A TAPHOFACIES MODEL OF THE RECENT SOUTH FLORIDA CONTINENTAL SHELF: A NEW PERSPECTIVE FOR A CLASSIC, EXPOSED CARBONATE ENVIRONMENT

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It is entitled A Taphofacies Model of the Recent South Florida Continental Shelf: A New Perspective for a Classic, Exposed Carbonate Environment.

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ABSTRACT

The *taphofacies* model was first proposed in 1986 as a tool for comparing environments and extracting additional, heretofore, unobtainable aspects of ancient sedimentary systems. The method consists of describing general biostratinomic (reorientation, transportation, disarticulation, abrasion, and fragmentation) and diagenetic processes (sediment infilling, mineralization, etc.). Once integrated, these two sources of taphonomic data are used to establish criteria upon which sedimentary rock units are subdivided into different depositional environments.

Actualistic studies of modern marine environments have been initiated to develop specific taphofacies models. While these studies represent an excellent start, none of them test a taphofacies model across a suite of exposed, continental shelf environments; the majority of these investigations have limited geographic and ecological ranges. Specifically, these limitations have included the characterization of only two or three depositional environments and/or study sites located on intertidal flats or the shallow subtidal areas on protected shelves.

The purpose of this dissertation were threefold: 1) to develop a taphonomically-based facies (taphofacies) model for a classic, modern carbonate system, the south Florida shelf. 2) to compare and contrast the south Florida taphofacies model to the only other published modern carbonate taphofacies model, that of Parsons (1992) study of the northeastern Caribbean. 3) to compare and contrast a taphofacies model developed from the total mollusc assemblage (pooled sample approach) to models that only evaluate taphonomic changes within a single taxon as it occurs in different environments.

This project is the first taphofacies study of a modern environment in which samples were taken across a carbonate continental shelf. The sampling of a wide range of depths (1.7 - 33.5 m), hydrologic regimes (exposed shelf break to restricted embayment), depositional environments (deep fore reef, reef flat, backreef, inner shelf margin and lagoon), and habitats (seagrass, rippled sand, and rubble/hardgrounds) along this 'transect' yielded abundant taphonomic information which was then analyzed by several methods to compare specific approaches to the study of taphonomy, and to compare and contrast the classic carbonate environments off south Florida with insular carbonate shelves in the northeastern Caribbean around St. Croix (U. S. Virgin Islands) and Isla de Mona (Puerto Rico).

Cluster analyses of averaged (mean) taphonomic indices from samples of pooled molluscs and two target taxa (ceriths and chamids) produced associations of stations that resembles each other based on similarities between specific taphonomic signatures (high surface degradation and abrasion). The dendrogram generated by the averaged *Tellina* taphonomic indices was quite different from the others. This analysis clustered adjacent stations together based upon higher levels of edge alteration, surface degradation and abrasion.

Averaged taphonomic indices of pooled shells produced taphofacies models that distinguished between geographically distant sampling stations, but could not segregate different, immediately adjacent backreef environments. The use of ternary taphograms and confidence interval - bounded proportions produced a more detailed picture of the distribution of taphonomic indices, making the description of taphofacies more accurate as opposed the use of a single averaged value.

Three new carbonate taphofacies were defined for the south Florida shelf: reef sands, back reef and restricted circulation grassbed. The reef sands are areas where high carbonate production and low to moderate hydrodynamic energy conditions produce shells with low to moderate levels of taphonomic attributes evaluated in this study except surface degradation, which was in the moderate to high range here. The shallow backreef taphofacies is characterized by higher levels of hydrodynamic energy which is responsible for the medium levels of encrustation, surface degradation, and abrasion. The shell edges were highly altered and there was a bimodal distribution of whole shells and fragments, both of which were lacking in color and luster. The restricted circulation grassbed had shells with low levels of epibiont encrustation and color loss. Fragmentation, loss of luster, surface degradation, and edge alteration were in the medium range and there was neither evidence of abrasion nor conchiolin structures (periostracum, ligament) present.

A comparison of the northeastern Caribbean taphofacies (Parson 1992) shows environments that were similar enough to be comparable. These included the general reef, grassbeds and mud bottoms. The general reef taphofacies from both locations were similar in all ways with the exception of higher levels of surface degradation occurring on the south Florida shells. Grassbeds in south Florida were quite variable in their taphonomic signature and all had extremely low numbers of rhizome etchings. The taphonomic signature of the normal marine conditions grassbed from south Florida was different from the northeastern Caribbean grassbeds in the levels of all attributes except edge alterations, loss of luster and sponge borings and the reasons for these differences can be explained. Likewise, the two regions had very different signatures attached to mud

bottoms. These differences are probably attributable to differences in the rate of sedimentation and level of hydrodynamic energy.

TABLE OF CONTENTS

Acknowledgements

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Lee Barr, Ph. D. and Luther L. Barr and my parents, Gene and Edith Dent for all their love and support. I dedicated this dissertation to our new son, Richard Barr Dent . Finally and most importantly, I thank God for all the blessings in my life and without whom I would not have completed this dissertation.

TABLES:

PLATES:

LIST OF FIGURES

INTRODUCTION

Taphonomy, "the study of processes of preservation and how they affect information in the fossil record" (Behrensmeyer & Kidwell 1985) has been pursued traditionally by paleontologists as a means to determine sources of bias (e.g. loss of information) within the fossil record (Johnson 1960, Lawrence 1968). However, a more positive perspective emerged in the mid 1970's as scientists began to successfully extract subsidiary information concerning organisms' life habitats, types of post-mortem processes, and paleoenvironmental attributes from taphonomic data. By the mid 1980's taphonomy had achieved recognition as a valuable subdiscipline of paleontology as the scope of its questions were extended into the arena of ecosystem structure and evolution (Kidwell & Brehensmeyer 1988).

The use of taphonomy as a tool for comparing environments and extracting additional, heretofore unobtainable aspects of ancient sedimentary systems was first proposed by Brett and Baird (1986). They defined *comparative taphonomy* as the study of "differential fossil preservation both within, and between facies." The proposed method consisted of calibrating a variety of biostratinomic and diagenetic processes in different kinds of paleoenvironments. Among the processes considered by Brett and Baird were: 1) reorientation and transportation, 2) disarticulation, 3) fragmentation, 4) corrasion (a combination of mechanical abrasion and biogeochemical corrosion) 5) skeletal dissolution, 6) sediment infilling, and 7) mineralization of fossils. Once these attributes were integrated, Brett and Baird (1986) established taphonomic criteria which could then be used to subdivide sedimentary rock units into different environments of deposition. They found taphonomic data to be useful in providing information concerning relative paleobathymetry (depth), water movement, sedimentation rate, and sediment

geochemistry as illustrated with Silurian and Devonian rocks of the northern Appalachian Basin.

Speyer and Brett (1986) demonstrated that taphonomic information could be used successfully to designate facies and provide an additional data set for paleoenvironmental analysis. They applied comparative taphonomic techniques to Devonian trilobite remains from the New York Hamilton Group and found that the taphonomic attributes were distributed nonrandomly. The relative frequency of these "distinctive associations of taphonomic attributes" were used to designate specific taphonomic facies (taphofacies) which greatly enhanced their paleoenvironmental reconstruction.

The taphofacies concept was expanded by Speyer and Brett (1988) into a model that included all preservable faunas found in Paleozoic epicontinental seas. The taphonomic attributes of five general types of skeletonized marine taxa were defined and related to variations in the physical, chemical and biological processes present in their respective environments. Indices or 'signatures' were generated to quantify the different types of fossil preservation and to permit comparison between sedimentary sequences. Speyer and Brett (1988) concluded that taphofacies models assist in understanding "(1) the nature and timing of sedimentary events, and (2) the distribution of-chemical conditions across a spectrum of environments".

The emergence of the taphofacies concept and its application to ancient sedimentary units (Parsons et al. 1988; Meyer et al. 1989) sparked a number of actualistic investigations which sought to develop specific taphofacies models for Recent marine settings (Fürsich & Flessa 1987; Davies et al. 1989; Parsons 1989,1992; Meldahl & Flessa 1990; Staff & Powell 1990a, 1990b; Callender et al. 1992; Nebelsick 1992; Kowalewski et al. 1994). These reports, summarized in Table 1, validated the basic principles behind taphofacies analysis, but their

Table 1. Summary of previous actualistic taphofacies studies.

Study	Location	Environment	Subenvironments	Conditions	Taxa Studied
Davies, Powell & Stanton (1989)	Gulf of Mexico Texas	Siliciclastic - Microtidal Inlet Facies	1 Intertidal	Microtidal Inlet Flats	Mollusca
Fürsich & Flessa (1987)	Northern Gulf of California	Siliciclastic - Tidal Flat Facies	3 Intertidal 1 Subtidal (<7m)	Semi -Protected Bay (High tidal range)	Mollusca
Parsons (1989, 1992)	NE Carribean Sea St. Croix, USVI Isle de Mona	Carbonate - Reefs & Related Facies	6 Subtidal	Windard & Leeward Sides of Islands	Mollusca
Meldahl & Flessa (1990)	Atlantic Ocean Provincetown, MA	Siliciclastic - Intertidal & Shallow Subtidal Facies	4 Intertidal 2 Subtidal (<10 m)	Provincetown Harbor. Cape Cod Bay	Mollusca
Callender & Powell (1990)	Gulf of Mexico Lousiana	Siliciclastic - Upper Slope Facies	1 Subtidal	Slope Petroleum Seeps	Mollusca
Staff & Powell (1990)	Gulf of Mexico Texas	Siliciclastic - Microtidal Inlet & Inner Shelf Facies	4 Subtidal	Semi-Enclosed Inlet & Inner Shelf	Mollusca
Staff & Powell (1990)	Gulf of Mexico Texas	Siliciclastic - Microtidal Inlet, Inner Shelf and Slope Facies	4 Subtidal	Semi-Enclosed Inlet & Inner Shelf	Mollusca
Staff et al. (1990)	Gulf of Mexico Texas	Siliciclastic - Inner Shelf & Slope Facies	5? Subtidal	Open Shelf & Slope	Mollusca
Davies et al. (1989)	Gulf of Mexico Texas	Siliciclastic - Microtidal Inlet & Inner Shelf Facies	4 Subtidal	Semi-Enclosed Inlet & Inner Shelf	Mollusca
Callender et al. (1992)	Gulf of Mexico Texas	Siliciclastic - Microtidal Inlet, Inner Shelf, and Slope Facies	1 Intertidal 11 Subtidal	Microtidal Inlet Open Shelf & Slope	Mollusca
Nebelsick (1992)	Red Sea Egypt	Carbonate - Reefs & Related Facies	9 Subtidal	Semi -Protected Bay	Echinodermata
Kowalewski et al. (1994)	Northern Gulf of California	Siliciclastic- Chenier Beach ridge facies	3 Supratidal	River Delta	Mollusca

collective scope was somewhat limited. For example, only one study investigated molluscs from carbonate depositional environments (Parsons 1989, 1992). Most of these investigations (Davies et al. 1989; Callender & Powell 1990; Staff et al. 1990; Staff & Powell 1990) have limited geographic and/or environmental range, usually evaluating only one or two modern environments. However, two studies have examined the taphonomic attributes of multiple Recent environments (Meldahl & Flessa 1990; and Parsons 1989, 1992).

The above-mentioned studies can be divided into two general types of analyses: the 'pooled' type where the shells of many species are evaluated for taphonomic attributes and their individual scores averaged to provide a composite taphonomic score for the environment; and the 'target' type wherein the variations of an individual species' taphonomic condition is tracked across a range of environments . The major drawback to the pooled approach is the potential for conflation of environmental or taxonomic differences (shell mineralogy, architecture, size, thickness, mode of life, etc.). Conversely, the use of a single species produces taphonomic rankings that are biased toward that target species. These rankings may not be applicable to other, co-occurring species with different skeletal attributes (Kowalewski et al. 1994). Examples of the 'pooled' approach include Davies. et al. (1989a), Staff & Powell, (1990a, 1990b) and Parsons (1989, 1992), while the 'target' method has been used by Fürsich & Flessa (1987), Meldahl & Flessa (1990), and Kowalewski et al. (1994).

Parsons (1992) is the only published molluscan taphofacies study that focuses on modern carbonate environments, although the environments she investigated were limited to the narrow (< 1 - 5 km) insular shelves of St. Croix and Isla de Mona in the northeastern Caribbean. Using pooled samples of

mollusc shells, she was able to successfully discern the depositional settings of shells by applying discriminant analysis to their taphonomic indices. These indices also permitted interpretations of the depositional settings of shells taken from Holocene reef cores.

The present study examines the taphonomic signatures of mollusc shells collected along a "transect" on an open (exposed) carbonate-dominated continental shelf off the Florida Keys (Figures 1 and 2). This sampling "transect" (≈11 km) covered a wide range of depths (1.7-33.5 m), hydrologic regimes (exposed shelf break to restricted embayment), depositional environments (deep reef flat, forereef, reef top, back reef, inner shelf margin and lagoon), and habitats (seagrass, rippled sand, and rubble/hardgrounds). Samples from these environments contained approximately 33,000 identifiable skeletons or skeletal fragments of molluscs, fish, brachiopods and scleractinian corals. Multivariate analytical techniques (cluster analysis and detrended correspondence analysis) applied to a reduced mollusc data set (100 most abundant species, 84 % of all molluscs) objectively corroborated variation among the environments in the study area based strictly on species composition (Miller and Dent 1995, in prep).

Rather than pooling all molluscs or selecting a single target species for taphonomic evaluation, I took an intermediate approach in an attempt to more fully-define the taphofacies of the south Florida shelf. I analyzed the taphonomic characteristics of a variety of species which, in life, exhibit substantial taxonomic, morphologic, and ecologic differences. Two analytic approaches were take at this point: 1) The traditional one of taking pooled species data from within the same environment and averaging it prior to examination with multivariate techniques. 2) A combination of the multivariate

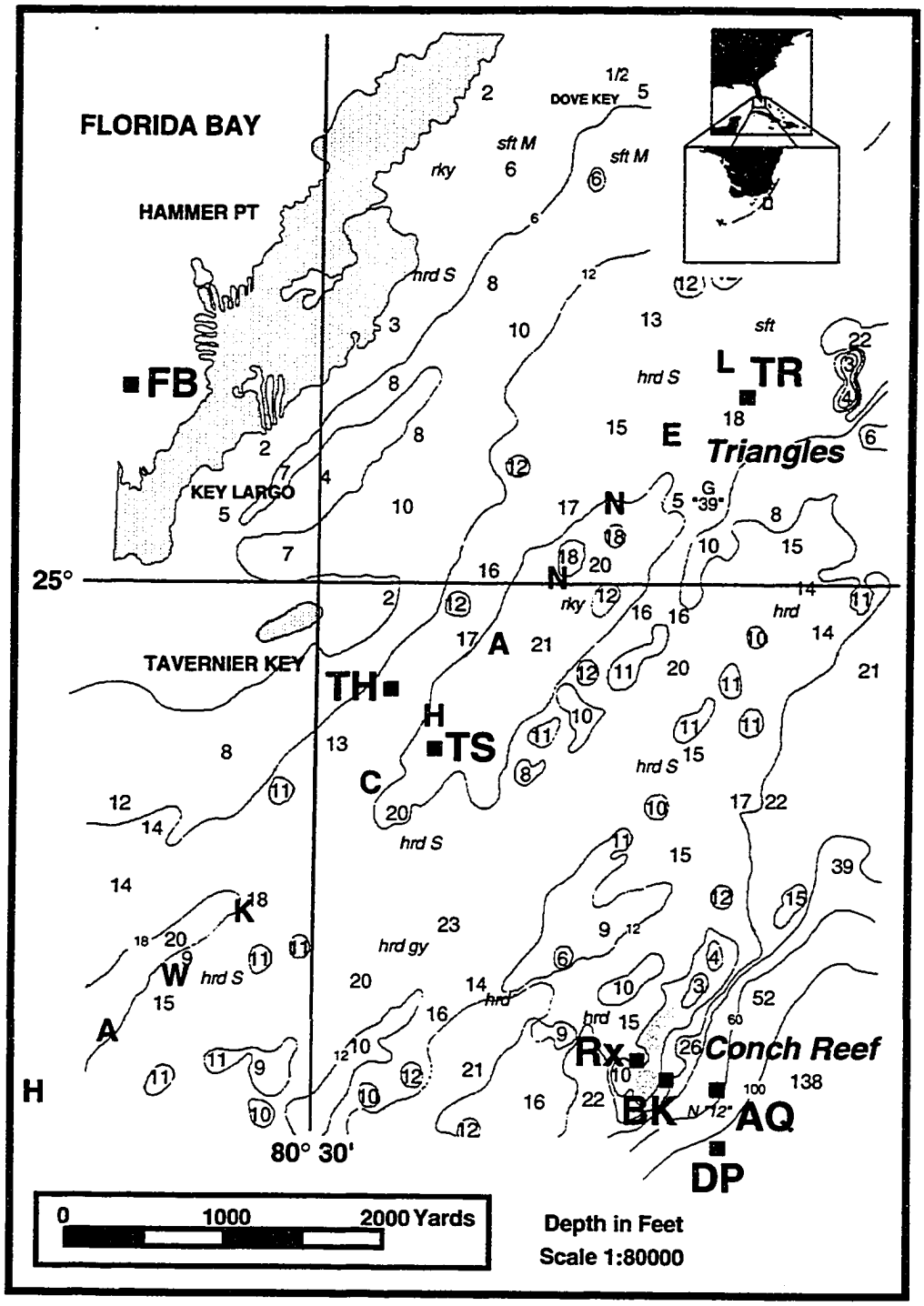
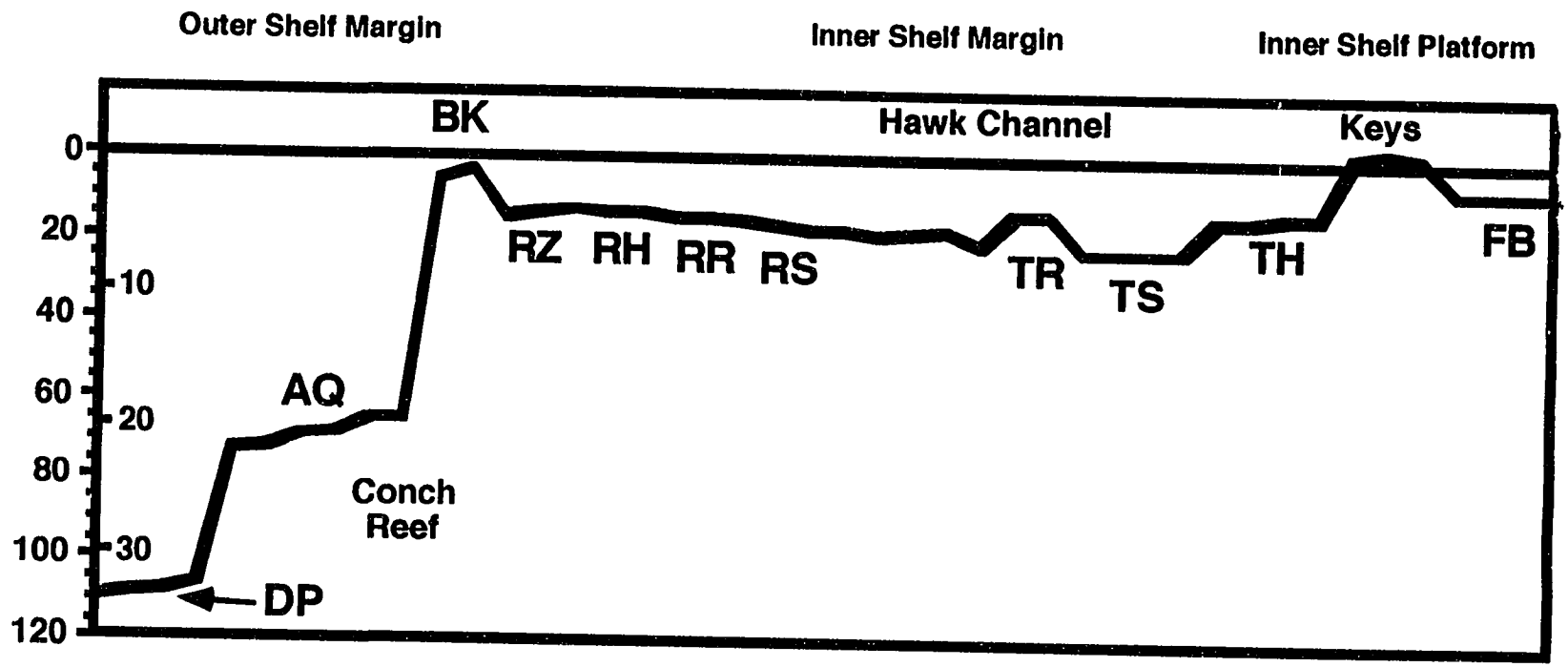


Figure 1. Map showing collecting sites of Key Largo, Florida Keys. Bold letters represent locations; DP = Deep reef sand flat, AQ = Forereef sand flat, BK = reef flat, Rx = Location of backreef stations (see Figure 4 for close up), TS = Unvegetated bottom, TR = Patch reef, TH = Seagrass bed, and FB = Florida Bay seagrass bed.



DP = Deep reef sand flat
AQ = Forereef sand flat
BK = Reef flat
RZ = Backreef rubble zone
TH = Seagrass bed
FB = Florida Bay

RH = Backreef grassbed
RR = Backreef transition zone
RS = Backreef rippled sand
TR = Patch reef
TS = Unvegetated bottom

Figure 2. Composite cross-section of sampling stations on south Florida shelf. Horizontal distances not to scale, see Figure 1 for true horizontal relationships.

techniques, frequency distributions that are confidence limit - bounded, and a recently introduced form of graphical analyses.

To better understand the range of variation within composite taphonomic signatures, I examined taphonomic variation within and among three individual species to determine their individual taphonomic signatures and how they compared to one another. Finally, using averaged indices of pooled data and the information gained from the pooled taphofacies, a reduced South Florida taphofacies model is compared and contrasted to Parsons' (1992) Caribbean island carbonate taphofacies.

Background Information And Methods

Taphonomic Attributes

The objective evaluation of taphonomic attributes and their assignment to semiquantifiable categories is the first step in any taphofacies study. Davies et al. (1990) proposed such standardized, objective methods in an effort to provide: "(1) a quantitative approach allowing replication, statistical analysis, and objective comparison between other environments and by other investigators and (2) the separation of sedimentological and taphonomic attributes so that unbiased comparison can be achieved." Parsons (1992) used their criteria as a basis for her analysis, but she simplified their approach by not subdividing shell surfaces into sections and then separately recording the taphonomic condition of each section. Her approach makes the examination of greater numbers of shells more practical. It is also justifiable given that Staff and Powell (1990a) found no taphonomic differences among locations on individual shells in their pilot study.

Parsons (1992) noted that the development of useful taphonomic indices represents a compromise between the desire to quantify accurately the types of alterations that shells have undergone, while maintaining a straightforward,

practical method that permits compilation of a large data set (Parsons 1992). These requirements have generally lead researchers to collect presence/absence and categorical data, the latter consisting of descriptions of the degrees to which taphonomic changes have occurred (e. g. Color: Absent, Faded, or Original). Simple methods, such as the use of hand specimens and low power dissecting microscopes also permit researchers to standardize techniques and allow easy comparisons among various researchers (Parsons 1992). The taphonomic features examined in this study (encrustation, color, luster, periostracum/ligament, predatory boring, fragmentation, edge alterations, dissolution, abrasion, and bioerosion) are described below, along with a listing of the numerical indices that were assigned them. Table 2 summarizes these criteria and lists the numerical ranking scheme for each category.

Encrustation

The surfaces of shells are often occupied by other organisms referred to collectively as epibionts. This group of extremely diverse organisms draws members from most groups of invertebrates, algae and protistans. Many of these epibionts leave potentially preservable remains attached to the shell upon their death; coralline algae, foraminiferans, bryozoans, coelenterates, polychaetes, barnacles and molluscs are the most common. Because sediment cover tends to exclude the colonization of encrusters, the degree to which epibionts coat a shell surface is a good indicator of exposure at the sediment-water interface (Parsons and Brett 1991).

The diversity and abundance of epibionts have been shown to vary among environments (Parsons 1992). These differences have been attributed to such factors as the frequency of disturbance, degree of exposure to the water column, light intensity, and variations in the physical and chemical

Table 2. Taphonomic criteria used to evaluate mollusc shells in the present study.

Attribute	Description	Grade
Encrustation	None	0
	Coverage ≤ 20%	1
	Coverage 20 - 80%	2
	Coverage > 80%	3
Color	Original, unaltered	0
	Altered (stainedred, gray of black)	1
	Original, but faded	2
	Loss of color (bleached)	3
Luster	Original	1
	Dull	0
Periostracum/Ligment	Present	3
	Partially removed	2
	Ligament only remaining	1
	Absent (present during life)	0
Predatory borings	Absent	0
	Present	1
Fragmentation	No Breaks	0
	Minor Break (< 20% of shell broken)	1
	Major Break (20 - 80 % of shell broken)	2
	Fragment (> 80 % of shell broken)	3
Edge Alterations	Edge sharp or natural	0
	Edges chipped	1
	Edges slightly worn	2
	Edges smooth	3
Surface Degradation	No Surface Degradation	0
	Minor Surface Degradation	
	Chalkiness	1.1
	Minor (<20% of surface) pitting or etching	1.2
	Major Surface Degradation	
	General pitting or etching (20-80% of surface)	2.1
	Corrosion	
	Pitting or etching >80% of surface	2.21
	Surface very soft	2.22
	Surface sculpture gone	
	Sculpture enhanced	2.3
	Extreme dissolution	
	Deeply dissolved-imperforate	2.41
	Deeply dissolved-perforated	2.42
Abrasion	No abrasion	0
	Minor abrasion	
	Small nicks or frosted	1.1
	Surface scultpture eroded	1.2
	Major abrasion	
	Highly polished surface	2.1
	Deeply eroded, imperforate	2.2
	Deeply eroded, perforated	2.3
Bioerosion	Predatory Boring	
	Graze Marks	
	Rhizome Etchings	
	Absent	0
	Present	1

characteristics of the overlying water (Parsons and Brett 1991). Encrustation by epibionts has been demonstrated by Parsons (1992) to be a sensitive indicator of carbonate environments in the Virgin Islands.

A variety of methods have been use to quantify encrustation, ranging from simple presence/absence through detailed and more accurate measurements of surface area occupied by encrusters and abundance data of all species present. An intermediate approach is to make visual estimates (high, medium, low and none) of the percentage of shell surface area encrusted. These estimates are based on a comparison chart similar to those used by petrologists for estimating percentage of a field occupied by a particular mineral (Parsons 1992). Percent coverage in this study was estimated using the same chart. Plate1 shows an example each of low, medium and high encrustation.

