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Community Study of Brachyuran Crab at Setiu Lagoon, Terengganu, Malaysia

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ABSTRACT

Brachyuran crab of Setiu Lagoon was systematically sampled between July 2011 and May 2012 to determine the community structure of animals and their relationship with environmental parameters. The semiterrestrial crabs were collected from a 100 m^2 quadrat at eight stations. In addition, fishing devices were used to collect true aquatic crabs employed at the subtidal habitat. Forty-four species and 13 families were identified representing semiterrestrial and true aquatic crabs (i.e., Sesarmidae, Varunidae, Grapsidae, Ocypodidae, Macropthalmidae, Dotillidae, Camptandriidae, Pilumnidae, Portunidae, Eriphiidae, Oziidae, Dorippidae and Leucosiidae). *Parasesarma plicatum, Perisesarma eumolpe*, *Clistocoeloma merguiense*, *Haberma* sp., *Uca* (*Austruca*) *annulipes*, *Uca* (*Gelasimus*) *vocans*, and *Moguai aloutos*) were widely distributed in this lagoon. ST5 (at mix mangrove forest) recorded the highest number of species with density (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 other stations. The results indicated that water salinity, pH and sediment grain size influence the community pattern of brachyuran in this lagoon.

Keywords: Brachyuran, community, Setiu Lagoon, species diversity

INTRODUCTION

Globally, there are 6793 valid species and subspecies of brachyuran crabs had been described (Ng *et al*., 2008) whilst the number of species is still ascending with new genera and species were discovered every year. Brachyuran crabs belong to infraorder Brachyura and sometimes are confused with hermit and porcelain crabs from infraorder Anomura (Pechenik, 2010). Brachyuran crab habitats range from deep seas to high altitude streams and moist lands. Various species are characterised by their respective habitats and their survival is dependent on specific environmental variables and used as bioindicator for environment perturbation (MacFarlane *et al*., 2000; Nudi *et al*., 2007; Amaral *et al*., 2009; Yeh *et al*., 2009; Arya *et al*., 2014; Saadati *et al*., 2020).

In Malaysia, the study of brachyuran crabs has focused on mangrove forests (Tan & Ng, 1994; Sasekumar & Chong, 1998; Ashton *et al*., 2003a, 2003b), rivers (Ng, 1995; Ng & Ahmad, 2016; Grinang *et al*., 2018; Grinang *et al*., 2019) and marine ecosystem (Yeo & Ng, 1999). The crab fauna contributes a significant role in ecological functions through their feeding and burrowing activities (Smith *et al*., 1991; Nourdhaus *et al*., 2006; Kristensen, 2008; Alongi, 2009) and forms an important link in food web between detritus at the base of trophic level and higher consumers. Brachyuran crab distributions are influenced by several environmental factors such as water salinity, water temperature, tidal inundation, soil pH, organic content and sediment characteristics and how they tolerate with these environmental factors (Smith *et al*., 1991).

Setiu Lagoon comprises a unique inter-connected habitat of *Melaluecae* forest, mangrove, estuaries and intertidal mud-sandy flats. These habitats support variety of flora and fauna communities which in turn create socio-economic opportunities to local communities.

This includes artisanal and commercial fisheries, aquaculture, charcoal production and small-scale manufacturing of traditional food. The information of marine brachyuran crabs in Malaysia is rather outdated with several published records dating back to more than 19 years ago (Sasekumar 1974; Sasekumar & Chong, 1998; Ng, 1995; Ashton *et al*., 2003a, 2003b) of which the past studies had focused only on a small area of the wetland ecosystem. As a consequence, the Setiu Lagoon constitutes a gap in the known number of brachyuran crab species. Previous studies on brachyuran in this lagoon only focused on commercial species of mud crab *Scylla* spp. (Ikhwanuddin *et al*., 2010; Amin *et al*., 2018). Hence, this creates a need to explore these precious crab communities as a whole as they are important ecologically and economically.

A fundamental property of understanding any ecosystem habitat is the number of species it contains (Henderson, 2003; Likens, 2005). Nowadays, anthropogenic disturbance and climate change may result in degradation of ecosystems and lead to biodiversity loss. The impacts towards the ecosystem are less recorded due to a lack of baseline studies in interest ecosystems. Therefore, this study aims to determine the species of brachyuran crab in Setiu Lagoon with emphasis on the relationship of brachyuran community structure and environmental variables. The study generates a new fundamental knowledge on marine crabs in Malaysia, and the data can be used for conservation and sustainable management of the fisheries resources.

MATERIALS AND METHODS

Study Sites

The climate of Terengganu is monsoonal influence. The minimum and maximum temperature are 24.6 ℃ and 32 ℃, respectively, with average rainfall between 3,302 to 4,318 mm/year (Malaysian Meteorological Deparment, 2019). Based on the wind direction, Setiu Wetlands have events of monsoon seasons, namely the Southwest Monsoon prevails (May – September), Northeast Monsoon (October – March) and periods of inter-monsoon seasons (data from the Malaysian Meteorological Service, 2011 – 2012: http://www.met.gov.my/).

