



UNIVERSITI PUTRA MALAYSIA

***BEHAVIOUR OF SAMBAR DEER, (*Rusa unicolor* Kerr) AT DIFFERENT
CAPTIVE FACILITIES IN MALAYSIA***

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By

KUSHAAL A/L SELVARAJAH

**Thesis Submitted to the School of Graduate Studies, Universiti Putra
Malaysia, in Fulfilment of the Requirements for the Degree of Master of
Science**

April 2022

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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

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Chair : Geetha Annavi, PhD
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Sambar deer (*Rusa unicolor*) is listed as Vulnerable under the International Union for Conservation of Nature (IUCN) Red List. In Malaysia, its population is expected to be less than 700 left in the wild. Yet, this species is often seen only as a prey species to the Malayan tiger (*Panthera tigris*). The lack of published study in captivity and in the wild was a concern. The purpose of this study was to update the last study that was done in captivity on sambar deer and to better understand their behaviour on an individual and social behaviour in such settings. Direct and indirect observations were used for data collection purposes in all three sites. We had found there were differences in behaviour among the three captive sites namely Zoo Negara, Zoo Taiping and Sungkai Conservation Center that were researched. Our findings show that the tested factors such as temperature and sex do affect the behaviour of captive sambar on both observed social and individual behaviours. Behaviour such as foraging time was highly influenced by the feeding time at each captive site which also concurrently changed the behaviour and time spent on other behaviour such as rumination and sitting. Having a fixed feeding time may have altered or conditioned the captive population. A more sporadic or unscheduled feeding time may benefit and more importantly mimic their natural behaviour in the wild where foraging may be opportunistic. The study shows that there are several factors such as temperature that influence the behaviour and activity spent by sambar deer in captivity specific to the sites in this study. In addition, it was shown that temperature and time of day influenced the selective behaviour, both in observed individual and social behaviour. The notion of captive welfare is still a handle that is hard to grasp in the Malaysian context, hence the need for relevant stakeholders to take initiative to improve our animal's welfare. In addition, more in depth and longer duration of behavioural observation needs to be carried out in order to understand sambar deer in captivity.

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

**TINGKAH LAKU RUSA SAMBAR, (*Rusa unicolor* Kerr) DI DALAM FASILITI
KAWASAN LINDUNGAN YANG BERBEZA MALAYSIA**

By

KUSHAAL A/L SELVARAJAH

April 2022

Pengerusi : Geetha Annavi, PhD
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Rusa sambar disenaraikan sebagai “Terdedah ancaman” dalam Senarai Merah IUCN. Di Malaysia, dianggarkan hanya 700 individu rusa sambar liar yang masih ada. Namun, spesies ini hanya dianggap sebagai mangsa bagi Harimau Malaya (*Panthera tigris*). Justeru, terdapat kekurangan kajian yang telah dilakukan bagi rusa sambar terutamanya di dalam kurungan. Kajian yang telah dijalankan bertujuan untuk mengemaskini kajian yang pernah dilakukan sebelum ini dan memahami perilaku rusa sambar di dalam lindungan. Pemerhatian dilakukan secara langsung dan tidak langsung sepanjang kajian dijalankan. Melalui kajian ini, kami telah mengenalpasti bawah faktor-faktor luaran dan sekitar seperti suhu dan jantina memainkan peranan yang ketara di tahap perilaku sosial dan individu. Selain itu, terdapat juga perbezaan dari segi perilaku diantara tiga kawasan kajian. Masa yang diluangkan untuk mencari makanan dipengaruhi oleh masa diberi makanan oleh penjaga di kawasan kajian yang boleh dikaitkan dengan perilaku dan masa diluangkan untuk pencernaan dan berehat. Jadual pemberian makanan oleh penjaga perlulah dilonggarkan dan tidak mengikut masa yang sama pada setiap hari. Pemberian makanan pada masa yang sama setiap hari mungkin akan mengubah perilaku semula jadi rusa di dalam kurungan. Selain itu, ia akan mengekalkan perilaku rusa-rusa ini sama seperti populasi yang liar. Tambahan pula, didapati bahawa suhu dan waktu mempengaruhi perilaku rusa di tahap individu serta sosial. Kebajikan haiwan dalam lindungan masih boleh dikatakan, dipertikaikan oleh pihak pengurusan di Malaysia. Justeru, pihak terlibat perlu lebih cekal dan aktif dalam menaiktaraf tahap kebajikan haiwan kita. Namun begitu, lebih banyak kajian perlu dijalankan bagi memahami perilaku rusa sambar ini.

