WALLOWS AND WALLOW UTILIZATION OF THE SUMATRAN RHINOCEROS (*DICERORHINUS SUMATRENSIS*) IN A NATURAL ENCLOSURE IN SUNGAI DUSUN WILDLIFE RESERVE, SELANGOR, MALAYSIA

Julia Ng, S.C[1], Zainal-Zahari, Z[2] and Adam Nordin[2]

[1] *Worldwide Fund Malaysia, 49 Jalan SS23/15, 47301 Petaling Jaya*
[2] *Sumatran Rhinoceros Conservation Center, Department of Wildlife and National Parks (DWNP), Km 10 Jalan Cheras, 56100 Kuala Lumpur*

Abstract:- A study on wallows and their utilization by the Sumatran rhinoceros (*Dicerorhinus sumatrensis*) was carried out in a 10-acre natural enclosure from March 1998 to October 1999 at Sungai Dusun Wildlife Reserve, Selangor. Observations of a pair were also carried out to determine the wallowing period. Three active wallows were observed in April and May 1998 and September 1999. Two distinct periods of increased wallow construction were from March-July 1998 and March-Jun 1999. Twenty wallows were identified with three distinct networks located on a slope near the main trail and adjacent to a swamp. Wallowing starts between 1000H-1030H with a peak at 1400H-1430H and the wallowing period decreases gradually from 1400H to 1600H. The wallows or its contents should be changed every three months as observed during the study. Man-made wallows could be improved by selecting good quality mud of thick consistency. Further studies should also be carried out to determine the reason of animals abandoning a wallow after a period of time and the chemical elements in a wallow.

Key Words:-*Dicerorhinus sumatrensis*-Sungai Dusun-wallow-Sumatran rhinoceros-Zoo Melaka-artificial wallow

Abstrak:- *Kajian tentang kubang badak telah dijalankan di sebuah kurungan semulajadi yang bersaiz 10 ekar dari Mac 1998 hingga October 1999. Sepasang Badak Sumatera juga telah diperhatikan untuk menentukan waktu berkubangnya. Sejumlah 20 buah kubang telah dikenalpasti dengan tiga rangkaian berbeza yang dijumpai di lereng bukit, dekat dengan denai utama badak dan bersebelahan tempat berpaya. Aktiviti berkubang bermula dari pukul 1000H-1030H, dan memuncak pada 1400H-1430H. Badak akan berkubang selama 2-3 jam sebelum keluar untuk makan. Waktu berkubang akan berkurangan secara beransur-ansur dari 1400H hingga 1600H. Kubang adalah satu keperluan bagi seekor Badak Sumatera. Di dalam kurungan, adalah patut bagi air kubang ditukar setiap tiga bulan seperti yang diperhatikan dalam kajian ini. Kubang yang dibuat oleh manusia boleh diperbaiki dengan menggunakan lumpur yang lebih pekat. Lebih banyak kajian perlu dijalankan untuk mengetahui sebab badak meninggalkan kubang selepas satu masa tertentu dan untuk mengenalpasti komposisi kimia di dalamnya.*

INTRODUCTION

Wallows are mud pools formed in poor drainage areas where the soil remains wet for long periods. They are widely distributed and are found in swamps and on mountain ridges. Wallows often exist individually or in a network of up to 10 pits. Wallowing, in which the animal covers itself with a layer of mud, is an important daily activity for a Sumatran rhinoceros. The layer protects the rhino against attacks from biting insects (Tabanidae) and keeps the animal's skin moist and cool.

Captive Sumatran rhinoceroses (*Dicerorhinus sumatrensis*) that were not provided with adequate bathing facilities developed broken and inflamed skins with suppurations, eye problems, inflamed nails and hair loss (Anderson, 1961; Coenraad-Uhlig, 1933). Similarly, in the Melaka Zoo, pyoderma was observed in Sumatran rhinoceros caused by insufficient wallowing facilities (Zainal-Zahari *et al.* 1991). A young captive Sumatran rhinoceros that was not allowed to bathe for a week suffered a generalized cracked skin, and it died shortly

afterwards (Hubback, 1939). Although most facilities for captive rhinos now provide pools or constructed wallows, these are not enough. Problems of the integumentary system still recur.

Information on wallows and wallowing habits of the Sumatran rhinoceros is lacking, yet it is important for the health and survival of captive rhinos. This study looks at wallows in a natural enclosure and how Sumatran rhinoceros use and compares the information to that in previous reports.

