

# Daily behavior sumatran rhinoceros (*Dicerorhinus sumatrensis*) in Sumatran Rhino Sanctuary Way Kambas National Park

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**Abstract.** The sumatran rhino is one of Indonesia's endemic species. The decreasing number of its population made the sanctuary project become more important to maintain the population existence. Sumatran Rhino Sanctuary is one of breeding project to keep the existence of sumatran rhinoceros. For the successful management in a sanctuary, it is necessary to understand about how wildlife daily behavior so it can be adjusted with any management steps that will be applied. The purpose of this research is to understand and to analyze the daily behavior of sumatran rhinoceros in Sumatran Rhino Sanctuary at Way Kambas National Park. This research was conducted at July 2017. The data was collected by using Focal Animal Sampling and was analyzed with quantitative descriptive technique. The result showed that sumatran rhinoceros behavior in the Sumatran Rhino Sanctuary was not significantly different with their natural behavior. The dominant behavior in the morning was feeding and in the noon was resting, while the moving behavior was constantly occurred between those behavior.

**Keywords:** sumatran rhino, behavior, focal animal sampling, Sumatran Rhino Sanctuary, Way Kambas National Park

## 1.Introduction

The Sumatran rhinoceros is one of the five existing species of rhinoceros in the world. Sumatran rhinoceros has the smallest body compared to other member of the family Rhinocerotidae [1]. Sumatran rhinoceros population now remains in Aceh, Lampung and South Sumatra only [2]. Sumatran rhinoceros is a very sensitive wild animal that like to live away from the crowds and humans disturbance [3]. Sumatran Rhinoceros is one of slow-breeding species that are highly prized by poachers. Their horns were highly demanded because of its use in traditional Chinese medicine [4]. Estimated number of Sumatran Rhinoceros vary considerably and this uncertainty is of great concern [5]. According to [6], the numbers of wild Sumatran Rhinoceros remained unknown despite evidence of a precipitous decline from several hundred individuals in 1984 to less than 100 in 2013. Poaching has been a causal factor in the decline of the Sumatran rhinoceros, which has also been affected by habitat loss and isolation [6]; [7].

Sumatran Rhino Sanctuary is breeding centre for Sumatran Rhinoceros that established in 1998 as a last effort to save the population from extinction [2]. The Sumatran rhinoceros is now Critically Endangered species according to International Union Conservation of Nature and Natural Resources [8], with a decreasing population trend, and confined to a few disjunct populations in Indonesia and Malaysia [9]. The Sumatran rhinoceros is a good example to illustrate the challenges in the conservation of a highly endangered species [10]. Identifying the best strategy for conserving the Sumatran rhinoceros is a pressing concern of the international conservation nowadays [11]. In order to support itsconservation and preservation as well as its

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utilization is through breeding both inside (in-site) or outside (ex-site) its natural habitat. To formulate appropriate management measures in captivity, knowing the animal's daily behavior is important [12].

The knowledge about Sumatran Rhinoceros daily behavior is not widely known. The results are expected to provide more detailed information of Sumatran Rhinoceros behavior and its daily activities to perform effective management actions. The success of Sumatran Rhinoceros protection and conservation was determined by manager's capability that has adequate education about Sumatran Rhinoceros behavior in order to know what the obstacle in its management) [3].

