Daily Activity Pattern of the Group in Male Western Lowland Gorilla (Gorilla gorilla gorilla, Savage & Wyman 1847) at Schmutzer Primate Center, Taman Margasatwa Ragunan, Jakarta - Indonesia

1Luthfiralda Sjahfirdi, 2Aya Yuriesia Arifin, 3Hera Maheshwari, 4Asteria, 5Lisa Rahorjo and 6Pudji Astuti

1Department of Biology, Faculty of Mathematic and Natural Sciences, University of Indonesia, Depok, 16424, Indonesia
2Faculty of Veterinary, Bogor Institute of Agriculture, Bogor, Indonesia
3Faculty of Veterinary, University of Gadjah Mada, Yogyakarta, Indonesia

Abstract: A study on daily activity pattern of male Western lowland gorilla (Gorilla gorilla gorilla, Savage & Wyman 1847) had been done at Schmutzer Primate Center, Taman Margasatwa Ragunan Jakarta, Indonesia. The aim of the study was to observe the daily activity pattern of adult male gorilla group without any female in captivity in order to obtain a condition of preparing incoming female gorillas leading to successful conservation program. Three male gorillas: silverback, blackback 1 and blackback 2, had been observed in their inner cage and enclosure. The observation method used was a combination of scan sampling method and ad libitum method. Observation was conducted on 6 main activities and 14 supporting activities. Data were analyzed using Between-Subject Effect Test and Multiple Comparison Turkey HSD Test. Statistical test showed that there were no percentage differences between moving, vocalization, autogrooming and allogrooming activities within group. Resting was the biggest activity proportion in silverback and blackback 1 while moving was in blackback 2. Chest-beating, chest-barking, hand-clapping and sliding happened to all of them. Abnormal behavior like regurgitating-reingesting mostly happened to silverback; stress-induced behavior occurred to all individuals, while sexual behavior mostly was done by blackback 2 to silverback. According to external factors as visitor numbers and weather, there was no effect of these factors related to the gorilla behavior in captivity. This daily activity pattern showed the adaption ability of the gorillas to their captive life environment and it can be used to assure the successful ex situ conservation conducted by Schmutzer Primate Center.

Keywords: Adaption ability · Behavior · Captivity · Conservation · Male group

INTRODUCTION

Indonesia has several ex situ conservation centers, one of them is the Schmutzer Primate Center (SPC), which is the largest Primate center in Southeast Asia region as well as the largest in the world [1]. Some of critically-endangered species owned by SPC are the Javan Gibbon (Hylobates moloch) and Western lowland gorilla (Gorilla gorilla gorilla). Those gorillas owned by SPC originally came from Howletts Zoo, United Kingdom. Howletts Zoo granted four male gorillas to SPC on August 2002. Since they are not endemic species of Indonesia [2], study of gorilla in captivity are needed to determine their adaptation ability in the new environment.

Gorilla group structure within SPC only consists of three adult males. All of them are captive-born gorillas who came from the same group with the same alpha-male, so that they are actually related to one-another. Schmutzer Primate Center is the only conservation center based in Southeast Asia region trusted to nurture G. gorilla gorilla. It took a long time and procedures to transfer the gorillas from Howletts Zoo to SPC that finally made them the primadonna in SPC [5-3]. In March 2008, one of the gorilla at SPC died of haemorrhagic stroke. The death of the youngest gorilla was suspected caused by a fight with another gorilla. The intraspecies conflict was also triggered by the competition for subdominant position within the group. Hence, SPC increase observation and

Corresponding Author: Luthfiralda Sjahfirdi, Department of Biology, Faculty of Mathematic and Natural Sciences, University of Indonesia, Depok, 16424, Indonesia
care for Primate collection, gorilla in particular. It is quite distinctive compared to normal gorilla group structure in the wild who have several harem, their babies and led by a silverback. The difference in the social structure is suspected to be the cause for changes in daily activity patterns. Thus, a study of their daily activity pattern is needed. It is the first study to provide daily activity of gorilla since this male group habituated in SPC. As recommended by Angus [5-3], daily activity pattern must be studied exclusively for each species before providing a new atmosphere system in conservation center. Moreover, SPC will complete the group by adding female gorilla to increase the population numbers. The decreasing number of G. gorilla gorilla in the wild is then worsen by the habitat loss, wild hunting, bushmeat and plague [3,4]. Wildlife Conservation Society estimated that now only about 125,000 species of G. gorilla gorilla survived in the wild [4,5]. Since IUCN Red List classified Gorilla gorilla gorilla as critically-endangered species [2,6], the arrival of female gorilla will complete the gorilla group in SPC and it is hoped to increase the population numbers.

