Behavior Analysis of Sumatran tiger (Panthera tigris sumatrae, Pocock, 1929) in Taman Rimba Zoo Jambi

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Abstract. The Sumatran tiger (Panthera tigris sumatrae) is an endemic animal on the island of Sumatra that is nearing extinction. Ex-situ conservation efforts such as at zoos have an important role in preserving and increasing populations through breeding and maintenance programs. Habitat changes can cause changes in daily behavior patterns because they have different habitat characteristics. The purpose of this study was to determine the habitat characteristics and daily behavior of Sumatran tigers in the Taman Rimba Zoo Jambi. This research was conducted for 12 hours / day starting at 7:00 to 19:00. There are two female Sumatran tigers used as objects in this study. The description of ex-situ habitat characteristics is done through direct observation and literature reference as a comparison. Daily behavior of Sumatran tigers includes eating behavior, resting behavior, social behavior, and others. Ex-situ habitat characteristics generally have similarities with their natural habitat to meet the basic needs of tigers. The results of recording daily behavior in the parent and cubs have a value with a percentage of feeding behavior (2.2% and 2.92%), resting behavior (87.92 and 85.97 %%), social behavior (3.43% and 4.05%), and others (6.43% and 7.06%).

1. Introduction

Indonesia has three tiger subspecies but two of them have been declared extinct namely Javanese tiger (Panthera tigris sondaica) and Bali tiger (Panthera tigris balica). Subspecies that still exist today are the Sumatran tiger (Panthera tigris sumatrae). The wild population of Sumatran tigers is estimated to be 300-500 in the wild [1] and it is believed there are more tigers in breeding zoos [2]. Sumatran tiger populations are scattered in six National Parks namely Gunung Leuser, Kerinci Seblat, Way Kambas, Berbak, Bukit Barisan Selatan, and Bukit Tigapuluh. In conservation efforts including ex-situ 375 Sumatran tigers are listed in the Global Species Management Plan [1,3].

The Sumatran tiger is an animal protected by the Government based on the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number P.106 / MENLHK / SETJEN / KUM.1 / 12/2018. Tigers are categorized as endangered animals on the red list by IUCN [1] and CITES have also banned the trade and hunting of these animals. The conservation of Sumatran tigers is also reflected in the Minister of Forestry Regulation Number: P.42 / Menhut-II / 2017 concerning the Strategy and Action Plan for the Conservation of Sumatran Tiger (Panthera tigris sumatrae) 2007-2017.

Ex-situ breeding programs (zoo) for endangered animals need to be carried out because they have a function as protection, guaranteeing animal welfare [4] health insurance, reducing pressure on tigers due
to conflict [5] conservation, care, breeding, and as an effort to promote conservation [6]. Public visits to the zoo can also develop positive perceptions and further support conservation efforts [4] Ex-situ conservation is not only in the maintenance and captivity (captive breeding), but also guarantees a source of food, free from human threats and defending tiger populations [5]. In addition, the ex-situ conservation program is also a center for research, education, and genetic reservoirs [7] because tigers have genetic traits and clear morphological differences with other tigers [8].

The transition of its natural habitat to ex-situ habitat can indirectly affect changes in animal behavior patterns. The results of the study by Szokalski et al., [2] show that in a captive breeding environment it can cause changes in tiger behavior patterns and create significant problems in the population if released back into the wild. Public visit is thought to be a trigger factor for changes in behavior patterns in captive animals. In addition, the characteristics of their natural habitat and the existing habitat in ex-situ conservation have differences in meeting the basic needs of tigers such as the breadth of habitat, prey and vegetation. That the depopulation of Sumatran tigers in ex-situ conservation areas occurs because of imbalanced feed, unable to express behavior freely, animals become stressed, unclean animal cages, and many other things what is a factor in the reduction in Sumatran tiger population and habitat characteristics in zoos are not in accordance with their natural habitat. Based on the description above, this study aims to determine the characteristics of ex-situ habitat and the daily behavior of Sumatran tigers in the Taman Rimba Zoo Jambi (TRZJ) Park. The selection of species in this study is because tigers have the potential for behavior change patterns in ex-situ captivity.

2. Methods

This research was conducted at the Taman Rimba Zoo Jambi Zoo (1°37'38" S 103°38'44" E) in May 2018. The location of the zoo is ± 500m from Sulthan Thaha Saifuddin Jambi airport. Map making using ArcGIS 10.2 software.

![Figure 1. Research location map.](image)

The method used is Instantaneous Sampling. The focus of daily behavioral research is on two female Sumatran tigers, namely the parent (Uni) and cub (Ayu) because TRZJ only has two female tigers. Tiger activity was observed based on the frequency of occurrence, duration of time, and percentage of time during observation and characteristics of ex-situ habitat of Sumatran tigers in TRZJ. This research was conducted for 7 consecutive days. Time recording starts from 07.00 to 19.00 hours when the tiger is removed from the cage in the morning until the eating process is finished at night at 19.00.
3. Results and discussion

3.1. Daily behavior

In this study using the Instant Sample method to see the daily behavior of tigers during the recording of tiger behavior data. This recording is only done during the day from 07.00 - 19.00 WIB every day for 7 consecutive days. Every day two tigers are removed from the cage outside the time issued at 07.00.