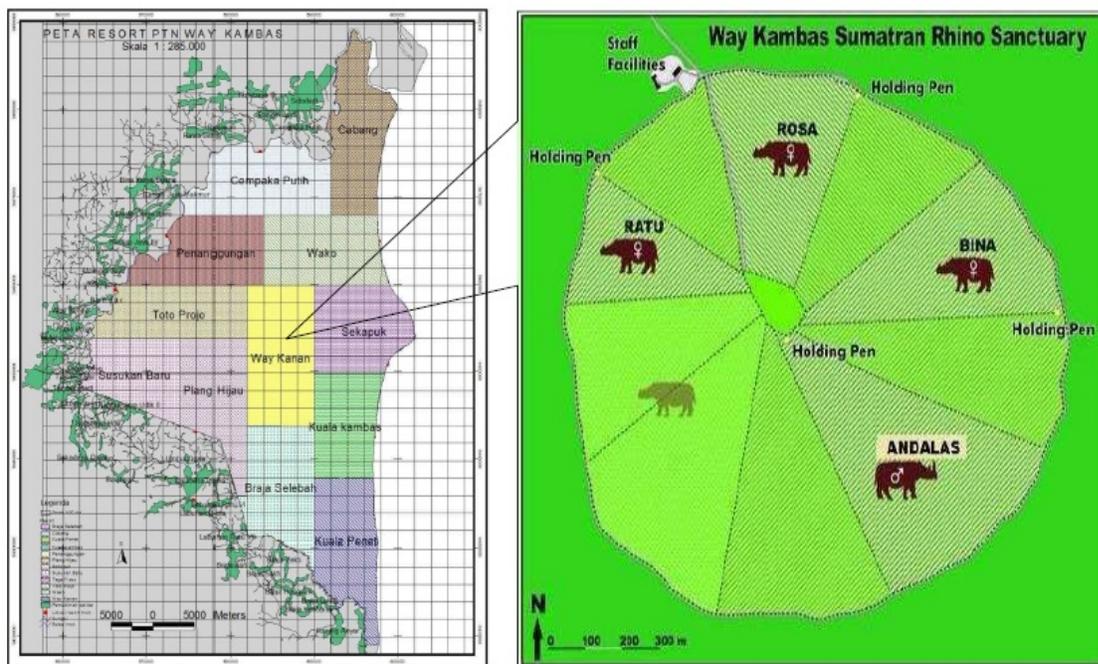
## 2. Research methods

This research aimed to analyze how the daily behavior of Sumatran Rhinoceros in SRS including the eating behavior, resting behavior and moving behavior.

### Materials and Methods

#### 2.1 Study area

This research was conducted on 5-18 July 2017 at Sumatran Rhino Sanctuary Way Kambas National Park, Lampung Province, Indonesia (Figure 1).



**Figure 1.** Location of Research, Sumatran Rhino Sanctuary, Way Kambas National Park [13].

#### 2.2 Procedures

Daily behavior data of Sumatran Rhinoceros was obtained using Focal Animal Sampling method. In this sampling method, all of the actions of one animal are recorded for a specified time period. ([14]; [15]; [16]). The collected data includes primary data and secondary data. Primary data is daily behavior data of Sumatran Rhinoceros classified in three major behavior which are feeding behavior, resting behavior, and moving behavior. Secondary data is supporting data in form of books, journals, and other literature. The tools used are

camera, binocular, watch, stationary, laptop, and tallysheets, while the research object is a female Sumatran Rhinoceros named "Ratu".

### 2.3 Data analysis

Data analysis using quantitative descriptive data analysis technique. Data processing is done by recording the daily behavior of Sumatran Rhinoceros. The data afterwards tabulated using the calculation formula of Focal Animal Sampling method ([14]: [15] [16]).

$$\text{Activity Analysis} = \frac{\text{Number of Actifity}}{\sum \text{Total Actifity}} \times 100\%$$

$$\text{Time Analysis} = \frac{\text{Time for eachActifity (minute)}}{\sum \text{Total Time (minute)}} \times 100\%$$

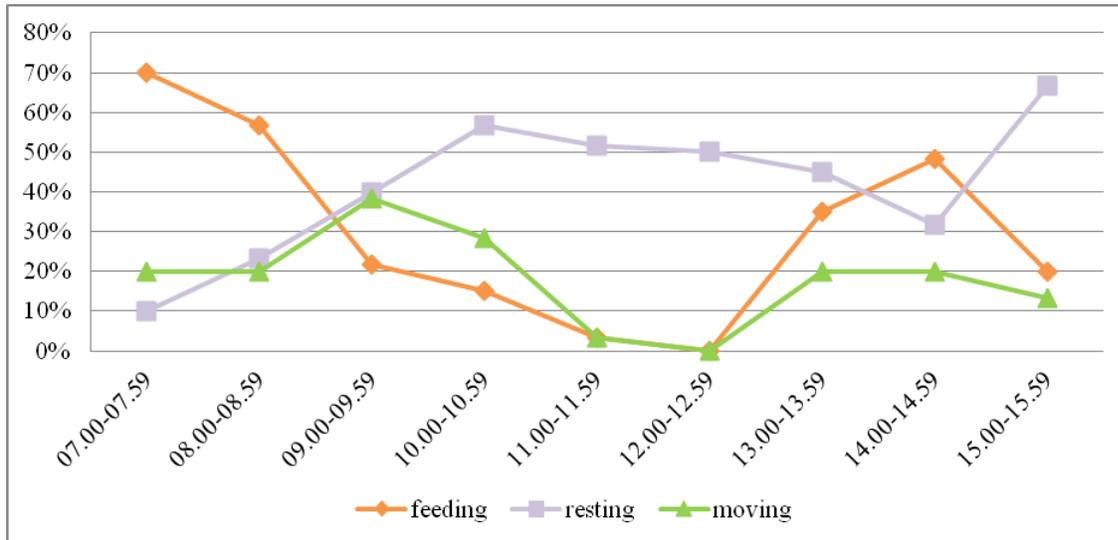
The result of these calculation is the percentage of Sumatran Rhinoceros daily behavior. The explanation of Sumatran Rhinoceros daily behavior was analyzed descriptively.

