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Assessment of economically important invertebrate fauna present in the coastal areas of San Pablo, Zamboanga del Sur, Philippines

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Abstract

Marine invertebrates play a vital role in the coastal areas and are incremental to prosper job opportunities, food security, and other substantial positive consequences to the environment and to the people in the coastal community. The study was conducted to identify the economically important macro invertebrates present in the shell fishing grounds of Illana Bay particularly in San Pablo, Zamboanga del Sur and determine its species diversity, dominance, and richness. The collection of samples was made during low tide. Shannon diversity and Simpson dominance index formulas were used to treat the data. Results showed that 24 marine invertebrates under the phyla of Mollusca, Echinodermata, and Sipuncula inhabit the areas. Majority of the organisms are mollusks which were thriving on the muddy peats as substrates on the water column and intertidal zone. These organisms are diverse (0.3372) and species dominantly found were *Canarium urceus*, *Anadara antiquata*, and *Grafarium tumidum*. The sediment composition, sea grasses and algae abound in the study sites believed to be the contributory factors to species abundance in the place. Implementation of local policies and shell fishing practices in the coastal areas are soundly observed to resist habitat destruction and invertebrates' extinction. Diminishing the yield of these organisms would not be possible because traditional shell fishing practice through hand picking and leaving the smaller ones. Local development initiative was in placed to promote economic and ecological benefits for the coastal dwellers and sustainability of these marine resources.

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Introduction

Marine invertebrates comprise more than 91% of all identified animal species in the ocean (FWC, 2011). They are undeniably promoting crucial benefits for the survival of human community and are important components of coral reef diversity and community structure (Netchy *et al.*, 2015), thus providing essential ecosystem services and income from tourism, commercial, and recreational fisheries (Anderson *et al.*, 2011). They are more abundant and diverse in the coastal habitat compared to the open ocean because more nutrients and substrates are available on the coastal habitats necessary for survival and reproduction (Levinton, 2009).

In the Philippines, macro invertebrates sold by the coastal dwellers in the market as food or ornaments which caused problems like declining population and even extinction due to overexploitation, destructive fishing practices, increasing temperature, and decreasing pH of the ocean (Miloslavich *et al.*, 2011) and the alteration of water clarity, sedimentation, nitrification, temperature variation, habitat

destruction, decreased herbivory, and natural disasters (Selig *et al.*, 2012). The United States Department of the Navy considered acoustic, energy, physical disturbance and strike, entanglement, ingestion, and toxic chemicals as potential stressors and a threat to the population of these species (Northwest Training and Testing Draft, 2014) and extinction risk (Purcell *et al.*, 2014).

This study was conducted to determine the macro invertebrate species of economically important present in the shell fishing grounds of Illana Bay in San Pablo, Zamboanga del Sur and calculating its species diversity, dominance, and richness. The identification of these organisms can be of great help for constant coastal monitoring and development initiatives for the sustainability of these species.

Materials and methods

Sampling and Collection of Samples

San Pablo is one of the coastal municipalities along Illana bay of Zamboanga del Sur (Fig. 1).



Fig. 1. Map of the study sites.

It lies at 07°39'N 123°27'E. A five-month study period (July-November 2014) was conducted in the three sampling stations in the said coastal areas. Manual collection of samples was employed during low tide on near shores. The collected samples were

sorted out and classified according to their local and scientific names. Experts of the field were consulted in identifying the species collected as well as books and electronic sources were also used in taxonomic identification.

Data Treatment

The species composition was analyzed using the simple percentage and ecological statistics in terms of species diversity, dominance, and richness. Shannon Wiener and Simpson indices were used in calculating the species diversity and dominance of the invertebrate fauna in the area.

Results and discussion

Local government in the municipality of San Pablo has promulgated various laws and policies which protect coastal areas and species from overfishing, declining, and deterioration. With the current status, twenty-four (24) marine invertebrates in the three sampling sites were found which represented 3 phyla, 4 classes, 8 orders, and 12 families (Table 1).

Table 1. Taxonomic classification of the economically important invertebrate fauna in the coastal waters of Illana Bay in San Pablo, Zamboanga del Sur (July – November 2014).

