

MATING SYSTEM AND GENETIC VARIABILITY OF
SPOTTED SEAHORSE (*Hippocampus kuda*) FROM
PULAI ESTUARY, JOHOR

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ABSTRACT

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfillment of the requirements for the degree of Master of Science

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The first part of this study was to clarify whether *H. kuda* in Pulai Estuary possess truly long term pair bonding and monogamous mating system through microsatellite DNA markers. A total of 330 embryos from 19 brooding males were analyzed using four microsatellite markers (Habd3, Habd9, Hcau11 and Hcau36). Results showed that each locus was highly polymorphic, and GERUD produced only one single unique solution for maternal genotype. Results suggested *H. kuda* only receives one clutch of egg from one female. It therefore can be concluded that seahorse from Pulai Estuary have monogamous mating system, consistent with previous studies on genetic mating system of other species of seahorses. As for long term pair bonding, due to sampling limitation, it was not sufficient to determine the sexual fidelity of *H. kuda*. Further in-situ and ex-situ study is needed to confirm the sexual fidelity of *H. kuda* with a bigger sample size and shorter sampling interval (approx. 10 days).

The second part of this study focused on the genetic variability and gene flow of *Hippocampus kuda* between Merambung Seagrass Bed (MSB) and Sungai Duku (SD) located within Pulai Estuary, Johor. A total of 35 samples were obtained (MSB=24; SD=11) and based on the mitochondrial control region (mtDNA), seven haplotypes were identified. The five haplotypes (C17, C18, C19, C29 and C30) found were also previously reported by Lourie *et al.* (2005) and the other two haplotypes (DUKU11, DUKU12) were newly discovered. Haplotypes C18 and C29 were shared by both population and was the common haplotypes that occurs in Lineage C. The pairwise F_{ST} test ($P>0.05$) suggested that the seahorse from MSB and SD are from the same genetic stock. High value of haplotype diversity ($h = 0.7143$) and nucleotide diversity ($\pi = 0.0029$) in Pulai Estuary indicate that the genetic pools of the population is still in a healthy stage and comparative results with Lourie *et al.* (2005) suggested that Pulai Estuary *H. kuda* population had gone through fragmentation and obtained private haplotypes.

ABSTRAK

Abstrak tesis yang dikemukakan kepada Senat Universiti Malaysia Terengganu sebagai memenuhi keperluan untuk ijazah Sarjana Sains

SYSTEM PEMBIAKAN DAN GENETIK VARIASI BAGI KUDA LAUT (*Hippocampus kuda*) DARI PULAI ESTUARY, JOHOR

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November 2012

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Bahagian pertama kajian ini adalah untuk memahami sama ada kuda laut, *Hippocampus kuda* di Pulau Estuary mempunyai ikatan pasangan jangka masa panjang dan sistem pembiakan monogami dengan menggunakan penanda DNA mikrosatelit. Sejumlah 330 embrio dari 19 kuda laut induk jantan telah dianalisis dengan menggunakan empat penanda mikrosatelit (Habd3, Habd9, Hcau11 dan Hcau36). Keputusan menunjukkan bahawa setiap lokus adalah sangat polimorfik dan GERUD menghasilkan hanya satu penyelesaian unik bagi genotip induk betina. Keputusan mencadangkan bahawa *H. kuda* hanya menerima satu klac telur dari satu induk betina. Oleh itu, boleh disimpulkan bahawa *H. kuda* dari Pulau Estuary mempunyai sistem pembiakan monogami, dan keputusan ini adalah konsisten dengan kajian terdahulu mengenai sistem pembiakan genetik bagi spesies kuda laut yang lain. Had penyampelan telah menghadkan kapasiti saya untuk menentukan kesetiaan seksual *H. kuda*. Kajian lain adalah diperlukan bagi menentukan kesetiaan seksual dengan menggunakan saiz sampel yang lebih besar dan

selang tempoh penyempelan yang lebih pendek (kira-kira selang 10 hari bagi setiap penyempelan).

Bahagian kedua kajian ini memberi tumpuan dalam kebolehubahan genetic dan aliran gen antara populasi *H. kuda* di Merambung (MSB) dan Sungai Duku (SD) yang terletak di dalam Pulau Estuary, Johor. Sebanyak 35 sampel telah diperolehi (MSB=24; SD=11) dan analisis DNA mitokondria (mtDNA) menunjukkan bahawa terdapat tujuh haplotaip dalam kedua-dua populasi. Lima haplotaip (C17, C18, C19, C29 dan C30) pernah dilaporkan oleh Lourie *et al.* (2005) dan dua yang lain (DUKU11, DUKU12) adalah haplotaip baru. Haplotaip C18 dan C29 adalah berkongsi antara kedua-dua populasi. Analisis statistik ujian pasangan F_{ST} mencadangkan bahawa kedua-dua populasi adalah dari stok genetik yang sama ($P>0.05$). Nilai tinggi dalam kepelbagaian haplotaip ($h=0.7143$) dan kepelbagaian nukleotida ($\pi = 0.0029$) di Pulau Estuary menunjukkan bahawa variasi genetic dalam populasi *H. kuda* masih dalam keadaan yang sihat. Perbandingan populasi antara MSB dan SD dengan Lourie *et al.*, (2005) menunjukkan bahawa populasi *H. kuda* di Pulau Estuary telah melalui fragmentasi dan telah memperolehi haplotaip yang khusus.