

ESTIMATES OF POLLUTION OF AIR IN RESIDENTIAL
AREAS OF UOEA UNIVERSITY: SAINS DAN
TEKNOLOGI MALAYSIA (UOEA)

DR. MOHD H. B. MOHD MUSTAFFA

SAINS DAN TEKNOLOGI
UNIVERSITI UOEA SAINS DAN TEKNOLOGI MALAYSIA
2106

ECTOPARASITES COMPOSITION OF BAT AT RESIDENTIAL AREA OF KOLEJ
UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA (KUSTEM)

By

Aina Mutharah binti Mohd Yusoff

Research Report submitted in partial fulfillment of
the requirements for the degree of
Bachelor of Applied Science (Biodiversity Conservation and Management)

Department of Biological Sciences
Faculty of Science and Technology
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA
2006

This project should be cited as:

Aina Mutharah, M.Y.2006.The composition of ectoparasites on bats at residential area of Kolej Universiti Sains dan Teknologi Malaysia (KUSTEM).Undergraduate thesis, Bachelor of Applied Science in Biodiversity Conservation and Management, Faculty of Science and Technology, Kolej Universiti Sains dan Teknologi Malaysia, Terengganu.67p.

No part of this project report may be produced by any mechanical, photographic, or electronic process, or in the form of phonographic recording, nor may it be stored in a retrieval system, transmitted, or otherwise copied for public or private use, without written permission from the author and the supervisor(s) of the project.



**JABATAN SAINS BIOLOGI
FAKULTI SAINS DAN TEKNOLOGI
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA**

**PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN I DAN II**

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: ECTOPARASITES COMPOSITION OF BATS AT RESIDENTIAL AREA OF KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA (KUSTEM) oleh Aina Mutharah binti Mohd Yusoff, no. matrik: UK8119 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Biologi sebagai memenuhi sebahagian daripada keperluan memperoleh ijazah Sarjana Muda Sains Gunaan-Pemuliharaan Dan Pengurusan Biodiversiti, Fakulti Sains dan Teknologi, Kolej Universiti Sains dan Teknologi Malaysia.

Disahkan oleh:

.....
Penyelia Utama:

Nama: **WONG CHEE HO**

Cop Rasmi: **Pensyarah
Jabatan Sains Biologi
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
(KUSTEM)
21030 Kuala Terengganu.**

Tarikh: **3/5/06**

.....
Ketua Jabatan Sains Biologi

Nama:

Cop Rasmi:

Tarikh: **4/5/06**

PROF. MADYA DR. NAKISHAH BT. MAHMOUD
Ketua
Jabatan Sains Biologi
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
(KUSTEM)
21030 Kuala Terengganu.

ACKNOWLEDGEMENT

First of all, I would like to express my deepest thanks to God the Almighty for His blessing, guidance and the strength that He had given to me until I could accomplish my final year project.

I also would like to express my gratitude to Mr.Wong Chee Ho as my supervisor for the opportunity, ideas, patience and his advice in guiding me to complete this project. Beside that, I would like to thanks the laboratory assistants in Histology Laboratory, Mr.Muhammad bin Embong, for his kindness and land a hand in helping during sampling and laboratory session.

My special thanks and and warmest love goes to my parents, Mr.Mohd Yusoff bin Abdul Hamid and Mrs.Fauziah binti Shamsudin , for their supportive, patience, love and caring that I really need as my strength to endure the journey of my life. Not forget. to my understanding and loving siblings. I love you all!

In addition, I would like to dedicated special thanks to Intan Nurlemsha, Hazihani, Nurul Hanani, Nursyazana, Joann, Suriya and Lee Choon Pei for their cooperative, ideas, information and help during accomplishment of this project and to everyone that involved in this project either directly or indirectly that I did not mention above, I really appreciate all your help and ideas until I complete my final year project. Only God may repay all your kindness. Thank you very much....

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF ABBREVIATIONS/SYMBOLS	ix
LIST OF APPENDICES	x
ABSTRACT	xi
ABSTRAK	xii
CHAPTER 1 INTRODUCTION	1
CHAPTER 2 LITERATURE REVIEW	4
2.1 The Origins of Bats	4
2.2 The Morphology of Bats	5
2.3 Distribution and Diversity of Bats	6
2.4 Reproduction of Bats	6
2.5 The Roost Site of Bats	7
2.6 Communication of Bats	8
2.7 Ecosystem Roles of Bats	9
2.8 Predation of Bats	10
2.9 Conservation of Bats	10
2.10 Parasitism	11

2.11	Kind of Host	13
2.12	Kind of Parasites	13
2.13	Types of Ectoparasites Associated with Bats	14
2.13.1	Mites	14
2.13.2	Ticks	15
2.13.3	Fleas (Siphonaptera)	17
2.13.4	Diptera	18
2.13.5	Hemiptera	18
2.14	Adaptation of Ectoparasites	19
2.14.1	Mites	19
2.14.2	Ticks	20
2.14.3	Fleas (Siphonaptera)	20
2.14.4	Diptera	20
2.14.5	Hemiptera	20
2.15	Ectoparasites-Host Relationship	21
2.16	The Environment of Parasites	21
2.17	Host Specificity	22
CHAPTER 3 METHODOLOGY		24
3.1	Study Area	24
3.2	Bat Captured and Identification	24
3.3	Collecting of Ectoparasites	24
3.4	Slide Observation and Mounting Slide	26
3.5	Determination of Parasitism Rate	26

