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# Morphometric Characteristics of Snapping Shrimps (Alpheus sp.): The Case of Calape, Bohol, Philippines

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## Abstract

Morphometric studies are the most common and cost-effective tools used today to identify and characterize stocks or even populations of some fishes and crustaceans. This study aims to assess the morphometric characteristics of snapping shrimps (*Alpheus sp*.) in Calape, Bohol, Philippines. A sequential exploratory mixed-method design was used to characterize the data gathered. A total of 30 randomly selected snapping shrimps were collected from the local gatherer. Results have shown that snapping shrimps greatly vary in their qualitative to the quantitative description. Out of nineteen characteristics, 4 characters show high values of correlation coefficient indicating that these characters are directly proportional to each other and 11 characters show moderate correlation coefficient. Linear relationships have been observed between all the independent and dependent characters. The characterization of the snapping shrimps gives a good indicator for further studies and the creation of proper directives to minimize the collection of stocks is a good indicator of how to increase the population.

**Keywords:** exploratory, morphometric, snapping shrimps

## Introduction

The morphological study includes the characterization of various attributes into morphometric or meristic characters. These two types of morphological characters are frequently used to embody the stocks of a variety of exploited species. Morphometric and meristic studies are a vigorous tool for measuring the discreteness of the same species. These studies can potentially contribute to aquaculture purposes, management, and conservation strategies for a population and lead to a better understanding of species ecology, behavioral traits and stock enhancement. In the recent development in fishery, shrimp is one of the most exploited stocks. One of the shrimp species that gives the potential for stock enhancement is the snapping shrimps is taxonomically defined as snapping shrimps describes as having a big claw shrimp which is scientifically known as *Alpheus heterochaelis* belongs to the Phylum *Anthropoda*; Class *Malacostraca*; Order, *Decapoda*; Family, *Alpheidae*, Genus, *Alpheus;* Species, *heterochaelis*. This shrimp species was further described by Matheson (2008) as he collected individual samples from Florida Bay mudbanks experiencing studies on salinities resulted to a ranged from mesohaline (12.8 ppt) to hypersaline (49ppt).

A study conducted by Herberholz and Schmitz (1998) shows some morphometric characteristics and describes the body possesses a single, large chela (claw) that has been modified such that it is capable of producing a distinct snapping or popping sound. The acoustic claw snap of *Alpheus heterochaelis* is important as a means of stunning/killing prey, in defense, and as part of a threat display in agonistic intraspecific encounters as well. As illustrated individuals typically have a dark translucent green with orange and blue-tipped uropod. The rostrum is small and the carapace edge is smooth and spineless and the large

snapping claw is strongly notched on both the upper and lower margins at the base of the fingers. The snapping claw can be either the left or right claw, and it attains a length nearly half that of the body. The opposite paired claw remains an unmodified pincer. The snapping claws of male *A. heterocheilis* are larger and broader than those of females of equal size (Nolan and Salmon 1970; Herberholz and Schmitz 1998). A crustacean with a hard shell called an exoskeleton that forms a head, thorax and abdomen. This shrimp lives near the water surface. Its exoskeleton is often transparent, making them less visible to predators. Bottom-dwelling shrimps are typically brown or green, while most deep-sea species are red. Shrimps that live in coral reefs can be quite vivid in color; and include some of the most beautifully colored animals in the seas (Bagarinao 1986).

The culture of this species is a challenge among fish farmer because this species is usually found in mangrove areas and prefers the shallowest areas. They also like to burrow into sandy and silt sediments. They are also known for burrowing into the sand, mud, undersea grass mats, oyster flats, and gravel with their front claws. However, they prefer to burrow in lagoons and reef edges-areas with little to no cover from predators. This precarious housing location, combined with their relatively poor eyesight, requires snapping shrimps to solicit the help of certain gobies (Fathererree 2012). Like most other alpheid shrimp, *Alpheus heterochaelis* individuals are most often encountered as mated pairs and social monogamy appears to be a widespread phenomenon. A study by Rahman et al. (2003) suggests that mate guarding by the male appears to be the key factor leading to social monogamy in *A. heterochaelis*, i.e., rather than shared territoriality or biparental care of young. Matherson (2008) indicates that the female molt cycle is highly cryptic and those females are only receptive for a few hours immediately after molting. Mate guarding through male-female pairing is therefore advantageous to the male because it maximizes mating opportunities and also to the female because it minimizes the need to search for a mate during the vulnerable soft-bodied receptive phase. This species is unusual in that it exhibits an abbreviated larval life cycle consisting of three larval stages. At 22-25 ¼ C, the first instar last only 1- hour, the second instar for approximately 28 hours, and the entire larval period is just 4-5 days (Knowlton 1973).

