

THE DETECTION OF PHYTOPLANKTON DENSITY ALONG
COASTAL AREAS USING SATELLITE IMAGERY
(EMPHASIS ON MODIS DATA)

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2007

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THE DETECTION OF PHYTOPLANKTON DENSITY ALONG COASTAL AREAS
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Research Report submitted in partial fulfillment of the requirement for the degree of
Bachelor of Science (Marine Science)

Department of Marine Science
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UNIVERSITY MALAYSIA TERENGGANU
2007

1100054368

This project report should be cited as:

Nurmazihah, S., 2007. The Detection of Phytoplankton Density along Coastal Waters using Satellite Imagery (Emphasis on MODIS DATA). Final Year Project Report, Bachelor of Science (Marine Science), Faculty of Maritime Studies and Marine Science, University Malaysia Terengganu. p 63.

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**DEPARTMENT OF MARINE SCIENCE
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**RESEARCH PROJECT FINAL YEAR FINAL DRAFT APPROVAL AND
VALIDATION FORM I AND II**

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The Detection of Phytoplankton Density along Coastal Areas Using Satellite Imagery (Emphasis On MODIS data), by Nurnazihah Binti Shamsulhuda, Matric. No UK 9997 has been read and all the alteration and correction recommended by examiners have been done. This final draft submitted to Marine Science Department has been accepted as fulfillment of the requirement for Bachelor of Science (Marine Science) under the faculty of Maritime Studies and Marine Science, University Malaysia Terengganu.

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ACKNOWLEDGEMENTS

First of all, I would like to thank Allah S.W.T for guidance and blessing through out the project. I would also like to thank my supervisor, Dr. Razak Zakariya for his precious guidance, advices and continuous support through out the completion of this project. I really appreciate him for giving me the chance to do this great research.

Thank you to MACRES officers for giving the image satellite data for this research project. My gratitude also goes to my beloved parents Shamsulhuda and Fuziyah, also for my brothers and sisters. The support from family was indispensable. They gave me the encouragement from the beginning until the completion of the study.

Thanks also to En. Suffian, Pn. Kartini, Nur Adila for their precious help. I also would like to thank my beloved friends, Ahmad Asyrani, Aimi, Muna, Siti Waznah, Shuhada, Rina, Erin, Huda and many more persons that not stated which had directly and indirectly involved in fulfilling this research project.

Last but not least, the appreciation also goes to the lab assistants of Oceanography Laboratory, Biological Diversity and Informatics Laboratory, for allowing me to use the apparatus, instruments and computer during my sampling and lab work.

This project will not able to complete without the help and guidance of any above.

Thank you very much.

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LIST OF ABBREVIATION

μm	micrometer
mm	millimeter
ml	mililiter
m	meter
μL	microliter
L	liter
no. /L	number per Liter
<	less than
>	more than
∞	Infinity
%	percentage
N	North
E	East
DO	dissolved oxygen
pH	$\log_{10}(\text{H}^+)$
ppt	part per thousand
Mid	middle
MACRES	Malaysia Remote Sensing Centre
MODIS	Moderate Resolution Imaging Spectroradiometer
MRSO	Malaysian Rectified Skewed Orthomorphic
PVC	Poly-Venil Chloride

ROI	Region of Interest
SeaWiFS	Sea -viewing Wide Field-of-view Sensor
SW	south west
UMT	University Malaysia Terengganu
DGPS	Digital Global Positioning System
HABs	harmful algal blooms
FLH	fluorescence line height
Chl	chlorophyll- <i>a</i>
$L_w(\lambda)$	spectral water-leaving radiance
CO ₂	Carbon dioxide
H ₂ O	Hydrogen dioxide
C ₆ H ₁₂ O ₆	Carbohydrate
O ₂	Oxygen
VSSR	Visible Sea Spectral Reflectance

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ABSTRACT

The study was conducted to determine the phytoplankton density in Merang and Kuala Terengganu coastal areas using satellite imagery (MODIS data). From the ground sampling analysis, phytoplankton density was ranged between 7,865.7 no. /L to 58,015 no. /L. In this study, phytoplankton density was higher in Kuala Terengganu coastal area (279,774.81 no./L) compared to Merang coastal area (118,744.21 no./L). Then, Terra satellite (MODIS) was used to detect the phytoplankton density to compare with the in-situ data to define that MODIS data could use or not to detect phytoplankton density in this study area. The correlation between in-situ data of phytoplankton and water-leaving radiance derived using band 8 (405-420 nm) gives the best result with $R^2 = 0.4994$. Then, this correlation was used to develop a map of phytoplankton density in study area. Futhermore, from this map, regression analysis by using in-situ data of phytoplankton and *water-leaving-radiance* was carried out the model phytoplankton density data from satellite imagery. Correlation between satellite data and in-situ data of phytoplankton density shown that $R^2 = 0.9796$ which has a highest value. Highest value of R^2 means that phytoplankton density was highest in that area. Result showed that MODIS is suitable for use to detect the phytoplankton density in this study area.

ABSTRAK

Tujuan utama projek ini dijalankan adalah untuk mengesan kepadatan phytoplankton di persisiran pantai menggunakan imej satellite (data MODIS). Daripada analisis, didapati bahawa kepadatan phytoplankton adalah diantara 7,865.7 no. /L hingga 58,015 no. /L. Di kawasan kajian ini didapati bahawa kepadatan phytoplankton adalah tinggi di persisiran pantai Kuala Terengganu iaitu sebanyak 279,774.81 no./L berbanding persisiran pantai Merang yang hanya mengandungi 118,744.21 no./L. Kemudian, Satelit Terra (MODIS) digunakan untuk mengesan kepadatan phytoplankton untuk dibandingkan dengan data in-situ samada data MODIS dapat digunakan atau tidak untuk mengesan kepadatan phytoplankton di kawasan kajian ini. Perhubungan antara data in-situ dan data *water-leaving radiance* menggunakan band 8 (405-420 nm) memberikan keputusan yang terbaik dengan R^2 ialah 0.4994. Kemudian, hubungan regresi ini digunakan untuk menghasilkan peta kepadatan phytoplankton di kawasan kajian. Seterusnya, daripada peta ini hubungan regresi antara data in-situ phytoplankton dan *water-leaving radiance* digunakan untuk mendapatkan data model kepadatan phytoplankton dari satelit. Perhubungan antara data model kepadatan phytoplankton dari satelit dan data in-situ menunjukkan bahawa kepadatan phytoplankton adalah sangat tinggi iaitu dengan nilai $R^2 = 0.9796$. Keputusan menunjukkan bahawa MODIS amat sesuai untuk mengesan kepadatan phytoplankton di kawasan kajian.