



UNIVERSITI PUTRA MALAYSIA

***AEDES* MOSQUITO COLLECTION AND RECORD AT UNIVERSITI
PUTRA MALAYSIA, SERDANG AND POTENTIAL OF JUMPING SPIDER
AS PREDATOR**

ALHAJI HAMISU MAIMUSA

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By

ALHAJI HAMISU MAIMUSA

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

June 2011

DEDICATION

This thesis is dedicated to

Our beloved Prophet,
Prophet Muhammad (Peace be upon Him)

And

My beloved late father
(May his soul rest in perfect peace)



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirements for the Degree of Master of Science

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Chairman: Professor Jambari Hj Ali, PhD

Faculty: Science

The study was conducted in two parts. The first part was on abundance of *Aedes* mosquitoes at Agricultural Conservatory Park (ACP) of Universiti Putra Malaysia (UPM) and its surrounding areas that include Pine Plantation, Rubber Plantation and Faculty of Design and Architecture, from January to September, 2010. Larvitrap method was used to study the population of *Aedes* larvae and eggs. Twenty ovitraps were set at predetermined spots in each location and collected after five days on alternating week basis. Larvitrap density Index (LTDI) (number of larvae per trap/number of trap/positive trap x 100%), larval density (mean number of larvae per ovitrap) and eggs density (egg/paddle) for all study sites were compared using SPSS v. 17. Climatic conditions such as rainfall, temperature and relative humidity of the sites were also recorded. The LTDI showed that, the abundance of *Aedes* ranged from 26.50% - 98.42% and the larval density ranged from $5.20 \pm 2.63 - 19.50 \pm 2.80$; while the eggs density ranged from $2.95 \pm 1.67 - 20.05 \pm 4.65$. There was no significant difference in both larval and egg populations between the first three sites ($p > 0.05$). However, there was significant difference between Faculty of Design and

Architecture and the other three sites ($p < 0.05$). The studies indicated significant correlation between LTDI, larval density and eggs density in all the four sites. The study also indicated significant correlation between *Aedes* population with rainfall ($r = 0.796$, $p < 0.01$); while the relationship between the *Aedes* population with temperature was weak ($r = -0.409$, $p < 0.01$). The correlation was also significant between *Aedes* population with relative humidity ($r = 0.546$, $p < 0.01$). The population showed downward trend from January, 2010 and reaches its lowest point sometimes in March, 2010 before it rise again and attained its peak around July and August, 2010 after which it showed another downward trend again. Both the LTDI and larval density showed almost identical trend and had also shown significant correlation. No *Aedes aegypti* mosquitoes were captured in the study areas. The duration of larval development of *Ae. albopictus* at UPM Agricultural Conservatory Park was 11.9 ± 0.54 ; at Rubber Plantatio 10.8 ± 0.74 ; Pine Plantation 11.4 ± 0.68 and Faculty of Design and Arcitecture 12.7 ± 0.82 . The second part of the study was on collection and recording species of spiders in the same study areas and prey preference test. Collection was done based on man's effort method (number of individual collected per man per hour). Total of eight species from five families were collected. These include four species (*Plexippus petersi*, *Evarcha flavocincta*, *Viciria pavesii* and *Hasarius adansoni*) from the family Salticidae; *Tetragnatha mandibulata* from the family Tetragnathidae; *Chryosso species* from the family Theridiidae; *Oxyopes species* from the family Oxyopidae and lastly, *Cyrtophora beccarii* from the family Araneidae. Two species of Salticidae, *Plexippus petersi* and *Evarcha flavocincta* were chosen for a test of prey preference. The test spiders were maintained in captivity on diet of early stage larvae of *Tenebrio molitor* (mealworm beetle) and midges, *Chironomus* sp. For testing, adult mosquito species (*Aedes*

albopictus), fruit flies (*Drosophila melanogaster*) and rice weevil (*Sitophilus oryzae*) were used as prey. Two types of tests using living prey were employed, i.e. simultaneous-presentation tests (two types of prey provided at the same time) and alternate-day tests (different types of prey provided on successive days). Analysis by Chi-square t-Test Goodness of Fit and Mc Nemar test with level of significance at $\alpha = 0.05$ revealed that, well-fed (last meal 7 days before testing) and starved (last meal 14 days before testing) test spiders of each species took *Ae. Albopictus* mosquito more often than other insects in both alternate-day and simultaneous-presentation tests ($p < 0.05$). It was found that, the preference of *Plexippus petersi* for *Ae. albopictus* mosquito over other insects offered is weaker than that of *Evarcha flavocincta*. There was similar preference by both test spiders when well-fed and starved. *Ae. albopictus* was observed to predominate over *Ae. aegypti* as the later was not found in either of the study sites. The two species of spider (*Plexippus petersi* and *Evarcha flavocincta*) found to be potential predators of *Ae. albopictus* mosquitoes.