Color Loss

Color patterns on mollusc shells are located most frequently in the outer shell layers or the periostracum and are therefore lost whenever the surface of the shell is broken down. This degradation can be the result of abrasion, biological actions (bacterial action and/or endolithic algal borings) and exposure to ultraviolet light (Hollingworth and Barker 1991). Variability in chemical composition of these pigments plays an important role in determining how stable the material is and, therefore, just how long color is retained by the shell. Likewise, the location of the pigments within the shell (surface layers vs deep layers) also plays a role in color longevity (Hollingworth and Barker 1991). The existence of this interspecific variation in pigments means that color loss should "ideally be compared within similar taxa" (Parsons 1992). Plate 2 has examples of color loss in all stages.

Plate 1. *Murex* sp. showing high level of encrustation by coralline algae.

Plate 2. Examples of different taphonomic attributes as seen on *Barbatia cancellaria*. (A). Bleached and broken valve with high surface degradation and major encrustation. (B, C, and D) Faded, whole valves with medium surface degradation and encrustation. (E) Faded, whole shell with minor encrustation and surface degradation. (F) Original color, whole shell with no surface degradation or encrustation.

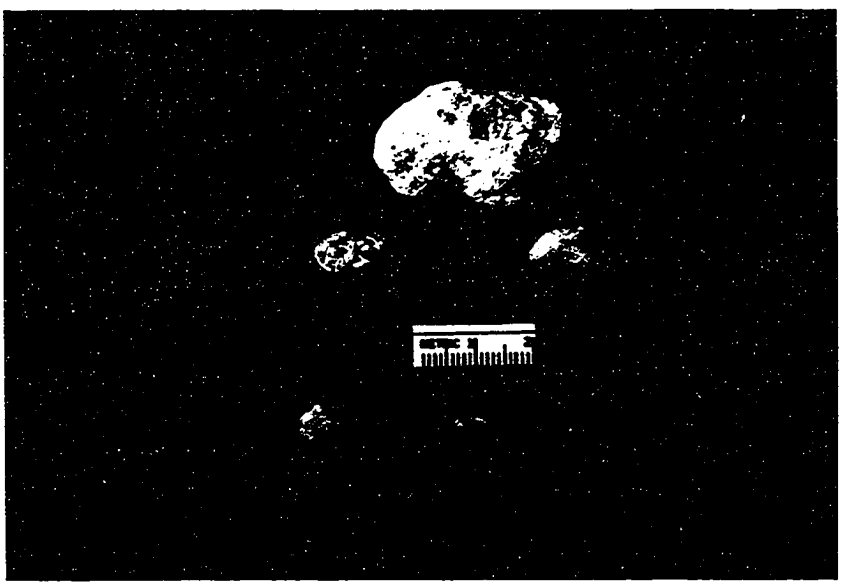
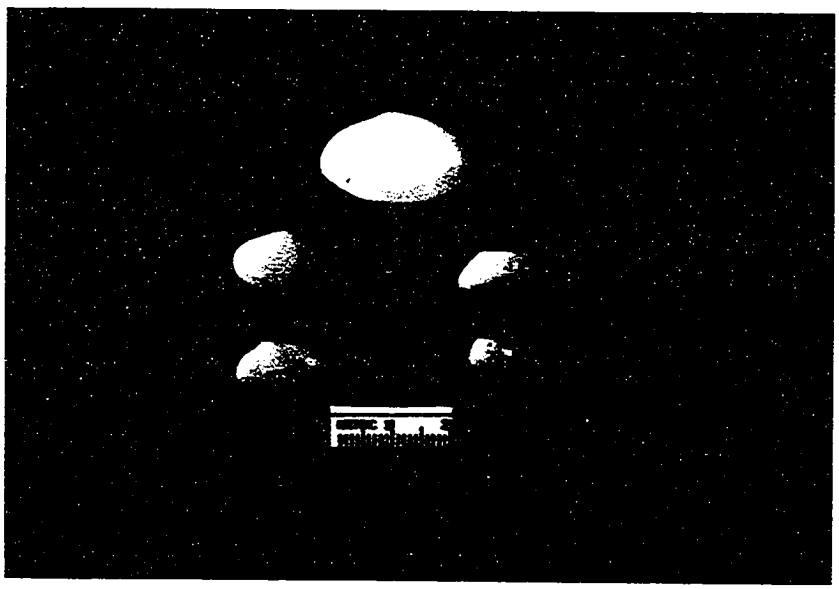


Plate 3. Members of the *Tellina* target genus: (A) *T. similis* with faded colors; (B) *T. similis* with partial ligament; (C) *T. similis* collected live, note intact ligament and protruding siphon; (D) *T.* sp. from Florida Bay with chipped edges; (E) *T. gouldi* with predatory gastropod borehole.



Luster

The original shiny or glossy appearance of a shell was evaluated here. It is frequently the first feature to be lost, usually to microborers (Parsons 1992). Dull is not synonymous with chalkiness, an attribute dealt within the Surface Degradation section (See below).

Periostracum/ligament

Both the periostracum of all shells and the ligament of bivalves are composed of conchiolin, a protein; the presence of either or both on living shells vary from species to species. The periostracum is an external coating that varies in both appearance and thickness (thick and hairy to completely absent). The ligament, an elastic strip connecting the two shells of a bivalve at the umbo, is more resistant to bacterial degradation than the periostracum and may persist long after the bivalve has died, especially if rapid burial has occurred or the shell is exposed to anoxic conditions (Parsons 1992). Plate 3 shows whole and partial ligaments.

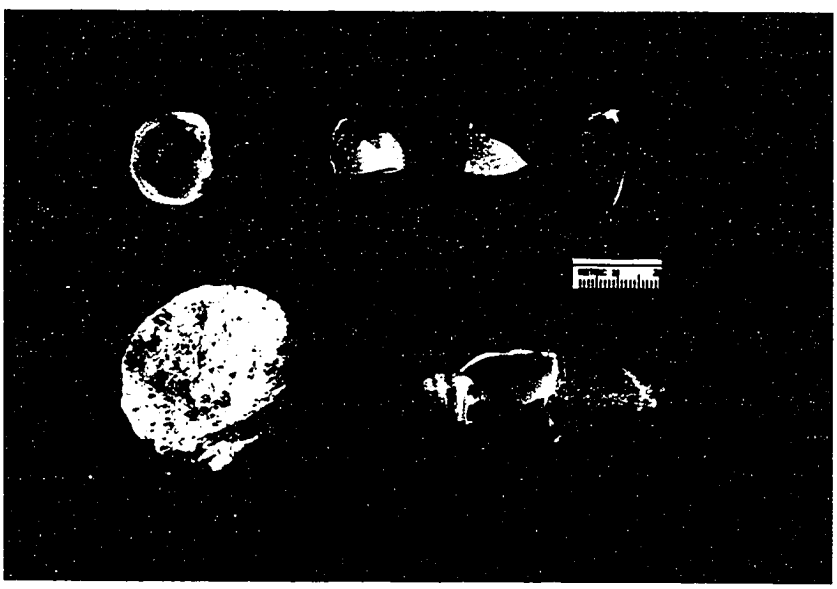
Predatory Boring

Predatory gastropods belonging to the families Naticidae and Muricidae produce distinctive boreholes while feeding on bivalves and other gastropods (Carriker 1981). These borings are easy to see and provide indirect evidence of predation during life (Plate 3E). If the predator's ecological requirements are narrower than those of the victim's, such documentation would further constrain the habitat in which the bored shell lived.

Fragmentation

Shell fragmentation results from the application of physical energy to the shell, either through the actions of the physical environment, (water movement and the resulting collisions with other objects) or biological interactions

Plate 4. (A) *Oliva* sp. with major fragmentation and abrasion and highly rounded edges. (B) *Chama* spp. with high levels of surface degradation, encrustation, and edge rounding. (C, D, and E) *Chione cancellata* illustrating major fragmentation (intact umbo - C and E) and minor fragmentation (umbo missing - D). Minor edge rounding occurs on (C) while (D) and (E) are fresh breaks. (F) *Chama* spp. showing no alterations to shell margin; note crenulations on shell margin.



(predation, boring and bioturbation). Areas of relatively high energy levels, such as beaches, reef crests, and active tidal channels are habitats where fragmentation might be expected to be greatest . Less energetic environments have lower rates of breakage (Parsons and Brett 1991). The ability of a shell to resist fragmentation depends upon its geometry, and the structure of the shell wall (Vermeij 1993). Parsons (1992) notes that susceptibility of a shell to fragmentation is "a function of its surface area to volume ratio: Higher ratios result in a shell that is more easily fragmented." Additional sources of weakness include internal wall cracks, degradation of the organic matrix though bacterial action and both micro-and macro-borings (Parsons 1992, Vermeij 1993). Plate 4 shows examples of all types recorded in this study.

Edge Alterations

Newly broken shells normally exhibit sharp edges that are perpendicular to the wall. The presence of these unaltered edges in a sample can indicate rapid burial (Parsons 1992). As time passes in the absence of burial, the edge would be exposed to a number of taphonomic agents that degrade its sharpness, including epibiont overgrowth, dissolution, and abrasion (Plate 4).

Surface Degradation

Surface degradation is manifested as shell destruction resulting from dissolution, as well as maceration and/or microborings by biological agents. While these processes are quite different, their products are indistinguishable without the use of a scanning electron microscope. The end products include chalkiness, general pitting and corrosion of the shell surface (Swinchatt 1965; Davies et al 1990; Parsons and Brett 1991; Parsons 1992).

The role that dissolution plays in shallow, tropical environments is not clear given that these waters tend to be supersaturated with respect to calcium

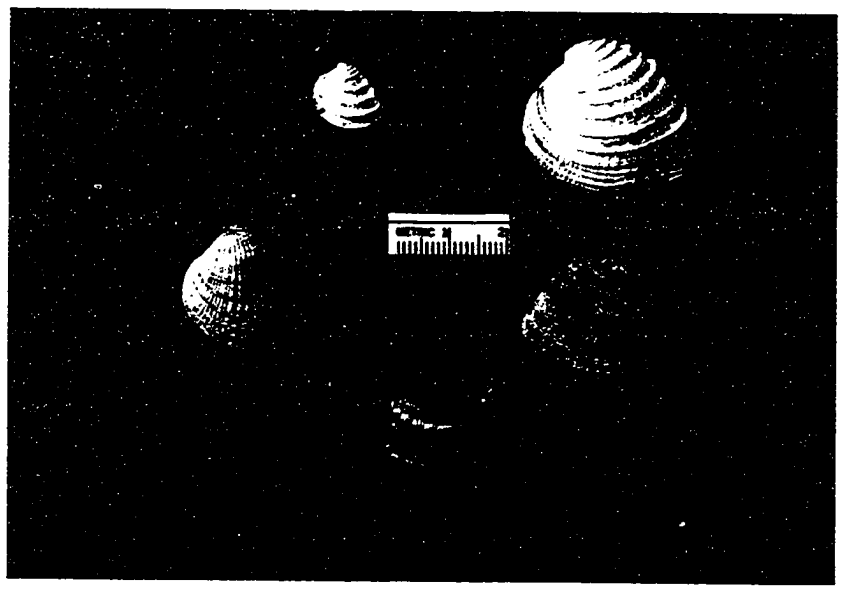
carbonate (Milleman 1974; Bathurst 1975). Environments where dissolution might possibly occur include areas where high rates of organic decay may reduce the pH, such as lagoonal settings (Walter and Burton 1990).

Maceration involves the bacterial decay of the shell's organic matrix (i.e., the mortar that cements the calcium carbonate crystals together into a coherent shell). The loss of this matrix releases calcium carbonate crystals, producing the chalky, corroded appearance of shells (Alexandersson 1978). Microborings are generated by endolithic, photosynthetic organisms. Cyanobacteria are the most common microborers in the waters around St. Croix, followed by green algae (Perkins and Tsentas 1976). Boekschoten (1966) reported that boring cyanobacteria are most common in high energy areas, where moving water promotes low sedimentation rates. Endolithic borers can invade fresh carbonate material within days of exposure to seawater, often creating extensive damage to the surface of shells (Parsons 1992). Examples of the different levels of surface degradation include Plate 2 (all levels) and 4B (major surfade degradation).

Abrasion

Abrasion, in a taphonomic sense, can be defined as erosion of a shell's surface resulting from collisions between that shell and other objects in a fluid medium. These objects can be other skeletal elements or sediment grains. Abrasion tends to be a very good proxy for the velocity and frequency of fluid movement within an environment. High energy hydrodynamic settings (nearshore wave action, currents and tidal activity) tend to be areas of intense abrasion where smoothing can occur within months of the molluscs' death. Abrasion occurs much more slowly, if at all, in lower energy subtidal settings (Driscoll 1967, Driscoll and Weltin 1973). Driscoll (1967) demonstrated that

Plate 5. Abrasional states as expressed on *C. cancellata*: (A) No abrasion, sculpture intact. Predatory boring on present margin. (B) Minor abrasion - small nicks. (C) Minor abrasion - sculpture eroded. (D) Minor abrasion with sponge borings. (E) Fragmentation with major abrasion with highly polished surface.



shells tumbled in quartz sand lost their surface ornamentation within hours, while the coarse ornamentation was only moderately eroded after much longer exposes. Other factors affecting the degree of abrasion include a shell's surface area per unit weight, its geometry, and a number of characteristics associated with surrounding sediment grains (e.g. size, shape, and the degree of sorting). Not surprisingly, abrasion tends to be accelerated by hard, large, angular, poorly sorted sediment grains (Driscoll and Weltin 1973, Müller 1979). To date there have been no experimental studies of mollusc shell abrasion by carbonate particles, although Kotler et al. (1992) provided experimental results for Foraminifera in carbonates. They found that fragile species tended to be destroyed, but specimens of most species were still easily recognized after 1000 hours of active abrasion in medium-sized carbonate sand.

It can be difficult to distinguish between abrasion and dissolution, even when viewed under a dissecting microscope. Generally, the abraded shell surface is hard and shell integrity remains constant across a lateral gradient. Additional evidence of abrasion can include polishing, local faceting, and a smoothing of ornamentation (Davies et al. 1990, Parsons 1992). Plate 5 illustrates the various abrasional states.

Bioerosion (Macroscopic)

The breakdown of hard substrates by organisms is termed bioerosion; bioeroders sometimes degrade carbonate material in the search for food and shelter (Scoffin 1987). Feeding activities damage sediment grains both chemically and mechanically during ingestion and digestion by deposit feeders; skeletons can either be damaged superficially by grazing organisms such as fish, urchins, and molluscs, or fractured by predatory birds, fish, and arthropods. Organisms seeking shelter within carbonate material create borings through

chemical and/or mechanical means. Borers include cyanobacteria, green algae, sponges, Bryozoa, polychaetes, molluscs and urchins (Scoffin 1987, Tucker, et al. 1990). Several specific bioerosional features were recorded for this dissertation:

Boring

The significant group of borers, endolithic phototrophs, were discussed earlier in the section on *Surface Degradation*. The next most destructive boring group are sponges of the family Clionidae (Plate 5D). They penetrate carbonate substrates through chemical dissolution, greatly weakening the host material and producing large quantities of small (20 - 80 μ), distinctively shaped chips (Bergquist 1978, Scoffin 1987).

Grazing

Grazing organisms consume the organic material (microbial coatings, coral tissue and zooxanthellae, boring and/or encrusting algae) located on and just under carbonate surfaces. The feeding guild referred to as *Grazers* includes such diverse groups as the fish, urchins, molluscs and polychaetes. The traces left by their feeding apparatuses are generally distinctive enough to be identified at low levels of magnification (see Boekschoten 1966). I found graze marks produced by the radular teeth of chitons to be quite distinctive and recorded their presence.

Rhizome Etchings

Parsons (1989, 1992) described the unique bioersional signature produced by the rhizomes of the seagrass, *Thalassia testudinum* . These meandering linear traces are quite distinctive and the most direct, diagnostic feature of grassbeds. Their presence was noted in this study. See Parsons (1992) for further details.

Study Area

The carbonate platform of south Florida is approximately 375 km long and varies in width from 6 to 35 km (Multer 1977). An arcuate chain of low islands, the Florida Keys, divides the platform into an inner region and the shelf margin (Figure 1 and 2). Located between the southern tip of the Florida mainland and the Keys is the restricted inner shelf of Florida Bay. Seaward of the Keys toward the east and south, is a the 5 to 10 km - wide shelf margin zone that contains two major subdivisions, the inner and outer shelf margin. The inner shelf margin, know as Hawk Channel, is carpeted by thick beds of seagrass while the outer shelf is covered mainly by bare sand (Enos 1977; Multer 1977).

The climate is essentially tropical with cool periods during winter when strong cold fronts sweep out of Canada. These fronts bring strong rains and high wind conditions. Wind patterns are seasonal with the southeast trades dominating the summer months and northeast winds prevailing in winter (Pitts 1994). Strong winds can generate very active wave and current conditions that produce turbid water conditions. Fall and winter currents within Hawk Channel run to the southwest, with an average velocity of 1 cm/s^{-1}, and spring and summer currents average 0. 4 cm/s^{-1} in the opposite direction (Pitts 1994). Periodically the area is subjected to hurricanes or tropical storms that create unusually high flow regimes across the shelf from offshore to onshore (Tucker and Wright 1990).

The dominant hydrographic feature in the study area is the Florida Current which moves north through the Straits of Florida with an average speed of 1.3 m/s^{-1} (Enos 1977). Lee et al. (1992) reported longshore currents speeds of 13 -25 cm/s^{-1} in the vicinity of the Key Largo shelf break. Enos (1977) estimated bottom currents in excess of 50 cm/s^{-1} near the shelf break, based on

observations of current ripples and diving experiences in the area. Such currents appear to originate with tide changes and "favorably oriented, but light winds." Tides are of low amplitude (averages 0.7 m) and the currents they generate are of greatest influence in the channels between islands where velocities can reach 130 cm/s^{-1} (Enos 1977, Tucker & Wright 1990).

Water temperature of the shelf margin is regulated by its close association with the Florida Current (Enos 1977). the Outer shelf margin averages 18-31°, while the inner shelf margin is several degrees cooler; Florida Bay shows the greatest extremes of temperature (12-40° C) (Enos 1977; Zieman 1982). Salinity also exhibits increasing variability as one moves from the outer shelf margin (35-36‰) through the inner shelf margin (34-37‰), and into Florida Bay (6-58‰; Enos 1977, Zieman 1982).

Inner Shelf Platform

Florida Bay is a shallow ($\leq$3 m) area where water circulation is restricted by dense stands of mangroves, mud banks and basins ("lakes") created by the mud banks. Wang, et al. (1994) reported that "distinct compartmentalization" produced by these structures "causes extraordinary damping of diurnal and semidiurnal tides within the bay" resulting in "partial isolation of subregions and strong gradients in salinity." The western, open portion is fully marine in character while the northeastern region receives freshwater input from the Everglades (Merriam 1988). Turney and Perkins (1972) divided the bay into four subenvironments based molluscan distribution patterns; northern subenvironment, interior subenvironment, Atlantic subenvironment, and the Gulf subenvironment. The interior subenvironment, while not as harsh as the northern region, is a physically stressful habitat. The bay bottom is covered by seagrasses and calcareous green algae; each is a major contributor of mud-

sized carbonate particles (Ginsburg 1956, Nelson and Ginsburg 1986). The benthic community is dominated by molluscs and Foraminifera, both major producers of sediment (Ginsburg 1956).

Florida Bay has experienced a number of environmental perturbations in the last few years, in the form of seagrass diebacks. The cause of these kills is currently unknown, but it is speculated that restricted water flow into the Everglades has increased salinity levels beyond the tolerance of the seagrasses. Another hypothesis involves eutrophication from agricultural runoff (Wang et al. 1994).

Inner Shelf Margin

The inner shelf margin is quite discernible visually and on charts of the Florida Keys (Figure 2). Marked as Hawk Channel on navigation charts, its thick seagrass beds give the water a darker color compared to the light colored waters of the outer shelf margin. Its bottom slopes gradually seaward (1:1000) from the rocky intertidal and mangrove shores of the Keys to depth of ≈ 5 m. From there it "deepens into a depression 8 to 15 m deep and as much as 2.5 km wide." (Enos 1977). Besides extensive grassbeds, other inner shelf margin features include small emergent sediment banks (Tavernier Key, Rodriquez Key), patch reefs (Triangles), and tidal deltas (Enos 1977; Multer 1977). Wave action and currents here are limited and the sediments are chiefly lime mud and sandy mud (Enos 1977, Pitts 1994); calcareous green algae are abundant along with branching coralline algae (*Neogoniolithon* sp.) buildups (Bosence et al. 1985). Sediment cover is thin (0 - 4.5 m) compared to the outer shelf margin, except in the vicinity of mud banks where accumulations may reach 7 m (Enos 1977).

Outer Shelf Margin

The outer shelf margin is a band that runs approximately 5-7 km offshore of the Keys, and is covered chiefly by skeletal sands. These sands include high percentages of the green alga, *Halimeda* sp. and mollusc shells (Ginsburg 1956). The thickest sediment accumulations in the study area occur here (up to 10 m), around the shelf edge reefs and sand bodies (Enos 1977). Seagrass beds are usually restricted to more sheltered areas (leeward of reefs) by wave action (Enos 1977).

The outer reef tract contains intermittent living coral reefs. These reefs display five distinct zones related to depth and wave exposure (Shinn 1963; 1980): 1) *Back Reef*, containing lime sand, large cobble-sized pieces of coral rubble, and small living colonies of hermatypic corals (Plates 6 to 8) *Reef flat* of dead and living *Acropora palmata,* colonies of which show no preferred growth orientations and almost reach the surface. 3) *Oriented A.palmata* zone, where the corals' branches are pointed away from the prevailing wave fronts in 0.5-4.0 m of water. 4) *Spur and groove zone* of massive growth of *Monastrea annularis* and blade-shaped *Millepora* sp. (3-7 m depths). 5) *Deep coral rubble zone* (6-8 m) with large populations of octocorals (soft corals) and some living hermatypic corals.

Located in front of the reefs are forereef muddy sand belts (Plate 9 and 10). These are situated on gently sloping surfaces at depths greater than 20 m, and are covered by sediments composed of the remains of calcareous green algae, molluscs, foraminifera, echinoids and corals (Multer 1977). Sediment thickness here varies depending upon the proximity to 'sand chutes' which funnel sediment into deeper water (Enos 1977).

Plate 6. Sampling station in backreef rubble zone (RZ) showing coral cobbles and brown algae.

Plate 7. Sampling station in backreef grassbed (RH).

Plate 8. Sampling station in backreef transition zone (RR) between rippled sand (RS) and grassbed (RH). Note thick seagrass rhizome mat above the sand ripples.

Plate 9. Sampling station in forereef sand flat (AQ). Sampling template is the white object held by diver.

Plate 10. Sampling station on deep reef sand flat (DP). Diver is attempting to remove samples of hardground from beneath sand veneer.

The South Florida Shelf has been described as a rimmed shelf (Ahr 1973; Read 1985). The seaward, wave - dominated margins of such platforms contain the defining features of these shelves; semi-continuous to continuous rims or barriers consisting of reefs, skeletal or ooid sand shoals, and/or islands (Read 1985). South Florida's shelf margin is bounded by skeletal sands and (living and dead) bank barrier reefs (Enos 1977). This energetic periphery is also the location of the shelf break, where the bottom dips 1-10° seaward (Read 1985).

Sampling And Analytical Methods

Sampling was conducted at stations established along a general onshore-offshore transect that extended from Tavernier Key to Conch Reef (Figures 2 and 3). Along the larger transect, eight "mini-transects" were established on a variety of substrates including seagrass, rippled sand, and rubble/ hardgrounds in depths ranging from 3.7 to 35.0 m (Table 3). A ninth mini-transect was located in a *Thalassia* bed on the Florida Bay side of Tavernier Key. Each mini-transect was 30 m long, with the exception of one that was 50 m on the forereef sand flat (Station AQ). Bulk sediment samples were collected at 10-m intervals along the mini-transects (4 samples per 30 m mini-transect) using a SCUBA-powered airlift equipped with a mesh collection bag (2 mm diagonal openings).

Sampling localities within uniform habitats will be referred to throughout this dissertation as 'stations', while the location of an individual sample on each transect will be called a 'site'. Thus, the deep reef flat is station "DP" while the four individual sampling sites along the "DP" mini transect are designated 'DP-0', 'DP-10', 'DP-20', and 'DP-30'. Sampling was performed by pushing a core tube (30 cm wide by 50 cm high; Plate 9) into the substrate, the interior contents

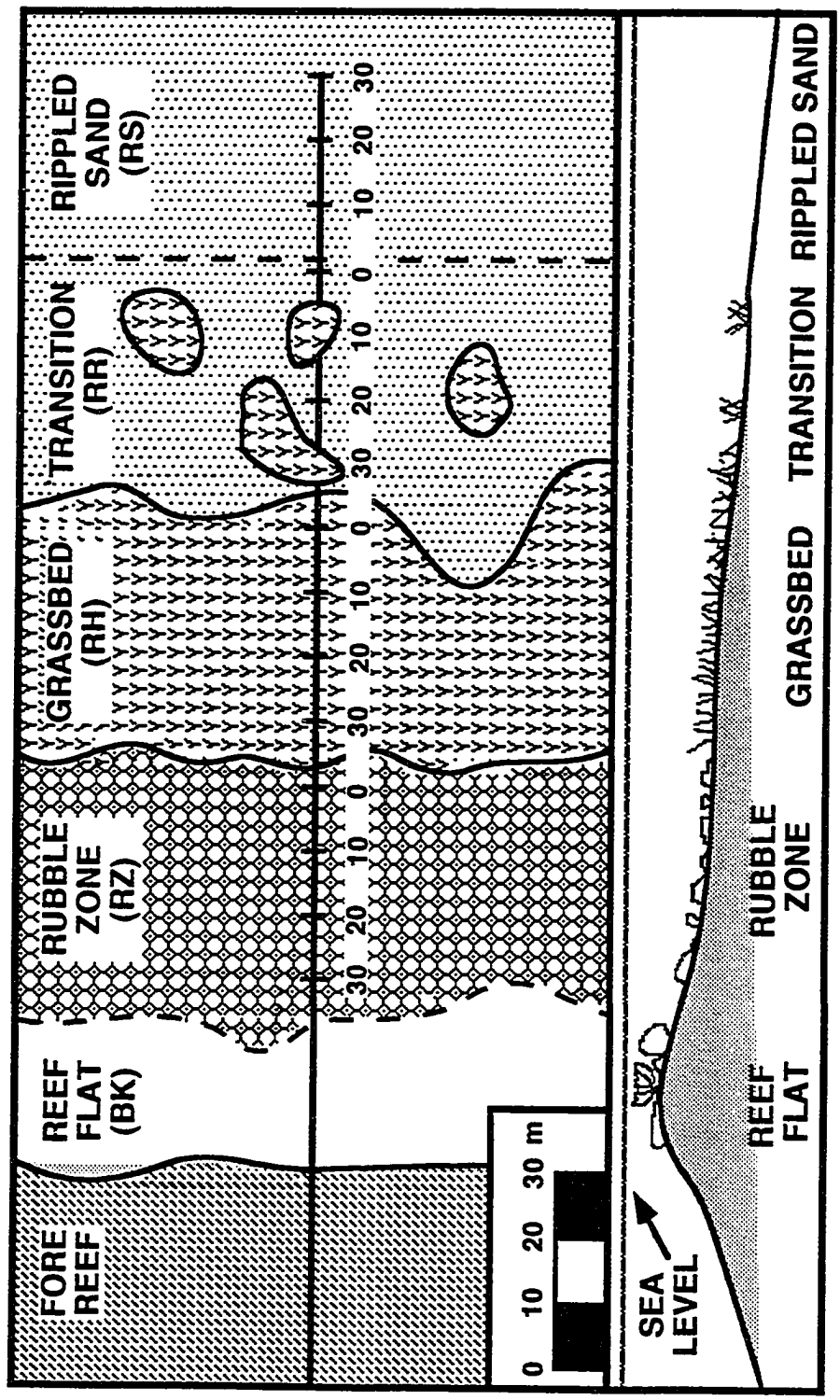


Figure 3: Diagram of backreef sampling station at Conch Reef, Florida Keys

Table 3. Summary of sampling station physical characteristics.

