Study on the crab family Portunidae from Zeephyuthaung and SabelarCoastal areas

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Abstract

A total of 8 species of branchyuran crabs belonging to 3 genera of the family Portunidae were recorded from the two study areas, Zeephyuthaung(Lat. 15° 11′N, Long. 97°47′ E) and Sabelar(Lat. 16° 14′N, Long. 97°32′ E) from January 2012 to December 2015. During the study period, all of these 8 species were collected from Zeephyuthaung and 6 species from Sabelar area. The two species of *Portunus* (*Portunuspelagicus* and *P. sanguinolentus*) was not observed in Sabelar. Some population aspects such as size distribution and length (carapace width)-weight relationship of *Scylla* species were also studied. The lengths of 3cm to 15 cm in both sexes were observed the size distribution (carapace width) for each month. Allometric growth (symmetrical) was found in both sexes. The catch weight and catch per unit effort (CPUE) of *Scylla* species were higher in Zeephyuthaung than Sabelar coastal area.

Key words: classification, distribution, family Portunidae, population aspect.

Introduction

Mon State in Myanmar is one of the regions famous for its inland and offshore. Its climate condition also gives tendency to abundance of crab fauna. Portunid crabs are one of the most commercial functions in the Mon coastal areas. Crabs are decapods crustaceans, their eyes are on short stalks and they have short, broad and more or less flattened bodies (carapace) with small abdomens that are folded under the thorax. According to Bouchard *et.al* (2011), crabs play on important role in marine benthic communities ranging from intertidal to deep waters. There is a large variety of crab species occupied along the coastal areas of Myanmar. Many species of crabs were collected in different habitats such as rocky shore, sandy beach and muddy mangrove areas.

One of the portunid crab *Scylla sp.*are economically important species and are edible and a favorite dish for many nations. Many earlier researchers had studied the crabs in many aspects such as taxonomy, distribution and abundance and economic values in different areas. The assessments of population characteristics such as sex composition (sex ratio) size-group distribution and length-weight relationship are of great important tools and are very useful in fishery managements: the estimation of population size of a stock for the purpose of its exploitation. The analysis of the carapace width-weight relationship can be an indication of some important events in the life history of fishes such as maturity and growth (Muhanmed and Javed, 2013). Moreover, this study was also used to calculate biomass of crabs (Lagler, 1908; Muhanmed and Javed, 2013). The present study is an attempt to identify and describe the various portunid crabs collected from Mon coastal areas(Zeephyuthhaung and Sabelar), to assess some population aspects and to know some information of crab fishery sector in the study area with aim of contributing in part, to the future crustacean fisheries delve.

Materials and Methods

Study sites and study period: The study was conducted at the two study sites of Mon Coastal area: Zeephyuthaung(Lat. 15° 11′N, Long. 97°47′ E)andBilukyune (Sabelar)(Lat. 16° 14′N, Long. 97°32′ E) in from January 2012 to December 2015. The location of study areas were shown in Fig.1.

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Sample collection and identification: The samples were collected out monthly from the study areas. After collection, individual crabs were measured the carapace width (cm) and body weight (kg) by using vernier caliper and kilo balance. The investigation was separately carried out for both sexes. The colorations, localities and date of collection of the crabs were noted immediately after they have been caught. After that, crabs were washed and took photographs by using digital camera and then immersed in 10% formalin forfarther study.Species identification was largely based on the F.A.O species identification sheets and some identification guide books. Diagnostic characters of the specimen were following after Alcock (1985, 1900), Carpenter and Niem (1998), Keenan 1998, Chhapgar (1956), Motoh (1980), De Man (1988), Peter (2008) and previous workers.

