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Species abundance distribution of Mud clam (*Polymesoda erosa*) in selected Mangrove wetlands of Butuan Bay, Philippines

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Key words: Length-Weight Relations, Mangrove Wetland, Sustainable Utilization, Adult species, Juvenile Species, Bequibel shell midden, Butuan Bay

Abstract

Abundance distribution of mud clam (*Polymesoda* erosa) was determined in selected mangrove wetlands of Butuan Bay, Philippines. Out of 241 collected individuals of *P. erosa* in site 1 (Pagatpatan); 29 were juveniles and 212 were adults. Site 2 (Camagong) had 238 collected individuals of *P. erosa* where 79 were juveniles and 159 were the adults. The total length (TL) of *P. erosa* in site 1 ranged from 4.2 cm to 8.0 cm with a mean of 4.75 cm and the body weight (BW) of 5.33 g to 168.53 g with a mean of 76.43 g. The TL of *P. erosa* in site 2 ranged from 2.9 cm to 8.0 cm with a mean of 4.29 cm and the BW of 1.36 g to 174.85 g. The equation $W = aL^b$ was used for length-weight relationships (LWRs) analysis expressed as Log W = b log L + log a. Log W = 1.240 + 3.116 (r^2 = 0.916) was used to express the pooled LWRs of *P. erosa* in the two sites. Thus, more juveniles and fewer adults of*P. erosa* with higher weight individuals were noted at site 2 compared to site 1 having fewer juveniles with higher adult individuals but have lighter weights.

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Introduction

Polymesoda erosa, Polymesoda expansa, Polymesoda bengalensis and *Batissa violacea* are the common species of mud clams abundant in Southeast Asia (Morton, 1984).

Indo-west Pacific from India to Vanuatu to the northern and southern island of Japan, and south to Queensland and New Caledonia in where traced of species abundance and distribution of mud clams is highly present (Poutiers, 1998). Mangrove areas are suitable habitats for Corbiculidae due to the abundance source of nutrient (Macintosh *et al.,* 2002).

P. erosa is a filter feeder that can only feed during immersion in settling stage at low-tide where there is frequent inundation.

They feed themselves sufficiently and achieve the critical size at which susceptibility to physical and chemical limits is significantly reduced. Therefore, availability of food with recurrent inundation is the main factor influences on the dispersal of juveniles on the low tide levels (Clemente and Ingole, 2011).

The abundance and activity of mud clams are dependent on the type of substrates in which favorable to facilitate aerial respiration (Clemente and Ingole, 2011). The larval stage of bivalve can entrain by hydrodynamic factors (Bertness *et al.*, 1996); however, it cannot affect the abundance and distribution on the coastline even on a large spatial scale. The distinction of a larval settlement with low abundance near inland region could be due to the unfavorable area thus mortality rate is higher (Gosselin and Qian, 1997). Desiccation and predation have been recommended for many appraisals and studies, thus, may often be the most significant causes of the mortality rate of juvenile invertebrates (Gosselin and Qian, 1997; Hunt and Scheibling, 1997). Previous readings have conventional information that major determinant of vulnerability and impermanence of a species largely dependent on the body size during the first hours or days especially for individuals located in unfavorable areas (Gosselin and Qian, 1997).

Mud clam is considered one of the most important shellfishes in Butuan City since the species is very abundant. The Bequibel shell midden in Barangay Bonbon, Butuan City proves that ancient Butuanons consumed mud clams as part of their diet. In the present time, mud clams still exist; however, human activities often change and alter the distribution and composition of bivalve communities. In this paper, it aimed to assess the abundance distribution of *P. erosa* in Butuan Bay.

Materials and methods

Study Site

Two mangrove ecosystems in Butuan Bay were utilized as study sites. Mantangue Creek in Barangay Pagatpatan is a tributary of Agusan River where site 1 was located. This creek is situated along the mouth of the river basin. Mostly *Sonneratia alba*, *Avicennia* spp. and its association such as *Nepa fruticans* were the common species present in the site. Adjacent to it, site 2was located within the political jurisdiction of Barangay Camagong, Nasipit. It is kilometers of distance away in the river mouth of Agusan River. Camagong mangrove wetland dominated mostly of *Sonneratia alba* and *Avicennia* sp. (Figure 1).

