UNIVERSITI PUTRA MALAYSIA

GENETIC AND MORPHOMETRIC VARIATION OF MARINE PRAWNS, *Penaeus monodon* Fabricius AND *Fenneropenaeus merguiensis* De Man IN MALAYSIAN WATERS

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*Penaeus monodon* Fabricius AND *Fenneropenaeus merguiensis* De Man IN MALAYSIAN WATERS

By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirement for the Degree of Master of Science

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September 2011

Chairman: Prof. Siti Shapor Siraj, PhD

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Marine prawns are divided into two common genera of *Penaeus* and *Fenneropenaeus*. *Fenneropenaeus merguiensis* is locally known as banana prawn while *Penaeus monodon* is tiger prawn. These prawns are widely distributed and are extensively cultured in the tropical and subtropical waters. Information on the genetic structure and diversity of natural populations for both the species is still limited eventhough it has long been exploited. Thus, the present study is to genetically characterize the wild and cultured populations by using morphological and microsatellite markers.

A total of 16 populations were randomly selected representing 12 from Peninsular Malaysia and 4 from East Malaysia. Nineteen characters were measured using the conventional morphometric method and were analyzed according to the ratios of abdominal length and total length to reduce the
allometric effects. The T-test analysis showed that the two species are statistically different from each other in the majority of the morphological traits.

A total number of alleles per locus ranged from 3 to 9 with the allele size ranging from 100 to 300 base pairs. Overall $F_{ST}$ value was high (73.4%), with great differentiation among the populations of both the species. $F_{IT}$ and $F_{IS}$ values were low but highly significant ($P<0.05$), suggesting a slight deficiency of heterozygosity. Chi-square ($\chi^2$) and likelihood ratio ($G^2$) tests showed significant deviation ($p<0.05$) from Hardy-Weinberg equilibrium except for two loci.

Considerable genetic distances were observed among all the populations with values ranging from 0.0103 to 0.6296. The genetic structure among the prawns within each region implies that mixing of individuals might have occurred, UPGMA dendrogram showed two major clusters, representing the two species. The wild and the cultured populations were also grouped separately. The genetic relationship between both the species was close, probably because the prawns are marine-estuarine species. There are no specific barrier to prevent migrations and genetic flow thus, there is still some form of interaction via migration and mating between the populations despite their geographical distance.
Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

MORFOMETRIK DAN VARIASI GENETIK UDANG MARIN, *Penaeus monodon* Fabricius DAN *Fenneropenaeus merguiensis* De Man DI PERAIRAN MALAYSIA

Oleh

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Sejumlah 16 populasi dipilih secara rawak mewakili 12 populasi daripada Semenanjung Malaysia dan 4 populasi dari Malaysia Timur. Sembilan belas
ciri diukur menggunakan kaedah morfometrik konvensional dan dianalisisa mengikut nisbah panjang abdomen dan panjang keseluruhan untuk mengurangkan kesan alometrik. Analisis T-test menunjukkan perbezaan yang ketara dari segi statistik untuk kedua-dua spesies bagi majoriti ciri morfologi setiap individu.

Sejumlah bilangan alel per lokus berjulat daripada 3 hingga 9 dengan julat saiz alel daripada 100 hingga 300 pasangan bes. Nilai $F_{ST}$ menunjukkan perbezaan yang tinggi (73.4%) di kalangan populasi kedua-dua spesies. Nilai $F_{IT}$ dan $F_{IS}$ adalah rendah tetapi signifikan ($P<0.05$), ini menunjukkan berlakunya pengurangan heterozigositi. Nilai $(\chi^2)$ chi-square dan nisbah 'likelihood' $(G^2)$ menunjukkan penyimpangan signifikan daripada Hukum Hardy-Weinberg kecuali dua lokus.

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I certify that a Thesis Examination Committee has met on 9th September 2011 to conduct the final examination of Dania Aziz on her thesis entitled "Genetic Variation of Marine Prawns, *Penaeus monodon* Fabricius and *Fenneropenaeus merguiensis* De Man in Malaysian Waters" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

_____________________
DANIA AZIZ

Date: 9th September 2011
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>ii</td>
</tr>
<tr>
<td>ABSTRAK</td>
<td>iv</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>vi</td>
</tr>
<tr>
<td>APPROVAL</td>
<td>vii</td>
</tr>
<tr>
<td>DECLARATION</td>
<td>ix</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xiii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xv</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>xiii</td>
</tr>
</tbody>
</table>

## CHAPTER

1. **INTRODUCTION**

2. **LITERATURE REVIEW**
   - 2.1 Penaeid
     - 2.1.1 *Fenneropenaeus merguiensis* 5
     - 2.1.2 *Penaeus monodon* 6
   - 2.2 Taxonomy
     - 2.2.1 *Penaeus monodon* 8
     - 2.2.2 *Fenneropenaeus merguiensis* 8
   - 2.3 The new classification of penaeid shrimp 9
   - 2.4 Morphology of penaeid prawn 10
   - 2.5 Geographical distribution 13
   - 2.6 Habitat and biology 15
   - 2.7 Diet and feeding behaviour 16
   - 2.8 Life cycle 17
   - 2.9 Commercial importance 18
   - 2.10 Polymorphism 19
   - 2.11 Importance of genetic characterization 20
   - 2.12 Microsatellite markers
     - 2.12.1 Application of Microsatellite Markers 24
   - 2.13 Heterozygosity 25
   - 2.14 Hardy-Weinberg Equilibrium 26
   - 2.15 Wright’s F-statistics 27
   - 2.16 Morphological Variations and Morphometric study 27

3. **MATERIALS AND METHODS**
   - 3.1 Collection of samples 29
   - 3.2 Morphological analysis 32
     - 3.2.1 Data Analysis 33
3.3 DNA extraction 34
3.4 DNA quantification 35
3.5 Microsatellite primers 36
3.6 Polymerase chain reaction 36
3.7 Gel Electrophoresis using 4% metaphor agarose gel 40
  3.7.1 Preparing the gel 40
  3.7.2 Loading the gel 40
3.8 Population study and data analysis 41

4 RESULTS 43
4.1 Optimization Process 43
4.2 *Penaeus monodon* 47
  4.2.1 Morphological analyses 47
  4.2.2 Microsatellite marker analyses 51
4.3 *Fenneropenaeus merguiensis* 66
  4.3.1 Morphological analyses 66
  4.3.2 Microsatellite marker analyses 70
4.4 Morphological variations of *P. monodon* and *F. merguiensis* 88
4.5 Genetic diversity of *P. monodon* and *F. merguiensis* 90
  4.5.1 Number of alleles and level of heterozygosity 90
  4.5.2 F-statistics 91
  4.5.3 Hardy Weinberg equilibrium 93
  4.5.4 Genetic distance and cluster analysis 94

5 DISCUSSION 98
5.1 *Penaeus monodon* 98
  5.1.1 Morphological variations 98
  5.1.2 Genetic Diversity of *P. monodon* 100
5.2 *Fenneropenaeus merguiensis* 102
  5.2.1 Morphological variations 102
  5.2.2 Genetic Diversity of *F. merguiensis* 102
5.3 Genetic diversity of *P. monodon* and *F. merguiensis* 105

6 CONCLUSION 109
REFERENCES 111
APPENDICES 121
BIODATA OF STUDENT 122
LIST OF PUBLICATIONS 123