

STAND STRUCTURE OF ANI GROVE FOREST AT RILAU
(THE LUNAN MOUNTS), KELANTAN
NEELA, TUNJUNG

ERSON, RATHNIA SURETI

FAKULTI SAINS DAN TEKNOLOGI
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA

2006

**STAND STRUCTURE OF MANGROVE FOREST AT PULAU CHE MINAH
(SOUTH), KELANTAN DELTA, TUMPAT**

By

Farah Farhana binti Shaari

**Research Report submitted in partial fulfillment of
the requirement 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:

Farah Farhana, S. 2006. Stand structure of mangrove forest at Pulau Che Minah (South), Kelantan Delta. Undergraduate thesis, Bachelor of Applied Science in Biodiversity Conservation and Management, Faculty of Science and Technology, Kolej Universiti Sains dan Teknologi Malaysia, Terengganu.71p.

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.

1100046081



**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: STAND STRUCTURE OF MANGROVE FOREST AT PULAU CHE MINAH (SOUTH), KELANTAN DELTA, TUMPAT oleh Farah Farhana binti Shaari no. matrik: UK 8771 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:

8.5.06



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:

Cop Rasmi:

PROF. MADYA DR. NAKISAH BT. MAT AMIN

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

Tarikh:

10.05.06

ACKNOWLEDGEMENT

Alhamdulillah, a great thank to ALLAH S.W.T that had gave an opportunity for me to accomplish this research. A lot of thanks go to En. Kasawani Ibrahim for graciously agreeing to be my supervisor and also giving a supportive morale and technical during this research. Some notable thank to Assoc. Prof. Sulong Ibrahim as my co-supervisor.

Many thank due to all that had also give cooperation and energy contributed through this research had conducted until it is completed. I am sincerely grateful for the time throw in along this research by Tuan Hj. Mohd Razali Salam and En. Haber as the lab assistances. Their patience and collaboration afford a balanced process throughout many month of activity. Much gratitude also goes to the many individuals who contributed to this research, Karthigayen and Mohd Yunus Ibrahim. And also thanks to Institute of Oceanography (INOS), Faculty of Science and Technology (FST) that helped me smooth through this project and others who directly or indirectly involved.

Deeply indebted to my beloved parents En Shaari Ahmat Talib and Pn. Dalijah Ahmad and also my brothers and sister, Farid Rafiq Shaari, Fairus Izzati Shaari and Faris 'Izzuddin Shaari. They always become my aspiration all the way in this project.

Many thank are goes to my outstanding buddies and my special friend also my housemates Salbiah, Hidayati, Fadhilah and Zurina and also to Biodiversity friends for never ending supported and remain as my inspiration.

TABLE OF CONTENTS

| | Page |
|--|-------------|
| ACKNOWLEDGEMENTS | ii |
| LIST OF TABLES | vi |
| LIST OF FIGURES | vii |
| LIST OF ABBREVIATIONS | viii |
| LIST OF APPENDIX | ix |
| ABSTRACT | x |
| ABSTRAK | xi |
| CHAPTER 1 INTRODUCTION | |
| 1.1 Introduction | 1 |
| 1.2 Justification | 3 |
| 1.3 Objective | 4 |
| CHAPTER 2 LITERATURE REVIEW | |
| 2.1 Definition of mangrove | 5 |
| 2.2 Mangrove distribution | 6 |
| 2.3 Mangrove classification | 7 |
| 2.4 Important of mangrove | 8 |
| 2.4.1 Ecosystem services | 8 |
| 2.4.2 Economic value | 9 |
| 2.5 Problem and threat to the mangrove ecosystem | 9 |
| 2.6 Conservation of Matang Mangrove | 10 |
| 2.7 Species composition | 10 |

| | | |
|------|----------------------------------|----|
| 2.8 | Stand structure | 12 |
| 2.9 | Basal area | 13 |
| 2.10 | Avicennia-Sonneratia forest type | 14 |