MATERIALS AND METHODS

This study was carried out in a 10-acre natural enclosure within the Sungai Dusun Wildlife Reserve, Selangor The area is forested and enclosed by electric fencing. The enclosure is moderately undulating and has both the characteristics of a lowland dipterocarp and peat swamp forest. It is built on swampy terrain with an altitude of 40 m.

Sungai Dusun is a prime habitat for the Sumatran rhinoceroses, and a pair was released into the reserve. The width and length of each wallow was measured. Barriers including fallen trees, logs, trees and Bertam palms (*Eugeisonna triste*) that were found surrounding the wallows were noted. The wallows were classified as active (used) or inactive (not used) and as shaded, partially shaded or unshaded. Activity periods of each wallow were recorded from March 1998 to October 1999. During this period, the rhino pair was observed from 1000 to 1600 for 38 days to determine wallowing periods. Observations were only carried out during these periods as they coincide with the keepers work schedule. In addition, the rhinos would come to the feeding area for foliage. Sampling throughout the study was by spot check except between 1300 and 1400, when a one-hour focal sampling was used.

RESULTS

The average length and width of wallows were 2.57 m (±0.61) and 1.94 m (±0.68) respectively with an estimated area ranging from 2.5 to 14.8 m^2 (Table 1). The length of active time for each wallow ranged from 2 to 12 weeks with an average of 5.85 weeks (Figure 1). Three active wallows were the maximum observed, these in the months of April and May 1998 and September 1999. The rhinos made their wallows in two distinct periods, between March and July 1998 and between March and June 1999 (Figure 2).

The rhinos made all their wallows under open canopy, mostly in forest gaps. Half were completely shaded by Bertam palms, 25% were partially shaded and 25% were in the open. The barriers observed during the study were mainly Bertam palm, trees and logs. A total of 20 wallows were identified in three distinct networks, consisting of 4, 6 and 10 wallows. Network 1 was located in a swampy region while networks 2 and 3 were found at an elevation of 5 and 20 m respectively (Figure 3).

The animals customarily wallowed continuously for 2 or 3 hours before coming out to feed. Spot checks indicated that frequency of wallowing increased in the morning hours until 1130, decreased at midday before reaching a maximum at 1300H and gradually decreasing again from 1400H to 1600H (Figure 4).

DISCUSSION

Wallow shape varied from elongate to irregular ovoid, often conforming to the shape of the rhinoceros. Wallows increased in size as the rhinoceros continued to use them, because the animal would scrape mud from the wall of a wallow to reconstitute the contents. The Sumatran rhinoceros prefers mud that is thick and viscous enough to stick to the skin after it wallows. The dimension of wallows varies from location and within a network. The length and width observed were within previously reported dimensions of 2 to 4 m by 1 to 2.1 m (Talbot, 1960; van Strien, 1985). However, wallows of up to 8 m in diameter have been recorded (Kurt, 1970). Of the three networks of wallows identified during the study, two were located near the main trail (at 5 and 20 m altitude) and one near a swamp. Each network consisted of 4 to 10 wallows. Studies in Gunung Leuser indicated 10 wallows within a network located along the main rhinoceros trails. Within the network of wallows, only one or two were active. These findings are similar to those from previous studies (van Strien, 1975; 1985). Wallows are more frequented than salt licks and are often found near streams and low saddles on ridges (Foenander, 1944). In Sungai Dusun, the wallows were located under open canopy, 75% of them completely or partially shaded by Bertam palms. The barriers surrounding the wallows include Bertam palms, fallen logs and trees. However, in Gunung Leuser, wallows often bordered fallen tree trunks and cavities left by uprooted trees (van Strien, 1985). The areas surrounding the wallows were intact except for the trails that led into them, which ranged from 1 to 4 in number.

Table 1: Dimensions and estimated area of wallows in a 10-acre enclosure

Wallows	Length (m)	Width (m)	Estimated area (m^2)
1	2.20	1.20	2.64
2	2.50	1.40	3.50
3	3.00	1.80	5.40
4	2.20	1.30	2.86
5	4.00	3.70	14.8
6	2.10	1.90	3.99
7	1.25	3.00	3.75
8	2.10	1.20	2.52
9	2.20	1.30	2.86
10	2.50	2.00	5.00
11	2.00	1.80	3.60
12	3.50	2.70	9.45
13	3.20	2.40	7.68
14	3.20	2.80	8.96
15	2.70	1.90	5.13
16	2.70	1.70	4.59
17	2.60	2.10	5.46
18	2.20	1.20	2.64
19	2.50	1.80	4.50
20	2.80	1.60	4.48

For location of wallows, refer to the numbers in Figure 3.

