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Morphometric Variability in Selected populations of *Strombus urceus Linne*

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Abstract

This study was conducted to know if there are variations within, between and among populations of Strombus urceus, *a gastropod widely used as food.*

Three (3) sites were established: Mati Davao Oriental; Bacolod, Lanao del Norte and Kauswagan, Lanao del Norte. Within each site, five subpopulations of S. urceus *were sampled where for each subpopulation, ten individuals were gathered. The following morphological characters were used in the study; length of the shell, length of the body whorl, width of the shell, number of varices on body whorl, number of spires length of operculum, number of operculum teeth, direction of spiral or coil, length of the left of and right eyes, and number of oblique lines on the shell's dorsal surface.*

Results of multivariate analysis showed that populations of S. urceus *showed a high degree of similarity, a pattern which could be attributed by the organism's sedentary nature, and the more or less uniformity and the ephemeral nature of their habitat.*

Key Words: *Strombus urceus, spires bodyweight/*

Introduction

Strombus urceus Linne, locally known as aninikad, is a group of marine fauna belonging to the family that contain some of the largest, most colorful, and ornamental forms of marine gastropods, the family Strombus (Hinton, 1978). The *Strombus gigas*, for example, is the largest gastropods in the United States, thus, its common name, Queen conch. Aside from its flesh being highly edible, its shell is used as horn and for making ornaments (Englemann and Hegner, 1981).

S. urceus belongs to the order Mesogastropoda, subclass Prosobranchia, class Gas-

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tropoda and phylum Mollusca (Englemann and Hegner, 1981). *S. urceus* and its relative conches, strombs, tibias and spider shells are herbivorous feeders, and are most prolific in the shallow waters of the tropical Indo-pacific, specially, the intertidal sand and mud flats (Hinton, 1978).

In the present situation of industrial revolution, much attention has been focused on the effect of the product of industrialization to environment and its resources. Much studies reveal a fast degrading environment as evidenced from poor-quality life support systems (land, water, air) and loss of diversity. On the other hand, several studies explore the possibility of diverging populations over geographical locations. As said "population isolated from one another over time may accumulate sufficient genetic difference to achieve the status of separate species."

Several examples are known of adaptations to certain environmental stress. Accounts, for example, of the evolution of industrial melanic months *(Biston betularia)* and DDT-resistant species of mosquito, among animals, and metal-tolerant plants, have been well documented (Rickets, 1979). Adaptations to heavy metals are demonstrated in aquatic organisms, flies, and springtails. If the toxicant stress with the combined influence of environmental and genetic factors will facilitate or favor a large impact (selection intensity), and variability and heritability of the tolerance in the population to study the variability of the population of species. As Berger (1983) said, a description of the extant variation is necessary to understand the nature and magnitude of forces that change gene and phenotype frequencies over time. In this way, we understand the anthropogenic contributions to diversity change and enable us to see our place in this process, particularly, and the ecosystem, generally.

The present work seeks to achieve the same end and also aims to enhance understanding of this species, a necessity in properly managing this organism. Being utilized as food, its potential for culture is not explored due partly to the paucity of baseline information necessary to develop the technology for its culture. This study is hoped to contribute to this need. Furthermore, the organism could also be sued as a pollution index or in assessing the general condition of the area, specially so that several studies reveal the seagrass and their resident fauna are bioaccumulators of metal pollutants (Larkum, McComb and Sheperd, 1989). In fact, the effects of metals on fauna normally found in seagrass sytems have been well studied (Nard, 1989).

Specifically, the study would like to know if there are differences within between and among population of *S. urceus.*

Methodology

The Study Site

Three (3) geographical locations, namely, Bacolod and Kauswagan both in Lanao del Norte and Mati, Davao Oriental were chosen as the study sites (Figure 1). Since, Bacolod and Kauswagan are geographically located near each other while Mati, Davao Oriental is very far from the others. Uniqueness of the habitat or differing ecological conditions can be explored.