CHAPTER 3 METHODOLOGY

| | | |
|-----|-----------------|----|
| 3.1 | Materials | 15 |
| 3.2 | Sampling method | 15 |
| 3.3 | Study area | 17 |
| 3.4 | Transect line | 19 |
| 3.5 | Plot design | 20 |
| 3.6 | Forest profile | 22 |
| 3.7 | Data analysis | 23 |

CHAPTER 4 RESULT

| | | |
|-----|---|----|
| 4.1 | Species composition | 26 |
| 4.2 | Mortality of <i>Avicennia alba</i> and <i>Sonneratia caseolaris</i> | 27 |
| 4.3 | Forest profile | 28 |
| 4.4 | Stand structure | 31 |
| 4.5 | Basal area | 33 |
| | 4.5.1 Diameter at breast height | 33 |
| | 4.5.2 Basal area per hectare | 34 |
| 4.6 | Diversity index | 39 |
| | 4.6.1 Diversity index for tree with dbh 5 cm and larger | 39 |
| | 4.6.2 Diversity index for saplings | 40 |
| | 4.5.3 Cluster analysis | 42 |

| | |
|-----------------------------|----|
| CHAPTER 5 DISCUSSION | 43 |
| CHAPTER 6 CONCLUSION | 51 |
| REFERENCES | 53 |
| APPENDIX | 56 |
| CURICULUM VITAE | 71 |

LIST OF TABLES

| Table | | Page |
|--------------|--|-------------|
| 2.1 | List of plant species found in mangrove forest in Semantan, Sarawak | 11 |
| 3.1 | Calculation formula | 25 |
| 4.1 | Species composition for woody trees | 26 |
| 4.2 | Species composition for non-woody | 26 |
| 4.3 | Number of trees, saplings and seedlings per hectare | 27 |
| 4.4 | Number of dead tree of <i>Avicennia alba</i> and <i>Sonneratia caseolaris</i> | 28 |
| 4.5 | Summary of plot sampling data | 30 |
| 4.6 | Abundance, frequency, distribution and important value for each species for trees 5cm and larger | 32 |
| 4.7 | Abundance, frequency and distribution for each species for sapling | 32 |
| 4.8 | Abundance, frequency and distribution for each species for seedlings | 32 |
| 4.9 | Diameter of trees with dbh 5cm and larger | 33 |
| 4.10 | Estimating the basal area per hectare using 20 plots for <i>Avicennia alba</i> | 35 |
| 4.11 | Estimating the basal area per hectare using 20 plots for <i>Sonneratia caseolaris</i> . | 37 |
| 4.12 | Summary of three species for tree with 5 cm dbh and larger | 39 |
| 4.13 | Summary of 20 plots for tree with 5cm dbh and larger | 40 |
| 4.14 | Summary of five species for saplings | 41 |
| 4.15 | Summary of 20 plots for saplings | 41 |

LIST OF FIGURES

| Figure | | Page |
|---------------|--|-------------|
| 3.1 | Flow chart of the methodology | 16 |
| 3.2 | Map of Kelantan Delta, Tumpat and Pulau Che Minah | 18 |
| 3.3 | Sampling layout with bearing | 19 |
| 3.4 | The circular plot design | 20 |
| 3.5 | Crown Form indices | 22 |
| 3.6 | Forest profile transect | 23 |
| 4.1 | Forest profile at Pulau Che Minah (South) | 29 |
| 4.2 | Diameter at breast height of the trees with dbh 5cm and larger | 33 |
| 4.3 | Cluster analysis for tree with 5 cm dbh and larger | 42 |
| 4.4 | Cluster analysis for the saplings | 42 |

LIST OF ABBREVIATIONS

| | | |
|----------|---|--|
| <i>d</i> | - | Diameter class |
| dbh | - | diameter at breast height |
| E | - | Evenness |
| G | - | Average basal area per hectare |
| g_{ij} | - | basal area in the <i>j</i> th diameter calss of the <i>i</i> th plot |
| GPS | - | Geographical Positioning System |
| H | - | Diversity |
| <i>m</i> | - | Number of diameter class in the plot |
| <i>n</i> | - | Number of plots in stand |
| R | - | Richness |