Moreover, a great interest is put into this species because of its unique characteristics which can be found abundantly in the locality. It is one of the best delicacies in Calape, Bohol, Philippines with high consumer acceptability and commands a higher price because it is considered one of the most requested fishery products among Cebuanos and Boholanos. This indicates a good promise for aquaculture especially, for mass production.

In spite of its potential, limited snapping shrimps' study has been conducted in the Philippines especially about species' stock assessment and development for the culture technology either in contrivance to bring about cultural or in the animal's natural habitat aqua-silviculture and it is now a challenge among researchers to elaborately exhaust the species to answer the existing condition of culturing snapping shrimps from wild in captivity.

With the current findings of some preliminary studies conducted, this study supports the call for fishery conservation as one way of controlling and utilizing our fisheries resources that ensures optimum yields and a continuous supply of fish and other fishery products (Amos et al. 2003). An assessment of snapping shrimp catch could give an assurance. It would not only determine the present status of the population of snapping shrimps but also implement some conservation programs as well. The result of this evaluation would make the government draw control measures to avoid catching and harvesting the species (Caton 1998).

***Objectives***

Generally, this study aims to assess and describes the morphometric characteristics snapping shrimps as to the form and shape including the sizes.

## Materials and Methods

This study uses the exploratory sequential mixed method designs that involve the qualitative description first before the quantitative assessment. The interview was done with the selected gatherers (Figure 1). A total of 20 gatherers and 8 vendors from different barangays in Calape, Bohol, Philippines was interviewed as to the habitat characteristics, a possible number of shrimps gathered per day, and number of fishing effort. A total of 30 randomly selected samples were collected from the selected snapping shrimp gatherers and vendors. The samples were explored quantitatively as to the percentage of the total length by its identified characteristics. The total specimens of snapping shrimps (Figure 2) were collected from mangrove areas with the help of standard fishing gears like trawls and hand nets from January-February, 2022. The specimens were collected and placed in a basin. The morphometric measurements were recorded following the standards (Holden M.J. and Raitt D.F.S., 1974). The statistical coefficient has been calculated after (Snedecor G.W. and Cochran W.G., 1967. Data were presented using tables and pictographs.