Size distribution and Carapace width-weight relationship: Data on monthly size distribution and carapace width weight relationship were emphasized on both sexes of *Scylla* species. The collected samples were grouped as the six size- groups with class interval three, ranging from 3 cm to 15 cm such as 3-5; >5-7; >7-9; >9-11; >11-13; >13-15 respectively.Measurements of carapace width and body weight were carefully made in individual crabs. The carapace width was measured across the widest part of the carapace from the left to the right lateral spines. The weights (kg/g) were taken using kilo-balance. The carapace width and weight relationship was examined the equation as, $W= \alpha L^{b}$, which was followed after Pauly (1993) as:W is the weight of crab, α is the antilogarithm of intercept (a), L is the carapace width and b is the slope

Catch data collection: In each field work, monthly catch data of *Scyllasp*. were collected (watching and collecting)in each station from local fishermen. Catch per unit effort (CPUE) was computed the total catch weight kg per month of crabs to total number of boats practiced in the activities in that month.

Fig. 1.Map showing the samples collecting sites; 1.Zeephyuthaungand 2.Sabelar

Result

A. Classification of collected crab species from the study areas

A total of 8 species, 3 genera of families Portunidaebelonging to Order Decapodaunder PhylumArthropoda were collected from the study areas during study periods. Among the recorded species 2 species included in the genus *Scylla*(*Scylla serrata* and *S. olivacea*)and *Portunus* (*Portunuspelagicus*and*P. sanguinolentus*) and 4 species in the genus *Charybdis*(*Charybdis natator*, *C.annulata*, *C.cruciata*and *C.affanis*).The classified list and illustration of portunid crabs of the study areas were presented in Table 1 and Fig.2.

Table1. The Classification List of portunid crabs from the study areas.

Phylum	Class	Order	Family	Genus	No.	Species
Arthropoda	Crustacean	Decapoda	Portunidae	*Charybdis*	1	*Charybdis natator*
					2	*C. annulata*
					3	*C. cruciata*
					4	*C. affanis*
				Scylla	5	*Scylla serrata*
					6	*S. olivacea*
				Portunus	7	*Portunussanguinolentus*
					8	*P. pelagicus*

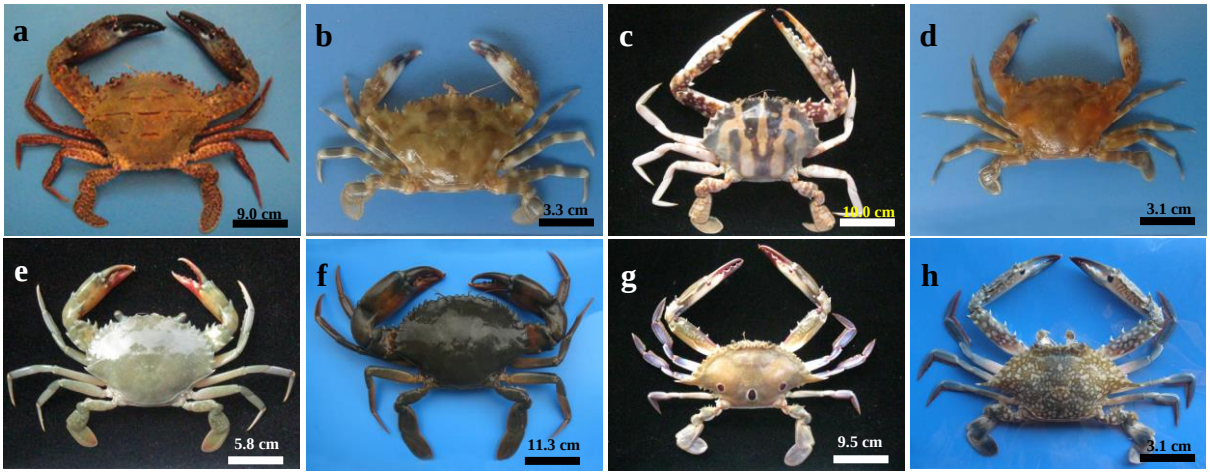

Figure 2. a) *Charybdis natator*; b) *C. annulata*; c) *C. cruciata*; d) *C. affanis*; e) *Scylla serrate*; f) *S. olivacea*; g) *Portunussanguinolentus*; h) *P. pelagicus*

B. Occurrence and distribution of crabs in the study area

The present study was conducted on two coastal areas during the study period were presented in Table 2. Among the recorded species, almost all (eight) species were observed in Zeephyuthaung coastal area while six specieswere recorded from Sabelarcoastal area.