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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:

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LIST OF ABBREVIATIONS

AIC	Akaike's Information Criterion
Δ AIC	Delta- Akaike's Information Criterion
DWNP	Department of Wildlife and National Parks
GLMM	Generalized Linear Model Analysis
IUCN	International Union for Conservation of Nature



CHAPTER 1

INTRODUCTION

Sambar deer is listed as 'Vulnerable' in accordance with the International Union for Conservation of Nature (IUCN) in 2008 (Timmins, et al., 2015). In Malaysia, their population is being threatened due to poaching for parts and meat. This is not good news for a species that has important ecological roles as a prey to the Malayan tiger and as seed disperser.

There is no single definition for the term animal welfare to date, as well as there are no proper guidelines or boundaries to it. It has been defined as the balance between positive and negative factors pertaining to the acceptance level on how animals are being treated (Spruijt et al., 2001). Moreover, a concept such as animal welfare can only be understood further through a variety of methods, cognitive and observational data, and physiological studies. Through analyzing these methods we are able to take a step forward (Clegg, 2018).

With the lack of studies of animals in captivity, it's prevalent that we need to start shifting our focus to the welfare of the population in captivity, in regards to species that are not doing well in the wild.

In addition to the lack of study of this species in captivity, captive environments can play a crucial role in the welfare and health of the population such that they could potentially alter or eradicate behaviour that could normally be seen in the wild. Having a foundation of understanding in terms of their behaviour in captivity may shed light into their current situation. With the latest study done in Malaysia conducted by Aun and Rahman back in 1980, there is an urgent need to stack and build up on their research to better reflect the current readily available level of knowledge.

The following chapters are separated based on their objectives to better understand the difference in behaviour observed on a social and individual levels of this species. Leading forward in Chapter 2 will be detailed studies directly on sambar deer and research on captive animals conducted globally in hopes to understand their interactions with their captive environment.

In chapter 4, the social behaviour of sambar encompasses any form of interaction that involves more than one deer for example Flehmen which is the act of detecting hormones through urine (refer to Chapter 4, Table 1). The purpose of this Chapter 4 is to explore the interactions between the tested extrinsic parameters with their influence on this observed behaviour.

The following chapter 5 is aimed to investigate the influence of tested extrinsic parameters on an individual behaviour level with an emphasis to understand the difference between the male and female in these captive facilities with their behavioural differences in different environmental settings. In order to better understand its effect on the time spent as an individual in captivity for example foraging (refer to Chapter 5, Table 5) and more importantly to create an ethogram that is able to encapsulate and be used for further research purposes.

1.1 Problem statement

With sambar deer facing major threats to their population in the wild, and the lack of study or research conducted in captive populations could potentially lead to an untimely extinction of the species as with our Sumatran rhinos. Moreover, little or no attention is given to the general population of the species in captive settings aside that it is bred to increase prey numbers in the wild. Furthermore, there is a lack of study understanding the influence of external factors in Malaysia that may be changing the behaviour of captive populations.

1.2 Study Objectives

The study aimed to update existing understanding and research on the behaviour of sambar deer in different captive facilities in Peninsular Malaysia. The three captive facilities that were assessed are i) Zoo Negara, Selangor; ii) Zoo Taiping, Perak; iii) Sungkai Conservation Center, Perak. The specific objectives of this research were;

- i) To modify and establish an ethogram that was based on Aun and Rahman back in 1980 for the purpose of assessing the observed behaviour of sambar deer in an individual and social setting.
- ii) To identify the extrinsic factors that influence the behaviour of sambar deer across all three captive sites aforementioned.
- iii) To investigate the observed behaviour of sambar deer at social and individual settings in relation to extrinsic factors.

The null hypothesis of the research is no effect of extrinsic factors on the behaviour of sambar deer across all three captive sites at social and individual settings. The alternative hypothesis of the research is that extrinsic factors play a vital role in the wellbeing both in short and long terms on the behaviour of sambar deer regard to adaptability, stereotypes and abnormalities that may occur due to unfavorable conditions at settings in these captive sites at social and individual setting.

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