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Evaluation of The Reproductive Behavior of Male Timor Deer (*Cervus timorensis*) Agains Weather Changes

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Abstract

Indonesia has two seasons, namely rainy and dry. During this season, weather changes can occur. These weather changes can affect the reproductive conditions of male deer that are in heat. This study aims to evaluate the reproductive behavior of male Timor deer Cervus timorensis against weather changes in Ranca Upas Deer Captivity. Observations were made for 14 days on 3 males deer. Observation of male Timor deer reproductive behavior was carried out on the parameters of vocalization, fighting, licking the female, kissing the female genitalia, riding the female, mating, flehmen, wallowing, rubbing the body, and following the female. Observations were made by recording each reproductive activity based on its frequency. Observations were made for 6 hours, namely in the morning and afternoon. Observations were made at a fairly close distance of about 5 - 10 meters from the deer. Observations were also made of weather, temperature, and humidity. The results of observing the temperature at Ranca Upas Deer Captivity showed that the average temperature in the morning was 18°C and afternoon 16°C. The average humidity in the morning is 77 % and 81 % in the afternoon. Observations on the reproductive behavior of male Timor deer showed the effect of weather on sexual reproductive behavior. Cold weather causes mating frequency and sexual activity to increase compared to summer. This condition can be seen from the increase in reproductive activity based on behavior, namely licking the female, kissing the female genitalia, riding the female, mating, flehmen, rubbing the body against the female and following the female

Keywords: *Copulation; Male; Reproduction; Timor Deer; Weather*

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INTRODUCTION

Timor deer (*Cervus timorensis*) is a type of tropical deer with the widest distribution in Indonesia. The Timor deer population has decreased due to poaching, so ex-situ conservation efforts have been made to increase the population. Captive deer is one of the ex situ conservation for deer. Deer breeding aims to make it easier for deer to marry to increase their population (Muar et al., 2021). Deer have an advantage over other animals, namely sexual maturity is faster at the age of 1.5 years (Maha et al., 2021).

Ranca Upas Deer Breeding is one of the Cervus timorensis ex-situ conservation. The maintenance system for the Timor deer in the Ranca Upas Deer Captivity is carried out by releasing deer without individual cages, but special quarantine cages are provided for sick or female deer who will give birth to breastfeed. Ranca Upas Deer Breeding is located at an altitude of 1700 meters above sea level and is located in the high area of Ciwidey Bandung. The air temperature in the Ciwidey area ranges from 8 °C – 23 °C. This area has 2 seasons throughout the year, namely the rainy and dry seasons. Captive deer with a rearing system are usually released in the form of a mini ranch (Suparta et al., 2022).

The rainy and dry seasons in Indonesia can cause weather changes, namely rainy and hot weather can occur (Prakoso, 2018). Changes in weather can certainly affect the reproductive conditions of Timor deer, especially male deer that are in heat. Lust is a condition in which males copulate with females that are ready to mate (Huda, 2017). Deer are productive wild animals in terms of reproduction, the reproductive period of deer starts from 2 years to 12 years of age (Sukmasuang et al., 2022). Male timor deer who are in heat have aggressive behavior. Changes in the weather in captivity where the deer live is of course very influential on the reproductive behavior. Research on the reproductive behavior of male deer has been carried out in intensive maintenance management in ex situ conservation institutions (Purba et al., 2023; Husna et al., 2024). Research on the reproductive behavior of male Cervus timorensis in Lampung captivity has been conducted by Purba et al., (2023) The results of the study showed the reproductive activities of male Timor deer which include restless behavior, kissing females, urination and mating. This reproductive behavior is not affected by the weather. Not many studies of climate change on the reproductive behavior of Timor male deer have been carried out, so it is necessary to study this matter. This study aims to evaluate the reproductive behavior of male Timor deer against weather changes in Ranca Upas Deer Captivity.

METHOD

The research was conducted at the Ranca Upas Deer Captivity located in Cai Village, Jalan Raya Rancabali, Patengan Village, Bandung Regency, West Java Province. Observation of reproductive behavior was carried out on 3 adult male Timor deer aged 3-10 years. The three eastern male deer have a horn length between 44-65 cm and an antler diameter between 4-6 cm. Nurinsi (2019), the hallmark of an adult male deer is having antlers as a display of typical secondary sexual characters when they reach puberty Ranggah is a display of secondary sexual characters, antlers are used to spar (fight) between male deer. According to Maha et al., (2021), based on the

results of the study, the length of male Cervus Timorensis in Kupang City is 26.10 - 6.87 cm. The longest main antler of the Timor deer in Kupang City is 35 cm at the age of 6 years, while the length of the Timor deer in Bogor City is 63 cm. The antlers of Timor deer vary in length depending on the species.

