

COMMUNITY STRUCTURE OF BRACHYURAN CRAB IN SETIU LAGOON, TERENGGANU

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Thesis Submitted in Fulfillment of the requirement for the Degree of
Master of Science in the Institute of Oceanography and Environment
Universiti Malaysia Terengganu

July 2013

DEDICATION

The work in this thesis is dedicated to my late father

Mohamad Taufek Bin Shahrān

&

My beloved mother

Mazenah Bt. Simpol

ABSTRACT

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

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A study on the diversity and community structure of Brachyuran crab was conducted in the Setiu lagoon, Terengganu. The sampling has been done once in every two months for a year starting from July 2011 until May 2012. The study aims to investigate the abundance and community structure of Brachyuran crab in the Setiu lagoon. In addition, this study also investigated the relationship between Brachyuran crab community and selected physico-chemical parameters of waters such as salinity, pH and Dissolved oxygen) and sediment grain size and total organic matter.

The Setiu lagoon is stretched from Benting Lintang at the Northern part and Penarik to the South. Totally, eight stations were placed. At the Northern region (ST1 and ST2) the surrounding area covered mainly by *Rhizophora* sp., *Nypa fruticans* (Nipah palm) and Casuarina forest. In the middle region of the lagoon (ST3, ST4, ST5) the area received seawater input from the nearest river mouth. Meanwhile, at the southern region (ST6, ST7, ST8) the area received freshwater input mainly from Setiu and Chalok river. The crab was sampled by conducting 100 m² quadrat. Within the quadrat, the crabs were collected in five 1 m x 1 m subplot (five replicates) for 15-20 minutes time-based collection. The physical parameters were measured *in situ*. The additional qualitative method by using fishing device (crab trap and gill net) was employed as an attempt to investigate subtidal species in order to increase the number of Brachyuran species occurred in Setiu lagoon. However, results for subtidal was not included for statistical analysis.

Totally, forty-four Brachyuran species were identified and grouped into 13 Families (Sesamidae, Varunidae, Grapsidae, Ocypodidae, Macrothamidae, Dotillidae, Camptandriidae, Pilumnidae, Portunidae, Eriphiidae, Oziidae, Dorippidae and Leucosiidae). Most of the species contributed by Sesamidae (18 species). Meanwhile, Portunidae accounted for 76% of total crab caught in subtidal. The species obtained were mostly contributed by mangrove species. *Parasesarma plicatum* recorded highest total number of individual crab caught

(359 Individual) and followed by *Scopimera* sp. (199 Individual), *Uca lactea annulipes* (156 Individual), *Metaplex elegans* (152 Individual), and *Cleistocoeloma merguense* (124 Individual).

The Brachyuran abundance was significantly varied between the stations ($p < 0.05$). The highest abundance was recorded at ST6 and ST2 (12 Ind.m⁻² and 10 Ind.m⁻²) at the exposed area of intertidal flat with undergrowth of young mangrove vegetations. ST1 (beach) was accounted for the lowest abundance (2.12 Ind.m⁻²). *Parasesarma plicatum* (3-4 Ind.m⁻²), *Scopimera* sp. (2-3 Ind.m⁻²) and *Dotilla* sp. (3-2 Ind.m⁻²) were occurred in high density at ST2, and ST6. In turn, contribute to high density of Brachyuran crab in these stations. Though the highest density was recorded in ST2, ST6, but ST5 (mix mangrove forest) recorded the highest number of species, (S) (12 Ind.m⁻²), species richness (D) (2.68±0.72), species evenness; (J') (0.90±0.06) and species diversity (H') (2.17±0.32) as compared to othes stations. In contrast to ST5, ST7 (*Nypa* mangrove forest) showed decreasing the number of species (7±3.32 Ind.m⁻²) and diversity indices (D=2.29±1.16, J'= 0.80±0.11, H'=1.73±0.60,) and occurrence of *M.elegans* in high abundance (3 Ind.m⁻²). The presence of *M.elegans* and low number of species might influence by high Total Organic Matter recorded in this stations. Similarly to ST7, the stations with less vegetation covered (ST1 and ST8) also showed the reduction in number of species (2-6 ind.m⁻²), and this lead to decreasing of H' (0.51±0.26). Suggesting

that heterogeneity of habitat and environmental variables are responsible in influencing the distribution of Brachyuran in this lagoon.

