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Diversity Assessment of Bivalves in the Intertidal Zone in Pilar Bay

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A B S T R A C T

Municipality of Pilar is the last town in the eastern province of Capiz. Pilar Bay, spanning 20 square kilometers, is a boon. At low tide, a variety of edible bivalves' shells may be found around the bay's shoreline, offering a source of money for the residents. The loss in bivalve variety, abundance, and ecological functions due to overharvesting signifies a loss of environmental integrity at the local and watershed levels. The purpose of this study was to catalog and assess the variety of edible bivalves found in the Municipality's intertidal zone. Descriptive survey methods were used to gather data from December 2015 to January 2016 in eight barangays in Pilar: Dulangan, Binaobawan, Rosario, Poblacion, Natividad, San Ramon, Casanayan, Balogo, and Dayhagan. Three 1 × 1 m2 quadrats were placed down in each of the nine stations that were chosen using the belt transect approach and a quadrat. The following items were utilized to perform the study: a tiny garden trowel, a laptop computer, a nylon rope, pegs, a meter stick, and a camera. The findings indicate that seven (7) edible bivalves belonging to the families Arcidae, Veneridae, Psammobidae, Mactridea, and Solenidae were known locally as *paros, litob, punaw, bug-atan, higda-higda, tikhan,* and *kagaykay*. It also demonstrates which species were most prevalent and prolific in Pilar's intertifal zone: *litob, punaw, kagaykay, higda-higda,* and *bug-atan*.

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INTRODUCTION

The municipality of Pilar is the last town in the eastern province of Capiz. It is fortunate to have a 20-kilometer Pilar Bay. It is the source of a large number of fishing supplies. At low tide, a variety of edible bivalves' shells may be found around the bay's shoreline, offering a source of money for the residents. The harvesters of consumable bivalve shells have traditionally depended on customary techniques for processing the aforementioned shells, which often entail boiling them alongside malunggay and other leafy green vegetables to impart flavor and nutritional value. To utilize the shell meat for a longer period of time, however, many individuals attempted to figure out how to process the preservation of the flesh at a later stage. "Dayok nga paros" is now considered a delicacy exclusive to the Municipality of Pilar, illustrating the achievement of the preservation strategy in preserving its diversity. The group known as bivalves (Bivalvia) includes clams, scallops, oysters, mussels, razor shells, cockles, venus shells, borers, trough shells, and a variety of other mollusks, some of which are yet unknown.

With about 9,200 extant species, bivalves are the second most diversified category of molluscs, only exceeded in species variety by gastropods. It is the second-largest group of mollusks known as gastropods, which also includes slugs and snails. All of its species are aquatic. The entire animal is contained in the two valves that make up the shells, which are often bilaterally symmetrical (equivalved). The forms of the shells vary widely and might be beaked, circular, ovoid, oval, wedge-shaped, or scrabbled-like. There is often variation between the front and posterior shells, which might be tapering or rounded. Most of the time, the valves mesh well. Some species, however, have valves that gape or have different forms, allowing one valve to expand and catch the edge of the other. Furthermore, the curvature or degree of the valves may differ. (Linnaeus (1758).

A decline in bivalve biodiversity, abundance, and ecological abundance at the local and watershed levels denotes a breakdown in the integrity of the environment. Freshwater mussels and marine bivalves often operate as the main component of aquatic food webs from the source to the coast, improving the quality of the sediment, the water, and the complexity of the environment. Because they may dominate the structural and functional ecology, inhabit a range of niches, and exist in both tidal and non-tidal environments, bivalve shellfishes are perhaps the greatest taxonomic group to target for combining these efforts.

This is a result of the shift toward ecosystem-based methods for managing, preserving, and assessing the diversity of edible benthic frogs in Pilar Bay's intertidal zone in order to restore aquatic resources. Bridging the freshwater and marine sectors might be facilitated by basing conservation and restoration objectives on the products and services provided by ecosystems. An approach known as "natural capital" may be used to enhance the health of all native bivalve assemblages and, by extension, the health of entire watersheds, by providing a common lexicon and quantitative currencies. Biodiversity plays a major role in both sustaining the human life support system and creating

opportunities for livelihood. Biological resources are a capital asset with significant long-term gain potential. Species and ecosystems must be preserved and protected immediately in order to guarantee the sustainable management and use of biological resources. At the local, national, and international levels, it is necessary to strengthen capacities for the assessment, investigation, and systematic observation and evaluation of biodiversity. Hence this study was conducted. This study aimed to determine and assess the diversity of edible bivalves that exist in the inter tidal zone of the Municipality of Pilar. Specifically, this study was conducted with the following objectives: 1. To assess the different kinds of edible bivalves found in the inter tidal zone in Pilar and classified according to its Local names, English Names, and Scientific Names. 2. To find out species richness, abundance, frequency, and diversity index of the different bivalves in the inter tidal zone areas in Pilar 3. To obtain base-line quantitative data and create resource maps and environmental database for Pilar.

