Section: Research Paper

Sightings and Shell Morphometric Relationships of Muricidae (murex) (*Chicoreus ramosus*) in Mantatao Island Calape, Bohol

Maria Danesa S. Rabia
mariadanesa.rabia@bisu.edu.ph
Fisheries Department
Bohol Island State University-Calape, Bohol

Abstract. Global changes are one of the well-known shifts in species ranges in response to changing climate. Muricidae (murex) (*Chicoreus ramosus*) is one of the less well-known species in our locality. The early detection on the range in shifts of some seashell species and quick execution of culture and resource enhancement strategy are critical, so this study aims to document the sightings and morphometric relationships as the basis for a possible culture management program. The study uses a mixed-methods research design, particularly a sequential exploratory design. Results showed that there are a variety of murex species that are found on the island. The shell morphometrics relationship got this model of LW = 0.095 + 1.08 length, or weight =323.32 + 1.08 length, and LW = 0.195 + 2.478 width, or weight =887.06 + 2.478 width, respectively. Results suggest that there could be potential for reproductive biology and culture in captivity.

Keywords: *murex, morphometric, shells, sightings, relationships*

Introduction

Nowadays, the aquaculture industry has undeniably established its vital role in global food security and nutrition in order to reduce the supply-demand gap for some aquatic foods. Sea snails are one of the most common sea products that are nearly depleted because they are consumed by humans for food, and they are extensively circulated in the Indo-West Pacific, particularly in the east to South Africa (Houart R., Kilburn R.N., & Marais A.P., 2010).

The sea snail that has the potential to be investigated is *Chicoreus ramosus*, commonly known as murex or branched murex, one of the species that is considered as a voracious seasnail, a marine gastropod mollusk belongs in the family Muricidae (Steyn, D.G., & Lussi, M. (2005). *C. ramosus* is being labeled as a snail that has a large, solid, very rugged, and with heavy shell ranging from 1 to 330 mm in length. The outside shells are describe with relatively globose, have a short pinnacle, a slightly overstated body spiral, and a long siphonal canal. *C. ramosus* possessed the most prominent decorations, with conspicuous leaf-like and recurved resonating digitations. It also has three spinose axial varices per whorl, with two elongated nodes in between. The shell color description is white to light brown outwardly, with a white aperture, and generally pink towards the inner edge, the outer lip, and the columella. The murex usually lives in sandy and wreckage bottoms near coral reefs, to depths of around 10 m (Kilburn, R.N., & Rippey, E., 1982). Muricidae usually have the same characteristics and look like *C. ramosus, which* is a carnivorous predatory species that usually feeds on bivalves and other gastropods.

On the other hand, the growth and survival of the murex in the wild face several tests, especially in the face of changes in environmental conditions like pollution anchoring, harvesting habitat degradation, and others like threats of global warming, which bring a decrease in juveniles' survival rates and have contributed to accelerating the decline of shell populations in the past decade in some Mediterranean basins. But, in recent years, estimates of abundance for murex populations have always been required for fisheries management; this will include population estimates or indices before any quantitative estimates. The abundance assessment includes surveys that assess the relative importance of environmental influence, interspecific interactions, and intraspecific density-dependent effects in regulating population size. In other words, assessing population sizes can also be beneficial to test ecological hypotheses in the area, especially for the murex species.

The murex is being sighted on the islands of Mantatao, Calape, and Bohol. This island is very well known to have a vast intertidal zone that is a good indicator for culture and other seawater management. In addition, there are plenty of potentials with regards to the monitoring mechanisms that have been instituted on the island to evaluate the impact of population, habitat degradation, offshore, or field development, but not on murex. The murex is still a new subject on the island, as the shells command greater potential for shell craft making and the shell export industry (Gaspar et al., 2002).