## 3. Results and Discussion

### 3.1 Results

Behavior observation were performed for 105 hours of observation within 14 days ( $\pm$  7 hours observation/day). Observations of Sumatran Rhinoceros daily behavior are divided into three: feeding behavior, resting behavior, and moving behavior. Feeding behavior involves activity such as chewing, swallowing, or put a part of animals or plants or another feed material into mouth [17]; [18]. Resting behavior involves activity such as lying, sleeping, and standing with head drooping down . Moving behavior involves walking, running, or jumping [19]. SRS menerapkan sistem pengelolaan kawasan dengan konsep semi in-situ. Badak dibiarkan hidup sealami mungkin di habitat aslinya, meskipun terbatas pada luas areal yang hanya 20-50 ha untuk masing-masing individu. Sistem yang diterapkan menyesuaikan dengan sifat asli satwa .

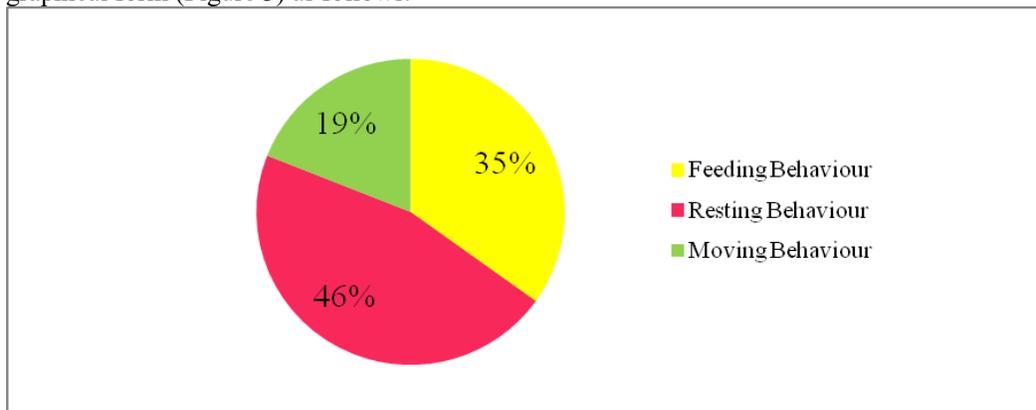
Behavior dynamics is a pattern of activity changes that shows the highest frequency of activity at certain hours to represent the general trend of activity. The behavior dynamics was used to understand the time laps between behavior one and another. It can presented the most occured behavior at certain times, therefore the dominant behavior can be found. The dynamics of Sumatran Rhinoceros activity are presented in table from (Figure 2) as follows.



**Figure 2.** Dynamics Activity Per Hours of Sumatran Rhinoceros “Ratu”

Based on Figure 2 the most dominant activity in the morning (07.00 AM-10.00 AM) is feeding activity because it was the usual time for rhino to get drop-in feed. In accordance with the statement [20] that eating behavior in the cage mostly occur between 07.00-09.00 with the average percentage of meal time of 57.5%. During the day (10.00 AM-14:00 PM), the most dominant activity is resting activity because the Sumatran Rhinos loves to wallow during the day to stabilize their body temperature. According to [19] states that at certain times around 11.00 to 13.00 PM Sumatran rhinos will go to the wallow area to wallow. The most dominant activity in the afternoon (14.00-16.00) is resting activity because in the afternoon rhino had given additional drop-in feed around the wallow area, so when the feed necessity were fulfilled the rhino will soon return to the wallow.

The proportion time of daily activity is the allocation amount of time for each activities of feeding, resting, and moving based on rhino daily time (Figure 3). The data was calculated then percentaged with the total daily time of the Sumatran Rhino started from 07.00 AM until 16.00 PM. The percentage result was presented in graphical form (Figure 3) as follows.



**Figure 2.** Percentage of Sumatran Rhinoceros “Ratu” Daily Behavior

The percentage in Fig. 4 was obtained from the comparison of total feeding behavior time of 2211 minutes, total time of resting behavior of 2963 minutes, and total moving behavior time of 1185 minutes with total daily behavior of “Ratu” starting at 07.00 AM until 16.00 PM, that is equal to 6359 minutes.