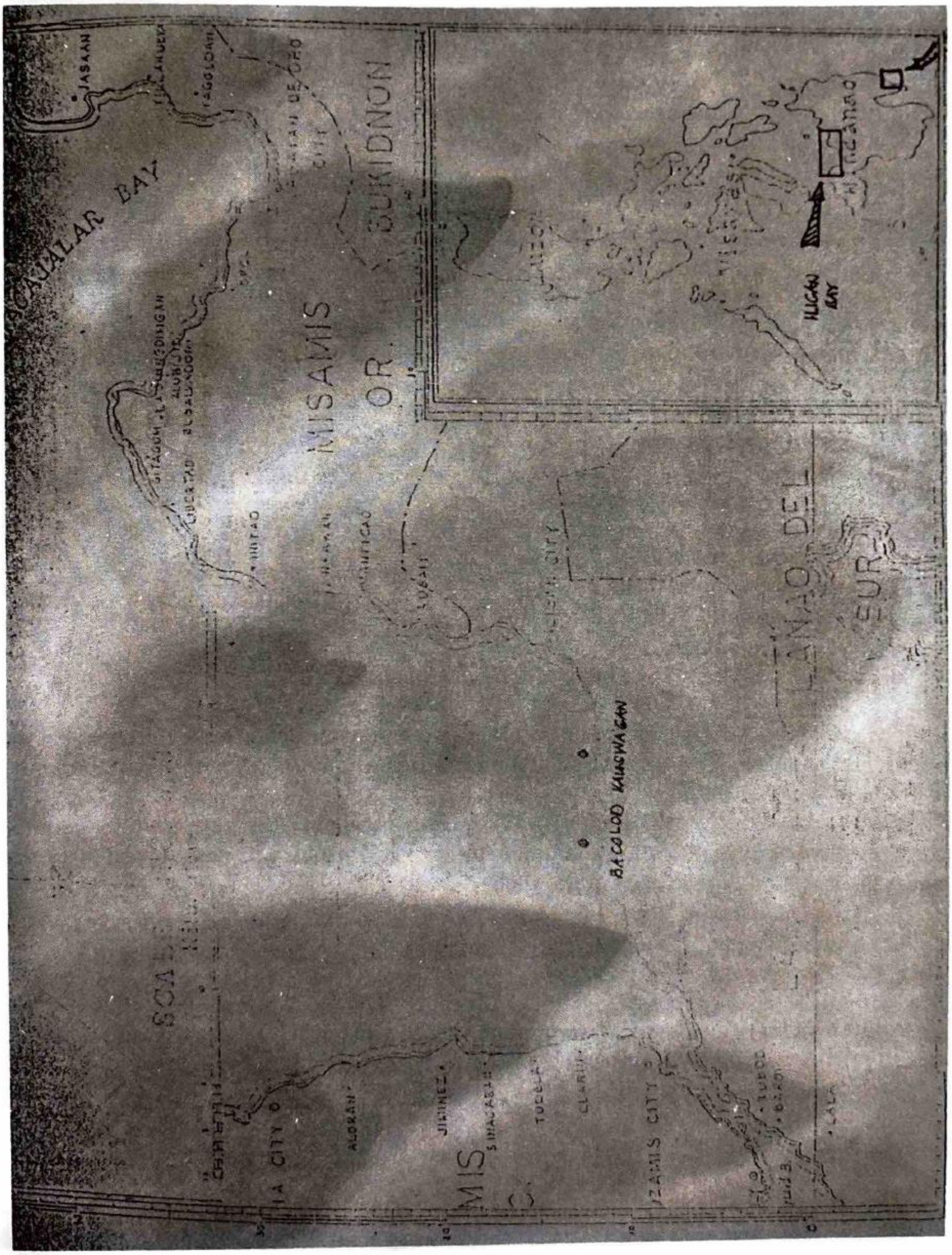


Figure 1. Location where *S. unceus* Line individuals were collected.

Field Sampling

Within each location, five (5) subpopulations of *S. urceus* were used as sources where samples were drawn. Ten (10) individuals per subpopulation were examined, thus, making a total of fifty (50) individuals examined per location.

For easy access to the organism, sampling was done during low tide. The individuals were easily seen and, thus, were just handpicked from the substratum.

Taxonomic Characters Used

Of the morphometric characters only the general external morphology of the shell and the organism were specifically used among other morphological characters.

The following morphometric characters were chosen and used in the analysis:

1. length of the shell
2. length of the body wall
3. width of the shell
4. number of varices on body wall
5. number of spires
6. length of operculum
7. number of opercular teeth
8. direction of spiral or coil
9. length of the left eye
10. number of oblique lines on the shell's dorsal portion

The sex of the individual or sex ratio of the populations was also noted. Because of the difficulty in quantifying the varying color patterns, this character was not used in the analysis although this was noted.