Sampling design

Each of the sampling sites was further subdivided into three stations with (3) 10x10 meters belt transect with a minimum of 50 meters and a maximum of 100 meters interval. All corners in each of the quadrat were gleaned for the collection of *P. erosa*.

Species abundance distribution and size structure of P. erosa

The collected individuals of *P. erosa* in the two sampling sites were used to determine the species abundance distribution and size structure of samples. Some morphological characteristics of *P. erosa* such as length and width were determined using a caliper.

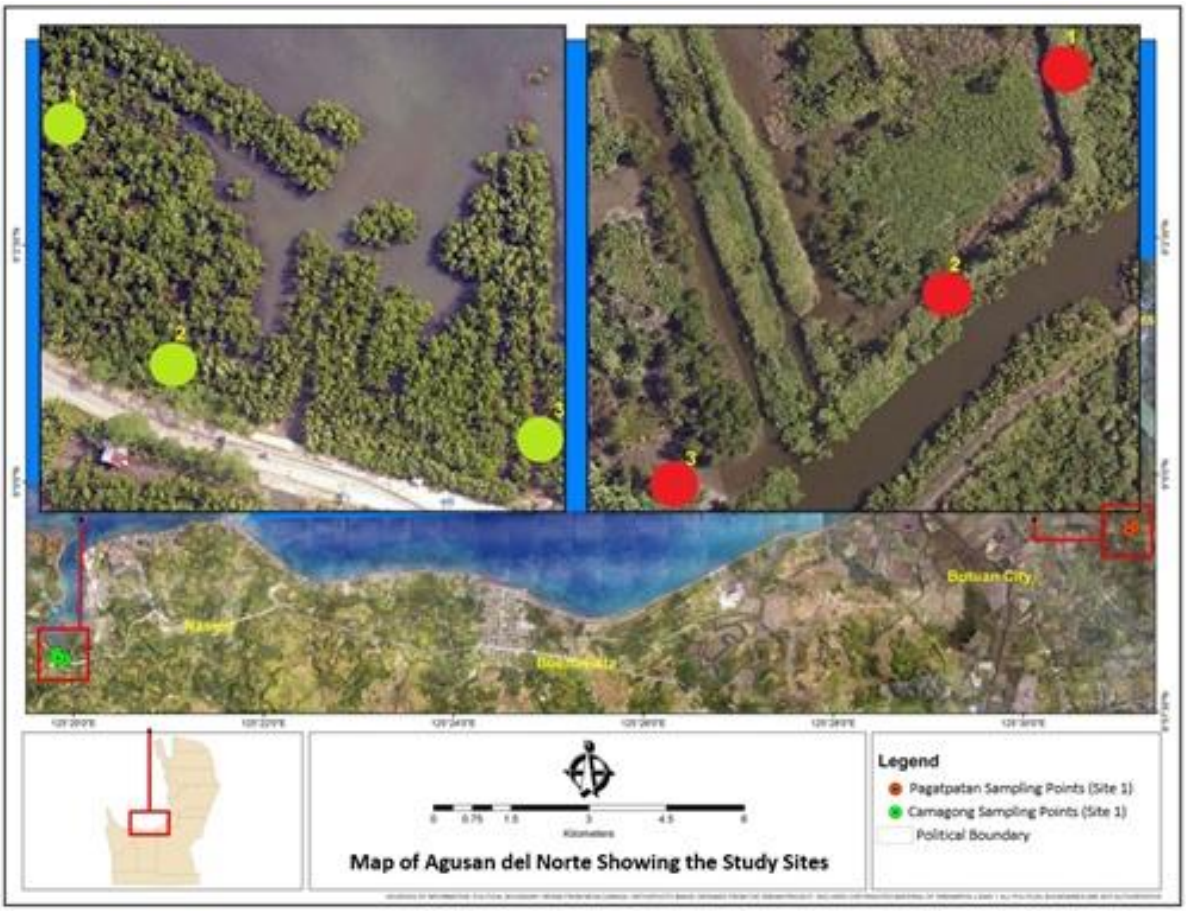

Fig. 1. Map of Butuan Bay showing the study sites.

