UNIVERSITI PUTRA MALAYSIA

SALTLICK TOPOGRAPHY IN THE ROYAL BELUM RAINFOREST AND SPECIES PREFERENCE

BRYAN ANDREW LAZARUS

FPV 2018 13

SALTLICK TOPOGRAPHY IN THE ROYAL BELUM RAINFOREST AND SPECIES PREFERENCE

BRYAN ANDREW LAZARUS

A project submitted to the

Faculty of Veterinary Medicine, Universiti Putra Malaysia

In partial fulfilment of the requirement for the

DEGREE IN DOCTOR OF VETERINARY MEDICINE

Universiti Putra Malaysia

Serdang, Selangor Darul Ehsan

FEBRUARY 2018

It is hereby certified that we have read this project paper entitled 'Saltlick Topography in the Royal Belum Rainforest and Species Preference', by Bryan Andrew Lazarus and in our opinion, it is satisfactory in terms of scope, quality, and presentation as partial fulfilment of the requirement for the course VPD 4999 project.

DR. HAFANDI AHMAD

B.Sc (UPM), M.Sc (UPM), Ph.D (LA TROBE)

Senior Lecturer,

Department of Veterinary Pre-Clinical Sciences

Faculty of Veterinary Medicine, Universiti Putra Malaysia

(Supervisor)

DR. TENGKU RINALFI PUTRA TENGKU AZIZAN

B.App.Sc(UMT),M.Sc (UKM), Ph.D Canterbury

Senior Lecturer,

Department of Veterinary Pre-Clinical Sciences,

Faculty of Veterinary Medicine, Universiti Putra Malaysia

(Co-Supervisor)

DEDICATION

“It is our choices, that show what we truly are, far more than our abilities…”

ACKNOWLEDGEMENTS

I would like to extend my deepest gratitude to my supervisor Dr.Hafandi Ahmad for being a truly inspiring supervisor. I would also like to thank him for his patience and guidance in supporting me to complete my final year project. The time spent, and knowledge gained is truly precious and cannot be replicated in any other manner. I would also like to thank Dr.TengkuRinalfi Putra TengkuAzizan, as the co-supervisor, for his generous input and knowledge on animal behaviour that guided me throughout this project. In addition to that, I would like to thank all the lecturers and post-graduate students that were involved in the success and completion of this project.

This thesis is dedicated to my parents, Dr. Kevin Lazarus and Cecilia Gertrude Salais Francis for their support and understanding during the completion of this project and the five years spent in veterinary education. Thank you for the immeasurable support and guidance.

I would also like to thank my friends, classmates of DVM 2018, and everyone directly or indirectly involved in the completion of this project and the completion of my veterinary education. Special mention to Muzammil, for aiding me through part of this project. Special mention to the Rangers of Pulau Banding Research Centre, En. Najmi and En. Saiful for guidance through the journey.

Lastly, special recognition the Royal Belum Rainforest and the abundant wildlife species it holds, may it forever be a sanctuary for flora and fauna that makes Malaysia a biodiversity hotspot in Asia.

CONTENTS

	Page
TITLE	**i**
CERTIFICATION	**ii**
DEDICATION	**iii**
ACKNOWLEDGEMENTS	**iv**
CONTENTS	**v**
LIST OF TABLES	**vii**
LIST OF FIGURES	**viii**
LIST OF PLATES	**x**
ABSTRAK	**xi**
ABSTRACT	**xiii**
1.0 INTRODUCTION	**1**

	Page
2.0 LITERATURE REVIEW	**3**
2.1 Topography of the Royal Belum Rainforest	**3**
2.2 Saltlick (Sira)	**5**
2.2.1 Types of saltlick	**7**
2.2.2 Saltlicks and Minerals	**8**
2.2.3 Saltlicks and the ecosystem	**11**
3.0 MATERIALS AND METHODS	**13**
3.1 Location of the study	**13**
3.2 Saltlicks	**13**
3.3 Data Recording	**14**
3.4 Methodology	**15**
3.5 Data analysis	**16**
4.0 RESULTS	**17**
5.0 DISCUSSION	**25**
6.0 CONCLUSION	**30**
7.0 RECOMMENDATIONS	**31**
REFERENCES	**32**
APPENDICES	**36**