The ever-increasing number of recovery plans for endangered species is one of the challenges in the aquaculture industry that requires further programs like careful monitoring of population sizes, and these programs include a careful experimental design and an abundance survey with considerable statistical precision if they are to function properly (Abott, 1991). In fact, monitoring programs are only a subset of broader ecological studies that are one of the best recommended techniques for looking into species distributions. In this study, the identification of shell morphometrics is very timely to discover the shell's potential, either for culture or rehabilitation. Hence, there is a need to further go into the details of sightings and shell morphometric characteristics.

Objectives

Generally, this study aims to identify and explore the existence of Muricidae (murex) (*Chicoreus ramosus*) in the Island of Mantatao, Calape, Bohol as basis for potential aquaculture management program.

Methods

Study location and sampling

The study was carried out in the coastal area of Calape, Bohol, particularly on Mantatao Island. The coastal area is approximately 12.56 hectares, and the total coastal area of Calape, Bohol is approximately 403.46 hectares. The total coastal area of Mantatao Island is 1/32 of the total coastal area of Calape, Bohol.

Murex sightings were analyzed in this study, including the data compiled and the daily records with more than 20 samples gathered during the 2-month study. There are 20 sightings considered, which is a small amount of data but still a good set for habitat and distribution identification. The specimens were collected from November 2022 to February 2023, during low tide, in a delimited area of 100 m2 at an upper level.

The design and habitat variables.

The sightings of murex are documented in the area where this species is rare and randomly seen. The location is only described as the precise location of an observation that is mainly determined by the availability of the gatherers and not directly by the characteristics of the habitat at the site.

Shell measurements

The measurements include the length (mm), width (mm), weight (g), aperture (AL) length, and shell aperture width (AW). A total of 20 Muricidae (murex) (*Chicoreus ramosus*) were measured using a vernier caliper.

Statistical analysis

All morphometric measurement data were grouped using descriptive statistics. Spearman correlation coefficients were also used to look into the relationships among variables. The test of the hypothesis was analyzed using the analysis of variance (ANOVA).

Results and Discussion

Shell Sightings.

The realization of a stochastic point process can be used to simulate the sighting record. Sighting data is very vital in some conservation studies. Because some species are nearly threatened and some species need action for conservation management. Nonetheless, conservation regulations have a social and economic impact not only on the gatherer's side but also on the community as a whole. Figure 1 below shows the remarkable view of the island of Mantatao, one of the most promising islands in the town of Calape that is very abundant in natural species, particularly the Muricidae (murex) (*Chicoreus ramosus*). This species is not new to the island. Since 2010, the prevalence of murex has kept on increasing, according to personal communication reports. Many of the gatherers claimed that they could get the murex from different types of fishing, mostly gleaning, and even from deep sea fishing associated with other shells. The empty shells of murex are being sold for 15 to 25 pesos per piece, depending on the sizes. Aside from the shell meat as a source of food, they also get additional income through their shells.

Figure 1. Location map of sampling site in Mantatao Island, Calape, Bohol, Philippines

Schematic representation

The murex shells' length and width are depicted schematically below. It is crucial to determine the representation since it will be used to compile and compare any additional morphometric relationships in a relevant way. (Affenzeller S., Haar N., Steiner G. (2017)) that also includes the indices and relative growth features that are important in improving the knowledge that is currently available. In addition, the lack of biological information on the existence of the murex shell in the islands provides an avenue for studying its ecological and economic importance. The schematic representation showed that knowing the length, width, and weight increased knowledge and contributed to the management methods and alternative sustainable uses for the marine resources found on the island. Additionally, this data serves as a starting point for future investigations into the murex and other gastropod mollusc communities from these islands across time. These investigations will take into account environmental changes, whether they are caused by anthropogenic or natural causes. (Montes, R. et al., 2018).