Seven species (*P.plicatum*, *P.eumolpe*, *C.merguiense*, *Haberma* sp., *U. lactea annulipes*, *U. vocans vocans*, and *M. aloutos*) were widely distributed in the Setiu lagoon (ST2, ST3, ST4, ST5, ST6, and ST8). ST1 (beach) and ST7 (*Nypa* forest) discriminate from the others stations in this lagoon by species-specific occurred in both stations and totally absent at others station where ST1 discriminate by *Ocypode ceratophthalmus* and *O.coridamanus* while *Labuanium politum* is presence only in ST7. Multi-Dimension Scaling (MDS) ordination performed was clearly distinguished the stations into five distinct group; Group 1 (ST1), Group 2 (ST7), Group 3 (ST4), Group 4 (ST8), and Group 5 (ST2, ST6, ST3 and ST5).

Pearson-correlation and linear regression analysis showed that salinity and pH strongly correlated with D (pH, $r = -0.83, p = 0.01$; salinity, $r = -0.75, p = 0.03$), and H' (pH, $r = -0.89, p = 0.003$; salinity, $r = -0.82, p = 0.013$). The environmental variables might responsible for the Brachyuran occurrence in this lagoon. The data obtain from this study might contribute to current information on the brachyuran crab at the Setiu lagoon in turn provide importance baseline data for future work and comparison with other habitat elsewhere in Malaysia.

Abstrak thesis yang dikemukakan kepada pihak Senat Universiti Malaysia
Terengganu sebagai memenuhi keperluan ijazah Master Sains

**KEPELBAGAIAN DAN STRUKTUR KOMUNITI KETAM BRACHYURA DI
KAWASAN LAGUN, TANAH BENCAH SETIU, TERENGGANU**

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Kajian mengenai kepelbagaian dan struktur komuniti ketam Brachyura telah dijalankan dilagun Setiu, Terengganu. Persampelan telah dilakukan sekali dalam setiap dua bulan bermula dari bulan Julai 2011 sehingga Mei 2012. Kajian ini bertujuan untuk menyiasat kelimpahan dan struktur komuniti ketam Brachyura di lagun Setiu. Di samping itu, kajian ini juga bertujuan untuk mengenalpasti sama ada komuniti ketam Brachyura mempunyai perkaitan dengan parameter terpilih fiziko-kimia air dan sedimen seperti kemasinan, pH, oksigen terlarut, saiz pasir dan jumlah bahan organik.

Kawasan lagun meliputi Benting Lintang di bahagian utara sehingga ke Penarik di bahagian selatan. Terdapat lapan stesen secara keseluruhan. Di bahagian utara (ST1 dan ST2), kawasan persekitaran dilitupi oleh *Rhizophora* sp., *Nypa fruticans* (Nipah) dan hutan Casuarina, sementara ST3, ST4 dan ST5 di bahagian tengah lagun pula menerima kemasukan air laut daripada muara sungai yang berdekatan. Di kawasan selatan iaitu ST6, ST7 dan ST8 ianya menerima kemasukan air tawar dari Setiu dan Sungai Chalok. Persampelan ketam telah dijalankan dengan menggunakan 100 m² kuadrat. Dalam setiap kuadrat, ketam telah disampel di dalam 1 m x 1 m subplot (5 replikasi). Parameter fizikal telah diukur secara *in situ*. Kaedah kualitatif tambahan dengan menggunakan alat memancing (perangkap ketam dan pukut tiga lapis) telah digunakan sebagai satu usaha untuk mengenal pasti spesies subtidal.

Secara keseluruhannya, 44 spesies ketam Brachyura telah berjaya diidentifikasi dan dikelaskan kepada 13 Famili (Sesarmidae, Varunidae, Grapsidae, Ocypodidae, Macropthalmidae, Dotillidae, Camptandriidae, Pilumnidae, Portunidae, Eriphiidae, Oziidae, Leucosiidae and Dorippiidae). Kebanyakan spesies adalah daripada Famili Sesarmidae (18 spesies). Sementara itu, Portunidae menyumbang sebanyak 76% daripada jumlah keseluruhan ketam yang ditangkap di subtidal. *Parasesarma plicatum* mencatatkan rekod bilangan individu tertinggi dalam 100 m² kuadrat (359 Individu) diikuti oleh *Scopimera* sp. (199 Individu), *Uca lactea annulipes* (156

Individu), *Metaplex elegans* (152 Individu) dan *Cleistocoeloma merguense* (124 Individu).