LIST OF TABLES

		Page
Table 1	Mineral analysis of the natural licks present in Deramakot Forest Reserve in a study by Matsubayashi and Lagan (2006).	**9**
Table 2	An analysis of the concentration of mineralsin major diets of herbivores showing the low levels of sodium and prominent levels of potassium by Matsubayashi and Lagan	**10**
Table 3	Differences in the three saltlicks	**17**
Table 4	The animal density in Sira Kuak	**18**
Table 5	The animal density in Sira Batu	**20**
Table 6	The animal density in Sira Tanah	**22**

LIST OF FIGURES

		Page
Figure 1	The map of the Royal BelumRainforest location in Peninsular Malaysia	**4**
Figure 2	The detailed map of the Royal BelumRainforest.	**5**
Figure 3	The ratio of mammalian food habit in the entire Deramakot forest reserve to that of natural licks in a study by Matsubayashi*et. al.*,(2006)	**6**
Figure 4	A mountain goat licking a natural lick on the mountainside.	**7**
Figure 5	A possible food web present in the Royal BelumRainforest.	**11**
Figure 6	The measuring tape and camera trap used for this study.	**14**
Figure 7	The journey taken via boat, to the saltlicks and back.	**16**

		Page
Figure8	Bar chart showing the number of animals frequenting Sira Kuak	**19**
Figure9	Bar chart showing the number of animals frequenting Sira Batu	**21**
Figure10	Bar chart showing the number of animals frequenting Sira Tanah	**23**

LIST OF PLATES

		Page
Plate 1	An adult bull elephant spotted in the Royal BelumRainforest	**37**
Plate 2	A village of the indigenous people native to the Royal BelumRainforest.	**37**
Plate 3	An example of one of the saltlick, Sira Kuak	**38**
Plate 4	A Sambar Deer utilizing the saltlick at Sira Tanah, captured via camera trap	**38**

ABSTRAK

Abstrak daripada kertas projek yang dikemukan kepada Fakulti Perubatan Veterinar untuk memenuhi sebahagian daripada keperluan kursus VPD 4999- Projek.

TOPOGRAFISIRA SEMULAJADI DI HUTAN SIMPAN ROYAL BELUM DAN KAITANNYA DENGAN SPESIES HAIWAN YANG MEMILIHNYA

Oleh

Bryan Andrew Lazarus

2018

Penyelia: Dr.Hafandi, Ahmad

Penyelia Bersama: Dr.Tengku Rinalfi Putra Tengku Azizan

Sira adalah suatu deposit mineral semulajadi yang digunakan oleh haiwan di alam liar, untuk menambah kekurangan diet pemakanan. Tujuannya adalah untuk memastikan haiwan liar, khususnya herbivore dapat memperolahi mineral yang diperlukan dalam diet. Ini adalah kerana sira mengandungi nutrient penting seperti kalsium, magnesium, natrium dan zink. Selain itu, sira berfungsi sebagai titik perhimpunan untuk sepsis hidupan liar yang berbeza. Disebabkan fenomena ini, kita boleh menggunakan sira bagi mengenalpasti populasi haiwan, sepsis haiwan, rantai makanan, ekosistem dan lain-lain tujuan biologi. Objektif kajian ini adalah untuk menentukan hubungan antara ciri-ciri topografi sira yang berlainan, contohnya sira yang berbatu, atau sira bertanah dan spesis fauna berbeza yang menggunakan sira tersebut sebagai tempat untuk memperoleh mineral tambahan. Lokasi sira ditentukan oleh tapak kaki haiwan yang melalui kawasan tersebut.Sebaik sahaja sira dikenalpasti, perangkap kamera ditempatkan di lokasi strategic terhadap laluan haiwan yang menuju ke sira tersebut.

Tingkahlaku dan sepsis haiwan tersebut akan direkodkan. Hasil yang diperoleh menunjukkan bahawa tiga sira yang berbeza dari segi saiz, lokasi, kemudahan akses dan jenis tumbuh-tumbuhan, kesemua pada asasnya adalah topografi sira. Topografi yang berbeza memainkan peranan terhadap keinginan sepsis haiwan yang menuju ke sira tersebut. Oleh itu, kajian ini menunjukkan bahawa topografi adalah factor tarikan penting bagi hidupan liar dan keadaan sira yang berbeza dari segi topografi mempengaruhi kepelbagaan spesies hidupan liar yang mengunjunginya.