LITERATURE REVIEW

Bivalve (class Bivalvia) refers to any of the more than 15,000 species of clams, oysters, mussels, scallops, and other Mollusca that have a shell that is divided into left and right valves from the front to the back. The valves are connected to each other via a hinge. While the respiratory gills of most species have developed into filtering structures called ctenidia, primitive bivalves still eat silt. Typical of most mollusks, bivalves have lost their heads and their radular rasping equipment to adapt to a mostly sedentary existence of deposit- or suspension-feeding. The Tridacna gigas is the biggest known mollusk; it may grow up to 137 centimeters (54 inches) in length and 264 kilograms (582 pounds) in weight on coral of the South Pacific.

This kind of animal may live for about 40 years. Shell form and hinge structure are used to determine classification. Most species that burrow on the surface have small, round or oval shells that contain equal numbers of left and right valves—an supposed ancestral trait. Animals that burrow deeper have their shells crushed laterally, which speeds up their passage through the sediments. The best burrowers, the razor clams Ensis and Solen, have smooth, elongated shells that are laterally compressed. Animals that burrow on the surface may grow an external shell that is sculpted and has projections, concentric lines, and radial ribs to strengthen it against harm and predators. Bivalves are mostly marine animals that may be found at any depth on nearly any substrate. In shallow seas, bivalves are often the dominating species on rocky and sandy shores, and they play an important role in offshore sediments. They can be found at abyssal and hadal depths, either as surface-dwelling creatures or as burrowing members of the mid-oceanic rift fauna. Though they could possibly contribute to the bioerosion of corals, bivalves can also sift through compacted muck and soft shale. Bivalves are therefore found everywhere, independent of depth or latitude, albeit none of them are planktonic.

Estuary bivalves are also known to exist, and two prominent families—the Unionidae and Corbiculidae—consist mostly of freshwater species with complex reproductive cycles. There are no terrestrial bivalves, despite certain freshwater and high-intertidal species being able to survive in dry environments. As may be expected, there are wide variations in abundance across a class of over 15,000 living species. Small, usually very host-specific commensal and parasitic species make up some of the rarest animals. Some are so abundant that they totally dominate their habitats and have a major impact on nutrient cycles, such as mussels and oysters on stony beaches and cockles and clams on sandy coastlines

METHODOLOGY

A. Research Design

This study used the descriptive survey methods. The researcher used this method to get information on the current status of the different edible bivalves found in the coastal areas in Pilar and to describe the characteristics of such species in terms of its species richness, frequency, abundance, density and diversity index and its economic valuation.

B. Locale of the Study

Pilar has an income classification of third class. Development in basic infrastructure has been stagnant during the last decades. Annual income is low and poverty rates are said to be high, although the town has also seen greater years. The rural municipality is said to be rich in natural resources such as aquatic and mineral wealth. It used to be a very strong seafood producer in the province and once even possessed its own sugar and mining industry. Major agricultural products of the town include fish, prawn, crab, rice, sugar, cattle and poultry. The town also has its own Baptist Church and Iglesia ni Kristo Parish as well as its own rural bank along the town market. Dulangan and Casanayan serve as satellite villages of the town. Pilar Bay covers 10 barangays of the municipality fom Brgy. Dulungan to Brgy. Dayhagan and is considered the longest bay in the entire Province. The beach is clean and not over-crowded. It is the main source of fishing industry in the area and nearby municipalities. It is a perfect spot to witness the sunrise and sunset. Pilar municipality waters are also a sanctuary of different marine life.

C. Survey Technique

Bivalves harvesting barangays in Pilar was identified by gathering data from the Local Government and interviewing bivalve collecting people living near the coastal areas. Belt transect method and a quadrat was employed. Nine (9) Stations was selected and three 1 x 1 m2 quadrat was laid down in each station.

D. Materials

The materials used during the conduct of the study was, tape measure, meter stick, a nylon rope, pegs, camera, and a laptop computer, and a small garden trowel.

E. Field Work (Procedure)

A permit to survey the edible bivalves in the locality of Pilar was secured from the office of the municipal mayor, from the office of the municipal Agricultural Office and from the Barangay Captain of sample barangay. As soon as the permit was secured the area was survey for planning and familiarity of the site. The survey was conducted on three spate weekends with the first beings December 26-27, 2015, second January 9-10, 2016 and the third and final survey January 16-17, 2016. Study area was selected during low tide. A belt transect method was used. Three (3) 1 x 1 m2 quadrat was laid down in each station. In barangay Natividad, the first quadrat was laid down 200 meters from the shore ,the second quadrat was laid 30 meters from the first quadrat and third quadrat was laid 30 meters from the second quadrat. In Brgy. San Ramon, Binaobawan, Rosario and Brgy Dulangan the first quadrat was laid down 250 meters from the shore, the second quadrat was laid down 25 meters from the first quadrat and the third quadrat was laid down 25 meters from the second quadrat. In Casanayan, Balogo and Dayhagan, the first quadrat was laid down 300 meters from the shore, the first quadrat was laid down 30 meters from the shore, the second quadrat was laid down 30 meters from the first quadrat and the third quadrat was laid down 30 meters away from the second quadrat. Bivalve was collected using gleaning technique using a small a trowel. Gleaning is the collection of marine species, especially invertebrates from the reef flat at low tide (Shoppe et al. 1998). It was done early in the morning and late in the afternoon during low tide. All specimen collected was place in a pail for sorting of species and for enumeration. It was then place in a specimen jar and was labelled with the site they were found.

