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INFLUENCE OF ENCLOSURE CONDITION AND VISITOR NUMBERS ON BEHAVIOUR OF CAPTIVE MALAYAN TAPIR

KALAI ARASI ARUMUGAM

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INFLUENCE OF ENCLOSURE CONDITION AND VISITOR NUMBERS ON BEHAVIOUR OF CAPTIVE MALAYAN TAPIR

By

KALAI ARASI ARUMUGAM

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

INFLUENCE OF ENCLOSURE CONDITION AND VISITOR NUMBERS ON BEHAVIOUR OF CAPTIVE MALAYAN TAPIR

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KALAI ARASI ARUMUGAM

March 2018

Chair : Geetha Annavi, PhD
Faculty : Science

The population of Malayan tapirs (*Tapirus indicus*) in the wild is experiencing a radical decline mainly due to habitat destruction throughout their regions. Often during in search for a new habitat, food or mating partner, tapirs are victimised to traffic accidents when the roads are cutting through their habitats. In Peninsular Malaysia, a total of 68 tapirs death were recorded within five years since year 2012. Therefore, as an initiative measure to sustain the population, ex-situ conservation was established. However, the ability of captive management to maintain and breed endangered species has been proved challenging. While many other wild animals under captivity showed changes in their natural behaviours that resulted in stress, breeding difficulties, poor health, and repetitive stereotypic behaviours, information on Malayan tapir is still lacking. Hence, instantaneous sampling over 20 minutes period with an interval of 30 seconds was used to investigate the effects of enclosure type and size, weather (temperature and humidity) and the number of visitors on a range of behaviours to determine their role as potential stressors in male and female captive Malayan tapirs. Analysing the data using generalised linear mixed-effects models and multiple regression models, it was found that enclosure type had a significant effect on feeding behaviour where tapirs in semi natural enclosures fed more frequently than tapirs in artificial enclosure, mirroring natural feeding activity. Enclosure condition was also found to increase the investigative behaviour and reduced the time spent on resting in artificial enclosures. High visitor numbers overall lowered activity of tapirs, while low humidity caused tapirs to suffer from dryness, and thus resulted in more frequent snout licking as an indicative of thermal stress. In addition, increased number of visitors had reduced the sexual interaction such as, initiation, antagonistic and vocalisation in both male and female Malayan tapirs. Overall from this study, it is concluded that unsuitable enclosure conditions of extreme dryness and number of visitors are prone to be potential stressors that lower the activity pattern that possibly alter the natural behaviours of Malayan tapir. Therefore, further evaluation on exhibit design and management practices are encouraged to identify variables that could increase the reproductive success and physical well-being of captive Malayan tapirs.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Sarjana Sains

KAJIAN TINGKAH LAKU TAPIR MALAYA TERHADAP KESAN DARIPADA KONDISI KANDANG DAN BILANGAN PENGUNJUNG

Oleh

KALAI ARASI ARUMUGAM

Mac 2018

Pengerusi : Geetha Annavi, PhD
Fakulti : Sains

Populasi tapir Malaya (*Tapirus indicus*) di habitat liar sedang mengalami penurunan populasi yang radikal akibat ancaman pemusnahan habitat di seluruh kawasannya. Seringkali semasa mencari habitat baru, tapir menjadi mangsa kepada kemalangan jalanraya apabila jalanraya dibina melintasi habitatnya. Di Semenanjung Malaysia, sebanyak 68 kematian tapir telah direkod dalam tempoh lima tahun sejak tahun 2012. Oleh itu, sebagai langkah inisiatif untuk mengekalkan populasinya, strategi pemuliharaan ex-situ telah ditubuhkan. Walau bagaimanapun, usaha ini bergantung kepada keupayaan pengurusan konservasi untuk mengekalkan dan membiakkan spesies terancam yang cukup mencabar ini. Banyak haiwan liar lain menunjukkan perubahan dalam tingkah laku semula jadi mereka yang mengakibatkan stres, kesulitan pembiakan, kesihatan yang buruk, dan tingkah laku stereotip berulang. Walaubagaimanapun, maklumat berkaitan aspek-aspek tersebut mengenai tapir Malaya masih kurang. Oleh itu, dalam kajian ini, persampelan segera selama 20 minit dengan selang 30 saat digunakan untuk menyiasat kesan jenis dan saiz kandang, cuaca (suhu dan kelembapan) dan bilangan pelawat kepada pelbagai tingkah laku tapir Malaya bagi menyiasat peranan factor-faktor tersebut sebagai penekanan yang berpotensi yang boleh menjejaskan kesihatan spesies tapir Malaya dalam kurungan semi semulajadi dan kandang bukan semulajadi. Keputusan mendapati bahawa jenis kandang mempunyai kesan yang signifikan terhadap tingkah laku pemakanan di mana tapir di kandang semi semulajadi lebih kerap makan daripada tapir dalam kandang bukan semulajadi. Keadaan kandang juga didapati meningkatkan tingkah laku penyiasatan dan dengan itu mengurangkan masa yang dihabiskan untuk berehat di kandang bukan semulajadi. Bilangan pelawat yang tinggi secara keseluruhan menurunkan aktiviti tapir, manakala kelembapan yang rendah menyebabkan tapir mengalami kekeringan, dan menyebabkan kelakuan snout-lick yang lebih kerap, menunjukkan tekanan haba. Di samping itu, kesan peningkatan bilangan pengunjung telah mengurangkan interaksi seksual seperti tingkah laku pendayausaha, antagonis dan vokal pada kedua-dua tapir Malaya jantan dan betina. Kesimpulan daripada kajian ini, mendapati bahawa keadaan kandang yang terdedah mengakibatkan kekeringan melampau menjadi penekan potensial kepada