### 3.2 Discussion

The sumatran rhino has a different behavioral pattern compared to the other animal species. Based on research "Ratu" spent 35% of her total daily time for feeding behavior. The Sumatran rhino is basically a nocturnal animal so its feeding activity is more active at night [20]. The feeding behavior of the Sumatran Rhino in SRS were divided into drop-in feeding behavior and natural feeding behavior. Drop-in feeding was done twice a day in the morning (07.00-09.00 AM) and afternoon (13.30-14.30 PM). According to [21], rhinos get food by destroying, biting, and bending the tree feed with its horn, teeth, and legs. Sumatran rhino drop-in feeding behavior begins by walking to the source of feed, sniffing and snorting, then eating by biting the feed that has been provided.

Sumatran rhino is a natural browser animal. As long as the feed needs fulfilled, the sumatran rhinoceros will stay for quite long time. The Sumatran rhino natural feeding behavior was by push the trunk of the feed tree and then step on the tree until it collapses to obtain the feed, sticking out its mouth and pulling the hanging roots off. Rhino also feeds nursing by twist or bite the plant stems to pick the leaves. When the sumatran rhinoceros full, they will immediately look for a place to rest, either for wallowing or lying down.

Ratu spent 46% of her total daily time (07.00-16.00 WIB) to do resting behavior. The resting behavior of the Sumatran Rhino in the SRS were divided into wallowing, standing still, sleeping, and lying down. Rhino resting behavior not always did by lying down, but also done while standing with head drooping down [19]. At summer, the sumatran rhinoceros preferred to wallowing and lying down underneath the trees, bamboos, or open forest. The Sumatran rhino lies down or sleeps with one or both legs stretching forward and lying down on the ground. Sumatran rhinoceros like to wallow to cover their body with mud. Their wallowing area can be found at the area with a flat land with 2-3 meters length. Sumatran rhinoceros also like to bath and wash their body with water to maintain the skin moisture. The sumatran rhinoceros used to wallow once or twice a day for 2-3 hours [19]. The wallow spot of sumatran rhinoceros usually located at cool and hidden area [22].

The sumatran rhinoceros was a soliter animal. It is hardly possible that two rhino would walked together in same path, unless when the mother taking care of its baby and also when the male come to the female for breeding [23]. Sumatran rhinoceros used 19% of total daily time to do moving behavior. The moving behavior of sumatran rhinoceros in SRS were divided into walking by stepping, running or jumping. The Sumatran rhino moves very slowly but remains alert to the surrounding circumstances. The rhinos will run or jump when they are disturbed or startled. The sumatran rhinoceros regularly will followed the same path, especially the path near the wallow area. The moving behavior of every wildlife basically was influenced by two factors which were the factor that stimulate rhino to complied their physiology or hungry and thirst feelings [3]. Every animal will move to find their food and drink or for breeding [21]. The movement of sumatran rhinoceros was also affected by weather condition. At the rainy season, the river in the mountains will drain off to the lowland area, the sumatran rhinoceros will leave the inundated area and look for the hills to made the puddles for wallow spot [20].

It can be concluded that based on this research, the feeding behavior mostly occurred at morning (AM) and the resting behavior mostly occurred at noon (PM). The moving behavior was constantly occurred during feeding and a moment to resting behavior.

### 4. References

- [1] Candra D, Radcliffe R W, Khan M, Tsu I H and Paglia D E 2012 Browse diversity and iron loading in captive sumatran rhinoceroses (*Dicerorhinus sumatrensis*): a comparison of sanctuary and zoological populations *J. of Zoo and Wildlife Medicine*. **43 (3)** 66-73
- [2] Zafir AWA, Payne J, Mohamed A, Law C F, Sharma D S K, Amirtharaj R A, Williams C, Nathan S, Ramono W S and Clements G R 2011 Now or never : what will it take to save the sumatran rhinoceros *Dicerorhinus sumatrensis* from extinction? *J. Oryx* **45 (2)** 225 – 233

