



**UNIVERSITI PUTRA MALAYSIA**

***DIVERSITY AND TEMPORAL ACTIVITY PATTERNS OF DIPTERA  
ASSOCIATED WITH CAPTIVE WILD MAMMALS AND THE EFFICIENCY  
OF TRAPPING METHODS***

**JESSIE HO SI WAI**

**FPV 2015 20**

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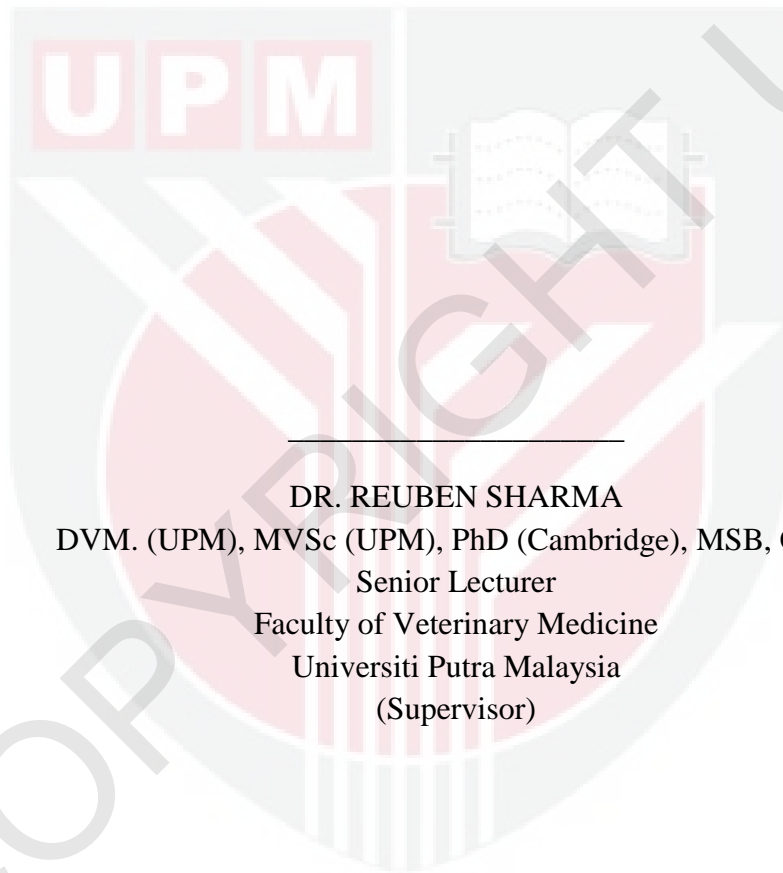
**A project paper submitted to the  
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**2014/2015**

## CERTIFICATION

It is hereby certified that we have read this project paper entitled “**Diversity and Temporal Activity Patterns of Diptera Associated with Captive Wild Mammals and the Efficiency of Trapping Methods**” by Jessie Ho Si Wai and in my opinion it is satisfactory in terms of scope, quality and presentation as partial fulfilment of the requirement for the course VPD 4999 – Project.



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## DEDICATION

This project is dedicated to all the wild animals and the dipteran flies that have sacrificed their lives meaningfully.



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### LIST OF ABBREVIATION

CDC	Centers for Disease Control and Prevention
UV	Ultraviolet light
CO <sub>2</sub>	Carbon dioxide



**ABSTRAK**

Abstrak kertas projek yang dikemukakan kepada Fakulti Perubatan Veterinar untuk memenuhi sebahagian daripada keperluan kursus VPD 4901- Projek Ilmiah Tahun Akhir

**KEPELBAGAIAN DAN AKTIVITI TEMPORAL DIPTERA YANG  
MENGINFESTASI MAMALIA DALAM KURUNGAN DAN KECEKAPAN  
KAEDAH MEMERANGKAP**