Behavior Observation

The observed male Timor deer are marked on the area around the neck to the back using a different color pick, the aim is to make it easier to make observations. Observation of male Timor deer reproductive behavior was carried out on the parameters of vocalization, sparring, licking the female, kissing the female genitalia, riding the female, mating (penile erection, intromission, and copulation), flehmen (grinning), wallowing, rubbing the body against the female, and follow the female. This parameter based on (Murad et al., 2023; Nurcholis & Muchlis, 2018). Observations were made by recording each reproductive activity based on its frequency. Observations were made for 6 hours, namely 3 hours in the morning starting at 9 - 12 AM and 3 hours in the afternoon which is carried out at 3 - 5 PM. Observations were made at this time due to the time difference temperature midday and afternoon (Dikmen, 2024). Observations were made at a fairly close distance of about 5-10 meters from the deer. Documentation was carried out to observe the reproductive behavior of male Timor deer. Total observations were made for 14 days.

Observation of Temperature and Humidity

Observation of temperature and humidity using The Weather Channel application on the smartphone. Observations of temperature, humidity and weather conditions were carried out for 14 days. The observation time was carried out for 6 hours per day from 9 - 12 AM and 3 - 5 PM. Weather and humidity observations were carried out in the morning and evening on the grounds that at that time there was a change in the weather.

Data Analysis

Data from observations of reproductive behavior and weather activities were analyzed quantitatively and presented in the form of tables and graphs, while qualitative data were presented descriptively.

RESULT AND DISCUSSION

Observation Weather, Temperature And Humidity

The results of observations of ambient temperature and humidity at the Ranca Upas Deer Captive for 14 days showed results, namely a temperature of 18 ^{0}C with 77 % humidity during the morning and a temperature of 16 ^{0}C and 81 % humidity in the afternoon. Average weather in the morning days tend to be hot and evenings tend to be cold with the frequency of rain occurring more frequently in the afternoon. The results of weather, temperature and humidity observations are shown in Table 1. The manifestation of the weather during the day at Ranca Upas Deer Captivity is that it tends to be hot. This can be seen from the high ambient temperature when compared

to night and low humidity. Cold weather tends to occur at night with low ambient temperatures and high humidity.

Ambient temperature is the level of heat in a place and is expressed in degrees Celsius (^{0}C). Air relative humidity is the content of water vapor in the air. Humidity is measured using a hygrometer and is expressed in % units. Ambient temperature is inversely proportional to the relative humidity of the air. This means that when the ambient temperature is high and the air is hot, the air humidity decreases and vice versa (Gunawan et al., 2022).

Table 1. Observations of Weather, Ambient Temperature, and Humidity in Ranca Upas Captivity

Day	Ambient Temperature (^{0}C)		Humidity (%)		Weather	
	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
1	15	5	100	100	Rain	Rain
2	17	6	80	80	Rain	Rain
3	20	6	77	80	Hot	Rain
4	19	6	74	82	Hot	Cold
5	20	8	74	75	Hot	Cold
6	20	7	72	72	Hot	Cold
7	21	6	80	90	Hot	Rain
8	17	16	90	92	Rain	Rain
9	20	18	84	88	Hot	Rain
10	21	18	50	66	Hot	Cold
11	21	17	58	58	Hot	Cold
12	20	16	55	60	Hot	Rain
13	16	15	80	88	Rain	Rain
14	10	15	100	100	Rain	Rain
Average	18	16	77	81	Tends to be hot	Tends to be cold

The difference in temperature and humidity in the morning and afternoon is not significantly different, because Ranca Upas Deer Captivity is located in the Ciwidey area of Bandung with an altitude of 1700 meters above sea level. The Ciwidey area has cold weather in the rainy and dry seasons. The high rainfall in the Ranca Upas Deer Captivity is caused by the influence of the season which at the time the observations were made in July. July is the month when entering the beginning of the dry season with moderate rainfall intensity. This condition is in accordance with the statement from (Aprianto et al., 2023). Ranca Upas Deer Breeding has a relatively low average temperature and humidity due to the influence of its geographical location in the highlands. This condition is also supported by high rainfall in the Ranca Upas Deer Captivity. The average annual rainfall in the Ciwidey area is between 2000 – 4000 mm (Monika et al., 2018).

