

**MANGROVE FISH ABUNDANCE AND DIVERSITY IN KUCHING
WETLANDS NATIONAL PARK**

By

Sophia Sik Sze Yong

**Research Report submitted in partial fulfillment of
The requirements for the degree of
Bachelor of Science (Marine Biology)**

**Department of Marine Science
Faculty of Maritime Studies and Marine Science
UNIVERSITY MALAYSIA TERENGGANU
2007**

1100058051

This project report should be cited as:

Sophia S.Y. Sik. 2007. Mangrove Fish Abundance and Diversity in Kuching Wetlands National Park. Undergraduate thesis, Bachelor of Science (Marine Biology), Faculty of Maritime Studies and Marine Science, University Malaysia Terengganu (UMT). 72p.

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



**JABATAN SAINS MARIN
FAKULTI PENGAJIAN MARITIM DAN SAINS MARIN
UNIVERSITI MALAYSIA TERENGGANU**

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

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:

Mangrove Fish Abundance and Diversity in Kuching Wetlands National Park oleh Sik Sze Yong No. Matrik UK10376 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Marin sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Sains (Biologi Marin) Fakulti Pengajian Maritim dan Sains Marin, Universiti Malaysia Terengganu.

Disahkan oleh:


.....
Penyelia Utama : **PROF. MADYA LIEW HOCK CHARK**
Nama : Pensyarah
Cop Rasmi : Institut Oseanografi
Universiti Malaysia Terengganu (UMT)
21030 Kuala Terengganu, Terengganu.

Tarikh: 03 MAY 2007


.....
Penyelia Kedua :
Nama :
Cop Rasmi : **AMIRRUDIN AHMAD**
Pensyarah
Jabatan Sains Biologi
Fakulti Sains dan Teknologi
Universiti Malaysia Terengganu
21030 Kuala Terengganu.

Tarikh: 03 MAY 2007

ACKNOWLEDGEMENT

First of all, I would like to thank Mr. Liew Hock Chark and Mr. Amirrudin Ahmad for their guidances, advices and patience throughout this project. Mr. Liew, thanks for teaching me statistics which helped a great deal in my data analysis. Mr. Amir, thank you for imparting the much needed knowledge in fish identification. It was a pleasure working with both of you.

I would also like to extend my gratitude to Sarawak Forestry Corporation (SFC) for their generosity in lending me the sampling equipments for the study. I am also grateful to Sarawak Museum, especially Dr. Charles Leh for letting me use the laboratory and giving constructive opinions in my report writing. Thanks to Mr. Yusri Yusuf for contributing in my report as well. Next, I would like to express my appreciation to the lab assistants in General Biology Laboratory (UMT) and the Butterfly Laboratory (Sarawak Museum) for their kind assistance during my lab work.

Sam, thank you for being a great partner and friend throughout this project! My heartfelt gratitude to Doreen, Chen Lin, Hema, Cecilia, Lay Hoon, Siao Jean, Lee Chuen, Gyn Yee and Yee Ling for their help and encouragements. Many thanks to Milton, Seh Ling, Boon Leong, Kok Ho, Su Ee and Chon Wee.

This project is dedicated to my parents and my brothers, Sem Yew and Sem Khuan for their love and encouraging words. Above all, I am grateful to my Father in Heaven who gave me strength to carry on despite all the trials and tribulations. Without Him, this project would not have been possible.

TABLE OF CONTENTS

	Page
TITLE PAGE	i
APPROVAL FORM	ii
ACKNOWLEDGEMENT	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	viii
LIST OF FIGURES	x
LIST OF ABBREVIATIONS / SYMBOLS	xii
LIST OF APPENDICES	xiii
ABSTRACT	xiv
ABSTRAK	xv
CHAPTER 1	
1.0 Introduction	1
CHAPTER 2	
2.0 Literature Review	5
2.1 The Significance of Mangrove Forests	5
2.2 Mangroves as Nursery, Feeding and Breeding Grounds	7
2.3 Fish Abundance and Diversity in Mangroves	8
2.4 Seasonal Changes in Fish Composition	10
2.5 Sampling Mangrove Fishes	11
2.6 Fish Production Supported by Mangroves	11
CHAPTER 3	
3.0 Materials and Methods	13
3.1 Sampling Site	13

