

Short Communication: Population structure of mangrove crab *Scylla oceanica* in mangrove ecosystem of Tanjung Lesung, Banten, Indonesia

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Abstract. Pudiawati T, Patria MP. 2017. Short Communication: Population structure of mangrove crab *Scylla oceanica* in mangrove ecosystem of Tanjung Lesung, Banten, Indonesia. *Biodiversitas* 18: 813-817. The mangrove crab *Scylla oceanica* is one of the dominant crabs in the mangrove ecosystem at Tanjung Lesung Beach, Banten, Indonesia. The aim of the study was to determine the temporal distribution, carapace width-weight relationship and condition factors of *S. oceanica*. The crabs were collected by using traps for four months from August to November 2015. It was observed that the carapace was larger in male crabs (9.97 cm) than in female crabs (9.34 cm) and the average weight of the males (206.08 g) was higher than that of the females (183.83 g). *b* value of male (1.955) and female (2.123) crabs were significantly different ($P < 0.05$). Both of them have a negative allometric growth pattern. The result of the distribution analysis was a Morisita spread index *I*_d of 1.5176; this indicates the crabs have clustered distribution patterns and their distribution was allegedly associated with the reproductive cycle.

Keywords: *Scylla oceanica*, mangrove, carapace width-weight relationship

INTRODUCTION

Since 1980, mangrove crab fisheries have become an important commodity with high economic value in Indonesia (Cholik 2005). The growth of the mangrove crab is influenced by internal and external factors. Internal factors consist of sex, age, nutrition and disease resistance, while external factors such as water quality, predator, and habitat or mangrove condition (Effendi 1997; Levay and Walton 2007). Distribution patterns of the mangrove crabs depend on the spawning season, age and the relationship between the crab with environmental changes (Sulaiman and Hanafi 1992; Sherazul et al. 2013).

Mangrove crabs *Scylla oceanica* and *Scylla serrata* are fast growing crab species and their eggs are commonly available in shallow coastal waters, lagoons, estuaries and intertidal swampy mangrove areas of Banten and are prone to overfishing. The crab *S. oceanica* is widely preferred by consumers as it grows to the biggest size (Marichamy 1996; Anil and Suseelan 2001). According to Catacutan (2002), this type of crab is a valuable food source for local people because of its high nutritional value.

The Tanjung Lesung mangrove of Banten is located between 6°21'-7°10' South latitude and 104°48'-106°11' East longitude and are intensively used for harvesting mangrove crabs in Indonesia. Mangrove crab fishing has been practiced by people of Tanjung Lesung, Panimbang sub-district, Pandeglang, Banten, Indonesia for a long time, which causes a major decline of mangrove crab populations in this mangrove ecosystem; as it happens in the surrounding area (Irnawati et al. 2014). The pressure

increases due to turning the coastal areas into tourist area (Sugiwo 2014).

Biological information of mangrove crab needed as a basis for conservation management of these crabs and mangrove ecosystems (Paital 2012). Therefore it is necessary to do research with the aim to analyze the crab, *Scylla oceanica*, in terms of distribution, carapace width, and body weight. It can be used to determine the condition of mangrove crab population in the mangrove ecosystem of Tanjung Lesung, Pandeglang, Banten, Indonesia.

MATERIALS AND METHODS

The study was conducted between August and November 2015 at the mangrove forest area of Tanjung Lesung Beach, Panimbang sub-district, Pandeglang, Banten, Indonesia using three sampling stations; station 1 in Mekarsari Village, station 2 in Citeureup Village and station 3 in Tanjung Jaya Village. They represent three different types of mangrove forests; station 1 is mangrove forest rehabilitation; station 2 is a natural mangrove forest areas that are close to human settlement; and station 3 is natural mangrove forest areas far from residential areas. (Figure 1).

The crabs were captured using traps placed randomly with three repetitions in each station. In each sub-station (10 m x 10 m), trap positions on each repetition were always changing, which is expected to occupy the entire plot observations. The traps size were 40 cm x 25 cm x 15 cm, with a mesh size of 1.5 cm. The traps filled with small

fish or shrimp as bait to attract the crabs to get into the trap. Collected mangrove crabs were identified as gender, weighed (g) and measured in length and width of the carapace (cm) using the caliper and the scales.