F. Laboratory Work

All specimen collected was placed in the laboratory. Specimen was taken out from the preserving jar, dried, sorted out and was arranged according to standard taxonomic groupings. Identification of specimen was based on published materials like books, journal and with the web.

G. Bivalve Identification

Identification of bivalve species was made in the site. Specimens was collected put in a jar and was subject for further process of investigation such as color, length and texture of the shell. Specimens was also photographed for authentication based on publication, published references collection and website of the Department of Fisheries. Specimens was be brought to the Municipal Agriculture Office for those specimens in which field identification is not certain to facilitate the proper identification.

H. Enumeration Technique

A total enumeration Technique was used in this study. All species found in each quadrat was identified, listed and enumerated. Complete enumeration technique was used so that a complete statistical data on species and number of

species could be obtained.Provide clear and concise versions of your methods of conducting research, population and samples, and data analysis tools.

I. Measuring Bivalve Diversity

Biological communities vary in the number of species they contain and a knowledge of this number is important in understanding the structure of the community. Communities with a large number of species that are evenly distributed are the most diverse and communities with few species that are dominated by one species are the least diverse. In measuring the diversity of bivalve species found in the coastal areas of Pilar, the researcher will use the following formulas as introduced by Curtis & McIntosh (1950) and Simpson's Divesity Index

RESEARCH RESULT

Science groups organisms into logical categories that make them easy to recognize. Based on connections within those categories, living things are categorized into progressively larger groups. According to their English names, scientific names, orders, families, genus names, and species names, the study's edible species identified in Pilar Bay were named..

Species of Bivalves

There were seven (7) edible bivalves found in Pilar Bay: These were locally known as *paros, litob, punaw, bug-atan, higda-higda, tikhan* and *kagaykay*. The species found had the following family names: Arcidae, Veneridae, Psammobidae, Mactridea and Solenidae.

TABLE 1. THE SPECIES COMPOSITION OF EDIBLE BIVALVES AT PILAR BAY

FAMILY	SPECIES	COMMON NAME	LOCAL NAME
Arcidae	Anadara granosa	Blood Cockle	Litub
Psammobidae	Soletellina diphos		paros
Solenidae	Pharella acuidens	Razor Clam	tikhan
Mactridea	Mactra mera	Plain trough shell	punaw
	Mactra maculate	Surf Clam	Kagaykay
	Solid mactra		higdahigda
Veneridae	Gafrarium pectinatum	Comb venus clam	Bug-atan

Abundance, Frequency, and Species Diversity Barangay Natividad

The findings indicate that the frequencies of *Litob, Punaw, Higda-Higda, Bug-Atan*, and *Tikhan* are 100%, followed by *Paros* at 66.67 and *Kagaykay* at 33.33%. This demonstrates the prevalence of *litob, punaw, hig-higda*, and *bug-atan* in every quadrat, followed by *paros*, which are frequently seen, and *kagaykay*, which are infrequently found.

Punaw has the highest abundance (18.33), followed by *paros* (15.00), *higda-higda* (7.33), *litob* and *bug-atan* (5.33), *tikhan* (4.67), and *kagaykay* (4.00). In barrio Natividad, *punaw* was said to be the most common species, followed by *paros*.

The data showed that Quadrat A has a diversity index of (0.19), quadrat B with 0.19 and quadrat C with 0.21, followed by quadrat C with SID of 0.21 which is said to be less diverse.

A community which is dominated by one or two species is said to be less diverse. Both Quadrat A and B with SID of 0.81 is said to be more diverse

TABLE 2. ABUNDANCE, FREQUENCY AND SPECIES DIVERSITY IN BARANGAY NATIVIDAD

Species	No. of Individual/Quadrat			Total	Frequency	Abundance
	A	B	C			
Paros	0	20	25	45	66.67	15.00
Litob	5	4	7	16	100	5.33
Punaw	20	15	20	55	100	18.33
Higda-higda	9	7	6	22	100	7.33
Bug-atan	5	5	6	16	100	5.33
Tikhan	4	5	5	14	100	4.67
Kagaykay	12	0	0	12	33.33	4.00
Total	60	62	73			
Simpsons Diversity Index	0.19	0.19	0.21			
Simpsons Index of Diversity	0.81	0.81	0.79			

Abundance, Frequency, and Species Diversity Barangay Dulangan

The results indicate that the frequencies of *litob, punaw, higda-higda, bug-atan*, and *tikhan* are 100%, whereas the frequency of *kagaykay* is 66.67%. This demonstrates that the most prevalent species in each quadrat were *litob, punaw, hig-higda*, and *bug-atan*, followed by *kagaykay*. Additionally, the data demonstrates that not every quadrat had *paros*.

