

OBJECT BASED IMAGE ANALYSIS FOR PREDICTIVE
SUBSTRATE DISTRIBUTION MAP USING MULTIBEAM
ECHO SOUNDER (MBES) AND BACKSCATTER
BACKS IN BIDONG ISLAND ISLAND

NORAZIANEE BINTI ANUAR

BACHELOR OF SCIENCE (MARINE SCIENCE)
SCHOOL OF MARINE AND ENVIRONMENTAL
SCIENCES

UNIVERSITI MALAYSIA TERENGGANU

2017

lp
LP
5
PPSMS
2
2017

1721

1100103695



lp
LP 5 PPSMS 2 2017



1100103695
Object based image analysis for predictive substrate distribution
map using multibeam echo sounder (MBES) and backscatter in
Bidong Island / Norzainee Anuar.

PERPUSTAKAAN SULTANAH NUR ZAHIRAH UNIVERSITI MALAYSIA TERENGGANU (UMT) 21030 KUALA TERENGGANU		
1100103695		
RECEIVED 18 OCT 2018		

Lihat Sebelah

**OBJECT BASED IMAGE ANALYSIS
FOR PREDICTIVE SUBSTRATE DISTRIBUTION MAP
USING MULTIBEAM ECHO SOUNDER (MBES) AND
BACKSCATTER IN BIDONG ISLAND**

By

Norazianee binti Anuar

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

**School of Marine and Environmental Sciences
UNIVERSITI MALAYSIA TERENGGANU**

2017

This project should be cited as:

Anuar N.(2017). Object based image analysis for predictive substrate distribution map using multibeam echo sounder (MBES) and backscatter in Bidong Island. Undergraduate thesis, Bachelor of Science (Marine Science), School of Marine and Environmental Sciences, Universiti Malaysia Terengganu, Terengganu. 36p.

No part of this project may be produced by any mechanical, photographic, or electronic process, or in the form of photographic 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.

Sekyen
Pengeindeksan &
Metadata / BPS
LP
5
pbsms
2
2017
- ops 15/10/17

1100103695



SCHOOL OF MARINE AND ENVIRONMENTAL SCIENCES
UNIVERSITI MALAYSIA TERENGGANU

FINAL YEAR PROJECT REPORT VERIFICATION
PENGAKUAN DAN PENGESAHAN LAPORAN

It is hereby declared and verified that this project report titled
by
have been examined and all errors identified have been corrected. This report is
submitted to the School of Marine and Environmental Sciences as partial fulfillment
towards obtaining the **Bachelor's of Science (Marine Science)** from School of
Marine and Environmental Sciences, Universiti Malaysia Terengganu.

Verified by:


.....

Main Supervisor

Name: **KHAIRA ISMAIL**

Official stamp:

Date: **1/6/2017**

DR. KHAIRA BINTI ISMAIL
Pensyarah
Pusat Pengajian Sains Marin dan Sekeloa
Universiti Malaysia Terengganu
..... 21030 Kuala Terengganu

Co- Supervisor

Name:

Official stamp:

Date:

(*Insert if applicable)




SCHOOL OF MARINE AND ENVIRONMENTAL SCIENCES
UNIVERSITI MALAYSIA TERENGGANU

DECLARATION

I hereby declare that this dissertation

is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at UMT or other institutions. This report is submitted to the School of Marine and Environmental Sciences as partial fulfillment towards obtaining the **Bachelor's of Science (Marine Science)** from School of Marine and Environmental Sciences, Universiti Malaysia Terengganu.

Verified by:


.....

Date: 1/6/2017

Name: NORAZIANEE BINI ANUAR

Matriculation no.: UK34814

ACKNOWLEDGEMENTS

Alhamdulillah, all praise to Allah yhat with His permission and blessing, I have completed my final year project on predictive substrate distribution mapping using MBES and backscatter data in Bidong Island. First of all, I would like to thank my dedicated supervisor Dr Khira Binti Ismail for supervising and encouraging me from start to finish. Besides, I feel thankful to have her as my supervisor which without her, I barely able to carry out my final year project. I also would like to thank Mr Hafiz and Mr. Yuzwan for helping me in using of ArcGIS software. Thanks to all laboratory assistant who gave cooperation during my work in GIS lab.

Special thanks to Izanna, Ain Hajar, Sarah, Raihanah whom lend me a hand and provide much moral support during my laboratory work. For all my coursemate Marine Science batch 2014, thanks for all your hardwork and working as a team.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	ii
LIST OF TABLES	vi
LIST OF FIGURES	vii
ABSTRACT	viii
ABSTRAK	ix
CHAPTER 1: INTRODUCTION	
1.1 Background of Study	1
1.2 Justification of Study	2
1.3 Objectives of Study	2
CHAPTER 2: LITERATURE REVIEW	
2.1 Substrate	3
2.2 Object Based Image Analysis (OBIA)	4
2.3 Bathymetry	
2.3.1 What is Bathymetry	5
2.3.2 Importance of Bathymetry	6
2.4 Multibeam Echo Sounder (MBES)	
2.4.1 What is MBES	7
2.4.2 Principle of MBES	7
2.4.3 Application of MBES in previous study	9

2.5	Backscatter data	10
-----	------------------	----

CHAPTER 3: METHODOLOGY

3.1	Study Area	11
3.2	General flow of Method	12
3.2.1	Data Acquisition	13
3.2.2	Data Processing	13
3.2.3	Data Analysis	14
3.2.4	Classification	15

