

THE EFFECTS OF POLLUTANTS TO MARINE
BENTHIC AND PELAGIC INVERTEBRATE SPECIES
IN THE SOUTH CHINA SEA REGIONAL MARINE ECOSYSTEMS
AND WETLANDS

BY DR. HUIYI HAN, B. ENG. HUIYI HAN

FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU

2007

LP
30
FMSM
1
2007



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 :

FATTY ACID BIOMARKERS TO INDICATE ORGANIC FOOD SOURCE OF
MUSKIPPER SPECIES *Bombulus belati* AND *Peripatus*
gracilis IN SETIU WETLANDS, TERENGGANU

oleh MOHD NOR NAIMAN HAKIMI B. MOHD NAIMUDDIN No. Matrik: UK101501

telah diperiksa dan semua pembedaan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Marin sebagai memenuhi sebahagian daripada keperluan memperoleh ijazah GRADUA MUDA SAINS (BIOLOGI MARIN) Fakulti Pengajian Maritim dan Sains Marin, Universiti Malaysia Terengganu.

Disahkan oleh :

Penyelia Utama

DR. ZAINUDIN BACHOK

Nama :

Lecturer

Cop Rasmi:

Department of Marine Science
Faculty of Maritime Studies and Marine Science
Universiti Malaysia Terengganu (UMT)
21030 Kuala Terengganu.

Tarikh :

25/4/2007

Penyelia Kedua (Jika Ada)

Nama:

Cop Rasmi:

1100054061

FATTY ACID BIOMARKERS TO INDICATE ORGANIC FOOD SOURCE OF
MUDSKIPPER SPECIES *Bolocephalmus boddarti* and *Periophthalmus gracillis* IN
SETIU WETLANDS

By

Mohd Nur Nazaqul Hakimi Bin Mohd Najmuddin

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

Department of Marine Science
Faculty of Maritime Study and Marine Science
UNIVERSITI MALAYSIA TERENGGANU
2007

This Project should be cited as :

Mohd Nur Nazaqul Hakimi, M.N.2007. Fatty acid biomarkers to indicate the organic food source of mudskipper species, *Boleophthalmus boddarti* and *Periophthalmus gracillis* in Setiu Wetland, Terengganu. Project report of B. Sc. (Marine Biology). Faculty of Maritime Study and Marine Science. Universiti Malaysia Terengganu. 28p.

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

ACKNOWLEDGEMENT

Alhamdulillah, thankful to Allah s.w.t. for giving me the opportunity in have this final year research project done well.

A grateful thank you to Dr. Zainudin Bachok, my supervisor in doing this project for his guidance, to his support and effort to help me. Also a lot thanks you to my second supervisor, Dr, Ahmad Shamsudin Ahmad in assisting me. Thanks to all science officers, staff and Department of Marine Science and Faculty of Maritime study and Marine Science for their help.

Especially thank you for my parent for support and encouragement to me in accomplish this work. Also I would thank you to all my friends and Marine Biology third student in everything they done for me.

Content	Page
List of table	ii
List of figure	iii
List of abbreviation	iv
List of appendix	v
Abstract	vi
1. Introduction	1
2. Literature review	
2.1 Mangrove ecosystem	3
2.2 Mudskipper	3
2.3 Lipids and Fatty acids	4
2.4 Fatty acids as Biomarkers	6
3. Materials and methods	
3.1 Study area	8
3.2 Survey	9
3.3 Sampling	9
3.4 Sample preparation	9
3.5 Lipid extraction	10
3.6 Thin layer chromatography	11
3.7 Statistical analysis	12

4. Result	
4.1 Total lipid content	13
4.2 Fatty acids composition table	14
4.3 Major fatty acid classes	16
4.4 Fatty Acids markers	17
5 Discussion	
5.1 Lipid content and FA composition of Mudskippers species and sediment	19
5.2 Major group of FA	19
5.3 Bacteria sources	20
5.4 Macrolagae sources	21
6 Conclusion	22
7 References	23
8 Appendix	25

List of table

Table 1 Total lipid content (g g⁻¹ dry wt) an fatty acids composition (µg g⁻¹ dry wt) of

B.boddarti, *P. gracillis* and sediment. Values represent mean ± SD; -: not detected.

List of figure

Fig. 1 Mudskipper species, *P. gracillis*

Fig. 2 Mudskipper species, *B. bodarti*

Fig. 3 Sampling site in Setiu wetland, site 1 and site 2

Fig.4 Comparison of total lipid content (g g^{-1} dry weight) in *B. bodarti*, *P. gracillis* , and sediment (mean \pm SD).

Fig.5 Major Classes of fatty acid concentration found on all sample ($\mu\text{g g}^{-1}$ dry wt.) (mean \pm SD)

Fig 6: Concentration of bacterial markers (MUFA) ($\mu\text{g g}^{-1}$ dry wt.) in tissue sample of *Boleophthalmus bodarti*, *Periophthalmus gracillis* and sediment from Setiu wetlands.

Fig 7: Concentration of macroalge markers (18:2 ω 6, 18:3 ω 3) ($\mu\text{g g}^{-1}$ dry wt.) in tissue sample of *Boleophthalmus bodarti*, *Periophthalmus gracillis* and sediment from Setiu wetlands

List of abbreviation

μ	micro
ω	omega
FA	fatty acid
SAFA	saturated fatty acid
MUFA	monounsaturated fatty acid
PUFA	polyunsaturated fatty acid
GC	gas chromatography
TLC	thin layer chromatography
HPLC	high performance liquid chromatography
GC-FID	gas chromatography flame ionized detector
FAMES	fatty acid methyl ester

List of Appendix

Table of study schedule from year 2006-2007

Table of references for fatty acid markers

Table for raw data and lipid content calculation

Picture of sample preparation, freeze dry.

Picture of lab work for lipid extraction

Picture of Lab work for TLC method

Abstract

Study of fatty acid biomarker was done in order to investigate the organic food source of Mudskipper species, *Boleophthalmus boddarti* and *Periophthalmus gracillis* in Setiu Wetlands. Both species are dominant species of mudskipper in Setiu Wetlands. Analysis was done to find and compare both species organic food source and sediment with fatty acids markers

Data obtain shows that *B. boddarti* (0.077 g g^{-1} dry wt.) has the highest total lipid content, followed by *P. gracillis* (0.057 g g^{-1} dry wt.). Sediment has the least total lipid content (0.009 g g^{-1} dry wt.). In *P. gracillis* tissues, 15 FAs component found and in *B. boddarti* tissues there 18 component of FAs. In fatty acid composition, SAFA (saturated fatty acid) are the mainly fatty acid found in tissues 3.503 g g^{-1} dry wt. in *P. gracillis*, 2.168 g g^{-1} dry wt. in *B. boddarti* and sediment samples 1.866 g g^{-1} dry wt. MUFA (monounsaturated fatty acid) also occur in high level content with 1.140 g g^{-1} dry wt. in *P. gracillis*, 0.950 g g^{-1} dry wt. in *B. boddarti* and 0.278 g g^{-1} dry wt. in sediment. PUFA (polyunsaturated fatty acid) is the least fatty acid classes found with only 0.012 g g^{-1} dry wt. in *P. gracillis*, 0.102 g g^{-1} dry wt. in *B. boddarti* and 0.184 g g^{-1} dry wt. in sediment. The organic food source of two species primarily is bacteria, as indicated by bacterial markers, MUFA, with highest in *B. boddarti* have an additional diet, when fatty acid macroalgae marker $0.012 \mu \text{ g}^{-1}$ dry wt. found.