The analytical weighing balance was also used to determine the actual weight of *P. erosa* for length-weight relationships (LWRs) analysis.

Data analysis

The frequency of matured and juvenile *P. erosa* was compared between two sites presented in a bar graph. The length-weight relationship was determined on the exponential equation$W = aL^b$. The total body weight of *P. erosa* was represented by "W", regression intercept as "a", regression coefficient as "b", and standard length as "L". The parameters (a, b, andr^2) were estimated by linear regression analysis expressed as Log W = b log L + log a with "W" as the dependent variables for logarithm-transformed LWR expression. Statistical package of Microsoft Excel was used for the analysis of data.

Results and discussion

Species Abundance Distribution of P. erosa

Out of 241 collected individuals of *P. erosa* in site 1; 29 individuals were juvenile, and 212 were adult individuals. Site 2 had 238 collected individuals of *P. erosa* where 79 were juvenile and 159 were the adult (Figure 2). About 12% of the measured samples fall below 4 cm (assumed juveniles) in site 1 and about 33% in site 2 (Figure 3). The observed maximum length of *P. erosa* in this study was 8 cm. However, only one individual with this size was collected in Pagatpatan while two individuals in Camagong during sample collection. Clemente (2011) reported a much higher maximum shell length for *P. erosa* which was 12 cm. Observations from this study indicate that density of adult *P. erosa* was higher at the sites with fine silt but absent at sites with a high sand content. According to Dolorosa and Galon (2014) that the population of *P. erosa* can vary between regions and even between patches of mangroves as maybe influenced by environmental conditions and harvesting.

Table 1. Body weight (BW) - Total length (TL) correlation of *P. erosa*.

Area	N	b (95% Cl)	a (95%Cl)	r^2	TL	BW
Pagatpatan	241	2.621	-0.810	0.761	4.75 (4.2-8.0)	76.43 (5.33-168.53)
Camagong	238	3.280	-1.375	0.956	4.29 (2.9-8.0)	41.12 (1.36-174.85)
Pooled	479	3.116	-1.240	0.916	4.52 (2.9-8.0)	96.99 (1.36-174.85

n, sample size; Cl, confidence interval; TL, total length; BW, body weight.

Thus, exploitation and environmental conditions might also a reason for *P. erosa* on the size differentiation.

Length Weight Relations Analysis

The total length of *P. erosa* in site 1 ranged from 4.2 cm to 8.0 cm with a mean of 4.75 cm and the body weight of 5.33 g to 168.53 g with 76.43 g mean value. Moreover, the total length of *P. erosa* in site 2 ranged from 2.9 cm to 8.0 cm with a mean of 4.29 cm and the body weight of 1.36 g to 174.85 g with 41.12 g mean value (Table 1).

Although environmental factors were not considered in this study, it was thought to have a significant contribution to the length and weight variability of *P. erosa* in the two sites. Environmental factors known to influence the bivalve species with respect to its shell morphology and relative proportions, like depth according to Claxton *et al.*(1998), currents (Fuiman *et al.*, 1999), water turbulence (Hinch and Bailey, 1988), latitude (Beukema and Meeha, 1985), wave exposure, type of bottom and type of sediment (Claxton *et al.*, 1998) and burrowing behavior (Seed, 1980).