PHYLUM	CLASS	ORDER	FAMILY	SCIENTIFIC NAME	LOCAL NAME (MUSLIM/CEBUANO)				
MOLLUSCA	Gastropoda	Littorinimorpha	Stromboidae	<i>Canarium urceus</i>	Paminditan/Aninikad 1				
				<i>Canarium labiatus</i>	Paminditan/Aninikad 2				
				<i>Canarium mutabile x urceus</i>	Paminditan/Aninikad 3				
				<i>Canarium sp.</i>	Paminditan/Aninikad 4				
				<i>Gibberulus gibbosus</i>	Paminditan/Aninikad 5				
				<i>Laevistrombus canarium</i>	Paminditan/Bungkawil				
				<i>Lambis lambis</i>	Karangaranga/Saang 1				
				<i>Lambis millipeda</i>	Karangaranga/Saang 2				
				<i>Lambis scorpius</i>	Karangaranga/Saang 3				
				<i>Conomurex luhuanus</i>	Pamikit /Liswi				
				<i>Conus radiatus</i>	Pamikit				
							Turbinellidae	<i>Vasum turbinellus</i>	Kabutabuta /Guba-guba
							<u>Turbinidae</u>	<i>Turbo marmoratus</i>	Paligutos/Tubo
							<u>Tegulidae</u>	<i>Tectus fenestratus</i>	Baluso
						Archaeogastropoda	Neritidae	<i>Nerita exovia</i>	Sehi
						<u>Vetigastropoda</u>	<u>Angariidae</u>	<i>Angaria delphinus delphinus</i>	Taktak lake
					Bivalvia	Taxodonta	Arcidae	<i>Anadara antiquata</i>	Litub
				<i>Anadara nodifera</i>	Bacalan				
			Venerriidae	<i>Grafarium tumidum</i>	Balinsala				
		<u>Veneroida</u>	<u>Cardiidae</u>	<i>Trachycardium subrugosum</i>	Sudlay-sudlay				
ECHINODER MATA	Echinozoa	Diadematoidea	Diademaidae	<i>Echinotrix calamaris</i>	Tuyom				
					<i>Diadema setosum</i>	Sijok			
					<i>Holothuria atra</i>	Balatpisot			
SIPUNCULA	<u>Sipunculidea</u>	<u>Sipunculiformes</u>	<u>Sipunculidae</u>	<i>Sipunculus nudus</i>	Salpo				

These organisms are commonly thriving on the muddy peats as substrates in the seafloor and intertidal zones similar to the observations of World Register of Marine Species (Appeltans *et al.*, 2010) and Catalogue of Life (Bisby *et al.*, 2009). Phylum Mollusca (83.34%) is a major group found in the study area whereas Sipuncula (4.17%) is the least. Similar observation is also revealed on the studies of Northwest Training and Testing Draft (2014), Wong

Kang *et al.* (2012), and Anisimova *et al.* (2011) that mollusks are one of the major macro invertebrates inhabiting coastal waters. Possible reasons of mollusk abundance in the area were the muddy peats and sea grasses covering in the place. The findings of Northwest Training and Testing Draft (2014) and Levinton (2009) stated that greater number of marine invertebrates thrives in the muddy surface, thus habitat condition and water quality factors such as

temperature, salinity, acidity, and nutrient content all affect the marine species distribution. Coastal dwellers in the sampling sites harvested these organisms for income and consumption purposes since these benthic organisms can be easily found on the seafloor composing sand, mud, and rock beds. In

the current study, invertebrates were considered by the gatherers because it appealed local demand for food and eventually gained income when sold to the local market. Policies in the locale were strictly implemented resulting to avoidance of picking those small in size.