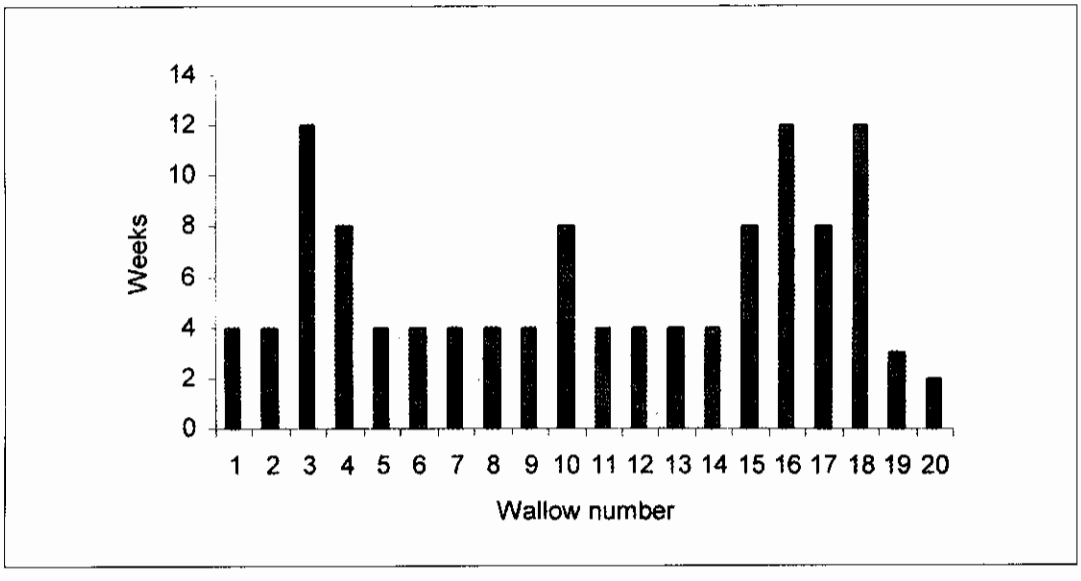

Figure1. Length of active time in weeks for each of the wallows in the 10-acre natural enclosure. Numbers indicate location of wallows, as shown in Figure 3

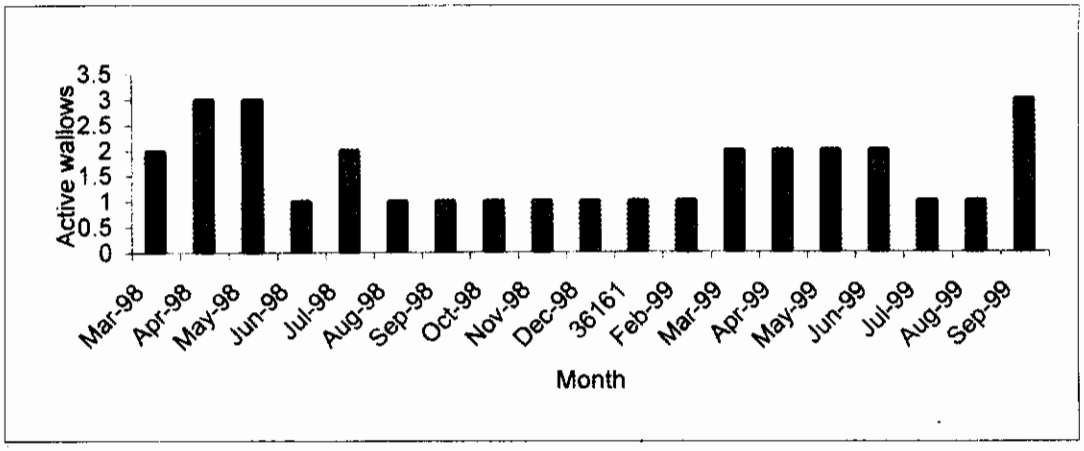

Figure 2. Number of active wallows used by the pair of rhinos for each month of the study period.

