

## Social behavior of Timor deer (*Cervus timorensis*, de Blainville 1822) in Menjangan Island, West Bali National Park

Lala Latifah<sup>1</sup>, Najda Rifqiyati<sup>1\*</sup>

<sup>1</sup>Department of Biology, Faculty of Science and Technology, Universitas Islam Negeri Sunan Kalijaga  
Jl. Laksda Adisucipto, Yogyakarta, Indonesia. 55281

\*Email: [najda.rifqiyati@uin-suka.ac.id](mailto:najda.rifqiyati@uin-suka.ac.id)

**ABSTRACT.** *Cervus timorensis* is one of the four endemic deer species in Indonesia and is protected wildlife under the Regulation of Minister Environment and Forestry of Republic Indonesia Number P. 106 of 2018. Animal behavior covers functions and typical behavior patterns determined by heredity, training, learning, and experience. Social behavior is one example of the interaction carried out by animals in their environment. This study aims to analyze, calculate the frequency and proportion of the Timor deer's behavior by observing social behavior, include grooming, horn rubbing, aggressiveness, obedient, nurturing and vocalization, among other. The methodology used in this study is the scan sampling method with an interval of 60 min on Menjangan Island, West Bali National Park (TNBB). The social behavior of deer is often observed in the morning and evening period, whereas in the noon period, most of the deer were often observed sitting under a tree resting and not doing any activities. Behaviors observed were grooming behavior (65%), vocalization (13%), horn rubbing (9%), aggressive, submissive, and reproductive (4%). Grooming is the most observed behavior which is commonly observed when the grazing activities. This behavior is carried out such as cleaning the remaining food in his mouth by rubbing his mouth against his feet. During this study, mothering behavior was not observed, this behavior is indicated by parental behavior that aims to protect and care for their children. This behavior is not observed, presumably because most of the Timor deer found during the observation have entered the age of teenagers aged 6-8 months and at that age the female parent will wean her child.

**Keywords:** *Cervus timorensis*; endemic deer; scan sampling; social behavior; West Bali National Park

**Article History:** Received 27 July 2022; Received in revised form 10 October 2022; Accepted 1 December 2022; Available online 30 December 2022. Ver: Pre-Press

**How to Cite This Article:** Latifah L, Rifqiyati N. 2022. Social behavior of Timor deer (*Cervus timorensis*, de Blainville 1822) in Menjangan Island, West Bali National Park. *Biogenesis: Jurnal Ilmiah Biologi*. vol 10(2): 190–195. doi: <https://doi.org/10.24252/bio.v10i2.30712>.

### INTRODUCTION

The environment and organisms are an inseparable unit. The frequently changing environment makes organisms form adaptive behaviors to survive (Snell-Rood, 2013; Wong & Candolin, 2015). One form of behavior carried out by organisms is social behavior. Social behavior is one example of the interaction carried out by individuals, both humans and animals in their environment, both biotic and abiotic environment. Animal behavior has characteristics to perform functions and distinctive behavior patterns whose nature is determined by heredity, practice, lessons, and experience (*Sih et al.*, 2012; Wolf & Weissing, 2012; Gusmalinda, 2017).

Indonesia has a vast biodiversity, with the most mammal species in the world (Iskandar, 2016). Timor deer (*Cervus timorensis*) is one of the endemic mammals in Indonesia, among four other endemic deer and is an essential species in maintaining the sustainability of biodiversity and ecosystem balance. Timor deer is one of the protected wild animals based on the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number P. 106 of 2018 concerning types of plants and animals that are protected from all forms of hunting, capture and possession. Based on data from the International Union for Conservation of Nature and Natural Resources (IUCN, 2022), *C. timorensis* has a conservation status of vulnerable (VU), the animal faces the risk of extinction in the wild for the future.

The behavior of walking or running in deer can be caused by social factors, including agonistic behavior in the form of running away from enemies because of fear (Rands *et al.*, 2014; Schuttler *et al.*, 2017). Animals communicate through vocalization which are signs used specifically to modify other traits. Deer can communicate when walking or running while avoiding danger. When grazing,

the female deer is often made the head of the group because the female deer is responsive to foreign dangers. Female deer often give signal to their members by making sounds (Teixeira *et al.*, 2019).