Daily activity observation aimed to understand the gorilla daily activity pattern in different environment and is needed to assure the successful ex situ conservation conducted by SPC. Thus, giving opportunities to control and research the factors influencing the physical conditions and at least sustain the population numbers [7].

MATERIALS AND METHODS

Location and Research Subject: The observation was being conducted to a group of male adult gorillas at SPC. The group consists of one silverback (SB) gorilla named Kumbo and two blackback gorillas named Kihi (BB1) and Komu (BB2). Kumbo and Kihi are 13 years old, while Komu is 11 years old. All of them are fed four times a day on 09:00 a.m, 12:00 a.m, 03:00 p.m, dan 04:00 p.m with fruits, vegetables and additional nutrition like bread, sunflower seeds, raisins, milk and honey, while water was given ad libitum. All of them are kept together in a inner cage (about 1,500 m²) made from steel with mechanical sliding door directly open to the enclosure with 8,000 m² field. Gorilla will be put in inner cage after the last meal and be released back to the enclosure in the morning after the first meal.

Sampling Method and Data Analysis: Daily observation was being conducted to the gorilla group on August – October 2009 starting from 08:00 a.m - 04:00 p.m each day. Gorilla at SPC would be released from the cage starting from 09:00 a.m, so that the first one hour observation (08:00 a.m – 09:00 a.m) will be done in the inner cage. The observation in the enclosure was being conducted from 09:00 a.m - 04:00 p.m. The daily activity observation data was then separated into the first one hour inner-cage activities and enclosure activities for the rest of the observation period. A combination of scan sampling and ad libitum method with 5 minutes duration without gap between sampling points was implemented [8].

Scan sampling method was used to observe main activities such as resting, moving, feeding, vocalization, autogrooming and allogrooming. Supporting activities that have been recorded during observation were chest-beating, chest-barking, hand-clapping, sliding, regurgitating-reingesting, coprophagy, pacing, stereotyped rocking, diarrhea, sniffing other genital part, touching genitalia, oral sex, penetrating and pelvic thrusting main activities such as resting, moving, vocalizing, eating and grooming (including autogrooming and allogrooming). Abnormal activities such as regurgitating-reingesting and coprophagy induced by specific condition apart from the main activities were noted using ad libitum method [8]. The condition of the weather, total number of SPC’s daily visitors and total number of visitors who were being in the cage area were analysed semi-quantitatively. Visitor numbers value ranges from (+) to (++++) based on the modification of Meder [9]. For this research, value (+) was set to describe a no-visitor condition, (+++) for 1-5 visitor numbers, (++++) for 6-20 visitor numbers and (++++) for more than 20 visitor numbers. Each of visitor number value would be divided into two categories: active and passive. The data of total daily visitors from the ticketing box were being collected at the end of observation.

The methods for data analysis were Between-Subject Effect Test and Multiple Comparison Turkey HSD Test, with P (T ≤ t), α=0.05 that was conducted by sorting out all of observation data in a form of a table presentation. All of the data gathered from the observation would be in the form of average percentages of activities conducted by three gorillas kept in inner-cage and enclosure which then later being analyzed descriptively and statistically.

RESULTS AND DISCUSSION

Gorilla in captivity spend most of their active time everyday for resting [10], while data based on the observation at SPC is shown in Table 1. The percentage of time spent resting in the inner cage were 38.56 ± 0.33 (SB), 37.74 ± 0.14 (BB1) and 12.5 ± 0.13 (BB2) and
Table 1: Average percentages of daily activity pattern of West lowland gorillas at Schmutzer Primate Center

