

The Time Budget of Javan Deer (*Rusa timorensis*, Blainville 1822) in Panaitan Island, Ujung Kulon National Park, Banten, Indonesia

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Received March 10, 2014/Accepted July 15, 2014

Javan deer that exist in Panaitan Island was reintroduced from Peucang Island during 1978-1982. We observed behavior of the reintroduced Javan deer inhabiting Panaitan Island. Javan deer in this island spent most of their diurnal time for feeding. There were no significant differences between all age-sex variation for all activities pattern. The behavior of Javan deer was influenced by age, sex, social group, temperature, and food availability.

Key words: Javan deer, behavior, reintroduced, time budget

INTRODUCTION

Javan deer is protected by Indonesian law (Kemenhut 1999). Panaitan Island is one of the area for habitat of Javan deer. Javan deer which is occur in this island was reintroduced from Peucang Island during 1978-1982 (sixteen individuals; 3♂: 13♀). In 1997, Ujung Kulon National Park Agency reported that the population size of Javan deer in Panaitan Island was about 78 individuals and in 2008 it increased to about 400 individuals. The information of Javan deer in this island is very limited; information on ecology including behavior is unavailable, whereas the success of animal for surviving and reproducing depends on its behavior (Krebs & Davies 1990).

Behavioral studies are useful for conservation (Caro 2007). The information on behaviour can be incorporated into improved strategies for wildlife management by facilitating the expression of behavioral pattern in the species being managed (Singh & Kaumanns 2005). The knowledge of Javan deer behavior in Panaitan Island is expected to provide useful information to be used in their conservation.

One ways to quantify the animal behavior is to record the duration of each behavior type over a specified time period (Blackshaw 1986), and a record of how an organism spends its time is called time

budget (Crews *et al.* 2002). The objective of this research was to measure the time budget of Javan deer in Panaitan Island and to address their age-sex class variation.

MATERIALS AND METHODS

Study Area. Panaitan Island is located at Sunda strait around 06°34'8" S and 105°12'50" E, with an area of 17.500 ha (Figure 1). Panaitan Island is composed by primary dryland forest (9.213%), secondary dryland forest (55.81%), shrub (15.444%), secondary mangrove forest (5.727%), secondary swamp forest (9.877%), shrub swamp (3.927%) and grass land (0.002%). Topography of Panaitan Island is generally flat and the highest point is Gunung Raksa with a height of 320 m. Panaitan Island has three big rivers and many of wallows and swamps. Panaitan island is an area for habitat of javan deer (*Rusa timorensis*), barking deer (*Muntiacus*



Figure 1. Research site.

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munjak), smaller mouse deer (*Tragulus javanicus*), wild boar (*Sus scrofa*), long-tailed macaque (*Macaca fascicularis*), musang (*Paradoxurus hermaphrodites*), lizard (*Varanus salvator*), python (*Python reticulatus*), crocodile (*Crocodylus porosus*) and many species of birds. Mean temperature and humidity of the island varies 24-32 °C and 65-92%, respectively.

Behavioral Observation. The behaviors of Javan deer were observed using focal animal sampling method (Altmann 1974) by following the individual target and record the activity and its duration. When the individual target went out of sight, other individual with the same age-sex class was picked up and its behavior with the duration were recorded. The observations were conducted during daytime from 08.00 to 16.00 and recorded from March to December 2013.

The Javan deer were classified into: fawn, sub adult male, sub adult female, adult male and adult female. Determination of the age criteria based on body size and behavior of each age class (Yuliawati 2011). Fawn is characterized by small body size with smooth feathers, still in the care of its mother so always be near its mother. Sub adult is characterized by medium body size (bigger than fawn), usually active in groups of same age-sex class. At sub adult, males start growing single antler. Adult is characterized by a large body size. Adult male is marked by the antler that has developed and adult female usually be followed by fawn. We recorded behavior of 23 individuals of Javan deer (4 adult males; 5 adult females; 3 sub adult females; 5 sub adult males; 6 fawn) with total of 7200 minutes observation. Binocular was used to observe the behavior.

The activities pattern of Javan deer were divided into six categories: feeding, moving, resting, grooming, anti predator, and others. Feeding includes searching for food, handling the food and chewing, ruminating, drinking and drinking mother's milk. Moving includes walking and running. Resting includes standing still, sitting still, and sleeping

with eyes closed. Grooming includes licking itself, scratching itself, and licking another deer. Anti-predator includes standing scanning for anything suspicious, an alert posture, and giving alarm call. Others were defined as defecating, urinating, playing, fighting, wallowing, display (rubbing forehead or antlers on vegetation and decorating the antlers with vegetation), and sexual behavior. (Sharaichandra & Gadgil 1980; Xu *et al.* 2012).

Statistical Analysis. The percentage of each activity type of each individual was calculated. Kruskal-Wallis test was used to measure the potential behavior and sexual differences between each age class of Javan deer. Data were analyzed using SPSS 16.0 statistical package. Significant level were set at $P = 0.05$.

RESULTS

The result showed that all age-sex classes of Javan deer spent most of their time for feeding (Table 1). There were no significant differences between all age-sex variation for all activities pattern (Kruskal-Wallis test, $P > 0.05$), although adult female dedicated more time for feeding ($76.72 \pm 3.61\%$) than adult male ($57.73 \pm 6.23\%$) and adult male spent more time for other activities ($3.68 \pm 1.85\%$) than fawn ($0.08 \pm 0.03\%$).

The spread of time activity budget of adult female from 08.00 to 16.00 can be seen in Figure 2. It showed that adult female dedicated most of their time for feeding. Adult female spent most of their time for resting at 12.00-14.00. Meanwhile, adult male spent most of their time for resting in the morning (08.00-10.00) and in the afternoon (13.00-15.00), and they dedicated most of their time for feeding at 10.00-13.00 and 15.00-16.00 (Figure 3).

The spread of time activity budget of sub adult female and sub adult male were almost similar (Figure 4 & 5). During the day, sub adult male and sub adult female spent most of their time for feeding which interspersed by resting, moving, grooming, anti predator, and other. Sub adult male spent more

Table 1. Activity time budget of Javan deer in Panaitan Island

Activity patterns	Proportion of time spent (mean \pm SE)					Different time budget between all age-sex class compared by Kruskal-Wallis test
	Fawn	Sub adult male	Sub adult female	Adult male	Adult female	
Feeding	57.69 \pm 16.18	60.66 \pm 20.77	72.46 \pm 5.34	57.73 \pm 6.23	76.72 \pm 3.61	$\chi^2=2.433$; df=4; P=0.657
Moving	16.1 \pm 5.42	9.84 \pm 2.43	4.85 \pm 3.04	8.01 \pm 3.62	5.63 \pm 0.72	$\chi^2=5.433$; df=4; P=0.246
Resting	19.93 \pm 9.25	18.84 \pm 13.99	17.48 \pm 2.73	17.81 \pm 5.25	11.2 \pm 4.03	$\chi^2=0.700$; df=4; P=0.951
Grooming	1 \pm 0.52	4.48 \pm 4.43	3.12 \pm 1.42	6.59 \pm 3.41	1.29 \pm 0.65	$\chi^2=2.680$; df=4; P=0.613
Anti predator	5.19 \pm 1.83	5.18 \pm 1.74	1.99 \pm 1.13	6.17 \pm 0.87	4.94 \pm 0.77	$\chi^2=4.333$; df=4; P=0.363
Other	0.08 \pm 0.03	1.01 \pm 0.57	0.09 \pm 0.05	3.68 \pm 1.85	0.22 \pm 0.03	$\chi^2=6.214$; df=4; P=0.184

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