Kata Kunci: sira, topografi, perbezaan geografi, hidupan liar

ABSTRACT

An abstract of the project paper presented to the Faculty of Veterinary Medicine in partial fulfilment of the course VPD 4999-Project.

TOPOGRAPHY OF SALTLICKS IN THE ROYAL BELUM RAINFOREST AND SPECIES PREFERENCE

By

Bryan Andrew Lazarus

2018

Supervisor: Dr.Hafandi, Ahmad

Co-supervisor: Dr.TengkuRinalfi Putra TengkuAzizan

A saltlick is a natural mineral deposit used by animals in the wild, to supplement dietary nutritional deficiencies. The purpose of this is to ensure that animals, especially herbivores, can obtain the necessary minerals in the diet as salt licks can contain essential nutrients like calcium, magnesium, sodium and zinc. Besides that, when salt licks appear, it serves as a rally point for different wildlife species. In this circumstance, salt licks will be used to identify animal population, animal species, animal food chain, ecosystem and for other biological purposes. Thus, the objective of this study is to determine the relationship

between the geographical characteristics of different salt licks in the Royal Belum Rainforest(e.g. rocky areas, low lands or hill areas) and the distinct species of fauna that access the saltlick. The individual location of the salt licks was identified based on the animal trails. Once identified, camera traps were placed in strategic locations directed towards the salt licks to identify which species of animal frequents that salt lick. The results showed that the three different saltlicks differed in terms of size, location, ease of access and the type of vegetation, basically the topography of the saltlicks. The different topography of the saltlicks played a role towards the preference of distinct species of animals the frequent it. Thus, this study suggests that the topography is a crucial factor attraction for wildlife and the different topography of saltlicks influence the diversity or species of wildlife that frequent it.

Keywords: salt lick, topography, geographical differences,wildlife

1.0 INTRODUCTION

Salt licks are naturally occurring mineral deposits originating in mineral springs or ground, that contain or bear salt or any other minerals. The spring saltlicks are formed when natural springs with high mineral content seep out and form shallow pools of water. The dry-land saltlicks are formed when minerals are deposited and absorbed into the earth and soils from natural thermal spring processes (Jones, 1970). Wildlife obtain minerals from salt licks to supplement their diet either by drinking the pooled water or ingesting the soil. This natural behaviour is to ensure that animals, especially herbivores, can obtain necessary minerals in their diet (Herbert and Cowan, 2001).It has been established that salt licks are rich in minerals, containing minerals like sodium, potassium, fluorine, chlorine, calcium, magnesium, sodium and zinc (Herbert and Cowan, 2001).

In regard to this, salt licks serve as a rally point for distinct species of wildlife (Weir 1972). Research can be conducted at this aggregation points to better understand the wildlife population in the area, such as animal population and other biological purposes. Research regarding wildlife especially in their natural habitat is difficult due to them often requiring large contiguous areas of habitat that can support requirements of the predator and the prey. This rally points enable us to increase our chances of encountering wildlife in their natural habitats. Besides that, salt licks can also be a hidden observation point for wildlife enthusiast wanting to observe wildlife in their natural habitat. However, salt licks can also be a poaching point due to the fact that many species of wildlife use the salt licks to supplement their diet, thus proper management of the surrounding ecosystem and the topography protection is necessary.

In this study, we have identified three different saltlicks (Sira); Sira Kuak, Sira Batu and Sira Tanah within the Royal Belum Rainforest. These three salt licks are different in terms of topography, surrounding vegetation and sizing. Therefore, we would like to observe if there is a difference in animal preference towards the three salt licks regarding its topography. Realising the benefits of salt licks towards animal population, abundant different possible wildlife researches can be conducted at these salt licks to better understand wildlife ecology and natural behaviour. In fact, it is important that we understand and study the different animal species that are attracted to the salt licks. Thus, this study will assist further, more specific research that can be done at this wildlife rally points such as herd preference, and wildlife food chains.

REFERENCES

Alfred R, Ahmad AH, Payne J, Williams C, Ambu LN, How PM, et al. (2012) Home Range and Ranging Behaviour of Bornean Elephant (*Elephas maximus borneensis*) Females. PLoS ONE 7(2): e31400.

