THE STUDY OF SPECIES ABUNDANCE AND ABOVEGROUND BIOMASS FOR RHIZOPHORA-AVICENNIA FOREST TYPE TOK BALI, KELANTAN

FELICIA GUMPEH

FAKULTI SAINS DAN TEKNOLOGI
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA

2006

The study of species abundance and aboveground biomass for rhizophora-avicennia forest type Tok Bali, Kelantan / Felicia Gimpeh.

Lihat sebelah

THE STUDY OF SPECIES ABUNDANCE AND ABOVEGROUND BIOMASS FOR RHIZOPHORA-AVICENNIA FOREST TYPE AT TOK BALI, KELANTAN

FELICIA GIMPEH

FAKULTI SAINS DAN TEKNOLOGI
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA
2006

THE STUDY OF SPECIES ABUNDANCE AND ABOVEGROUND BIOMASS FOR RHIZOPHORA-AVICENNIA FOREST TYPE AT TOK BALI, KELANTAN

By

Felicia Gimpeh

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 report should be cited as:

Felicia, G. 2006. The study of species abundance and aboveground biomass for Rhizophora-Avicennia forest type at Tok Bali, Kelantan. Undergraduate thesis, Bachelor of Applied Science in Biodiversity Conservation and Management, Faculty of Science and Technology. Kolej Universiti Sains dan Teknologi Malaysia. 76p.

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: THE STUDY OF SPECIES ABUNDANCE AND ABOVEGROUND BIOMASS FOR RHIZOPHORA-AVICENNIA FOREST TYPE AT TOK BALI, KELANTAN oleh Felicia Gimpeh no. matrik: UK9185 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Biologi sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Sains Gunaan - Pemuliharaan dan Pengurusan Biodiversiti, Fakulti Sains dan Teknologi, Kolej Universiti Sains dan Teknologi Malaysia.

Disahkan oleh:

.....

Penyelia Utama

Nama: Kasawani Ibrahim

Cop Rasmi: Pensyarah
Jabatan Sains Biologi
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
21030 Kuala Terengganu

Tarikh: 30.4.06

.....

Penyelia Kedua (jika ada)

Nama: PROF. MADYA SULONG BIN IBRAHIM

Cop Rasmi: *Fellow*
Institut Oseanografi
Kolej Universiti Sains dan Teknologi Malaysia
Mengabang Telipot
21030 Kuala Terengganu.

Tarikh: 04.05.06

.....

Ketua Jabatan Sains Biologi

Nama: PROF. MADYA DR. NAKISAH BT. MAT AMIN

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

Tarikh: 07.05.06

ACKNOWLEDGEMENT

With thanks to God who always lifts my spirit up, finally, I have finished my thesis. Many people have helped me to complete this thesis. Firstly, I would like to extend the greatest acknowledgement to Mr. Kasawani Ibrahim, my first supervisor, for his advices, guidance, criticisms and kindness throughout the study and in the preparation of this study. Acknowledgment is also extended to Associate Professor Sulong Ibrahim for his guidance and advices. Without him, this study might not have been completed. I would like to extend my gratitude to, Mr. Razali Salam, who has sacrificed a lot of time and energy in order to give full commitment during the sampling period in Tok Bali, Kelantan. I also would like to thank all the researchers' assistance for their opinions and guidance. I appreciate my friends, Nurun, Nancy, Elvy, Cathrine and Lilian for their invaluable help and cooperation during the sampling. Finally, I want to extent my deepest gratitude and sincere thanks to my parents, Mr. Gimpeh Andoh and Mrs. Gustinah Kimbin and also to my siblings for their sacrifice, support and understanding throughout my study at Kolej Universiti Sains dan Teknologi Malaysia.

TABLE OF CONTENT

		Page
ACKNOWLEDGEMENT		i
TABLE OF CONTENT		ii
LIST OF TABLE		v
LIST OF FIGURES		vi
LIST OF SYMBOLS		vii
LIST OF APPENDICES		viii
ABSTRACT		ix
ABSTRAK		x
CHAPTER 1 INTRODUCTION		1
1.1	Justification	3
1.2	Objectives	3
CHAPTER 2 LITERATURE REVIEW		4
2.1	Definitions of Mangrove	4
2.2	Mangrove Species Distribution	5
2.3	Mangrove Vegetation	7
2.4	Mangrove Anatomy	11
	2.4.1 Root Anatomy	11
	2.4.2 Wood Anatomy	13
	2.4.3 Leaf Anatomy	14
	2.4.4 Seed and Seedling Anatomy	15

