

INDUCE MATING AND STIMULATION OF  
OVARIAN MATURATION IN THE BLUE  
SWIMMING CRAB , *Portunus pelagicus*  
( Linnaeus, 1758 )

WAN NURUL NADIAH BINTI WAN RASDI

MASTER OF SCIENCE  
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Induce mating and stimulation of ovarian maturation in the blue  
swimming crab, portunus pelagicus (linnaeus, 1758) / Wan Nuru  
Nadiyah Wan Rasdi.

PERPUSTAKAAN SULTANAH NUR ZAHIRAH  
UNIVERSITI MALAYSIA TERENGGANU (UMT)  
21030 KUALA TERENGGANU

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SEPTEMBER 2010

**WAN NURUL NADIAH BINTI WAN RASDI**

Supervisor: Dr. Mohd Shamsuddin & Polly Ann Abdullah

Member: Assoc. Prof. Dr. Mohd Haniffa Abdul Djalil

Dr. Young Tin Hong

Institute: Institute of Tropical Aquaculture (IATRA)

Development of optimal broodstock production strategies is essential for the blue swimming crab, *P. pelagicus* which is one of the important aquaculture commodities. Broodstock management and reproduction are still unclear, with much effort

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**WAN NURUL NADIAH BINTI WAN RASDI**

**SEPTEMBER 2010**

**Chairperson** : **Dr. Mhd Ikhwanuddin @ Polity bin Abdullah**

**Member** : **Assoc. Prof. Dr. Abol Munafi Ambok Bolong**

: **Dr. Yeong Yik Sung**

**Institute** : **Institute of Tropical Aquaculture (Akuatrop)**

Development of berried females production technique in captivity of the blue swimming crab, *P. pelagicus* using mating and maturation techniques were studied. Since mating and reproduction are both linked with each other, suitable ways of inducing mating and maturation process needs to be implemented. Two techniques were applied by using limb autotomy to induce mating and eyestalk ablation (ESA) to stimulate the ovarian maturation in blue swimming crab, *P. pelagicus*. Results have shown that limb autotomy technique is the best stimulant to induce molting in *P.*



*pelagicus*. About fourteen days ( $14.65 \pm 0.93$  days) after limb autotomy induction, the female crabs in the first treatment begin to exemplify positive signs towards molting. Five females successfully entered post-molt stages were then transferred to the mating tanks together with an inter-molt male crab. Second treatments (control) showed no sign of mating among the male and female crabs after 14 days of experiment. Pre-copulatory guarding, molting of female, copulation and post-copulatory guarding were observed on the mating behavior of *P. pelagicus* of current study. Mating behavior in this study have depicts similar pattern of behavior with previous study on other portunid crab such as in *Portunus sanguinolentus* (Dinakaran and Soundarapandian, 2009).

The results obtain from this study demonstrated that ovary matures to stage four after 20 days of ablation in both unilaterally and bilaterally eyestalk ablated females. Eyestalk ablation was found to be the principle factor in inducing maturation of *P. pelagicus* in the current work, confirming the results for other crustacean species such as in an estuarine crab, *Metopograpsus messor* (Sudha and Anilkumar, 2007). GSI values were slightly increased from day 0 until day 20 of the study in intact crabs. However, GSI levels were significantly increasing in unilateral and bilateral eyestalk ablated females. Methyl farnesoate (MF) hormone has been identified for the first time in a hemolymph extract of *P. pelagicus* for control, unilaterally, and bilaterally eyestalk ablated females of the present study. The presence of this hormone was analyzed by comparing the spectra of standards with those of biological samples using GC-MS. Hemolymph MF

hormone levels were higher in unilateral and bilateral eyestalk ablated crabs compared to intact crabs. Eyestalk ablation in female *P. pelagicus* results in increased methyl farnesoate (MF) concentrations in the hemolymph of these animals, and a stimulation of ovarian development, allowing further evidence that MF is a reproductive hormone in crustaceans. As a conclusion, limb autotomy and eyestalk ablation are important in producing a quality and productive berried females under captivity. Both techniques are proved to be made as protocols for improving the management practices of *P. pelagicus* broodstock management and aquaculture.