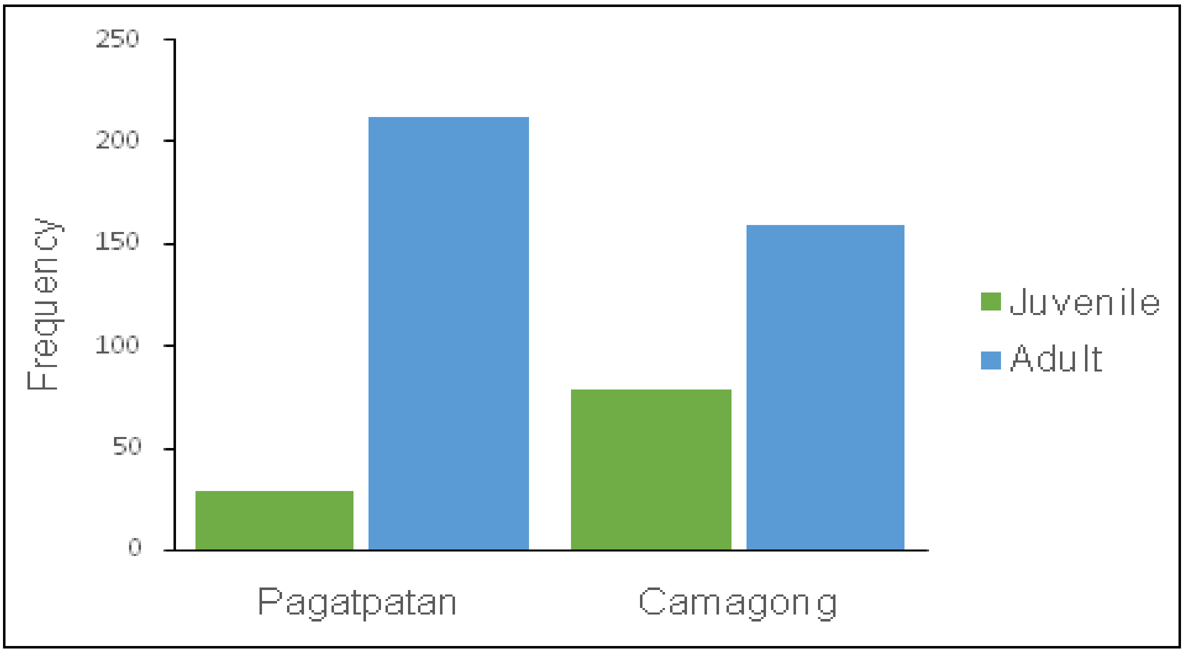

Fig. 2. Frequency of mature and juvenile samples of *P. erosa*.

Furthermore, linear regression was performed to determine the correlation of shell morphology across sampling sites. Log W=1.240 + 3.116 (r^2 = 0.916) was used to express the pooled LWRs of *P. erosa* in the two sites (Figure 4). The value of the coefficient of determination in a pooled LWRs was r^2=0.916 showed a strong correlation between length and weight of *P. erosa*. This indicates no significant variation for both sites. Thus, probability might the two sites shared the same environmental conditions.

