

Abundance, Frequency, Economic Valuation and Polymorphism of *Umbonium vestiarium* in Pilar Bay: Basis for Environmental and Economic Policy Making

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Abstract

Life on earth is exceptionally rich and varied. It can appear in the shape and on the scale of anything from very small bacteria to gigantic animals such as the blue whale. Almost 8 years that common button tops vanished from the beaches of Pilar and only on the year 2015 it re appeared. This study was conducted at 9 baranggays in Pilar, Capiz, Philippines to determined the abundance, frequency, economic valuation and polymorphism of *Umbonium vestiarium* in Pilar Bay. A line transect of 100 meters in every sample site and a four 1 x 1 quadrat was used in collecting the species. A comprehensive matrix was used in identifying the color polymorphism. There were a total of 1915 species of *U. vestiarium* collected from seven (7) sample sites. The species were abundant in Barangay Natividad followed by Baranggay Dulangan , and Balogo .It frequently or commonly occurred in every quadrat in Barangay Dulangan, Rosario, Natividad, San Ramon, Casanayan, Balogo and Dayhagan. The average harvesting of *Umbonium vestiarium* in Baranggay Dulangan were around 35 kgs / day, 45 kgs in Natividad, and, 30 kgs in Balogo. The selling price of *Umbonium vestiarium* in the municipality of Pilar is Php 10.00/glass. There were 33 different morphs observed with 9 distinct band and 18 whorl designs respectively.

Keyword: *Umbonium vestiarium*, economic valuation polymorphism, Pilar Bay

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Introduction

Life on earth is exceptionally rich and varied. It can appear in the shape and on the scale of anything from very small bacteria to gigantic animals such as the blue whale. Mollusk live in all the seas of the world and even appear on land and in fresh water. Remains from this group of animals, their shells can be found almost everywhere. Their shells captivate and fascinate people with their magnificent display of color and wealth of form. They wash up on all the cost of the world, where they are easily collected and sold or given away. The health of the ocean and marine life are so often taken for granted and due to our increasing numbers and wasteful practices, the ocean appears to be as vulnerable to harm by human activities as any other environmental realm. Humankind seemed to view the ocean as a source of infinite resources. The threats to marine species are difficult to perceive because marine animals are not as visible as animals on land. But unfortunately, marine creatures are equally, if not more, vulnerable to problems such as habitat destruction and overexploitation. (Marinebio, 2019)

Umbonium vestiari or common button tops is a tiny pretty snail found in thousands, lying just beneath the sand surface on some parts of our shores. It has a size of 0.8-1cm. Shell thin, circular, glossy with an amazing variety of colors and patterns. The operculum is thin made of a horn-like material with concentric yellow rings. The flexible operculum allows the animal to withdraw deep into the coils of the shell. The body is pale speckled, edge of the mantle fringed with long tentacles. Tiny eyes on long stalks, long tentacles finely banded, with two tubular siphons, one with fringes. The long mobile foot can be used to burrow rapidly into wet loose fine sand (the snail doesn't do so well in compact dry sand). The streamlined shell helps them burrow rapidly (Button snail, 2016).

To escape predators, button snails make a short, spiraling leap then quickly bury themselves into the sand again. Sometimes, on wet sand, you might see the tiny trails left by panicky button snails, punctuated by little holes where they disappeared into the sand. When disturbed, submerged button snails may also pop up and float on the water surface, sometimes forming 'rafts' of several snails. More like bivalves rather than snails, *U. vestiari* lie just beneath the sand and filter feed for detritus and plankton. *U. vestiari* appear to be among the favorite prey of Moon snails. Olive snails have also been seen hunting them. Other large animals probably also snack on them. Empty buttons shells are favorite homes of tiny hermit crabs. Sadly, these beautiful tiny animals are collected, killed and their shells sold as cheap curios and for handicrafts. (Button snail, 2016).

Ubonium vestiari is commonly landed species. Ladies and children are mainly involved in the harvesting of these shells by handpicking and using small scoop nets (Felix et al., 2017). They are commonly gathered as food. Vendors traditionally provide the buyer with an aromatic thorn from the Calamsi or Acacia to pry the meat out. *U. vestiari* were highly abundant in Pilar, Capiz particularly in Barangay Natividad, but populations have declined drastically their habitats since become degraded or were lost. Careless visitors trampled and over collected these species

which brought impact on local populations.