*C. timorensis* in wildlife are animals that live in groups, can reach hundreds during the breeding season (Pangau-Adam *et al.*, 2022). When mating, male deer will accompany the female and surround them. Male deer will fight to get the female. The fight can last for 3 h until a winner is found and the weak are eliminated. After the mating is complete, the deer will gather and play as before (Debeffe *et al.*, 2013).

Distribution of *C. timorensis* in Indonesia is spread over several islands. One of the places for the preservation of *C. timorensis* is Bali Island specifically in TNBB, which is an area that functions as a place for conservation of biological natural resources and their ecosystems. The resort is the smallest management unit and becomes the spearhead in the implementation of the conservation of living natural resources and ecosystems in TNBB. One of the famous resorts in TNBB is Menjangan Island (Rani *et al.*, 2019).

Menjangan Island is one of the main natural tourist attractions and destinations in TNBB area which has been known both nationally and internationally. Menjangan Island has a variety of vegetation which is divided into lowland forest areas, savanna, and coastal forests. It can be concluded that Menjangan Island is the right habitat for the deer population (Rahayu *et al.*, 2020). Therefore, because there are no observations regarding the social behavior of *C. timorensis* on Menjangan Island, this observation needs as an effort to conserve *C. timorensis* on Menjangan Island, West Bali National Park.

## MATERIALS AND METHODS

The method used in this study is the scan sampling method, with an interval of 60 min for 3 days. In this observation, behavior is focused on social behavior in the form of grooming, horn rubbing, aggressive, submissive, mothering and vocalization, and if there are other social behaviors that are observed, they are recorded and included in other categories. Observation time started at 06.00-17.00 WITA, which is divided into 3 periods: morning (06.00-10.00 WITA), noon (11.00-12.00 WITA) and afternoon (13.00-17.00 WITA). The frequency and percentage of each observed social behavior were calculated.

**Calculation and data analysis.** The frequency calculation is carried out using the formula (Sudjana, 1992):

$$F = F_{i1} + F_{i2} + F_{i3} + \dots + F_{in}$$

Note:

F = Frequency

$F_{i1,2,3,\dots,i}$  (n) = Frequency of an activity

The average of each activity is calculated by the formula:

$$\text{Average activity} = \frac{\text{Number of frequencies } F(n)}{\text{Number days of observation}}$$

Note:

$F(n)$  = Frequency of observed social behavior

While the percentage calculation is calculated using the relative frequency formula:

$$F_{\text{rel}} = \times 100\% \frac{F_i}{F_a}$$

Note:

$F_{\text{rel}}$  = relative frequency

$F_i$  = Frequency of an activity

$F_a$  = Frequency of all activities

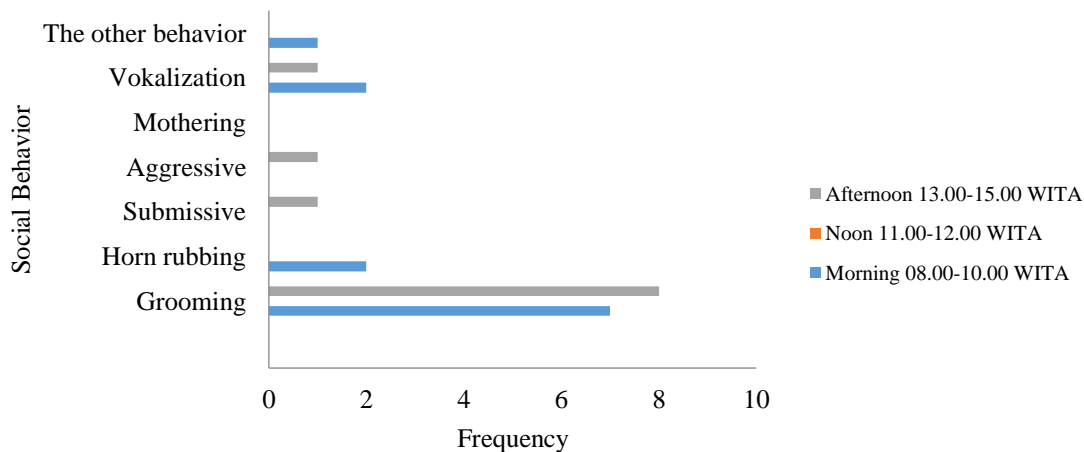
**RESULTS AND DISCUSSION**

The observation results of the social behavior of Timor deer on Menjangan Island TNBB observed were grooming, horn rubbing, aggressive, submissive, vocalization and reproductive behavior.