Kelimpahan ketam *Brachyura* adalah lebih tinggi di kawasan terbuka yang mempunyai tumbuh-tumbuhan bakau muda seperti di ST6 (12.43 Ind.m⁻²) dan ST2 (10.33 Ind.m⁻²). Kepadatan terendah (2.12 Ind.m⁻²) direkodkan di ST1 (kawasan pantai). Terdapat perbezaan struktur komuniti yang signifikan pada stesen-stesen ini ($p < 0.05$). Kepadatan spesies *Parasesarma plicatum* (3-4 Ind.m⁻²), *Scopimera* sp. (3-4 Ind.m⁻²) dan *Dotilla* sp. (2-3 Ind.m⁻²) adalah tinggi di stesen ST2 dan ST6. Walaupun kepadatan tertinggi direkodkan di ST2 dan ST6, namun ST5 (hutan bakau) mencatatkan struktur komuniti yang tertinggi berbanding stesen-stesen lain dari segi bilangan spesies (S)(12 Ind.m⁻²), kekayaan spesies (D)(2.68±0.72), kesamarataan spesies (J')(0.90 ± 0.06) dan kepelbagaian spesis (H')(2.17 ±0.32). Berbanding ST5, ST7 (hutan bakau nipah) menunjukkan penurunan bilangan spesis (7±3,32Ind.m⁻²) dan indeks kepelbagaian (D = 2,29±1,16, J ' = 0.80± 0.11, H' = 1,73± 0.60) serta kehadiran *M. Elegans* dalam kepadatan yang tinggi (3 Ind.m⁻²).

Kehadiran kepadatan yang tinggi untuk spesies *M.elegans* di ST7 mungkin antara faktor pengurangan bilangan spesies ketam *Brachyura* dan ini mungkin dipengaruhi oleh jumlah bahan organik yang tinggi direkodkan di stesen ini. Seperti ST7, stesen yang mempunyai kurang kepadatan tumbuh-

tumbuhan (ST1 dan ST8) juga menunjukkan pengurangan bilangan spesies (2-6 ind.m⁻²), dan seterusnya membawa kepada kepelbagaian spesies yang rendah (0.51 ± 0.26). Stesen ini mempunyai peratusan jumlah bahan organik yang tinggi dan sedimen bercirikan pasir halus, kelodak dan sedimen tanah liat.

Kajian menunjukkan bahawa ciri-ciri sedimen dan bahan organik mungkin juga menyumbang kepada taburan Brachyura. Sebaliknya, ST1 (pantai) dan ST7 (hutan nipah) berbeza dari stesen-stesen lain di lagun ini kerana kewujudan spesies yang spesifik dikedua-dua stesen ini dan tiada terdapat di stesen lain di mana ST1 didiami oleh *Ocypode ceratophthalmus* dan *O. coridamanus* manakala *Labuanium politum* hanya dijumpai di ST7 sahaja. Ini menunjukkan bahawa kepelbagaian habitat dan pembolehubah persekitaran bertanggungjawab dalam mempengaruhi taburan ketam Brachyura di lagun ini.

Tujuh spesies (*P.plicatum*, *P.eumolpe*, *C.merguiense*, *Haberma* sp., *U. lactea annulipes*, *U.vocans vocans* dan *M.aloutos*) tertabur secara meluas di lagun Setiu (ST2, ST3, ST4, ST5, ST6, and ST8). MDS ordinasi telah jelas membezakan kesemua stesen kepada lima kumpulan yang berbeza; Kumpulan 1 (ST1), kumpulan 2 (ST7), kumpulan 3 (ST4), kumpulan 4 (ST8) dan kumpulan 5 (ST2, ST3, ST5, ST6).

Pembolehubah persekitaran mungkin bertanggungjawab untuk taburan dan kewujudan Brachyura di dalam lagun ini. Data yang diperolehi daripada kajian ini dapat menyumbang kepada maklumat semasa mengenai ketam Brachyura di lagun Setiu seterusnya menyediakan data asas yang penting untuk kajian pada masa depan dan perbandingan dengan habitat di tempat yang lain di Malaysia.