Hence, this study was conducted to determine the abundance, frequency, economic valuation, polymorphism and to identify and categorize different morphs of *Umbonium vestiarium* in Pilar Bay, Capiz, Philippines.

Methodology

This study used the descriptive survey methods. The researcher used this method to get information on the current status of the *Umbonium vestiarium* found in the coastal areas in Pilar Bay, Capiz, Philippines and to describe the characteristics of such species in terms of its abundance, frequency, economic valuation and polymorphism. Materials such as tape measure, meter stick, a nylon rope, pegs, camera, and a laptop computer, and a specimen jar were used in the study.

In gathering the level of exploitation of *Helex pomotia*, 15 snail collecting people were interviewed. They were selected through accidental sampling technique. There were 6 respondents from Barangay Yating, 7 respondents from San Silvestre, and 2 respondents from Barangay Tabun-acan.

Before the conduct of the study, a proper protocol was followed. A permit was secured from the Municipal mayor and barangay captains of selected study site. Permit was also secured from the Department of Environment and Natural Resources and from the Department of Fisheries

Line transect method and a quadrat were employed in each sample site. Three (3) stations were selected and 4 1x1 m quadrat was laid down in each station.

Field Work

Before the final survey, a preliminary survey was conducted on April 14 to April 16, 2017 for planning and familiarity of the site. The first survey was conducted on April 21 to April 23, 2017 and the second and was conducted on April 28 to April 23 and the third and final was conducted during April 28, to April 30 during low tides. Four (4) 1 x 1 quadrat was laid down in each station. A 100-meter line transect was laid down in each station during low tide and in every 25 meters 1 x 1 quadrat was laid down. In collecting *Umbonium vestiarium* a gleaning technique was used. Specimen from the site was enumerated, and tabulated to get information on abundance, and frequency. For economic valuation, button tops collecting people or local sellers of *Umbonium vestiarium* was interviewed. The respondents were present during the conduct of the study and each of them were interviewed.

Laboratory Work

Analysis of the specimen for color polymorphism was done during the month of May to June 2017. All specimens collected were cleaned, examined and sorted and were placed in the specimen jar and were brought to laboratory for color polymorphism observation. A comprehensive matrix with different band and whorl

designs was created to categorize the color polymorphism of the specimen.

Enumeration Technique

A total enumeration technique was used in this study. All species of *Umbonium vestiarium* found in each quadrat was collected, counted and enumerated.

Measuring Species Abundance

In measuring the abundance and frequency of *Umbonium vestiarium* found in the sample site, the researcher used the formula as introduced by Curtis & McIntosh (1950)

Abundance

Abundance is the number of individuals of different species in the community per unit area. By quadrat method, samplings were made at random at several places and the number of individuals of each species was summed up for all the quadrats divided by the total number of quadrats in which the species occurred. It is represented by the equation:

$$\text{Abundance} = \frac{\text{Total number of individuals of a species in all quadrats}}{\text{Total number of quadrats in which the species occurred}}$$

Frequency (%)

Frequency refers to the degree of dispersion of individual species in an area and usually expressed in terms of percentage occurrence. It is calculated by the equation:

$$\text{Frequency (\%)} = \frac{\text{Number of quadrats in which the species occurred}}{\text{Total number of quadrats studied}} \times 100$$

Polymorphism

In identifying the polymorphism of the species, a simple morph identification matrix was constructed. Comprehensive matrix with different band designs on the vertical axis and whorl design on horizontal axis.

