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Daily Activity of Elephant Allomothers (*Elephas maximus sumatranus*) in Tangkahan Conservation Response Unit (CRU) Area, Langkat, North Sumatera

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Abstract. Sumatran elephant (*Elephas maximus sumatranus*) is a social animal living in groups. A group of elephant is called herd consists of male, female, allomother and calf. Non-parenting females are called allomother with the role of maintaining calves from other females. In daily activity, allomother may also display a typical infant handling which is valuable for studying interaction between them. This study will describe the daily activity of elephant allomother in Tangkahan Conservation Response Unit (CRU) Area, Langkat, North Sumatera. Methodology used was focal animal sampling with continuous sampling of data record. Object in this study were two allomothers, namely *Ardana* and *Sari* with three calves, namely *Christopher*, *Albertina* and *Eropa*. Daily activities of allomothers were recorded as Defecating (DF), Urinating (UR), Mudding (MU), Resting (RE), Mating (MT), Salting (ST), Feeding (FE), Parenting (PR), Drinking (DR) and Walking (WK). We recorded 19,569 sample points from allomother daily activities with *Ardana* having 10,838 points and *Sari* having 8,821 points. The longest duration of activity recorded were: Parenting (PR) with 5,807.13 min, Walking (WK) with 5,695.50 min and Feeding (FE) with 3,842.71 min. The shortest duration recorded was Mating (MT) with only 18.96 min while remaining activities lasting between 346.25 to 614.63 min. Duration of daily activities is directly proportional to the percentage of frequency performed by allomothers.

1. Introduction

Elephants are the largest land mammals that still survive in the world. In general, Asian elephants have four sub-species, one of which is the Sumatran elephant (*Elephas maximus sumatranus* Temminck, 1847) inhabiting Sumatra Island, Indonesia [1]. Elephants live in groups or called herds, may consist of 25 to 35 individu or less [2,3]. The herd is led by one female or lady elephant having a matriarchal social system [3]. Living in herds is very important to protect younger elephant members.

Frequent daily activities displayed by elephants in their natural habitat were feeding and exploring [4]. However, variation in daily activities may be seen if there are parenting elephants and allomother elephants, displaying parenting behaviours. Allomother is a non-parenting female elephant in herd which helps nurturing calves from other female elephants. This behavior or allomothering exists to support parenting elephant for caring and training the calves during their pre-adulthood phase [5].



Allomothering is a typical behaviour which can be observed in ex situ conservation site of Tangkahan. However, empirical study concerning typical behaviour is still limited. Here, we reported allomother daily activities to obtain any useful informations in supporting the conservation of Sumatran elephants in the Tangkahan, Langkat, North Sumatra Conservation Response Unit (CRU) area.

2. Materials and Method

2.1. Location and Time

The study was conducted from May to October 2018. Study site located in Tangkahan Conservation Response Unit (CRU) Area, Namo Sialang village, Batang Serangan district, Langkat regency, North Sumatera, Indonesia. Tangkahan CRU area is a buffer zone of Gunung Leuser National Park.

2.2. Objects

The main objects in this study were two allomother elephants (*Elephas maximus sumatranus*), namely *Ardana* and *Sari* with three calves with age of ± 2.5 yr, namely *Cristhoper*, *Albertina* and *Eropa* from total of nine elephants conserved in Tangkahan CRU area.

2.3. Materials

Materials used in this study were stationary and tally sheet for data recording, digital camera for recording elephant behaviour and documentation, and stopwatch for limiting observation time.

2.4. Data collection

The study used observation and descriptive approaches combined with focal animal sampling and continuous sampling method to obtain daily activities of allomothers [7]. Focal animal sampling was performed to selected one individual, in this case one elephant allomother without disturbing any behaviours or activities displayed. The behaviours were recorded at a pre-determined time frequency (5 min interval) for 10 hr per day with a total observation time of 300 hr.

2.5. Data analysis

Allomothering behaviours was analyzed descriptively to present a specific description and general pattern of allomothers towards calves. Quantitative data is displayed using graphics and diagrams. The percentage of frequency is calculated using following formula:

$$\% \text{ Frequency} = \frac{\text{Frequency of Behavior}}{\text{Total Frequency of Behavior}} \times 100 \%$$

3. Results and Discussion

The elephant herd in Tangkahan CRU area consisted of one male, three mother elephants, three calves and two allomothers. This group is generally interrelated to the offspring and also interdependent with each other. Daily activity of allomothers is a reflection of all behaviours displayed in the area. Daily activities consisted of individual and social behavior during growth and development which increased during juvenile stage of elephants [3].