Oleh

**JESSIE HO SI WAI**

**2015**

**Penyelia: Dr Reuben Sharma**

Diptera gigit adalah artropod yang berkepentingan dalam bidang veterinar dan perubatan sebagai vektor kepada haiwan dan manusia. Kajian ini dijalankan untuk menentukan kepelbagaian, kelimpahan dan corak aktiviti Diptera yang menginfestasi mamalia liar dalam kurungan di zoo tempatan serta kecekapan kaedah memerangkap (Nzi, Malaise, Intercept, CDC-UV dan CDC-CO<sub>2</sub>). Selama 1800 jam masa perangkap telah dijalankan dalam enam spesies mamalia liar yang berbeza (Lembu Ankole, Rusa Berbintik, Gajah Asia, Badak Putih, Kijang dan Tapir). Perangkap diletakkan 10m daripada satu sama lain dan akan diperiksa selang tiga jam dari pukul 0700 hingga 1900 dan dibiarkan semalaman untuk menentukan jumlah tangkapan malam. Lalat yang ditangkap kemudiannya dibunuh menggunakan etil asetat atau dengan pembekuan, dipasang-kering dan diperiksa dengan

stereomikroskop. Pengenalpastian lalat dilakukan dengan menggunakan panduan kunci taksonomi yang sudah diterbitkan. Enam famili Diptera gigit ditemui dalam kajian ini (Ceratopogonidae, Culicidae, Psychodidae, Sarcophagidae, Muscidae and Calliphoridae) yang terdiri daripada 17 genus. 20 spesies nyamuk (Culicidae) ditangkap terutamanya *Culex quinquefasciatus* dan *Aedes albopictus*. Agas (*Culicoides peregrinus*, *Culicoides guttifer* dan *Culicoides actoni*) dan lalat pasir (*Sergentomyia spp.*) telah juga dijumpai. Majoriti (90%) lalat adalah daripada genus *Musca spp.* diikuti oleh *Stomoxys spp.*, dan *Sarcophaga spp.* Perangkap Nzi telah mengumpul lebih banyak lalat secara signifikan ( $p < 0.05$ ) berbanding dengan perangkap Malaise dan perangkap Intercept. Berbanding perangkap yang diumpan dengan karbon dioksida, perangkap CDC-UV telah memerangkap 73 % lebih nyamuk. Terdapat corak aktiviti diurnal menaik untuk lalat besar, yang memuncak dari jam 1600-1900. Kebanyakan nyamuk adalah bersifat nokturnal dengan aktiviti puncak diperhatikan dari jam 1900-0700. Hubungkait kepelbagaian dan kelimpahan Diptera yang tinggi dengan mamalia liar dalam kurungan adalah membimbangkan kerana artropod ini boleh bertindak sebagai vektor untuk kebanyakan haemoparasit dan virus. Di samping itu, perkaitan antara haiwan liar, manusia dan vektor penyakit berkemungkinan akan menyebarkan penyakit zoonotik bawaan vektor yang menjadi perhatian kepada zoo.

Kata Kunci: Diptera gigit, mamalia liar dalam kurungan, aktiviti temporal, kaedah memerangkap

## **ABSTRACT**

An abstract of the project paper presented to the Faculty of Veterinary Medicine in partial fulfilment of the course VPD 4999 – Final Year Project

### **DIVERSITY AND TEMPORAL ACTIVITY PATTERNS OF DIPTERA ASSOCIATED WITH CAPTIVE WILD MAMMALS, AND THE EFFICIENCY OF TRAPPING METHODS**

By

**JESSIE HO SI WAI**

**2015**

**Supervisor: Dr Reuben Sharma**

Diptera are arthropods of veterinary and medical importance as a large number are efficient vectors of diseases for both animals and humans. This study was conducted to determine the diversity, abundance and activity patterns of Diptera associated with captive wild mammals at a local zoo, as well as the efficiency of five different fly traps (Nzi, Malaise, Intercept, CDC-UV, and CDC-CO<sub>2</sub>). A total of 1800 trap hours were conducted in the enclosure vicinity of six different species of wild mammals (Ankole Cattle, Spotted Deer, Asian Elephant, White Rhinoceros, Barking Deer and Tapir). The traps were placed approximately 10m apart and checked at intervals of three hours and twelve hours respectively from 0700 – 1900hrs, and subsequently left overnight to determine the night catch. The captured flies were killed using ethyl acetate, dry mounted and examined under a stereomicroscope. Identification of the