haiwan ini. Oleh itu, penilaian lanjut mengenai reka bentuk pameran dan amalan pengurusan digalakkan untuk mengenal pasti pemboleh ubah yang meningkatkan kejayaan reproduktif dan kesejahteraan fizikal tapir Malaya dalam habitat kurungan.

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I certify that a Thesis Examination Committee has met on 9 March 2018 to conduct the final examination of Kalai Arasi a/p Arumugam on her thesis entitled "Influence of Enclosure Condition and Visitor Numbers on Behaviour of Captive Malayan Tapir" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

Members of the Thesis Examination Committee were as follows:

Syaizwan Zahmir bin Zulkifli, PhD
Senior Lecturer
Faculty of Science
Universiti Putra Malaysia
(Chairman)

Puan Chong Leong, PhD
Senior Lecturer
Faculty of Forestry
Universiti Putra Malaysia
(Internal Examiner)

Shahrul Anuar Mohd Sah, PhD
Professor
Universiti Sains Malaysia
Malaysia
(External Examiner)

RUSLI HAJI ABDULLAH, PhD
Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 30 July 2018

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the Degree of Master of Science. The members of the Supervisory Committee were as follows:

Geetha Annavi, PhD
Senior Lecturer
Faculty of Science
Universiti Putra Malaysia
(Chairman)

Wan Norhamidah Binti Wan Ibrahim, PhD
Senior Lecturer
Faculty of Science
Universiti Putra Malaysia
(Member)

Christina Dagmar Buesching, PhD
Poleberry Foundation Research Fellow
Wildlife Conservation Research Unit
Department of Zoology
University of Oxford
(Member)

ROBIAH BINTI YUNUS, PhD
Professor and Dean
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Universiti Putra Malaysia

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Signature: 
Name of Chairman of Supervisory Committee: DR. GEETHA ANNAVI

Signature: 
Name of Member of Supervisory Committee: Dr. WAN NORHAMIDAH WAN IBRAHIM

ON BEHALF,
Signature: 
Name of Member of Supervisory Committee: DR. CHRISTINA DAGMAR BUESCHING

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LIST OF ABBREVIATION

IUCN	The International Union for Conservation of Nature
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
˚C	Degree celsius
AICc	Akaike's Information Criterion
Δ	delta
Df	degree of freedom
Ω	weight
Lm	Linear model
Glmer	Generalized linear mixed effect model
CI	Confidence Interval

CHAPTER 1

INTRODUCTION

1.1 Introduction

For the past few decades, human activities related to infrastructure development and economic enhancements have resulted in habitat loss and species extinction. Human utilised nature to gain financial stability, leisure and recreational pleasure, thus impacting wildlife population (Bergstrom & Randall, 2016). In Malaysia, the population of many large mammals have declined since large areas of lowland forests have been converted into oil palm and rubber plantations through governmental agricultural development (Kawanishi & Sunquist, 2004; Aiken & Leigh, 1992).

Among the large mammals, the Malayan tapir (*Tapirus indicus*), which is conventionally known as Cipan or Tenuk by the local is seriously affected by land conversion (Bodmer & Matola, 1997). Malayan tapir is an important animal to maintain the richness of Malayan forest ecosystem by dispersing a wide variety of plant species through carrying and excreting their seeds over long distance up to 3.3 kilometres (O'Farrill, Galetti & Campos-Arceiz, 2013; Campos-Arceiz, Traeholt, Jaffar, Santamaria & Corlett, 2012; Holden, Yanuar & Martyr, 2003). Sadly, the population of this animal is experiencing a radical decline in the wild with only 1300 to 1700 individuals left in Peninsular Malaysia.