Data analysis

The relationship between the width of the carapace and their weight was analyzed using a regression by equation $W = aLb$, where W is the weight (g), L is the width of the carapace (mm), a and b are regression constants (Effendie 1997). To see the significance of the regression, analysis of variance (ANOVA) was performed with a confidence level of 95%.

RESULTS AND DISCUSSION

Density of *Scylla oceanica* population by sex

During sampling of *Scylla oceanica*, as many as 172 individuals were collected from three stations, consisting of 108 males (62.8%) and 64 females (37.2%). The population density of male crabs (*S. oceanica*) was 18.3 individuals/station in the first station, the second station consists of 14.3 individuals/station and the third station was 3.3 individuals/station. The population density of female *S. oceanica* crabs was 11.3 individuals/station in the first

station, the second station consists of 8.3 individuals/station and the station III was 1.7 individuals/station. It was observed that the population densities of male crabs were higher (12 individuals/station) than female (7.1 individuals/station). (Table 1).

Size composition of *Scylla oceanica*

The weight and size of collected crabs were variable. The smallest size of female crabs was 95 g, while the largest size was 495 g. From Table 2, it can be seen that the average weight of male and female crabs found in Tanjung Lesung, Banten amounted to 197.80 g with a lower limit of 187.54 g and the upper limit of 208.07 g (95% CI). If separated, the average weight of the female crab was 183.83 g and 206.08 g for the male crab. We found that the crabs weigh more than 200 g only 52 individual (48.15%) in male and 17 individual (26.56%) in female respectively.

Table 1. Density of mangrove crab population by sex in Tanjung Lesung Beach, Pandeglang, Banten, Indonesia

Station	Number of Individuals caught			Population density	
	Males	Females	Total	Males	Females
1	55	34	89	18,3	11,3
2	43	25	68	14,3	8,3
3	10	5	15	3,3	1,7
Average				12,0	7,1



Figure 1. The location of sampling stations in Tanjung Lesung Beach, Panimbang sub-district, Pandeglang, Banten, Indonesia. A. Station 1 in Mekarsari Village, B. Station 2 in Citeureup Village, C. Station 3 in Tanjung Jaya Village

Composition of carapace width in *Scylla oceanica*

Carapace width ranged from 6.8 to 14.5 cm in male and from 7.1 to 13.5 cm in the female. The average width of the crab carapace was 9.74 cm, the average for female crab was 9.34 cm and for the male crab 9.97 cm (Table 2). The average estimate of mangrove crab carapace width of males and females at stations 1, 2, and 3 can be seen in Figure 2.

Growth patterns of *Scylla oceanica*

The weight of female crabs ranged from 95-495 g while the weight of male crab ranged between 100-420 g. Carapace width of female crabs ranged from 6.8 to 14.5 cm while carapace width of males ranged from 7.1 to 13.5 cm. Carapace length of female crabs ranged from 5.5 to 10.2 cm while carapace length ranged from 5.2 to 9.6 cm in males. (Table 3). The analysis of data for weight and length of *S. oceanica* is shown in Table 4.

The results show that the total relation carapace width and weight of male crabs are as follows: $\text{Log } W = 0,351 + 1,955 * \text{log } L$ ($b = 1,955$) then, that of female crabs are as follows: $\text{Log } W = 0,188 + 2,123 * \text{log } L$ ($b = 2,123$). The result of a combination of both is $\text{Log } W = 0,285 + 2,022 * \text{log } L$ ($b = 2,022$).

Based on the value b of the equation ($b < 3$), then the pattern of growth male crabs are *negative allometric*, that means the increase of carapace width is faster than the increase of weight gain. Likewise, the female crab's growth is *negative allometric* too. It can be concluded that the growth pattern of both male and female mangrove crabs (*Scylla oceanica*) is *negative allometric*, which means the increase of weight gain is not as fast as the increase in carapace width.

The distribution pattern

By using the formula of Morisita spread index ($I_d = 1.52$), the analysis of the distribution pattern of *S. oceanica* at three stations in Tanjung Lesung, Banten, shows $I_d > 1$, which indicates that the distribution of species was assumed to be clustered.

