RETROSPECTIVE REVIEW ON CAPTIVE BREEDING OF MALAYAN TAPIR IN SUNGAI DUSUN WILDLIFE CONSERVATION CENTER, PENINSULAR MALAYSIA FROM 2004 TO 2020

***Donny, Y. [1,2], Magintan, D.[1], Enos, G.[2], Rahmat, T.[1] & Abdul-Kadir, A.H. [1]**

[1]Department of Wildlife and National Parks, Peninsular Malaysia, KM 10, Jalan Cheras, 56100 Kuala Lumpur, Malaysia.
[2]Sungai Dusun, Wildlife Conservation Centre, 44010, Kuala Kubu Baru, Selangor, Malaysia.

*Corresponding author's email: donny.yawah@gmail.com

ABSTRACT

Malaysia started a Malayan tapir breeding program in ex-situ and semi-wild facilities in 2004 at the Sungai Dusun Wildlife Conservation Center (SDWCC). This study assesses the breeding pattern and frequencies of the Malayan tapir in the SDWCC from 2004 to 2020. Within 16 years, 16 calves were produced from founders consisting of four males and seven females. Usually, a Malayan tapir produces one calf per pregnancy; however, a twin birth was recorded in 2007. The analysis of the reproductive pattern showed that the average calving interval was 20.9 months and birth occurred between February to June and October to December. No birth occurs between July to September. The average gestation period of Malayan tapir was approximately 13 months. Therefore, mating likely occurred between December to April and August to October. This information is vital for understanding the breeding pattern of Malayan Tapir in captivity for conservation and management purposes.

Keywords: Sungai Dusun Wildlife Conservation Center, Malayan tapir, breeding pattern, captive breeding, semi-wild.

Received (31-January-2022); Accepted (20-May-2022); Available online (25-September-2022).

Citation: Donny, Y., Magintan, D., Enos, G., Rahmat, T. & Abdul-Kadir, A.H. (2022). Retrospective review on captive breeding of Malayan tapir in Sungai Dusun Wildlife Conservation Center, Peninsular Malaysia from 2004 to 2020. *Journal of Wildlife and Parks,* **37**: 1-13.

INTRODUCTION

The Malayan tapir (*Tapirus indicus*) captive breeding program is one of the conservation efforts undertaken by the Department of Wildlife and National Parks (PERHILITAN), Peninsular Malaysia. A total of eight premises includes seven zoos and one Malayan tapir conservation centre (Sungai Dusun Wildlife Conservation Centre, SDWCC) are currently involved in breeding this species in Malaysia.

The Malayan tapir is the biggest of the world's four tapir species and the only tapir species in South East Asia (Southern Thailand & Myanmar, Peninsular Malaysia and the island of Sumatra, Indonesia). The Malayan tapir is listed as "Endangered" on the International Union for Conservation of Nature (IUCN) Red-list and on the national Red List of Mammals for Peninsular Malaysia (Traeholt *et al*., 2016; PERHILITAN, 2017). The world wild population of the Malayan tapir is approximately 2500 (Traeholt *et al*., 2016), with an estimation of around 1000 to 1500 individuals are found in Peninsular Malaysia (PERHILITAN, 2009). Meanwhile, the current captive population of the Malayan tapir within Malaysia is 38 individuals spread over zoos and a conservation center.

Malayan tapir is a solitary animal. However, males and females will come together during estrous for courtship and mating (Kusuda *et al*., 2007). According to Roman (2010), there is no evidence of reproductive seasonality in the estrous cycle activity of captive Malayan tapir. However, the wild tapir increases their breeding activity before the rainy season (Nowak, 1999). Meanwhile, Hoyer & van Engeldorp Gastelaars (2014) reported tapirs as seasonal breeders which breed in May and June. Based on the Malayan tapir's breeding behavioural studies, a various estimate of estrous length of the Malayan tapir were reported; 35 days (Horan, 1983), 29.4 days (Read, 1986), two months (Eisenberg, 1990) and 28-32 days (Barongi, 1993). However, studies based on serum progesterone (P4), the estrous cycle is 54 – 63 days (Schaftenaar *et al*., 2006), 21 - 84 days, (Kusuda *et al*., 2007) and 32-64 days (Kusuda *et al*., (2008). A Malayan tapir becomes sexually mature at about 2 - 3 years old and gives birth to a calf after 13 months of pregnancy (Barongi, 1993; Khan, 2014). Besides, twin birth in Malayan tapir occurs on rare occasions (Zainuddin & Mathew, 2014). In the wild condition, a calf continues to stay with the mother for up to two years. However, a calf can be separated from the female (weaning) as early as six months old in captivity. Generally, the Malayan tapir's life span is approximately 25 years in the wild and 35 years in captivity (Padilla & Dowler, 1994; Murphy *et al*., 1997).