Characters with asterisks were measured using a caliper while the rest were counted except for the determination of direction of spiral or coil which was determined by ocular inspection by looking at the apex of the shell.

Ecological Parameters

At each site during sampling water temperature, water depth, salanity and substrate type, and the occurring flora and fauna associates were noted.

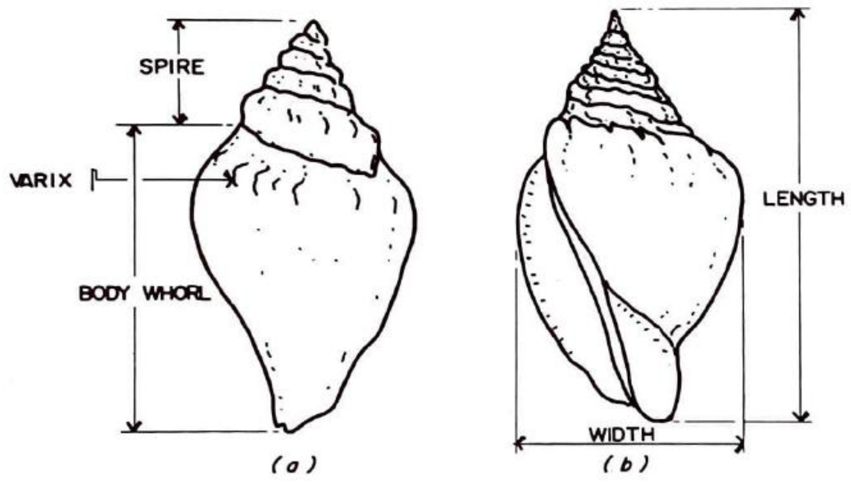
Data Analysis

The data gathered were standardized and were analyzed using the software for multivariate analysis. The approach takes on a similarity matrix that in the end results to a graphical display linking samples that mutually high levels of similarity.

Description of *Strombus urceus* (Figure 2)

Average shell length 40 mm; width 20 mm; at widest width of aperture 10 mm; length of aperture 30 mm. Color brown but also green in some areas on the shell surface or color in various patterns while brown to light brown at the aperture. Dark coloration on the outer surface of the long, slightly curved siphonal canal. Narrow aperture reaches the shoulder of the body whorl. White oblique bands crossed the dorsal areas. Shell solid with a thickened flaring lip. The characteristics notch in the lip present at the anterior end. A row of blunt spines on each whorl of the spire and the body whorl. Whorl in clockwise or 'right handed', ie., coil to the right when viewed with the apex nearest the eye. Operculum attached to the animal's foot modified primarily for use in locomotion, about 1.44 mm long, brown and claw-like or with distinguishable serrations on one side.

Animal's flesh ranges from greenish to yellowish with spots. Two black eyes mounted on slender stalks, an elongated fleshly structure in between the pair of stalks.



Figures 2a & b. Schematic Drawing of the Dorsal and Ventral View (at the side of the operature) of the shell of *Strombus urceus.*