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

**KOLEKSI DAN REKOD NYAMUK *Aedes* DI UNIVERSITI PUTRA
MALAYSIA, SERDANG DAN POTENSI LABAH – LABAH LOMPAT
SEBAGAI PEMANGSA**

Oleh

ALHAJI HAMISU MAIMUSA

Jun 2011

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Kajian ini dilakukan dalam dua bahagian, dimana bahagian pertama, mengkaji kelimpahan nyamuk *Aedes* di Taman Pemuliharaan Pertanian (ACP), Universiti Putra Malaysia (UPM) dan sekitarnya yang meliputi Ladang Pain, Ladang Getah dan Fakulti Rekabentuk dan Senibina yang telah dilakukan selama sembilan bulan mulai Januari hingga September 2010. Kaedah ovitrap digunakan untuk kajian populasi larva dan telur dengan dua puluh ovitrap diletakkan di kawasan yang telah dikenalpasti di setiap lokasi dan dikumpulkan selepas lima hari pada setiap minggu berselang. Indeks Kepadatan Larvitrap (LTDI) (jumlah larva/ovitrap/ovitrap positif x 100%), kepadatan larva (jumlah purata larva / ovitrap) dan kepadatan telur (jumlah telur / papan) untuk semua lokasi kajian dianalisa. Ciri-ciri cuaca lokasi juga telah direkodkan. LTDI menunjukkan kelimpahan populasi *Aedes* berkisar antara 26.50% - 98.42% dan kepadatan larva berkisar antara 5.20 ± 2.63 - 19.50 ± 2.80 , sedangkan kepadatan telur berkisar antara 2.95 ± 1.67 - 20.05 ± 4.65 . Tiada perbezaan yang

berarti bagi populasi larva dan telur antara ketiga-tiga lokasi pertama diatas ($p < 0.05$). Namun, ada perbezaan yang berarti antara Fakulti Rekabentuk dan Senibina dengan tiga lokasi yang lain ($p < 0.05$). Analisa telah menunjukkan korelasi yang berarti antara LTDI, kepadatan larva dan kepadatan telur di keempat-empat lokasi. Terdapat korelasi antara populasi *Aedes* dengan curahan hujan ($r = 0.796$, $p < 0.01$). Populasi nyamuk menurun sejak Januari hingga terendah pada Mac sebelum meningkat semula mencapai puncak pada Julai dan Ogos. Selepas itu populasi menurun semula hingga akhir masa kajian. Kedua-dua LTDI dan kepadatan larva menunjukkan tren yang sama dan terdapat korelasi diantara keduanya yang berarti. Tidak terdapat nyamuk *Ae. aegypti* di semua kawasan kajian, yang demikian *Ae. albopictus* merupakan vektor utama demam denggi di lokasi kajian. Kadar perkembangan larval nyamuk *Ae. albopictus* di Taman Pemuliharaan Pertanian UPM ialah 11.9 ± 0.54 ; di Ladang Getah 10.8 ± 0.82 ; Ladang Pain 11.4 ± 0.68 dan Fakulti Rekabentuk dan Senibina 12.7 ± 0.82 . Bahagian kedua kajian pula dilakukan untuk menentukan spesies dan populasi labah-labah di semua kawasan kajian. Populasi dikira dengan kaedah usaha manusia iaitu jumlah individu labah-labah dikumpulkan per orang per jam. Sebanyak lapan spesies labah-labah daripada lima famili berlainan telah dikumpulkan. Empat spesies daripada famili Salticidae (*P. petersi*, *E. flavocincta*, *Viciria pavesii* and *Hasarius adansoni*), *Tetragnatha mandibulata* (Tetragnathidae), *Chryosso species* (Theridiidae), *Oxyopes species* (Oxyopidae) dan *Cyrtophora beccarii* (Araneidae). Dua jenis labah-labah lompat Salticidae, *Plexippus petersi* dan *Evarcha flavocincta* dipilih untuk kajian pemilihan kutamaan mangsa. Labah-labah yang akan diuji dipelihara dengan makanan larva peringkat awal *Tenebrio molitor* (kumbang mealworm) dan larva midges, *Chironomus* sp. Untuk ujian, nyamuk dewasa (*Aedes albopictus*), lalat buah (*Drosophila*