LIST OF APPENDIX

Appendix: Table of data during sampling

58

ABSTRACT

The study about the mangrove stand structure and composition is to determine the species composition and the stand structure of the mangrove forest. The study was conducted at Pulau Che Minah (South), Kelantan Delta, Tumpat. A quantitative study of mangrove vegetation (trees, saplings and seedlings) was recorded from 100 m² plot, include the species diversity, density and basal area. Overall, there were three species for trees were found, there were *Avicennia alba*, *Sonneratia caseolaris* and *Nypa fruticans*. While there were five species for sapling were found and only *Nypa fruticans* was found for the seedling. Pulau Che Minah is classified as *Avicennia-Sonneratia* forest type. The dominance species that recorded at this area were *Avicennia alba* and *Sonneratia caseolaris*. There was 8.045 m²ha⁻¹ total basal was recorded at Pulau Che Minah. The importance value that was recorded by *Avicennia alba* was 126.966 and *Sonneratia caseolaris* was 59.619. The density for the trees, saplings and seedlings was 2810 tree ha⁻¹, 1620 saplings ha⁻¹ and 9000 seedling ha⁻¹ respectively. The average richness, evenness and diversity for the tree was 16.7, 0.942 and 2.628 respectively. The average richness for the sapling was 5.0, the average evenness for the saplings was 0.449 and the average diversity for the saplings was 0.873. The mangrove vegetation of this island was related with the location of the island which located at the seaward zone and influence by tidal inundated. The baseline data from this study can provide a valuable comparison with other mangrove in Malaysia.

DIRIAN STUKTUR HUTAN PAYA LAUT DI PULAU CHE MINAH (SELATAN), DELTA KELANTAN, TUMPAT

ABSTRAK

Kajian mengenai dirian stuktur hutan paya laut adalah untuk mengetahui komposisi hutan dan dirian hutan tersebut. Kajian mengenai kuantitatif pertumbuhan di kawasan hutan paya laut (pokok, anak pokok dan biji benih) adalah direkodkan daripada plot yang berukuran 100 m². Ini adalah merangkumi kepelbagaian spesies, kepadatan dan luas pangkal. Secara keseluruhannya, hanya terdapat tiga spesies pokok dewasa yang dijumpai di kawasan kajian. Manakala lima spesies yang dijumpai di kawasan kajian adalah merupakan anak pokok. Hanya biji benih *Nypa fruticans* dijumpai di kawasan kajian. Jenis hutan yang terdapat di Pulau Che Minah adalah hutan jenis *Avicennia-Sonneratia*. Spesies yang dominan di Pulau Che Minah adalah *Avicennia alba* dan *Sonneratia caseolaris*. Luas pangkal adalah sebanyak 8.045 m²ha⁻¹. Nilai kepentingan yang bagi *Avicennia alba* adalah sebanyak 126.966, manakala bagi *Sonneratia caselaris* adalah 59.619. Kepadatan pokok di Pulau Che Minah adalah sebanyak 2810 pokok m²ha⁻¹, kepadatan anak pokok adalah sebanyak 1620 pokok m²ha⁻¹ dan kepadatan biji benih adalah sebanyak 9000 pokok m²ha⁻¹. Purata kekayaan spesies, keseragaman, dan kepelbagaian spesies bagi pokok masing-masing adalah 16.7, 0.942 dan 2.628. Manakala purata kekayaan, keseragaman dan kepelbagaian spesies bagi biji benih masing-masing adalah 5, 0.499 dan 0.873. Hutan paya laut di Pulau Che Minah dipengaruhi oleh pasang surut air dan kedudukan pulau tersebut menyebabkan pulau ini hanya ditumbuhi oleh *Avicennia alba* dan *Sonneratia caseolaris*. Data yang diperolehi boleh digunakan sebagai rujukan untuk membuat perbandingan dengan kawasan hutan paya bakau di tempat lain.