**Table 1.** The relative frequency of Timor deer social behavior during observations

Social behavior	Relative frequency (%)
Grooming	65
Horn rubbing	9
Submissive	4
Aggressive	4
Mothering	0
Vocalization	13
Other behaviors (Reproductive)	4

It shows the percentage of social behavior carried out by *Cervus timorensis* (Table 1) sequentially from the most frequently observed to the unobserved behavior, include grooming (65%), vocalization (13%), horn rubbing (9%), submissive, aggressive and reproductive (4%), while mothering behavior was not observed during the observation.



**Fig. 1.** The frequency of *Cervus timorensis* social behavior based on the period of observation

Based on the data during the observation period (Fig. 1), it seems that the social behavior of deer is often observed in the morning and evening period. Several behaviors in deer can often be observed in one observation period. When grazing, they also move, defecate and even carry out social interactions. Feeding behavior in deer and mating behavior can lead to social behavior among each other.

During the observation in the noon period, most of the deer were often observed sitting under a tree resting and not doing any activities, when it rained, the deer looked for shelter under a thick tree but if drizzle, some deer were observed grazing.

**Grooming.** Grooming is a social behavior in the form of touch by using fingers, toes, teeth and tongue, which is divided into two: autogrooming (self-cleaning) and allogrooming (mutual cleaning). During the observation, allogrooming was not observed. Autogrooming was observed when deer were grazing. This behavior is carried out such as cleaning leftover food in his mouth by rubbing his mouth against his feet (Fig. 2).



Fig. 2. Grooming behavior on *Cervus timorensis*

**Rubbing horn/head.** The behavior of rubbing horns or heads is carried out between individuals or by rubbing the horns on trees, tree roots, or seedling level (Luruk *et al.*, 2022). The behavior of rubbing trees is thought to be carried out to mark his territory. The behavior of rubbing horns on trees aims to mark the territory of the deer, while the behavior of rubbing horns with other individuals shows interest or fighting. During the observation the behavior of rubbing horns on trees was rarely found, even not found at all. This is presumably because there are not many mature male deer in one territory and more female deer and adult male deer are found. Adult male deer are more aggressive than female deer.

The behavior of rubbing horns between individuals can be categorized into 2, rubbing horns due to aggressive behavior or rubbing horns because they are attracted to each other. Usually, the behavior of rubbing horns due to aggression is carried out between male individuals during fights, whether it is because of the struggle for territory or because of the struggle for a female deer. The behavior of rubbing horns between males was not observed during the observation period. Meanwhile, the behavior of rubbing horns due to mutual attraction was observed in a pair of male and female deer. This behavior is carried out by rubbing their heads against each other, this behavior can also be categorized as reproductive behavior.

**Agonistic behavior and vocalization.** Agonistic behavior is divided into submissive and aggressive. Submissive is behavior that shows fear, while aggressive is behavior that is threatening or attacking. The three behaviors were observed simultaneously in one observation period and occurred alternately. This behavior was observed during deer eating activities, the agonistic behavior occurred between mature female deer and adult deer. At the time of observation, a mature female deer approached an adult deer that was grazing in an area, then chased her away by stomping her feet followed by a shrill "erk..erk" sound like a jerk. Then the adult deer also shows submissive behavior or fear so that he stays away from the mature female deer while running and making a moaning sound like "erk..erk ..". The communication in deer can be done while walking or standing while avoiding danger.