Station	Geographic Location	Environment	Habitat	Depth (m)	Bottom Type	Hydrodynamic Energy
FB	Florida Bay	Inner Shelf Platform	Grassbed	1.8	Vegetated	Low
TH	Hawk Channel	Inner Shelf Margin	Grassbed	4.3	Vegetated	Low - Medium
TS	Hawk Channel	Inner Shelf Margin	Unvegetated Bottom	6.8	Fine sand - mud	Low
TR	Triangles	Inner Shelf Margin	Patch Reef	4.0	Hardground with mud veneer	Medium
RS	Conch Reef	Outer shelf Margin	Back Reef Rippled Sand	4.6	Sand	High
RR	Conch Reef	Outer shelf Margin	Back Reef Transition	4.6	Vegetated and unvegetated sand	High
RH	Conch Reef	Outer shelf Margin	Back Reef Grassbed	4.6	Vegetated sand	High
RZ	Conch Reef	Outer shelf Margin	Back Reef Rubble Zone	4.3	Unvegetated with coral cobbles	High
BK	Conch Reef	Outer shelf Margin	Reef Flat	1-1.5	Hardground with pockets of gravel	High
AQ	Conch Reef	Outer shelf Margin	Fore Reef Sand Flat	21	Sand	Medium
DP	Conch Reef	Outer shelf Margin	Deep Reef Sand Flat	33	Hardground with sediment veneer	Low to Medium

were then vacuumed out with the airlift to a depth of up to 30 cm (less at sites with only a thin veneer of sediment). A garden trowel was used to gently loosen rhizome mats at sites carpeted with thick seagrasses.

Two additional stations were also sampled: sediment pockets among the coral rubble on the reef flat of Conch Reef (BK) and a patch reef, Triangles (TR), located in the middle of Hawk Channel. Together these stations and the mini transects yielded a total of 41 individual bulk samples. Sediment samples from each airlift station and vegetation censuses, where appropriate, were also taken to permit characterization of subenvironments in terms of mean grain size distribution and degree of vegetation cover. Sediment was collected via a small piston core constructed by removing the distal end of a 60 cc medical syringe. Eight replicate vegetation counts were taken at each vegetation census site by haphazardly dropping a 10 X 20 cm lexan quadrat on to the bottom, except in Florida Bay. There, only two replicates were counted because strong winds on the day of sampling had reduced visibility to less than 10 cm. All individual macroalgae and the individual blades of the two seagrasses located within the quadrat were recorded. The seagrass *Thalassia testudinum* dominated the vegetated bottoms, however the shallow transitional site (RR) contained a the seagrass, *Syringodium filiforme* and high diversity of macroalgae (*Penicillus* spp., *Avrainvillea* sp., *Caulerpa lannginosa, Batophora oerstedii, Halimeda* spp., *Udotea* spp., and *Dictyota* spp.). Quantification of plant coverage was calculated by determining the average number of plants (algae) or blades (seagrass) per 200 cm^2 quadrat at each site and multiplying that number by 50 to yield an average density of plants per m^2. Station densities were then computed by summing up their sites' density and dividing by the number of sites per station.

Laboratory processing began with sorting and removal of all recognizable molluscan, echinoderm, vertebrate, crustacean, brachiopod, and coral skeletal remains under a illuminated magnifier (2.5 X). All molluscan shells (≈ 33,000) were identified with a dissecting microscope (10 - 60 X) to the lowest possible taxonomic level (usually species) using several literature sources (Perry and Schwengel 1955, Warmke and Abbott. 1961, Vilas and Vilas 1970, Abbott 1974, Morris 1975, Emerson and Jacobson 1976, Andrews 1977, Rehder 1981). Only bivalves with umbos (beaks), and gastropods with apices or apertures were counted. Each single bivalve shell was counted as a single individual shell, unless there were matching pairs of shells. It was quite unlikely that this would have overestimated species abundances, as most right and left valves of a single sample were quite mismatched with respect to size or preservation state. However, if two shells did appear to be a close match they were counted as one individual. In any case, the absolute species' abundance information was not a critical part of this taphofacies study, as it would have been in a paleocommunity or ecological study.

Sediment samples were sieved to determine grain size distribution. Those samples with clean sand-sized particles were dry sieved through 2000, 500, 250, 125, and 62.5 μ openings. Samples containing muddy sediment were wet sieved through the 62.5 μ sieve, air dried and then dry sieved as described above. (Folk 1980).

Taphonomic Evaluation

A total of 2482 individuals representing 15 taxa (14 species and one genus) were selected for taphonomic analysis on the basis of their abundance, widespread distribution across stations, type of shell architecture (robust vs. thin), and / or close taxonomic affinity to other well - distributed species. Table 4

lists the taxa that were examined in this study and summarizes these organisms' modes of life and habitats. The taphonomic condition of each shell was ranked using the criteria described earlier (Table 1). Additionally, the size (maximum anterior-posterior axis for bivalves and gastropods and longest axis of fragments) and identity (right, left or articulated valves for bivalves and whole shells vs. apices or apertures for gastropods) were recorded. These data were combined for each station and average taphonomic rankings for these pooled samples were calculated.

The taphonomic attributes of "Target' or individual taxa were also evaluated so that their taphonomic signatures could be compared individually to the pooled data. The target taxa were suites of related species that were distributed across a majority of the sampled environments: *Cerithium* spp. (*C. eburneum, C. litteratum* and *C. muscarum*) are high spired, epifaunal gastropods with that occur at all stations (Plate 11). *Tellina* spp.(*T. gouldi, T. smilis and T.* sp. FB) are thin shelled, infaunal bivalves found at all stations; although their abundances are limited at some locations (Plate 3); Chamidae (*Chama* spp. and *Pseudochama radians*) are very abundant in the outer shelf margin, but their numbers decrease rapidly toward shore. Members of the family Chamidae are thick shelled, epifaunal bivalves that cement to hard substrates (Plate 12).

Data Analysis

Cluster Analysis:

The exploration and analysis of large sets of data have greatly benefited from the use of multivariate techniques. These techniques are capable of simultaneously examining large numbers of samples and variables, summarizing that information, and then revealing any underlying structures that might otherwise be masked (Gauch 1982). Multivariate procedures are useful

Plate 11. Members of the *Cerithium* target genus: (A) *C. muscarum*, (B) *C. eburneum*, and (C) *C. litteratum*.

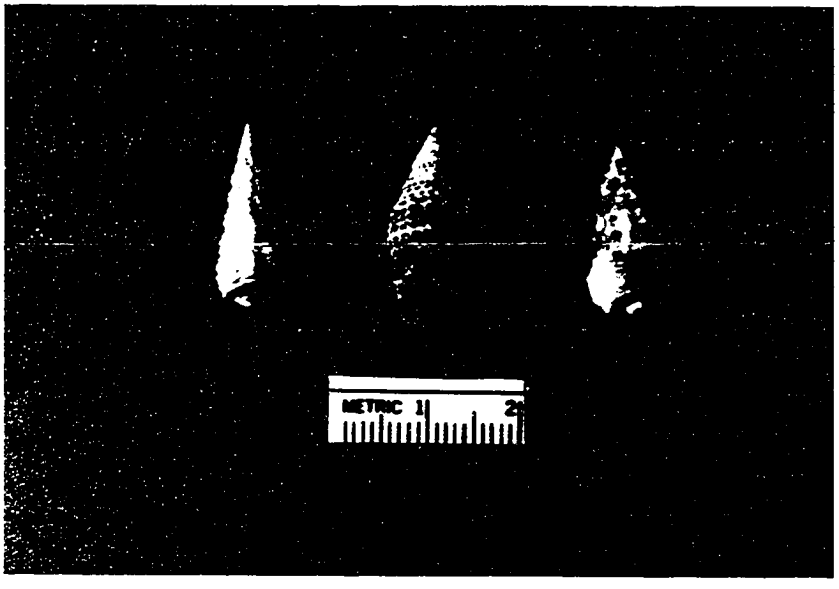
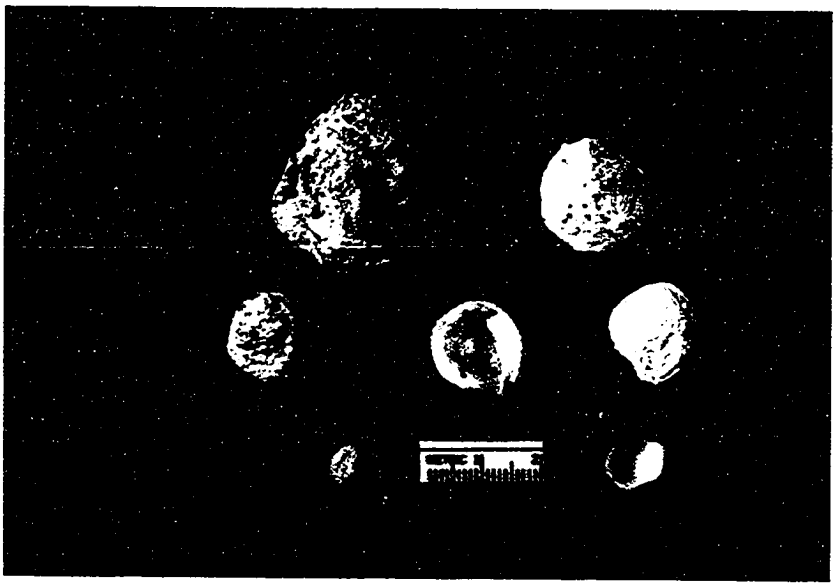


Plate 12. Members of the target family Chamidae.



for determining the existence and extent of interrelationships between the data. Besides assisting in the determination of structure within ecological data, multivariate techniques are relatively objective and easy means to summarize data. They can "both facilitate the ecologist's comprehension of the data and provide a means for effective communication of results" (Gauch 1982).

One of the techniques use here was cluster analysis. In this instance, the Unweighted Pair-Groups Method using Arithmetic averaging (UPMGA) was the specific method of clustering chosen. According to Sneath and Sokal (1973), UPMGA is the classification technique most frequently used with biological data and its use is advocated when the investigator has no specific reason for choosing another type of hierarchical procedure. UPMGA computes an average similarity between the sample or cluster being evaluated and an extant cluster, weighting each sample in that cluster equally, regardless of its structural subdivision (Sneath and Sokal 1973). UPMGA has been use with a great deal of success in a number of paleoecological and taphonomic studies (e. g. Springer & Bambach 1986, Miller 1988, Miller et al. 1991, Kowalewski 1994).

The first step in performing a cluster analysis is to place the data into a matrix with stations represented as rows (Q) and species or taphonomic attributes as columns (R). At this point, transformations are commonly preformed on the data to ameliorate factors that can obscure meaningful results. Taxonomic data are typically percent transformed but the taphonomic data, in this study were percent range transformed. Percent transformation for taxonomic data changes the raw species' abundances into percentages of the total number of individuals within each sample, thus minimizing effects of unequal sample sizes. By contrast, percent range transformation is preformed on variables to "equalize" their relative contributions tot he data.

For this investigation, the mean values of each taphonomic attribute from the stations were calculated and compared to every other station to determine the extent to which they have average attributes in common. Pooled data were used to produce an averaged index for each taphonomic feature. Averages (means) were calculated for each taphonomic characteristic at every station by summing up the scores from every individual and then dividing by the number of individuals. This average value was then classified as either low, medium or high.

The pair-wise comparison of samples (Q-Mode analysis) performed can be calculated by a variety of similarity coefficients. The 'quantified ' Dice (Czekanowski) Coefficient was chosen because it been used widely , with great success in ecological studies (Goodall 1972, Springer and Bambach 1985). The coefficient, which was used initially with presence - absence data, has been 'quantified ' by rewriting the algorithm to use "minimum and maximum values of paired elements of parallel vector arrays." (Sneath and Sokal 1973). The original analytic attributes were retained and the new equation gained the ability to handle quantitative data (Sepkoski 1974).

The quantified DiceCoefficient (Equation 1) takes the number of items two samples have in common and divides that by the average size of the two samples:

$$S_D = \frac{2 \sum \min (X_{1j}, X_{2j})}{\sum X_{1j} + \sum X_{2j}}$$

Equation 1. Quantified Dice Coeffcient

Samples with no attributes in common have a similarity equal 0 while those that are identical have perfect similarity and equal 1. This produces a number (Similarity Coefficient or SC) that is placed into a similarity matrix for clustering. The UPGMA computer program, CLAP, utilized to do the analysis

was written by Sepkoski and Sharry (1976) and modified for microcomputer by Miller (1987).

Average Taphonomic Score

Pooled data were used to produce an averaged index for each taphonomic feature. Averages (means) were calculated for each taphonomic characteristic at every station by summing up the scores from every individual and then dividing by the number of individuals. This average value was then classified as either low, medium or high.

Table 4. List of molluscs pooled for taphonomic analyses. Specific target taxa are marked with *.

Species	Mode Of Life	Habitat
Class: Gastropoda		
Family: Cerithiidae		
Genus *Cerithium* *		
Cerithium eburneum	Epifauna	Algae-covered rubble among seagrasses
Cerithium litteratum	Epifauna	Algae-covered rocks and rubble among seagrasses in shallow water
Cerithium muscarum	Epifauna	*Thalassia* blades in estuaries and bays
Class: Bivalvia		
Family: Arcidae		
Arca imbricata	Epifauna	Bysally attached to rocks and corals in shallows
Arca zebra	Epifauna	Bysally attached to rocks and corals in shallows
Arcopis adamsi	Epifauna	Bysally attached under rocks in shallows
Barbatia cancellaria	Epifauna	Bysally attached preferably within coral, *Porites porties*, in shallow subtidal
Barbatia domingensis	Epifauna	Bysally attached under rocks and corals in shelterd shallow subtidal
Family: Veneridae		
Chione cancellata	Infauna	Clean, slightly muddy sand with little to no seagrasses in the intertidal and shallow subtidal
Chione grus	Infauna	Shallow sand to sandy mud
Family Tellinidae		
Genus *Tellina* *		
Tellina gouldi	Infauna	Sand, to weedy sand in depths 1.8 - 512 m
Tellina similis	Infauna	Rapid, burrower in slightly muddy to gravelly sand.
Tellina "FB"	Infauna	Mud with shell hash in shallow, Florida Bay grassbed
Family: Chamidae *		
Chama spp.	Epifauna	Firmly cemented to hard substrates in depths from 0.3 to 80 m. Commonly covered with epibionts.
Pseudochama radians	Epifauna	

Proportion (Percentage) Comparisons:

The total number of species collected from each station varied greatly (Table 5) and made direct comparisons between stations unproductive. To facilitate more equitable comparisons, the abundance data were recalculated so that the number of individual observations (species or taphonomic rank) were re-expressed as a proportion of the total number of individual observations for the total number of species or taphonomic ranks. This proportion has been referred to by a number of terms; relative abundance, percent abundance, percent species, species frequency, etc. (Buzas 1990).

To further decrease the uncertainity of these comparisons, confidence intervals for the resulting proportions (percentages) were calculated at the 95 % level. Calculations were made using a computer program published by Raup (1991). This program generates a binomial probability distribution based on the percentage of occurrences within the actual sample. These confidence intervals were then added to the graphs as error bars; observations that had overlapping error bars would be not significantly difference from each other five times out of 100.

Ternary Taphogram

Stations were also compared to each other with a simple graphical technique that utilized ternary diagrams (Kowalewski et al. 1994). While Kowalewski et al. (1994) were not the first researchers to use ternary diagrams in taphonomic studies (see Parsons 1992), their method of constructing a "ternary taphogram" allows individual taphonomic indices to be compared easily across a range of depositional environments. This simple system ranks individual shells according in a three-fold taphonomic classification system (Figure 4). For example in a comparison of surface degradation, all shells within a each sample would be ranked as either "Low" (little to no surface

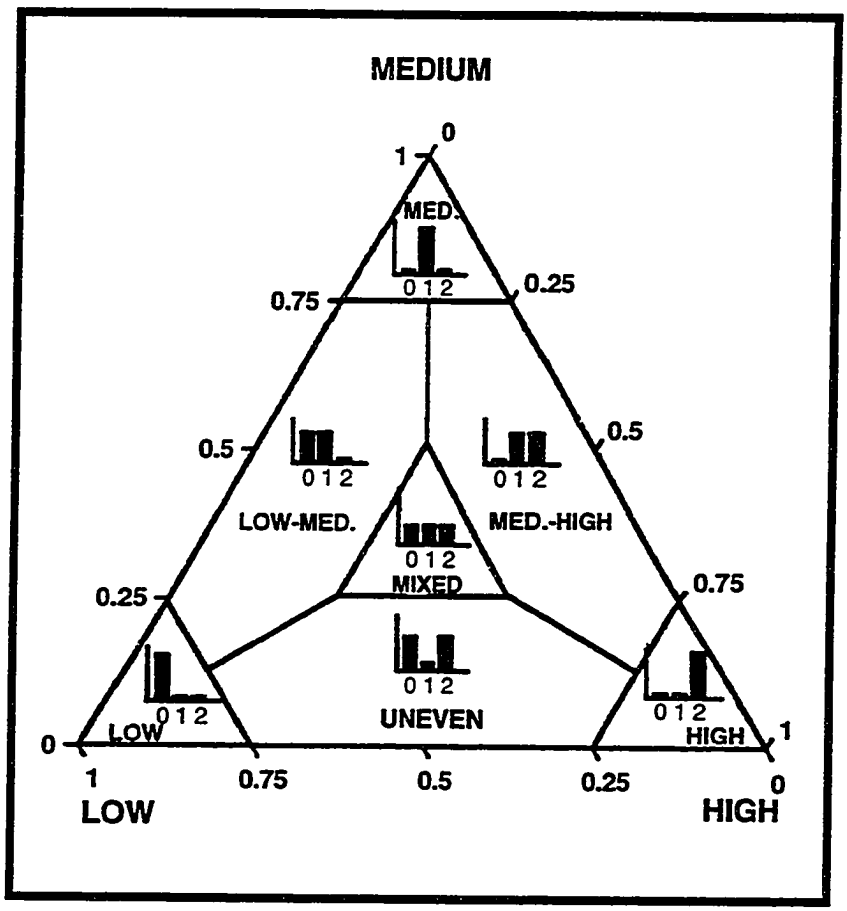


Figure 4: Key to interpreting ternary taphograms. Taphomomic attribute divided into three classes representing a "continuum of preservational quality" (Kowalewski et al. 1995). Apices of triangle equal maximum expression of the condition; "Low" = minimal alteration, "Medium" = moderate alteration, and "High" = maximum alteration. Samples are plotted on the diagram based on their frequencies within each class. Histograms within each region of the diagram represent the proportions of each class represented in that region when a location is graphed there. Figure modified after one by Kowalewski, et al. (1995).

Table 5. Summary of taxa abundances by collecting station.

				Number of Individuals Examined Per Station			
Station	Location	Environment	Habitat	Pooled	*Cerithium* spp.	Chamidae	*Tellina* spp.
FB	Florida Bay	Inner Shelf Platform	Thalassia Bed	206	58	0	15
TH	Hawk Channel	Inner Shelf Margin	Thalassia Bed	72	55	1	13
TS	Hawk Channel	Inner Shelf Margin	Unvegetated Bottom	40	13	3	20
TR	Triangles	Inner Shelf Margin	Patch Reef	146	10	22	10
RS	Conch Reef	Outer shelf Margin	Back Reef Rippled Sand	417	171	76	33
RR	Conch Reef	Outer shelf Margin	Back Reef Transition	205	82	49	22
RH	Conch Reef	Outer shelf Margin	Back Reef Grassbed	327	130	63	58
RZ	Conch Reef	Outer shelf Margin	Back Reef Rubble Zone	424	257	27	26
BK	Conch Reef	Outer shelf Margin	Reef Flat	98	67	14	2
AQ	Conch Reef	Outer shelf Margin	Forereef Sand Flat	402	41	142	107
DP	Conch Reef	Outer shelf Margin	Deep Reef Flat	144	10	92	6

Table 6. Reduced categories of taphonomic criteria used to rank shells in the present study. Data from this ranking system was used to plot ternary taphograms.

Attribute	Ternary Rank	Pooled Rank	Grade
Encrustation			
	Low	None + Coverage ≤ 20%	0
	Medium	Coverage 20 - 80%	1
	High	Coverage > 80%	2
Color			
	Original	Original, unaltered	0
	Faded	Original, but faded or stained	1
	Bleached	Loss of color (bleached)	2
Fragmentation			
	Low	None	0
	Medium	Minor (<20% of shell broken)	1
	High	Major + Fragment (>20% of shell broken)	2
Edge Alterations			
	Low	Edge sharp or natural + Edges chipped	0
	Medium	Edges slightly worn	1
	High	Edges smooth	2
Surface Degradation			
	Low	NoDegradation	0
	Medium	Minor Degradation	1
		Chalkiness	
		Minor pitting or etching (<20% of surface)	
		General pitting or etching (20-80% of surface)	
	High	Major Degradation	2
		Corrosion	
		Pitting or etching >80% of surface	
		Surface very soft	
		Surface sculpture gone	
		Sculpture enhanced	
		Extreme dissolution	
		Deeply dissolved-imperforate	
		Deeply dissolved-perforated	
Abrasion			
	No	No abrasion	0
	Minor	Minor abrasion	1
		Small nicks or frosted	
		Surface scultpture eroded	
	Major	Major abrasion	2
		Highly polished surface	
		Deeply eroded, imperforate	
		Deeply eroded, perforated	

degradation), "Medium" (moderate surface degradation), or "High" (extensive surface degradation). Next, the proportions of each rank within an individual sample are determined and this information is plotted on a ternary diagram as a single point. These points (proportions of taphonomic ranks) can then be compared to the locations of other stations' points, a practice that greatly reduces the number of individual graphs required for comparisons among stations. Additionally, the single point on the ternary diagram encodes a greater quantity of information than a simple average taphonomic score. For example a bimodal distribution of shells nearly equal numbers of low and high levels of surface degradation would be arithmetically averaged represent a medium value and obscuring a potentially interesting observation (Kowalewski et al. 1994).

Because ternary taphograms require a tripartite classification system, much of the taphonomic data originally collected using Table 1 had to be reduced to a three fold system. This reduction was accomplished by combining various ranks (Table 6).

RESULTS

Sediment Analysis

The outer shelf margin stations (DP, AQ, RZ, RH, RR, and RS) had sediment dominated by clean, coarse to fine sand-sized particles (Figure 5). The deep reef flat's thinner sediment layer (5-6 cm) had the widest distribution of grain sizes for all outer shelf margin stations with coarse to fine sand-size particles making up the majority of the sediment (Figure 6A). The balance of these stations had sediment that fell within the coarse to medium sand range (Figures 6B, 7A, 7B, 8A and B). Inner shelf margin stations in Hawk Channel had much finer sediment (Figure 9A and B). The *Thalassia* bed held a wide range of size classes (coarse sand to mud) while the unvegetated and slightly deeper (6.7 m vs. 4.3 m) Hawk Channel station was covered with very fine sands and mud. Figures 10 shows the Florida Bay (FB) station's bimodal grain size distribution with peaks in the coarse sand-sized category (mollusc shell hash) and mud (< 62.5 μ).

Vegetation Census

Table 7 shows the results of the vegetation censuses. *T. testidinum* density was highest in the backreef grassbed and had similar densities throughout the remaining grassebeds sampled. *S. filiforme*, found only backreef transition zone, was approximately a third the density of *Thalassia.* Macroalgae was most diverse and abundant in backreef grassbed with both measures decreasing with proximity to shore. *Halimeda* spp. became more abundant moving toward shore.