Discussion

The population densities of the crab *Scylla oceanica* is larger in males (12 individuals/station) than females (7.1 individuals/station). These results are consistent with the suggestions of Siahainenia (2008) who states that based on the life cycle and behavior, adult female crabs tend to leave the mangrove forest to migrate towards the sea for reproduction in search of waters with relatively stable environmental parameters. In accordance with Hill (1975) the dominance of male crabs may occur during the female reproductive migration. The crabs mate in the waters of the mangrove area and female gradually migrate to the sea to spawn in accordance with the development of eggs, while the male crabs remain in the mangroves or estuaries during this period. In line with this, Webley et al. (2009) said that the crab *S. oceanica* is a type of organism that does migrate (swimming) during their life cycle, so that at each stage of his life *S. oceanica* occupies different habitats by their needs. Bonine (2008) says the environmental conditions allow crabs to survive up to the age of 3-4 years and reach a size of maximum carapace width of more than 200 mm.

The capture of crabs (*Scylla* spp and *Portunus* spp) is regulated in the Circular Letter of the Minister of Marine Affairs and Fisheries No. 18/MEN-KP/1/2015 About Catching Lobster (*Panulirus* spp). It states that from January 2015 until December 2015, the weight of mangrove crabs that may be captured is more than 200 g. Under this regulation, as much as 48.15% of the male crabs and only 26.56% of the female crabs that were caught during the study were as regulated by the Minister of Marine Affairs and Fisheries.

Table 3. Width measurement results, carapace length and weight of male crabs in Tanjung Lesung Beach, Pandeglang, Banten, Indonesia

Gender	Number of crabs	Mangrove crab weight (g)	Carapace width (cm)	Carapace length (cm)
Female	64	95-495	6.8 to 14.5	5.5 to 10.2
Male	108	100-420	7.1 to 13.5	5.2 to 9.6

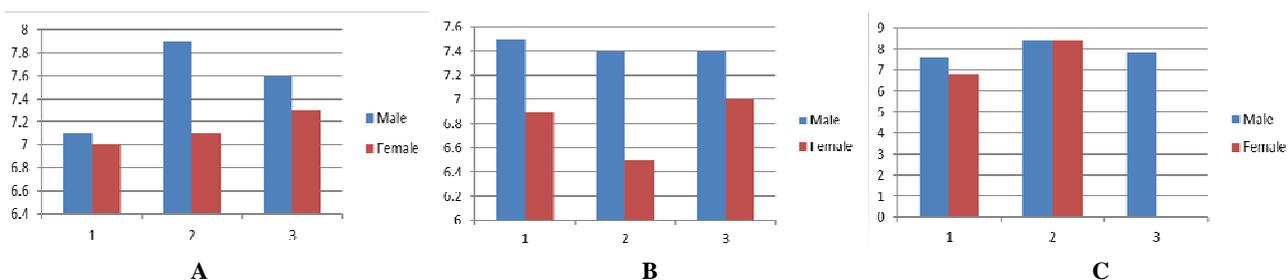


Figure 2. Crab carapace width for males and females in three stations in Tanjung Lesung Beach, Pandeglang, Banten, Indonesia. A. Station 1 in Mekarsari Village, B. Station 2 in Citeureup Village, C. Station 3 in Tanjung Jaya Village

Table 2. Comparison of the size of the body of mangrove crab in Tanjung Lesung Beach, Pandeglang, Banten, Indonesia

Body size		N	Mean	Std. Dev.	Std. Error	95% Confidence interval for mean		Min.	Max.
						Lower bound	Upper bound		
Weight (g)	Female	64	183.83	77.259	9.657	164.53	203.13	95	495
	Male	108	206.08	61.074	5.877	194.43	217.73	100	420
	Total	172	197.80	68.187	5.199	187.54	208.07	95	495
Carapace Width (cm)	Female	64	9.341	1.5309	.1914	8.958	9.723	6.8	14.5
	Male	108	9.973	1.4330	.1379	9.700	10.247	7.1	13.5
	Total	172	9.738	1.4975	.1142	9.512	9.963	6.8	14.5
Carapace Length (cm)	Female	64	7.110	1.0318	.1290	6.852	7.368	5.5	10.2
	Male	108	7.525	.9880	.0951	7.336	7.713	5.2	9.6
	Total	172	7.370	1.0214	.0779	7.217	7.524	5.2	10.2

Table 4. Equation weight relationship and mud crab carapace width of male and female in Tanjung Lesung Beach, Pandeglang, Banten, Indonesia