SDWCC located in the state of Selangor, is the only semi-wild conservation and breeding center for Malayan tapir in Malaysia. The center is used to shelter and provide veterinarian care and treatment to the rescued wild Malayan tapir that

involved in human-wildlife conflicts and reproduce Malayan tapir in captivity. This study aimed to evaluate the breeding pattern of Malayan tapir in SDWCC.

MATERIALS AND METHODS

Sungai Dusun Wildlife Conservation Center (SDWCC)

This study was conducted at SDWCC, which is located within the Sungai Dusun Wildlife Reserve (SDWR), approximately 120km north of Kuala Lumpur (3.4075° N, 101.2382° E) (Figure 1). The SDWR was established in the year 1964 under the Selangor State Government, consisting of 4330 hectares, and the first forest was reserved to protect the Sumatran rhinos. This reserve mainly consists of low land dipterocarp and peat swamp forest, with the highest location about 253 meters from sea level. This reserve is surrounded by the Sungai Dusun river in the north and the Sungai Tengi river in the south. A canal known as the Ben Canal connects Sungai Tengi and Sungai Bernam rivers in the west. SDWCC facilitated with ten night-stalls ($20m^2$) linked to seven outdoor pens (approximately $250m^2$) accessible any time of the day. The night stall's floor is cemented, while the walls were made of concrete and metals, and a feeding and drinking tray is provided. Only one outdoor pen is with a pool facility. There are two existing fenced enclosures of 10 and 100 acres in size, covering a part of the natural habitat. These enclosures are for rehabilitation and rewilding of tapirs before being released back to their natural habitat.

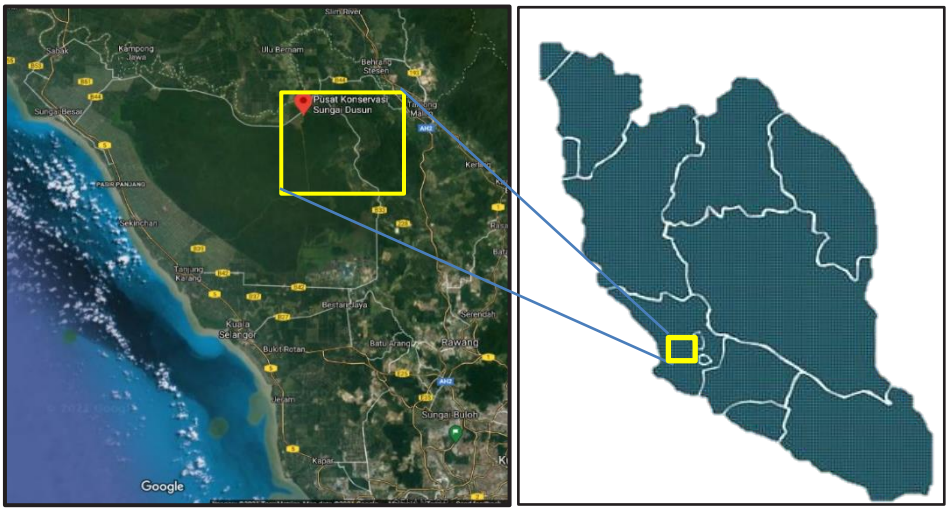

Figure 1 Location of Sungai Dusun Wildlife Conservation Centre on the map of Peninsular Malaysia.

Animals

Up to the time the current study was conducted, SDWCC houses 11 individuals of Malayan tapirs for breeding stock (4:7) which include seven originating from the wild and four captive-born. The breeding project in SDWCC was started in year 2004 with one young male (a captive-born individual from a zoo) and three females (two from the wild and one captive-born). Later, another adult female and male were brought in from the wild in the year 2005 and 2006, respectively. In the year 2007, a male calf was born and became one of the active breeding bulls, while, in the same year, a wild-caught young female was brought in. In the year 2010, another wild-caught adult female was acquired to this centre to increase the number of breeding females. Following this, a pair of wild-born calves were brought to the centre in the year 2015. These calves were less than a month and were rescued from a different region of Peninsular Malaysia. Figure 2 shows the adult Malayan tapir and a calf.

Figure 2 An adult tapir and her three-weeks-old calf at Sungai Dusun Wildlife Conservation Centre.