2.5 Mangrove Species Diversity 15

2.6 Reproduction, Dispersal and Establishment of Mangrove 17

2.7 Concept of Species Diversity and Diversity Indices 18

2.8 Aboveground Biomass of Mangrove 19

CHAPTER 3 METHODOLOGY 20

3.1 Study Area Description 20

3.2 Material and Method 22

3.3 Data Analysis 25

CHAPTER 4 RESULTS 26

4.1 Species Composition 26

4.2 Existence, Percent Cover and Number of Mangrove Species 27

4.3 Community Structure 32

4.4 Diversity Indices 35

4.5 Cluster analysis 39

4.6 Aboveground Biomass 40

CHAPTER 5 DISCUSSION 42

CHAPTER 6 CONCLUSION AND RECOMMENDATION 50

REFERENCES 52

APPENDICES 55

CURRICULUM VITAE 76

LIST OF TABLES

Table		Page
4.1	List of overall mangrove species found in the Rhizophora - Avicennia forest type.	26
4.2.1	Existing, percent cover and number of adult trees.	28
4.2.2	Existing, percent cover and number of saplings.	30
4.2.3	Existing, percent cover and number of seedlings.	31
4.3.1	Number of individual in six DBH-size classes of the seven mangrove species.	32
4.3.2	Summary on tree diameter of seven mangrove species.	33
4.4	Community structure.	34
4.5.1	Mean values and univariate measures of adult trees species.	35
4.5.2	Mean values and univariate measures of saplings species.	36
4.6.1	Mean values and univariate measures of sampling point for adult trees.	37
4.6.2	Mean values and univariate of sampling point for saplings.	38
4.7	Above ground biomass of each species.	41

LIST OF FIGURES

Figure		Page
2.1	Mangroves community types	10
2.2	The most remarkable adaptations of the mangroves	12
3.1	The overall of the methodology	21
3.2	The location of study site	22
3.3	The distance between plots	23
3.4	Sampling plot diagram	24
4.1	Cluster analysis for adult trees	38
4.2	Cluster analysis for saplings	39

LIST OF SYMBOLS/ABBREVIATIONS

%	-	Percent
ABG	-	Aboveground Biomass
°C	-	Celcius
DBH	-	Diameter at Breast Height
E	-	Species Evenness
H'	-	Species Diversity
H	-	Height
Ha	-	Hectare
Ha^{-1}	-	Per Hectare
Kg	-	Kilogram
No	-	Number
S	-	Species Richness
Sap	-	Sapling
Seed	-	Seedling

LIST OF APPENDICES

Appendices		Page
1.	Data Sheet Form	55
2.	Formula involved in data calculation	72
3.	Classification of Crown Shape and Stem Form	73
4.	Picture of Mangrove	74

ABSTRACT

This study was carried out in the Rhizophora-Avicennia forest type at Tok Bali, Kelantan to determine the species abundance and to estimate the aboveground biomass of mangrove species. About 24 of plots had been built in this area. Classification and feature of the mangrove trees such as type of species, height, crown form and stem category were recorded. All the data must be analyzed by using the suitable formula and PC–ORD statistical program to get the diversity index H'. A total of seven species of mangrove were identified such as *Rhizophora apiculata*, *Avicennia alba*, *Ceriops decandra*, *Bruguiera cylindrica*, *Bruguiera gymnorrhiza*, *Sonneratia alba* and *Dolichandrone spathacea*. *R. apiculata* dominated this study area for adult tree category and for seedling category. *C. decandra* dominated this study area for sapling category. The highest basal area (17.1162 m^2 ha^{-1}) and DBH (30.5 cm) shown by *R. apiculata*. Adult tree category represented the average value of species richness (7) and species diversity (1.327) with the species evenness (0.799). Sapling category also represented the average value of species richness (7.5) and species diversity (1.312) with the species evenness (0.632). Species diversity for seedling was very poor in this area because of its diversity index (H') = 0. The most high amount of aboveground biomass showed by *S. alba* (10,914 kg ha^{-1}). Further study in the future is needed to gain more information about mangrove forest.

KELIMPAHAN SPESIS DAN BIOJISIM PERMUKAAN HUTAN PAYA LAUT JENIS RHIZOPHORA-AVICENNIA DI TOK BALI, KELANTAN

ABSTRAK

Kajian ini telah dijalankan di hutan paya laut jenis Rhizophora-Avicennia untuk memastikan kelimpahan spesis dan untuk menganggar biojisim permukaan spesis hutan paya laut. Sebanyak 24 plot telah dibina di kawasan ini. Klasifikasi dan ciri-ciri hutan paya laut akan direkod seperti jenis spesis, tinggi, bentuk kanopi dan kategori batang. Kesemua data akan dianalisis menggunakan formula yang sesuai dan program statistik PC-ORD untuk mendapatkan kepelbagaian index H'. Sebanyak tujuh species hutan paya laut telah dikenalpasti seperti *Rhizophora apiculata, Avicennia alba, Ceriops decandra, Bruguiera cylindrica, Bruguiera gymnorrhiza, Sonneratia alba* dan *Dolichandrone spathacea. R. apiculata* mendominasi kawasan ini untuk ketegori pokok dan anak benih. *C. decandra* mendominasi kawasan ini untuk kategori anak pokok. Luas dasar (17.1162 m^2 ha^{-1}) dan ukur lilit (30.5 cm) tertinggi ditunjukkan oleh *R. apiculata*. Kategori pokok menunjukkan nilai purata kekayaan spesis (7) dan kepelbagaian spesis (1.327) dengan kesamarataan spesis (0.799). Kategori anak pokok juga menunjukkan nilai purata bagi kekayaan spesis (7.5) dan kepelbagaian spesis (1.312) dengan kesamarataan spesis (0.632) telah ditunjukkan oleh *Ceriops decandra*. Kepelbagaian spesis bagi anak benih sangat rendah kerana kepelbagaian index (H') = 0. Jumlah tertinggi untuk biojisim permukaan adalah *Sonneratia alba* (10,914 kg ha^{-1}). Kajian yang selanjutnya pada masa akan datang diperlukan untuk mendapatkan maklumat yang lebih banyak tentang hutan paya laut.