Figrue 2e. Shematic Drawing of Operculum of *Strombus urceus*

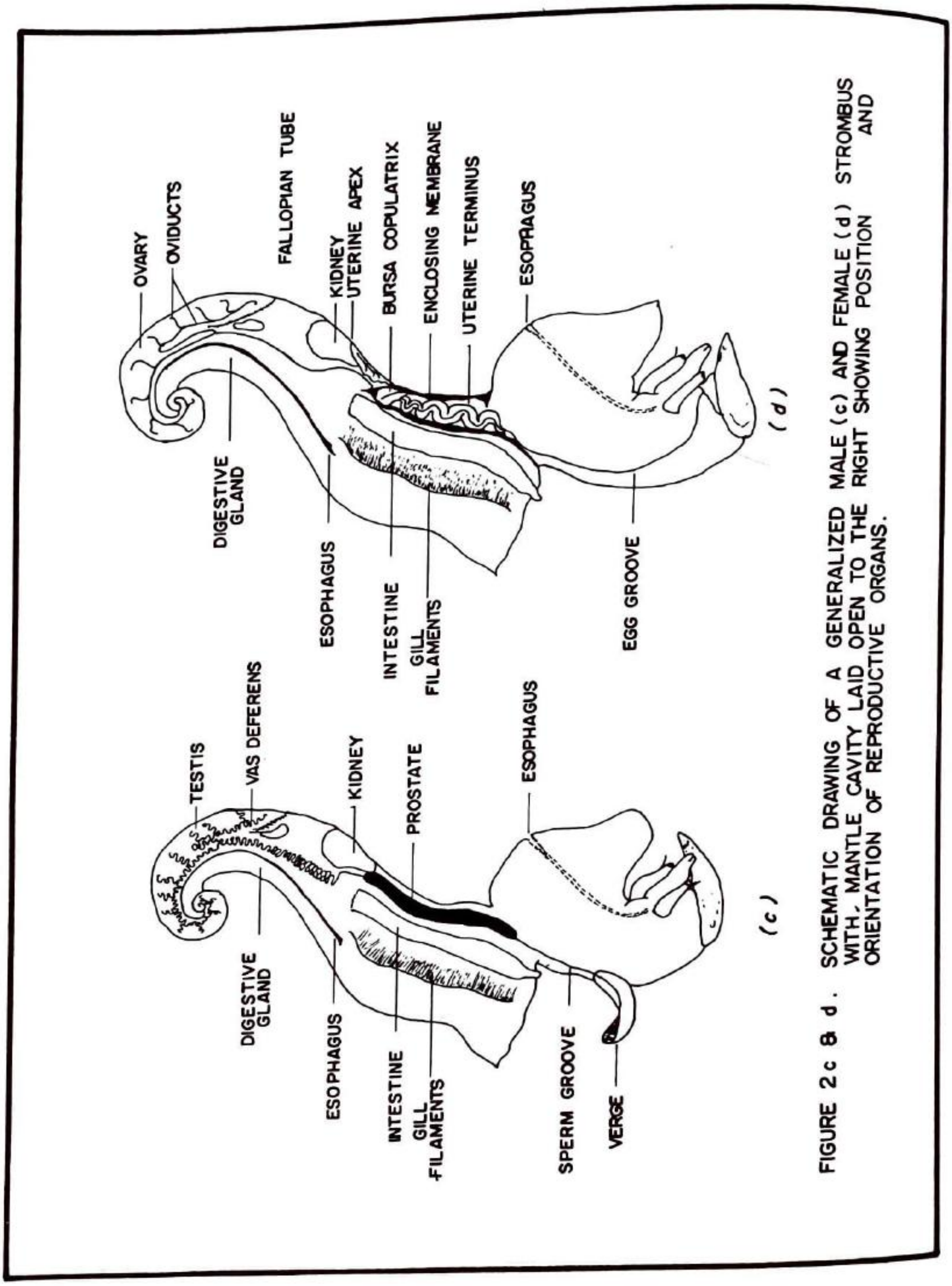


Figure 2c & d. Schematic Drawing of a Generalized Male (c) and Female (d) *Strombus* with, Mantil Cavity Laid Open to the Right Showing Position and Orientation of Reproductive Organs.

Results and Discussion

Result of the study shows that there is a very high similarity of populations of *S. urceus*. Figure 3 shows similarity between populations of *S. urceus*. The Close examination shows that Davao has higher within-site similarities than do subpopulations within. Although there are subpopulations within each site that are clustered together, there are also subpopulations from the three sites that are clustered together or linked near each other, and this inspite of the great geographical distance of the Davao population. This diffuse pattern of the similarity between populations of *S. urceus* can also seen in Figure 4 where if otherwise, this graph would have shown certain clumping.

The same pattern is also seen in Figure 5 where the similarity of individuals (150 in all for the 3 sites) is plotted in this dendrogram. As seen, individuals within and among populations of *S. urceus* from three sites showed a diffuse pattern implying a high degree of similarity except for one or two individuals.

Perhaps the most obvious contributory factor for this pattern could be the more or less homogeneity or uniformity of the species' environment. In several studies and literature, the importance of the environment - its variation - has been pointed out as critical for evolutionary divergence. According to Ricklefs (1979), difference in selective pressures along environmental gradients are undoubtedly been responsible for the establishment of genetic between populations.