Litob has an abundance of 7.67, which is followed by *punaw* (5.33), *kagaykay* (3.67), *bug-atan* (3.33), *higda-higda* (2.67), and *tikhan* (1.67).

Quadrat A has a diversity index of (0.86), quadrat B with 0.84 and quadrat C with 0.83, Quadrat A with SID of 0.86 is more diverse followed by quadrat B with SID of 0.84 and Qaudrat C with an SID of 0.83 is less diverse. A community which is dominated by one or two species is said to be less diverse.

TABLE 3. ABUNDANCE, FREQUENCY AND SPECIES DIVERSITY IN BARANGAY DULANGAN.

Species	No. of Individual/Quadrat			Total	Frequency	Abundance
	A	B	C			
Paros	0	0	0	0	0	0.00
Litob	6	9	8	23	100	7.67
Punaw	5	5	6	16	100	5.33
Higda-higda	3	3	2	8	100	2.67

Bug-atan	2	3	5	10	100	3.33
Tikhan	2	1	2	5	100	1.67
Kagaykay	5	6	0	11	66.67	3.67
Total	25	32	27			
Simpsons Diversity Index	0.14	0.16	0.17			
Simpsons Index of Diversity	0.86	0.84	0.83			

Abundance, Frequency and Species Diversity in Barangay Poblacion

The findings indicate that the frequencies of *Litob, Punaw, Higda-Higda,* and *Bug-Atan, Takhan*, and *Kagaykay* are 100%, 66.67%, and 66.67%, respectively. This further demonstrates that the most prevalent species in each quadrat are *litob, punaw, higda-higda*, and *bug-atan*, followed by *tikhan, kagaykay*, and *bug-atan.*

Punaw has the highest abundance (6.33), followed by *litob* (4.67), *higda-higda* and *tikhan* (4.00), *bug-atan* (3.33), *kagaykay* (2.67), and *bug-atan* (1.67).

The data also showed that Quadrat A has a diversity index of (0.25), quadrat C with 0.15 and quadrat B with 0.14. Quadrat B with SID of 0.86 is more diverse followed by quadrat C with SID of 0.85 and Qaudrat A with an SID of 0.75 is less diverse.

TABLE 4. ABUNDANCE, FREQUENCY AND SPECIES DIVERSITY IN BARANGAY POBLACION

Species	**No. of Individual/Quadrat**			**Total**	**Frequency**	**Abundance**
	A	B	C			
Paros	0	0	0	0	0.00	0.00
Litob	4	6	4	14	100	4.67
Punaw	7	6	6	19	100	6.33
Higda-higda	2	5	5	12	100	4.00
Bug-atan	0	2	3	5	66.67	1.67
Tikhan	0	6	6	12	66.67	4.00
Kagaykay	6	2	0	8	66.67	2.67
Total	19	33	30			
Simpsons Diversity Index	0.25	0.14	0.15			
Simpsons Index of Diversity	0.75	0.86	0.85			

Abundance, Frequency and Species Diversity in Barangay Binaobawan

The findings indicate that the frequencies of *litob, punaw, higda-higda, bug-atan*, and *tikhan* are 100%, whereas the frequencies of *kagaykay* and *paros* are 66.67% and 33.33%, respectively. This further demonstrates that the most prevalent species in all quadrats were *litob, punaw, higda-higda, bug-atan,* and *tikhan*, followed by mostly present *kagaykay* and seldom present *paros*.

With respect to abundance, *punaw* has 15.33, followed by *litob* (9.33), *higda-higda* and *bug-atan* (8.67), *paros* (5), *kagaykay* (4.00), and *tikhan* (2.67).

Result also showed that Quadrat A has a diversity index of (0.19), quadrat B and C with 0.15. Quadrat B and C with SID of 0.85 is said to be more diverse and quadrat A with SID of 0.81 is said to be less diverse.

TABLE 5. ABUNDANCE, FREQUENCY AND SPECIES DIVERSITY IN BARANGAY BINAOBAWAN

Species	**No. of Individual/Quadrat**			**Total**	**Frequency**	**Abundance**
	A	B	C			
Paros	0	0	15	15	33.33	5.00
Litob	9	8	11	28	100	9.33
Punaw	20	15	11	46	100	15.33
Higda-higda	8	9	9	26	100	8.67
Bug-atan	7	10	9	26	100	8.67
Tikhan	2	3	3	8	100	2.67
Kagaykay	5	7	0	12	66.67	4.00
Total	56	60	63			
Simpsons Diversity Index	0.19	0.15	0.15			
Simpsons Index of Diversity	0.81	0.85	0.85			

Abundance, frequency and Species Diversity in Barangay Rosario

According to the results, the frequencies of *litob, punaw, higda-higda*, and *tikhan* are 100%, whereas the frequencies of *bug-atan* and *kagaykay* are 66.67%. This further demonstrates that the most prevalent species in each quadrat are *bug-atan* and *kagaykay*, followed by *litob, punaw, higda-higda*, and *tikhan*.