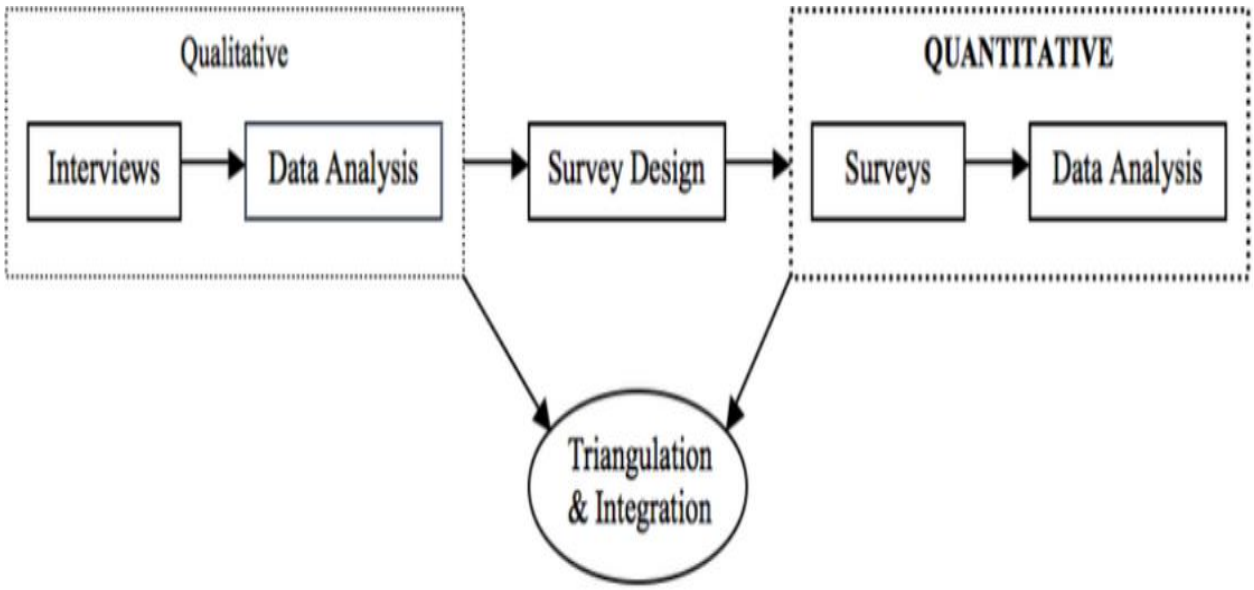


**Figure 1.** *A sequential exploratory mixed method design (Philip Fei Wu, 2015)*

Geographically, this study was conducted in Calape, Bohol, Philippines. The identified gatherers and local vendors were randomly selected as the subject for qualitative assessment. The town of Calape was known to have plenty of snapping shrimps, in fact, this shrimp was considered as the emblem of the town. Consumers from other towns if ever they passed along Calape town, wouldn't miss of buying the said shrimps because of its palatable taste that equates to some common shrimps like pink shrimp, and freshwater prawn, and even the usual prawn.

**Figure 2.** *The total snapping shrimps (Alpheus sp) specimen*

## Results and Discussion

In the case of present studies, snapping shrimps have been collected from the mangrove flats of Calape, Bohol, Philippine area. Different morphometrics have been measured for population dynamics which includes proper identification of the shrimps. These kinds of studies may help in making proper conservation measures for the fishes and other fishery products. Different morphometric characters were identified that are expressed in the percentage of total fish length and head length have been taken for statistical analysis like mean, standard deviation, range, range difference, correlation coefficient, and regression equation.

***In percentage of total snapping shrimp length***: There are nineteen characters that have been studied in the percentage of total snapping shrimp length where all of the characters were environmentally controlled. Out of nineteen characters, 4 characters show high values of correlation coefficient indicating that these characters are directly proportional to each other and 11 characters show moderate correlation coefficient (table-1). Linear relationships have been observed between all the independent and dependent characters.

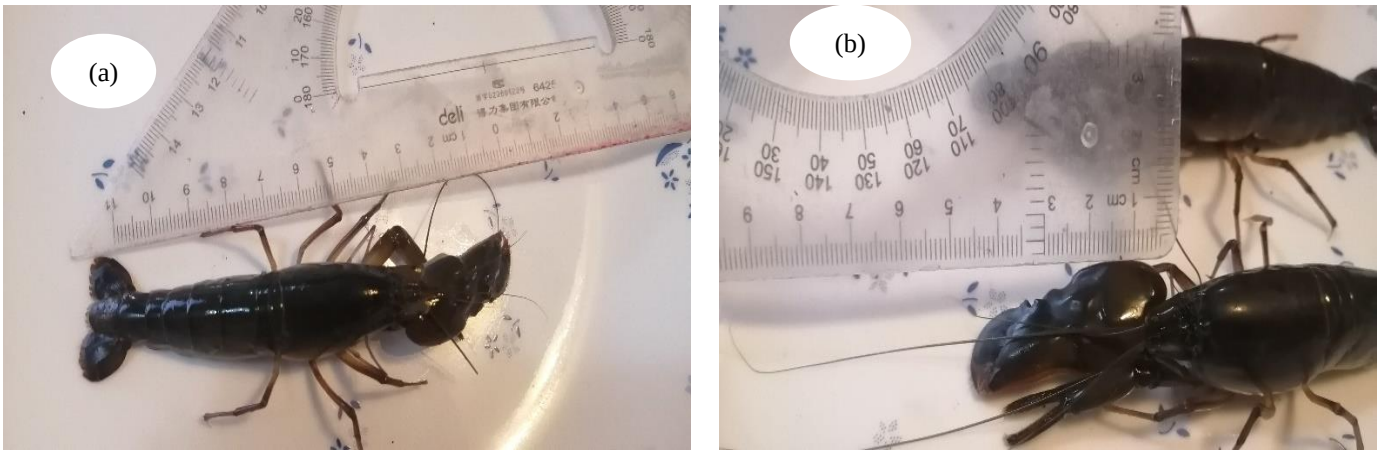


**Figure 3. (a)** *Picture of the snapping shrimps (Alpheus sp) length; (b) picture on head morphometric.*

**Table 1.** *Morphometric characteristics of snapping shrimps as describes in the percentage of shrimp total length (cm).*