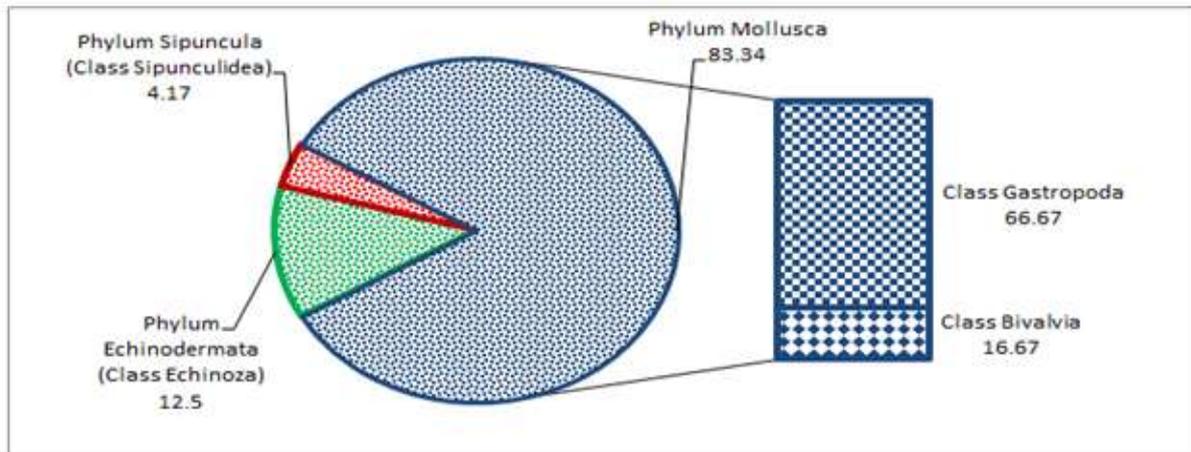


Fig. 2. Composition of economically important invertebrates in San Pablo of Zamboanga del Sur.

This action is congruent to the suggestion of Purcell *et al.* (2014) that local authorities could convene plausible actions regarding countermeasure and harvesting engagements of coastal dwellers regarding future attempt of using extensive equipments and

abusive shell fishing responsible for habitat destruction which may lead to species extinction. Also, the absence of regulation imposed on this type of economic activity may result a negative impact to the people residing the community and nearby places.

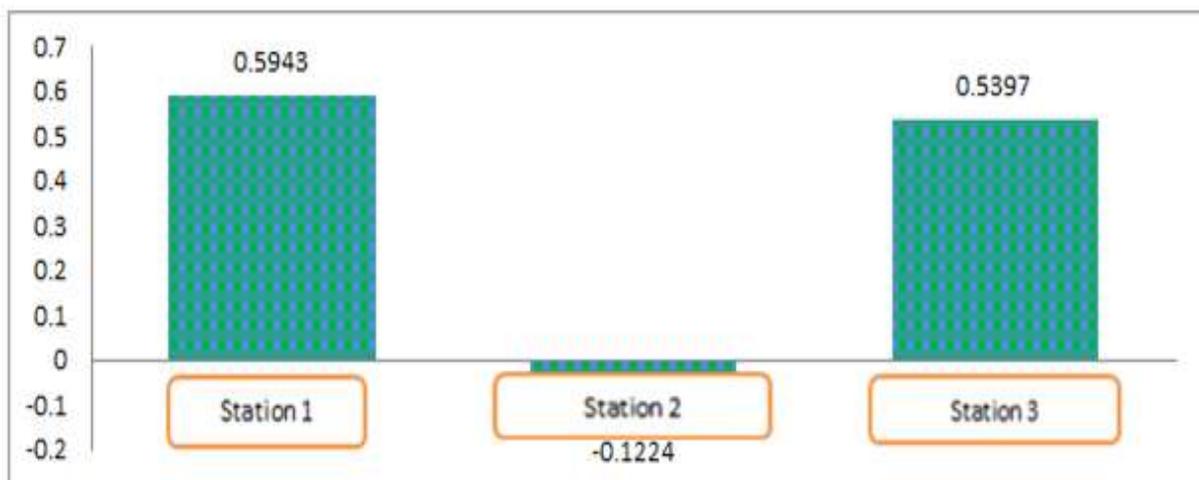


Fig. 3. Diversity index of economically macro invertebrates in the study sites.

Marine invertebrates were presented by phylum and classes composition (Fig. 2). Phylum Mollusca is evident major group found in the study area as concurred on the taxonomic groups presented by the

Northwest Training and Testing Study (2014), Appeltans *et al.*, 2010, and Bisby *et al.*, 2010 while dominant species found in Station 2 (Marcos Village) is *Anadara antiquata*, *Canarium urceus* in Station 1

(Bubual), and *Grafiarium tumidum* in Station 3 (Tinapian). The dominance is influenced by significant factors like habitat structure and

composition, ocean currents, salinity, acidity, temperature, nutrient composition, and other related abiotic factors (Levinton, 2009).