Table 2.Occurrence and distribution of portunid crabs among study areas of Mon coast.

No.	Species	Zeephyuthaung	Sabelar
1	*Charybdis natator*	+	+
2	*C. annulata*	+	+
3	*C. cruciata*	+	+
4	*C. affanis*	+	+
5	*Scylla serrata*	+	+
6	*S. olivacea*	+	+
7	*Portunussanguinolentus*	+	-
8	*P. pelagicus*	+	-
	Total	8	6

Abbreviation; + present; - absent

C. Size distribution of *Scylla* species in both sexes

At least a number of 92 samples with the size group (carapace width) of class interval three from the length 3 cm to 15 cm in both sexes were used to observe the size group for each month in Zeephyuthaung and Sabelar.

Monthly size group distribution of male and female *Scylla* species in Zeephyuthaung: This study was presented in Fig.3. For male sample, all size group (>3-5cm,>5-7cm, >7-9cm, >9-11cm and >11-13cm) were recorded in the month of March, April, May, July, August, November and December. In January, February and June, except crabs with the carapace width of (>3-5 cm), all of the remaining size group were observed. In the month of September and October only four size group (,>5-7cm, >7-9cm, >9-11cm and >11-13cm) were recorded. Nearly equal number of crabs were observed in the size groups of >7-9cm and >11-13cm in February. The size group >3-5cm

and >13-15cm were recorded in smaller number than the other size group in all months. For female sample, all size group (>3-5cm,>5-7cm, >7-9cm, >9-11cm and >11-13cm) were recorded in the month of April, July, August, October, November and December. Most abundant number of the size group >7-9cm was found in July and least in February. In January, February, June and September, all size groups, except the crabs in >3-5cm carapace width, were recorded. In March, except the size group >13-15cm, all size group were observed. In May and June, except the size group >3-5cm and >13-15cm, all of the remaining size group were observed. The size group (>3-5cm,>5-7cm and >13-15cm) were also recorded but fewer number than the other size group.

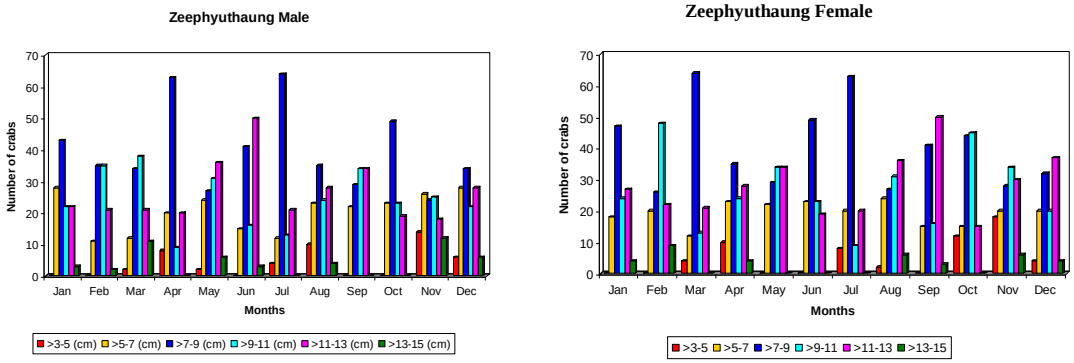

Fig 3.Month wise length frequency of male and female *Scylla sp.* in Zeephyuthaung.

