

THE STAMPEL OF THE STAMPED AND THE STAMPED
SIGNATURE FOR THE STAMPED FOREST
TYPE AND SIZE

STAMPED SIGNATURE AND SIZE

STAMPED SIGNATURE AND SIZE
STAMPED SIGNATURE AND SIZE
2006

**THE STUDY OF SPECIES ABUNDANCE AND ABOVE-GROUND BIOMASS
FOR MIXED MANGROVE FOREST TYPE, TOK BALI**

By

Nurun Nadhirah Md Isa

**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:

Nurun Nadhirah M. I. 2006. The study of species abundance and above-ground biomass of Mixed Mangrove forest type, Tok Bali. 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: THE STUDY OF SPECIES ABUNDANCE AND ABOVE-GROUND BIOMASS FOR MIXED MANGROVE FOREST TYPE, TOK BALI oleh Nurun Nadhirah bt Md Isa no. matrik: UK 8390 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: **Kasawani Ibrahim**
Pensyarah
Cop Rasmi: **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**
Fellow
Cop Rasmi: **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**
Ketua
Cop Rasmi: **Jabatan Sains Biologi**
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
(KUSTEM)
21030 Kuala Terengganu.

Tarikh: **07.05.06**

ACKNOWLEDGEMENT

A journey is easier when you travel together. Interdependence is certainly more valuable than independence. This thesis is the result of one year of work whereby I have been accompanied and supported by many people. It is a pleasant aspect that I have now the opportunity to express my gratitude for all of them. This thesis is by far the most significant scientific accomplishment in my life and it would be impossible without people who supported me and believed in me. Most of all I would like to thank my research supervisors, Mr. Kasawani Ibrahim and Associates Professor Sulong Ibrahim. They are not only a great scientist with deep vision but also and most importantly a kind person. Their trust and scientific excitement inspired me in the most important moments of making right decisions and I am glad to work with them. I sincerely thank my laboratory assistant Mr. Razali Salam for giving me more than just an advice but identifying mangrove species. My best regards I want to give to all research assistants who have help me during sampling period. I want to thank them for patience and professionalism in working under our project on mangrove inventory. I am also very grateful to my group research at Tok Bali because of their commitment until completing our sampling activity. My special thanks to Mr. Kasawani Ibrahim for being kind and patient while editing this text and political discussions which helped me to relax from writing it. As always it is impossible to mention everybody who had an impact to this work. However there are those whose spiritual support is even more important. I would also like to thank my parents Md. Isa Zakaria and Yang Mohamad, my siblings and my entire friend.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENT	ii
LIST OF TABLES	iii
LIST OF FIGURES	iv
LIST OF ABBREVIATIONS	v
LIST OF APPENDICES	vi
ABSTRACT	vii
ABSTRAK	viii
CHAPTER 1 INTRODUCTION	1
1.1 Introduction	1
1.2 Justification	5
1.3 Objectives of Study	5
CHAPTER 2 LITERATURE REVIEW	6
2.1 Mangroves	6
2.2 Mangroves zonation	6
2.3 Mangrove classification	7
2.4 Mixed Mangrove Forest	8
2.5 Species composition	9
2.6 Sampling designs	9
2.7 Diversity index	10
2.8 Mangrove biomass	11
2.9 Above-ground biomass	11

CHAPTER 3 METHODOLOGY	12
3.1 Study outline	12
3.2 Study area	13
3.3 Materials	13
3.4 Sampling	15
3.4.1 Phase 1 : Plots design.	15
3.4.2 Phase 2 : Data analysis	17
CHAPTER 4 RESULTS	18
4.1 Mangrove Existence in Mixed Mangrove Forest, Tok Bali	18
4.2 Existence, number and percent cover of mangrove species	19
4.2.1 Existence, number and percent cover of mangrove trees	19
4.2.2 Existence, number and percent cover of mangrove sapling	19
4.2.3 Existence, number and percent cover of mangrove seedling	22
4.3 Community structure	24
4.4 Diversity index	26
4.5 Aboveground Biomass	35
CHAPTER 5 DISCUSSION	36
CHAPTER 6 CONCLUSION AND RECOMMENDATIONS	41
REFERENCES	43
APPENDICES	46
CURRICULUM VITAE	67

LIST OF TABLES

Table		Page
4.1	A list of the plant species by family, their scientific classification and Malay name found in the mixed mangrove forest in Tok Bali, Kelantan.	18
4.2.1	Existence, number and percent cover of trees in Mixed Mangrove Forest	20
4.2.2	Existence, number and percent cover of sapling in Mixed Mangrove Forest	21
4.2.3	Existence, number and percent cover of seedling in Mixed Mangrove Forest	23
4.3.1	Number of individual in six DBH size classes of the eight mangrove species in Mixed Mangrove Forest, Tok Bali.	24
4.3.2	Community structure for trees in Mixed Mangrove Forest, Tok Bali.	25
4.4.1	Mean values and univariate measures of trees from 20 plots.	26
4.4.2	Mean values and univariate measures of 20 sampling plots for trees at Mixed Mangrove Forest, Tok Bali.	27
4.4.3	Mean values and univariate measures of saplings from 20 plots.	29
4.4.4	Mean values and univariate measures of 20 sampling plots for saplings at Mixed Mangrove Forest, Tok Bali.	30
4.4.5	Mean values and univariate measures of seedlings for 20 plots.	32
4.4.6	Mean values and univariate measures of 20 sampling plots for seedling at Mixed Mangrove Forest, Tok Bali.	33
4.5	Shows aboveground biomass for eight trees species in Mixed Mangrove Forest at Tok Bali.	35