Gross examination of some environmental factors prevailing in the *S. urceus* populations in the three sites revealed a more or less similar condition. Most notable is the presence of moderate seagrass or vegetation in sandy to sandy-muddy substratum. Salinity ranges from 33-34%, water temperature around 31C, water depth from 1-4 ft. at high tide and an associate flora and fauna of small crustaceans, annelids, echinoderms, fishes and other mollusks, sponges and algae. This similarity in seagrass or vegetation structure, sediment and water conditions could contribute to the preservation of the genetic condition of the population. According to Ricklefs (1979) a uniform habitat provides little opportunity for ecological specialization. Several studies reveal the association of structural heterogeneity of the habitat and diversification.

That there is a possible specific ecological requirement of the species is revealed in a study of related species, *S. gigas*, in the Bahamas where they observed the occurrence or aggregation of juveniles of this species in specific sector of large seagrass meadows in the area. Although it was revealed that no single habitat variable was found to be a good predicator of their abundance, it was found out that seagrass biomass and density, sediment organic, and algae abundance were all important elements associated with their abundance. All of these variables were generally low at stations with no long-term record of conch habitation.

Another factor could contribute to the maintenance of genetic stability of the population or species could be their sedentary nature inhibiting gene flow.

Perhaps the strongest argument that could explain the result observed was that which is pointed out by Ward (1989), and that is the relatively nature of seagrass habitats, a condition which is not suitable for the stable, long-term condition necessary for evaluation to occur.

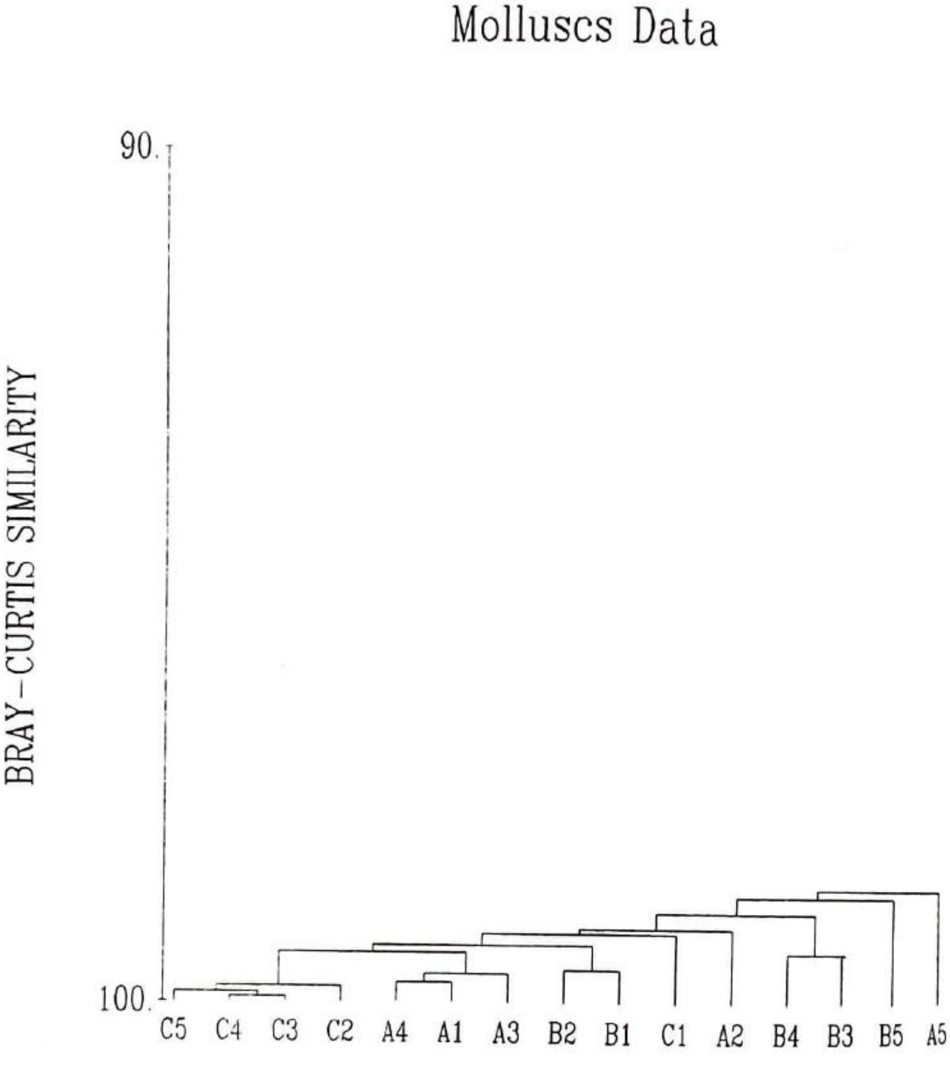


Figure 3. Cluster of subpopulations of ***S. urceus*** in the 3 sites.