Taxonomic Cluster Analysis

A total of 33, 005 individual skeletons or skeletal elements representing 386 distinctive molluscan taxa (367 species), fish, scleractinian corals and

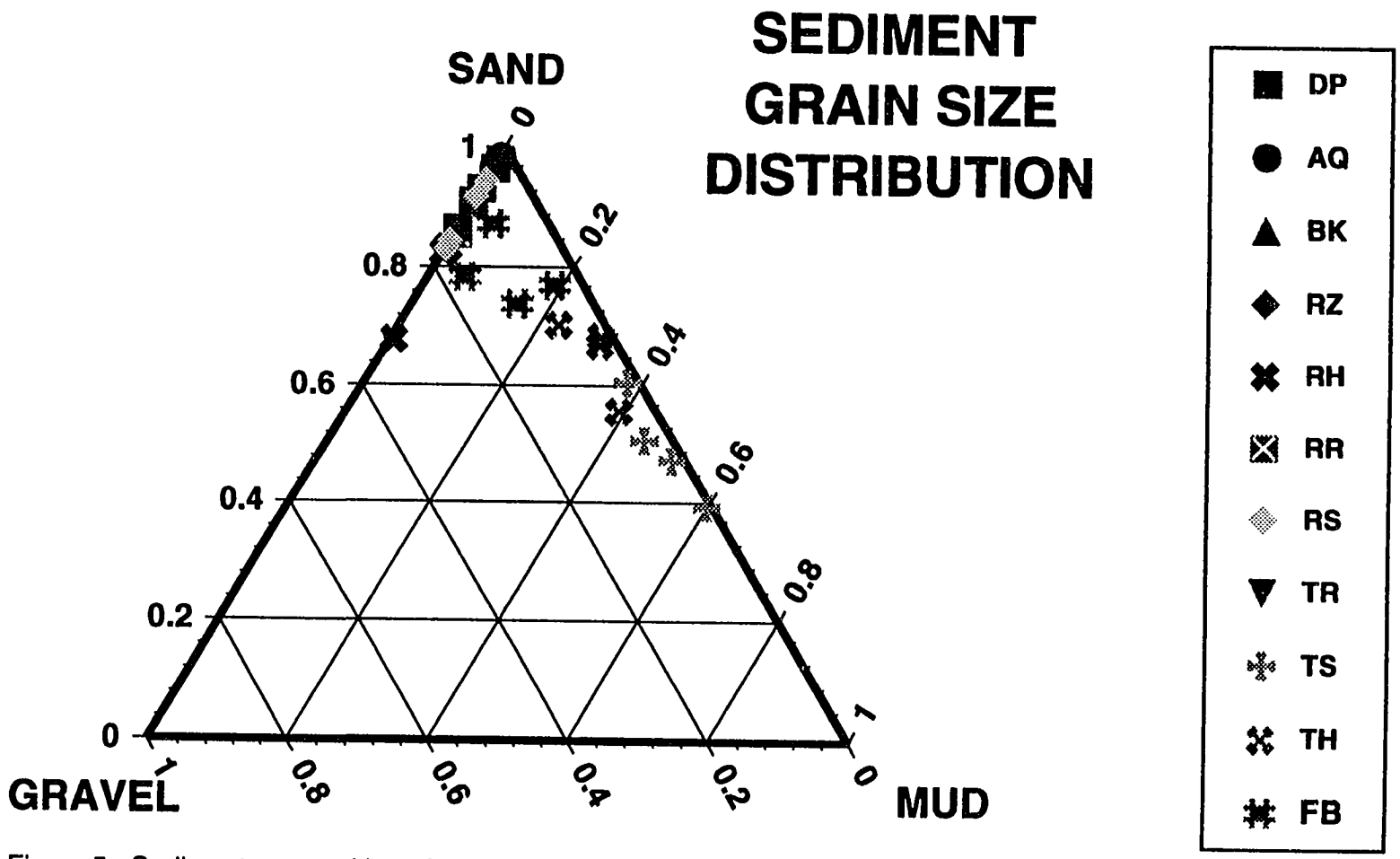
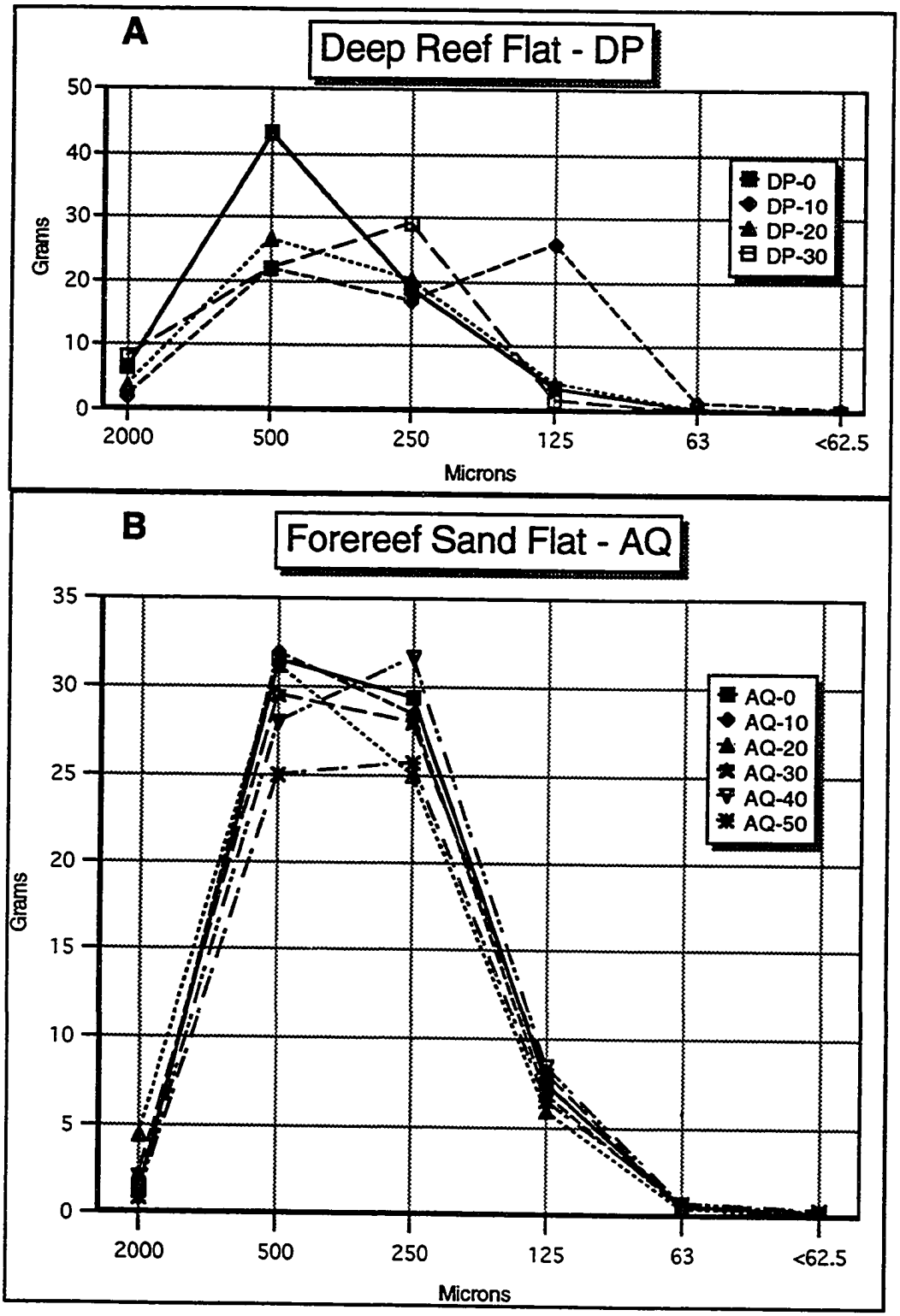
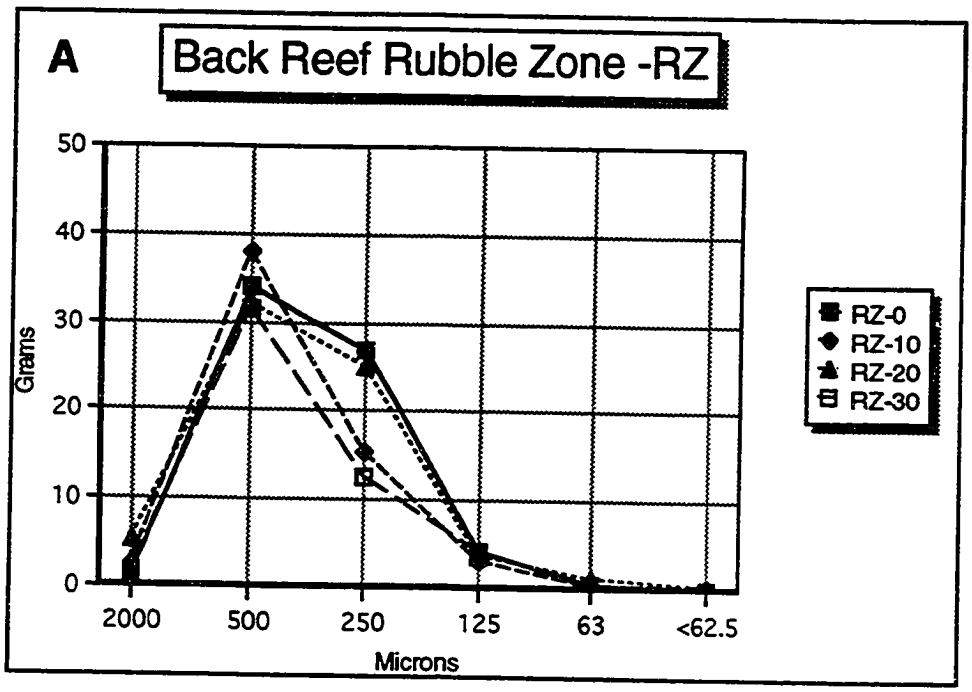
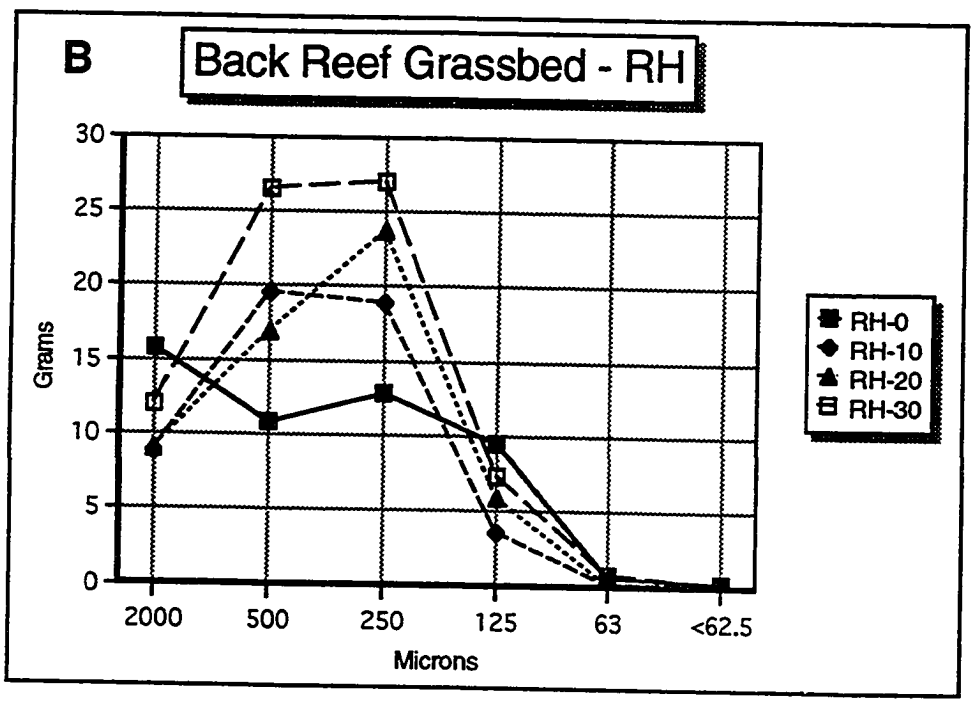


Figure 5. Sediment composition of individual sampling sites.

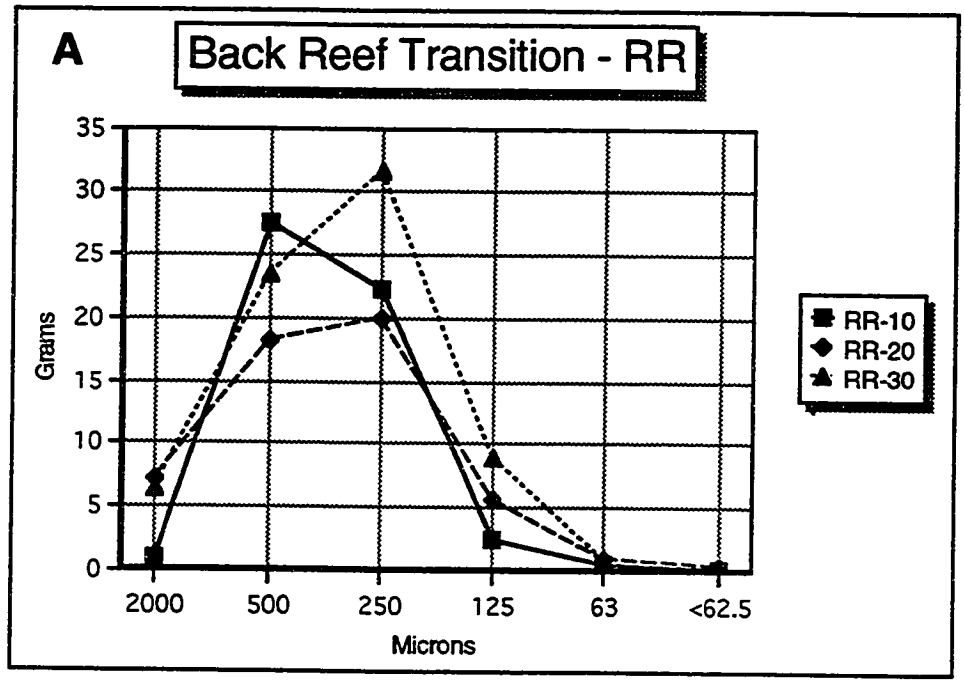


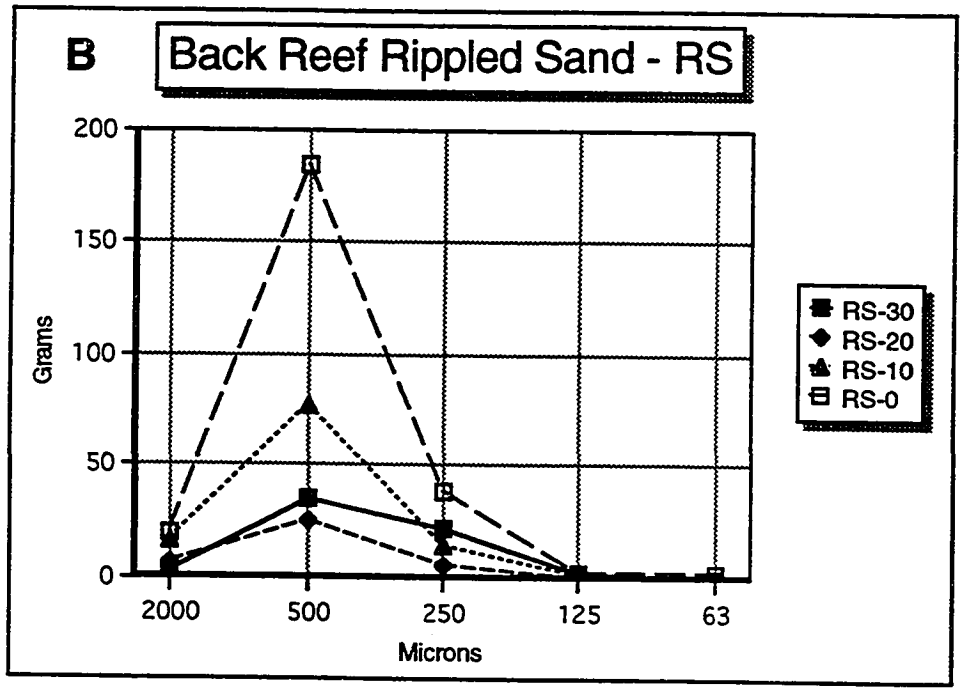
Figures 6A and B. Grain size distribution of sampling sites within (A) deep reef sand flat - DP and (B) forereef sand flat - AQ. Shown are the weights (g) retained by seive.



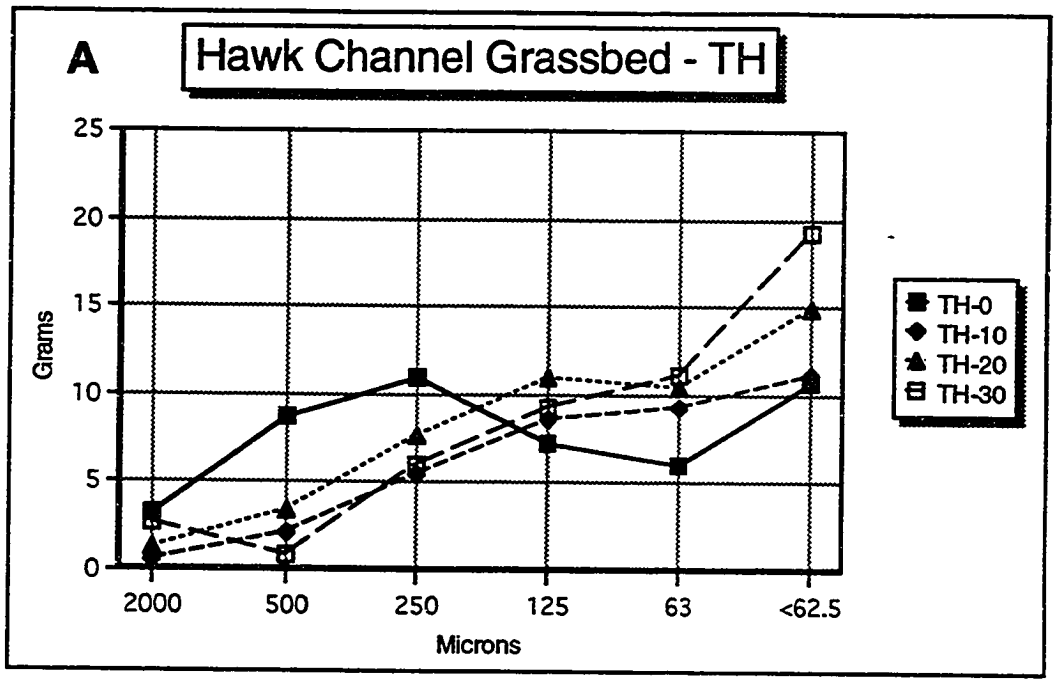


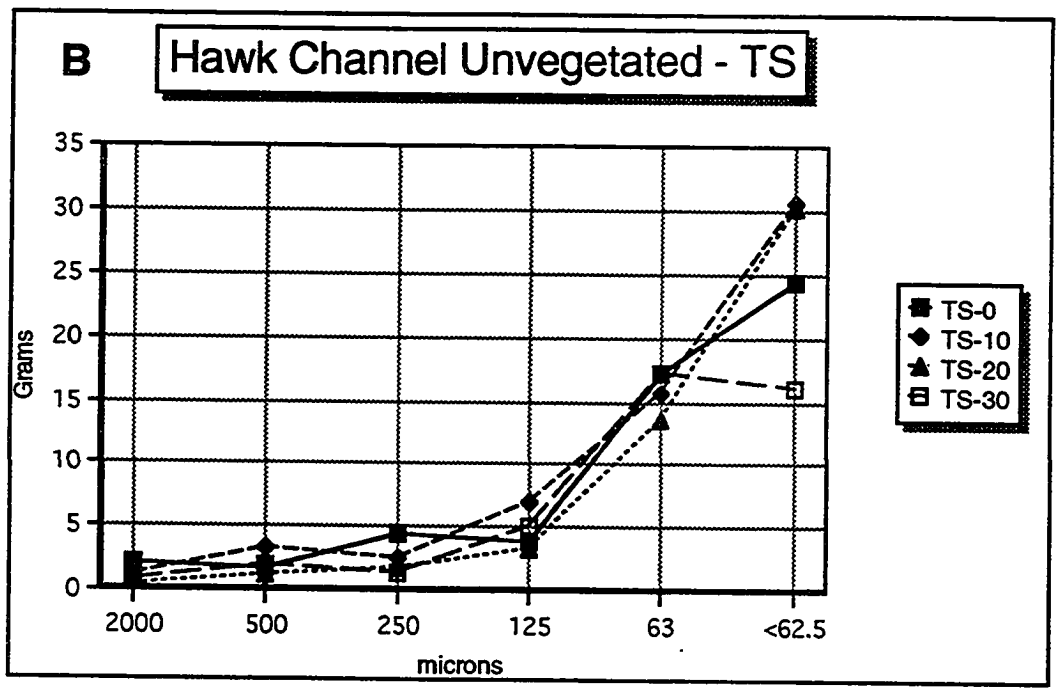
Figures 7A and B. Grain size distribution of sampling sites within (A) backreef rubble zone - RZ and (B) backreef grassbed zone - RH. Shown are the weights (g) retained on sieves.





Figures 8A and B. Grain size distribution of sampling sites within (A) backreef transition RR and (B) backreef rippled sand zone - RS. Shown are the weights (g) retained on sieves





Figures 9A and B. Grain size distribution of sampling sites within (A) Hawk Channel grassbed - TH and (B) Hawk Channel unvegetated bottom - TS. Shown are the weights (g) retained on sieves.

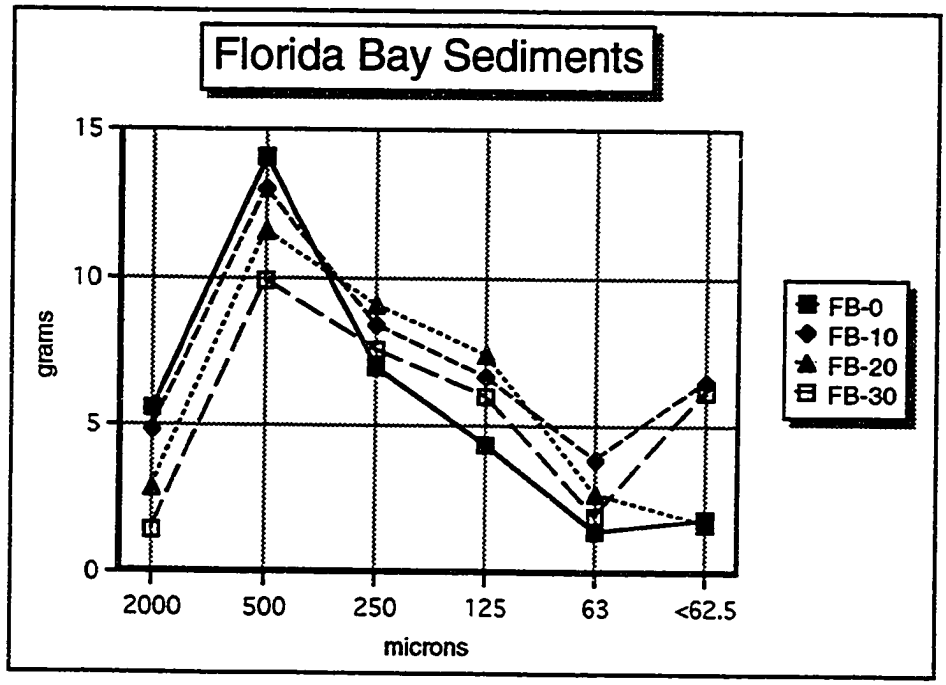


Figure 10. Grain size distribution of sampling sites within Florida Bay grassbed- FB. Shown is the weight (g) retained on sieves.

Table 7. Results of vegetation census by station. Numbers are of mean blades/m^2 for *Thalassia* and *Syringodium* and mean number of plants for macroalgae.

Species	RH	RR	TH	FB
Thalassia testudinum	1062.5	889.1	895.3	862.5*
Syringodium filiforme	0	309.4	0	0
Penicillus sp.	31.3	9.4	21.9	0
*Avrainvillea*sp.	6.3	1.6	1.6	0
Caulerpa sp.	18.8	4.7	0	0
*Batophora*sp.	84.4	0	0	0
*Halimeda*sp.	15.6	50.0	132.8	0
Dictyota sp.	3.1	4.7	4.7	0

*Based on only two drops rather than 8

brachiopods were identified. Cluster analysis of the 100 most abundant species (84% of all individuals) produced distinctive groupings of stations that objectively corroborated the variation seen within the environments (Figure 11). This cluster had a cophenetic correlation coefficient of 0.9121, indicating that clustering produced minimal distortion in the similarity values when compared to the original similarity matrix values.

