

**THE RELATIONSHIP BETWEEN THE PHYSICAL
CHARACTERISTICS' BIOMASS ESTIMATION AND SOIL
ORGANIC MATTER AT TWO MANGROVE ZONES**

SYLVIANA CHELENGGA ANAK WILLIAM ANGGONG

**Final Year Report Submitted in
Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science (Hons.) Biology
In the Faculty of Applied Sciences
Universiti Teknologi MARA**

JULY 2019

ACKNOWLEDGEMENTS

Upon completion of this project, I would like to express my gratitude to many parties. My heartfelt thanks goes to my supervisor, Dr. Patricia Natin. Without her assistance and guidance in every step throughout the process of completing this final year project, this report would have never been accomplished. I would like to thank her very much for being understanding and supporting me.

I wish to express my sincere thanks to Mr. Ajimi Jawan, project coordinator for his guidance and support to complete my project. I am also grateful to Mr. Mohd Ruzaleh, the coordinator of Kompleks Makmal Sains dan Agroteknologi (KOMSAT) and to the laboratory assistant staffs of KOMSAT for providing the facilities and apparatus to conduct my experiment.

I take this opportunity to express gratitude to Mr. Mohd. Nurazmeel and the staffs at Kota Kinabalu Wetland Ramsar site for giving me opportunities to conduct my fieldwork at the mangroves.

Finally, I would like to express my gratitude to my parents for providing me with support and continuous encouragement throughout my years of study and through the process of researching and writing this final year project. This accomplishment would not have been possible without them.

Sylviana Chelengga Anak William Anggong

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	viii
ABSTRACT	ix
ABSTRAK	x
CHAPTER 1 INTRODUCTION	1
1.1 Background of study	1
1.2 Problem statement	1
1.3 Significant of study	2
1.4 Objectives of study	3
CHAPTER 2 LITERATURE REVIEW	4
2.1 Mangroves in general	4
2.1.1 Importance of mangroves	6
2.1.2 Mangroves in Malaysia	7
2.1.3 Mangroves in Sabah	10
2.1.4 Mangroves in Kota Kinabalu Wetland Ramsar Site	12
2.2 <i>Avicennia</i> sp. mangroves	14
2.3 <i>Rhizophora</i> sp. mangroves	14
2.4 Physical characteristics in general	15
2.4.1 Physical characteristics of mangroves	15
2.4.2 Physical characteristics' biomass	18
2.4.3 Previous study on physical characteristics' biomass	19
2.4.4 Allometric equation	20
2.5 Soil in general	26
2.5.1 Soil in mangroves	27
2.5.2 Soil organic matter	28
2.5.3 Soil organic matter in mangroves	29
2.5.4 Previous study on soil organic matter in mangroves	29
CHAPTER 3 METHODOLOGY	31
3.1 Study Site	31
3.2 Materials	32
3.2.1 Raw materials	32
3.2.2 Apparatus	32
3.3 Methods	32
3.3.1 Fieldwork sampling	32

3.3.1.1	Physical characteristics measurement (Kauffman and Donato, 2012)	33
3.2.1.2	Soil collection (Effendy and Natin, 2016)	36
3.3.2	Laboratory work	37
3.3.2.1	Soil drying (Effendy and Natin, 2016)	37
3.3.2.2	Loss on ignition method (Effendy and Natin, 2016)	37
3.3.2.3	Loss on ignition method without hydrochloric acid (HCl) (Effendy and Natin, 2016)	38
3.3.2.4	Loss on ignition method with hydrochloric acid (HCl) (Effendy and Natin, 2016)	39
3.3.3	Data analysis	40
3.3.3.1	Normality test (Bluman, 2014)	40
3.3.3.2	Parametric test (Bluman, 2014)	41
3.3.3.3	Non-parametric test (Bluman, 2014)	41
CHAPTER 4 RESULTS AND DISCUSSION		43
4.1	The physical characteristics between <i>Avicennia marina</i> and <i>Rhizophora mucronata</i> zones	43
4.2	The physical characteristics' biomass between <i>Avicennia marina</i> and <i>Rhizophora mucronata</i> zones	47
4.3	The soil organic matter (SOM) between <i>Avicennia marina</i> and <i>Rhizophora mucronata</i> zones	50
4.4	The correlation between the effect of physical characteristics' biomass and the soil organic matter within the two mangrove zones	52
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS		57
5.1	Conclusion	57
5.2	Recommendation	58
CITED REFERENCES		59
APPENDICES		70
CURRICULUM VITAE		85

ABSTRACT

THE RELATIONSHIP BETWEEN THE PHYSICAL CHARACTERISTICS' BIOMASS ESTIMATION AND SOIL ORGANIC MATTER AT TWO MANGROVE ZONES

The mangroves which protect the coastal area from sea erosion and marine life breeding ground are suffering from rapid degradation due to human activity such as city development and farming. The main aims of this study are to assess the physical characteristics' biomass by using allometric equation and the soil organic matter (SOM) between *Avicennia marina* and *Rhizophora mucronata* zones. Other than that, the aim is to correlate the effects of physical characteristics' biomass by using allometric equation to the soil organic matter within *A. marina* and *R. mucronata* zones. This study showed that the tree diameter at breast height (DBH), height and physical characteristics' biomass at *A. marina* zone was higher than *R. mucronata* zone ($p < 0.001$). Other than that, there was no difference in SOM between *A. marina* and *R. mucronata* zones ($p = 0.185$). The SOM has no effect on the tree physical characteristics' biomass within both mangrove zones (*A. marina* zone, $p = 0.414$; *R. mucronata* zone, $p = 0.859$). In conclusion, physical characteristics' biomass estimation does not affect the soil organic matter within both mangrove zones. Further studies can be conducted to inspect another aspect in nutrient cycles of mangroves such as mangrove trees age, leaf area index (LAI) and litterfall to see whether it can affect SOM.