<table>
<thead>
<tr>
<th>Activity</th>
<th>Silverback (SB)</th>
<th>Blackback1 (BB1)</th>
<th>Blackback2 (BB2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IC(%) EN(%)</td>
<td>IC(%) EN(%)</td>
<td>IC(%) EN(%)</td>
</tr>
<tr>
<td>Resting</td>
<td>38.56 ± 0.33</td>
<td>42.77 ± 0.26</td>
<td>37.74 ± 0.14</td>
</tr>
<tr>
<td>Moving</td>
<td>27.11 ± 0.25</td>
<td>22.64 ± 0.17</td>
<td>34.59 ± 0.13</td>
</tr>
<tr>
<td>Vocalization</td>
<td>0.02 ± 0.06</td>
<td>1.89 ± 0.24</td>
<td>2.52 ± 0.06</td>
</tr>
<tr>
<td>Eating</td>
<td>21.69 ± 0.23</td>
<td>18.99 ± 0.14</td>
<td>15.72 ± 0.11</td>
</tr>
<tr>
<td>Autogrooming</td>
<td>7.83 ± 0.12</td>
<td>13.21 ± 0.11</td>
<td>8.81 ± 0.08</td>
</tr>
<tr>
<td>Allogrooming</td>
<td>2.41 ± 0.09</td>
<td>0.01 ± 0.00</td>
<td>0.01 ± 0.01</td>
</tr>
</tbody>
</table>

Remarks: IC = inner-cage; EN = enclosure

the percentage of time spent resting in the enclosure were 42.77 ± 0.26 (SB), 41.12 ± 0.34 (BB1) and 26.02 ± 0.17 (BB2). The percentage of time spent resting by gorillas kept in North America Zoo was ± 50, which is not really distinguished with the ones in SPC, except for BB2 who spent the least time for resting compared to the other two. Resting activity for gorilla in captivity is highly dependable on environmental condition, similar as reported by Lukas et al. [11], who showed that the environmental condition in SPC is quite sufficient for all gorillas to do their activities.

Common locomotion of gorillas during observation period were walking on their four limbs (knuckle-walking). Bipedal locomotion was also noted, although only several steps and also climbed enrichment bars in the inner-cage and climbed trees in the enclosure. According to Napier and Napier [12], gorilla is one of the great apes who anatomically has the brachiating adaptability (long hands, hook arms, broad chest) but does not have a brachiotr’s behavior. It can be caused by the anatomy and the size of their body and also the vegetation in their habitats [12].

Based on the observation, BB2 spent most of his time for moving, followed by BB1 dan SB, a contrast with the time spent for BB2 for resting. BB2 was one of the most active gorillas during observation period. According to Pika et al. [13] age affects to movements in gorilla. Young gorillas move their bodies more actively, variably and intensely. It corresponds with BB2 conditions who is the youngest among all. Being two years younger compared to SB and BB1 makes him a very active gorilla, especially in capturing SB’s attention. BB2 was having a time where young male acts as sub-ordinate gorilla who does solitary exploration to establish his own group [14]. However, being in captivity has limited his movements so that he had a very active behavior compared to the other two gorillas.

Vocalization activity occurred during observation mostly were groaning, sniffing, calling and barking. Most of vocalization activity occurred to be in conformity with other activities such as chest-beating and pacing. Groaning and barking followed by chest-beating were usually conducted to display power and territory [2, 13]. Calling was conducted by the three gorillas whenever they miss the other group member, which happened when one of the three of them was kept in their individual inner-cages. It showed that vocalization activity with all its variation can occur as abnormal characteristics that usually found in animals kept in captivity which forms a stereotypic behavior [15].

Feeding was conducted by throwing the food to the enclosure as to create a condition similar with their own natural habitat. When feeding time comes, nursing officer will call the three gorillas who are usually in the middle of the cage to move closer to the river banks then throw the foods to their surrounding area. They started to do foraging when all the food in the surrounding area were already eaten. All three of them were commonly seen to collect and carry the food by the mouth, but they never eat while walking [10]. Gorilla stopped in feeding location and started their eating activity in sitting position. In the inner-cage, feeding was conducted by providing the food in their own cage.

All activities involving fingers and/or lips and teeth to eliminate dirt, dust and parasites from the body parts such as nails, nose, ears and eyes are called autogrooming [15]. Autogrooming usually occurred during resting period. According to Napier and Napier [12], allogrooming is a mean of communication which uses the senses that most primates do. Allogrooming was an activity initially being conducted purely on hygienic basis, which then later developed into a valuable social attachments. Allogrooming activity observed in SPC mostly led to one-way sexual approach. BB2 often tried to
Table 2: Frequency of behavior influenced by specific condition on West lowland gorillas at Schmutzer Primate Center