The backreef stations (BK, RZ, RR, RS, and RH) were most similar to one another, forming the tightest grouping (Figure 12). The dominant fauna of this group consisted of high abundances and/or station specific presence of the following; epifaunal gastropods (*Cerithium litteratum*, *Hipponix antiquatus*, and *Fissurella angusta*) and infaunal bivalves (*Tellina gouldi, Chione cancellata, C. grus, Codakia orbicularis*, and *Parvilucina blanda*). The next most similar cluster include the stations adjacent to reefs and above wave base (AQ and TR). The deep reef flat (DP) was slightly less similar than the shallower reef stations. These reef related stations were most similar to the backreef stations. Abundant epifaunal bivalves, both abyssally attached (*A. zebra*, *A. imbricata*, *B. cancellaria*, and *B. domingensis)* and cemented (*Chama spp.*, *Plicatula gibbosa*, and *Lopho frons*) were the defining, unifying elements of these stations. The inner shelf margin stations in Hawk Channel (TH and TS) form a distinctive group which was determined by the presence of infaunal (*Lucina nassula*, *L. pensylvania*, and *L.* sp.) and the semi-infaunal bivalve *Carditamera floridana*. All shelf margin stations cluster together at a low level (0.24) and have very little in common with the Florida Bay station. This station was dominated by a few, numerically abundant species including the infaunal bivalves *Laevicardium mortoni*, *Transenella conradia* and *C. cancellata* and the epifaunal gastropod *C. muscarum.*

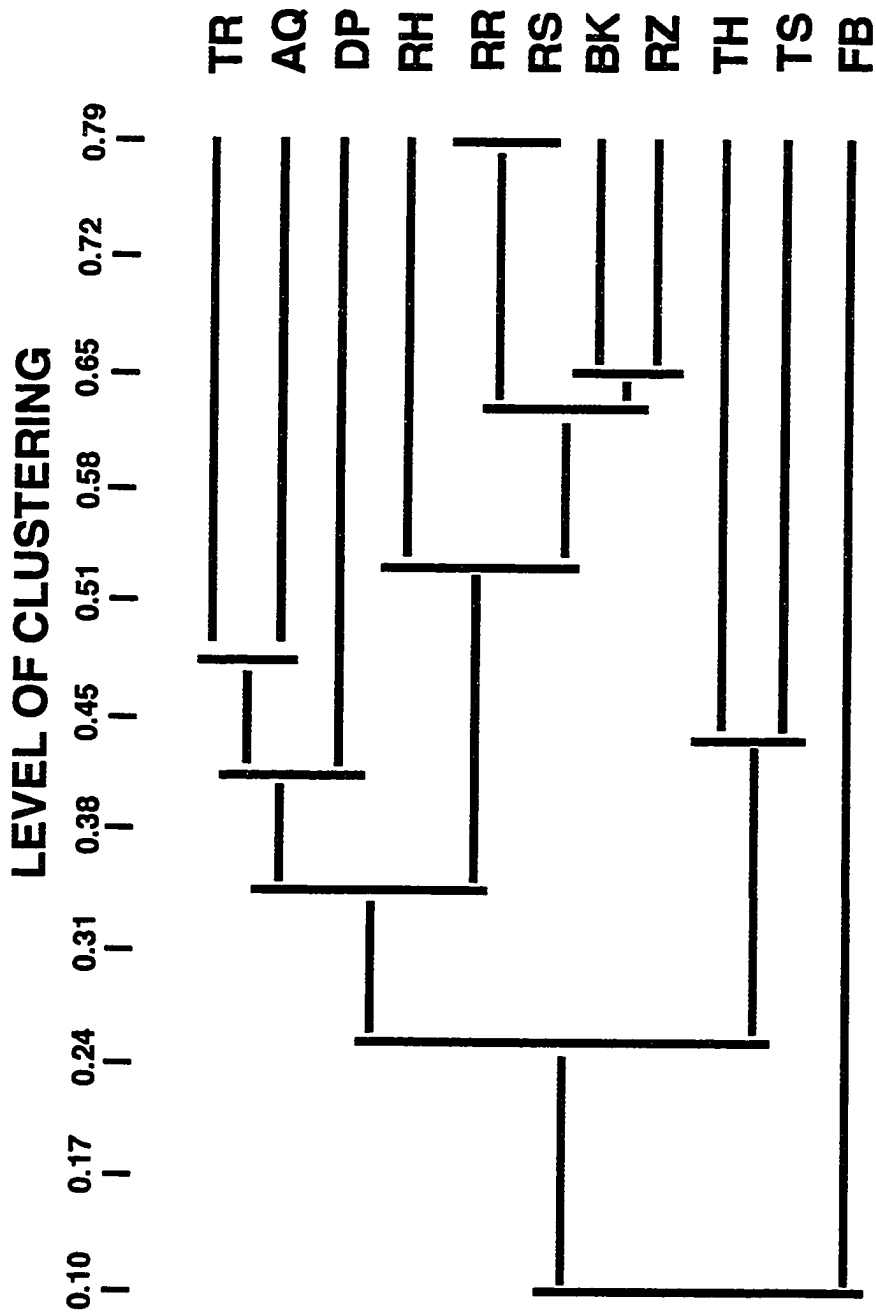


Figure 11. Dendrogram of taxonomic cluster analysis

	C. litteratum	*H. antiquatu*	*F. angusta*	*T. gouldi*	*C. orbiculari*	*Chama spp.*	*L. nassula*	*L. pensylvania*	*L. sp.*	*P. blanda*
TR	XX	X		X	X	XX	X	X	XX	
AQ	XX	X		X		XXXXX		X	XX	X
DP	X	X				XXXXXXXXX	X			
RH	XXXX	XX	X	XXX	XX	XXX		X		X
RR	XXXXXXX	XXX	X	XX	XX	XXX				X
RS	XXXXXXX	XXX	X	XX	X	XXXX		X		X
BK	XXXXXXXX	XX	X	X	XX	XXX				
RZ	XXXXXXX	XX	X	XX	X	XX				
TH	X			X	XX	X	X	X	XXXXXX	
TS	X				X	X	XX	XX	XX	
FB										

	A. imbricata	*A. zebra*	*B. cancellaria*	*B. domingensis*	*L. frons*	*P. gibbosa*	*L. mortoni*	*T. conradina*	*C. muscarum*	*C. cancellata*
TR	XX	X	XXXX	XX	XX	X				XX
AQ	XX		XX	XX	X	XX				X
DP	X		X	XX	XX	XX				X
RH	X	X	X	X	X	X		X		XX
RR	X	X	X	X						XXX
RS	X	X	XXX	X	X	X		X		XXXX
BK		X	X	X		X				X
RZ	X		XX	X		X				X
TH	X	X								XX
TS			X	X	X					X
FB							XXXXX	XXXXXXX	XXXXX	XXXXXX

Figure 12. Histograms based on the similarity results from taxa cluster analysis.

A surprising aspect of this taxonomic cluster analysis was that unlike earlier studies in comparable environments (Miller 1988, Parsons 1992) the *Thalassia* stations were not segregated into unique clusters. Parsons (1992) reported that grassbeds from opposite sides of St. Croix grouped more closely with other sites on their respective sides of the island, rather than with grassbeds from the other side. The Florida Keys grassbed stations did not group together on basis of definitive grassbed fauna because those unique components (e. g., epifaunal gastropods *Tegula fasciata*, *T. lividomaculata*, *Astrea phoebia* , etc.) were only present in low numbers and distributed widely across most of the stations.

Taphonomic Cluster Analysis

Figure 13 shows the results of cluster analysis on the mean pooled taphonomic values from each station. The cophenetic correlation coefficient was 0.7860, a value that represents only moderate distortion in the clustering pattern when compared to the original similarity matrix values.

Two major groups were defined; the larger first group (one cluster of very similiar samples plus three less similar stations) and a second, smaller group of three stations. Group one consisted of three of the backreef stations (RH, RR and RS) with highest similarity, plus the reef flat (BK) and patch reef (TR). The Hawk Channel grassbed (TH), deep reef flat (DP), and the backreef rubble zone (RZ) were less similar. The defining differences that separated the first group from the second include absence of luster, high rates of boring, and high levels of fragmentation, edge alteration, surface degradation and minor levels of abrasion (Figure 14A). A second group contains Florida Bay (FB), the unvegetated Hawk Channel (TS), and the forereef flat (AQ), areas with high

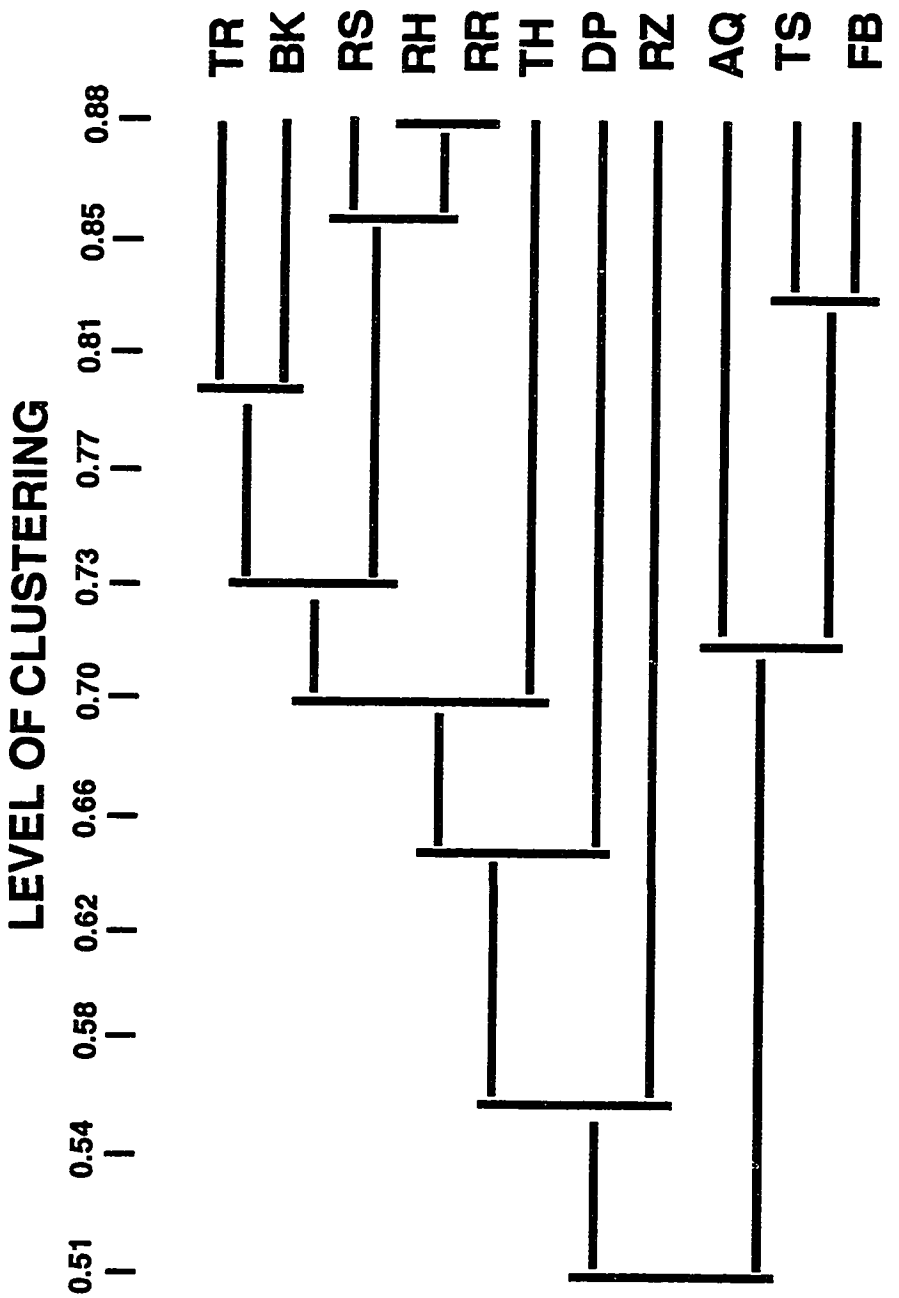


Figure 13. Dendrogram of the mean pooled taphonomic values cluster analysis

Figure 14. Histograms based on the similarity results of cluster analysis using:

	Luster	Predatory Boring	Fragmentation	Edge Alteration	Surface Degradation	Abrasion
TR	XXXX	X	XXX	XXXXXX	XXXXXXXX	XXXXXXX
BK	XXXX	XXX	XXXXXXXXX	XXXXXXX	XXXXXXXX	XXXXXXX
RS		XXXXXXXXX	XXXXXXX	XXXXXXXX	XXXXXXX	XXXXXXX
RH	XXX	XXXXXXXX	XXXXX	XXXXXX	XXXXXXX	XXXXXX
RR	XX	XXXXXXXXX	XXXXX	XXXXXXX	XXXXXXX	XXXXXXX
TH	XXXX	XXXXXXXX	XXXXXXXXX	XXX	XXXXXXX	XXXX
DP	X		XX	XXXXXXXXX	XXXXXXXXX	XXXXXXXXX
RZ	XX	XXXXXXX	XXXXXXX	XXXX		
AQ	XXXXXXXXX	XX			XXXX	XX
TS	XXXXXXXXX	XX	XXX	X	XXXXXXXXX	XXXX
FB	XXXXXXXXX	XXXXX	XX	XX	XXXXX	XXXX

A. Mean pooled taphonomic values

	Surface Degradation	Abrasion
TR	XXXXXXX	XXXXXXXXX
BK	XXXXXXXX	XXXXXXXX
DP	XXXXXXXXX	XXXXXXXX
RH	XXXXXXX	XXXXXXX
RR	XXXXXX	XXXXXXXX
RS	XXXXXX	XXXXXXXX
TH	XXXXXX	XXXX
AQ	XXXXX	XXXX
TS	XXX	XXXXXX
FB	XXXXXX	XXXXXXX
RZ		

B. Reduced mean pooled taphonomic values

	Encrustation	Predatory Boring	Fragmentation	Edge Alteration	Surface Degradation	Abrasion
TR	XXXXXXXX		XXXXXXXXX	XXXXXX	XXXXXXXX	XXXXXXXXX
DP	XXXXXXX		XXXXXXXXX	XXXXXXXXX	XXXXXXXXX	XXXXXXXXX
BK	XXXXXXX	XXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXXX
RS	XXXX	XXXXXXXX	XXXXXXX	XXXXXXXX	XXXXXX	XXXXXXXXX
RH	XXXXXXXX	XXXXXXXXX	XXXXXX	XXXXXXX	XXXXXXX	XXXXXXXXX
RR	XXXXXXX	XXXXXXXXX	XXXXX	XXXXXXX	XXXXXXX	XXXXXXXX
AQ	XXXXXXXXX	XXXX	XXXXXXXX	X	XXXXXX	XXXXXX
TS	XXXXXX		XXX	XX	XXX	XXXXXX
RZ	XXXXXX	XXXXXX	XXXX	XXX		
TH	XXXXXXXXX	XXXXXXXX	XXXXX	XX	XXXX	XXX
FB		XXX			XX	X

C. Mean taphonomic values from *Cerithium.*

	Luster	Predatory Boring	Fragmentation	Edge Alteration	Surface Degradation
RS		X	XXXXX	XXXXXXX	XXXXXX
RH	XXXXXX	X	XXXXX	XXXXXX	XXX
RR	XXX	XX	XXXX	XXXXXX	XXXXXXX
DP	XX		XXXXX	XXXXXXXXX	XXXXXXXXX
BK	XXXXXXXXX	XX	XXXXXXXXX		XXXXXXXXX
AQ	XXXXXXXX	XX	XXXXXX	XX	XXXXXXX
TH	XXXXXXXXX	X	XXXXXXXXX	XXXX	XXXXXXXX
RZ	XXXXXXX	XX	X	X	
TS	XXXXXXXXX	XXXXXXXXX		X	XXXXXXXXX
TH	XXXXXXXXX	XXXXXXXXX		X	XXXXXXXXX

D. Mean taphonomic values from Chamidae.

luster, no abrasion, and low levels of boring, fragmentation, edge alteration, and surface degradation.

Reduction of the detailed taphonomic indices into just three categories (Table 6) did not change appreciably the results of cluster analysis (Figure 15). Both the dendrogram and the cophenetic correlation coefficient are similar to those produced when the original taphonomic indices' means were clustered (0.7713 vs. 0.7860). Differences in the reduced data dendrogram include a slight reduction in the level of clustering, a reversal of two stations' positions, and two major station realignments. The minor reversal occurred when the rippled sand (RS) station changed locations with the backreef grassbed (RH). Major dendrogram changes include the appearance of an outlier station (RZ) and a major increase in similarity (0.74) of the deep reef flat (DP). All changes could be attributed to the compression of the highly divided surface degradation and abrasion scores into a three level grading system (e. g., surface degradation reduced from 9 ranks to 3 and Abrasion from 5 ranks to 3). This essentially "smoothed" the average values and resultant similarity values (Figure 14B).

The close similarity between the clusters produced by averaged taphonomic scores and the reduced values used for plotting ternary taphograms indicates, that at least in this case, little taphonomic information is lost when reducing the more detailed data to a tripartate system.

The results of clustering the taphonomic indices collected from all members the gastropod genus *Cerithium* are show in figure 16. Its cophenetic correlation coefficient (0.8901) indicates that clustering resulted in only minimal distortion. There are two highly similar (0.90) couplets of stations (TR and DP; RH and RR) within the first major grouping. The absence of boring and presence of high fragmentation set off DP and TR from the others, while the lack

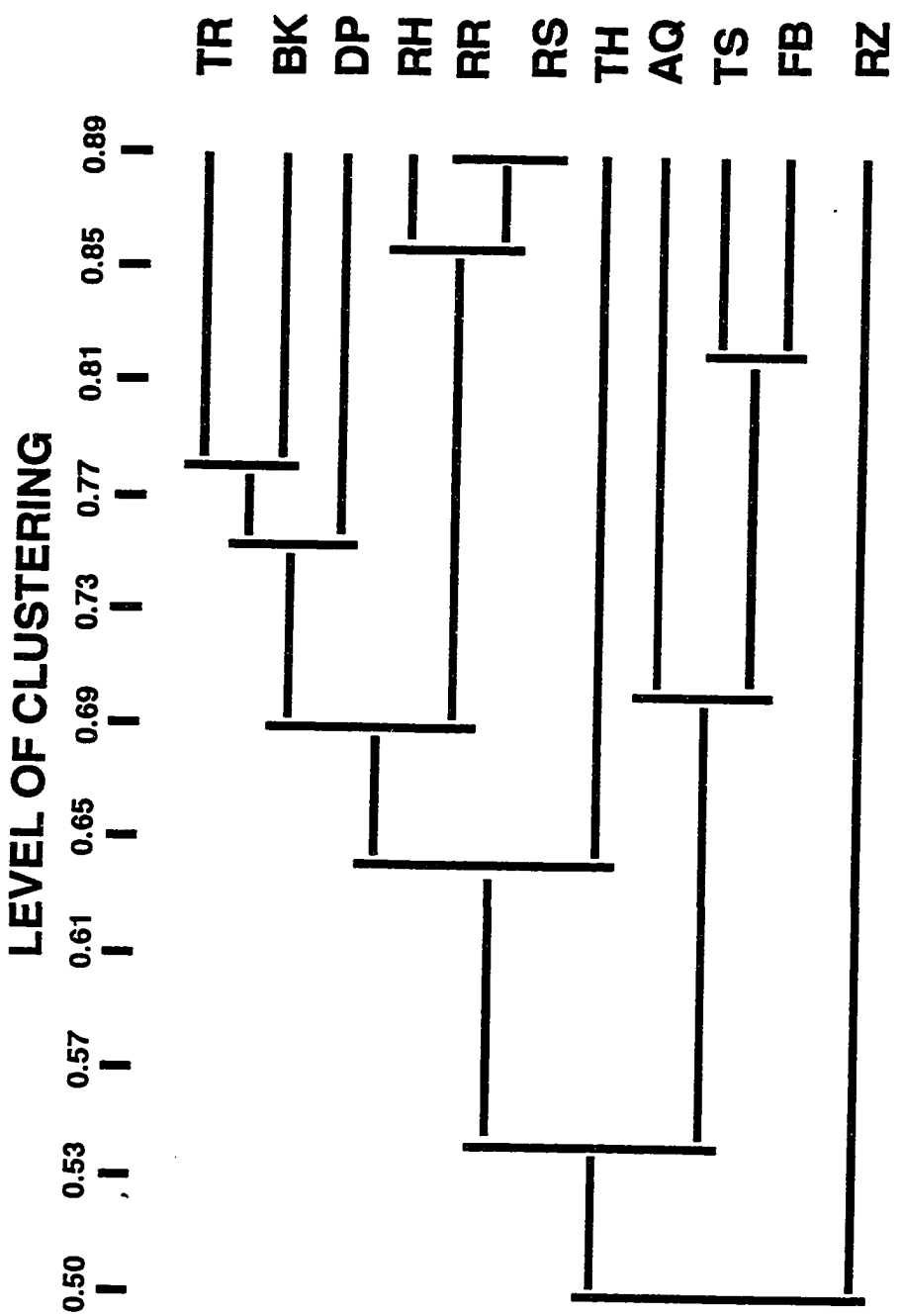


Figure 15. Dendrogram of the reduced mean pooled taphonomic values cluster analysis. See Table 6 for details of rank reduction.

of luster ties RH and RR together (Figure 14C). Other stations within this group include the reef flat (BK) and backreef rippled sand (RS). This first group is defined by higher levels of predatory borings, abrasion, fragmentation, edge alteration, and surface degradation. The second group consists of AQ, TS, RZ, and TH with moderate similarity. The edges of these shells are not as altered as those in the other group. Their surfaces also show moderately degraded and abraded. Florida Bay (FB) is an outlier, placed there by its lack of epibiont coverage, no abrasion, and low surface degradation. Cluster analysis of the pooled molluscs formed similar groupings of most reef - adjacent stations (DP, TR, BK, RH, RR, RS) to those seen when the *Cerithium* were clustered because the defining features creating these clusters were quite similar for both groups (Figures). Differences occurred for the forereef sand flat (AQ), backreef rubble zone (RZ) and the more landward stations. There, particularly at AQ and RZ, the differences in the levels of encrustation, fragmentation, abrasion, edge alteration and surface degradation created the divergence of groupings (Figures 14A and C).

Figure E displays the clustered taphonomic data collected only from members of the bivalve family Chamidae. Its cophenetic correlation coefficient is 0.8440. Backreef stations (RH, RS and RR) and the deep reef flat (DP) all cluster together, but at a lower level of similarity (0.66) than in the averaged (pooled) mollusc fauna and *Cerithium* dendrograms. (Figures 13 and 16). DP's position for the Chamidae is similar to that occupied by DP in the reduced, pooled data, however there the backreef stations are much more similar (Figure 15). Factors separating this group include medium fragamentation, low luster and boring and high levels of edge alteration (Figure 14D). A second group was made up of reef stations situated above wave base (AQ, BK and TR); defining features here were, higher fragmentation and surface degradation, and

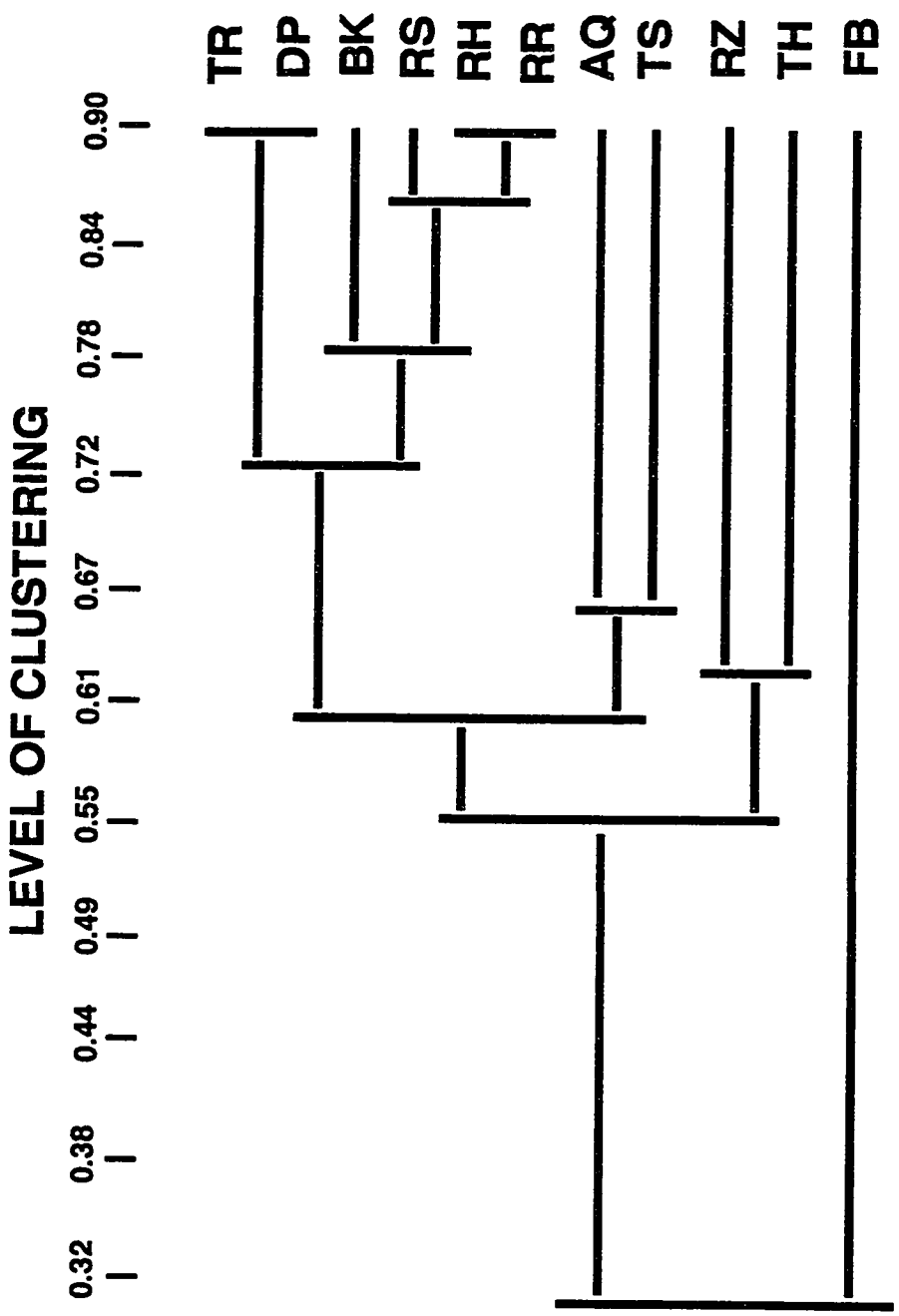


Figure 16. Dendrogram of the mean taphonomic values from *Cerithium* cluster analysis

lower edge alteration. Both the Hawk Channel grassbed (TH) and backreef rubble zone (RZ) again bear very little similarity to the main clusters of stations. RZ has no abrasion, low fragmentation, edge alteration, and surface degradation while TH lacks color and abrasion. It also has low edge alteration and fragmentation in addition to high surface degradation.

Both the pooled molluscs and the Chamidae show similar reef - related groupings when their cluster dendrograms are compared (Figures 13 and 17). Features responsible for this in both groups were high levels of surface degradation and abrasion. The Chamidae show more variability in attributes that are closely related in the pooled molluscs such as encrustation, luster, and fragmentation (Figures 14B and 14D).

Cluster analysis of taphonomic data from the bivalve family Tellinidae produced a dendrogram quite unlike the previous ones (Figure 18). There are two main groups; the first contains the grassbed (TH), patch reef (TR) and two deep water stations (DP and AQ). These stations have low color loss and edge alterations, low to medium surface degradation, and high luster. The second group is composed of all backreef stations (BK, RZ, RH, RR, and RS) and Florida Bay (FB). This cluster was produced by minor abrasion, and higher levels of edge alteration and surface degradation (Figure 19).

Figure 18 show that the clustering of *tellina* data created groupings within which adjacent stations were combined (except Florida Bay). This combining of adjacent stations had not occurred with previous clustering of pooled molluscs (Figure 13), *Certhium* (Figure 16),or the Chamidae (Figure 17). The features responsible for these groupings were the same as those in the previous clusters; lower luster and higher levels of edge alteration, surface degradation, and abrasion (Figures Histo14A and B).