Reproductive Behavior of Male Timor Deer

Based on observations of the reproductive behavior of male Timor deer in Ranca Upas Deer Captivity, they showed 10 types of reproductive behavior, namely

vocalization, sparring, licking the female, kissing the female genitalia, riding on the female, mating (penile erection, intromission, and copulation), spraying urine, flehmen, wallowing, rubbing against the female, and following the female. The highest frequency of reproductive behavior is following the female both in cold and hot weather as many as 142 times. The lowest frequency of behavior is rubbing the male's body against the female. This behavior is part of the warm-up before copulation occurs. The results of observing the reproductive behavior of male Timor deer during cold and hot weather are shown in Table 2.

Table 2. Value of the Frequency of Reproductive Behavior of Male Timor Deer in Ranca Upas Deer Captivity

Weather	A	B	C	D	E	F	G	H	I	J
Hot (time)	0	113	120	120	101	110	122	125	98	142
Cold (time)	0	109	124	128	108	115	134	107	101	142

Note: Frequency value in units of times per 14 days of observation. A. Vocalization. B. Sparring. C. Licking the female. D. kissing the female genitalia. E. Riding the female. F. mating (penile erection, intromission, and copulation). G. flehmen. H. wallow. I. rub the body to the female. J. follows the female.

Sexual behavior in male deer occurs in adulthood, marked by the growth of antlers. Sexual behavior seen in adult male deer includes approaching the female, kissing the female vulva, grinning, rubbing the horns, wallowing, sparring, riding the female deer, and mating. This sexual behavior is influenced by the hormone testosterone. Testosterone is closely related to the annual antler development in male deer. Testosterone peaks during the peak of the mating season (Gomes et al., 2023). Vocalization was not found in observations of reproductive behavior in Ranca Upas Deer Captivity because male deer tend to follow female deer for sexual activity. The results of this observation are supported by the statement of Lay et al. which states that male deer very rarely vocalize during heat. Vocalizations are more often performed by female deer when they are in heat (Lay et al., 2022).

Male Timor deer do more sparring and wallowing activities in hot weather than in cold weather in Ranca Upas Deer Captivity. This activity is not the main sexual activity in male Timor deer during heat. Sparring (fighting) aims to get females (Gomes et al., 2023; Airst & Lingle, 2019). The male deer will compete or fight with other male deer until a winner emerges and this will last 2-3 hours depending on the number of competitors. The position of the male deer is ready to fight by lowering its head with the horns horizontal. Males will gore each other and try to injure other males. The winning male deer will show walking in an upright position with the head pulled upwards, while the male who loses the fight will run away from his opponent (Silalahi et al., 2021).

The behavior of approaching the female occurs when the male deer smells the pheromone that is secreted along with mucus and urination, thus triggering the male deer to lick the female genitalia as a form of stimulation. Flehmen behavior is a behavior where the deer's mouth is open, the upper lip is pulled up so that it shows its front teeth while the head is lifted or pulled back like a grin. Flehmen behavior is a response in males to recognize females that emit a pheromone odor

(Setiyoargo et al., 2021). Pheromone is a type of chemical substance that is produced to stimulate, attract the opposite sex to the opposite sex of the same species. The male will only respond to the pheromone even though there are no visible females around him releasing the pheromone. Males will find a spot on the pheromone scent from just a few miles away (Sitepu, 2020). The behavior of riding a female deer is related to the stimulation of the pheromone odor released by the female deer. This hormone causes an increase in the libido of male deer so that they do copulation. Copulation is a behavior characterized by the entry of the male deer's genitals into the female deer's genitals (Gusmalinda et al., 2018).