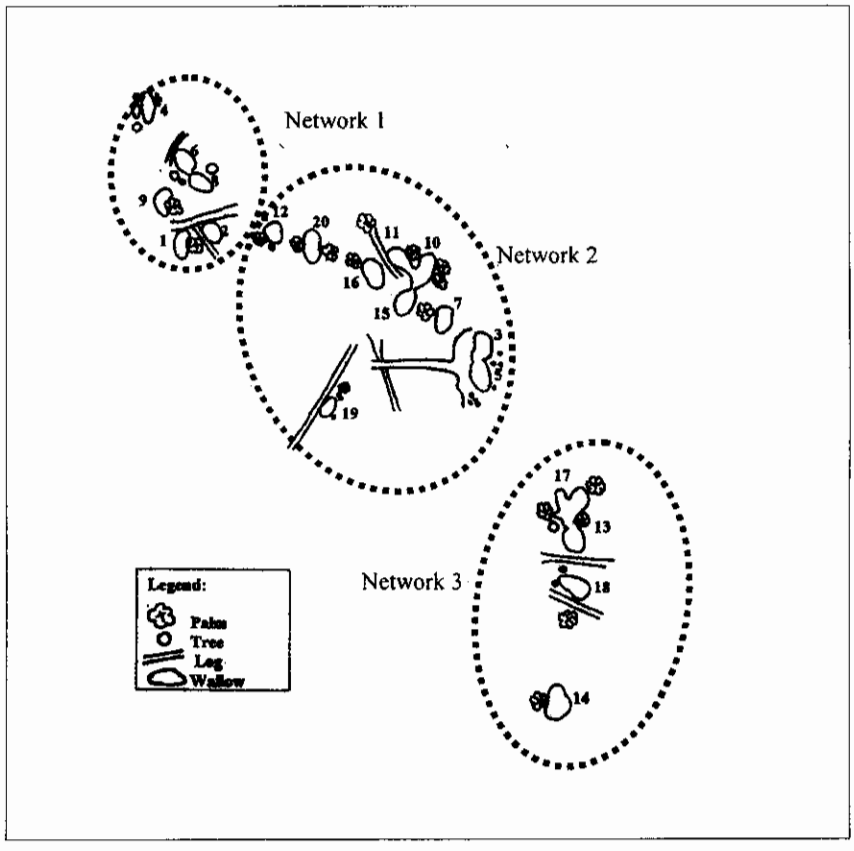

Figure 3. Location of wallows and wallow network in the 10-acre enclosure.

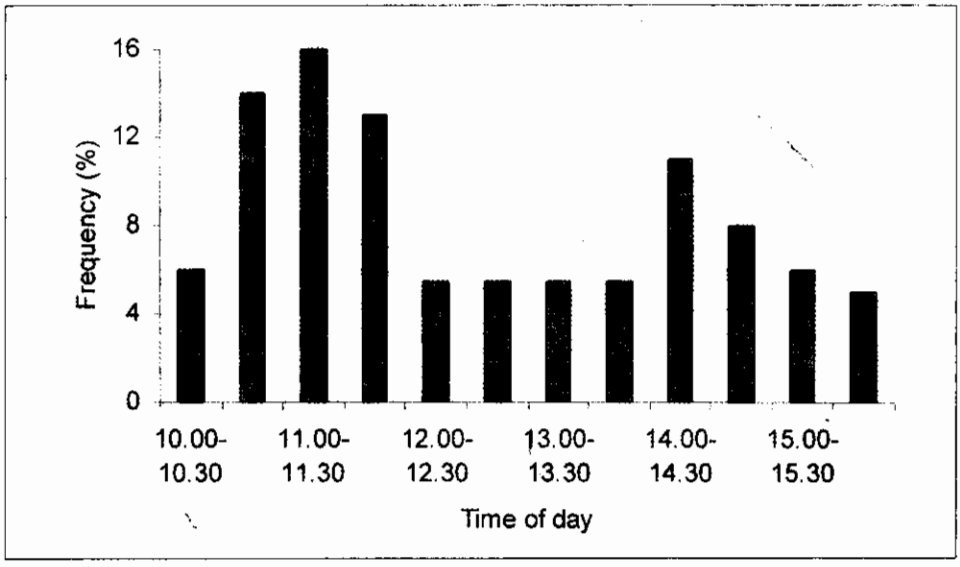

Figure 4. Frequency of wallowing per half-hour period, in percentage of the total number of observations.

These trails were clear of vegetation. Previous studies have shown that surrounding areas of 10 to 35 m around the wallows were cleared of vegetation (Kurt, 1970).