Punaw has the highest abundance (10.33), followed by *higda-higda* (7.67), *bug-atan* 5.00, *litob* (4.67), *kagaykay* (3.67), and *tikhan* (2.0).

Result also showed that Quadrat A has a diversity index of (0.26), quadrat C with 0.20 and quadrat B with 0.17. Quadrat B with SID of 0.83 is more diverse and quadrat C with SID of 0.80 and quadrat A with SID of 0.74 is less diverse.

TABLE 6. ABUNDANCE, FREQUENCY AND SPECIES DIVERSITY IN BARANGAY ROSARIO

Species	No. of Individual/Quadrat			Total	Frequency	Abundance
	A	B	C			
Paros	0	0	0	0	0.00	0.00
Litob	3	6	5	14	100	4.67
Punaw	10	11	10	31	100	10.33
Higda-higda	8	8	7	23	100	7.67
Bug-atan	0	7	8	15	66.7	5.00

Tikhan	0	2	4	6	100	2.00
Kagaykay	5	6	0	11	66.67	3.67
Total	26	40	34			
Simpsons Diversity Index	0.26	0.17	0.20			
Simpsons Index of Diversity	0.74	0.83	0.80			

Abundance, frequency and Species Diversity in Barangay Dulangan

The findings indicate that *punaw* and *litob* have a 100% frequency, whereas *higda-higda, bug-atan, tikhan*, and *kagaykay* have frequencies of 66.67% and 100%, respectively. This further demonstrates that *punaw* and *litob* are often found in all quadrats, followed by *bug-atan, higdahigda, tikhan*, and *kagaykay*. In terms of quantity, *punaw* has 10.67, followed by *litob* (7.33), *kagaykay* (3.33), *higda-higda* (3.00), *bug-atan,* and *tikhan* (2.67).

Result showed that Quadrat A has a diversity index of (0.29), quadrat B with 0.21 and quadrat C with 0.16. Quadrat C with SID of 0.84 is more diverse than quadrat B with SID of 0.79 and quadrat A with SID of 0.71.

TABLE. ABUNDANCE, FREQUENCY AND SPECIES DIVERSITY IN BARANGAY DULANGAN

Species	**No. of Individual/Quadrat**			**Total**	**Frequency**	**Abundance**
	A	B	C			
Paros	0	0	0	0	0.00	0.00
Litob	6	9	7	22	100	7.33
Punaw	12	11	9	32	100	10.67
Higda-higda	5	4	0	9	66.67	3.00
Bug-atan	3	0	5	8	66.67	2.67
Tikhan	0	5	3	8	66.67	2.67
Kagaykay	0	5	5	10	66.67	3.33
Total	26	34	37			
Simpsons Diversity Index	0.29	0.21	0.16			
Simpsons Index of Diversity	0.71	0.79	0.84			

Abundance, frequency and Species Diversity in Barangay Balogo

The findings indicate that *punaw* and *litob* have a 100% frequency, whereas *higda-higda, bug-atan, tikhan,* and *kagaykay* have frequencies of 66.67% and 100%, respectively. This further demonstrates that *punaw* and *litob* are often found in all quadrats, followed by *bug-atan, higdahigda, tikhan*, and *kagaykay*. In terms of quantity, *punaw* has 10.67, followed by *litob* (7.33), *kagaykay* (3.33), *higda-higda* (3.00), *bug-atan*, and *tikhan* (2.67).

Result also showed that Quadrat B has a diversity index of (0.18), quadrat A with 0.15 and quadrat C with 0.12. Quadrat C with SID of 0.88 is more diverse than quadrat A with SID of 0.85 and quadrat B with SID of 0.82.

TABLE 9. ABUNDANCE, FREQUENCY AND SPECIES DIVERSITY IN BARANGAY BALOGO

Species	No. of Individual/Quadrat			Total	Frequency	Abundance
	A	B	C			
Paros	0	0	5	5	33.33	1.67
Litob	5	6	6	17	100	5.67
Punaw	8	7	8	23	100	7.67
Higda-higda	6	6	8	20	100	6.67
Bug-atan	5	0	6	11	66.67	3.67
Tikhan	1	3	3	7	100	2.33
Kagaykay	4	0	2	6	66.67	2.00
Total	31	26	42			
Simpsons Diversity Index	0.15	0.18	0.12			
Simpsons Index of Diversity	0.85	0.82	0.88			

Abundance, frequency and Species Diversity in Barangay Casanayan

The findings indicate that the frequencies of *litob* and *punaw, tikhan*, and *higda-higda* are 100%, followed by 66.67% for *bug-atan, paros*, and *kagaykay*. This further demonstrates that *punaw* has an abundance of 8.00, followed by *higda-higda* with 4.67, *punaw* with 4.33, *paros* and *kagaykay* with 3.67, *bug-atan* with 2.67, and *tikhan* with 0.67. Additionally, it shows that *litob, punaw, tikhan*, and *higda-higda* commonly occurred in all quadrat, followed by *bug-atan, paros*, and *kagaykay*, which are mostly present in all quadrat.