melanogaster) dan kutu beras (*Sitophilus oryzae*) telah digunakan. Dua jenis ujian menggunakan mangsa hidup dilakukan, iaitu ujian sajian-serentak (dua jenis mangsa yang diberikan pada masa yang sama) dan ujian berselang hari (dua jenis mangsa setiap satu disajikan pada hari berturut-turut). Analisa Chi-square t-Test Goodness of Fit dan Mc Nemar test pada $\alpha = 0.05$ memberi keputusan labah-labah yang kenyang (makan terakhir 7 hari sebelum ujian) dan kelaparan (terakhir makan 14 hari sebelum ujian) bagi kedua-dua spesies labah-labah memilih nyamuk *Ae. albopictus* lebih kerap daripada serangga lain dalam kedua-dua ujian sajian-serentak dan sajian berselang hari ($P < 0.05$). Keutamaan memilih oleh *P.petersi* keatas nyamuk *Ae. albopictus* berbanding serangga lain adalah lebih lemah jika dibandingkan dengan *E.flavocincta*. Keputusan juga menunjukkan keutamaan memilih mangsa adalah sama ditunjukkan oleh kedua-dua labah-labah yang kenyang dan yang lapar. *Aedes albopictus* (dperhatikan) adalah lebih dominan mengatasi *Ae. aegypti* yang mana langsung tidak dijumpai di kawasan kajian. Dua spesis labah – labah lompat (*Plexippus petersi* dan *Evarcha flavocincta*) didapati adalah berpotensi sebagai pemangsa nyamuk *Ae. albopictus*.

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I certify that an Examination Committee has met on 17 June, 2011 to conduct the final examination of Alhaji Hamisu Maimusa on his Master of Science thesis entitled "Aedes Mosquitoes collection and record in UPM, and the Potential of Jumping Spiders (Order: Araneae, Family: Salticidae) as Predators" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the student be awarded the Master of Science.

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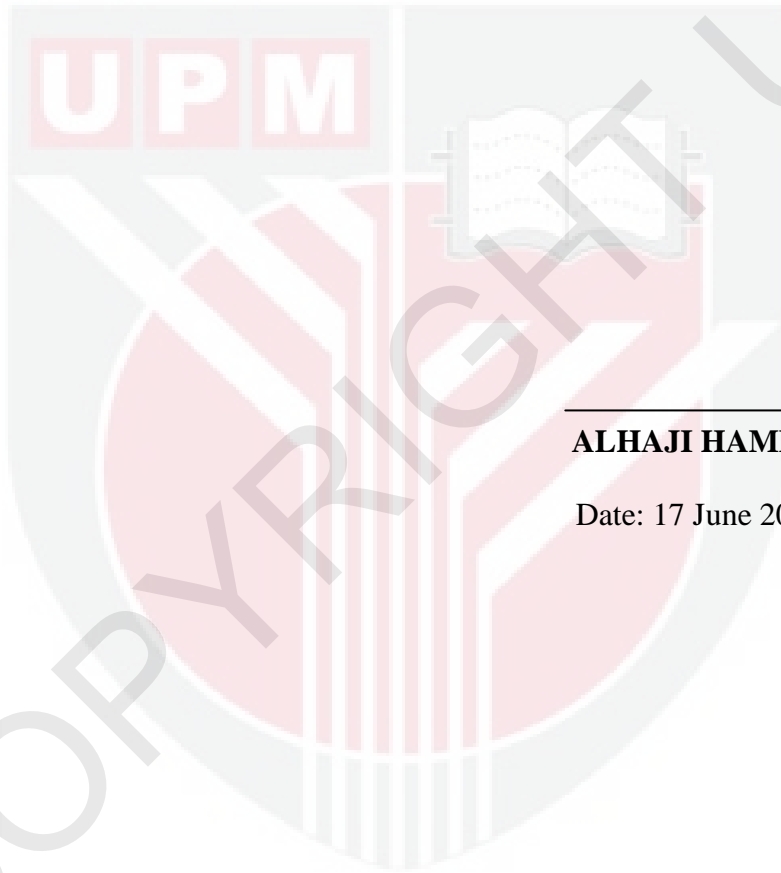
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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.



ALHAJI HAMISU MAIMUSA

Date: 17 June 2011

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