CHAPTER 4: RESULTS

4.1	Interpolation of Bathymetry Map	17
4.2	Backscatter Image	18
4.3	Parameters derivatives from Multibeam Bathymetry	19
4.4	Unsupervised image classification	
4.4.1	Classification of terrain feature using BTM	20
4.1.2	Classification of Substrate distribution using ISO cluster unsupervised	21
4.1.3	Classification of substrate using RSOBIA	22
4.1.4	Classification of substrate distribution using Hand Digitization	23

CHAPTER 5: DISCUSSION	
5.1 Bathymetry Map	24
5.2 Parameters Derivative	24
5.3 Standardized BPI for BTM classification	25
5.4 Comparison between ISO Cluster and RSOBIA classification	26
5.5 Distribution of substrate in South West of Bidong Island	27
5.6 Prediction of Substrate Distribution in South West of Bidong Island	28
5.7 Mismatch and Insufficient of Data	29
CHAPTER 6: CONCLUSION	30
REFERENCES	31
CURRICULUM VITAE	36

LIST OF TABLES

Table		Page
3.1	The derivative of parameters from multibeam bathymetry data.	54

LIST OF FIGURES

Figure		Page
3.1	Location of Study area in Bidong Island	4
3.2	General Flow Diagram to produce Substrate Map	10
4.1	Map of bathymetry in South West of Bidong Island	16
4.2	Image of acoustic backscatter in South West of Bidong Island	47
4.3	Parameters derivatives from multibeam bathymetry that has been choose for classification	51
4.4	Classification of terrain features using Benthic Terrain Modeler	59
4.5	Classification of substrate using ISO cluster in ArcGIS	67
4.6	Classification of substrate using MBES segmentation in RSOBIA	70
4.7	Classification of substrate using hand digitization	

ABSTRACT

This study conducted to map a seafloor substrate and the area that was covered was in South West of Bidong Island which located in Terengganu. The first part aims is to delineate meaningful pattern of substrate distribution in backscatter and multibeam bathymetry using Object Based Image Analysis (OBIA) and the second part classifies type of seafloor substrate using multibeam bathymetry and backscatter data. An acquisition of acoustic for multibeam bathymetry, backscatter mosaic and ground truth data in South West of Bidong Island is used to characterize the sea floor substrate. Acoustic data of were collected R2Sonic 2020. For ground truth data, sample of sediment has been grab and classified based on its texture from triangle plot, thus classifying the sediment as coarse sand and very coarse sand. The data of mutibeam bathymetry, backscatter image and parameters from mutibeam were used for predicting the type of substrate that can be found on these seafloor. These combination of data were runs using Benthic Terrain Modeler (BTM), ISO Cluster unsupervised and Remote Sensing Object Based Image Analysis (RSOBIA). The data of substrate sample from ground truth used for this project to help in identifying the categories which produced from RSOBIA classification. From automated classification using RSOBIA, there were three classes was produced and these classes recognize based on ground truth information. The map produced by ROBIA also compared to the ISO cluster map to identify the differences of these classification technique. From the result, the type of substrate that predicted to dominant of mapped area was sandy grain. This study not only important to provide a map with useful information towards sea floor properties but also plays an important role in coastal management.

**ANALISIS IMEJ BERDASARKAN OBJEK UNTUK MERAMALKAN
TABURAN SUBSRAT MENGGUNAKAN MULTIBEAM ECHO SOUNDER
(MBES) DAN BACKSCATTER DI BIDONG**

ABSTRAK

Kajian ini dijalankan untuk memetakan substrat dasar laut dan kawasan yang terlibat adalah Barat Selatan Pulau Bidong yang terletak di Terengganu. Kajian ini adalah bertujuan untuk mendapat gambaran tentang corak taburan substrat berdasarkan data multibeam batimetri dan backscatter dengan menggunakan teknik analisis yang berdasarkan imej (OBIA) Tujuan lain juga ialah untuk mengklasifikasikan jenis substrat di dasar laut dengan menggunakan batimetri dan data backscatter. Data akustik yang telah diperolehi di kumpulkan dengan menggunakan Multibeam R2Sonic 2020. Manakala data untuk sample substrat, ia telah di klasifikasikan sebagai kasar dan sangat kasar berdasarkan plot segitiga. Data batimetri multibeam, imej backscatter dan parameter dari multibeam juga digunakan untuk meramalkan jenis substrat yang boleh didapati di dasar laut ini. Data ini diproses menggunakan Benthic Terrain Modeler (BTM), ISO Cluster dan RSOBIA. Data sampel substrat digunakan untuk projek ini untuk membantu dalam mengenal pasti kategori yang dihasilkan daripada pengelasan RSOBIA. Pengelasan automatik daripada RSOBIA, menghasilkan tiga kelas dan kelas ini dikenalpasti berdasarkan maklumat daripada data sample substrat. Peta yang dihasilkan oleh RSOBIA juga dibandingkan dengan ISO Cluster untuk mengenal pasti perbezaan teknik pengelasan. Berdasarkan keputusan yang diperolehi, jenis substrat yang diramalkan dominan di kawasan kajian ialah substrat berpasir. Kajian ini bukan sahaja penting untuk menyediakan peta dengan

maklumat tentang ciri-ciri lantai laut tetapi juga memainkan peranan penting dalam pengurusan pantai.