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>i</th>
<th>ii</th>
<th>iii</th>
<th>iv</th>
<th>v</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB</td>
<td>28</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>BB1</td>
<td>21</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>BB2</td>
<td>11</td>
<td>13</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Remarks: A = chest-beat; B = chest-bark; C = hand clap; D = slide; E = regurgitate-reingest; F = coprophagy; G = pacing; H = stereotyped rock; I = abnormal defecation; i = sexual behavior; ii = sniff; iii = touching genitalia; iv = oral sex; iv = penetrate; v = pelvic thrust; - = not happened

Table 3: Qualitative effect of visitor number to the Gorilla's main activities in West lowland gorillas at Schmutzer Primate Center

<table>
<thead>
<tr>
<th>Visitor Numbers</th>
<th>Average main activities of the three gorillas</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (+)</td>
<td>/ / / **</td>
</tr>
<tr>
<td>1-5(+)**</td>
<td>/ / / **</td>
</tr>
<tr>
<td>6-20(++)**</td>
<td>/ / / **</td>
</tr>
<tr>
<td>&gt;20 (++)***</td>
<td>/ / / / /</td>
</tr>
</tbody>
</table>

Remarks: *: rain during observation; **: cloudy during observation; ***: visitor with active category; /: activity done by the gorillas during observation, + to +++: number of visitor

do physical approach to the other two gorillas by starting it with allogrooming activity. However, BB1 and SB did not seem to accept that behavior. Mostly, allogrooming in gorilla occurs between mother and her children and also between females in the group with the the silverback (SB) [16]. Several young male gorillas do allogrooming to silverback, but as they get older, allogrooming is no longer done by the male gorilla within the group [17].

During observation period, all of the three gorillas were noted to have done specific behavior apart from their six main activities. Table 2 shows the observation results. Those behavior were mostly conducted as a response from specific conditions happened in the male gorilla group. Aggression and affiliation condition within group created behavior such as chest-beating, chest-barking, hand-clapping and sliding. Boredom would create regurgitating-reingestng and coprophagy. Pacing behavior, stereotyped rocking and abnormal defecation occured when gorilla was isolated in the individual inner-cage, whether it was because of creating conflicts with member from other group or enclosure reconstraction. Sexual behavior most likely to occur due to the fact that all of them are males and they were put together without female gorilla in sight. Behavioral phenomenon occured only to animals in captivity or famously known as stereotypic behavior such as pacing, stereotyped rocking, regurgitation-reingestng and coprophagy found in the three gorillas were just the same with other gorilla groups in captivity. Stereotypic behavior most likely to occur as a process of adaptation, habituation and flexibility [18]. Table 3 showed that there has been weather and number of visitor fluctuation in Taman Margasatwa Ragunan, Jakarta during observation period. Day-1 to Day-3 were covered in heavy rain with visitor numbers value (++) with passive category. All of the three gorillas were often seen doing foraging in the enclosure and waiting for the nursing officer to open the sliding door to enter the inner-cage where the local temperature ranged from 25 to 26°C. The following day turned out to be a hot sunny day. Day-7 turned out to be a hotter day than before where visitor numbers value (+++) with active category. The high number of visitors did not give any impact to gorillas’ behavior, except one time when one of the visitor thrown rocks toward BB2; BB2 was startled and moved over. Day-9, 14 and 16 were bright sunny day with visitor numbers value (+++) with active category. Yet, the gorillas’ activity were not affected by that.

All of the three gorillas were seen to spend most of their time resting when it was cloudy with high wind intensity. Day-17, BB2 was seen to throw hays to the loud visitors, while on day-18 SB groaned angrily to the visitors calling him. It can be caused by the fact that during day-17 and 18 during the observation period, BB1 was having health problem which led into letting SB and BB2 slept out at the enclosure under the heavy rain, resulting in stress behavior. Other stress-induced behaviors such as pacing, stereotyped rocking and abnormal defecation were nowhere to be seen. It was,
however, important to note that both SB and BB2 were waiting in front of the sliding door, staring into BB1 who were isolated in the inner-cage.

Based on observation, the overall visitor numbers did not give any significant impact on all of the gorillas’ daily activity pattern and did not induce behavior such as in-group aggression, seek attention or avoiding visitors. This result has similarity to that reported by Keane et al. [19]. It could be caused by gorilla’s ability to adapt quite well to the environment and the cage construction which has barriers for visitors to enable gorillas in finding a safe and well-endowed environment.

In conclusion, daily activity pattern showed adaption ability of the gorillas to their captive life environment and it can be used to assure the successful ex situ conservation.

REFERENCES