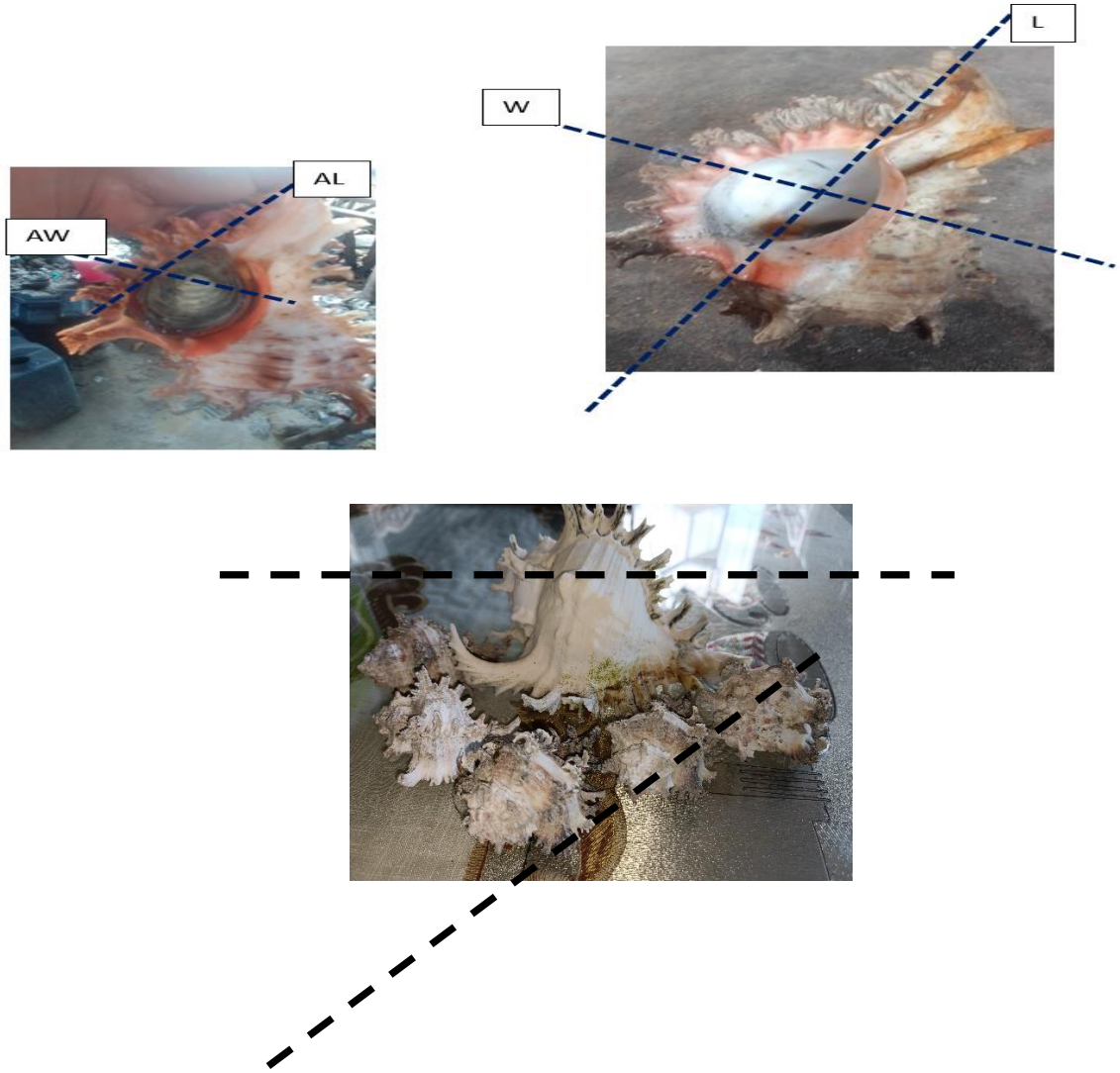


Figure 2. Schematic representation of Muricidae (murex) (*Chicoreus ramosus*) with the measurements taken in the morphometrics. L, length (mm), width (mm); AL shell aperture length; AW shell aperture width

Shell morphometric

The shell morphometrics of murex are being described in terms of the length-weight relationship and width-weight relationship that are closely associated with the study of population status. The abundance of the species in that particular area, with the assumption of growth in ideal conditions, maintains an equal length and weight and width and weight. Biometric connections are used in fisheries management and research to convert field data into acceptable and trustworthy indices. The length-weight relationship of murex (Table 1) revealed that there was no significant correlation in both the length-weight and width-weight relationships (Table 3). Even if the result is not significant, the results showed an allometric pattern that implies the growth of the murex is proportional; they become slenderer as the weight increases, as does the width.