- [3] Paripurnawan I and Dewi B S 2013 *Studi perilaku berkubang badak sumatera (Dicerorhinus sumatrensis Fischer, 1814) di Suaka Rhino sumatera Taman Nasional Way Kambas* Skripsi Lampung University Lampung Province (Indonesia : Unpublished)
- [4] Harper C K, Vermeulen G J, Clarke A B, de Wet J I and Guthrie A J 2013 Extraction of nuclear DNA from rhinoceros horn and characterization of DNA profiling systems for white (*Ceratotherium simum*) dan black (*Diceros bicornis*) rhinoceros. *Forensic Science International J.Genetics* 7. 428-433
- [5] Nardelli F 2014. The last chance for the sumatran rhinoceros? *Pachyderm Journal*. 55 43-53
- [6] Ahmad A H, Payne J and Zainudin Z Z 2013 Preventing the extinction of the sumatran rhinoceros *J.of Indonesian Natural History* 1 (2) 11-22
- [7] Havmoller R G, Payne J, Ramono W, Ellis S, Yoganand K, Long B, Dinerstein E, Williams AC, Putra R H, Gawi J, Talukdar K and Burgess N 2015 Will current conservation responses save the critically endangered sumatran rhinoceros *Dicerorhinus sumatrensis*? *J.Oryx*. 1-5
- [8] International Union for Conservation of Nature and Natural Resource 2008 IUCN red list of threatened species. <http://www.iucnredlist.org>
- [9] Gossens B, Lynn M S, Ryan J J R, Ahmad A H, Payne J, Zainudin Z Z, Nathan S K S S and Ambu L N 2015 Genetics and the last stand of the sumatran rhinoceros *Dicerorhinus sumatrensis*. *J.Oryx*. 1-5
- [10] Kretzschmar P, Kamer-Schadt S, Ambu L, Bender J, Bohm T, Ernsing M, Goritz F, Hermes R, Payne J, Schaffer J, Thayaparan S T, Zainal Z Z, Hildebrandt T B and Hofer H 2013 The catastrophic decline of sumatran rhino (*Dicerorhinus sumatrensis harrisoni*) in Sabah: historic exploitation reduced female reproductive performance and population viability *Global Ecology and Conservation Journal* 6 257-275
- [11] Pusparini W, Slevert P R, Fuller T, Randhir T O and Andayani N 2015 Rhinos in the parks: an island-wide survey of the last wild population of sumatran rhinoceros *PLoS ONE Journal*. 10 (9) 1-16
- [12] Gitta A, Masy'ud B and Suzanna E 2012 Aktivitas harian dan perilaku makan burung kakatua-kecil jambul kuning (*Cacatua sulphurea sulphurea* Gmelin, 1788) di Penangkaran *Jurnal Media Konservasi*. 17 (1) 23-26
- [13] Sumatran Rhino Sanctuary 2012 *Annual Report of Sumatran Rhinoceros in Way Kambas National Park*. (Indonesia : Unpublished)
- [14] Altman J 1973 *Observational study of behavior : sampling methods* (Chicago : University of Chicago)
- [15] Suherli D, Harianto S P and Widodo Y 2016 Kajian perilaku dan pakan drop-in monyet hitam sulawesi (*Macaca nigra*) di Taman Agro Wisata Bumi Kedaton *Jurnal Sylva Lestari*. 4 (2) 1-8
- [16] Daniati E, Rifanjani S and Winarti I 2017 Studi perilaku harian Kukang Kalimantan (*Nycticebus menagensis*) di Pusat Rehabilitasi Satwa International Animal Rescue Indonesia (IARI) Kabupaten Ketapang, Kalimantan Barat *Jurnal Hutan Lestari*. 5 (2) 171-176
- [17] Pambudi J A A 2006 *Studi perilaku dan ekologi kukang jawa (Nycticebus javanicus Geoffroy, 1812) di Kawasan Hutan Bodogol* Thesis University of Indonesia (Indonesia : Unpublished)
- [18] Firdilasari I, Harianto S P and Widodo Y 2016 *Kajian perilaku dan analisis kandungan gizi pakan drop in beruang madu (Helarctos malayanus) di Taman Agro Satwa dan Wisata Bumi Kedaton* Jurnal Sylva Lestari. 4 (1) 97-106
- [19] Kurniawanto A 2007 *Studi Perilaku Badak Sumatera (Dicerorhinus sumatrensis Fischer, 1814) di Suaka Rhino Sumatera Taman Nasional Way Kambas Lampung* Skripsi Institut Pertanian Bogor (Indonesia : Unpublished)
- [20] Arief H 2005. *Analisis habitat badak sumatera (Dicerorhinus sumatrensis Fischer 1814) studi kasus: Taman Nasional Way Kambas* Thesis Institut Pertanian Bogor (Indonesia : Unpublished)
- [21] Saputra A E 2012 *Anatomi otot daerah panggul dan paha badak sumatera (Dicerorhinus sumatrensis)* Skripsi Institut Pertanian Bogor (Indonesia : Unpublished)
- [22] Siswandi R 2005 *Pola Aktivitas Harian Badak Sumatera (Dicerorhinus sumatrensis) di Suaka Rhino Sumatera, Taman Nasional Way Kambas* Skripsi Institut Pertanian Bogor (Indonesia : Unpublished)
- [23] Durrel G 1984 *Longmann illustrated animal encyclopedia*. (England : Longmann Group)