Abstrak tesis yang dikemukakan kepada Senate Universiti Malaysia Terengganu sebagai syarat keperluan memenuhi Ijazah Master Sains

**MERANSANG PERSENYAWAAN DAN STIMULASI PERKEMBANGAN OVARI KETAM LAUT, *Portunus pelagicus* (Linnaeus, 1758)**

**WAN NURUL NADIAH BINTI WAN RASDI**

**SEPTEMBER 2010**

**Pengerusi** : **Dr. Mhd Ikhwanuddin @ Polity bin Abdullah**

**Ahli** : **Prof. Madya Dr. Abol Munafi Ambok Bolong**

: **Dr. Yeong Yik Sung**

**Institut** : **Institut Akuakultur Tropika (Akuatrop)**

Kajian perkembangan teknik penghasilan ketam bertelur di dalam kurungan menggunakan kaedah rangsangan persenyawaan dan stimulasi perkembangan gonad telah dijalankan. Oleh kerana persenyawaan dan perkembangan ovari adalah saling berkaitan antara satu sama lain, kajian mengenai kaedah yang sesuai untuk perkembangan kedua-dua proses adalah amat penting untuk dijalankan. Dua teknik diperkenalkan dalam kajian ini; iatu teknik pemotongan kaki untuk ransangan persenyawaan dan teknik pemotongan mata untuk stimulasi perkembangan ovari. Keputusan

daripada eksperimen ini telah menunjukkan bahawa teknik pemotongan kaki adalah kaedah yang paling berkesan dalam mempercepatkan proses salin kulit dalam ketam laut *P. pelagicus*. Selepas 14 hari stimulasi proses salin kulit dijalankan, ketam betina telah mula bersalin kulit. Perilaku persenyawaan seperti pra-copulatory menjaga, copulatory menjaga dan pasca-copulatory telah ditunjukkan oleh ketam *P. pelagicus* dalam penyelidikan ini. Perilaku persenyawaan dalam kajian ini telah menggambarkan pola perilaku yang sama dengan kajian sebelumnya pada ketam renjong yang lain seperti dalam *Portunus sanguinolentus* (Dinakaran dan Soundarapandian, 2009).

Keputusan yang diperolehi daripada kajian ini menunjukkan bahawa ovari ketam matang ke peringkat keempat 20 hari selepas teknik pemotongan mata dilakukan ke atas kedua-dua jenis pemotongan (ablasi) mata. Teknik pemotongan mata menjadi faktor utama dalam menggalakkan ovari ketam betina supaya matang dengan lebih cepat, seperti dalam Krustacea lain seperti ketam muara, *Metopograpsus messor* (Sudha dan Anilkumar, 2007). Nilai GSI sedikit meningkat dari hari 0 hingga ke hari 20 daripada kajian di ketam kawalan. Namun, peringkat GSI secara signifikan meningkat pada ketam yang dipotong sebelah mata dan kedua-dua belah mata. Methyl farnesoate (MF) hormon telah dikenalpasti buat pertama kalinya dalam ekstrak darah *P. pelagicus* untuk ketam kawalan, ketam yang dipotong sebelah mata, dan ketam yang dipotong kedua belah mata. Kehadiran hormon ini dianalisis dengan membandingkan spektrum standard dengan sampel biologi dengan menggunakan GC-MS. MF hormon lebih tinggi dalam



darah ketam yang dipotong mata berbanding ketam kawalan yang tidak dipotong matanya. Teknik pemotongan mata meningkatkan kadar MF hormon dalam darah ketam betina dan merangsang perkembangan ovari dan membuktikan MF adalah hormon pembiakan dalam krustasea. Sebagai kesimpulan, teknik pemotongan kaki dan pemotongan mata adalah penting dalam menghasilkan ketam bertelur yang berkualiti dan produktif dalam keadaan kurungan. Kedua-dua teknik terbukti berkesan dan sesuai untuk dijadikan sebagai protocol dalam meningkatkan mutu pengurusan induk *P. pelagicus* dan penting dalam akuakultur.