The study recorded 19,659 sample points from 300-hr observations with different points contributed by *Ardana* with 10,838 points and *Sari* with 8,821 points. Daily activity consists of several behaviors that are typical of animals, especially elephants. Daily activities of allomothers were recorded as Defecating (DF), Urinating (UR), Mudding (MU), Resting (RE), Mating (MT), Salting (ST), Feeding (FE), Parenting (PR), Drinking (DR) and Walking (WK). In this study, Defecating (DF), Urinating (UR), Mudding (MU), Resting (RE), Drinking (DR) and Walking (WK) were categorized as individual behaviours while Mating (MT), Salting (SA) and Parenting (PR) were categorized as social behaviours.

Table 1. Duration of behaviours displayed by allomothers in Tangkahan CRU area

Behaviours	Duration (minute)
Defecating (DF)	400.67
Urinating (UR)	434.33
Mudding (MU)	424.88
Resting (RE)	614.63
Mating (MT)	18.96
Salting (ST)	346.25
Feeding (FE)	3842.71
Parenting (PR)	5807.13
Drinking (DR)	414.96
Walking (WA)	5695.50

Behavioural development by elephants is formed from individual characters based on experience or learning outcomes in the herd. Therefore, allomother behaviours and activities may experience changes in their natural properties. Animal species have the potential to experience evolution or changes in social traits as adaptation to the environment [7]. Based on theory, elephants may also experience changes in their nature or character if the daily activities in herd displayed an imbalance of interaction among members. The duration of each behavior in allomother daily activities is listed in Table 1. Based on the table, three behaviors with longest duration were: Parenting (PR) with 5,807.13 min, Walking (WA) with 5,695.50 min and Feeding (FE) with 3,842.71 min. Meanwhile, the shortest duration were mating (MT) with only 18.96 min, followed with other behaviours with duration between 346.25 to 614.63 min.

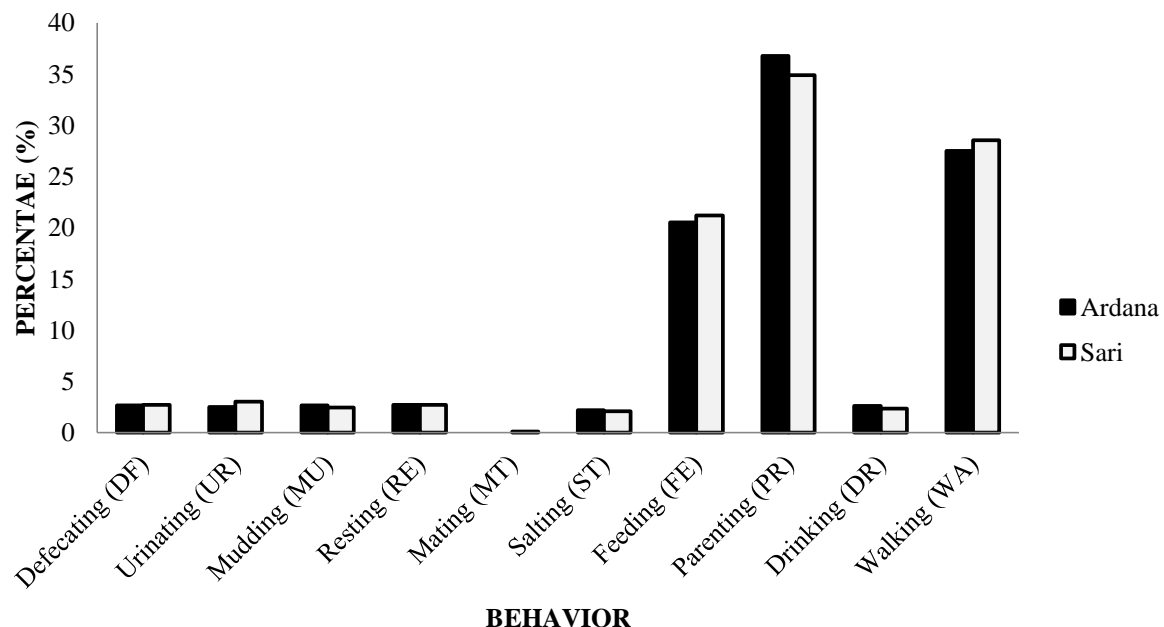


Figure 1. Frequency of behaviour on daily activities of allomothers

The parenting behaviour of allomothers has the longest duration during observation. This interaction is normal since allomothers presence in herd are to protect, maintain and interact positively with calves. A six-month old calf is readily to be nurtured by allomothers in a herd [5]. Allocation of allomothers is considered important to increase their survivability in the wild [8]. In this study, two-year calves were seemed to continue interacting with allomothers. The condition may thus create a sense of protection by allomothers until calves enter the adolescence phase. The allomothering will always be displayed in a herd until no adult female elephant exists.