Breeding Technique

The Malayan tapir breeding at SDWCC occurred through natural mating, and based on the breeding history, two breeding techniques were implemented. The first technique is pairing the tapirs in a large semi-wild enclosure where tapirs mate together inside the 10 acres of fenced forest for three months to let a natural mating occur. After three months, the female will be replaced with another female or another pair. In addition, the pair is also put side by side at the night stall before the mating for compatibility and familiarisation for a few days to weeks during mating seasons. Once the individuals experience body contact and no aggressiveness is observed, the individuals are ready to be paired in the semi-wild enclosure for breeding. The second technique is pairing the tapirs in a smaller enclosure (the night-stall and paddock) to allow them to mate throughout the year.

Data Collection and Analysis

All available data such as; the individual's name, sex, origin, age, the year brought into the conservation centre, current breeding status, paired partners and numbers of calves produced by each individual in captivity of SDWCC were gathered from the studbook from 2004 to 2020. Additional information was also obtained through verbal communication with the staff involved in the husbandry of the tapir at the center. All the information was analysed in Microsoft excel to evaluate the breeding pattern of the Malayan tapir in SDWCC. Only the Malayan tapirs involved in the breeding programs were evaluated in this study. The individual Calving Interval (CI) and Average Calving Interval (ACI) are calculated based on the formula below;

The calculation of calving interval only involves the females with at least two calving throughout the breeding period.

$$\text{Calving Interval} = \frac{\text{Number of months from first calving to latest calving}}{\text{Number of calving}}$$

$$\text{Average Calving Interval} = \frac{\text{Total calving interval}}{\text{Number of females involved in the calving}}$$

RESULTS

Breeding Progenies in SDWCC

Based on the Tapir studbook data, a total of 74 Malayan tapirs have been registered from the year 2004 to 2020 at the SDWCC (Figure 3). Of this record, 60.8% (45, 13:32) individuals were brought and temporarily placed at the center for treatment, conditioning and rehabilitation and were not involved in the captive breeding program. Meanwhile, 21.6% (16, 7:9) were calves born at the center, including a calf born from a ready pregnant female rescued tapir, whereas 17.6% (13, 4:9) were the breeding stock. However, two individuals from this breeding stock were excluded due to their mortalities during the early stage of the breeding project, putting together four males and seven females included in the analysis as shown in Table 1.

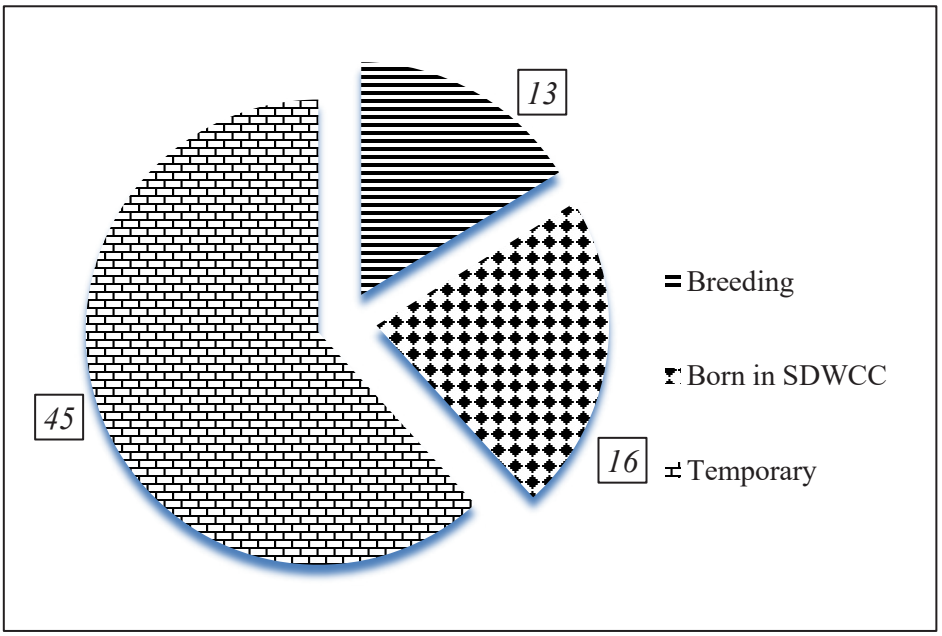

Figure 3 Number of Malayan tapirs registered in the tapir studbook in SDWCC (2004-2020).