There is no past study that shows the length of active time for a wallow. However, van Strien (1985) found wallows reopened that had not been used for many years. Inactive wallows are watery, clear and usually filled with, algae, dead branches, twigs and feces, unlike the soft, rich, creamy-looking mud in active wallows. This is similar to studies carried out in Gunung Leuser (van Strien 1985). Of the 20 wallows, wallows 3, 16 and 18 were active for a maximum period of 12 weeks each ($n = 20$; $\mu = 5.85$ weeks). The physical size, shape and type of barrier are not correlated to the length of time a Sumatran rhinoceros uses a wallow. Some possible factors influencing the usage time are the consistency of mud and the chemical composition.

During the study, a season when wallowing increased was distinctly marked. Three active wallows were observed in April 1998, May 1998 and September 1999 as compared with an average of 1.63 per month throughout most of the study period. Two distinct periods when the rhinos increased their wallow making were during March to July 98 and March to June 1999. These periods coincide with the dry season. This is similar to previous findings that wallowing frequency increased during the dry period (Borner, 1979; Richard *et al.* 1990). In Gunung Leuser, Sumatran rhinoceros were observed wallowing in both dry and wet periods.

Wallowing occurred throughout the observation period, with a peak time between 1100 and 1130; it then decreased gradually towardsevening. Similarly, in Zoo Melaka, wallowing was observed between 1100 and 1500 with increased frequency during hot weather. In these artificially made wallows or concrete pools at Zoo Melaka, the duration of wallowing ranged from 3 to 4 minutes on a cool day and 45 minutes during hot weather (Richard *et al.* 1990). In contrast, the study in Sungai Dusun indicated that the rhinoceros spends between 80 and 300 minutes daily (an average of 166.32 minutes) in wallowing. This is similar to the observations in Gunung Leuser, where the Sumatran rhinoceros spends hours wallowing (van Strien, 1985).

CONCLUSION

Wallows are essential in any management of the captive Sumatran rhinoceros. Whenever possible, the wallow or its contents should be changed every 3 months, according to the length of time a wallow was used as observed during the study. Although artificial wallows or pools cannot substitute for natural wallows, their

quality can be improved by selecting good-quality mud or clay with a thick, creamy consistency.

The wallows observed were made where there were natural barriers like palm trees or logs. The enclosure for the captive animals should therefore simulate such things. During the dry season, the management of the facility should ensure that the wallows for the rhinoceroses are sufficient in number.

Further studies should be carried out to find out why the animals abandon a wallow and what the chemical elements in a wallow are.

LITERATURE CITED

Anderson, S. 1961. Sumatran rhinoceros at Copenhagen Zoo. *International Zoological Yearbook* **3**:56–57.

Borner, M. 1979. A field study of the Sumatran rhinoceros (*Dicerorhinus sumatrensis*). *Ecology and behavior conservation situation in Sumatra*. Zurich. Juris: pp: 169.

Coenraad-Uhlig,V. 1933. Van Gefangenleben eines jungen Nashorns. *Zoologische Garten N.F.* **6**:114–116.

Foenander, E. C. 1944. *Big game of Malaya*. Pelican, Kuala Lumpur

Hubback, T. R. 1939. The Asiatic two-horned rhinoceros (*Dicerorhinus sumatrensis*). *Journal of Mammalogy* **20**:1–20.

Kurt, F. 1970. Final report. WWF Project 596: Leuser Reserve (Sumatra). IUCN/SSC and WWF International. p 139.

Richard, X. M., Zainal-Zahari, Z., Vidyadaran, M.K., Mohd Tajuddin, A. 1990. Some aspects of the behaviour of the Sumatran rhinoceros (*Dicerorhinus sumatrensis*). Proceedings, 2nd Congress Veterinary Association Malaysia.

Talbot, L.M. 1960. A look of at threatened species. A report on some animals of the Middle East and Southeast Asia which are threatened with extermination. *Oryx* **5**:153–294

Van Strien, N.J. 1975. Progress Report No. 2 (June–August). IUCN/WWF Project No. 884/1972/C/I/55.1. Sumatran Rhinoceros International Conservation Program. Intensive Program.

Van Strien, N.J. 1985. The Sumatran rhinoceros (Fischer 1814) in the Gunung Leuser National Park, Sumatra, Indonesia: its distribution, ecology and conservation. Verlag Paul Perey. Hamburg. pp: 207.

Zainal-Zahari, Z., Mohd Tajuddin, A., Mohd Samsuddin, M.S. 1991. The husbandry and veterinary care of captive Sumatran rhinoceros at Zoo Melaka, Malaysia. *Malayan Nature Journal* **44** (1):1–21.