

THE POPULATION ECOLOGY AND JUVENILE  
DEVELOPMENT OF THE SPOTTED SEAHORSE,  
*Hippocampus kuda* Bleeker

CHOO CHEE KUANG

MASTER OF SCIENCE  
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI  
MALAYSIA

2005

**1100053977** Perpustakaan Sultanah Nur Zahirah (UMT)  
Universiti Malaysia Terengganu



tesis

QL 638 .S9 K8 2005



1100053977

## The population ecology and juvenile development of the spotted seaorse Hippocampus kuda Bleeker / Choo Chee Kuang

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

100053977

I shot cahoolah

HAK MILIK  
PERPUSTAKAAN SULTANAH KUR ZAHIRAH UMT

THE POPULATION ECOLOGY AND JUVENILE DEVELOPMENT OF THE  
SPOTTED SEAHORSE, *Hippocampus kuda* Bleeker

THE POPULATION ECOLOGY AND JUVENILE DEVELOPMENT OF THE  
SPOTTED SEAHORSE, *Hippocampus kuda* Bleeker

CHOO CHEE KUANG

March 2005

Choo Chee Kuang, Faculty of Ocean Science, Universiti Malaysia Sabah.

Supervisors: Prof. Mohd. Azmi bin Aminah, PhD,  
Dr. Siti Nurul Jameela, PhD

Examiner: Institute of Oceanography

**CHOO CHEE KUANG**

The object of this study was to examine the population ecology of the Spotted Seahorse (*Hippocampus kuda*) in the Belait River Estuary, Brunei. A total of 162 individuals were caught during eight surveys conducted, with no significant bias in the sex ratio. The width of most of seahorses were wider in the two months July-August and November-December. The population size of 82 adults in the study area was estimated at 1000 individuals in the 100 ha area studied. The mean total length of males and females were similar. Length frequency distribution showed unimodal, normal and the mean length for males and females was 15.0 cm. Seasonal variation in growth rate was found weak. Mean growth increment was dependent on initial body size and characterized by an increasing trend from

Thesis Submitted in Fulfilment of the Requirement for the Degree of Master of Science  
in the Institute of Oceanography  
Kolej Universiti Sains dan Teknologi Malaysia

March 2005

1100053977

Abstract of thesis presented to the Senate of Kolej Universiti Sains dan Teknologi Malaysia in fulfillment of the requirement for the degree of Master of Science.

**THE POPULATION ECOLOGY AND JUVENILE DEVELOPMENT OF THE SPOTTED SEAHORSE, *Hippocampus kuda* Bleeker**

**CHOO CHEE KUANG**

**March 2005**

**Chairperson :** **Assoc. Prof. Liew Hock Chark, M.Sc.**

**Member :** **Prof. Mohd. Azmi bin Ambak, Ph.D.**  
**Siti Aishah Abdullah, Ph.D.**

**Faculty :** **Institute of Oceanography**

The first part of this study focused on the population ecology of the Spotted Seahorse, *Hippocampus kuda* in the Pulai River Estuary, Johor. A total of 102 females and 103 males were tagged from April 2002 to March 2004, with no significant bias in the sex ratio. The average sightings of seahorses were lower in the wet season (July-August and November-December). The population size of *H. kuda* in the study area was estimated at 438 individuals using the Jolly-Seber method. The mean total length in males and females were similar. Length frequency distribution exhibit a normal, unimodal curve and the modal length for males and females was 15.0 cm. Sexual maturity was reached at 14.0 cm in both sexes. Weight-length relationship was exponential ( $W=0.0038L^{2.97}$ ) and characterized by an isometric growth type. Reproduction was year-round but peak reproductive season could not be determined.

The maximum residency period of seahorses was 103 days with no significant difference in the residency periods between males and females. There was probable migration especially during the wet season. The mean home range size was  $32.35 \text{ m}^2$  and the home range shapes were somewhat elongated. The home range size of males (mean:  $39.25 \text{ m}^2$ ) and females' (mean:  $25.46 \text{ m}^2$ ) did not differ significantly. No significant association was detected in seahorse's preference for seagrass denseness with regard to sex and size.

The second part of this study was on juvenile development under hatchery rearing conditions. Newborns (mean standard length:  $9.33 \text{ mm} \pm 0.789 \text{ S.D.}$ ) were raised to 124 days old (mean standard length:  $119.35 \text{ mm} \pm 6.04 \text{ S.D.}$ ). The growth was characterized by three stages with two inflection points occurring at Day 21 and Day 76 respectively. The mean growth rate in the first, second and third phases were 0.68 mm/day, 1.16 mm/day and 0.71 mm/day respectively. The growth rate was most rapid in the second stage which was probably influenced by an ontogenetic shift in diet and saltatory behavioural changes into benthic form. Weight-length relationship was exponential ( $W=7.14 \times 10^6 L^{2.76}$ ) but the slope,  $b=2.76$ , reflected a negative allometric growth type. Sexes could be distinguished at around 110 days and the sex ratio was unbiased. The standard length in males and females did not differ significantly.

A morphological staging series divides *H. kuda* juvenile development into eight stages based on the development of coronet, cheek and eye spines, keel and pigment.

The morphometric ratios for all the body parts, except trunk length, showed considerable changes at a transition point occurring at approximately 25 mm SL. The high proportional growth in head length, head depth, pectoral fin base length, dorsal fin base length, snout length, snout depth and eye diameter at the initial stages, and the abrupt increase in tail length only after the first two weeks, were the reflection of the priorities during early development where important organs are being developed first for the enhancement of juveniles' survival.