Monthly size distribution of both male and female *Scylla* species in Sabelar :For male crabs included in the size group of >3-5 cm were not totally recorded in the months of February, June, July and October as well as those of the size group of >13-15cm were not noted in May and June. The size group >5-7cm was highestin May and lowest found in June. Crabs with the size group >7-9cm was highest in October while in April it was lowest. The carapace width >9-11cm was highest in April and the lowest was December. The size group >11-13cm was most abundance in December but in November it was smallest in numbers. The remaining size group (>3-5cm and >13-15cm) were also recorded but fewer in number than the others. For female crabs, individual crabs in the size groups of >3-5cm dominated in May, August, November and December. All size groups were recorded in the months of January, April, August, September, November and December. In the month of April, except >13-15cm, all size group were recorded. The crabs>5-7cm was highest in May but in June and September it was found in smaller numbers. The size group >7-9cm was dominated throughout the year and the most abundance was found in June and September but in February it was the least abundance month. The size group >9-11cm was highest in July and lowest in May. In December (>11-13cm) size group was most abundance and in January, it has lowest. The remaining size group (>3-5cm and >13-15cm) were also observed but smaller number than other size groups in all months. (Fig.4.)

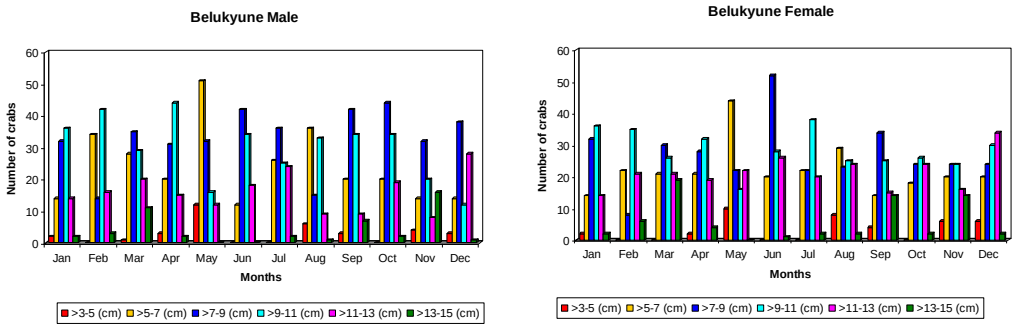

Fig 4.Month wise length frequency of male and female *Scylla sp.* in Sabelar.

D. Length (carapace width)-weight relationship

Totally 2156 numbers of crabs (*Scylla sp*.) in both sexes which were collected from Zeephyuthaung and Sabelarwere examined to observe the length-weight relationship (LWRs). According to this investigation, there were correlation between carapace width and weight in both sexes at the two study sites.

Carapace width-weight relationship of male and female *Scylla sp.* in Zeephyuthaung: A number of at least 729 sample crabs ranging from 3cm to 15cm, with the weight of ranging from 13g to 670g were used to examine this study.The relationship between carapace width and weight of male *Scylla* spp. in this area gave the equation as $W= 7.929L^{1.263}$, with the correlation coefficient $R^2 = r = 0.925$ while that of the female gave the equation as $W= 1.625L^{2.130}$with the correlation coefficient $R^2= r = 0.918$. In this study, the less value of b ($b<3$) in both sexes indicated the allometric growth although there were correlation (r value approached to 1) between carapace width and weight in both sexes. (Table 3, Fig.5)

Table 3. Length relationship and related statistics of*Scylla sp.* from Zeephyuthaung

Species/ Sex	n	Carapace length (cm)				Weight (g)				Regression parameters		
		min	max	mean	sd	min	max	mean	sd	a	b	r^2
Male	729	3	14.9	8.4	±3.2	25	277	120	±60.4	7.929	1.2632	0.925
Female	729	3	15	8.8	±2.8	13	670	192.8	±141.7	1.625	2.1303	0.918