The crab sampling was conducted for a year between July 2011 and May 2012. Sampling was carried in two-month intervals; 2011 (July, September, November) and 2012 (January, March and May) to conduct the sampling during representative monsoon events including pre-monsoon (July – September), monsoon (November – January) and post-monsoon (March – May).

Eight stations were selected with two stations in the north (ST1, ST2), three stations in the central (ST3, ST4, ST5) and three stations were located at the south of the lagoon (ST6, ST7, ST8). The selection of sampling stations was based on the habitat occupied and the accessibility to the sampling sites. The central lagoon connects the lagoon to the sea (Figure 1). The lagoon receives freshwater input mainly from rivers at the south of lagoon and seawater from the ocean during high tides. At the southern part of the lagoon, the area receives the freshwater input mainly from Chalok and Setiu River. The north part has a brackish condition and is surrounded with mangrove forest.

Samples Collection

The brachyuran crabs were collected using the systematic sampling procedure adapted from Ashton *et al*. (2003a, 2003b). This technique was used to estimate the crab density in the intertidal areas. Quadrats were made with a width of 10 m × 10 m in size. Crabs were sampled by conducting 1 m × 1 m subplots (five replicates) time-based collections within the quadrat and randomly chosen. The area covered in each 15 minutes timed period covered approximately one-third of the 100 m^2 quadrat with the assumption that the crab does not change significantly during this period. Catch per unit effort for one subplot (one replicate) was 15 minutes for collecting as much as crab encountered.

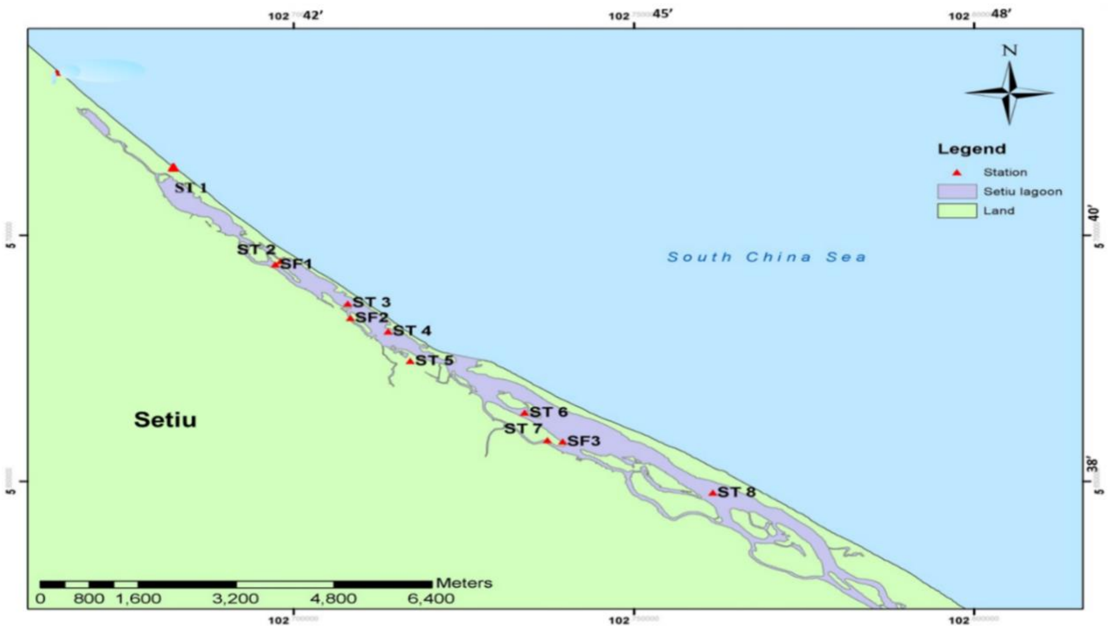


Figure 1. Map of sampling stations in the intertidal stations (ST1 – ST8) and subtidal stations (SF1 – SF3) in the Setiu lagoon, Terengganu

Crabs were collected by hand picking with the help of scoop nets. Within this plot, the crabs encountered at the surface in their burrow openings were caught. The burrows were dug up to reach the crabs hiding in their burrows. Specimens were carefully handled to ensure that no appendages were lost. Crab specimens were immediately stored in the freezer after the sampling to sedate them before being washed and measured. Later the specimens were preserved in 10% formalin and transferred in 70% alcohol to prevent the calcium carbonate in the shell dissolving before subsequent analysis.