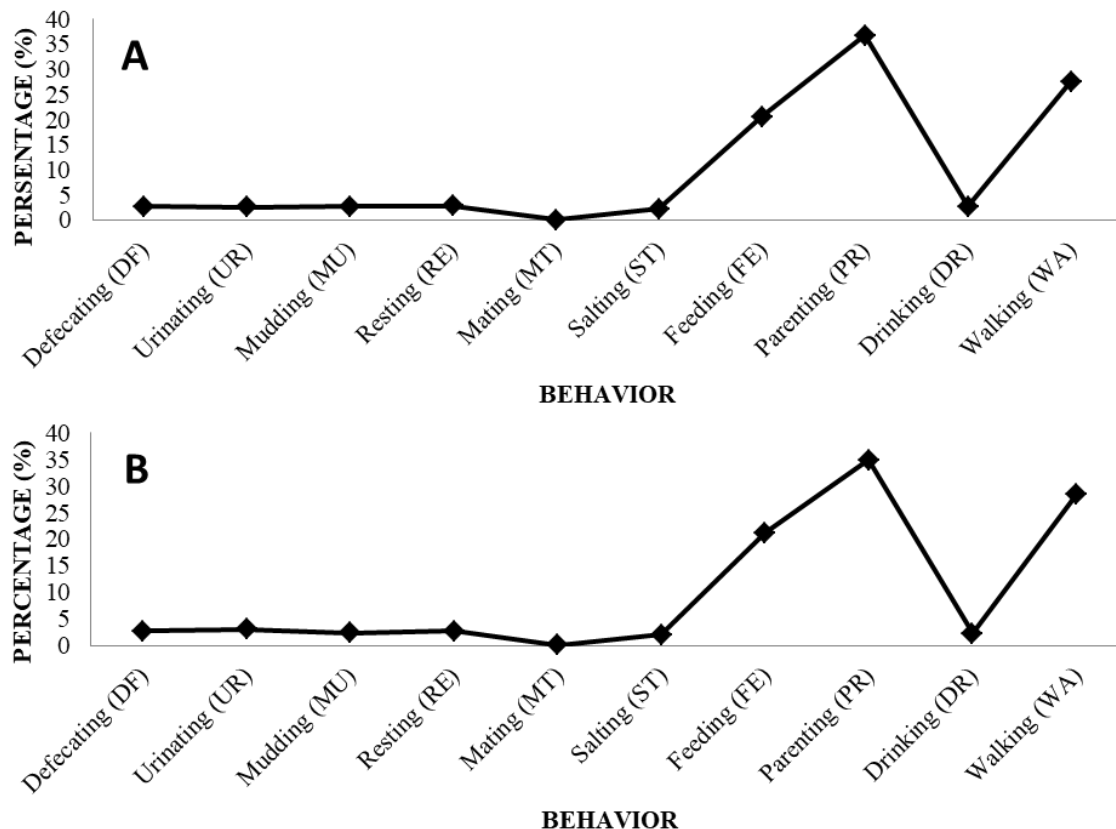


Figure 2. Percentage of behaviour frequency of daily activities by allomothers, **A.** *Ardana*, **B.** *Sari*

In this study, both elephant allomothers showed a similar pattern in daily activities (Figure 1). Parenting (PR) behavior displayed by *Ardana* was 36.72% and *Sari* 34.88%. The frequency of this behavior showed that it was directly proportional to their duration of behaviours, *Ardana* with 5,991.75 min and *Sari* with 5,622.50 min. During the display of PR, allomothers also displayed minor behaviours, i.e. learning, playing, grooming, teaching, kissing, following, hitting, bathing and vocalization to the calves. Theoretically, young elephant will always interact with allomothers until their age reach 10 or 15 yr [3]. In this study, the calves in Tangkahan CRU area are still 2.5 yr old and will keep interacting until reach theoretical ages. Based on Figure 2, the highest frequency of behavior other than parenting is Walking (WA) and Feeding (FE). *Ardana* displayed 27.50 and 20.52% of walking and feeding behavior while *Sari* displayed 28.50 and 21.17% of similar behaviours. Walking behavior is an individual movement in monitoring and protecting the calves.