	Page
3.2 Water Parameters	13
3.3 Sampling Method	15
3.4 Sampling Data	17
3.5 Data Analysis	17
3.5.1 Fish Identification	17
3.5.2 Ecological Statistical Analysis	18
3.5.3 Biostatistical Analysis	20
 CHAPTER 4	
4.0 Results	21
4.1 Water Parameters	21
4.2 Fish Distribution and Diversity	22
4.3 Fish of Commercial Value	29
4.4 Data Analysis	31
4.4.1 Cluster Analysis of Sampling Stations according to Fish Composition	31
4.4.2 Similarity Comparison between Sampling Stations based on Water Parameters	32
4.4.3 Comparing Species Diversity between Stations by Season	34
4.4.4 Comparing Species Evenness between Stations by Seasons	34
4.4.5 Comparing Species Richness between Stations by Seasons	35

	Page
4.4.6 Correlation Analysis for Determining Association between DO and Number of Species	35
4.4.7 Correlation Analysis for Determining Association between Salinity and Number of Species	36
4.4.8 Correlation Analysis for Determining Association between Species Diversity and Turbidity	38
4.4.9 Correlation Analysis for Determining Association between Species Evenness and Turbidity	38
4.4.10 Correlation Analysis for Determining Association between Species Richness and Turbidity	39

CHAPTER 5

5.0 Discussion	41
5.1 Water Parameters	41
5.2 Fish Distribution and Diversity	42
5.3 Fish of Commercial Value	45
5.4 Local Fish Landings	46
5.5 Clustering of Sampling Stations based on Fish Composition and Water Parameters	49
5.6 Comparison of Species Diversity, Evenness and Richness between Stations by Seasons	50

	Page
CHAPTER 6	
6.0 Conclusion and Recommendations	51
REFERENCES	52
APPENDICES	58
CURRICULUM VITAE	72

LIST OF TABLES

		Page
Table 1	Physical and hydrological parameters recorded at Sg. Jebung Lurus (S1), Sg. Sibul (S2), Sg. Seberang Rumah (S3), Sg. Radak (S4) and Sg. Besar (S5) from 4 - 6 September, 2006.	22
Table 2	Physical and hydrological parameters recorded at Sg. Jebung Lurus (S1), Sg. Sibul (S2), Sg. Seberang Rumah (S3), Sg. Radak (S4) and Sg. Besar (S5) from 4 – 5 December, 2006.	22
Table 3	List of fish with total number of family, species and individuals caught from all sampling sites in Kuching Wetlands National (KWNP) according to season.	23
Table 4	List of families, species, average standard length, average total length, and average weight with standard deviations (SD) caught using cast net during non-monsoon season at KWNP.	26
Table 5	List of families, species, number of individuals average standard length, average total length, and average weight with standard deviations (SD) caught using cast net during monsoon season at KWNP.	27
Table 6	The values of species diversity, evenness and richness for each station during both seasons.	28
Table 7	List of commercially-important fish species caught in KWNP.	29
Table 8	The size (in total length), habitat, life-cycle and feeding guild of selected fish species also caught in this study.	30
Table 9	Species diversity between stations by season.	34
Table 10	Species evenness between stations by season.	34
Table 11	Species richness between stations by season.	35
Table 12	DO and number of species based on season and stations.	35
Table 13	Salinity and number of species based on season and stations.	37
Table 14	Species diversity and turbidity based on stations during monsoon season.	38

		Page
Table 15	Species evenness and turbidity based on stations during monsoon season.	39
Table 16	Species richness and turbidity based on stations during monsoon season.	40
Table 17	Comparison of marine fish landings (metric tonnes) by species related to this study according to three selected districts in 2003, 2004 and 2005.	47
Table 18	Comparison of marine fish landings (metric tonnes) at three selected districts in September and December, 2003 and 2004.	48