LIST OF FIGURES

Figure	Page
3.1 Flow chart of study	12
3.2 Location of study area	14
3.4.1 Diagram of sampling plot	16
4.4.1 Cluster analysis for mangrove trees for Mixed Mangrove Forest, Tok Bali.	28
4.4.2 Cluster analysis for mangrove saplings for Mixed Mangrove Forest, Tok Bali.	31
4.4.3 Cluster analysis for mangrove seedling at Mixed Mangrove Forest, Tok Bali.	34

LIST OF ABBREVIATIONS

cm	-	centimeter
° C	-	degree Celsius
DBH	-	Diameter Breast Height
E	-	East
e.g.	-	exempli gratis (Latin)
GPS	-	Global Positioning System
H	-	height
ha	-	hectare
kg ha ⁻¹	-	kilogram per hectare
km	-	kilometre
lat	-	latitude
long	-	longitude
m	-	meter
mm	-	millimeter
m ² ha ⁻¹	-	meter square per hectare
N	-	North
t ha ⁻¹	-	tonne per hectare
%	-	percentage

LIST OF APPENDICES

Appendix		Page
1	Formula	46
2	Data recording	47

ABSTRACT

A study was conducted in July, September and November 2006 to determine species composition, diversity index and above-ground biomass in Mixed Mangrove forest type at Tok Bali, Kelantan. Twenty plots were built and DBH, height, crown form and stem categories of trees were measured and recorded. For sapling and seedling, number of individuals was counted. Diversity index and above-ground biomass were determined. A total of 10 species including nine exclusive and one non-exclusive mangrove were recorded. The most common species was *Sonneratia alba* with 234 trees, 33 saplings and 756 seedlings, followed by *Ceriops decandra*, *Excoecaria agallocha*, *Avicennia alba*, *Bruguiera cylindrica*, *B. sexangula*, *Rhizophora apiculata*, *Nypa fruticans* and *Derris trifoliata*. From the result, total number of seedling per hectare (5,305) represented a good regeneration potential. Total above-ground biomass was 2664.57 kg/ha. *Sonneratia alba* recorded the highest (665.73 kg/ha) total above-ground biomass because of the wide range of diameter and height. Mangrove trees showed total average of species richness (S) was 8.0, species evenness (E) was 0.793 and species diversity (H') was 1.603. Since the sampling plots were less than the standard sampling plot suggested, this inventory may not represent the total number of species in Mixed Mangrove forest type at Tok Bali. Therefore, it is recommended that future study should be 30 plots or cover 2% from the total mangrove area.

KAJIAN KELIMPAHAN SPESIES DAN BIOJISIM PERMUKAAN DI HUTAN PAYA LAUT CAMPURAN, TOK BALI

ABSTRAK

Satu kajian telah dijalankan pada Julai, September dan November 2006 untuk menentukan komposisi spesies, indeks kepelbagaian dan biojisim permukaan di Hutan Paya Laut Campuran, Tok Bali, Kelantan. Dua puluh plot telah dibina dan diameter di paras dada (DBH), ketinggian, bentuk kanopi dan kategori batang telah diukur dan direkodkan. Bagi anak pokok dan biji benih, hanya bilangan individu diambil kira. Indeks kepelbagaian dan biojisim permukaan ditentukan. Spesies yang paling umum ialah *Sonneratia alba* dengan 234 pokok, 33 anak pokok dan 756 biji benih, diikuti dengan *Ceriops decandra*, *Excoecaria agallocha*, *Avicennia alba*, *Bruguiera cylindrica*, *B. sexangula*, *Rhizophora apiculata*, *Nypa fruticans* dan *Derris trifoliata*. Daripada keputusan, jumlah bilangan biji benih per hektar (5,305) menunjukkan potensi regenerasi yang baik. Jumlah biojisim permukaan ialah 2664.57 kg/ha. Biojisim permukaan *Sonneratia alba* paling tinggi (665.73 kg/ha) kerana julat diameter dan ketinggian yang besar. Pokok hutan paya laut menunjukkan purata jumlah bagi kekayaan spesies (S) ialah 8.0, kesamarataan spesies (E) ialah 0.793 dan kepelbagaian spesies (H') ialah 1.603. Oleh sebab plot persampelan adalah kurang daripada piawai, bancian tidak menggambarkan jumlah spesies sebenar di Hutan Paya Laut Campuran, Tok Bali. Maka, kajian lanjutan dicadangkan supaya merangkumi 30 plot atau meliputi 2% daripada keluasan keseluruhan hutan paya laut.