| No. | In the percentage of the total shrimp length (cm) | Mean | SD | Range | Range Difference | Correlation Coefficient | Regression equation |
|---|---|---|---|---|---|---|---|
| 1 | Rostrum to Flipper (uropod) | 9.25 | 3.5 | 8.6-9.8 | 1.2 | 0.78 | Y=0.78-6.59X |
| 2 | Rostrum to Tail (telson) | 9.39 | 0.35 | 8.7-9.9 | 1.2 | 0.78 | Y=0.78-6.77X |
| 3 | Rostrum to last abdomen | 8.21 | 0.42 | 7.4-8.8 | 1.4 | 0.58 | Y=055+1.63X |
| 4 | Rostrum to 1st abdomen | 4.11 | 0.13 | 3.8-4.4 | 0.6 | 0.52 | Y=0.52-2.95X |
| 5 | Rostrum to carapace | 3.15 | 0.17 | 2.8-3.5 | 0.7 | 0.25 | Y=0.25+6.69X |
| 6 | Rostrum to eyes | 1.31 | 0.08 | 1.1-1.4 | 0.3 | 0.40 | Y=0.40+5.14X |
| 7 | Rostrum to first claws (cheliped) | 1.61 | 0.09 | 1.4-1.8 | 0.4 | 0.25 | Y=0.25+7.09X |
| 8 | Rostrum to walking legs/perciopods | 2.00 | 0.13 | 1.7-2.2 | 0.5 | -0.51 | Y=0.51+17.06X |
| 9 | Rostrum to swimmerets/pleopod | 6.04 | 0.18 | 5.6-6.3 | 0.7 | -0.03 | Y=0.003+10.55 X |
| 10 | Antennule | 8.76 | 0.17 | 8.6-9.5 | 0.9 | 0.10 | Y=0.10+6.10X |
| 11 | Antenna | 9.84 | 0.11 | 9.6-10 | 0.4 | -0.11 | Y=0.114+18.55 X |
| 12 | Abdomen 1st to last | 5.16 | 0.12 | 5.0-5.30 | 0.3 | 0.09 | Y=0.092+7.21X |
| 13 | Claws (cheliped | 3.72 | 0.09 | 3.5-3.9 | 0.4 | 0.45 | Y=0.45-3.69X |
| 14 | Walking legs (perciopods) | 3.27 | 0.23 | 2.8-3.5 | 0.7 | -0.28 | Y=0.28+13.80X |
| 15 | Swimmerets (pleopods) | 4.21 | 0.09 | 4.0-4.4 | 0.4 | 0.19 | Y=0.19+3.63X |
| 16 | Flipper (uropod) | 1.02 | 0.20 | 0.6-1.3 | 0.7 | 0.33 | Y=0.33+9.12X |
| 17 | Tail (Telson) | 0.78 | 0.90 | 0.6-0.9 | 0.3 | 0.04 | Y=0.036+10.22 X |
| 18 | Pincher length | 5.26 | 0.23 | 4.2-5.5 | 1.3 | 0.09 | Y=0.09+8.70X |
| 19 | Pincher width | 1.78 | 0.09 | 1.6-2.0 | 0.4 | 0.10 | Y=0.09+8.99X |

On the basis of range differences, the morphometric characters are classified into narrow range, moderate and vast range. Results have found that among the 19 identified characters most of the ranges belong to the moderate range meaning that the sizes and forms of snapping shrimps in the given period are only within noticeable range.

During the present investigations in the percentage of total lengths out of nineteenth characters, four characters show high values of correlation coefficient indicating that these characters are directly proportional to each other and eleven characters show moderate correlation coefficient. Linear relationships have been observed between all the independent and dependent characters

The pictograph below shows the ventral view of the snapping shrimps that indicates the number of counts of the walking legs, first and last abdomen, and swimmerets. It shows that snapping shrimps is a good potential for culture.