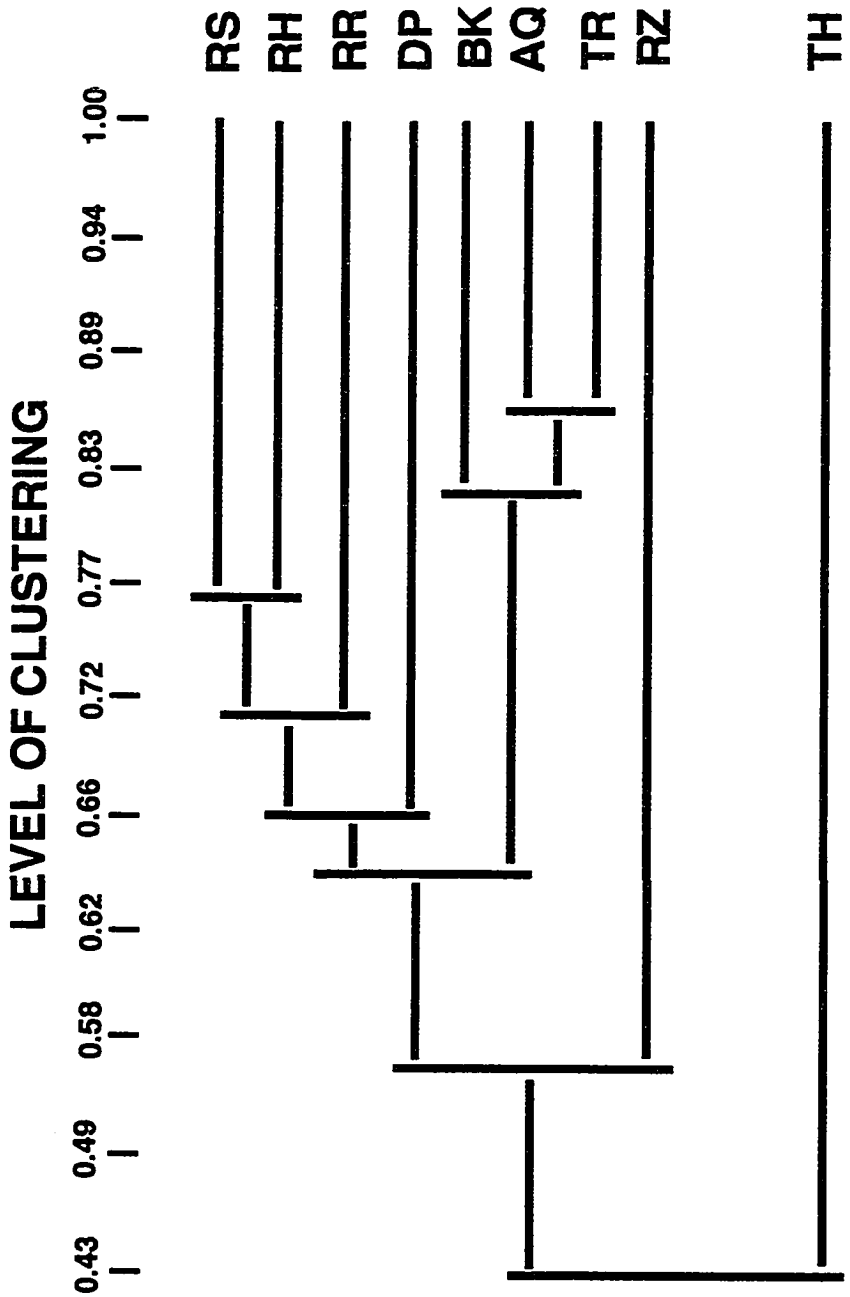


Figure 17. Dendrogram of the mean taphonomic values from *Chamidae* cluster analysis

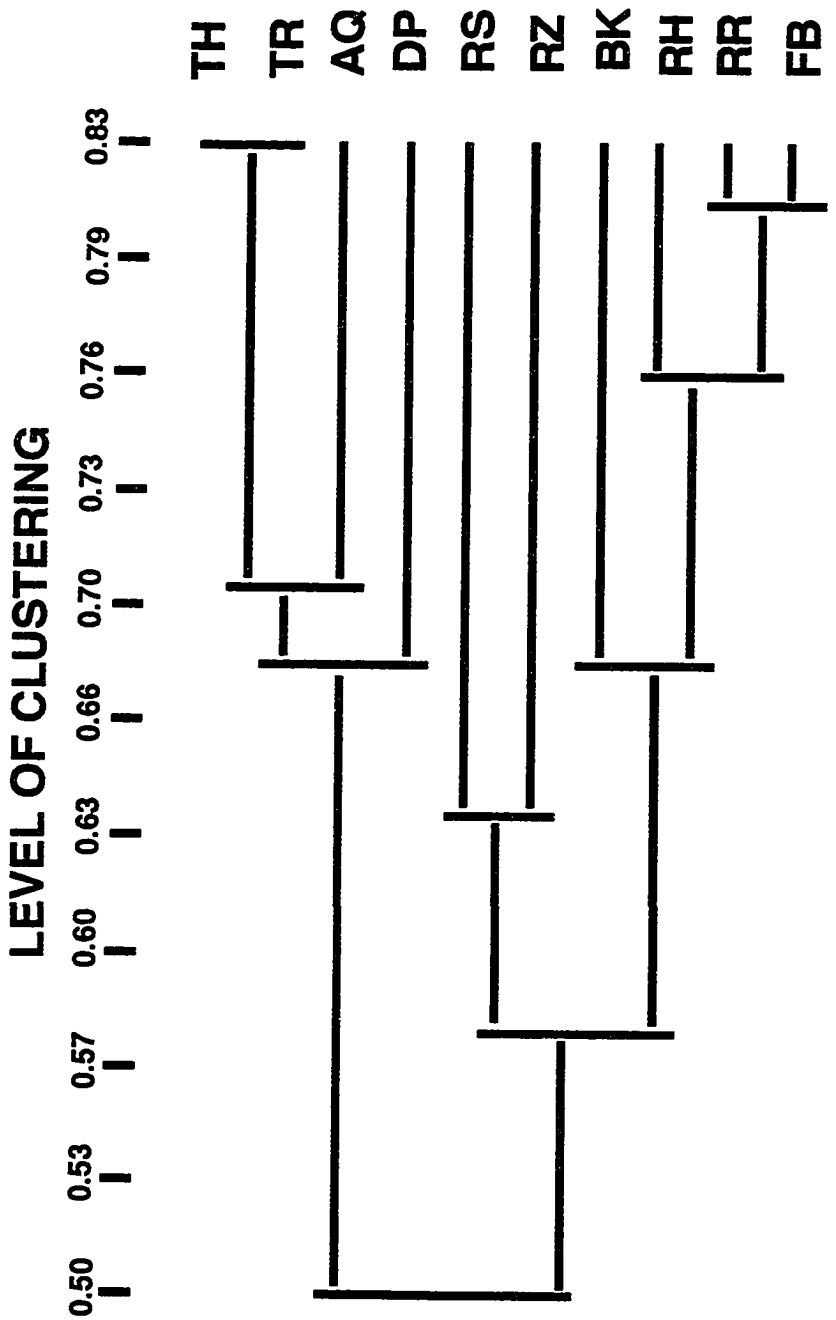
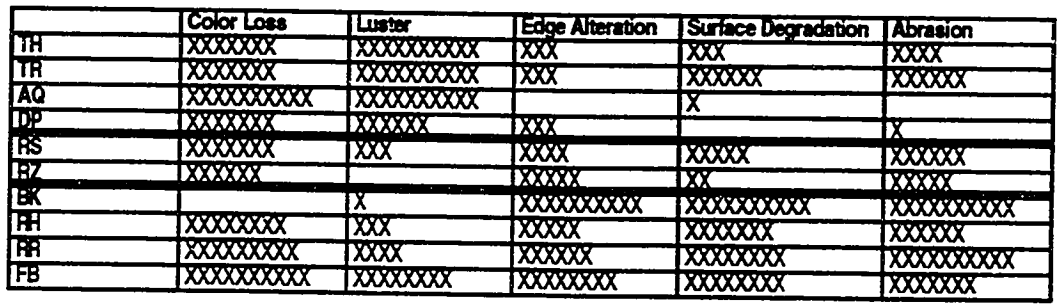


Figure 18. Dendrogram of the mean taphonomic values from *Tellina* cluster analysis

Figure 19. Histograms based on the similarity results of *Tellina* taphonomic values.



Pooled Taphonomic Data

Table 8 summarizes the taphonomic indices produced by averaging the taphonomic scores of all shells within a station. Environments of similar grains size distributions and/or vegetation cover did not produce similar signatures. Averaged indices also were unable to distinguish between environments immediately adjacent to one another. Grassbeds from the outer shelf margin (RH), inner shelf margin (TH), and inner platform (FB) show distinctive differences in the levels of encrustation, edge alterations, abrasion, color loss and luster. Different sand flats (DP, AQ, RS) each produced unique taphonomic signatures; differing from each other in all categories. The unvegetated, muddy bottom from Hawk Channel (TS) was one of the location to combined high levels of fragmentation with low encrustation. The patch reef (TR) and reef flat (BK) had different levels of epibiont coverage, surface degradation and altered edges.

One area in which the average data was not able to distinguish between stations was in the reef flat and backreef environments (Table 8). Here a lack of resolution associated with the pooled approach prevented diagnosis of the adjacent, but different habitats (See below).

Ternary Taphogram Analysis

Encrustation

Figure 20 shows how encrustation by epibionts varied across stations when all molluscan data were pooled. Florida Bay (FB) shells had the lowest level of epibiont growth. Other stations with low levels included the unvegetated bottom (TS) of Hawk Channel and the backreef stations RZ (rubble zone), RS (rippled sand) and RR (transition zone). The backreef seagrass bed (RH), was very close to the other backreef environments. Hawk Channel also

Taphonomic Attribute	FB Florida Bay	TH Hawk C. Grassbed	TS Hawk C. Unvegated	TR Triangles Patch Reef	RS Rippled San- Backreef	RR Transition Backreef	RH Grassbed Backreef	RZ Rubble Backreef	BK Reef Flat	AQ Forereef Sand Flat	DP Deep Reef Sand Flat
Encrustation	L	H	L	H	M	M	M	M	M	M	H
Surface Degradation	M	M	H	H	M	M	M	M	M	M	H
Edge Alteration	M	M	M	H	H	H	H	H	H	M	H
Abrasion	—	—	—	L	L	L	L	—	L	—	L
Color Loss	L	H	M	L	H	H	H	M	H	L	M
Fragmentation	M	H	M	M	M	M	M	H	H	L	L
Luster Loss	M	H	M	H	H	H	H	H	H	M	H
Periostracum Ligament	L	L	M	L	L	L	L	L	L	H	L

Table 8. Qualitative summary of taphonomic characteristics occurring on mollusc shells from the south Florida shelf. Categories based on averageing the taphonomic scores of all molluscs at each station (pooled data).

contains stations of low to medium encrustation; the patch reef (TR) and seagrass bed (TH) occur close together in Figure 20. Both reef flats (AQ and DP) have epibiont coverage at the upper end of the low to medium range. The reef flat (BK) had the greatest percentage of encrusted shells and these shells were moderately overgrown.

Most of these differences in epibiont distribution are significant, in that it can be shown statistically that at every station except in Hawk Channel (TS and TH), one of the three categories is significantly more dominat in the sample than the other two (Figure 21). In Hawk Channel, only TH has significantly fewer shells in the category containing > 80% coverage ('High" category"). Proportions in the low and medium categories are not significantly different.

The backreef stations (RZ, RH, RR and RS) show epibiont coverage to be distributed in similar pattern within each station (Figure 21). There, shells with low coverage dominated the assemblage while the proportion of shells with medium epibiont coverage was below 30%. Heavy encrustation is uncommon on the backreef shells.

Surface Degradation

Figure 22 shows the pooled values of surface degradation for all shells within a station. The deep reef flat (DP) shells seem to be the most degraded; slightly more than 80% of its shells exhibit poor surface condition. The reef flat (BK) shells had only slightly better surfaces; they appear closer to the high end of the medium to high region. All other stations, except the backreef rubble zone (RZ), are also located within this region. The majority of the backreef and Hawk Channel stations (RS, RR, RH, TR and TH) occur fairly close together. Shells from the forereef sand flat (AQ) and Hawk Channel (TR and TH) are not as degraded as BK and DP. The backreef rubble zone (RZ) shells consisted of

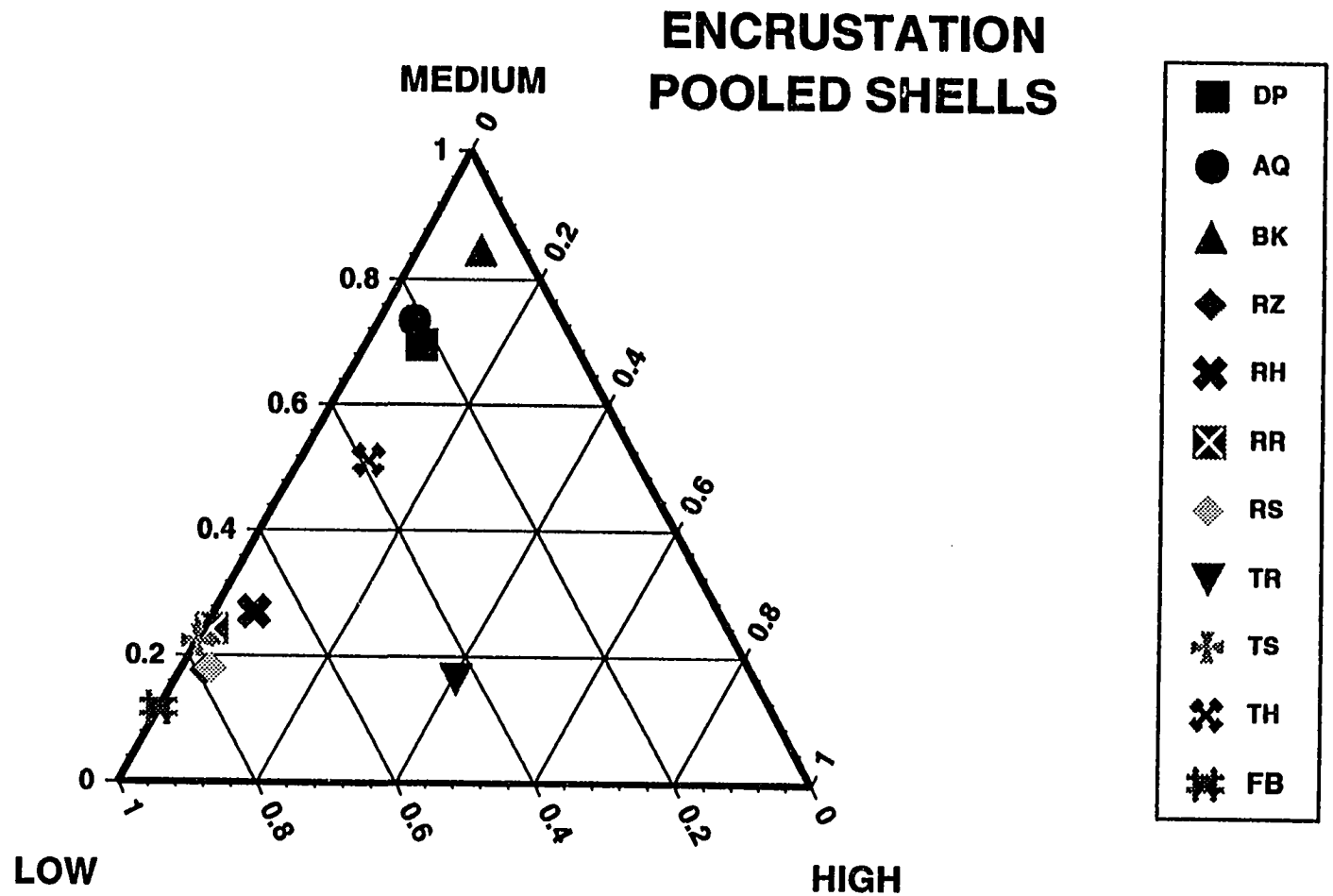


Figure 20. Ternary taphogram showing the proportion of pooled shells with low, medium, and high encrustation at each station.

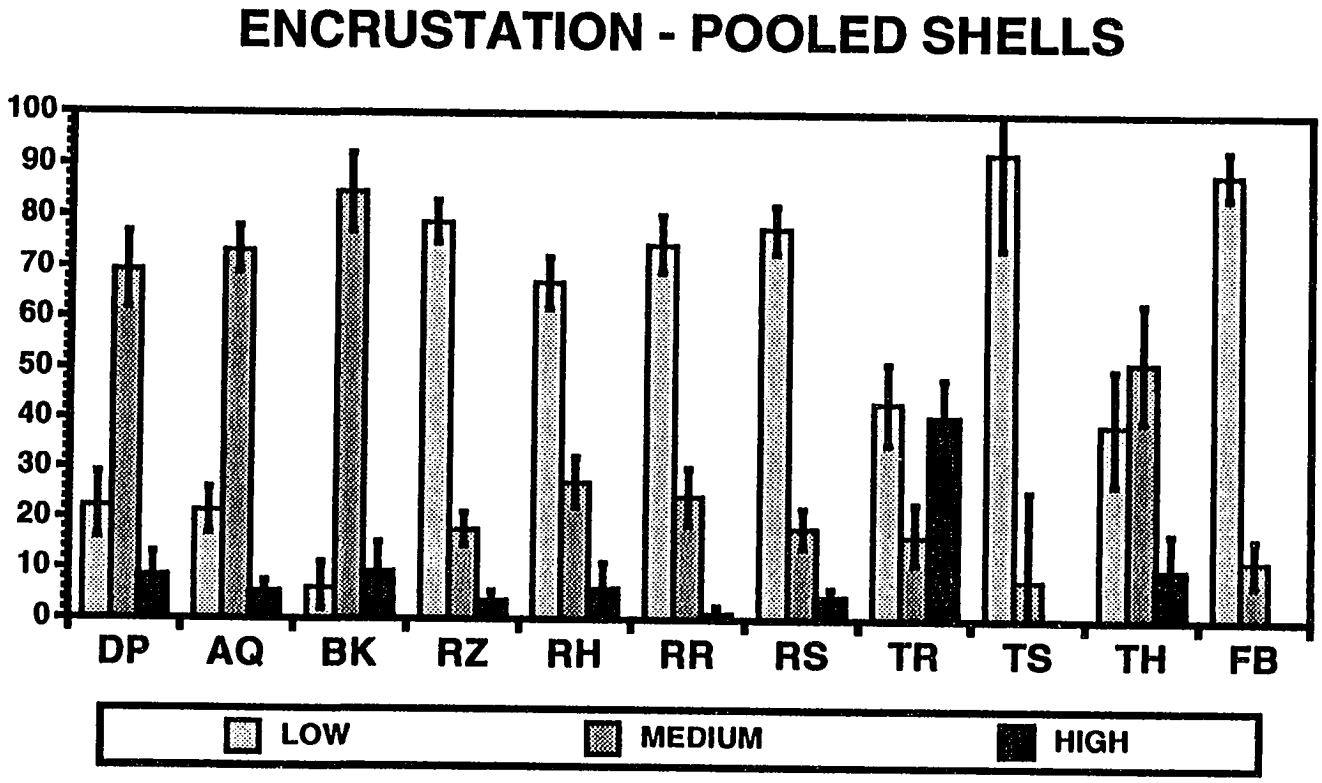


Figure 21. Proportion (percentage) of pooled shells at each station within the three taphonomic ranks (low, medium, or high) for encrustation. Error bars represent the 95% confidence intervals.

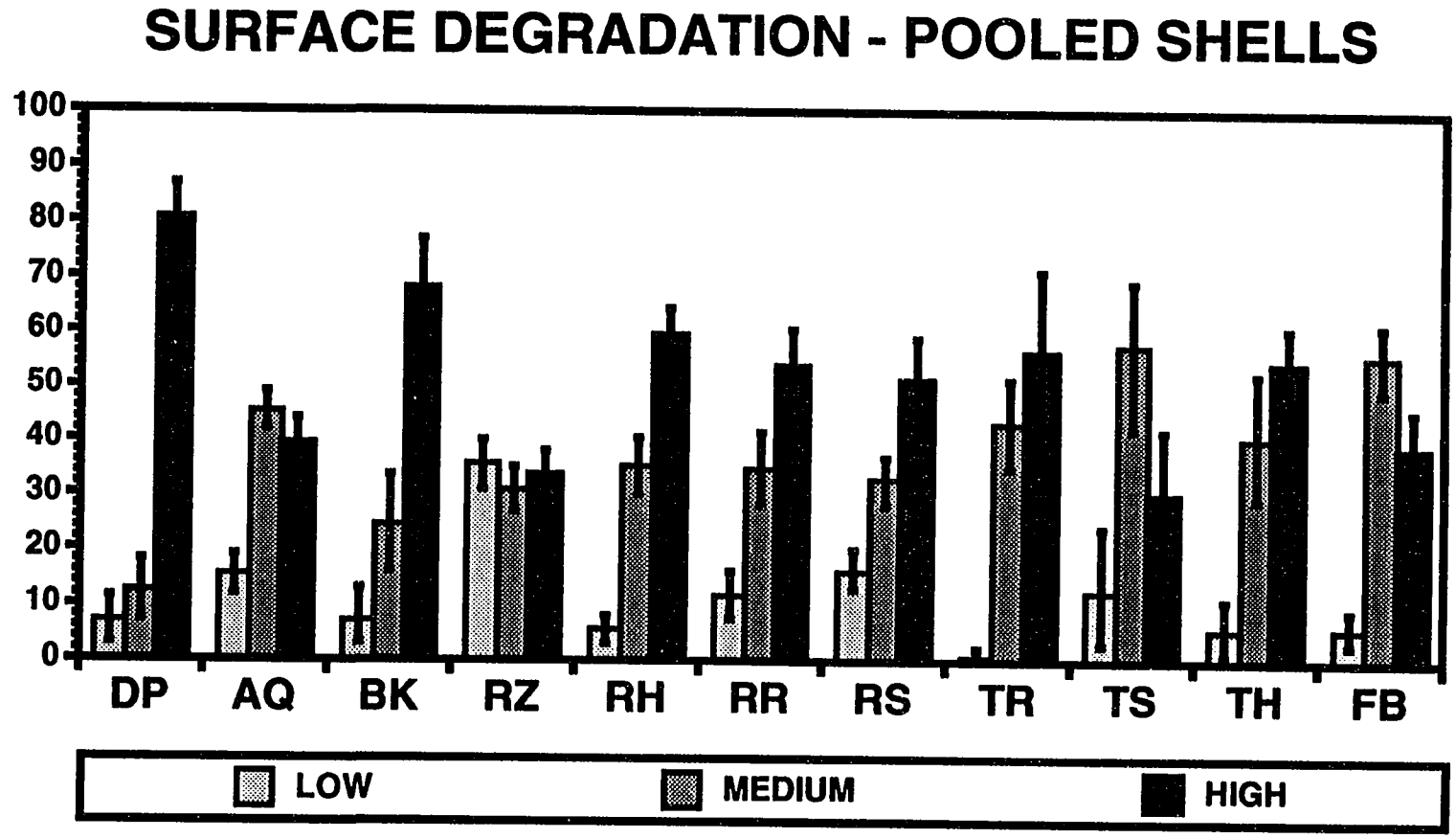


Figure 22. Ternary taphogram showing the proportion of pooled shells with low, medium , and high surface degradation at each station.

a mixed shell assemblage indicating a wide range of surface degradation conditions.

Figure 23 shows that all within - station differences in shell surface degradation are significant among all categories for the reef flat (BK), backreef grassbed (RH), transition zone (RR), rippled sand (RS),and Florida Bay (FB). The forereef sand flat (AQ), patch reef (TR) and inner shelf margin grassbed (TH) have significant differences between the number of shells with low amounts of surface destruction and those exhibiting medium to high degradation while the deep reef flat (DP) shows significant differences between the proportion of shells with high surface degradation and those with low and medium degradation. Two stations (RZ and TS) displayed no significant differences in the distribution of all three shell surface states.

The majority of the backreef stations (RH, RR, and RS) exhibited a very similar distribution of surface degradational states: low numbers of shells with little surface degradation, intermediate numbers with medium damage and the greatest numbers with highly degraded surfaces. This same pattern is also seen in shells from the reef flat (BK) and the Hawk Channel grassbed (TH).

Edge Alterations

Pooled edge alteration data (Figure 24) reveal that the majority of stations contain shells with an uneven distribution (see Figure 4) of edge states . Two stations are set off from the others; the patch reef (TR) with its shells located in the medium to highly altered edges category and Florida Bay (FB), whose central location indicates its population of shells have a mixture of edge states. The only environment in which the majority of shells are have a common edge state is the deep reef flat (DP), where highly altered shell edges set it apart from all other stations. The reef flat (BK), and backreef rippled sand (RS)

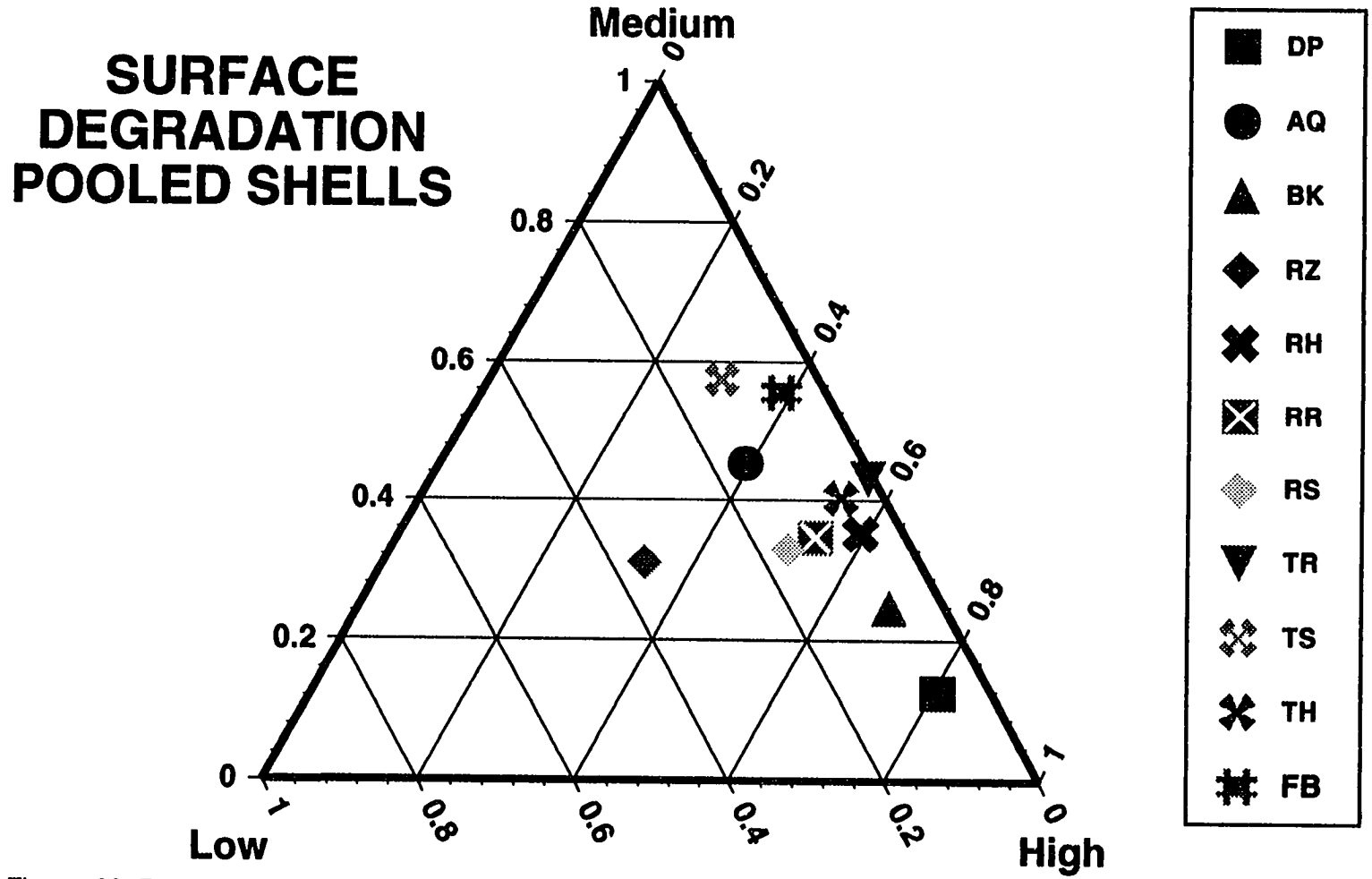


Figure 23. Proportion (percentage) of pooled shells at each station within the three taphonomic ranks (low, medium, or high) of surface degradation. Error bars represent the 95% confidence intervals.