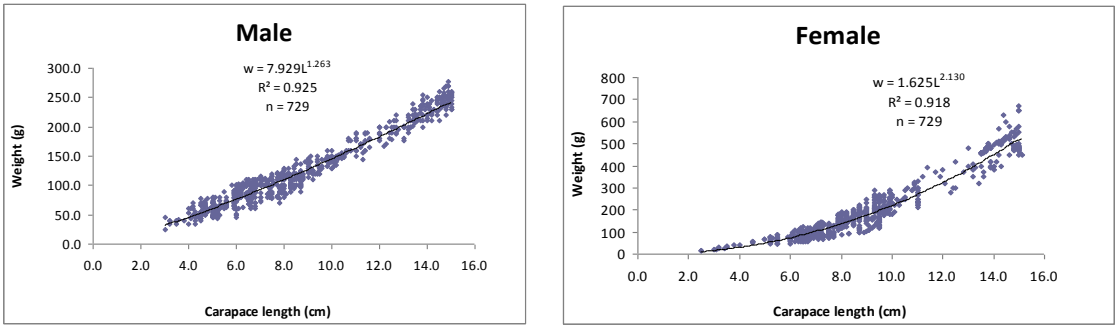

Fig5.Power regression analysis in length-weight relationship of male and female *Scylla sp.* at Zeephyuthaung

Carapace width-weight relationship of male and female *Scylla sp.*Sabelar:At least 349 male and female crab samples, ranging from 3cm to 15cm and 22g to 400g were investigated in the study.The relationship of male *Scylla sp.* showed as $W=2.4407L^{1.9687}$ with the correlation coefficient $R^2 = r = 0.9741$. The value b=1.9687, was less than 3, indicating the allometric growth as well as the correlation coefficient purchased to 1, proved the relationship between length and weight of the samples. The relationship between carapace width and weight of female *Scylla sp.* gave the equation as $W=2.704^{L1.915}$ with the correlation coefficient $R^2 = r = 0.954$. The value b= 1.92, was less than 3 and this showed the allometric growth of it and the correlation coefficient, r approached to 1. This was showed the correlation between carapace width and weight of female crab (Table 4, Fig.6)

Table 4. Length relationship and related statistics of *Scyllasp.*from Sabelar

Species/ Sex	n	Carapace length (cm)				Weight (g)				Regression parameters		
		min	max	mean	sd	min	max	mean	sd	a	b	r^2
Male	349	3	15	9.67	±3.02	15	523	233.65	±136.37	2.440	1.97	0.974
Female	**349**	3	15	10.1	±2.41	13	520	233.38	±108.90	2.151	1.92	0.956

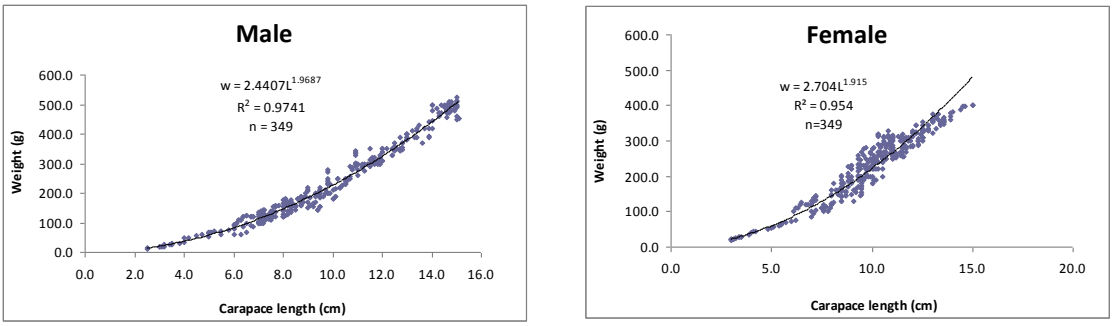

Fig6.Power regression analysis in length-weight relationship of maleand female*Scylla sp.*atSabelar

E. Catch weight (kg) and catch per unit effort (CPUE kg/boat) of *Scylla sp*: In Zeephyuthaung, the catch weight in each month approximately round 2196 kg to 9230 kg per month. Of these, the highest amount was found in January and the lowest amount was recorded in July. The CPUE values for those two months were 87.08 kg/boat and 20.72 kg/boa respectively. In Sabelar, the catch weight in each month approximately round 1538 kg to 3745 kg per month. Among them, the lowest weight was noted in April and the highest was found in December. In CPUE value for those two months were 19.23 kg/boat and 46.82 kg/boat respectively. (fig.7)