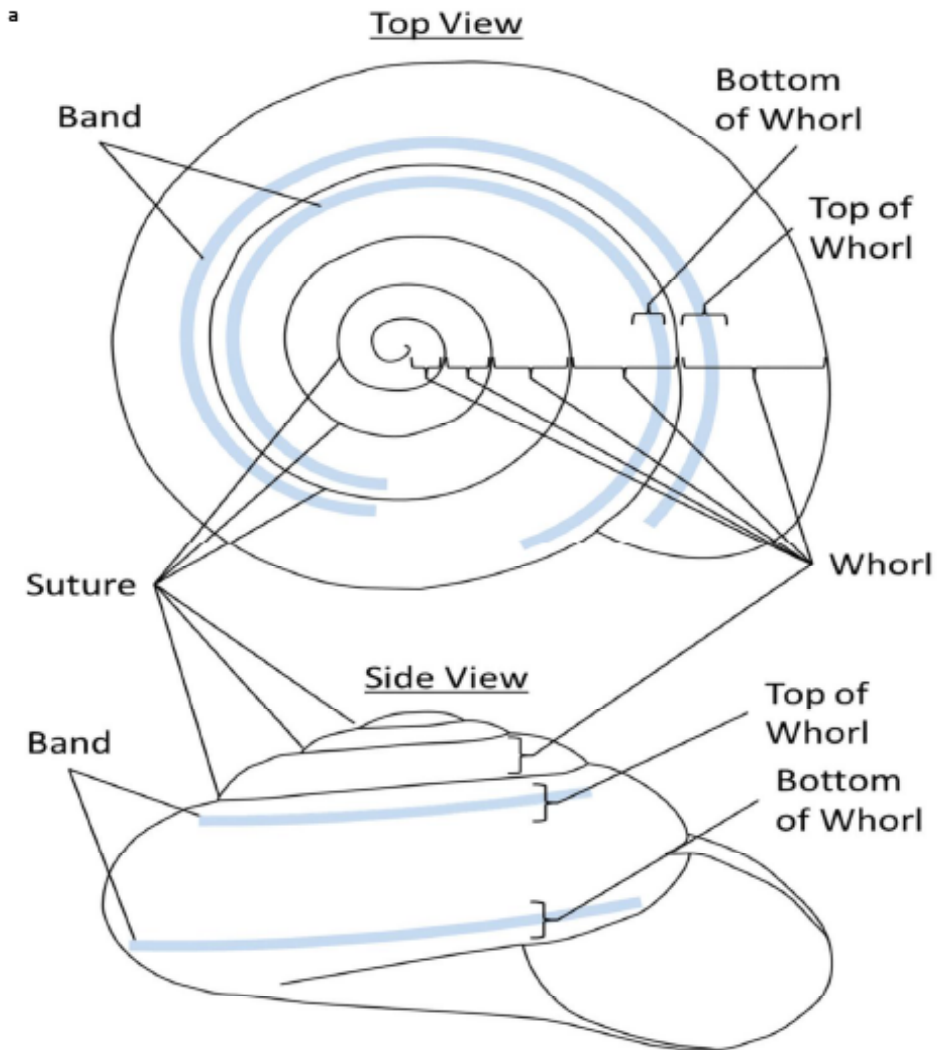


Figure 1. Illustration of the terms used to describe different aspects of *U. vestiarium* shells patterns (source: Chan et al: Polymorphism in *Umbonium Vestiarium*)

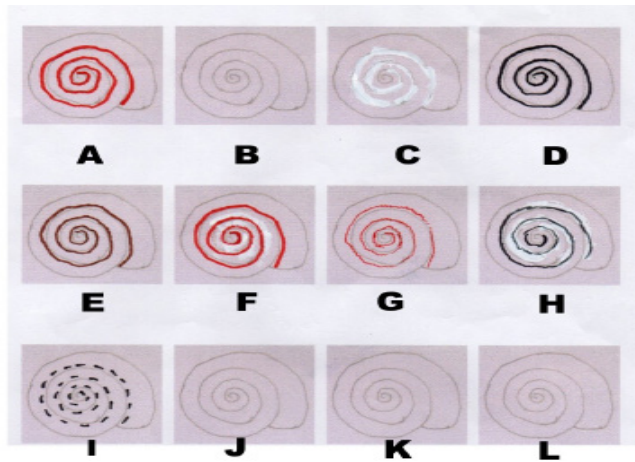


Figure 2. Illustration of the different types of band observed. Example A has solid red band design, B has no band, C has solid white band design, D with solid black band design, E has light band design, F depicts a two band design, white and red, G with light red band design, H has 2 bands with solid black and white and I has a black dashed design.



Fig 3. Illustration of the different types of whorl designs observed.

Legend:

1. Has a brown and black wavy lines.
2. Has white with red line.
3. Has red line at the top of the whorl with dotted brown at the bottom.
4. Has white with dotted black at the bottom.
5. Has uniform black design.