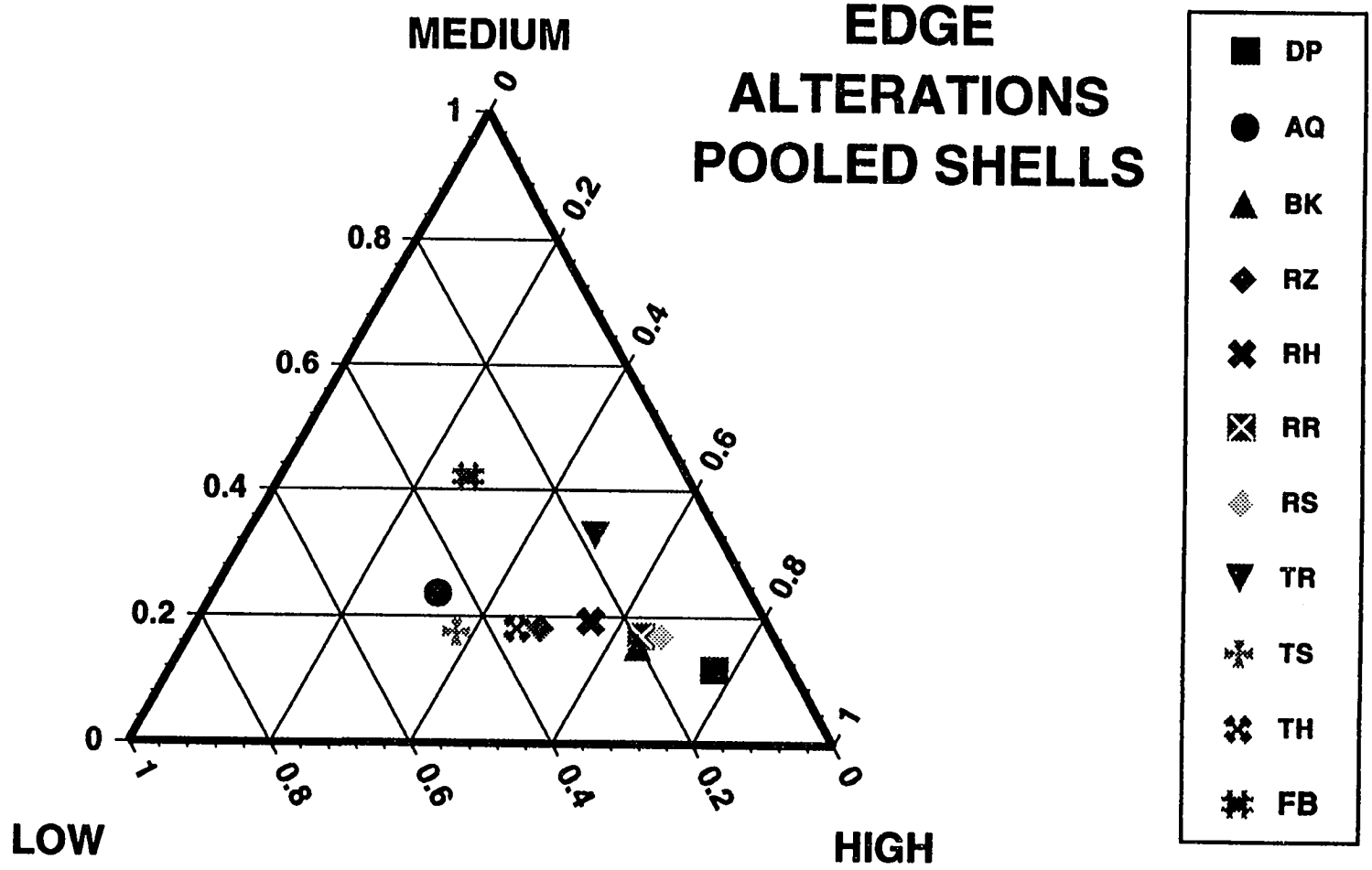


Figure 24. Ternary taphogram showing the proportion (percentage) of pooled shells with low medium, and high edge alteration at each station.

and transition zone (RR) plot very close together in the region between the medium to high and uneven categories. Figure 24 shows just how similar these stations' distributions are.

The occurrence of well - rounded edges was significant at all outer shelf margin stations (DP, BK, RZ, RH, RR, and RS) except the forereef sand flat (AQ; Figure 25). There, a significant percentage of the shells have unaltered or chipped edges, and there is no significant difference between the percentage of moderately and highly altered edges; this is also true at all other stations. Stations from the inner shelf margin (TR, TS, TH) and Florida Bay (FB) show no significant differences between the proportions of shells within the three edge alteration ranks.

Abrasion

The majority of environments show a minor amount of abrasion when all shells are pooled (Figure 26). Two possible exceptions to this are the backreef rubble zone (RZ) and the forereef sand flat (AQ). These stations have a significantly greater percentage (Figure 27) of shells with no abrasion to the percentage of shells than the other stations with the exception of TS.

Color Loss

The forereef sand flat (AQ) has the highest percentage of shells that retain their original color (Figure 28). The majority of the stations plot in the medium to low range. The reef flat (BK) and backreef stations (BK, RZ, RH, RR, and RS) again produce similar distributions of shell color states with significant differences between all three states at the backreef stations (RZ, RH, RR, and RS), but not on reef flat (BK; Figure 29). Additionally, Florida Bay's (FB) distribution of colors appears very close to that of RH and BK with significant differences among color rankings. Poor color preservation is also found in both

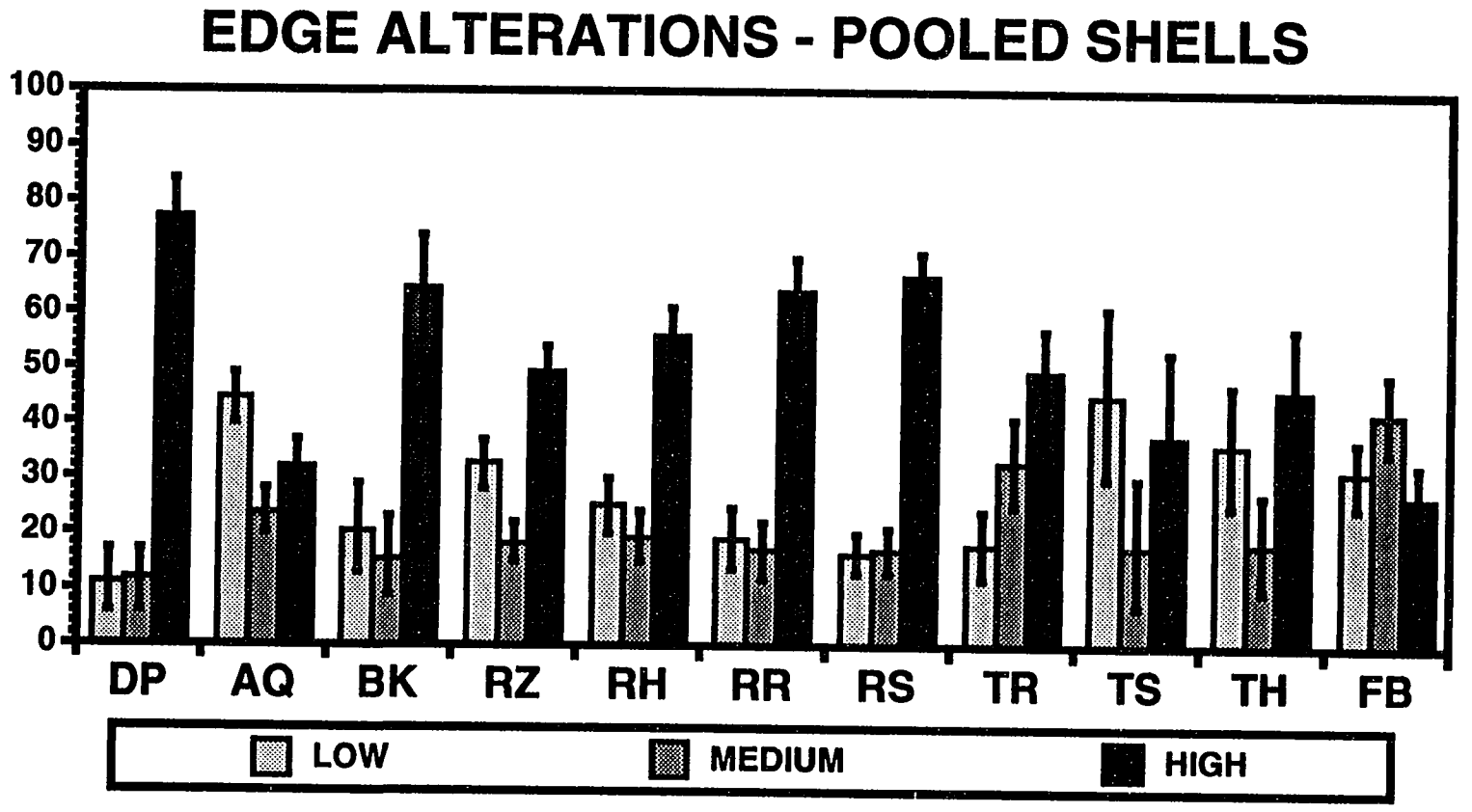


Figure 25. Proportion (percentage) of pooled shells at each station within the three taphonomic ranks (low, medium, or high) for edge alteration. Error bars represent the 95% confidence intervals.

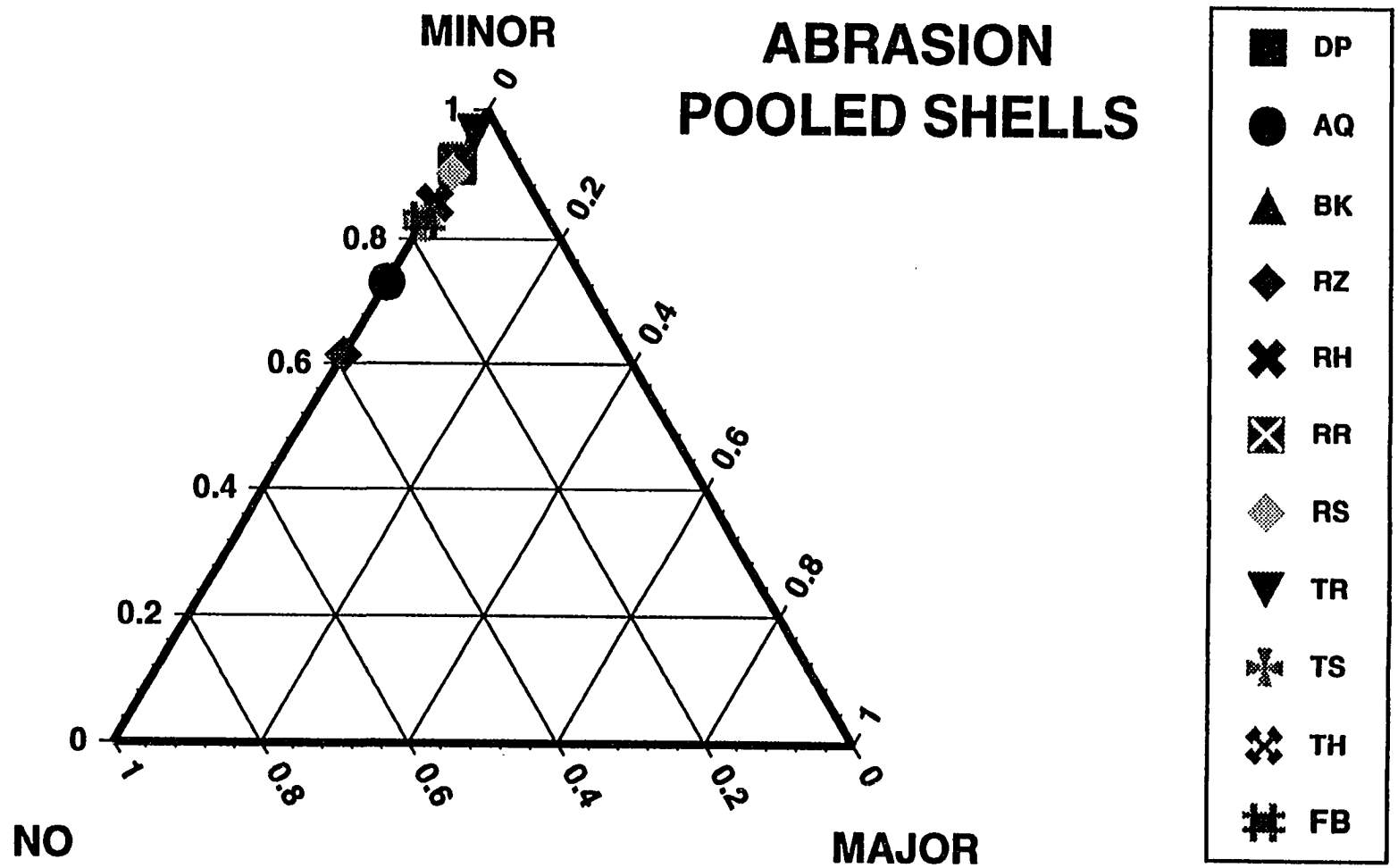


Figure 26. Ternary taphogram showing the proportion (percentage) of pooled shells with no, minor, and major abrasion at each station.

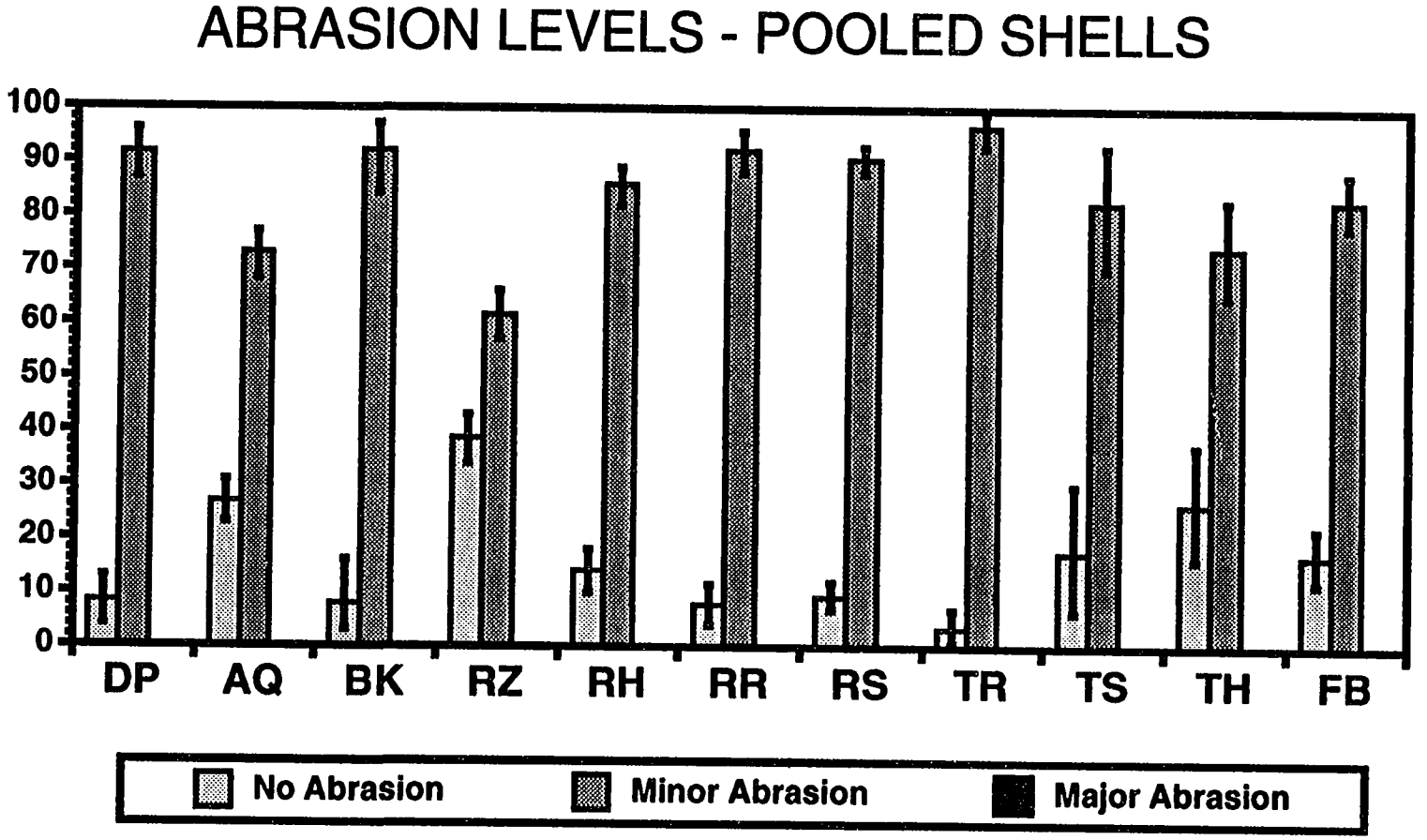


Figure 27. Proportion (percentage) of pooled shells at each station within the three taphonomic ranks (no, minor, and major) for abrasion. Error bars represent the 95% confidence intervals.

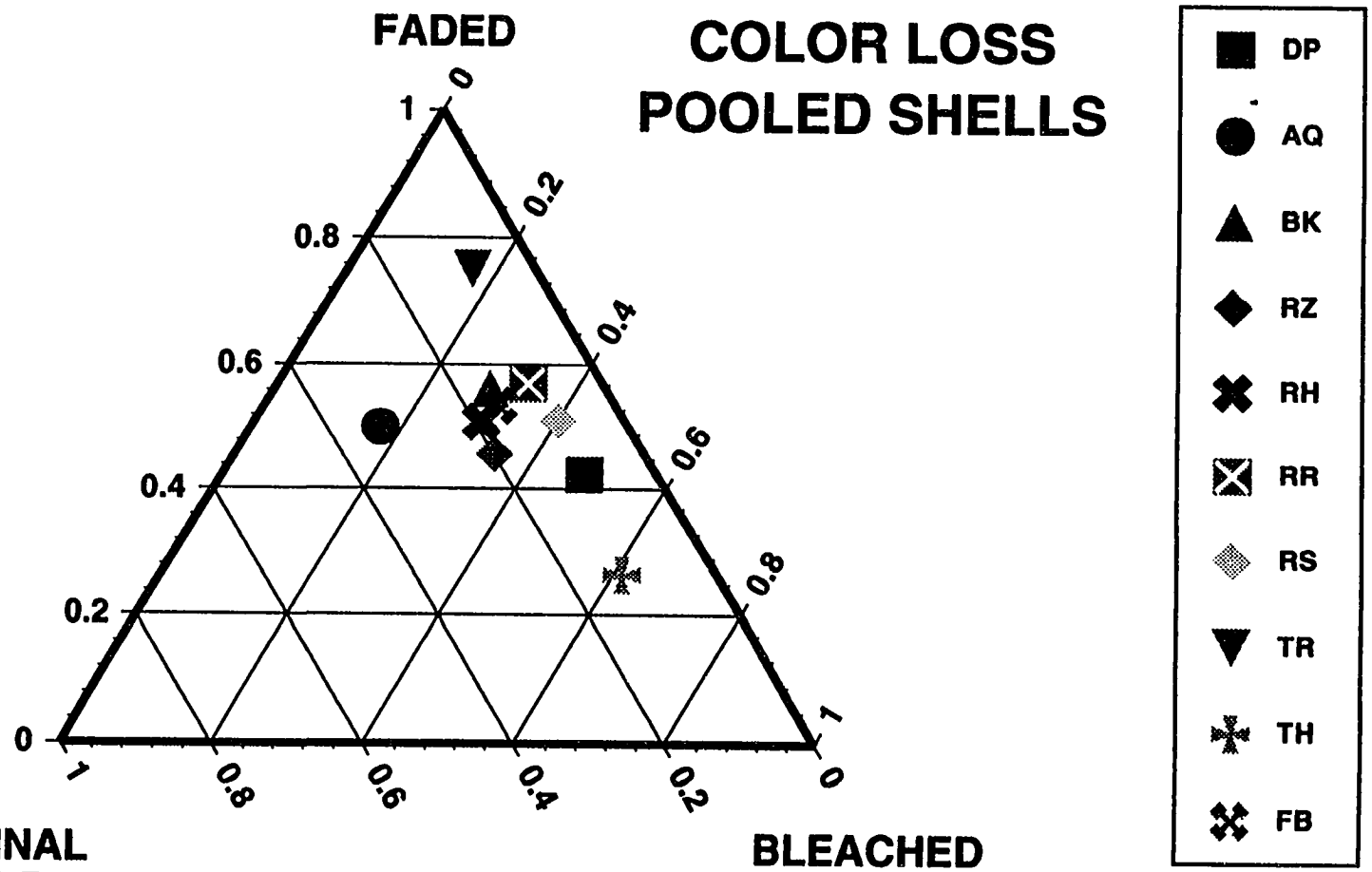


Figure 28. Ternary taphogram showing the proportion (percentage) of pooled shells with original, faded, and bleached color at each station.

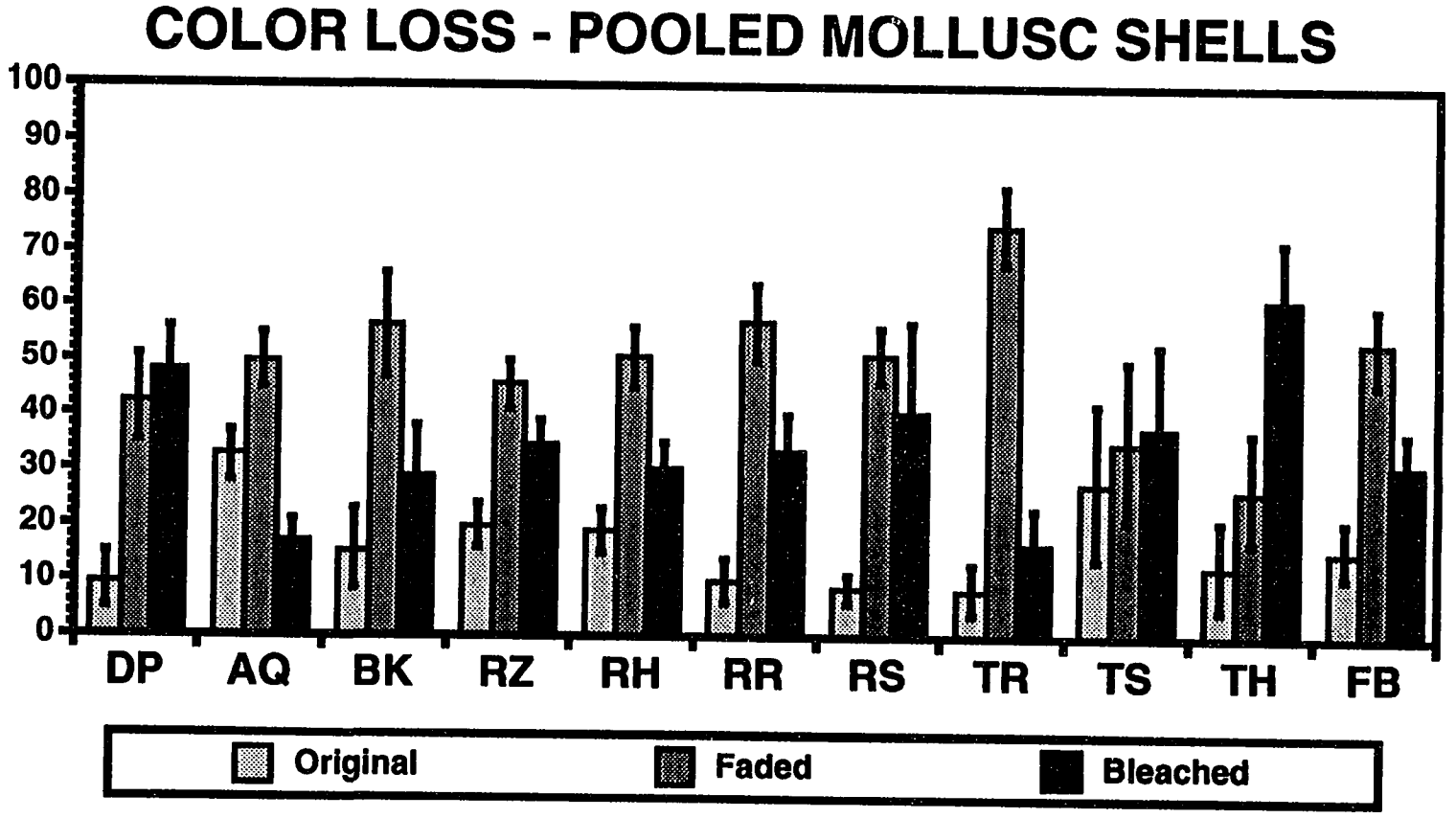


Figure 29. Proportion (percentage) of pooled shells at each station within the three taphonomic ranks (original, faded, and bleached) for color. Error bars represent the 95% confidence intervals.

the Hawk Channel grassbed (TH) and the deep reef sand flat (DP). Here, faded and bleached shells occur in significantly greater numbers compared to shells that have retained their original color.

Luster

The forereef sand flat (AQ) and the Florida Bay grassbed (FB) has significantly greater frequencies of shells that retained their original luster than shells with luster at all other stations (Figure 30). The forereef sand flat (AQ) has approximately equal numbers of dull and shiny shells while significantly greater number of Florida Bay shells are not dulled. All other stations had 20 - 35% of their shells with the original luster with the exception of the backreef rippled sand (RS) where only ≈ 10% have maintained their original luster.

