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Primary productivity and chlorophyll-a in Setiu Lagoon,
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PRIMARY PRODUCTIVITY AND CHLOROPHYLL-*a* IN
SETIU LAGOON, TERENGGANU.

By

Teoh Boon Sim

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

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UNIVERSITY MALAYSIA TERENGGANU
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**PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN I DAN II**

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:

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LIST OF ABBREVIATIONS

%	-	percentage
‰	-	part per thousand
°C	-	degree centigrade
APHA	-	American Public Health Association
BOD	-	biological oxygen demand
CO ₂	-	carbon dioxide
Conc.	-	concentrated
DO	-	dissolved oxygen
G	-	gross photosynthetic rate
GFC	-	glass micro fiber filters
GPS	-	global positioning system
<i>M</i>	-	Morality
mgL ⁻¹	-	milligram per litre
mgm ⁻³	-	milligram per cube
mgCm ⁻³ hr ⁻¹	-	milligram carbon per metre cube per hour
N	-	net photosynthetic rate
<i>N</i>	-	Normality
nm	-	nanometer
OD	-	optical density
pH	-	potential of hydrogen
R	-	respiration rate
Rpm	-	round per minute
stdev	-	standard deviation
µm	-	micrometer
µMolm ⁻² s ⁻¹	-	micrometer per metre cube per second

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ABSTRACT

This study aims to measure net photosynthetic rate, chlorophyll-a and total phytoplankton biomass in Setiu Lagoon, Terengganu. Three samplings were conducted: 13th September 2006 (South-West monsoon), 12th October 2006 (Intermonsoon) and 14th December 2006 (North-East monsoon). Fourteen sampling stations were set at Setiu Lagoon. The methods applied in this study were Winkler's dissolved oxygen method and Light-dark bottles for determination of primary productivity, chlorophyll-a determination using UV spectrophotometer, and Lackey drop method for determination of total phytoplankton abundance. The changing of monsoon season was found to be the most significant factor that affects the water quality in Setiu Lagoon. Low level of net photosynthetic rate was found in North-East monsoon season. The mean values of net photosynthetic rate for 1st, 2nd and 3rd sampling were 180.00 ± 67.50 mg.C.m⁻³.hr⁻¹, 123.19 ± 46.53 mg.C.m⁻³.hr⁻¹, and 68.06 ± 26.07 mg.C.m⁻³.hr⁻¹ respectively. The light intensity may be the major limiting factor. Besides, the mean value of chlorophyll-a level in 1st, 2nd and 3rd sampling were 2.19 ± 1.34 mg m⁻³, 0.94 ± 0.81 mg m⁻³, and 0.60 ± 0.46 mg m⁻³ respectively. The increasing volume of freshwater input into the Lagoon during North-East monsoon was the factor that caused lower level of chlorophyll-a in Setiu Lagoon. Furthermore, nutrient may affect the chlorophyll-a level. The mean value of total phytoplankton abundance was 841 ± 106 no. of organism/L (1st sampling), 560 ± 82 no. of organism/L (2nd sampling), and 412 ± 107 no. of organism/L (3rd sampling). The changing from South-West monsoon to North-East monsoon that bring high precipitation and low evaporation rate may cause the scattering in phytoplankton distribution and the decreasing of phytoplankton abundance in counting. The distribution of nutrient may affect the phytoplankton abundance in certain area. The primary productivity was

considered low in Setiu Lagoon. Setiu Lagoon is considered polluted by the domestic waste from human and aquaculture activities.

ABSTRAK

Kajian ini bertujuan untuk mengukur kadar fotosintesis bersih, kandungan klorofil-a dan jumlah biomas fitoplankton di Lagun Setiu, Terengganu. Tiga kali penyampelan telah dijalankan iaitu pada 13 September 2006 (Monsun Barat Daya), 12 Oktober 2006 (Antara Monsun) and 14 December 2006 (Monsun Timur Laut). Bagi setiap penyampelan, empat belas stesen telah dipilihkan di Lagun Setiu sebagai tapak kajian. Kaedah-kaedah yang telah digunakan dalam penyampelan adalah seperti kaedah Winkler's dissolved oxygen dan kaedah Light-dark bottles untuk produktiviti primer, kaedah UV-spectrophotometer untuk penentuan klorofil-a, dan kaedah Lackey drop untuk jumlah biomas fitoplankton. Perubahan dalam monsun merupakan factor utama yang mempengaruhi kualiti air di Lagun Setiu. Berdasarkan kajian, kadar fotosintesis yang rendah didapati pada penyampelan pertama iaitu Monsun Timur Laut. Nilai min bagi kadar fotosintesis bersih untuk penyampelan pertama, kedua dan ketiga adalah $180.00 \pm 67.50 \text{ mg.C.m}^{-3}.\text{hr}^{-1}$, $123.19 \pm 46.53 \text{ mg.C.m}^{-3}.\text{hr}^{-1}$, dan $68.06 \pm 26.07 \text{ mg.C.m}^{-3}.\text{hr}^{-1}$ masing-masing. Kadar keamatan cahaya merupakan satu faktor penghad yang utama. Selain itu, nilai min bagi klorofil-a semasa penyampelan pertama, kedua dan ketiga adalah $2.19 \pm 1.34 \text{ mg m}^{-3}$, $0.94 \pm 0.81 \text{ mg m}^{-3}$, dan $0.60 \pm 0.46 \text{ mg m}^{-3}$ masing-masing. Ini disebabkan oleh kemasukan isipadu air tawar yang banyak semasa Monsun Timur Laut. Tambahan pula, nutrisi juga mempengaruhi kandungan klorofil-a di dalam air. Nilai min bagi jumlah biomas fitoplankton begi penyampelan pertama, kedua dan ketiga adalah $841 \pm 106 \text{ no. of organism/L}$, $560 \pm 82 \text{ no. of organism/L}$ dan $412 \pm 107 \text{ no. of organism/L}$ masing-masing. Pertukaran monsoon dari Monsun Barat Daya kepada Monsun Timur Laut telah memnyebabkan kadar hujan yang tinggi dan penyejatan yang rendah . Hal ini menyebabkan penurunan bilangan organisma yang dikirakan. Taburan nutrisi juga menjejaskan biomas fitoplankton di kawasan tersebut.

Produktiviti primer di Lagun Setiu dianggap rendah. Lagun Setiu dianggap tercemar disebabkan oleh aktiviti manusia dan akuakultur.