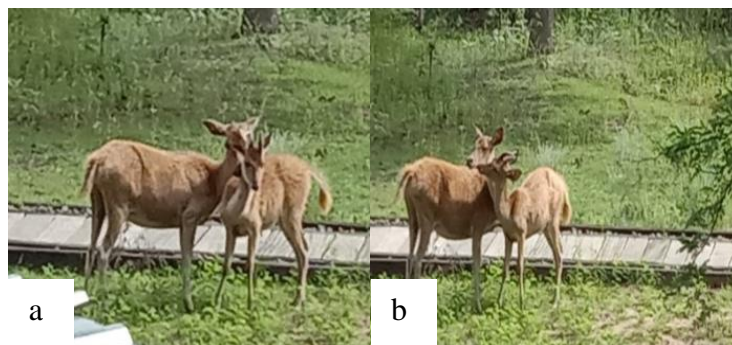
Vocalization or making sounds is also observed when the deer do grazing, the deer make sounds on the sidelines of grazing. This behavior was observed when grazing, then raised his head and made a sound while chewing as if enjoying the grass being eaten. The sounds made when the deer perform agonistic behavior and when the deer eat are different. When the deer eat, the sound that is issued is just like muttering and not too loud.

Fighting behavior for food is rarely found during the rainy season because of the abundance of food during the rainy season, besides that it is also rare for territorial disputes to occur because the available food sources are spread evenly both at the Menjangan Island resort or other resorts. Based on interviews conducted with the forest ranger on duty, that often during the dry season there is a battle for territory with abundant food sources. As for the deer that lost, he had to cross to another island to get food.

**Mothering.** Maternal behavior or mothering is a behavior that is generally owned by female animals, this behavior is indicated by parental behavior that aims to protect and care for their children

(Winarno & Harianto, 2018). The deer in Indonesia can breed throughout the year. However, during the observation period, mothering behavior was not observed. It is suspected that this is because most of the Timor deer found during the observation have entered the age of teenagers aged 6-8 months and at that age the female parent will wean her child. So it is rare and even not found fawn and the mothering behavior is not observed.

**Other behaviors (reproductive).** This reproductive behavior is shown by a pair of male and female deer who are attracted to each other, but no mating behavior occurs (Fig. 3). They just rub each other's heads (horns) then lick and kiss each other's bodies. However, when the male deer was about to climb on the doe's back, the female deer refused. This refusal can occur because the female deer has not entered estrus or is not ready to be bred. According to Binsasi *et al.* (2022), the increase in mating activity in Timor deer in Dramaga Research Forest captive breeding reaches its peak from April, July to September, while our observations take place in February, this can also be the cause of not much reproductive activity that can be observed.



**Fig. 3.** Reproductive behavior: a. Female deer kissing male deer; b. A male deer kisses a female deer

## CONCLUSION

The social behavior that was observed during the observation was the behavior of grooming, horn rubbing, aggressive, submissive, vocalization and reproduction. Grooming is the highest behavior that is 65%, vocalization 13%, horn rubbing 9%, aggressive, submissive and reproductive has the lowest frequency 4%. During the observation, often deer can be observed in the morning and afternoon. Meanwhile, during the day most of the deer often just sit under a tree resting and do nothing, then when it rains the deer look for shelter such as under a thick tree and if the rain is not so heavy (drizzle), some deer are observed grazing.

## ACKNOWLEDGEMENTS

Authors would thank to West Bali National Park for supporting the research on Menjangan Island. We also thank Dwi Ariya, Aap Ahmad, Tesya Atika, Nabilatul Amalia and Reza Sukma for helping in data collection.