LIST OF FIGURES

		Page
Fig. 1	Map showing the positions of the 5 sampling locations.	14
Fig. 2	Pictures showing major families (A, B, C) and rare species found during non-monsoon (1, 2, 3) and monsoon (i, ii, iii) seasons.	24
Fig. 3	Percentages of the dominant families in terms of the number of individuals caught during non-monsoon and monsoon season at KWNP.	25
Fig. 4	Comparison of number of individuals by station and season.	28
Fig. 5	UPGMA dendrogram for comparing fish composition among the five stations in KWNP during non-monsoon season.	31
Fig. 6	UPGMA dendrogram for comparing fish composition among the five stations in KWNP during monsoon season.	32
Fig. 7	UPGMA dendrogram for comparing water parameters among the five stations in KWNP during non-monsoon season.	33
Fig. 8	UPGMA dendrogram for comparing water parameters among the five stations in KWNP during monsoon season.	33
Fig. 9	DO versus number of species during non-monsoon season.	36
Fig. 10	DO versus number of species during monsoon season.	36
Fig. 11	Salinity versus number of species during non-monsoon season.	37
Fig. 12	Salinity versus number of species during monsoon season.	37
Fig. 13	Species diversity versus turbidity.	38
Fig. 14	Species evenness versus turbidity.	39
Fig. 15	Species richness versus turbidity.	40

		Page
Fig. 16	Average retail prices of twelve selected species of fish in Sarawak, 2003.	48
Fig. 17	Average retail prices of twelve selected species of fish in Sarawak, 2004.	49

LIST OF ABBREVIATIONS / SYMBOLS

ANOVA	-	Analysis of Variance
DO	-	Dissolved oxygen
FL	-	Fork length
GPS	-	Global Positioning System
KWNP	-	Kuching Wetlands National Park
MVSP	-	Muti-Variate Statistical Package
S1	-	Station 1
S2	-	Station 2
S3	-	Station 3
S4	-	Station 4
S5	-	Station 5
SL	-	Standard length
TL	-	Total length
UMT	-	University Malaysia Terengganu
UPGMA	-	Unweighted Pair-Group Method using Arithmetic Averages
α	-	Level of significance
D	-	Species richness index
H'	-	Species diversity index
H ₀	-	Null hypothesis
H ₁	-	Alternative hypothesis
J	-	Species evenness index
‰	-	Parts per thousand
mg/L	-	Microgrammes per liter

LIST OF APPENDICES

	Page
Appendix A List of fish species and total number of families and species from Sg. Jebung Lurus, Sg. Sibul, Sg. Seberang Rumah, Sg. Radak and Sg. Besar of Sarawak in September and December 2006.	58
Appendix B List of families and species caught during the non-monsoon season at Kuching Wetlands National Park (KWNP).	59
Appendix C List of families and species caught during the monsoon season at KWNP.	60
Appendix D Comparative list of fish caught from each station. “M” indicates the presence of species during monsoon while “N” indicates the presence of species during non-monsoon season in that station.	61
Appendix E Two-way analysis of variance (ANOVA) between stations and between seasons based on species diversity.	62
Appendix F Two-way analysis of variance (ANOVA) between stations and between seasons based on species evenness.	63
Appendix G Two-way analysis of variance (ANOVA) between stations and between seasons based on species richness.	64
Appendix H Correlation test between dissolved oxygen (DO) and number of species during non-monsoon and monsoon seasons.	65
Appendix I Correlation test between salinity and number of species during non-monsoon and monsoon seasons.	67
Appendix J Correlation test between species diversity and turbidity during monsoon season.	69
Appendix K Correlation test between species evenness and turbidity during monsoon season.	70
Appendix L Correlation test between species richness and turbidity during monsoon season.	71

ABSTRACT

Mangrove fishes at Kuching Wetlands National Park (KWNP) in western Sarawak, were sampled at five stations using a cast net 3/4" mesh size and 9' in length in September and December 2006, representing non-monsoon and monsoon season respectively. A total of 20 families and 31 species were recorded for the entire study with non-monsoon season having a higher catch. Chandidae and Mugilidae were the two most abundant families during both seasons. Fish caught in December varies more compared to those caught in September. Shannon-Weiner diversity indices ranged from 1.5 – 2.1 (non-monsoon) as compared to 1.2 – 1.6 (monsoon) for the five stations. More than 50% of the species caught were juveniles. Out of the 31 species, six were identified to be of commercial value. This might show that KWNP is a nursery ground for some commercial marine fishes. Comparison between the local fish landings and the results of the study revealed the season has an influence on fish composition in KWNP. Further researches are needed in order to better understand KWNP as a feeding and breeding ground for fishes.