

HISTOLOGICAL STUDY AND FATTY ACID COMPOSITION
IN HEPATOPANCREAS OF BLUE SWIMMING CRAB,
Portunus pelagicus AT DIFFERENT OVARIAN
MATURATION STAGES

MOHD SYAFIQ BIN MUKRIM

LP
11
PPSMS
1
2014

SCHOOL OF MARINE SCIENCE AND ENVIRONMENT
UNIVERSITI MALAYSIA TERENGGANU

2014

**HISTOLOGICAL STUDY AND FATTY ACID COMPOSITION IN
HEPATOPANCREAS OF BLUE SWIMMING CRAB, *Portunus pelagicus* AT
DIFFERENT OVARIAN MATURATION STAGES**

Mohd Syafiq bin Mukrim

UK26637

Bachelor of Science (Marine Biology)

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

**School of Marine Science and Environment
UNIVERSITY MALAYSIA TERENGGANU**

2014

This project report should be cited as:

Syafiq, M. 2014. Histological Study and Fatty Acid Composition in Hepatopancreas of Blue Swimming Crab, *Portunus pelagicus* at Different Ovarian Maturation Stages. Undergraduate thesis, Bachelor of Science in Marine Biology, School of Marine Science and Environment, Universiti Malaysia Terengganu, Terengganu, 57p.

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 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.

ACKNOWLEDGEMENT

This research would be impossible mission if I am walking on my own feet 100%. Support from many people have helped me to finish this project. My gratitude to my first supervisor, Assoc. Prof. Dr Mhd Ikhwanuddin Abdullah for his help and kindness during my time under his supervision. I have learnt a lot from him on how to do my research starting from zero. I want to express my gratitude to my second supervisor, Dr. Roswati Md. Amin and Dr. Lee Jen Nie who was offered good assistance especially for my presentation slide and writing format. I would like to thank Mr. Azmie Ghazali, Miss Mardhiah Hayati, Miss Faseha, Mr. Farouk and Miss Noor Azariyah Mokhtar for their invaluable assistance to me during lab work and data analysis. Special thanks to my mother, Wan Zaliha binti Wan Jusoh for her love and endless support that motivate me to keep on doing my work until complete. Not forgetting for my siblings and my friends who always in my side. Deep gratitude to science officers and lab assistances from Histology, Biodiversity and Instrumentation lab for providing my needs during my labwork. Thanks to Universiti Malaysia Terengganu for providing laboratory facilities and other accomodations.



SCHOOL OF MARINE SCIENCE AND ENVIRONMENT
UNIVERSITI MALAYSIA TERENGGANU

DECLARATION AND VERIFICATION REPORT
FINAL YEAR RESEARCH PROJECT

It is hereby declared and verified that this research report entitled Histological Study and Fatty Acid Composition in Hepatopancreas of Blue Swimming Crab, *Portunus pelagicus* at Different Ovarian Maturation Stages by Mohd Syafiq bin Mukrim, Matric No. UK26637 have been examined and all errors identified have been corrected. This report is submitted to the School of Marine Science and Environment as partial fulfillment towards obtaining the Degree of Marine Biology, School of Marine Science and Environment, Universiti Malaysia Terengganu.

Verified by:

First Supervisor

Name:

Mhd. Ikhwanuddin

Official stamp:

Date: 15/6/14

PROF. MADYA DR. MHD. IKHWANUDDIN ABDULLAH
Pensyarah
Institut Akuakultur Tropika
Universiti Malaysia Terengganu (UMT)
21030 Kuala Terengganu, Terengganu

Second Supervisor

Name:

DR. ROSWATI BINTI MD AMIN
Lecturer

Official stamp: School of Marine Science and Environment

Universiti Malaysia Terengganu
21030 Kuala Terengganu

Date: 15/6/14

TABLE OF CONTENTS

	Page
ACKNOWLEDGMENT	ii
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	viii
LIST OF APPENDICES	ix
ABSTRACT	x
ABSTRAK	xi
CHAPTER 1: INTRODUCTION	
1.1 Background of study	1
1.2 Problem statement	3
1.3 Justification of study	4
1.4 Objectives	4
CHAPTER 2: LITERATURE REVIEW	
2.1 Taxonomy of <i>P. pelagicus</i>	5
2.2 External morphology	5
2.3 Distribution and habitats	7
2.4 Feeding habits	7
2.5 Hepatopancreas as a storage organ of crab	8
2.6 Fatty acid as a component of lipid	9
2.7 Ovarian maturation stages	11

CHAPTER 3: METHODOLOGY

3.1	Study area	12
3.2	Sample collection	13
3.3	Sample storage and preparation	
3.3.1	Histology sample	15
3.3.2	Fatty acid sample	15
3.4	Histological analysis	15
3.5	Fatty acid composition analysis	
3.5.1	Internal standard preparation	16
3.5.2	Extraction procedure	16
3.5.3	Gas chromatography analysis	17
3.6	Data analysis	17

CHAPTER 4: RESULT

4.1	Histological characteristics of hepatopancreas tubules	19
4.2	Fatty acid composition at different ovarian maturation stages	
4.2.1	Individual fatty acids	21
4.2.2	Fatty acid classes	26
4.2.3	Fatty acid trend at different ovarian maturation stages	26
4.2.4	Fatty acid as biomarker	27
4.2.5	Ratios of n-6/n-3 (omega 6/omega 3) and PUFA/SAFA	27