In addition, fishing gears were employed as an attempt to gain additional information on brachyuran crab species from subtidal areas in order to increase the ability of getting as much as possible data on brachyuran species in this lagoon. Two fishing gears, crab trap and multifilament gill net were deployed. The gap between the traps was set at approximately 5 m apart. Ten to 15 traps were placed in each station with the use of fish as a bait. One set of 10 metres gill nets with the mesh size 1, 2, 3, 4 and 5 inch were deployed at each station. However, the crab caught was not included for further statistical analysis in this study.

Three replicates of surface sediment samples (~5 – 10 cm) were collected in each 1 m^2 subplot for the determination of grain size distribution and total organic matter (TOM). Sediment samples for TOM were immediately placed in a freezer to prevent degradation of organic material by microorganism in the sediment samples. In each quadrat, interstitial water parameters were measured *in situ* for temperature (°C), salinity (PSU), pH and dissolved oxygen (mg/L) using Hydrolab Quanta multi-probe meter and YSI 556 for verification.

Laboratory Analysis

Identification of brachyuran was done by referring to identification keys including Crane (1975), Wee & Ng (1995), Keenan *et al*. (1998), Banarjee (1960), Abele (1992), Ng *et al*. (2008), Ng (2012) and Tan & Ng (1993). The classification used essentially follows that proposed by Pechenik (2010) and Ng *et al*. (2008). Authorship and years for many problematic nomenclatures also referred those recommended in Ng *et al*. (2008). Identified brachyuran specimens were deposited at the South China Sea Reference Centre and Repository, Institute of Oceanography and Environment (INOS), Universiti Malaysia Terengganu (UMTCrust00103 – UMTCrust00148).

The sediment grain size analysis was determined by using dry and wet sieving technique to determine the fraction mixture of gravel, sand, silt and clay (Bale & Kenny, 2005). Statistical measures were calculated to define grain size distributions (phi) for mean size (measure of central tendency), sorting (measures of dispersion) and skewness (measures degree of asymmetry) following method described by Bale and Kenny (2005). Percentage of total organic matter content (TOM) was determined according to the method recommended by Greiser and Faubel (1988).

Data Analysis

Results of identified brachyuran were documented as species list. The gathered data of mean total number of individuals was used for determining the percentage contribution of species composition for spatial and temporal analysis. The density of brachyuran species was based on the number of species per 1 m^2 quadrat. Community structure was determined by three (3) parameters, namely species richness index (D'), species evenness (J') and species diversity (H').

The means of species density, diversity indices and environmental parameters were tested for significant differences between stations by using one-way analysis of variance (ANOVA). Post-hoc comparisons tests were performed using Tukey tests. The comparisons test lies of the hypothesis that the means of the parameters are different among stations. All analyses were performed at significance level of 0.05. The cluster analysis and multidimensional scaling (MDS) were conducted to determine the similarities of brachyuran crab between the stations. Pearson-correlation and RDA were performed to determine relationships between the brachyuran density and the environmental variables. The univariate and multivariate analyses were conducted using statistical package of PRIMER v6.0 and CANOCO version 4.5, respectively. The GraphPad Prism5 was used to plot diagram.

RESULTS & DISCUSSION

Brachyuran Species Composition

A total of 2028 brachyuran crabs were caught in eight stations (ST1 – ST8). Forty-four crab species were identified and grouped into 7 taxonomic superfamilies and 13 families based on Ng *et al*. (2008) classification. Most of the species originated from two major Superfamilies, which are Grapsoidea and Ocypodoidea (Zakirah *et al*., 2017). Meanwhile, Family Portunidae constitutes a high proportion of crab species in subtidal stations (Zakirah *et al*., 2017). The brachyuran species collected in Setiu Lagoon are mainly contributed by mangrove species (Tan & Ng, 1994). Some species was found out not recorded from the previous checklist of brachyuran crab in Malaysia including *Stelgistra* sp., *Haberma* sp., *M. frontalis*, *Baruna sinensis*, *Neodorippe callida*e, *Praosia punctata*, *Hemigrapsus glabra*, *Varuna literata*, *Scylla tranquebarica*, *S.paramamosain* and *Thalamita crenata.* The number of crab species in this study was moderately higher compared to other previous studies from Malaysia and adjacent countries. This is probably due to lack of standardised sampling method (Table 1). Hence, determination of sampling technique is important to be considered due to their burrowing nature and high mobility. We believe that there are still more undiscovered brachyuran crab species occupying this lagoon. Hence, there is a need for future studies to upgrade current sampling techniques to explore the brachyuran communities in this lagoon in both intertidal and subtidal habitats.