Abstrak tesis yang dikemukakan kepada Senat Kolej Universiti Sains dan Teknologi  
Malaysia sebagai memenuhi keperluan ijazah Master Sains.

**KAJIAN EKOLOGI DAN PERKEMBANGAN KUDA LAUT, *Hippocampus kuda*  
Bleeker**

**CHOO CHEE KUANG**

**March 2005**

**Pengerusi : Prof. Madya Liew Hock Chark, M.Sc.**

**Ahli : Prof. Mohd. Azmi bin Ambak, Ph.D.  
Siti Aishah Abdullah, Ph.D.**

**Fakulti : Institut Oseanografi**

Bahagian pertama kajian ini tertumpu pada populasi kuda laut, *Hippocampus kuda* di Kuala Sungai Pulai, Johor. Sebanyak 102 betina and 103 jantan *H. kuda* telah ditanda dari April 2002 hingga March 2004, di mana tiada ratio seks direkodkan. Purata permerhatian kuda laut lebih rendah semasa musim tengkujuh (Julai-Ogos dan November-Disember). Saiz populasi *H. kuda* di kawasan kajian dijangka sebanyak 438 melalui kaedah Jolly-Seber. Purata panjang badan jantan dan betina adalah sama. Frekuensi taburan panjang adalah normal dan unimodal, dengan panjang modal bagi jantan dan betina tertakluk pada 15.0 cm. Kematangan dicapai pada saiz 14.0 cm dalam kedua-dua jantina. Hubungan berat-panjang adalah eksponensi ( $W=0.0038L^{2.97}$ ) and ia dikategorikan dalam jenis tumbesaran isometrik. Walaupun pembiakan berlaku sepanjang tahun, namun musim pembiakan tidak dapat ditentukan..

Jangka penempatan maksimum kuda laut adalah 103 hari dan tiada perbezaan direkodkan antara jangka penempatan jantan dan betina.. Penghijrahan mungkin berlaku pada musim tengkujuh. Purata saiz kawasan yang diperlukan untuk hidup ialah  $32.35 \text{ m}^2$  dan kawasan hidup itu berbentuk panjang. Tiada perbezaan diperhatikan untuk purata saiz kawasan hidup bagi jantan (purata:  $39.25 \text{ m}^2$ ) and betina (purata:  $25.46 \text{ m}^2$ ). Tiada hubungan diperhatikan dalam kegemaran kuda laut terhadap kepadatan rumput laut dari segi seks dan saiz.

Bahagian kedua kajian ini adalah mengenai perkembangan kuda laut. Kuda laut yang baru dilahirkan (purata panjang:  $9.33 \text{ mm} \pm 0.789 \text{ S.D.}$ ) dipeliharakan sehingga usia 124 hari (purata panjang:  $119.35 \text{ mm} \pm 6.04 \text{ S.D.}$ ). Tumbesaran kuda laut tertakluk kepada tiga fasa, dan terdapat dua digit infleksi pada hari ke-21 dan hari ke-76. Purata kadar tumbesaran dalam fasa pertama, kedua dan ketiga adalah  $0.68 \text{ mm/hari}$ ,  $1.16 \text{ mm/hari}$  and  $0.71 \text{ mm/hari}$ . Kadar tumbesaran adalah paling tinggi pada fasa kedua disebabkan perubahan diet pemakanan dan kelakuan. Hubungan berat-panjang daalah eksponensi ( $W=7.14 \times 10^{-6} L^{2.76}$ ) namun kecerunan,  $b=2.76$ , mencerminkan perkembangan allometrik yang negatif. Jantina dapat diperbezakan pada 110 days dan ratio seks adalah sama. Panjang badan jantan dan betina juga adalah sama.

Suatu siri morfologi dilampirkan dan membahagikan perkembangan *H. kuda* kepada lapan fasa, bergantung kepada perkembangan “coronet, cheek dan eye spines, keel and pigment”. Ratio morfometrik untuk semua bahagian badan, kecuali panjang “trunk”, menunjukkan terdapat satu digit transisi yang berlaku pada 25 mm SL.

Nisbah tumbesaran yang tinggi bagi panjang kepala, lebar kepala, panjang asas sirip pectoral dan dorsal, panjang dan lebar muncung, dan diameter mata pada fasa awal, dan tumbesaran ekor dengan tiba-tiba hanya selepas dua minggu pertama ini semuanya mencerminkan keutamaan organ yang diperkembangkan dahulu adalah penting untuk meninggikan peluang hidup kuda laut.

Very experienced people will know exactly what I mean with me through the good and bad times. Sometimes simple words can have great power. What we produced are "thank you's" but you can't thank them enough. The freedom to follow our own path and during the field survey we gained self-confidence and independence. It's difficult and looks like the easiest place available. You can't thank them enough by saying a thousand times of "thank you".

The field survey would not have started, nor monitoring continued, without the assistance from Kuan Khian's Moon, Pauli Ali bin Sami, Andel Rizaldi Omer, Puteh and his family, and all the other people from various villages or cities. All the drivers and the cooks, drivers and family for no kind of monetary reward. I am grateful for you and helped in solving many difficulties.

Friends and relatives' participation have made the conducting field survey livelier. So thank Ardy, Sari, Tengku Cheah Cheah, Wong Chai, Nafira, Junit, Aisyah, Jumah Hanif, Khairul, and the rest of the village friends. The late Dr. Mohamad Muhamad, Tan Sri Wong Hock Yew, and others who I've mentioned my appreciation to the village kids who had taken care of my boat and helped carrying up