## REFERENCES

- Binsasi Y, Masy'ud B, Rushayati SB. 2022. Pola reproduksi rusa timor pada kondisi iklim mikro berbeda. *Jurnal penelitian kehutanan Bonita*. vol 4(2): 32-44. doi: <http://dx.doi.org/10.55285/bonita.v4i2.1643>
- Debeffe L, Morellet N, Cargnelutti B, Lourtet B, Coulon A, Gaillard JM, Bon R, Hewison AJM. 2013. Exploration as a key component of natal dispersal: dispersers explore more than philopatric individuals in roe deer. *Animal Behaviour*. vol 86(1): 143-151. doi: <https://doi.org/10.1016/j.anbehav.2013.05.005>.
- Gusmalinda R. 2017. Perilaku sosial rusa sambar (*Cervus Unicolor*) dan rusa totol (*Axis Axis*) di Kandang Penangkaran PT. Gunung Madu Plantations Lampung Tengah. [Skripsi]. Bandar Lampung: Universitas Lampung.
- Iskandar J. 2016. Etnobiologi dan keanekaragaman budaya di Indonesia. *Umbara: Indonesian Journal of Anthropology*. vol 1(1): 27-42. doi: <https://doi.org/10.24198/umbara.v1i1.9602>.
- IUCN. 2022. The redlist of threatened species. International Union for Conservation of Nature and Natural reserves <http://www.iucnredlist.org>.



- Luruk W, Kaho LMR, Kaho NPR. 2022. Analysis of spatial distribution and feed potential of timor deer (*Rusa timorensis*) in the forest area with the special purpose of Oelsonbai and its surroundings Fatukoa Village, Maulafa District, Kupang city. *Wana Lestari*. vol 6(1): 34-43.
- Pangau-Adam M, Flassy M, Trei JN, Waltert M, Soofi M. 2022. The role of the introduced rusa deer *Cervus timorensis* for wildlife hunting in West Papua, Indonesia. *Ecological Solutions and Evidence*. vol 3(1): 1-11. doi: <https://doi.org/10.1002/2688-8319.12118>.
- Rahayu EM, Syarifudin A, Galus I. 2020. Analisis vegetasi di Kawasan Pulau Menjangan Taman Nasional Bali Barat (TNBB). *Journal of Forestry Research*. vol 3(2): 79-89. doi: <https://doi.org/10.32662/gjfr.v3i2.993>.
- Rands SA, Muir H, Terry NL. 2014. Red deer synchronise their activity with close neighbours. *PeerJ*. vol 2: 1-9. doi: <https://doi.org/10.7717/peerj.344/supp-2>.
- Rani S, Murtafiah, Zakiyah N, Benardi AI. 2019. Motif Awan (Model Partisipatif Wisatawan) Sebagai Solusi Konservasi Hutan Evergreen di Taman Nasional Bali Barat. *Edu Geography*. vol 7(2): 188-197. doi: <https://doi.org/10.15294/edugeo.v7i2.30998>.
- Schuttler SG, Parsons AW, Forrester TD, Baker MC, McShea WJ, Costello R, Kays R. 2017. Deer on the lookout: how hunting, hiking and coyotes affect white-tailed deer vigilance. *Journal of Zoology*. vol 301(4): 320-327. doi: <https://doi.org/10.1111/jzo.12416>.
- Sih A, Cote J, Evans M, Fogarty S, Pruitt J. 2012. Ecological implications of behavioural syndromes. *Ecology Letters*. vol 15(3): 278-289. doi: <https://doi.org/10.1111/j.1461-0248.2011.01731.x>
- Snell-Rood EC. 2013. An overview of the evolutionary causes and consequences of behavioural plasticity. *Animal Behaviour*. vol 85(5): 1004-1011. doi: <https://doi.org/10.1016/j.anbehav.2012.12.031>.
- Sudjana MA. 1922. Desain dan Analisis eksperimen. Bandung: Tarsito.
- Teixeira D, Maron M, van Rensburg BJ. 2019. Bioacoustic monitoring of animal vocal behavior for conservation. *Conservation Science and Practice*. vol 1(8): 1-15. doi: <https://doi.org/10.1111/csp2.72>.
- Winarno GD, Harianto SP. 2018. Perilaku satwa liar (ethology). Bandar Lampung: Aura printing. ISBN 978-602-5940-31-6. pp. 1-153.
- Wolf M, Weissing FJ. 2012. Animal personalities: consequences for ecology and evolution. *Trends in ecology & evolution*. vol 27(8): 452-461. doi: <https://doi.org/10.1016/j.tree.2012.05.001>
- Wong B, Candolin U. 2015. Behavioral responses to changing environments. *Behavioral Ecology*. vol 26(3): 665-673. doi: <https://doi.org/10.1093/beheco/aru183>.