Coefficients^{a, b}

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error			
1	(Constant)	.351	.048		7,284	.000
	LogWidth	1,955	.048	.969	40,372	.000

Gender = Males

Coefficients^{a, b}

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error			
1	(Constant)	.188	.067		2,825	.006
	LogWidth	2,123	.069	.969	30 844	.000

Gender = Females

Coefficients^{a, b}

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error			
1	(Constant)	.285	.039		7,381	.000
	LogWidth	2,022	.039	.970	51,633	.000

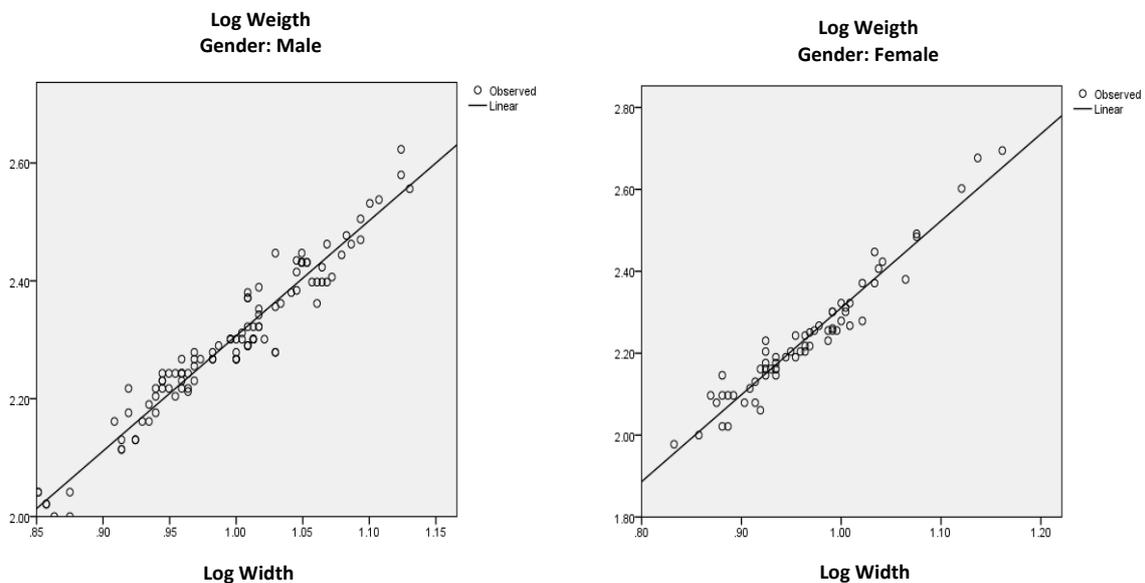


Figure 3. Carapace width and weight relationship of mangrove crabs in Tanjung Lesung Beach, Pandeglang, Banten, Indonesia

Scylla oceanica males and females show a *negative allometric growth*. According to Effendie (1997), negative allometric growth indicates that the width of the carapace grows faster than the crab can gain body weight. It is suspected that there is a close connection with the process of molting (the release of the shell) that occurs in the group of crustaceans, including crab. As stated by Kordi (1997), that after each of these molting processes, the crab will increase their weight around 1/3 times that of the previous body weight and the carapace width will be increased 5-10 mm (approximately two times the original size) in adult crabs.

The distribution pattern of *S. oceanica* at three stations in Tanjung Lesung was clustered. The clustered distribution patterns of species happen if individuals living in the community have a need for the same environmental factors (Levay and Walton 2007). In this case, the crab (*Scylla oceanica*) clustered distribution pattern can be allocated to the same need for environmental factors such as salinity, pH, temperature, substrate composition of the fractions, and the fulfillment of foods derived from mangrove ecosystem in Tanjung Lesung, Banten.

Catches of mangrove crabs (*Scylla oceanica*) at mangrove ecosystem Tanjung Lesung, Banten, are dominated by males at 62.8%, because their carapace width ranges from 6.8 to 14.5 cm of which 53.70% had sexual maturity, while the female crab carapace width ranging from 7.1 to 13.5 cm and only 28.13% have sexual maturity. Wijaya et al. (2010) suggest that the mangrove crabs have full-grown genitals development if their carapace width is more than 100 mm. Based on this, 53.70% of the male and 28.13% of the female crabs caught during the study were sexually mature.

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