

EFFECT OF WATER TEMPERATURE AND PHOTOPERIOD ON
FEMALE OVARIAN DEVELOPMENT AND OVIPOSITION OF
ORANGE MUD CRAB, *Scylla olivacea*
(HERBST, 1796)

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LP
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FMSM
3
2011

SCHOOL OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU

2011

1100088786

Perpustakaan Sultanah Nur Zahirah
Universiti Malaysia Terengganu (UMT)



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1100088786

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**EFFECT OF WATER TEMPERATURE AND PHOTOPERIOD ON FEMALE
OVARIAN DEVELOPMENT AND OVIPOSITION OF ORANGE MUD CRAB,
Scylla olivacea (HERBST, 1796).**

by

Chark Ling Wei

**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 Studies and Marine Science
UNIVERSITI MALAYSIA TERENGGANU
2011**

This project report should be cited as:

Chark, L.W. 2011. Effect of water temperature and photoperiod on female ovarian development and oviposition of orange mud crab, *Scylla olivacea* (Herbst, 1796). Undergraduate thesis, Bachelor of Science in Marine Biology, Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu, Terengganu. 62p.

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DEPARTMENT OF MARINE SCIENCE
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
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DECLARATION AND VERIFICATION REPORT
FINAL YEAR RESEARCH PROJECT

It is hereby declared and verified that this research report entitled:

Effect of Water Temperature and Photoperiod on Female Ovarian Development and Oviposition of Orang Mub Crab, *Scylla olivacea* (Herbst, 1796) by Chark Ling Wei, Matric No. UK 17386 have been examined and all errors identified have been corrected. This report is submitted to the Department of Marine Science as partial fulfillment towards obtaining the Degree of **Bachelor of Science (Marine Biology)**, Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu.

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ACKNOWLEDGEMENTS

I would like to express my heartfelt gratitude to my supervisor, Dr Mhd Ikhwanuddin for his supervision and support that he has given me throughout the duration of my project. Without his help and encouragement, my final year project will certainly have not progress as smoothly as it has. His invaluable experience in this field has not only helped me in different matters regarding my topic, but also in resolving many of the problems that I have come to face as my project was ongoing.

Also, I am grateful to the help provided by lab assistants and staffs of AKUATROP and BIOD lab, as their generous and enthusiastic assistance has helped me through many times when I had any queries or was in need of the use of various equipments available in the lab. Without them, the commencement of this project would not have been possible as they have helped me a lot in the beginning stages when I was still setting up the experiment and also many times after.

Last but not least I would like to thank my friends for helping me during the run of my project. They made themselves available despite their own busy schedule when I needed extra hands in carrying out some steps of the experiment. Their presence has made the running of the experiment easier for me.

I am greatly indebted to everyone who has lent me a helping hand during the duration of my project as their help has played a part in the successful completion of this project.

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LIST OF ABBREVIATIONS

cm	-	Centimeter
mm	-	Millimeter
°C	-	Degrees Celcius
GSI	-	Gonadal Somatic Index
ANOVA	-	Analysis of Variance

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ABSTRACT

This study was conducted in the marine hatchery of AKUATROP, Universiti Malaysia Terengganu using orange mud crab, *Scylla olivacea* obtained from Setiu Wetlands, Terengganu. The significance of this study is to develop berried female production technique in captivity using different temperature regimes and photoperiod. This study was done to examine ovarian development and oviposition of laboratory reared *S. olivacea* under different water temperature regimes; low temperature condition (20°C - 24°C), control temperature condition (25°C – 29°C) and high temperature condition (28°C – 30°C) as well as under different photoperiod regimes, control photoperiod condition (12 hours daylight and 12 hours darkness), 24 hours daylight and 24 hours darkness. However, only 10 crabs managed to achieve stage 4 maturity; 3 crabs in 24 hours Daylight regime, 2 crabs in low temperature regime and 5 in high temperature regime. High temperature regime was found to be able to accelerate gonadal growth compared to the others and photoperiod is found to be important for both the stage development and size growth of the gonadal material in *S. olivacea*. Low temperature retarded the growth and yield only 20% females in stage 4 ovarian maturity. Nevertheless it is much higher when compared to 24 hours darkness regime where none of the females achieved stage 4 gonadal maturity. But 30% females in 24 hours Daylight achieved stage 4 gonadal maturity, indicating some hours of light is required for successful maturation of the ovary. Mean Gonadal Somatic Index (GSI) values also supports the importance of photoperiod in ovarian maturation as it was lowest in the 24 hour darkness and daylight photoperiod regimes (2.05±0.82%; 2.61±1.17%) compared to the control regime (8.41±1.19%) which was the highest. Temperature regimes had values close to the control regime. Also, oocyte