The temporal crab density fluctuated between the sampling periods (Figure 2). The highest density in ST6 contributed by the occurrence of high densities of *P. plicatum*, *Dotilla* sp., *Scopimera* sp. and *Uca (Austruca) annulipes* in this station. Whereas low density at ST1 was discriminated by the presence of two species of ghost crab only which were *O. ceratopthalmus* and *O. cordimanus*. Among the brachyuran collected, it was observed that *U. Uca (Austruca) annulipes*, *C. merguiense*, *P. plicatum,* and *P. eumolpe* had the broadest distribution. *Parasesarma plicatum* occurred in high density in ST6 where the density can reach 3.93 ind.m^{-2}. *Parasesarma plicatum* was the most abundant in the exposed area with little vegetation cover, where the above ground is covered with mangrove seedlings (ST2 and ST6). The presence of mangrove seedlings and grasses in the intertidal floor is due to the accumulations of nutrients loading in sediment due to tidal activities, which provide suitable habitat for certain species of fauna and flora with strong dispersal characteristic as *P. plicatum* shown in the present study (Alongi, 1998; Walker & Wood, 2005).

Brachyuran Communities Structure

Species richness and species diversity index were significantly different between the stations (D: $p<0.05$; H': $p<0.05$) except for the evenness index (J': $p>0.05$). The diversity indices pattern showed fluctuation throughout the year (Figure 3). The highest D value was recorded at *Nypa fruticans* mangrove forest (ST7) in January 2012. This incorporated a high number of species collected in this month at this station. The higher number of species caught, the greater the number of species richness index. In the present study, there are two patterns of community structure based on diversity indices. First is the area with low species richness index (D), and species diversity index (H') with high value of evenness index (J'). Second pattern in contrast showed high value of all diversity indices. High evenness occurs when in one area many species have similar species abundance with no single species dominating as demonstrated in the communities at ST1 in which two species occurred are of equal abundance and so has lower species diversity. In contrast, the communities in ST5 showed high diversity indices (D, H' and J') having greater numbers of species (species richness) but in slightly equal proportion and no single species dominating in this station.

Cluster analysis and MDS ordination suggested that the brachyuran crab in Setiu Lagoon consisted of five groups (Figure 4). ST1, ST7, ST4 and ST8 were clearly separated from each other and made up of four distinct groups. Whereas, the last group consists of combinations of remaining stations (ST2, ST6, ST3 and ST5). Certain species in the present study are site specific. For example, at ST1 (beach) only *O. ceratoptalmus* and *O. cordimanus* were caught while *L. politum* exclusively present in the *Nypa fruticans* forest at ST7. Brachyuran crabs in this lagoon are mostly occupied in the intertidal of mangroves forest. This might be due to the presence of diverse microhabitats available in the form of various roots of mangrove plants and food sources derived by the mangrove forest itself (Fratini *et al*., 2005; Khan *et al.,* 2005). Therefore, the brachyuran crab in this study can be grouped based on their occurrence at intertidal mangrove forest, exposed sandy-muddy intertidal, subtidal and beach as summarised in Table 2.

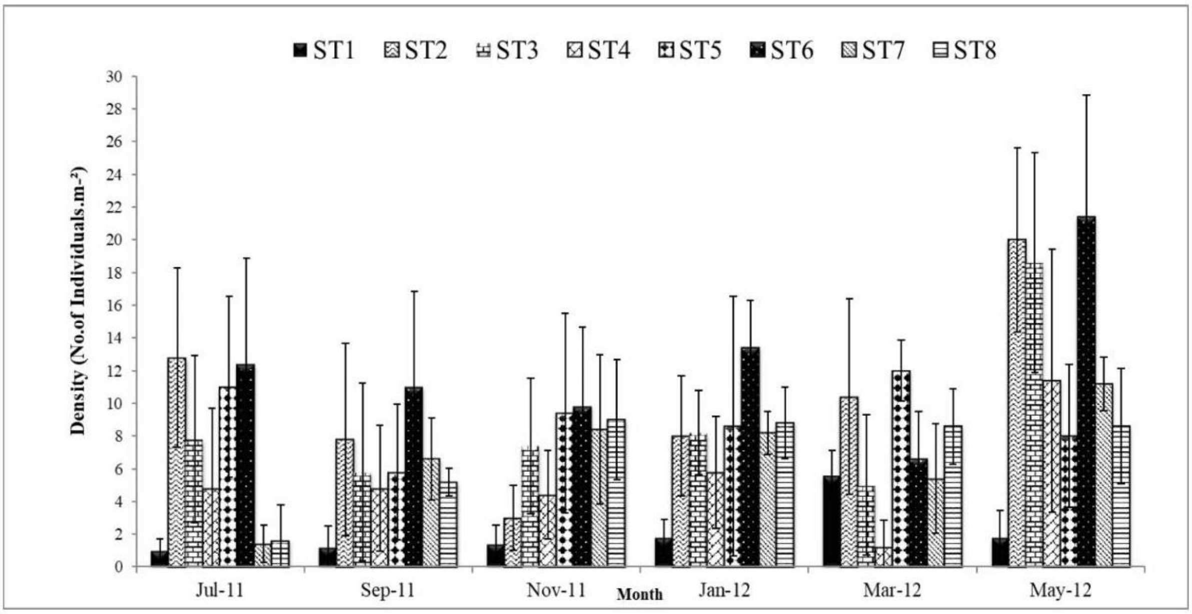


Figure 2. Temporal variation of brachyuran density in the Setiu Lagoon from 6 sampling periods starting July 2012 until May 2012 with a two-month interval (n = 6)