Result showed that Quadrat A has a diversity index of (0.20), quadrat B with 0.16 and quadrat C with 0.12. Quadrat C with SID of 0.88 is more diverse than quadrat B with SID of 0.88 and quadrat A with SID of 0.80.

TABLE 10. ABUNDANCE, FREQUENCY AND SPECIES DIVERSITY IN BARANGAY CASANAYAN

Species	**No. of Individual/Quadrat**			**Total**	**Frequency**	**Abundance**
	A	B	C			
Paros	0	8	3	11	66.67	3.67
Litob	4	5	4	13	100	4.33
Punaw	8	9	7	24	100	8.00
Higda-higda	5	5	4	14	100	4.67
Bug-atan	4	0	4	8	66.67	2.67
Tikhan	0	0	2	2	100	0.67
Kagaykay	0	5	6	11	66.67	3.67
Total	23	36	33			
Simpsons Diversity Index	0.20	0.16	0.12			
Simpsons Index of Diversity	0.80	0.84	0.88			

Abundance, frequency and Species Diversity in Barangay San Ramon

The findings indicate that *punaw* and *litob* have a 100% frequency, whereas *bug-atan* and *kagaykay* have a 66.67% frequency. This indicates that *punaw* has an abundance of 10.00, followed by *bug-atan* with 5.00, *litob* with 3.67,

kagaykay with 3.33, and *higda-higda* with 2.67. Additionally, it indicates that *punaw* and *litob* are regularly occurring in all quadrat, followed by *bug-atan* and *kagaykay*, which are generally prevalent in all quadrat.

Result also showed that Quadrat A has a diversity index of (0.36), and both quadrat B with C with 0.25. Both Quadrat B and C with SID of 0.75 is more diverse than quadrat A with SID of 0.64.

TABLE 11. ABUNDANCE, FREQUENCY AND SPECIES DIVERSITY IN BARANGAY SAN RAMON

Species	**No. of Individual/Quadrat**			**Total**	**Frequency**	**Abundance**
	A	B	C			
Paros	0	0	0	0	0.00	0.00
Litob	4	3	4	11	100	3.67
Punaw	10	9	11	30	100	10.00
Higda-higda	0	0	8	8	33.33	2.67
Bug-atan	0	7	8	15	66.67	5.00
Tikhan	0	0	0	0	0	0.00
Kagaykay	5	5	0	10	66.67	3.33
Total	19	24	31			
Simpsons Diversity Index	0.36	0.25	0.25			
Simpsons Index of Diversity	0.64	0.75	0.75			

Abundance, frequency and Species Diversity in Barangay Dayhagan

The findings indicate that the frequency of *litob* and *punaw*, *higda-higda, bug-atan*, and *kagaykay* is 100%, followed by *paros* at 33.33% and *tikhan* at % percent. This further demonstrates that *punaw* has an abundance of 10.00, followed by *litob* with 7.33, *higda-higda* with 5.33, *kagaykay* with 4.67, *bug-atan* with 3.33, and *paros* with 2.00. *Litob, punaw, higda-higda*, and *kagaykay* are generally found in all quadrats, with paros being the least prevalent.

Result showed that Quadrat A has a diversity index of (0.20), and quadrat B with 0.18 and quadrat C with 0.14. Quadrat C with SID of 0.86 is more diverse than quadrat B with SID of 0.82 and quadrat A with SID of .080.

TABLE 12. ABUNDANCE, FREQUENCY AND SPECIES DIVERSITY IN BARANGAY DAYHAGAN

Species	**No. of Individual/Quadrat**			**Total**	**Frequency**	**Abundance**
	A	B	C			
Paros	0	0	6	6	33.33	2.00
Litob	6	9	7	22	100	7.33
Punaw	12	11	10	33	100	11.00
Higda-higda	5	4	7	16	100	5.33
Bug-atan	3	5	2	10	100	3.33
Tikhan	0	0	0	0	0	0.00
Kagaykay	3	5	6	14	100	4.67
Total	33	37	43			

Simpsons Diversity Index	0.20	0.18	0.14			
Simpsons Index of Diversity	0.80	0.82	0.86			

Species Richness, Abundance, Frequency, Ecological Distribution and Species Diversity in Pilar Bay

The findings indicate that the frequencies of litob, punaw, higda-higda, bug-atan, and kagaykay are 100%, tikhan is at 75%, and paros is at 50%. This only indicates that all of Pilar's barangays frequently experienced litob, punaw, higda-higda, bug-atan, and kagaykay. Tikhan primarily happened in a few Pilar barangays. Conversely, Paros is hardly ever seen in several Pilar barangays.