Table 1. Results of recording the duration of time for tiger behavior 12 hours/day.

| Name | Recording duration of behavior 12 hours / day for 7 days | Feed | Rest | Social Interaction | Etc |
|------|---------------------------------------------------------|------|------|-------------------|-----|
|      | ∑ 7 days mean | dev. | ∑ 7 days mean | dev. | ∑ 7 days mean | dev. | ∑ 7 days mean | dev. |
| Uni  | 112’ 16’ | 1,67 | 4431’ 633’ | 0,67 | 173’ 24,7’ | 2,24 | 324’ 46,3’ | 1,9 |
|      | 2,2% | 87,92% | 3,43% | 6,43% |
| Ayu  | 147’ 21’ | 1,33 | 4333’ 619’ | 3 | 204’ 29,1’ | 1,8 | 356’ 50,9’ | 1,5 |
|      | 2,92% | 85,97% | 4,05% | 7,06% |

3.2. Eating behavior

The observed feeding behavior was started from taking food, licking, chewing food [9] to swallowing and digesting food [1]. Based on the results of recording the duration of meals (table 1), that the duration of time to spend food has a time difference of 0.72% between Uni and Ayu. The difference in duration of time is based on the ongoing eating process. Ayu in the process of eating always needs the help of a keeper in spending feed by being bribed (Figure 2). Inside the cage there are two containers for putting food and drinks made from stainless steel.

Feeding is done once a day at night after the TRZJ is closed and after the tiger is put in a cage at 18.00 WIB. Feed given on Tuesday and Saturday in the form of chicken meat for Uni and chicken liver for Ayu each as much as 2 kg. Another day in the form of pork and other animals that are in the zoo in a state of death that is as much as 5 kg.

Simcharoen et al., [10] tigers need 5-6 kg of meat every day. The main feed of the Sumatran tiger is sambar deer (Cervus unicolor) and Kijang muntjak (Muntiacus muntjak), and the family of wild boar. Fabregas et al., [11] stated that based on a comparison of the weight of food consumption with the ratio of body weight of tigers, tigers need an average of 6 kg of food per day. Tigers in TRZJ need on average 16 ’(uni) and 21’ (ayu) to spend their food per day.
3.3. Resting behavior
Observation of resting behavior (resting) ie in a fixed position (resting) lying or sitting with eyes open or closed and or with the position of the front legs straight and hind legs folded [9,12]. The results of observing resting behavior on the Sumatran tiger Uni (87.92%) and Ayu (85.97%) have a time difference of 1.95%. Uni has a longer time than Ayu. The results of this study are consistent with the statement of Breton & Barrot [13] that in their natural habitat the tiger is a crepuscular species and is active at night moving for 10-12 hours. During the day the tiger tends to be inactive and rest more. Active behaviors in animals provide savings to exploit the diversity of behaviors that will maintain good health and reproduction [14].

![Figure 4. Tiger resting position.](image1)

![Figure 5. Tiger resting position.](image2)

3.4. Social interaction behavior
The observation results of the Sumatran tiger's social behavior are Uni (3.43%) and Ayu (4.05%) for 12 hours / day for 7 days. This social behavior has a relatively similar daily percentage because both are in the same cage. Tiger interaction with the keeper occurs in the morning, which is when removing the tiger into the cage outside and in the afternoon, which is in the cage and feeding. The interaction of tiger social behavior with the keeper ranges from 20-30 minutes every day including when feeding social interaction between tigers has a duration of 4-6 minutes every day. However, tiger interaction with zoo visitors did not occur.

Visitor intensity significantly influences behaviors that become inactive in Felidae [14] The results of this study also show that the behavior patterns are the same as those of Mallapur & Chellam [15] and Marinath et al., [14] ie there is no interaction between tigers and visitors.

3.5. Other observed behavior
In this study, we also note other behaviors such as growling, urinating, moving, pacing. This behavior has a duration of time with a percentage of 6.43% (Uni) and 7.05% (Ayu) in Table 2. After leaving the inner cage, the shy tiger moves around the outside cage and immerses himself in a pond / water drain for cooling and drink. Tigers also perform vocalizations (growling) to show their existence to other animals, markers when the mating season starts, as a warning signal, tiger vocals can be used as indicators of their well-being, and as a monitoring tool for individuals in wild populations [16].

3.6. Effects of captivity against changes in behavioral patterns
The zoo has an important role in efforts to conserve endangered species and avoid ongoing conflicts with humans. Captive breeding is also an important concern for behavior change. According to Szokalski et al., [2] in captivity, they can change behavior and create significant problems in the population if released back into the wild. Limitation of space in captivity can cause stereotypical behavior in many species. In tigers 16% overall get stereotype behavior. This happens to animals that
have wide roaming in the wild. The results of research by Miranath et al., [14] prove passive feeding and the presence of visitor intensity significantly increases tiger inactivity. In the wild, tiger activity is influenced by abiotic and biotic factors. In areas that are dry and hot during the day, tigers tend to save energy by spending time resting and some activities indicate to hunt in the presence of abundant prey. The pattern of tiger activity is higher at night (nocturnal) and dusk (crepuscular) because it is closely related to abiotic factors [17].

4. Conclusion

TRZJ (ex-situ conservation) in general has met the needs of tigers which are located in the amount of feed provided, water sources, and vegetation cover, only the breeding area is still not ideal considering tigers are animals with very wide roaming. On the outer cage substrate in the form of soil with grass as an ideal condition in accordance with its natural habitat. We recommend expanding cage sizes and live animal feeding to train hunting instincts that have an impact on increasing tiger activity. Daily behavior results on the two tigers showed relatively similar values with average eating behavior (2.56%), resting behavior (86.95%), social behavior (3.74%), and others (6.75%).

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