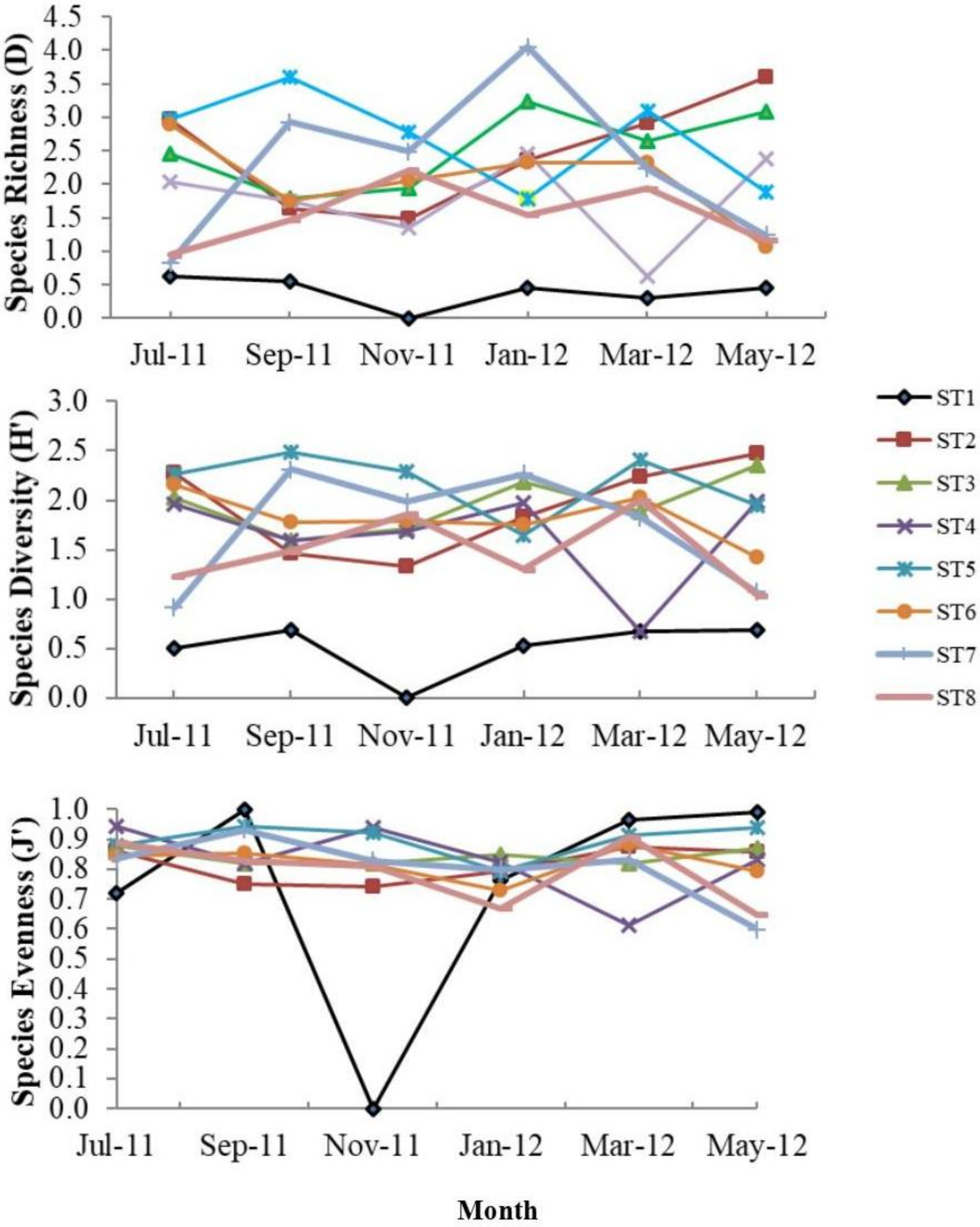


Figure 3. Temporal variation of diversity indices of brachyuran in the Setiu Lagoon from six sampling periods starting July until May 2012

Table 1. Report of occurrence of the intertidal brachyuran crab in Malaysia and adjacent regions

