rarely occurs, but because the duration is too short to be captured by the scan sampling method.



**Figure 7.** Overall percentage of juvenile deer feeding behavior

The feeding behavior of juvenile Timor deer is dominated by chewing activity, with the highest percentage among the three individuals (40%), related to greater energy and nutritional needs during the growth phase to support physical development (Dewi *et al.*, 2024). Browsing behavior was recorded as the lowest (1%), indicating that juveniles spend more time actively eating than resting. Foraging behavior (29%) and putting food into the mouth (15%) were also highest among the three individuals, reflecting the adaptation of young individuals in recognizing and selecting food according to their needs. Swallowing behavior had the lowest percentage (1%), which was due more to the limitations of the observation method than to the low frequency of this behavior.

#### *Timor deer response to available feed*

Timor deer at PPST are fed once a day, at 10:00 a.m. WITA, using drop-in feeding at the shelter with an uncertain amount of feed adjusted to the supply available at PPST (**Table 4**).

The source of feed for deer at the research site not only came from drop-in feed delivered by the PPST but also from undergrowth plants growing inside the breeding cages that were often consumed.

**Table 4.** Types of drop-in feed for Timor deer at PPST

No	Scientific Name	Local Name	Consumed Part
1	<i>Gliricidia sepium</i>	Gamal	Leaves
2	<i>Leucaena leucocephala</i>	Lamtoro	Flowers, leaves and stems
3	<i>Manihot esculenta</i>	Cassava	Leaves and stems
4	<i>Brassica oleracea</i>	Green cabbage	Leaves and stems
5	<i>Ricinus communis</i>	Castor bean	Leaves and stems
6	<i>Carica papaya</i>	Papaya	Fruit
7	<i>Ananas comosus</i>	Pineapple	Fruit
8	<i>Cucumis sativus</i>	Cucumber	Fruit
9	<i>Citrullus lanatus</i>	Watermelon	Fruit

The type of feed consumed by Timor deer consists of forage and fruit, with the most consumed parts of forage being leaves and stems. Deer are animals that enjoy almost all types of forage and other feeds and are able to adapt to changes in feed. Feed provision must be tailored to the physiological condition of the deer (Semiadi and Nugraha, 2004). In this study, feed weight was not measured, and the types of feed available were not always the same every day because they depended on the availability at the PPST. This study did not include feed weight measurements, and the types of feed given varied from day to day because they were adjusted according to availability at the PPST.

The relatively high foraging activity indicates that Timor deer are selective in determining which parts of plants to consume, with a tendency to choose parts that are softer in texture and easier to chew. Fruits such as papaya, pineapple, cucumber, and watermelon are consumed to supplement nutritional needs, while forage serves as the main source of food. The variety of feed types provided and the lack of feed weight measurements make it difficult to determine specific preferences for each feed type. Therefore, the consumption patterns observed in this study reflect the Timor deer's behavioral response to the feed available in the captive environment rather than fixed nutritional preferences.

## Conclusion

The feeding behavior of male, female, and juvenile Timor deer showed relatively similar patterns among the three individuals, with chewing being the dominant behavior (males 36%, females 28%, juveniles 29%), followed by foraging (males 25%, females 28%, juveniles 29%), while swallowing activity had the lowest percentage in all three individuals (males 1%, females 2%, juveniles 1%). Although the patterns were similar, there were differences in frequency between individuals that reflected differences in energy requirements based on sex and age.

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