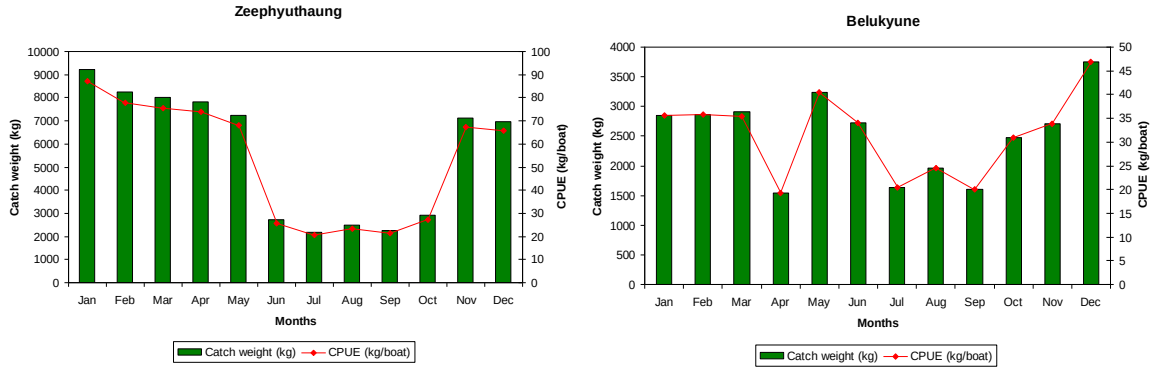

Fig 7. Catch weight (kg) and catch per unit effort (CPUE kg/boat) of *Scylla sp*. at Zeephyuthaung and Sabelar.

Discussion

In the present study, a total of 8speciesofportunid crabs were collected from the study areas during study periods. Among the recorded species, almost all (eight) species were observed in Zeephyuthaung coastal area while six species recorded from Sabelar coastal area.According to the results obtained from the observation of size groups (carapace width) distribution of crabs in both sexes at the two study areas the size group (>3-5cm and >13-15cm) were smaller number than other size groups in all months. In length weight relationship, Muhammed*et.al*. (2013) had cited that the result obtained from an extraordinarily large number of length-weight data taken from a wide varity of crustacean by Pauly (1984) and MiyasaKa*et.al* (2007) showed the values of b<2.5 or b>3.5 are generally based on a very small range of sizes and or such values of b are more likely to be an error. An exponent (b) value of 3 indicates symmetrical or isometric growth and the value other than 3 indicates allometric growth (Muhammed*et.al*. 2013). The study of length-weight and width-weight relationship of *Scylla sp.* by Muhammed and Javed (2013) indicated the value of b was below 3 and this showed the allometric growth for both sexes and there were no significant differences in slopes between males and females. In relation to catch weight and fishing effort, in Sabelararea, the catch weight and CPUE value were high in December that of in

Zeephyuthaung was noted in January. The investigation or assessment on the population characters of a give species may be applied as one of the indicators for the managements of fisheries for any species of salt and freshwater bodies. Continuation of these assessments should be carried out for sustainable utilization of fish.

Conclusion

A total of 8 species of crabs belonging to 3 genera of the family Portunidae were recorded from the two study areas. Study on some population characters: size-group distribution and carapace width-weight relationship of *Scylla sp.* have been carried. In the study areas, except the size of >3-5 cm and >13-15cm, all the remaining size were abundantly observed. According to length weigh relationships, the values of 'b' for both sexes from the two study areas were below 3 and gave the allometric growth and there were no considerable differences between male and female crabs for both study areas. The catch weight and catch per unit effort (CPUE)were higher in Zeephyuthaung than Sabelarcoastal area. As in conclusion,Portunid crabs especially (*Scyllasp.*) provide very good economic gains for local people. Occasionally, local people caught large number of crabs because these crabs inhabited shallow estuaries which were easily accessible at low tide without a boat. So, the conservation and management work has to be needed for sustainable utilization of crabs.

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