flies was done following published taxonomic keys. Six families of Diptera (Ceratopogonidae, Culicidae, Psychodidae, Muscidae, Sarcophagidae and Calliphoridae) comprising 17 genera, were encountered in this study. Twenty species of mosquitoes (Culicidae) were trapped, of which *Culex quinquefasciatus*, and *Aedes albopictus* were dominant. Biting midges (*Culicoides peregrinus*, *Culicoides guttifer* and *Culicoides actoni*) and sand flies (*Sergentomyia* spp.) were also encountered. The majority (90%) of the filth flies were from the genus *Musca*, followed by *Stomoxys* and *Sarcophaga*. The Nzi traps collected a significantly ( $p < 0.05$ ) higher number of large flies compared to Malaise and Intercept traps. The CDC-UV traps caught 73% more mosquitoes compared to those baited with carbon dioxide. There was an ascending diurnal activity pattern for the large flies, which peaked from 1600-1900hrs. The mosquitoes on the contrary, were mostly nocturnal with peak activity observed from 1900-0700hrs. The high diversity and abundance of Diptera associated with captive wild mammals is of concern as these arthropods may act as vectors of many haemoparasites and viruses. In addition, the possibility of vector-borne zoonotic disease transmission warrants attention as the zoos provide a close interface between wild animals, humans and disease vectors.

Keywords: Diptera, captive wild mammals, temporal activity, trapping methods

## 1.0 INTRODUCTION

The order Diptera is one of the largest groups in the Insecta class, containing an estimated 240,000 species although only under half of these have been described. Diptera means 'two-winged' in Greek (di + petron). They are also known as true flies as they have a pair of functional forewings and the hind wings are small and modified into a club like organs known as the haltere which functions as a balancing organ during flight (Richard and David, 1997). The mesothorax is extraordinarily large due to the dependence on forewings for flying. Dipteran flies have mouthparts that are adapted for biting and piercing or sponging and lapping.

The order Diptera has been divided into three distinct suborders: Nematocera, Brachycera and Cyclorrhapha. Nematocera is a smaller fly with long or narrow wings and its antennae is composed of several segments. Among the families in this suborder that are of veterinary importance include the Ceratopogonidae (biting midges), Culicidae (mosquitoes), Simuliidae (black flies), and Psychodidae (sand flies, moth flies). Brachycera of veterinary importance include the Tabanidae (horse flies, deer flies, and clegs). Flies in this group are usually stout bodied, medium to large in size with very large eyes and a stout piercing proboscis. The Cyclorrhapha flies are thought to be more advanced members of Diptera and have three segmented aristate antennae. This sub-order includes a diverse group of fly families which are of veterinary importance. Of most concern is the Muscidae (house fly, stable fly, horn flies and others) followed by Glossinidae (tsetse flies), Hippoboscidae (louse

flies), Calliphoridae (blow flies), Sarcophagidae (flesh flies) and Oestridae (sheep nose bot) (Williams, 2010).

Dipterans are of ecological, economical and medical importance. Flies that are ecologically associated with human are known as synanthropic flies which exploit food and habitat from human activities (Talib *et al.*, 2014). They also act as disease transmitters acting as vectors for malaria, dengue, West Nile virus, yellow fever, encephalitis and other infectious diseases. The objectives of the present study are:

1. To determine the diversity and abundance of flies associated with captive wild mammals at a local zoo
2. To ascertain the temporal activity patterns of these flies
3. To compare the efficiency of five different fly trapping methods

The results from this study can be used to facilitate a more focused management program to be initiated in the zoo for the prevention and control of vector-borne diseases of both humans and animals.

flies at the zoo. The CDC-UV traps are efficient at trapping various species, thus, it can be used as a supplementary means of mosquitoes control in the zoo.

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