6. Has white uniform design.
7. Has white with black stripe.
8. Has white with brown line and black stripe design.
9. Has white with red line and black stripe.
10. Has white and light red line with black stripe at the bottom of the whorl,
11. Has scaled black and brown with red line design.
12. Has white with broken brown line design.
13. Has uniform light brown design with white at the top.
14. Has uniform light design.
15. Has white with brown stripe design.
16. Has uniform light brown with white line at the bottom of the whorl.
17. Has uniform light brown with red line.
18. Has combination of black and brown stripe.

Results and Discussion

Abundance and Frequency of *Umbonium vestiarium* in Pilar Bay

Table 1 presents the abundance and frequency of *Umbonium vestiarium* in every barangay in the municipality of Pilar. The data shows that there were a total of 1915 species of *Umbonium vestiarium* collected from 7 sample sites. There were 1138 specimen collected from Barangay Natividad, 281 from barangay Dulangan, 263 from Barangay Balogo, 74 from barangay Rosario, 73 from barangay San Ramon 56 from Barangay Casanayan and 30 from Barangay Dayhagan. No species collected from 2 sample sites, specifically from Barangay Binaobawan and Poblacion.

As to species' abundance, Barangay Natividad got the highest with 284.5 followed by Barangay Dulangan with 70.25, Balogo with 65.75, Rosario with 18.5, San Ramon with 18.25, Casanayan with 14 and Dayhagan with 7.5.

For species' frequency, *Umbonium vestiarium* commonly occurs in every quadrat in Barangay Dulangan, Rosario, Natividad, San Ramon, Casanayan, Balogo and Dayhagan.

According to Kalyanasundaram, et al. (1974) *Umbonium vestiarium* restricts its habitat to mid-tide zone and generally avoids sands of finer grades or sands mixed with mud. In their findings it revealed that selection of habitat is influenced by extreme condition of illumination. The grade of sand exerts some influence on the habitat selection. The animal prefers medium sand to finer or courser grade.

The species were abundant in Barangay Dulangan, Natividad and Balogo because the sand depicts a medium grade and it is not muddy. It must be the reason why they are abundant on these barangays.

Table 1. Abundance, frequency of *Umbonium vestiarium* in every baranggay in Pilar Bay, Capiiz, Philippines

Name of Baranggay	Number of Species/Quadrat				Total	Abundance	Frequency (%)
	Q1	Q2	Q3	Q4			
Dulangan (guise)	57	76	78	70	281	70.25	100
Rosario	12	25	24	13	74	18.5	100
Binaobawan	0	0	0	0	0	0	0
Poblacion	0	0	0	0	0	0	0
Natividad	157	305	375	301	1138	284.5	100
San Ramon	14	22	25	12	73	18.25	100
Casanayan	12	14	17	13	56	14	100
Balogo	55	69	68	71	263	65.75	100
Dayhagan	5	8	7	10	30	7.5	100
Total				1915			

Economic Valuation of *Umbonium vestiarium*

Umbonium vestiarium also plays a role in the local economy because it is collected and sold for snack and for shell craft and also for local consumption.

Table 2 showed that out in Barangay Dulangan, the average harvesting of *Umbonium vestiarium* were around 35 kgs /day, 2 kgs in Rosario, 45 kgs in Natividad, 2 kgs in San Ramon, 1 kgs in Casanayan, 30 kgs in Balogo and 1 kgs in Dayhagan. The respondents also said that the volume of harvest depends on the abundance of the species during seasons. In Barangay Rosario, San Ramon, Casanayan and Dayhagan the respondents said that they harvest button tops for consumption purposes only. The selling price of *Umbonium vestiarium* in the municipality of Pilar is Php 10.00/glass.

Table 2. Economic valuation of *U. vestiarium*

Name of Baranggay	No. of <i>U. vestiarium</i> collected /day	Price of <i>U. vestiarium</i>
Dulangan (guise)	35 kgs	10 Php/glass
Rosario	2 kgs	10 Php/glass
Natividad	45 kgs	10 Php/glass
San Ramon	2 kgs	10 Php/glass
Casanayan	1 kgs	10 Php/glass
Balogo	30 kgs	10 Php/glass
Dayhagan	1kgs	10 Php/glass

Polymorphism of *Umbonium vestiarium* in Pilar Bay

The figure 4 shows that out of 1915 *Umbonium vestiarium*, 33 different morphs were observed. The comprehensive matrix classified individual species based on 9 distinct band design (according to the color, presence, and continuity) and 19 whorl design (based on marking color and type).