CHAPTER 5: DISCUSSION

5.1 Histological characteristics of hepatopancreas tubules 28

5.2 Fatty acid composition at different ovarian maturation stages 29

CHAPTER 6: CONCLUSION 34

REFERENCES 36

APPENDICES 42

CURRICULUM VITAE 46

LIST OF TABLES

Table		Page
4.1	Fatty acid concentration in hepatopancreas of <i>P. pelagicus</i> at different ovarian maturation stages.	23
4.2	Fatty acid percentage in hepatopancreas of <i>P. pelagicus</i> at different ovarian maturation stages.	25

LIST OF FIGURES

Figure		Page
2.1	External morphology of female blue swimming crab	6
2.2	Hepatopancreas of <i>P. pelagicus</i>	9
2.3	Nomenclature of fatty acids	9
2.4	Ovarian maturation stages of <i>P. pelagicus</i>	11
3.1	Sampling site	12
3.2	(a): Different abdomen shape between sexes of <i>P. pelagicus</i>	13
	(b): Colour difference between sexes of <i>P. pelagicus</i>	13
3.3	Measurement of carapace width	14
3.4	Collection of hepatopancreas sample for respective analysis	14
4.1	Hepatopancreas tubules development of <i>P. pelagicus</i>	20
4.2	Mean hepatopancreas tubules height at different ovarian maturation stages of <i>P. pelagicus</i>	21
4.3	Concentration of fatty acids (FA) in hepatopancreas of <i>P. pelagicus</i> at different ovarian maturation stages	22
4.4	Percentage of fatty acids (FA) in hepatopancreas of <i>P. pelagicus</i> at different ovarian maturation stages	22

LIST OF ABBREVIATIONS

CW	-	carapace width
BW	-	body weight
g	-	gram
cm	-	centimetre
°C	-	degree celcius
µm	-	micron
mg	-	milligram
mm	-	millimeter
min	-	minutes
rpm	-	rounds per minutes
mL	-	millilitre
SAFA	-	saturated fatty acid
MUFA	-	monounsaturated fatty acid
PUFA	-	polyunsaturated fatty acid

LIST OF APPENDICES

Appendix		Page
1	Normality test	42
2	One Way Anova	43
3	Morphometric data	45

ABSTRACT

Histological characteristics and fatty acid composition in hepatopancreas of female *P. pelagicus* were investigated. Samples were obtained from Gelang Patah, Johore, Malaysia. Present study showed the section and parts of hepatopancreas tubules through histology method. Fluctuation could be observed from the stages. Tubules in Stage 2 of the ovarian maturation stages had highest tubules height, 0.1633 mm. Statistically, there were significant different in tubules height at different ovarian maturation stages. Fatty acid composition in present study were expressed in concentration and percentage. The most dominant individual fatty acids was C16:0 with mean concentration and percentage of 343.6725 mg/g and 30.42-39.46%. Secondly was C18:0 (134.7723 mg/g, 11.78-14.59%) and followed by C20:5n3 (88.06968 and 6.22-10.33%). The most dominant fatty acid classes was SAFA, followed by PUFA and MUFA. Fatty acid composition in hepatopancreas pattern at different ovarian maturation stages was influenced by several factors like mobilization to ovary and other part of tissue, gonadal activity, time frame of fatty acid transfer to ovary and vitellogenesis. Statistically, there were no significant difference of fatty acids (SAFA, MUFA, PUFA, and total fatty acids) at different ovarian maturation stages. Instead of being important part in ovarian maturation, fatty acids also act as biomarkers and indicator for nutritious and safe diet to human.

**KAJIAN HISTOLOGI & KOMPOSISI ASID LEMAK DALAM
HEPATOPANCREAS KETAM RENJONG, *Portunus pelagicus* PADA
PERINGKAT KEMATANGAN OVARI YANG BERBEZA**

ABSTRAK

Ciri-ciri histologi dan komposisi asid lemak dalam hepatopancreas *P. pelagicus* betina telah disiasat. Sampel diperolehi daripada Gelang Patah, Johor, Malaysia. Kajian ini menunjukkan bahagian tubul hepatopancreas melalui kaedah histologi. Perubahan ketinggian sel dapat diperhatikan dari peringkat awal ke peringkat akhir perkembangan ovari. Sel dalam peringkat 2 mempunyai tubul tertinggi, 0.037 mm. Statistik, terdapat perbezaan yang signifikan dalam ketinggian tubul pada peringkat kematangan yang berbeza ovari. Komposisi asid lemak dalam kajian ini telah dinyatakan dalam kepekatan dan peratusan. Asid lemak individu yang dominan adalah C16:0 dengan kepekatan dan peratusan 343,67 mg / g dan 30,42-39,46 %. Asid lemak kedua adalah C18:0 (134,77 mg / g, 11,78-14,59 %) dan diikuti oleh C20:5n3 (88,07 mg/g dan 6,22-1.033 %. Kelas asid lemak yang dominan adalah SAFA, diikuti oleh PUFA dan MUFA. Komposisi asid lemak dalam hepatopancreas pada peringkat kematangan yang berbeza ovari telah dipengaruhi oleh beberapa faktor seperti mobilisasi kepada ovari dan bahagian lain di dalam tisu, aktiviti gonad, rangka masa pemindahan lemak asid kepada ovari dan vitellogenesis. Secara statistik, terdapat perbezaan yang signifikan dalam ketinggian sel pada peringkat kematangan yang berbeza ovari. Di samping menjadi sebahagian penting dalam kematangan ovari, asid lemak juga bertindak sebagai penanda biologi dan petunjuk untuk diet berkhasiat dan selamat untuk manusia.