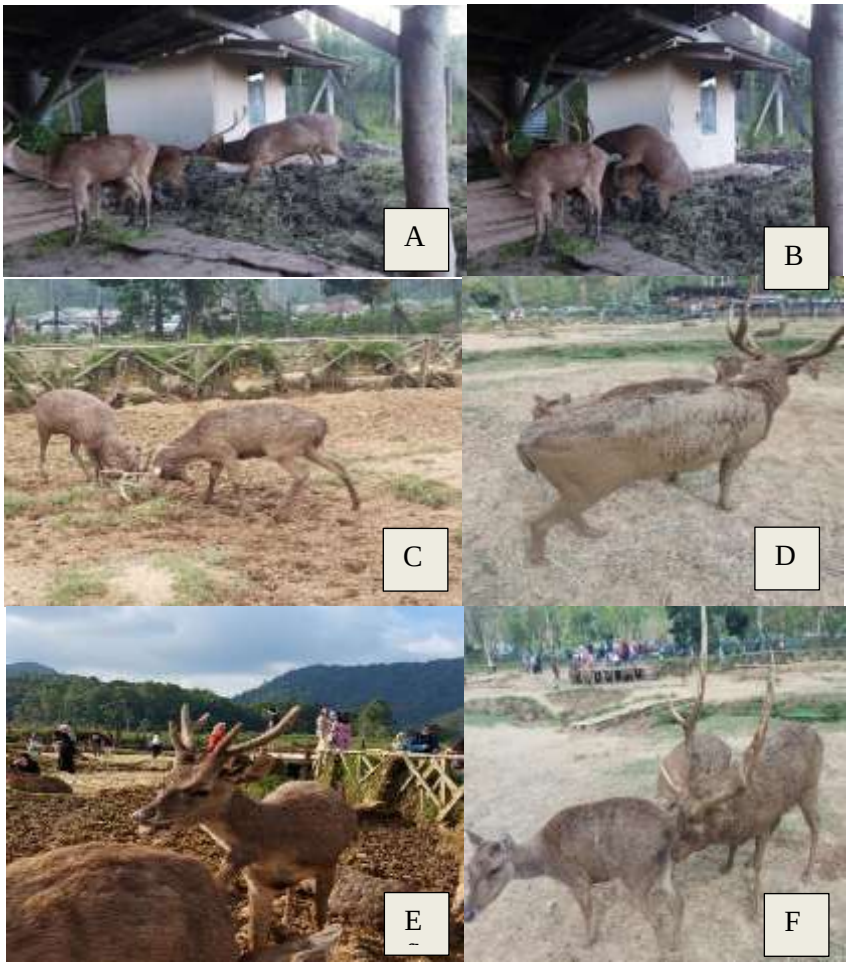

Figure 1. Reproductive Behavior of Male Timor deer in Ranca Upas Deer Captivity. (A). Licking the female, (B). Copulation, (C). Sparring, (D). Wallow, (E). Kissing female genitalia, and (F). Flehmen

The main sexual activity of male deer during heat tends to approach and attract the attention of females so that the copulation process occurs. During the observation of behavior in Ranca Upas deer captivity, this was an activity that was difficult for the two pairs of deer to carry out due to the large captive area and the inadequate conditions of the special mating cages due to gaps in the edges of the cages. This gap in the enclosure causes other deer to enter the mating enclosure area and interferes

with the reproductive activities of pairs of deer that are ready to mate (Maha et al., 2021). The deer mating cage must be made specifically with the aim that there are only two superior pairs of deer that will copulate. This special cage is made to facilitate the copulation process.

The behavior of swiping the body is carried out by males using their antlers. This method is an attempt by males to attract the attention of the female deer that they will marry during the mating season, besides this behavior is often done because the male deer wants to release his antlers to change to a new antler (Rosviani, 2018). The male deer will wallow by rolling over the mud, contaminating all of its limbs. Wallowing is more common in male deer than female deer. This activity is carried out to regulate body temperature when the weather is hot or hot and is an activity of male reproduction (Comte et al., 2022).

Based on observations of the reproductive behavior of male Timor deer in Ranca Upas Captivity, it was shown that the influence of weather on reproductive behavior (Figure 2). Cold weather and rainy conditions cause increased humidity and low temperatures, causing mating frequency and sexual activity to increase compared to summer. This condition can be seen from the increase in reproductive activity in winter compared to summer based on behavior, namely licking the female, kissing the female genitalia, riding the female, mating (penile erection, intromission, and copulation), flehmen, rubbing the body against the female and following the female. This is in accordance with the statement from (Silalahi et al., 2021; Gomes et al., 2023).Weather greatly influences sexual activity and reproductive behavior of male deer (Milla´n et al., 2021). Male deer sexual activity and behavior such as licking the female, kissing the female genitalia, riding the female, mating, flehmen and rubbing the female body generally increase in cold weather (Silalahi et al., 2021). Male deer sexual activity in cold temperatures tends to increase because hot temperatures will increase stress levels in animals which can reduce hormone production in general, including the hormone testosterone (Milla´n et al., 2021; Gomes et al., 2023). The hormone testosterone is an androgen hormone that functions to increase libido and influence male mating behavior (Anwar & Jiyanto, 2019).

CONCLUSION

Based on observations on the reproductive behavior of male Timor deer in Ranca Upas Captivity, it was shown that the influence of weather on reproductive behavior. Cold weather causes mating frequency and sexual activity to increase compared to summer. This condition can be seen from the increase in reproductive activity based on behavior, namely licking the female, kissing the female genitalia, riding the female, mating (penile erection, intromission, and copulation), flehmen, rubbing the body against the female and following the female. The highest frequency of reproductive behavior is following the female both in cold and hot weather as many as 142 times.

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