The species were abundant in Barangay Natividad with 284.5, followed by Barangay Dulangan with 70.25, Balogo with 65.75, Rosario with 18.5, San Ramon with 18.25, Casanayan with 14 and Dayhagan with 7.5. *Umbonium vestiarium* frequently or commonly occurs in every quadrat of Barangay Dulangan, Rosario, Natividad, San Ramon, Casanayan, Balogo and Dayhagan.

The average harvesting of *Umbonium vestiarium* in Barangay Dulangan were around 35 kgs /day, 2 kgs in Roario, 45 kgs in Natividad, 2 kgs in San Ramon, 1 kgs Casanayan, 30 kgs in Balogo and 1 kgs in Dayhagan. The volume of harvest depends on the abundance of the species during seasons. The selling price of *Umbonium vestiarium* in the Municipality of Pilar is Php 10.00/glass.

WHORL DESIGN	BAND DESIGN								
	A	B	C	D	F	F	G	H	I
	Solid Red Band Design	Has no band	Solid White Band	Solid Black Band	Light Brown Band	With White and Red Band	Light Red Band	Solid Black and white band	Black dashed band
1 Brown and brown wavy lines									
2 Uniform white with red line									
3. dotted brown with red line at the top									
4 dotted black with white line at the top									
5 Uniform Black design									
6 Uniform white design									
7 white with black stripe									
8 white and black stripe with brown									
9 white with black stripe and red line									

WHORL DESIGN	BAND DESIGN								
	A	B	C	D	F	F	G	H	I
	Solid Red Band (ie-	Has no band	Solid White Band	Solid Black Band	Light Brown Band	White and Red Band	Light Pink Band	Solid Black and white band	Black dashed band
10 white with red line and black stripe and the bottom									
11 Scaled black and									
12 White with broken brown line at the									
13 Uniform light brown with white line at the top									
14 Uniform light									
15 Uniform white design with brown stripe									
16 Uniform light brown with white line at the bottom									
17 Uniform light									
18 combination of black and brown stripe									

Figure 5. A matrix classifying the colour polymorphic of *Umbonium vestiarium* according to 9 different band design and 18 whorl design.

There were 33 different morphs were observed with 9 distinct band design (according to the color, presence, and continuity) and 18 whorl design (based on marking color and type).

Conclusions

There were a total of 1915 species of *Umbonium vestiarium* collected from seven (7) sample site. There were 1138 specimen collected from Barangay Natividad, 281 from barangay Dulangan, 263 from Barangay Balogo, 74 from barangay Rosario, 73 from barangay San Ramon 56 from Barangay Casanayan and 30 from

Barangay Dayhagan. No species collected from 3 sample site which is Barangay San Fernando, Binaobawan and Poblacion.

The species were abundant in Barangay Natividad with the highest with 284.5 followed by Barangay Dulangan with 70.25, Balogo with 66.75, Rosariowith 18.5, San Ramon with 18.25, Casanayan with 14 and Dayhagan with 7.5. *Umbonium vestiarium* frequently or commonly occurs in every quadrant of Barangay Dulangan, Rosario, Natividad, San Ramon, Casanayan, Balogo and Dayhagan.

The average harvesting of *Umbonium vestiarium* in Barangay Dulangan were around 35 kgs/day, 2 kgs in Rosario, 45 kgs in Natividad, 2 kgs in San Ramon, 1 kg Casanayan, 30 kgs in Balogo and 1 kg in Dayhagan. The volume of harvest depends on the abundance of the species during seasons. The selling price of *Umbonium vestiarium* in the Municipality of Pilar is Php 10.00/glass.

There were 33 different morphs were observed with 9 distinct band design (according to the color, presence, and continuity) and 18 whorl design (based on marking color and type.)

Recommendations

Based on the findings of the study the following recommendations were drawn: To stop the threat for species degradation the municipality may have a policy to stop the over harvesting of *Umbonium vestiarium*; To preserve the economic importance of *Umbonium vestiarium*, the community should help for the returning of the shell to the beach to be used as home for other species; The community may maintain the cleanliness of the beaches in Pilar to avoid species loss; and the Municipality in cooperation with the Capiz State University should have an information dissemination about the ecological role of this species so that they maybe aware not to waste its shells.

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