Table 1 List of Malayan tapirs for a breeding program in Sungai Dusun Wildlife Conservation Center from 2004 to 2020.

No	ID	Sex	Origin	Year of transfer to SDWCC	Age during transfer to SDWCC (years)	Current age (as of 2020) (years)	Current status	Pairing	Total no of calves (Male:Female)
1	Kemat	M	Wild born	2006	12y	-	Transferred to zoo	-	-
2	Boy	M	Captive born in Zoo	2004	1y	17y	Alive	-	-
3	Junior*	M	Captive born in SDWCC	2007	-	14y	Alive	-	-
4	Gadek	M	Wild born	2015	7 days	5y	Alive	-	-
5	Sumbing	F	Wild born	2005	7-10y	-	Dead**	#1	3 (2:1)***
6	Kulai	F	Wild born	2004	6-7y	-	Dead**	#2	1 (0:1)
7	Inas	F	Wild born	2004	7y	-	Dead**	#2	1 (1:0)
8	Rompin	F	Wild born	2007	5-7y	-	Dead**	#2	1 (1:0)
9	Mala	F	Captive born in Zoo	2004	1y	17y	Alive	#2 & #3	5 (2:3)
10	Peradong	F	Wild born	2010	8-11y	19-22y	Alive	#3	4 (0:4)
11	Bera	F	Wild born	2015	14 days	5y	Alive	#4	1 (1:0)

* Progeny of Kemat & Sumbing.
** All died in 2010 due to a bacterial infection outbreak.
*** Gave birth to a twin in 2007.

Breeding Pattern and Frequencies

Throughout the 16 years of breeding Malayan tapir, the SDWCC recorded 15 calving, that produced 16 calves (7:9), including a twin calf born two weeks apart in 2007. Based on Table 1, only three females (Sumbing, Mala & Peradong) were able to calve for at least twice. The average calving interval was 20.9 months. Based on age, the youngest female to calved was at age 4.2 years old, while the oldest was at age 17 years old.

The Malayan tapirs started to reproduce in 2007 (Figure 4). In general, the birth rate of Malayan tapir at this center was one to two births per year. No birth occurred in the year 2004 to 2006, 2009, 2013 and 2017. One calf died due to a bacterial infection in 2010 and another calf died due to premature birth in 2011.

Figure 4 Number of Malayan tapir calves born from 2007 to 2020 in Sungai Dusun Wildlife Conservation Centre.

The birth frequency at SDWCC is shown in the area chart graph in Figure 5. Based on the graph, the birth occurred between January to June (n=9) and from October to December (n=7). No birth occurred between July and September. The one birth that occurred in August was reported to be premature birth based on the size and appearance of the fetus. The fetus's age was estimated at ten-months old.

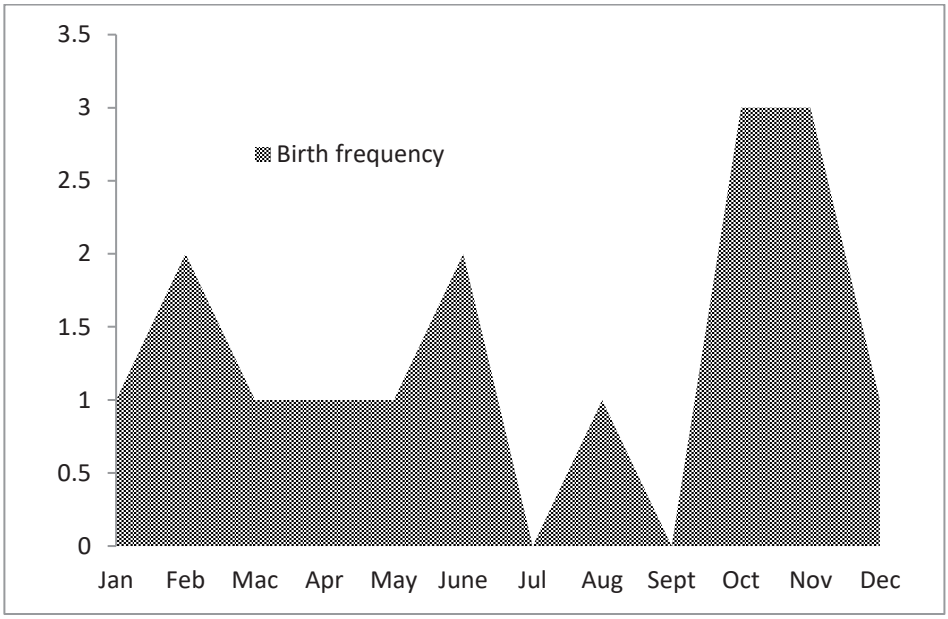

Figure 5 Area chart graph of the birth frequency of Malayan tapir in Sungai Dusun Wildlife Conservation Centre (2004-2020).