3.5.1	Mean abundance	26
3.5.2	Prevalence	26
3.5.3	Infection indices	27
3.6	Identification of Bats Ectoparasites	27
3.6.1	Mites	27
3.6.2	Ticks	27
3.6.3	Fleas (Siphonaptera)	28
3.6.4	Diptera	28
3.6.5	Hemiptera	29
CHAPTER 4 RESULT		30
4.1	The Composition of Bats	30
4.2	The Composition of Ectoparasite	33
4.2.1	The composition of ectoparasites according to month	33
4.2.2	The composition of ectoparasite according to bats species	33
4.3	Parasitism Rate	36
4.3.1	The mean abundance of ectoparasites per bat species	36
4.3.2	The infection indices of ectoparasites on bat	36
4.3.3	The prevalence of infested bat	39
4.3.4	The prevalence of ectoparasites according bats gender	39
4.4	Ectoparasites	42
4.4.1	<i>Argas</i> spp	42
4.4.2	<i>Nycteribia</i> spp.	42

CHAPTER 5 DISCUSSION	48
5.1 The Composition of Bat	48
5.2 The Composition of Ectoparasite	49
5.3 Parasitism Rate	50
CHAPTER 6 CONCLUSION	53
REFERENCES	55
APPENDICES	60
CURRICULUM VITAE	67

LIST OF TABLES

Tables	Page
4.1 The numbers of bats captured based on month at residential area of KUSTEM	33
4.2 The mean abundance of ectoparasites per bat species	38
4.3 The infection indices of ectoparasite on bat	39
4.4 The prevalence of infested bat at residential area of KUSTEM	41
4.5 The prevalence of ectoparasites based on bats gender	42
B.1 Data of captured bat at residential area of KUSTEM	62
B.2 Data of ectoparasites collected at residential area of KUSTEM	63

LIST OF FIGURES

Figures	Page
3.1 Map of study area	25
4.1 The total bats captured according to suborders	31
4.2 The composition of ectoparasites on bat according to month	34
4.3 The composition of ectoparasite according to bats species	35
4.4.1 a) Larvae of <i>Argasids</i> in dorsal view; b) Larvae of <i>Argasids</i> ; capitulum (Capt)	43
4.4.2a In dorsal view; a) <i>Nycteribia</i> sp1; b) <i>Nycteribia</i> sp2	44
4.4.2b End of body; a) <i>Nycteribia</i> sp1; b) <i>Nycteribia</i> sp2	45
4.4.2c The head and mouthpart of <i>Nycteribia</i> spp; a) the head is folded back into a groove ;b)the pierce-sucking mouthpart	46
4.4.2d The legs in <i>Nycteribia</i> spp ;a) claw(C) ,spine (S);b) the of the leg in <i>Nycteribia</i> spp.	47

LIST OF ABBREVIATIONS/SYMBOLS

Abbreviation/Symbols

KUSTEM	Kolej Universiti Sains dan Teknologi Malaysia
CCD	Camera Colour Digital
%	Percentage
M	Male
F	Female
NP	Non-productive
L	Lactating
PL	Post lactating
A	Adult
J	Juvenile
R	Recapture

LIST OF APPENDICES

Appendices		Page
APPENDIX A	Mounting procedures	61
APPENDIX B	Data research	62
APPENDIX C	The pictures of sampling session	64

ABSTRACT

The study on the diversity of ectoparasites on bats at residential area of Kolej Universiti Sains dan Teknologi Malaysia (KUSTEM) was conducted for five months, from September 2005 until January 2006, for five days monthly, respectively. The aims of this study are to study the distribution, diversity and examine the ectoparasites composition among different bats species. A total of 24 individuals of bats were captured, which were comprised of four species including *Cynopterus brachyotis*, *Cynopterus horsfieldii*, *Cynopterus sphinx* and *Scotophilus kuhlii*. The most infested bat was *C. sphinx* and *S. kuhlii* with 100% of infection rate. But, *C. brachyotis* had the highest number of bats species that was infested by ectoparasites. Ectoparasites were identified as *Argas* sp., *Nycteribia* sp.1, and *Nycteribia* sp.2. *Nycteribia* sp.1 was the most abundance of ectoparasites. Based on the gender of the host, *Nycteribia* sp.2 showed preference on female, while, *Nycteribia* sp.1 and *Argasid* showed preference on male.

**KOMPOSISI EKTOPARASIT ATAS KELAWAR DI KAWASAN KEDIAMAN
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA.**

ABSTRAK

Kajian mengenai kepelbagaian ektoparasit yang terdapat pada kelawar di kawasan kediaman Kolej Universiti Sains dan Teknologi Malaysia(KUSTEM)telah dijalankan selama lima bulan bermula daripada September 2005 hingga Januari 2006, dengan lima hari setiap bulan.Matlamat kajian ini adalah untuk mengkaji taburan,kepelbagaian serta memeriksa komposisi ektoparasit pada spesies kelawar yang berbeza.Sejumlah 24 ekor kelawar telah di tangkap,yang mana merangkumi empat spesies.Ini termasuklah spesies *Cynopterus brachyotis*,*C.horsfieldii*,*C. sphinx* dan *Scotophilus kuhlii*. *C. sphinx* dan *S.kuhlii* merupakan kelawar yang paling tinggi kadar jangkitan oleh ektoparasit dengan kadar jangkitan 100%.Tetapi, *C.brachyotis* merupakan spesies kelawar yang mempunyai bilangan kelawar yang paling banyak dijangkiti.Ektoparasit yang ditangkap dikenalpasti sebagai *Argas* sp,*Nycteribia* sp.1 dan *Nycteribia* sp.2 .*Nycteribia* sp.1 adalah ektoparasit yang paling kerap menjangkiti kelawar.Berdasarkan jantina perumah,*Nycteribia* sp.2 paling kerap menjangkiti kelawar betina,menakala, *Nycteribia* sp.1 dan *Argas* sp. merupakan ektoparasit yang paling kerap menjangkiti kelawar jantan.