The International Union for Conservation of Nature (IUCN) Red List listed Malayan tapirs as an 'Endangered' species because they are susceptible to extinction due to habitat loss, and other human activities such as illegal logging and hunting. In addition, our road system has also caused negative impact by impeding this animal's movement that often resulting them in road kills (Traeholt, Novarino, Saaban, Shwe, Lynam, Zainuddin, Simpson & Mohd, 2016). Along with these threats that increasing tapirs population decline, another crucial fact to emphasise is their reproductive rate. Malayan tapirs are strongly K-selected mammal (Dobson & Oli, 2007; Wilkie & Godoy, 1996), that have extremely low reproductive rate and produce one calf per parturition (Traeholt et al., 2016; Pukazhenthi, Quse, Hoyer, van Engeldorp Gastelaars, Sanjur & Brown, 2013; García, Medici, Naranjo, Novarino & Leonardo, 2012) after a long gestation period of up to 399 ± 3 days (Hoyer & van Engeldorp Gastelaars 2014; Pukazhenthi et al., 2013).

Thus, concerning to the population decline, low reproductive rate and the importance of this animal to our ecosystem, zoos and breeding centres attempted to manage their populations to protect and prevent them from becoming extinct via ex-situ conservation (Rose & Roffe, 2013). Hence, government-run captive breeding program at Sungai Dusun Wildlife Reserve was established in year 2005 as a semi-natural enclosure with the aims to provide refuge for displaced tapirs, breed tapirs in captivity and conduct research (malaytapir.org). Other than that, artificial enclosures like Zoo Negara,

Taiping Zoo and Johor Zoo also have taken part for conserving tapirs through captive breeding program (Traeholt, 2008). Several research were carried out on captive Malayan tapirs such as studies on their microhabitat, DNA, displacement, reintroduction and radio telemetry, captive activity pattern (Traeholt, 2008) and disease transmissions (Vellayan & Jeferry, 2014). Despite all these research, behavioural studies that investigate the potential stressors that could affect the conservation and welfare of captive individuals both in semi-natural and artificial enclosures are still lacking.

This study is crucial because changes in environment had resulted in behavioural changes, abnormalities or stereotypic behaviours in other wild animals kept in captivity (Mason, Clubb, Latham & Vickery, 2007; Clubb & Mason, 2003). This is particularly hazardous for endangered species, because it can affect their reproductive behaviours, physiology and life expectancy (Morgan & Tromborg, 2007; Hosey, 2005). While managing the Malayan tapirs in captivity, different managements had showed different types of enrichment practices that possibly alter their natural behaviours (Rose and Roffe, 2013). Among them are the activity budgets due to space impact (Mahler, 1984), adequate shade (Barongi, 1993) and daily diets, which are important factors to consider (Rose and Roffe, 2013) for Malayan tapirs' welfare needs. Furthermore, the majority of literatures on Malayan tapirs' reproduction are based on the study of their reproductive biology (Pukazhenthi et al., 2013), anatomy and system (Lilia, Rosnina, Abd Wahid, Zahari, & Abraham, 2010) and activity pattern (Tortato, Oliveira-Santos, Machado Filho, Brusius, & Hotzel, 2007). Yet, the effects of environmental factors to their reproductive behaviours in captivity are still lacking which should be considered as an essential conservation strategy for future continuation of a sustainable captive population.

Therefore, to design appropriate species-friendly enclosures, it is crucial to understand the focal species' specific needs that can be determined through scientific research and behavioural observations, providing important information about the physical and social requirements of endangered animals in captive breeding programmes (Festa-Bianchet & Apollonio, 2003). Therefore, the purpose of this study was to identify the potential stressors that may cause behaviour alteration and breeding difficulties in captive male and female Malayan tapirs by evaluating the environmental factors such as the enclosure condition and number of visitors.

1.2 Study Objectives

This research was conducted in order to provide conservational needs and information through the behavioural study of captive Malayan tapir. Thus, the objectives of this study were:

i) to compare the general behaviours of captive Malayan tapirs in two different enclosure conditions (semi-natural enclosures versus artificial enclosures)

ii) to investigate the influence of number of visitors and humidity on the general behaviours of captive Malayan tapirs,

iii) to compare the social and reproductive behaviours of captive male and female tapirs, and

iv) to investigate the effect of number of visitors, temperature and breeding month on captive Malayan tapirs' social and reproductive behaviours.

It is hoped that this study will increase the understanding of Malayan tapirs' basic needs in captivity and the results of this study will inform the design and management of captive breeding facilities, thus improving the welfare and conservation effort of the Malayan tapir.

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