Location	No. of species	Method	Authors
Kapar Mangrove Forest, Port Swettenham, Selangor, Malaysia	32	Enclosure-removal method	Sasekumar (1974)
Matang mangrove Forest, Perak, Malaysia	7	Quadrat (0.4m x 0.4m), hand collected, burrow excavated	Sasekumar & Chong (1998)
Klong Ngao Mangrove, Ranong, Thailand	28	Quadrat (10m x 10m), 15 min time-based collection, hand collected burrowed excavated	Macintosh *et al*. (2002)
Melaka Straits-Andaman Sea Coast of Malaysia and Thailand	28	Quadrat (10m x 10m),15 min time-based collection, hand collected burrowed excavated	Ashton *et al.* (2003a)
Sematan mangrove forest, Sarawak, Malaysia	31	Quadrat (10m x 10m),15 min time-based collection, hand collected burrowed excavated	Ashton *et al.* (2003b)
Bachok, Kelantan	9	Qualitative sampled- visible crab encountered were collected	Sasekumar and Moh (2010)
Teluk Penyabong and Telok Gorek, Mersing, Johor, Malaysia	10	Line-transect (Hand collected)	Cob *et al*. (2012)
Segara Anakan lagoon, Indonesia	49	Enclosure-removal method	Geist *et al*. (2012)
Setiu Lagoon, Terengganu, Malaysia	44	Quadrat (10m x 10m), 15 min time-based collection, hand collected burrowed	Present study

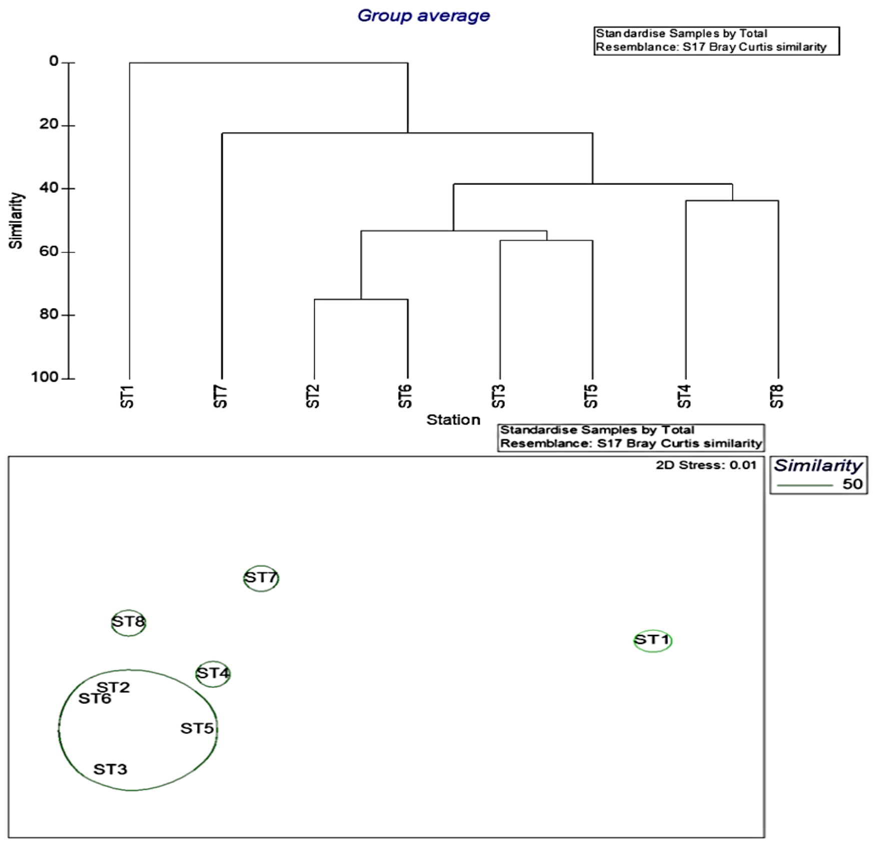


Figure 4. Dendogram produced by cluster analysis showing the percentage of similarity of intertidal brachyuran species collected in Setiu Lagoon

Table 2. The occurrence of brachyuran crab in intertidal of Setiu Lagoon

Species	Mix mangrove	*Nypa fruticans* Mangrove forest	Exposed sand-muddy tidal-flat	Subtidal	Beach
P. indiarum	√	√			
P. eumolpe	√				
P. plicatum			√		
C. merguiense	√	√			
L. politum		√			
E. singaporense	√	√			
Haberma sp.		√	√		
Stelgistra sp.			√		
Nanosesarma sp. 1			√		
Nanosesarma sp. 2			√		
Neosermatium sp.1			√		
V. literata	√		√		
Hemigrapsus sp. 1			√		
M. elegans	√	√	√		
M. latifrons	√		√		
M. frontalis	√		√		
O. ceratopthalmus					√
O. cordimanus					√
U. (Austruca) annulipes			√		
U. lactea(Gelasimus) parplexa			√		
U. (Tubuca) vocans	√				
Macropthalmus sp.1					
Macropthalmus sp.2					
Dotilla sp.			√		
Scopimera sp.			√		
Paracleistostoma sp.1					
Paracleistostoma sp.2					
M. aloutos	√	√	√		
T. crenata				√	
P. pelagicus				√	
S. paramamosain				√	
S. tranquebarica				√	
S. olivacea				√	
E. dentatus				√	
N. callidae				√	
B. socialis			√		
B. mangromorphy			√		
P. punctata			√		
H. glabra			√		