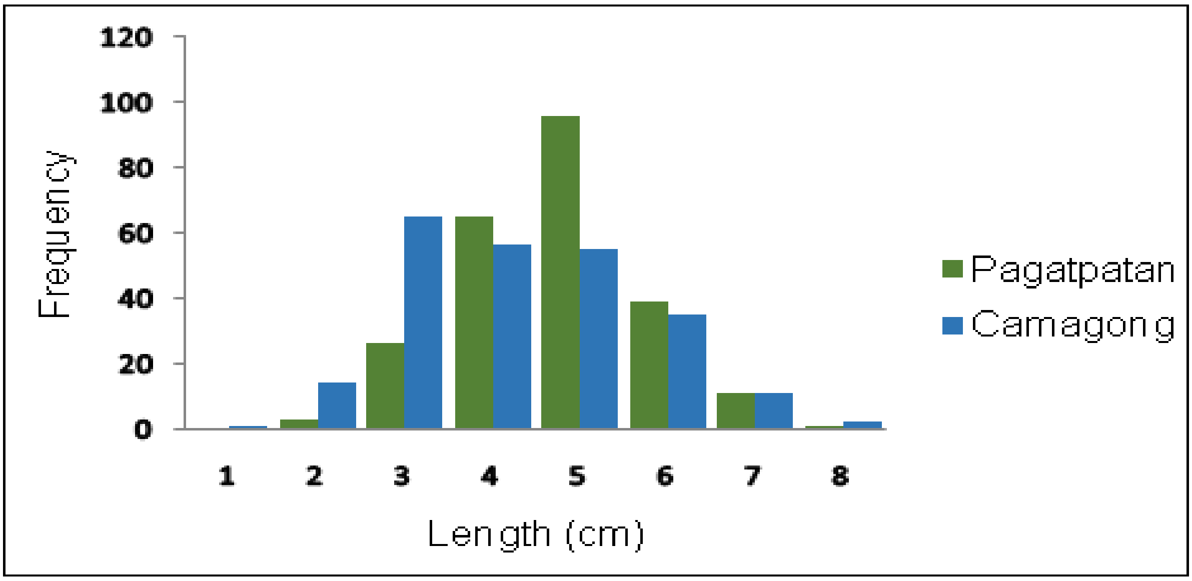

Fig. 3. Species length and abundance distribution of *Polymesoda erosa*.

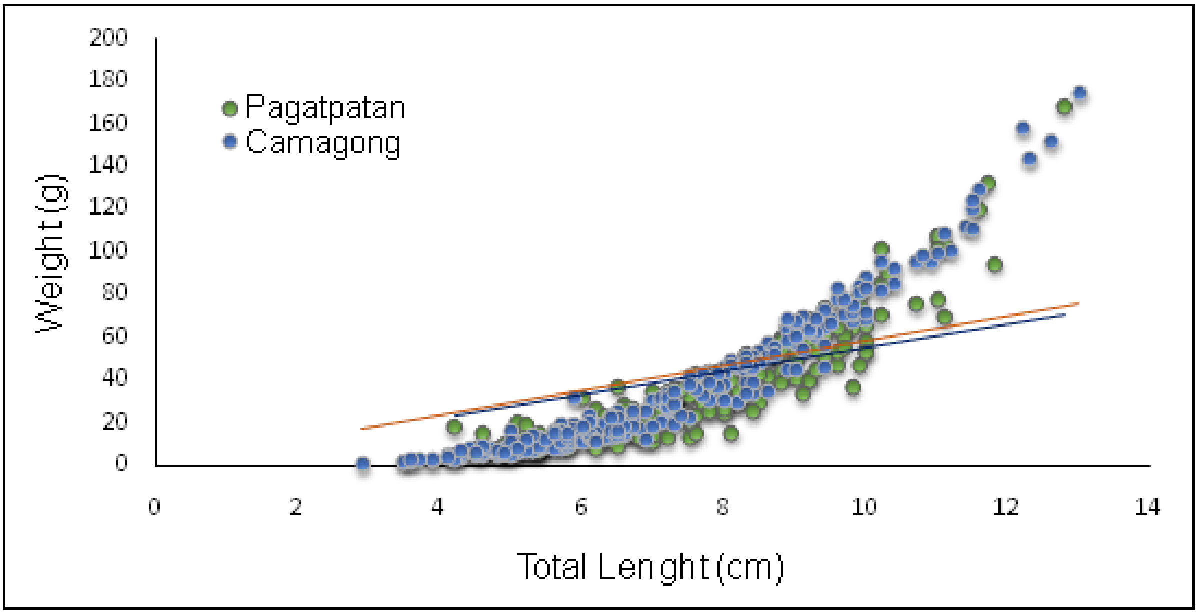

Fig. 4. Body weight (BW) - Total length (TL) correlation of *P. erosa*.

Conclusion

There were more juveniles and fewer adults of *P. erosa* with higher individual weights were noted in site 2. Moreover, fewer juveniles with higher adult individuals but have lighter weights in site 1. Yet, the equation Log W=1.240 + 3.116 (r^2 = 0.916) in a pooled LWRs analysis showed strong correlation. Thus, indicated no significant size variation of samples across sampling sites. Anyhow, researchers were limited to a maximum of 100 meters interval of the sampling stations due to patches of *P. erosa* distribution in the sites. Hence, it is recommended to have more quadrats with higher intervals to collect more samples. Also, sampling interval among sites must be considered to compare whether different mangrove ecosystems with different environmental conditions affect the length-weight relation of *P. erosa*. Lastly, environmental factors such as water depth, currents, turbulence, wave exposure, type of bottom and other physicochemical parameters of water and sediments should be considered to further understand the distribution pattern of *P. erosa*.

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