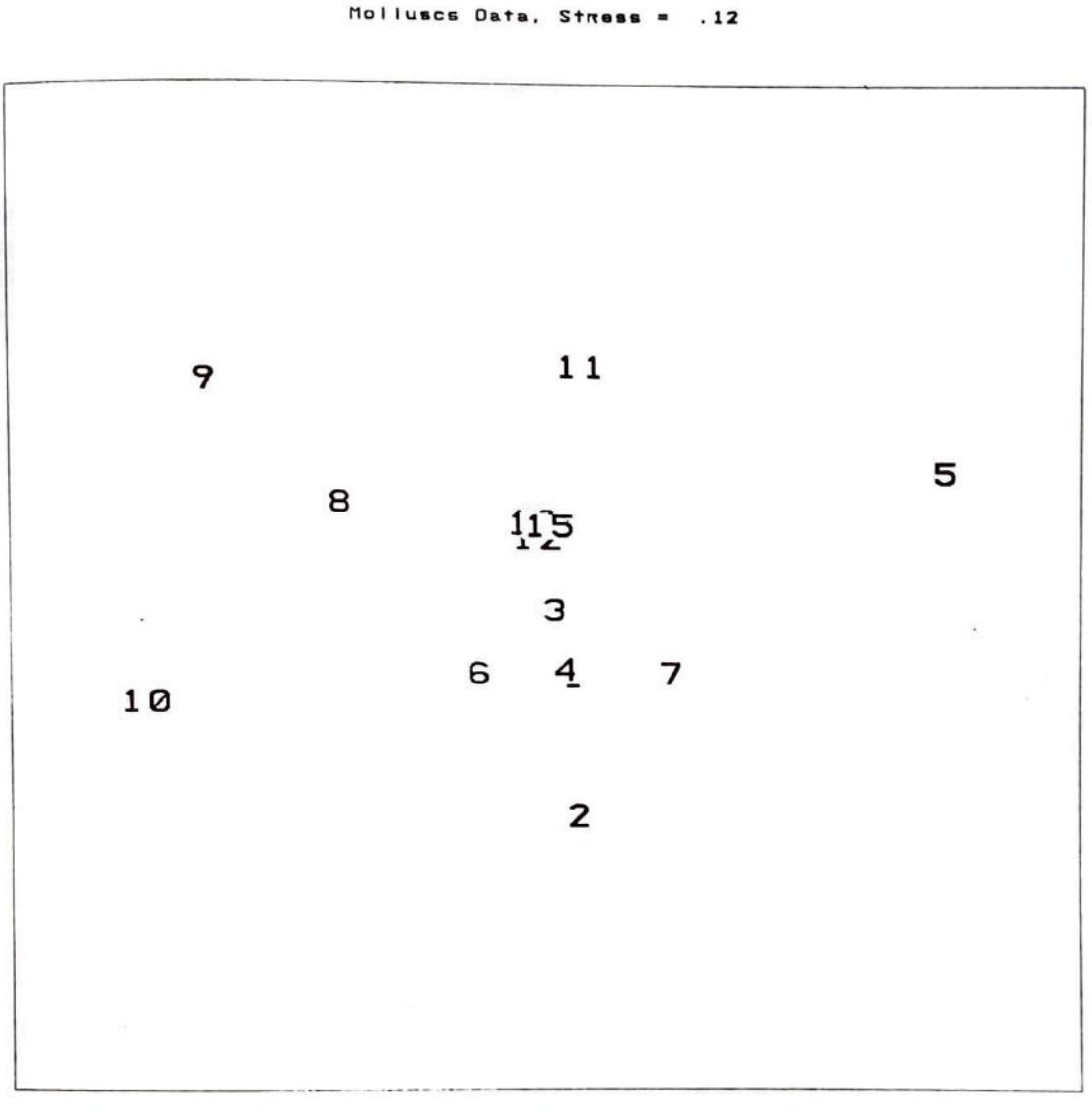


Figure 4. Ordination of subpopulations of *urceus* in the 3 sites.