Brachyuran Communities Structure in Relationship with Environmental Parameters

Distribution of particle size is shown in Table 3. The mean size value ranged from 1.21 to 1.75 phi (ø). The sediment surface total organic matter (TOM) showed variation across the stations. The percentage of surface TOM ranged from 0.99 to 12.4 (Table 4). There was significant difference between the temporal variations ($p<0.0001$). However, the only significant difference occurred between ST7 and ST2 ($p<0.05$) and ST3 ($p<0.05$). The *in situ* water parameters were varied between the stations ($p<0.05$). Generally, water temperature ranged from 28.55 ℃ to 31.4 ℃. The salinity was significantly different between the stations ($p<0.05$). The highest salinity was recorded in ST1 (32.48 PSU). Most of the stations located at central part of the lagoon where the salinity ranged between 17.64 and 18.63 PSU. The southern region (ST7 – ST8) is characterised with low salinity (3.75 – 9.05 PSU). ST1 also recorded high pH value (8.36 – 9.68) followed by the stations at the central part of the lagoon (ST2, ST3, ST4, ST5) with pH value range between 6.41 and 8.34. Dissolved oxygen values showed significant difference between the stations ($p<0.05$). Dissolved oxygen (DO) values ranged between 4.47 and 8.35 mg/L. The summary of Pearson's correlation analysis is shown in Table 6. Based on the analysis, the values of coefficient correlation (r) indicate that species diversity (H') was negatively strong correlated with pH, salinity and dissolved oxygen. Species diversity was also positively strong correlated with skewness. However, the only significant correlation was observed between H' and pH (r = -0.89; p<0.05) and salinity (r = -0.82; p<0.05). Similar to species diversity index, species richness (D) showed significant correlation with pH (r = -0.83; p<0.05) and salinity (r = -0.75; p<0.05).

Based on RDA graph (Figure 5), ST4, ST8, ST7 and ST1 were ordinated separately from other stations having correlation with pH, salinity, medium sand, very coarse sand, fine sand, very fine sand, silt and clay and organic matter. This group correlated with coarse sand, medium sand, dissolved oxygen, and temperature. *Uca* (*Austruca*) *annulipes*, *Uca* (*Gelasimus*) *vocan*, *Dotilla* sp., *Scopimera* sp., *Metapograpsus latifrons*, *Parasesarma plicatum* congregated near to the origin of the axes indicate that these species were widely distributed in the Setiu Lagoon.

Present study showed that most of the grain size in the sampling stations was negatively skewed and this explained the higher proportion of coarser sand than finer sand in almost all stations. It is due to high wave energy and strong current in Setiu Lagoon (Yaakob & Mustapa, 2010). For example, the sediment feeder's species (Family Ocypodidae) may occur in different habitats related to grain size properties. The ocypodidae crabs possess specialised mouthparts which are adapted to different grain size, related to their feeding mode of sieving the sediment (Crane, 1975). The mean surface TOM decreases in the coarser and increases in fine sediment. The highest percentage of organic matter was recorded in ST7 (*Nypa fruticans* mangrove forest) and ST3 (Mix mangrove nearest to sea bass cage culture). The total amount of silt and clay was also high in both stations. The sediment properties of ST7 might reflect the occurrence of high densities of *Metaplax elegans* and showed declination in species richness and species diversity in this station. In fact, a high percentage of organic matter at ST7 had resulted in a reduction in the number of crab species. The study carried out by Geist *et al*. (2012) indicated that in disturbed mangrove due to logging activity resulted in low species richness brachyuran diversity due to dominating the single species. Present study suggested that *M. elegans* have the potential as a bioindicator for environmental disturbance in the mangrove forest including mangrove clearance and reduction of environmental parameters.

Table 3. Sediment grain size distribution, total organic matter (TOM) and statistical parameters of the sediment grain size in all stations collected from six sampling periods from July 2011 until May 2012 (July 2011, September 2011, November 2011, January 2012, March 2012 and May 2012)