DISCUSSIONS

The results show that the Malayan tapir females involved in the breeding program at SDWCC were able to produce at least one calf with an average calving interval of 1.74 years (20.9 months). The average calving interval at SDWCC is slightly better than the Malayan tapir at St Louis Zoo, which is 2.65 years (31.8 months) (Read, 1986). The center was able to achieve this average calving interval because the weaning of the calf occurred at 6 to 7 months old, and mating occurs within three months of post-weaning. According to Barongi (1993), mating can occur within three months of post-weaning as the female can return to estrous cycle almost immediately after the calf is separated.

The mating chances were maximised by pairing the Malayan tapir in the 10 acres semi-wild enclosure for three months. This strategy allows at least one mating to occur within the period, as the estrous cycle length of the captive female Malayan tapir is approximately between one to three months (Barongi, 1993; Schaftenaar *et al*., 2006; Boer, 2007; Kusuda *et al*., 2007 & 2008). Based on the observation by the staff of SDWCC, aggressive behaviour was seen during the pairing process and it mainly occurs in the adult and less in the young individual. For this reason, every pair undergoes a conditioning process that involves keeping the female and

male inside a side-by-side night stall for a few days or weeks before mixing for mating. Observation also suggests that the conditioning process for breeding is not required when pairing a young Malayan tapir less than four months old.

The first birth of Malayan tapir at the SDWCC was in 2005 from a known pregnant female brought into the center from the wild. Therefore, the calf was not considered a captive-bred calf. In the year 2007, the birth of twin calves made the first captive birth of Malayan tapir at the center. The twin (male and female calves) was born two weeks apart and it was the first reported twin birth in the world for this species by Zainuddin & Mathew (2014). Another twin birth was reported at the Malaysia National Zoo on 5th June 2017 (Kavitha, 2021, *Personal comm.*).

Although the Malayan tapir in SDWCC breeds throughout the years, the Malayan tapir birth frequencies at the center are observed to have two distinct assemblages. Birth frequencies were high from January to June and from October to December according to the month. The findings suggest that the mating process might occur from December to April and from August to October. Only one birth occurred in August (2011). However, the calf was found dead inside the enclosure. Therefore the birth was considered outside of the assemblages. No breeding activities occur between May to July. In contrast to these findings, Hoyer & van Engeldorp Gastelaars (2014) reported that the breeding season of tapirs occurred in May and June, which is outside of the suggested breeding months of the Malayan tapir in SDWCC. This could indicate that the tapir's breeding season can be influenced by certain factors such as weather and the local environment. Therefore, more research is needed to understand the breeding seasonality of the Malayan tapir.

The breeding technique in the paddock (smaller enclosure) has a higher reproduction rate than the breeding technique in larger enclosures (10ha enclosure). This could be because the restricted spaces in smaller paddocks increase the mating chances of paired tapir.

RECOMMENDATIONS

In this study, we recommend a few points to improve the breeding performance of the Malayan tapir in captivity:

1. To increase the number of breeding pairs to enhance the genetic pool and raise the number of calves born yearly.

2. To incorporate advanced reproductive technology such as semen collection, artificial insemination and embryo transfer into the breeding management of Malayan tapir.

3. Establish non-invasive estrous cycle and pregnancy monitoring techniques.

4. Increase the variety of feeds given by enriching the paddocks with tapir-edible plants as a natural source of foods for the Malayan tapirs based on the study by Simpson *et al*. (2013).

CONCLUSION

In conclusion, Malaysia has successfully bred Malayan tapir in captivity. The information gained from this retrospective study gives insight into the performance of captive breeding of Malayan tapir. However, further investigation is required to understand the estrous cycle of the species in captivity so that a better breeding management plan can be implemented in the future.

ACKNOWLEDGMENT

The author would like to thank the staff in SDWCC for their help and Mr. Enos & Mr. Madzlan Misnan for their assistance with the data collection. Special thanks to the Director-General of the Department of Wildlife and National Parks for allowing this article to be published in the Journal of Wildlife and Parks.

REFERENCES

Barongi, R.A. (1993). Husbandry and conservation of tapirs *Tapirus spp*. *International Zoo Yearbook*, **32**(1): 7-15.