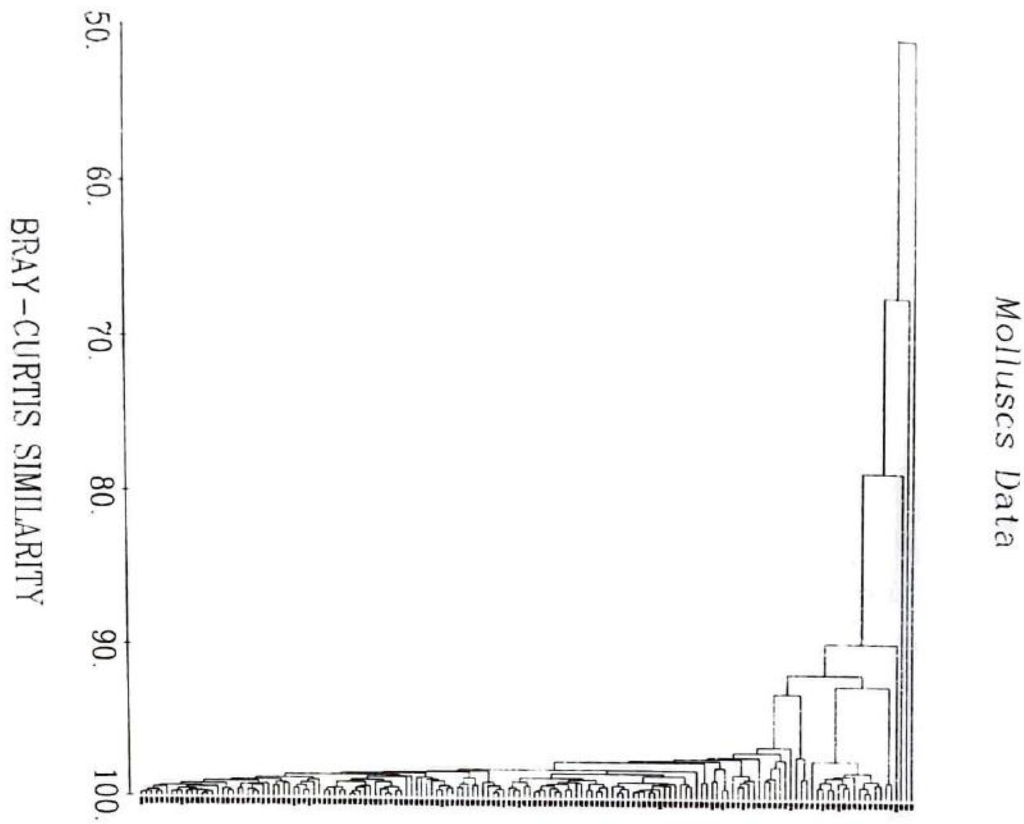


Figure 5. Cluster of individual ***urceus*** for the 3 sites.

Summary, Conclusion and Recommendation

Based on the morphological characters used in this study, results of the multivariate analysis showed a very high similarity index within, between and among populations of *Strombus urceus.*

There could be several factors responsible for this pattern - genetics, ecological and their interaction. Habitat uniformity, sedentary nature of the species and the ephemeral nature of their habitat are possible contributory factors. But as pointed out by Ricklefs (1979), we certainly will not be able to understand the genetic integration of population until geographical variation within species is more systematically studied in relation to environmental change and gene flow and that we know so little about gene flow and selection for divergence that it is impossible to draw any firm conclusions from the assortment of facts at hand. It has been demonstrated that these processes play important roles in determining the level of genetic uniformity within species.

Because in this study only gross examination of the species was made, a more conclusive result could be made by examining more thoroughly the seagrass habitat structure, sediment and water conditions and hydrography, among others, and other physico-chemical processes should also be looked into especially so that they are powerful ecological force that can exert a strong selective pressure on populations.

Other taxonomic characters should also be considered in addition to or other than those characters considered in this study. Since, there are characters that are affected or changed by development state of the organism use in these should be avoided as pointed out by systematists.

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