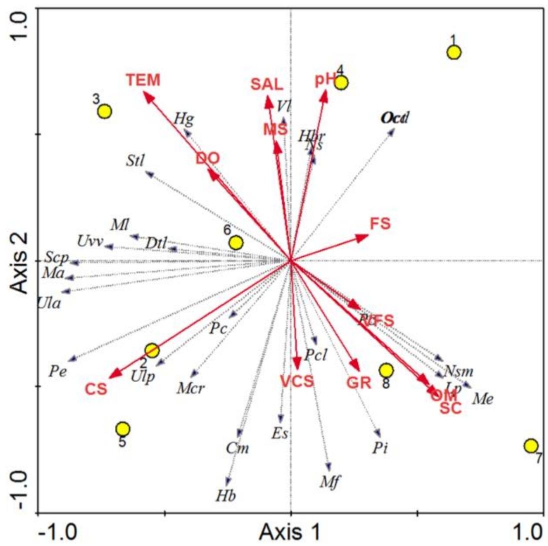
Sediment parameters	Station							
	ST1	ST2	ST3	ST4	ST5	ST6	ST7	ST8
Grain size (%)								
Granule *	1.0	0.35	1.2	3.2	5.0	4.4	7.2	0.5
Very Coarse sand *	3.6	4.9	10.8	10.4	14.7	14.1	18.3	6.2
Coarse sand *	13.7	25.9	26.4	18.8	27.1	29.6	21.8	22.3
Medium sand *	64.4	45.5	40.5	22.0	28.6	39.1	21.1	33.8
Fine sand *	17.0	19.4	18.5	28.6	15.7	11.3	19.2	27.1
Very fine sand *	0.19	3.4	2.5	15.7	7.8	1.3	9.5	8.7
Silt and clay *	0.10	0.32	0.24	1.42	1.1	0.2	2.8	1.4
Mean (ø)	1.36	1.60	1.41	1.57	1.27	1.15	1.21	1.75
Sorting (ø)	0.94	0.85	0.93	1.15	1.12	0.98	1.29	0.94
Skewness (ø)	-0.44	-0.33	-0.32	-0.50	-0.24	-0.37	-0.11	-0.33
TOM	1.6	2.4	1.9	4.6	4.1	1.0	12.4	2.5

* Granule = 4 mm, Very coarse sand = 2 mm; Coarse sand = 1 mm; Medium Sand =250 µm; Fine sand = 150 µm; Very fine sand = 163 µm; Silt and clay = <63 µm

Table 4. Pearson-Linear Correlation *r* between each environmental variable and indices; species richness (D), species evenness (J'), and species diversity (H')

Community structure indices	D		J'		H'	
	r	p	*r*	p	*r*	p
***In situ* water parameters**						
pH	-0.83	0.01*	0.51	0.20	-0.89*	0.00*
TEM	-0.46	0.25	0.02	0.96	-0.47	0.24
SAL	-0.75	0.03*	0.25	0.55	-0.82	0.01*
DO	-0.49	0.22	0.37	0.36	-0.54	0.17
Sediment						
Mean ø	-0.34	0.42	-0.48	0.22	-0.20	0.63
Sorting ø	0.30	0.47	-0.34	0.42	0.25	0.54
Skewness ø	0.61	0.10	-0.19	0.65	0.52	0.19
Silt + clay	0.31	0.45	-0.54	0.17	0.32	0.45
TOM	0.28	0.5	-0.45	0.27	0.24	0.57

*The values *r* was significant at $p<0.05$



*Yellow circle: Stations (ST1 - ST8); Red Arrow: Environmental parameters (GR-Granule, CS-Coarse sand, VCS-Very Coarse sand, MS-Medium sand, FS-Fine sand, VFS-Very fine sand, SC-Silt and clay, OM-Total organic matter, SAL-Salinity, pH, DO-dissolved oxygen, TEMP-Temperature, Grey arrow: Brachyuran crab species.

Figure 5. Triplot diagram of RDA showing the relationship between brachyuran communities with the environmental variables in the Setiu Lagoon

The Setiu Lagoon experienced the fluctuation of salinity from freshwater to brackish. Among the water parameters, community structure of brachyuran crab is best expressed by their relation with salinity and pH. For example, low salinity in ST8 at the south part which two river systems flow namely Chalok and Setiu River might explain the absence of *Scopimera* sp. and *Dotilla* sp. Several studies reported that salinity is important parameter of the succession of brachyuran crab larvae (Samuel & Soundarapandian, 2010). In depth study is needed to investigate the effects of salinity on the brachyuran community structure in this lagoon as this lagoon experienced the fluctuation of salinity from freshwater to brackish.

CONCLUSION

Sesarmidae and Ocypodidae were the main contributors for the brachyuran species in the intertidal of Setiu Lagoon and Portunidae were the common species caught in the subtidal area. Present study revealed that certain species are exclusive to certain habitats. Heterogeneity of habitats (mangrove, tidal flats and sandy beach) had promoted suitable niches for brachyuran crab species in this lagoon. The brachyuran crab species composition was higher in mixed mangrove forest (ST5). The stations with less vegetation covered showed the reduction in number of species, and this led to decreasing diversity index (H'). Among the environmental parameters, community structure of brachyuran crab is best expressed by their relation with sediment type, salinity and pH. Detailed investigation should be carried out for better understanding of brachyuran crab distribution in Setiu Lagoon. It is hoped that the documentation of the brachyuran crab species in the present study will encourage future study of ecology and taxonomic in this lagoon.

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