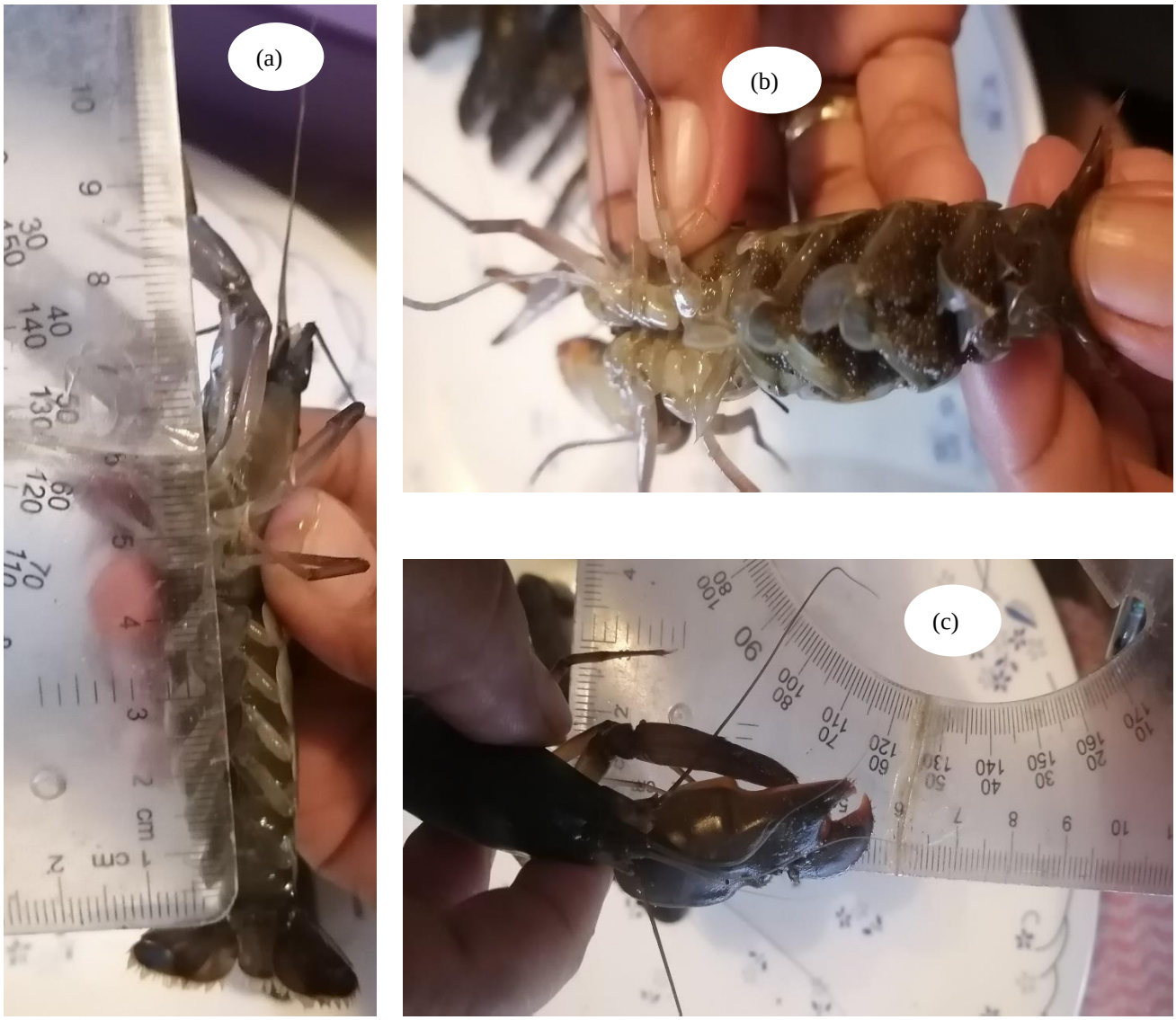


**Figure 4.** *A pictograph of (a) ventral form of Alpheus sp; (b) perciopods and pleopods; (c) pincher and claws*

## Conclusion

The morphometric characteristics of snapping shrimps found in Calape, Bohol mud flats confirmed that the population is quite different from other places. Of the 19 identified characters that have been studied in the percentage of total snapping shrimp length all characters were environmentally controlled. Surprisingly, it showed a great chance for stock enhancement if proper conservation strategies have not been planned for these snapping shrimps.

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