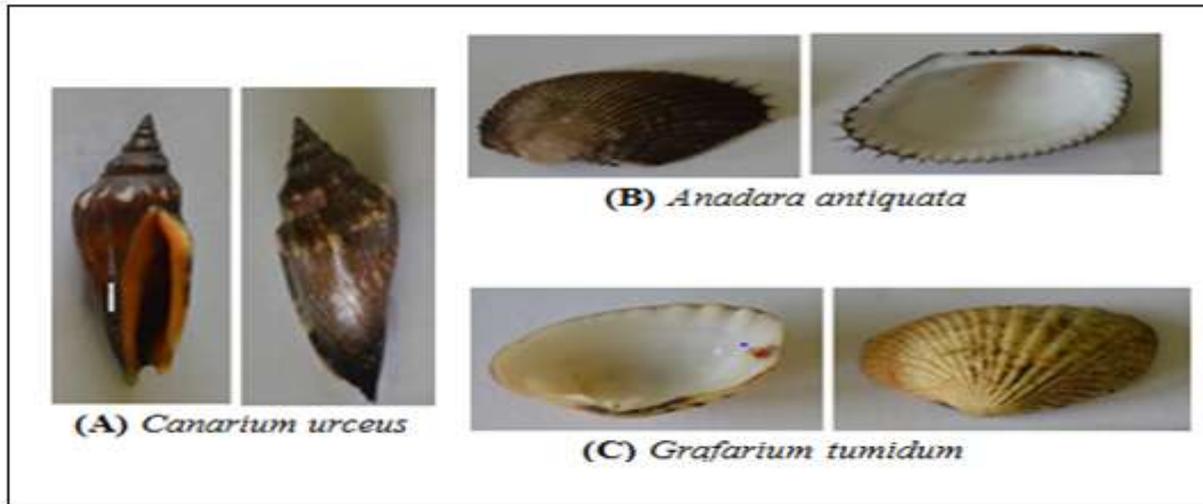


Fig. 4. Some of the economically important macro invertebrates present in the coastal waters of the study area.

Index of diversity of macro invertebrate species in the coastal waters of the study sites is shown in Fig. 3. It indicates that Station 1 (0.5943) is the most diverse followed by Station 3 (0.5397) and Station 2 (-0.1224) wherein mud peat dominantly covered the former areas as substrates. This is consistent to the findings of Won Kang *et al.* (2012) displaying mollusks as most diverse species dwell on muddy and sandy areas. In this study, Station 1 was covered with sparsely distributed sea grasses and algae aside from muddy substrate occupying nutrient abundance while rocky beds and sandy substrates were prevalent in Station 2. This agrees to the research results of Vroom and Braun (2010) and McKenzie *et al.* (2010) who asserted that sea grasses and algae are essential elements of habitat for these invertebrates that attracted their dwelling in the area.

Environment conducive for food and safe habitat are crucial elements to be considered by coastal dwellers to maintain the species and not to impoverish benthic communities (Forest *et al.*, 2010). The traditional shell fishing practices of people in the place make the species still diverse, rich, and dominant in the area. Though the study focused on living invertebrates, significant finding is also stressed on the evident

remains of dead sea shells in the study areas since it can benefit other small organisms. As highlighted on the recent report of International Science Times (2014), many small organisms settle on dead shells and so removing of them will eliminate habitats for these colonists. Policies in the locality can be promulgated to maintain the equitable environment of these species for proliferation and reproduction. Coastal management plans, conservation measures, and other related awareness campaigns can also be adhered to allow resiliency of the coastal areas and augment chances of sustainability of these marine resources.

Moreover, ecological programs such as acceptable shell fishing and harvesting practices, proper segregation or dumping of toxic wastes, and other pro-active activities can be applied to prevent natural or man-made stressors causing massive destruction and extinction (Miloslavich *et al.*, 2011) and to avoid misery to humans' livelihood and economy.

Conclusion

There are 24 economically important marine invertebrates inhabiting the shell fishing sites of Illana Bay in San Pablo, Zamboanga del Sur in which

majority of the organisms are mollusks. *Canarium urceus*, *Anadara antiquata*, and *Grafiarium tumidum* are dominant species in this coastal municipality. Diversity of these species all attribute to the present habitat condition. Ecological programs including proper segregation and disposal of wastes, acceptable and oriented shell fishing or harvesting practices, coastal management plans, conservation measures, and other pro-active activities could be conducted to prevent alteration of food and avoid failure of income opportunities, thus expedient sustainability of these marine resources will be assured.

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