Feeding behavior is the third longest duration of behavior during observation. In this study, mothers, calves and allomothers were seen together feeding in the forest. The mothers always approached her infants or vice versa during feeding. Likewise, allomothers also approached whenever the calves were in certain distance from their mother [10]. During feeding of mother elephants in specific site, the calves prefer to keep in distance with their mothers in order to display a more playing behaviour [11]. As a consequence, the calves often get lost while playing and will be dragged back by allomothers.

Elephants are megaherbivorous animals. Elephants are estimated to consume more than 400 different plant species, yet exhibiting selectivity towards certain species. The selection of feed will depend on geographical region, climate and ecosystem. Elephants show a tendency to select certain cultivated plants [11-14]. Elephants were also reported to prefer cultivated plants for consumption, i.e. rice, banana, oil palm, rubber plant and areca nut [15]. Elephants were also considered as pests due to their selective feeding on cultivated plants or commodity crops grown by local people which sometimes may trigger human-animal conflict [16,17]. In this study, allomothers chose their food in the forest using proboscis, then processed it prior chewing and swallowing. The results is similar to previous study reporting the feeding sequence of elephants [18]. In addition, palatable plants will soon be eaten while unfavored plants will be discarded [3,19]. Although allomothers displayed its own feeding behaviour to fulfill nutritional requirements, they also aided mother elephant in protecting the calves.

Based on observations, the shortest duration of behaviour displayed by the allomothers was Mating (MA). *Sari* displayed a frequency of mating behavior by 0.10%, while *Ardana* did not appear to display any related behaviour. The male elephant, *Theo* is ± 32 yr old and weighed $\pm 3,085$ kg which considered as productive age for breeding. Young Asian elephants will reach early sexual maturity at the age of 7/8 to 14/15 yr for male and 12 to 14 yr for female [20,21]. Furthermore, sexual maturity in elephants was related to nutrition in his body and was influenced by internal conditions and growth rates [20,22]. However, especially for elephants, the breeding capability depends not only by achieving the minimum critical body weight but also more importantly relied on their relative size and position in the social hierarchy.



Figure 3. Male elephant, *Theo* mates with allomother *Sari*

In Figure 3, allomother *Sari* was seen to display Mating behaviour (MA) with male elephant, *Theo*. Male elephants exhibit mating behaviors first by kissing genital organs, sniffing urine and feces, and touching the female body. The sequences are approved by theory which stated that examination of genital organs with proboscis followed by sniffing feces, hugging and touching of male temporal region is an important pre-contact behavior in mating behaviour [23]. Mating behaviour in this study showed a coitus duration of ± 5 -10 min. Coitus duration and urine secretion are important factors in

breeding success of elephants [21]. Meanwhile, elephants in Rajaji, India bred for ± 45 min and may occur four to five times a day. The total time needed for mating behavior, from foreplay to the end of coitus action may take an hour or two. Likewise, in this study, male elephants need about 1 hour of gestational behavior, starting from the beginning of genital organs check, sniffing feces, touching female elephants until the end of coitus. Male elephant was seen relaxed during mating sequence because *Theo* is the only male elephant in Tangkahan CRU area, yet there is no competition in selecting and seizing the pair. However, younger male elephants was afraid of other adult males to perform mating behavior. As a consequence, whole sequence in mating might be faster and performed in a short time [21].

In contrary, *Ardana* did not display any relevant mating behaviour. The male, *Theo* was seen to display the initial sequence of mating behaviour. However, *Ardana* chose to leave *Theo* once kissing and touching began. The male sometimes will force allomother to perform mating or coitus, however *Ardana* fled and produced a loud vocalization. In theory, female elephants may not accept males to do mating, indicated by loud vocalization to reflect the noise in a herd [21].

4. Conclusions

The overall sample points of allomother behaviours are 19,659 points with *Ardana* having 10,838 points and *Sari* having 8,821 points. Daily activities of allomothers were recorded as Defecating (DF), Urinating (UR), Mudding (MU), Resting (RE), Mating (MT), Salting (ST), Feeding (FE), Parenting (PR), Drinking (DR) and Walking (WK). The three behaviours with longest duration were Parenting (5,807.13 min), Walking (5,695.50 min) and Feeding (3,842.71 min). Other behaviours recorded, i.e. Defecating, Urinating, Mudding, Resting, Salting and Drinking were in the duration range of 346.25 to 614.63 min. The shortest duration of behaviour was Mating displayed by *Sari* with only 18.96 min.

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