Boer, A.M. (2007). Monitoring of the oestrous cycle of Malayan tapirs (*Tapirus indicus*) as a tool in reproduction management using a chemiluminescent immunoassay, immulite, to measure blood progesterone. *27th AZVT Annual Proceedings at Honolulu Zoo, Honolulu, Hawai.* Volume: 27.

Eisenberg, J.F., Groves, C.P. & MacKinnon, K. (1990). Tapirs. In *Grzimek's encyclopedia of mammals* (Parker, S.P. Ed.), pp. 598-608. New York: McGraw-Hill Publishing Company.

Horan, A. (1983). An outline of tapir management. In *Proceedings of the Symposium of the Association of British Wild Animal Keeper*s: **7**: 24-29.

Hoyer, M.J. & van Engeldorp Gastelaars, H.M.D. (2014). Ultrasonographic measurement of fetal growth parameters over three successive pregnancies in a captive Malayan tapir (*Tapirus indicus*). *Zoo Biology*, **33**(4): 295-304.

Khan, M.M. (2014). *Big 5 Malaysian animal series: the Malayan tapirs*. Kuala Lumpur: Institut Terjemahan & Buku Malaysia.

Kusuda, S., Ikoma, M., Morikaku, K., Koizumi, J.I., Kawaguchi, Y., Kobayashi, K., Matsui, K., Nakamura, A., Hashikawa, H., Kobayashi, K., Ueda, M., Kaneko, M., Akikawa, T., Shibagaki, S. & Doi, O. (2007). Estrous cycle based on blood progesterone profiles and changes in vulvar appearance of Malayan tapir (*Tapirus indicus*). *Journal of Reproduction and Development*, **53**(6): 1283-1289. https://doi.org/10.1262/jrd.19100.

Kusuda, S., Ishihara, K., Ikoma, M., Doi, O., Uetake, K., & Tanaka, T. (2008). Male and female behaviors related with estrus and copulation in the captive Malayan tapir, *Tapirus indicus*. *Japanese Journal of Zoo and Wildlife Medicine*, **13**(2): 45-50.

Murphy M.R., Masters, J.M., Moore, D.M., Glass, H.D., Hughes, R.E. & Crissey, S.D. (1997). Tapir (*Tapirus*) enteroliths. *Zoo Biology*, **16**(5): 427-433.

Nowak, R.M. (1999). Perissodactyla. In *Walker's mammals of the world* (Nowak, R.M. Ed.), pp.1025-1028. Baltimore: The Johns Hopkins University Press.

Padilla, M. & Dowler, R.C. (1994). *Tapirus terrestris*. *Mammalian species,* **481**: 1-8.

PERHILITAN. (2009). *Kompendium 2009*. Retrieved from http://www.wildlife.gov.my/images/stories/penerbitan/lain_lain/Kompendium2009PDF.pdf. (Version on September 2021).

PERHILITAN. (2017). *Red list of mammals for Peninsular Malaysia version 2.0.* Kuala Lumpur: Department of Wildlife and National Parks (PERHILITAN) Peninsular Malaysia. Pp.7. Retrieved from http://www.wildlife.gov.my/images/document/penerbitan/lainlain/REDLIST_OL%20(M)_2018%20Sept.pdf. (Version on July 2021).

Read, B. (1986). Breeding and management of Malayan tapir at St. Louis Zoo. *International Zoo Yearbook*, 24/25: 294-297.

Roman, J. (2010). *International Baird's tapir studbook*. USA: Virginia Zoological Park.

Simpson, B.K., Shukor, M.N. & Magintan, D. (2013). Food selection of the Malayan tapir (*Tapirus indicus*) under semi-wild conditions. In *AIP Conference Proceedings*. American Institute of Physics, **1571**: 317-324. https://doi.org/10.1063/1.4858676.

Schaftenaar W., de Boer, A.M. & Glatston, A.R. (2006). Monitoring of the oestrous cycle in a captive Malayan tapir (*Tapirus indicus*). *The veterinary record*, **159**(13): 421.

Traeholt, C., Novarino, W., Saaban, S., Shwe, N.M., Lynam, A., Zainuddin, Z., Simpson, B. & Mohd, S. (2016). *Tapirus indicus*. *The IUCN Red List of Threatened Species 2016*:e.T21472A45173636. Available at http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T21472A45173636.en. Downloaded on 27 February 2019.

Zainuddin, Z.Z. & Mathew, A. (2014). Notes on twinning in the Malayan tapir (*Tapirus indicus*). *Journal of Indonesia Natural History,* **2**(2): 47-49.