Pungaw has the highest rate of abundance (28.88), followed by litob (16.25), higda-higda (13.58), bug-atan (11.25%), kagaykay (13.28%), paros (8.38), and tikhan (5.75). This only indicates that the most common edible bivalves in Pilar Bay are punaw, which are followed in abundance by litob, higda-higda, bug-atan, kagaykay, paros, and tikhan.

Barangay Dayhagan has the most species richness at 8, followed by Barangay Poblacion and Dulangan at 7, Barangay Rosario at 8, and Barangay San Ramon at 5. Barangay Natividad, Casanayan, and Balogo has the lowest species richness at 9. This indicates that there are more edible bivalves in Barangay Natividad, Casanayan, and Balogo than in Barangay San Ramon.

As to its ecological distribution, paros occurred only in four (4) Barangay s namely: Natividad, Casanayan, Balogo and Dayhagan. Litob, Punaw, Higdahida, bug-atan and kagaykay can be found in all sample barangay.

TABLE 13 ABUNDANCE, FREQUENCY AND SPECIES DIVERSITY IN PILAR BAY

Species Name	No. of species/Branggay								Total	Frequency	Abundance
	Natlvidad	Poblacion	San Ramon	Casanayan	Balogo	Dayhagan	Rosario	Dulangan			
Paros	45	0	0	11	5	6	0	0	67	50	8.375
Ugpan	15	12	0	9	10	12	0	11	69	75	8.625
Litob	16	14	11	13	17	22	14	23	130	100	16.25
Punaw	55	19	30	24	23	33	31	16	231	100	28.875
Higda-higda	22	12	8	14	20	16	23	8	123	100	15.375
Bug-atan	16	5	15	8	11	10	15	10	90	100	11.25
Tikhan	14	12	0	2	7	0	6	5	46	75	5.75
Kagaykay	12	8	10	11	6	14	11	11	83	100	10.375
Total	195	82	74	92	99	113	100	84	839		
Species Richness	9	7	5	9	9	8	6	7			
Simpsons Diversity Index	0.17	0.15	0.25	0.15	0.15	0.17	0.20	0.16			
Simpsons Index of Diversity	0.83	0.85	0.75	0.85	0.85	0.83	0.80	0.84			

Description of the Species of Edible Bivalves Found in Pilar Bay

Litob (Blood Cockle)
Taxonomic Classification
Class: Bivalvia
Order: Pteriomorpha
Family: Arcidae
Species : Anadara granosa
(Linneaus, 1758)

Picture of Litob (Blood Cockle)

This bivalve has large, thick lungs. Shell elliptical, nearly equilateral. Throughout the Indo-Pacific region, this tough 6–9 cm periostracum with a brownish yellow to dark brown covering is prevalent. The majority of Anadara species are found in intertidal or slightly subtidal environments. Larva A in Malaysia. Granosa often settle on muddy coasts between the mean low water and mean high water of neap tides (MLWN and MHWN, respectively). They often don't get above MHWN, where mangrove swamp woods typically predominate. maximum densities in A. Granosa often occur at or around midtide level (MTL).The densest populations of Anadara granosa are frequently found on mudflats close to big river mouths, but not within them (Pathansali 1963; Broom 1980). The salinity of the coastal waters typically ranges from 28 to 31 ppt during seasons with less rainfall than normal; but, during the rainy season, the salinity over particular beds may dip as low as 5–10 ppt at neap tidal low water or as low as 15 ppt during high water (Broom 1980). According to reports, Penang's usual monthly range is 26 to 31 ppt, with significant tidal.

Paros (Lam shell)
Taxonomic Classification
Class: Bivalvia
Order: Veneroida
Family: Psammobidae
Species Soletellina diphos
(Linneaus, 1758)

Picture of Paros (Lam Shell)

Large, thin, somewhat compressed shell that is elongated and elliptical-ovate in appearance, with substantial anterior and posterior gapping. circular on the anterior side. The posterior border is pointed posteriorly and somewhat obliquely truncate. It meets the somewhat concave posterodorsal margin at an obtuse angle. Generally convex ventral edge. Clearly anterior to the middle of the valves are the umbones, and a low radial fold extends quite obliquely to the posterior end of the shell. Outside smooth, with the exception of tiny, circular development marks. Color: Purplish blue on the surface of the shell, frequently with two lighter rays going obliquely from the posterior ventral border to the umbones. Olive-brown, highly polished periostracum. within a rich purple. 12

cm is the maximum shell length; 8 cm is more typical. Muddy bottoms are its home. both littoral and sublittoral, extending from low tide to a maximum depth of around 30 meters. actively gathered for its highly valued meat in the Philippines. In China's Taiwan Province, this species is significant for commerce. It's likely that other Soletellina species are harvested nearby for food.