Table 1. Test of Significant Relationship of Length-weight of Muricidae (murex) (*Chicoreus ramosus*)

Length (mm)		Mean	SD	Weight	Length
	Pearson correlation	204.45	17.88	0.346	1.00
	(Sig (1 tailed)			.691	
	N	20			
Weight (g)	Pearson correlation	544.05	203.84	1.00	.346
	(Sig (1 tailed)				.691
	N	20			

[ns]. Correlation is not significant @0.05 level (1 tailed)

The length-weight relationship equation is expressed by regression equation: Log LW=0.095 +1.08Length or Weight =323.32 + 1.08 Length (Table 2) and LW=0.195 +2.478 Width or Weight =887.06 + 2.478 Width (Table 4) respectively.

Table 2. Regression analysis: Log Weight versus Log Length of Muricidae (murex) (*Chicoreus ramosus*)

Coefficient				
Predictor	*Coef*	*SE Coef*	*T*	*P*
Constant	323.32	548.96	.589	.563
LL	1.080	2.676	.404	.691
S=0.095	*Rq=.009*	*RSq (Adj)=0.46*		

The regression equation or model can be translated into:
LW=0.095 +1.08Length or Weight =323.32 + 1.08 Length

Table 3. Test of Significant Relationship of Length-weight of Muricidae (murex) (*Chicoreus ramosus*)

Width (mm)		Mean	SD	Weight	Width
	Pearson correlation	138.40	16.04	.205	1.00
	(Sig (1 tailed)			0.712	
	N	20			
Weight(g)	Pearson correlation	544.05	203.85	1.00	.205
	(Sig (1 tailed)			0.712	
	N	20			

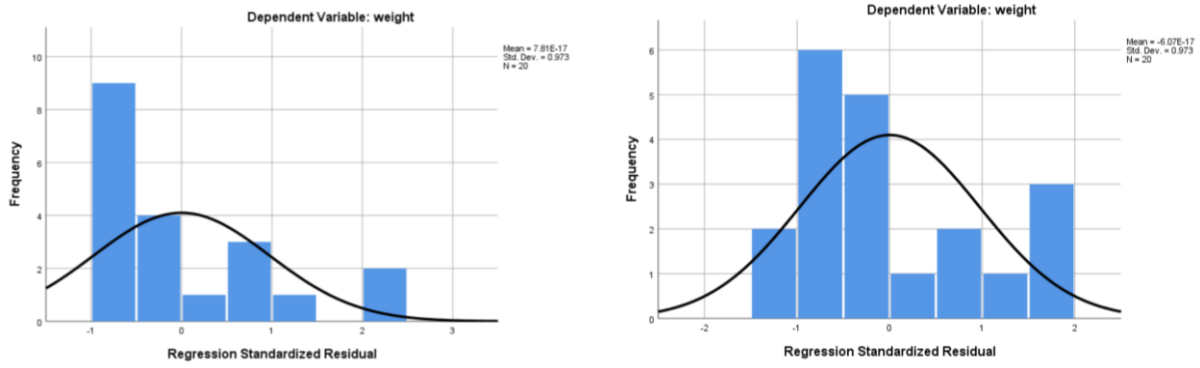
[ns]. Correlation is not significant @0.05 level (1 tailed)

Table 4. Regression analysis: Log Weight versus Log Length of Muricidae (murex) (*Chicoreus ramosus*)

Coefficient				
Predictor	*Coef*	*SE Coef*	*T*	*P*
Constant	887.06	409.09	2.168	0.44
WW	-2.478	-.195	-.844	.410
S=-0.195	*Rq=.38*	*RSq (Adj)=-0.015*		