Ashton, L. A., Barlow, H. S., Nakamura, A. and Kitching, R. L. (2015), Diversity in tropical ecosystems: the species richness and turnover of moths in Malaysian rainforests. Insect Conserv Divers, 8: 132–142.

Black, J. G.; Mosquera, D.; Guerra, J.; Loiselle, B. A.; Romo, D.; Swing, K. (2011). "Mineral licks as diversity hotspots in lowland forest of eastern Ecuador". Diversity. **3** (2): 217–234.

Brian K. McNab, "Bioenergetics and the Determination of Home Range Size," The American Naturalist 97, no. 894 (May - Jun. 1963): 133-140.

Clements, R., Rayan, D.M., Ahmad Zafir, A.W. et al. BiodiversConserv (2010) 19: 1115.

L, Nur Johana1, and A. M. Muzzneena. “Species Composition, Diversity and Relative Abundance of Amphibians in Forests and Non-Forest Habitats on Langkawi Island, Peninsular Malaysia.

Matsuda, Ikki&Ancrenaz, Marc & Akiyama, Yoshihiro &Tuuga, Augustine &Majalap, Noreen & Bernard, Henry. (2014). Natural licks are required for large terrestrial mammals in a degraded riparian forest, Sabah, Borneo, Malaysia. Ecological Research. 30. in press. 10.1007/s11284-014-1219-1.

Matsubayashi, H., Lagan, P., Majalap, N. et al. Ecol Res (2007) 22: 742. ht

Markovchick-Nicholls, L. *et al*. Relationships between human disturbance and wildlife land use in urban habitat fragments. Conserv. Biol. **22**, 99–109 (2008).

McKinney, M. L. Urbanization, biodiversity, and conservation. Bioscience **52**, 883–890 (2002).

Mike H. N. Chong, et al. “Management Recommendations for Wildlife Saltlicks with Particular Reference to Sira Air Hangat at Ulu Muda Forest Reserve, Kedah.

Mills, A.; Milewski, A. (2007)."Geophagy and nutrient supplementation in the Ngorongoro Conservation Area, Tanzania, with particular reference to selenium, cobalt and molybdenum". Journal of Zoology. **271** (1): 110–118.

MohdHasmadi, et al. "Forest Road Assessment in Ulu Muda Forest Reserve, Kedah, Malaysia." Modern Applied Science, vol. 2, no. 4, 2008,

Mohd. Khan Bin Momin Khan. 1967. Movements of a herd of elephants in the Upper Perak area. Malayan Nature Journal20 (1&2): 18-23.

Nor Liyana, M., Othman, Z., Abd Wahid, R., &AzizulHakimie, A. (2016). Habitat suitability prediction model of wildlife at Royal Belum State Park using geographical information system. International Journal of Geoinformatics, 12(2), *1-8*.

Prayurasiddhi, T. & N. Bhumpakpun. 1985. The study on behavior of saltlick utilisation by some wildlife species in Huai Kha Khaeng Wildlife Sanctuary. p. 5. In: Khao Nang Rum Annual Research Paper. Wildlife Conservation Division, Royal Forest Department.

Preisser, E. L., Bolnick, D. I. and Benard, M. F. (2005), Scared to Death? The Effects of Intimidation and Consumption In Predator–Prey Interactions. Ecology, 86: 501–509.

Simcharoen, A., Savini, T., Gale, G. A., Roche, E., Chimchome, V., & Smith, J. L. D. (2014). Ecological factors that influence sambar (Rusa unicolor) distribution and abundance in western Thailand: Implications for tiger conservation. RafflesBulletin of Zoology, 62, 100-106.

Smith, R. 1999. The ecology of Amazonian wildlife at saltlicks: implications for ecotourism in South-east Peru. Unpublished M.Sc. thesis, University of East Anglia

Stevens, W.E. 1968. Habitat requirements of Malayan mammals. Malayan Nature Journal

Strickland, D.L. 1967. Ecology of the rhinoceros in Malaya. Malayan Nature Journal 20(1&2**)**: 1-17.

Voigt CC, Capps KA, Dechmann DKN, Michener RH, Kunz TH (2008) Nutrition or Detoxification: Why Bats Visit Mineral Licks of the Amazonian Rainforest. PLoS ONE 3(4): e2011.