Tikhan (Lam shell)
Taxonomic Classification
Class: Bivalvia
Order: Solenidae
Family:
Species: Pharella acuidens
(Linneaus, 1758)

Picture of Tikhan (Lam Shell)

Within the Solenidae family, it is the biggest known species. Although it may grow up to 7 inches long, it is typically picked at a length of 4 to 5 inches. From South Carolina to the Canadian Maritimes, the Atlantic Coast of North America is home to razor clams. In the intertidal zones, razor clams are found thriving on the sandy bottoms. They dig vertical burrows in the sand, with their foot buried and their siphon extending upward. The clam moves startlingly fast, using its foot to swiftly elude predators. It swims well and burrows quickly. It can quickly open and close its shell, pull in its foot, and release water to move through the water. The jackknife clam burrows vertically in the sand with its foot. Its flesh is supposed to have a good, soft consistency and a highly sweet taste. Its shell features growth rings, and it is bivalve. The periostracum, the thin organic covering or "skin" that covers the outside of the shell of many shelled organisms, such as mollusks and brachiopods, is lustrous and greenish-brown. It is primarily observed in bivalves and gastropods, or snails and clams, but it is also present in cephalopods, like nautiluses.

Bug-atan (Comb Venus Clam)
Taxonomic Classification

Class: Bivalvia
Order: Veneroida
Family:Veneridae
Species: gafrarium pectinatum
(Linneaus, 1758)

Picture of Bug-atan (Comb Venus Clam)

Medium-sized shell with a modest laterally compressed shape. Sub-ovate outline with umbones near the anterior half that is noticeably longer than high. The posterior slope's divaricate ribs are concentrically striate from top to bottom, and concentric grooves extend into the symmetrical radial ribs close to the ventral margin. The sculpture of the nodulose radial ribs includes asymmetrical ribs where they change direction and are obliquely positioned in relation to the

central ribs. heart-shaped, narrow lunule. Pallial sinus absent. crenulate inner edge. mostly shallow, intertidal waters with dirty sands and gravels. It has a three-year lifespan and has two distinct seasons of low recruitment: spring and autumn. Gametogenic cycles substantiate this image.. Matures at a shell length 16-20 mm, after one year of life. Generally it is a dioecious species with sex rato about 1:1.

Punaw (Plain Through Shell)
Taxonomic Classification

Class: Bivalvia
Order: Veneroida
Family:Mactridae
Species: Mactra mera
(Linneaus, 1758)

Picture of Punaw (Plain Through Shell)

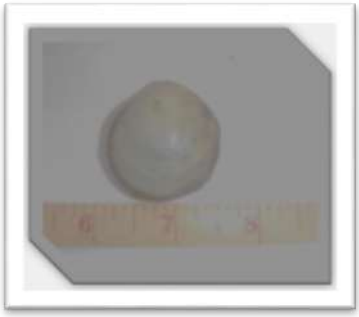
This enormous brown clam is possibly the most often found member of the Mactridae family in Pilar. It is frequently spotted on our northern coastlines in sandy, silty regions near seagrass habitats. The thick, smooth, two-part shell is often unmarked and ranges in color from plain brown to purplish brown. It often sits buried little below the surface with its short siphon protruding. On occasion, though, one can come upon an unburied person on the beach.

Kagaykay (Surf)
Taxonomic Classification

Class: Bivalvia
Order: Veneroida
Family:Mactridae
Species: Mactra maculate
(Linneaus, 1758)

Picture of Kagaykay (Surf)

This clam has light brown, extremely fine growth lines, and is shiny and smooth. Golden exterior, pale outside. The creatures dig only 10 cm below the surface and have very short siphons. After a storm, thousands of specimens are frequently discovered beached.



Higda-higda
Taxonomic Classification

Class: Bivalvia
Order: Veneroida
Family:Mactridae
Species: Solid Mactra
(Linneaus, 1758)

Picture of Higda-higda

This clam has a smooth surface, oval shape, rounded corners on both sides, and a thick shell measuring 55 cm in circumference. flattened with fan-like grooves on both sides of the umbones.

CONCLUSIONS AND RECOMMENDATIONS

Accurate data about bivalves, their distribution, and risks should be possessed by the municipality in order to mitigate the loss of these species due to human activities. Encourage the recovery of vulnerable and endangered species as well as the rehabilitation and repair of damaged ecosystems. Take steps to promote a better knowledge and awareness of the importance of biological variety as it is expressed in the ecosystem and in its constituent elements. Effective methods for baseline surveys and inventories, as well as for the methodical sampling and assessment of bivalves and other marine resources, should be funded by the local government. Programs for managers' and professionals' scientific and technical education and training on identification, biological diversity conservation, and sustainable use of biological resources—particularly bivalves—should be maintained or established by the community. Encourage the inclusion of these subjects in educational programs and raise awareness of the significance of the actions necessary for the preservation of the diversity of bivalves and their sustainable use at all levels of government policy-making and corporate decision-making.

ADVANCED RESEARCH

Future studies could use other means of sampling to further recognize and discover unidentified species of bivalves with its economic use in the area. Conduct more research on the biodiversity of bivalves and univalves not only in the intertidal zone but also in the deep seas.

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