diameters in 24 hours darkness and daylight photoperiod regimes were significantly smaller ($136.39 \pm 29.16 \mu\text{m}$; $147.43 \pm 34.76 \mu\text{m}$) compared to control, low and high temperature regimes ($283.67 \pm 68.44 \mu\text{m}$; $227.7 \pm 53.21 \mu\text{m}$; $221.25 \pm 61.32 \mu\text{m}$). Therefore, it is believed there is a critical photoperiod that is optimum for optimal ovarian development and further studies in this direction should be done to identify the optimal critical photoperiod for the full development of ovarian maturity of *S. olivacea*.

**PENGARUH SUHU AIR DAN FOTOPERIOD TERHADAP
PENGEMBANGAN OVARI DAN OVIPOSISI KETAM BAKAU BETINA,
Scylla olivacea (Herbst, 1796)**

ABSTRAK

Kajian ini telah dijalankan di hatcheri AKUATROP, Universiti Malaysia Terengganu dengan menggunakan *Scylla olivacea* yang diperolehi daripada Setiu, Terengganu. Tujuan kajian ini adalah untuk mengkaji teknik pengeluaran ketam betina matang dengan telur bagi *S. olivacea* yang dikultur di kawasan tertutup dengan menggunakan suhu dan fotoperiod yang berbeza. Kajian ini dilakukan untuk mengkaji perkembangan ovari dan oviposisi *S. olivacea* yang dipelihara di dalam makmal dibawah keadaan suhu air yang berbeza iaitu: suhu rendah (20 ° C - 24 ° C), suhu kawalan (25 ° C - 29 ° C) dan suhu tinggi (28 ° C - 30 ° C) serta dibawah keadaan fotoperiod yang berbeza iaitu: fotoperiod kawalan (12 jam cahaya dan 12 jam gelap), 24 jam cahaya serta 24 jam gelap. Namun, hanya 10 ekor ketam berjaya mencapai kematangan ovari pada tahap 4 dimana 3 ekor berjaya dalam masa 24 jam cahaya, 2 ekor dalam keadaan suhu rendah dan 5 ekor dalam keadaan suhu tinggi. Keadaan suhu tinggi yang dikaji didapati mempunyai kebolehan untuk mempercepatkan pertumbuhan gonad berbanding dengan keadaan-keadaan yang lain. Fotoperiod juga didapati penting bagi pembangunan tahap kematangan ovari dan pertumbuhan saiz gonad *S. olivacea*. Suhu rendah didapati melambatkan pertumbuhan dan hanya menghasilkan 20% *S. olivacea* betina yang mencapai kematangan ovari tahap 4. Namun demikian, keputusan ini jauh lebih tinggi bila dibandingkan dengan keadaan 24 jam kegelapan dimana tiada *S. olivacea* betina yang mencapai tahap 4. Bagi keadaan 24 jam siang pula, terdapat 30% *S. olivacea* betina yang tercapai kematangan gonad tahap 4. Ini menunjukkan bahawa jam bercahaya diperlukan untuk

permatangan ovari yang sempurna. Nilai Indeks Tumbuhan Somatik (GSI) juga menyokong kepentingan fotoperiod dalam permatangan ovari kerana nilai yang terendah didapati dalam keadaan 24 jam kegelapan dan cahaya ($2.05 \pm 0.82\%$; $2.61 \pm 1.17\%$) berbanding dengan keadaan kawalan ($8.41 \pm 1.19\%$) yang mempunyai nilai tertinggi. Keadaan suhu mempunyai nilai yang berhampiran dengan keadaan kawalan. Selain itu, diameter oosit dalam masa 24 jam kegelapan dan cahaya lebih kecil ($136.39 \pm 29.16 \mu\text{m}$; $147.43 \pm 34.76 \mu\text{m}$) berbanding dengan keadaan kawalan, keadaan suhu rendah dan keadaan suhu tinggi ($283.67 \pm 68.44 \mu\text{m}$; $227.7 \pm 53.21 \mu\text{m}$; $221.25 \pm 61.32 \mu\text{m}$). Oleh kerana itu, diyakini terdapat fotoperiod kritikal yang optimum untuk kematangan ovari optimal dan kajian lebih lanjut mengenai perkara ini harus dilakukan untuk mengenalpasti fotoperiod kritikal yang optimum untuk pembangunan kematangan ovari *S. olivacea* yang sempurna.