The regression equation or model can be translated into:
LW=0.195 +2.478 Width or Weight =887.06 + 2.478 Width

The regression-standardized residual is depicted below. Based on the expectation that the z-scores of individual studies, sometimes referred to as standardized residuals, will follow a normal distribution around the aggregate effect size, the standardized residual histogram was developed (Sutton et al., 2000). According to figure 2 from (a) length-weight, outliers in the effect sizes have an impact on the width-length ratio as well as the height in bins and plots. The proportion of residuals in each bin, which are organized as standardized residuals, defines the height of the bar. The shifts of the line of the length-weight at point 4 differ from the shifts of the width-weight, which has the perfect balance; it means that as the width increases, the proportion of weight also increases.



Length (mm) (a) Width (mm) (b)

Figure 2. The regression standardized residual of Muricidae (murex) (*Chicoreus ramosus*)

Conclusion

Notable data in the sightings of Muricidae (murex) (*Chicoreus ramosus*) on the islands of Mantatao, Calape, and Bohol is observed and documented. There was no significant correlation coefficient value obtained in both length-weight and width-weight of murex. This implies that the specimens need further investigation and collaboration for possible resource stock enhancement and species exploration.

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References

Abbott, R. Tucker, 1991. Seashells of South East Asia. Graham Brash, Singapore. 145 pp.

Affenzeller S, Haar N, Steiner G (2017) Revision of the genus complex Gibbula: an integrative approach to delineating the Eastern Mediterranean genera Gibbula Risso, 1826, Steromphala Gray, 1847, and Phorcus Risso, 1826 using DNA-barcoding and geometric morphometrics (Vetigastropoda, Trochoidea). Org Divers Evol 17:789–812. https://doi.org/10.1007/s13127-017-0343-5

FAO (Food and Agriculture Organization). Plantas e Invertebrados. Guía para la iden-tificación de Especies para Los Fines de la pesca Pacifico Centro-Oriental. VolumenI. Roma, Italia; 1995. p. 646

Gaspar, Miguel B., Miguel N. Santos, Vasconcelos, Carlos C. Monteiro (2002) Shell morphometric relationships of the most common bivalve species (Mollusca: Bivalvia) of the Algarve coast (Southern Portugal)

Houart R., Kilburn R.N. & Marais A.P. (2010) Muricidae. pp. 176–270, in: Marais A.P. & Seccombe A.D. (eds), Identification guide to the seashells of South Africa. Volume 1. Groenkloof: Centre for Molluscan Studies. 376 pp.

Kilburn, R.N. & Rippey, E. (1982) Sea Shells of Southern Africa. Macmillan South Africa, Johannesburg, xi + 249 pp.

Montes, Ruth Escamilla, Salvador Granados-Alcantar and Wenceslao Valenzuela-Quiniones, et al. 2018. Biodiversity of Gastropod in the Southeastern Gulf of California, Mexico. From) Biodiversity of Gastropod in the Southeastern Gulf of California, Mexico. Available from:

https://www.researchgate.net/publication/324801575_Biodiversity_of_Gastropod_in_the_Southeastern_Gulf_of_California_Mexico [accessed May 05 2023].

Poutiers, J. M. (1998). "Gastropods". In Carpenter, K. E.; Niem, V. H. (eds.). The living marine resources of the Western Central Pacific Volume 1. Seaweeds, corals, bivalves and gastropods (PDF). FAO Species Identification Guide for Fishery Purposes. Vol. 1. Rome: FAO. p. 562. ISBN 92-5-104052-4.

Steyn, D.G & Lussi, M. (2005). Offshore Shells of Southern Africa: A pictorial guide to more than 750 Gastropods. Published by the authors. pp. i–vi, 1–289

Spencer Yau Jia Ming, Sarah Priyanka Nelson & Bryan Wong Kang Ing. 30 September 2020. Ramose murex snails at Changi Beach. Singapore Biodiversity Records 2020: 136-137. The National University of Singapore.