Periostracum / Ligment

Figure 31 shows the frequency at which shells with intact periostraca and ligaments were encountered. The forereef sand flat (AQ) has significantly more shells with these structures than all other stations. Periostracum and /or ligments are not found on any shells from the backreef grass (RH) and rippled sand (RS) stations.

Predatory Borings

Figure32 presents the frequencies of predatory gastropod borings from each station. While these holes are found at all locations, the deep reef sand flat (DP) and the patch reef (TR) stations have significantly lower numbers of these borings than all other locations.

Fragmentation

Figure 33 shows the degree of breakage seen within the pooled shell sample. Again, the majority of the backreef stations (RH, RR, and RS) plot

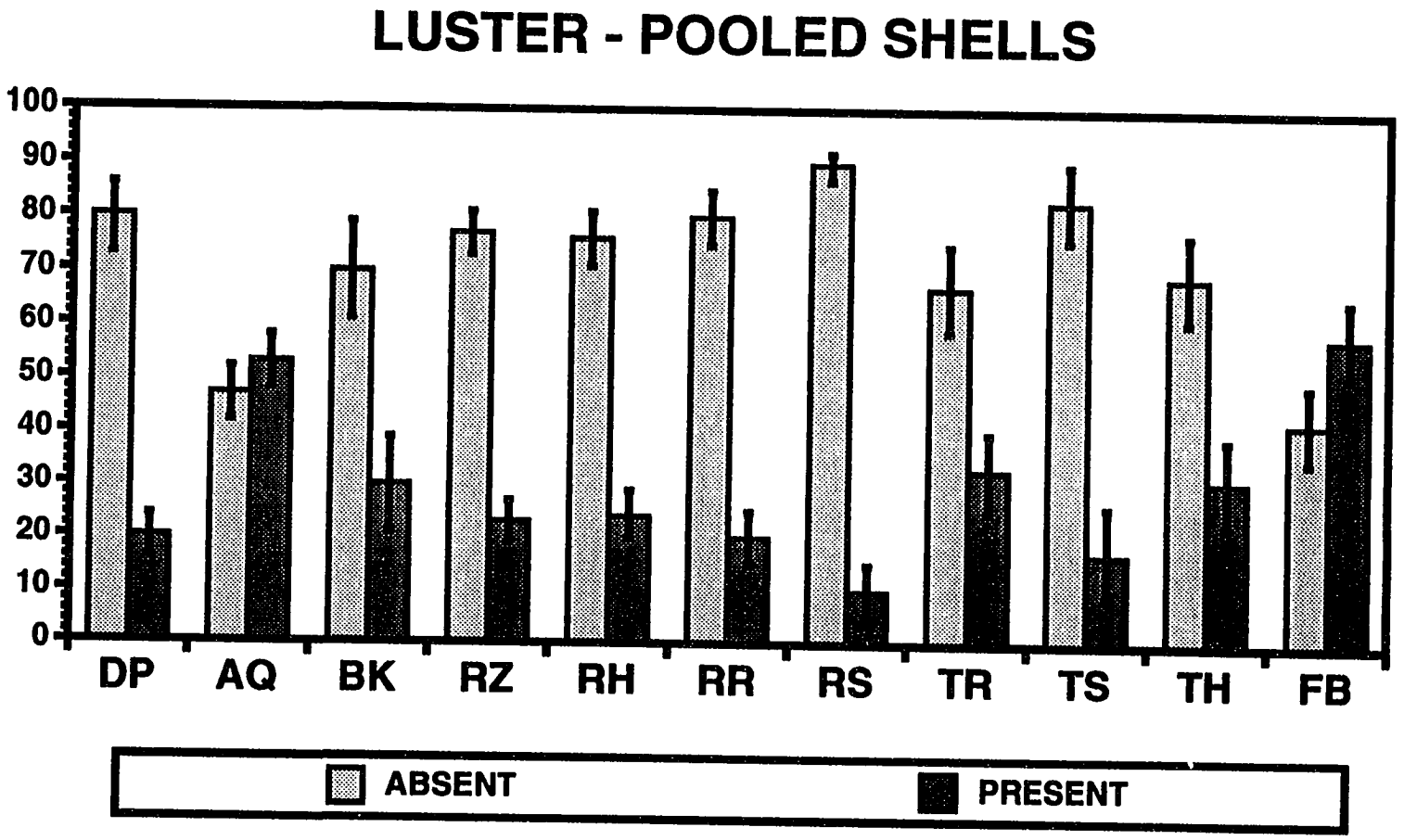


Figure 30. Proportion (percentage) of pooled shells at each station within the two taphonomic ranks (absent or present) for luster. Error bars represent the 95% confidence intervals.

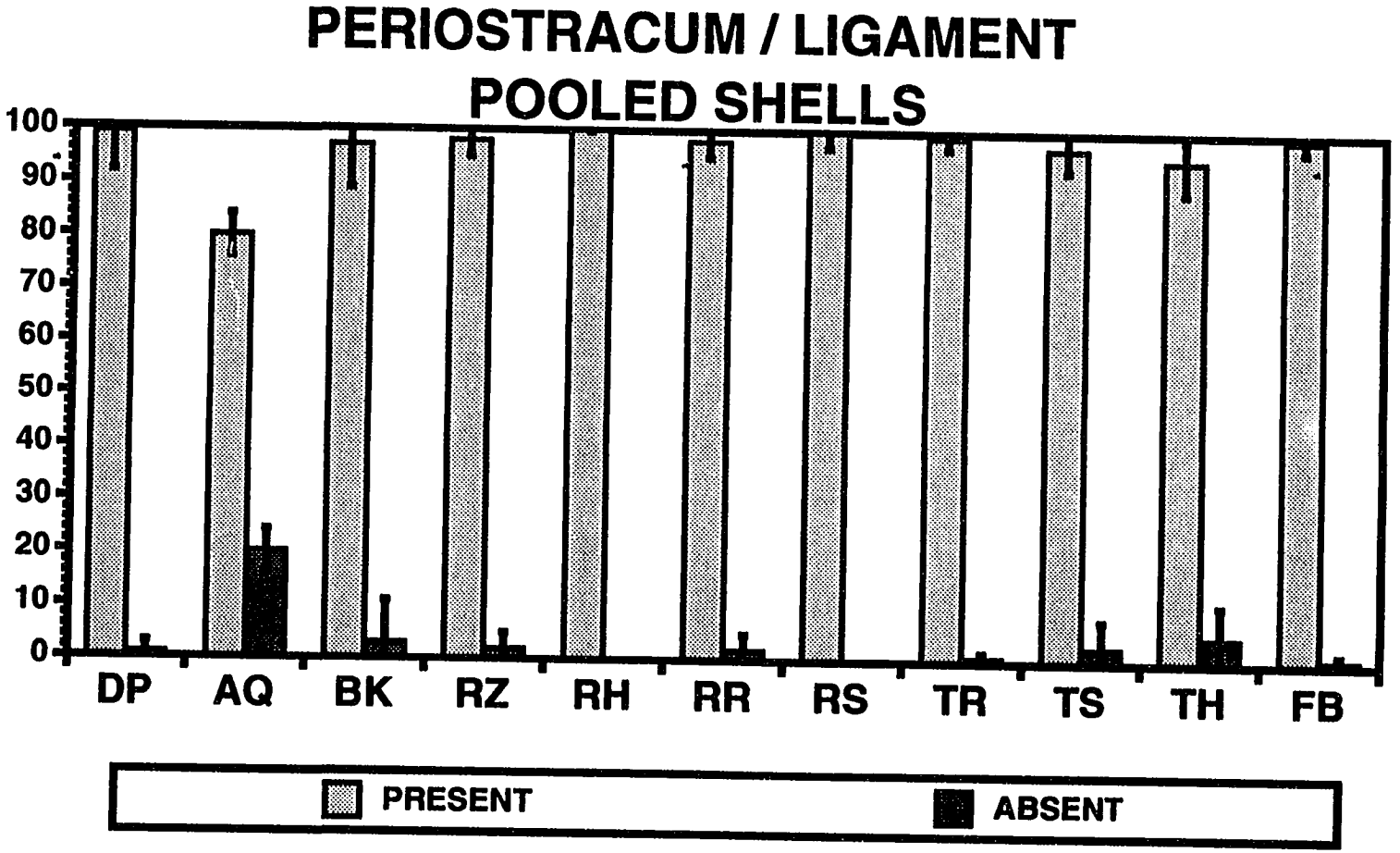


Figure 31. Proportion (percentage) of pooled shells at each station within the two taphonomic ranks (absent or present) for periostracum and/ or ligament. Error bars represent the 95% confidence intervals.

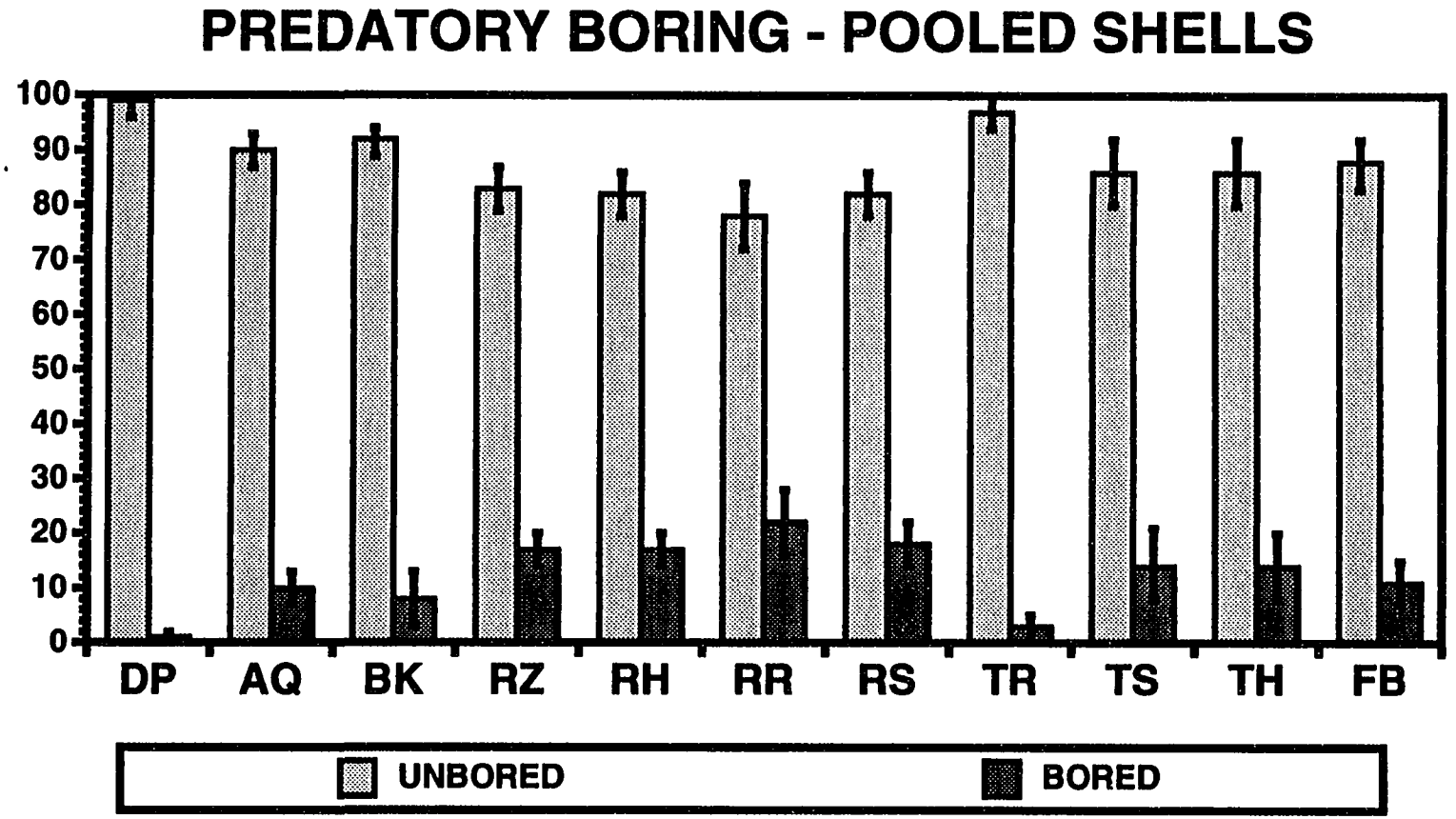


Figure 32. Proportion (percentage) of pooled shells at each station within the two taphonomic ranks (absent or present) for predatory borings. Error bars represent the 95% confidence intervals.

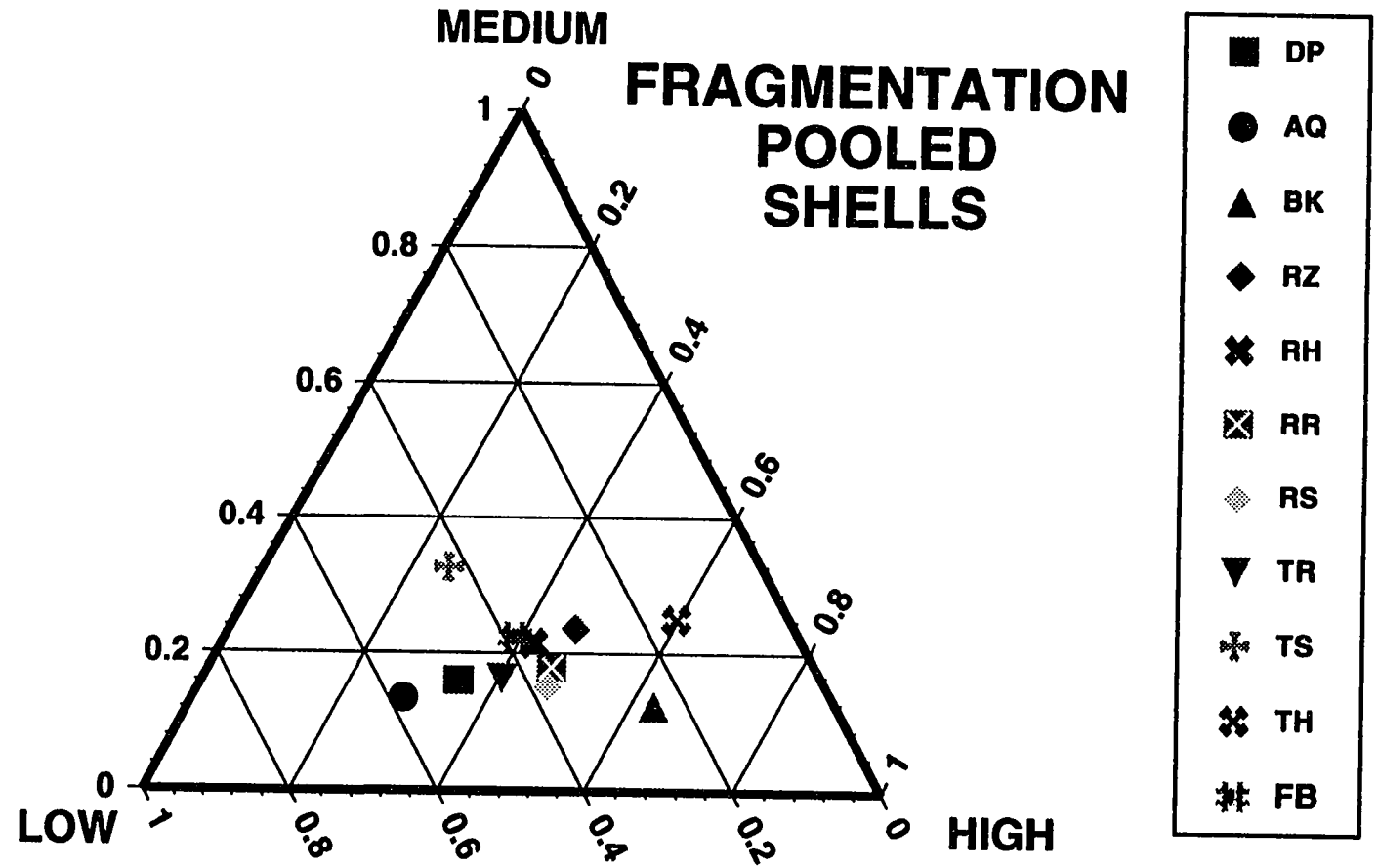


Figure 33. Ternary taphogram showing the proportion (percentage) of Cerithium with no, minor, and major abrasion at each station.

closely together along with thepatch reef (TR) and Florida Bay (FB), indicating a similar proportion of whole shells, damaged shells and fragments. These stations are characterized by shell populations in which the majority of shells are either whole (≤ 20% of the shell missing) or in identifiable fragments. These two components are not significantly different from one another, but they do occur in significantly greater numbers than do damaged shells (Figure34). The two outer shelf margin stations (AQ and DP) have greater shell proportions in an unbroken condition, rather than in fragments. Although this only significant for AQ. The reef flat (BK) and rubble zone (RZ) exhit an opposite pattern; significantly more fragments occur at these stations than the others.

Bioerosion (Macroscopic)

The three types of distinguishable bioerosion; predatory borings,chiton grazing marks and rhizome etchings were seen on shells off Key Largo. All three types occurred at low levels, with sponge borings and chiton graze marks present at most stations.

Sponge Borings:

Figure 35 shows sponge borings were rarely encountered, the maximum number of shells with them occurred on the deep reef sand flat (≈ 9%), followed by the Hawk Channel and Florida Bay grassbeds (5 - 6%). None were found at the forereef sand flat (AQ), backreef transition zone (RR) and the patch reef (TR).

Chiton Graze Markes:

Florida Keys chitons (molluscs of the Class Polyplacophora) are small (< 2.5 cm) epifaunal grazers who leave distinctive parallel scratches on the shell surfaces. Shells most frequently grazed had endolithic borers or crustose coralline algae on them. The frequency of graze marks was significantly greater

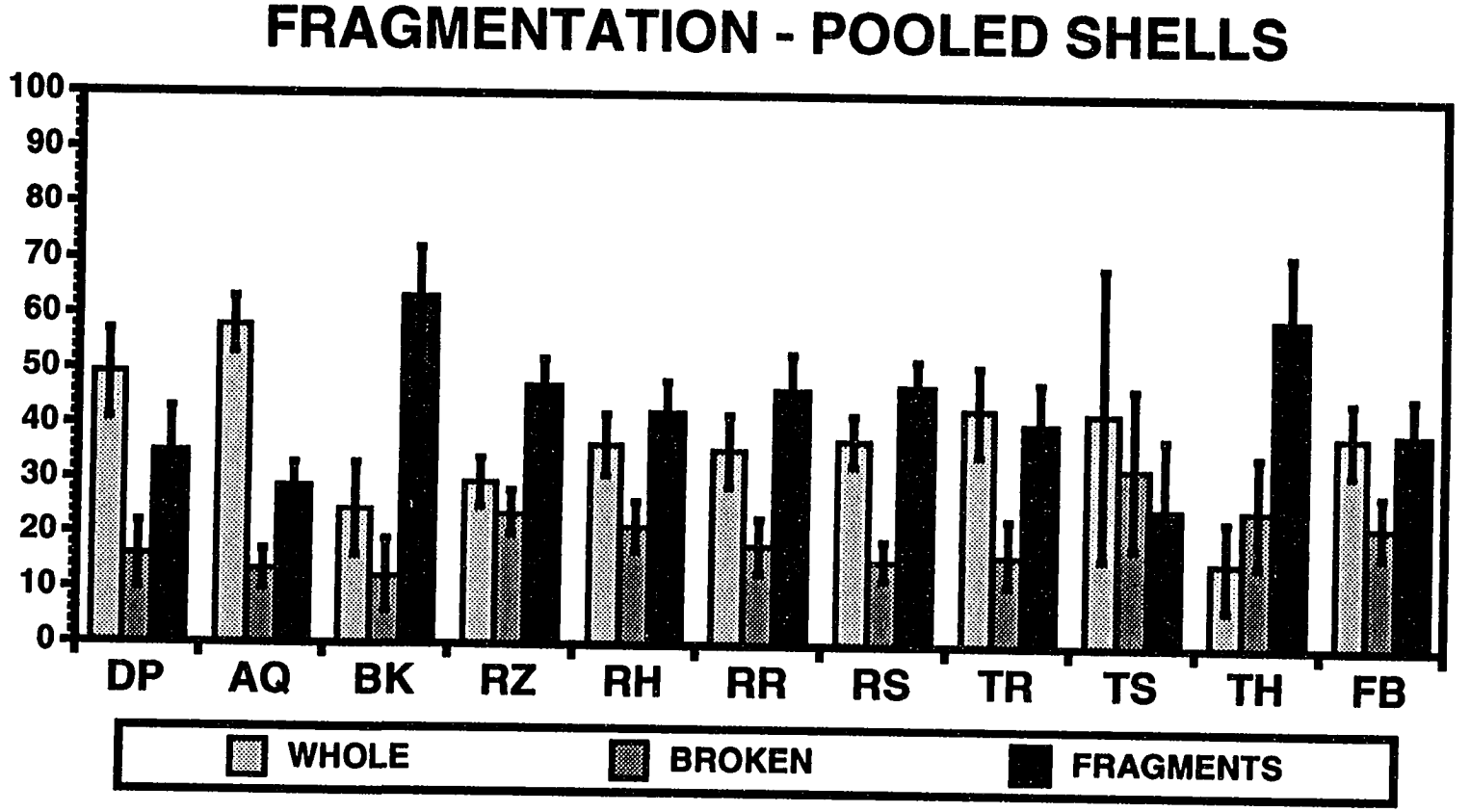


Figure 34. Proportion (percentage) of pooled shells at each station within the three taphonomic ranks (whole shells, broken shells, and shell fragments) for fragmentation. Error bars represent the 95% confidence intervals.

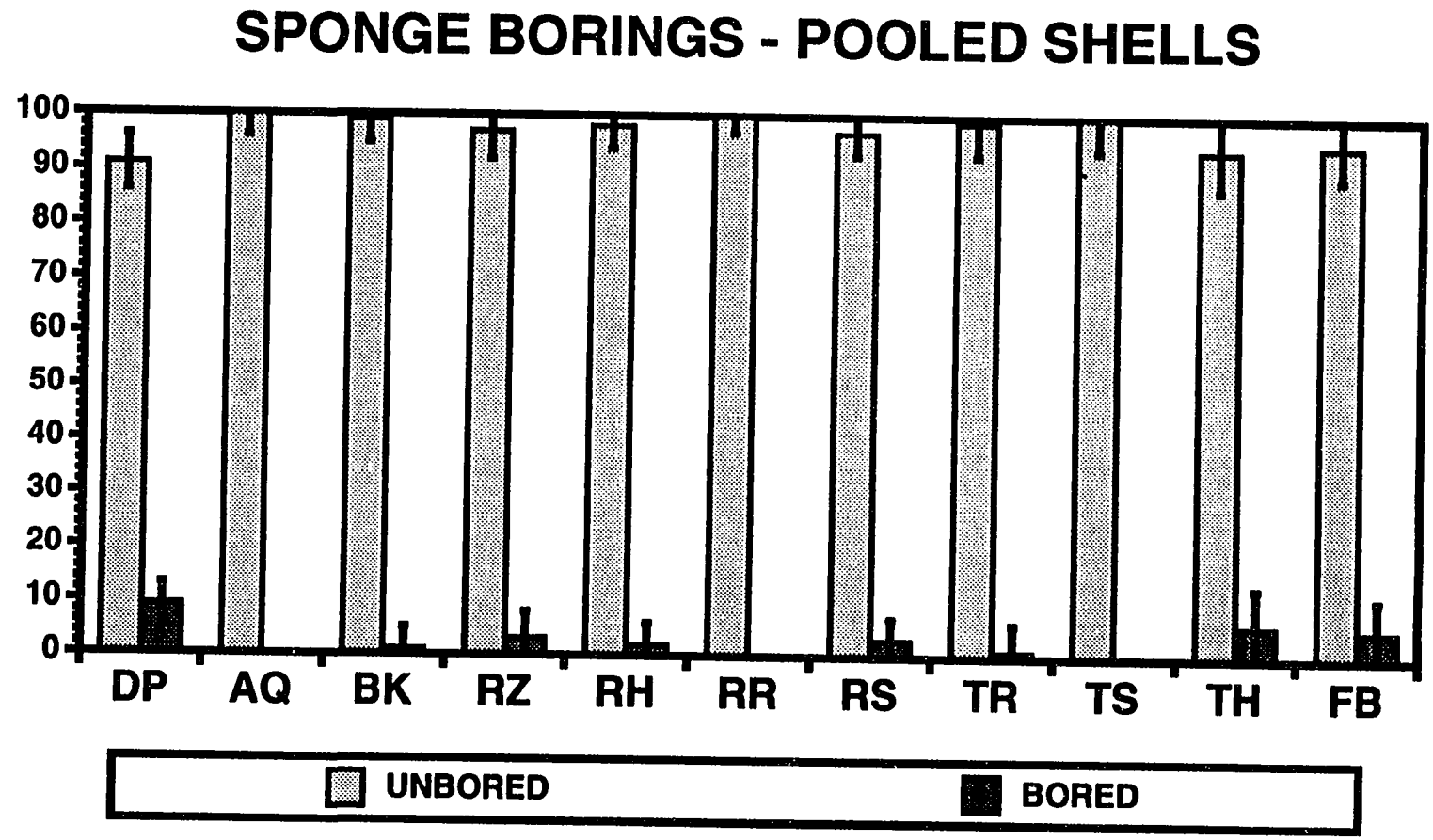


Figure 35. Proportion (percentage) of pooled shells at each station within the two taphonomic ranks (absent or present) for sponge borings. Error bars represent the 95% confidence intervals.

on the deep reef sandflat (DP) where shell surfaces were highly degraded (Figure 36). The Hawk Channel grassbed (TH), another station characterized by high surface degradation, also had a greater, nonsignificant frequency of graze marks; however, the reef flat (BK) shells and their high degraded surfaces did not showed any evidence of grazing.

Rhizome Etchings:

Rhizome etchings were virtually absent from shells collected in the Florida Keys, only 8 of the 2481 (0.0028%) individual shells examined carried these features. These etchings were distributed as follows: five from the backreef grassbed (0.2% of the shells collected), two of the Hawk Channel grassbed (2.8% of the shells collected) and one from the Hawk Channel unvegetated bottom (2.5% of the shells collected).

This highly diagnostic form of bioerosion created by the rhizomes of the seagrass, *Thalassia testudinum*, was found by Parsons (1992) to be very important in determining whether a shell had spent some part of its history within a grassbed, were 40 to 70% of the shells examined contained these marks. Its scarity on Keys shells is quite puzzling.

"Target" Taxa Taphonomic Data

Taphonomic characteristics of "target " taxa (i.e. closely related molluscs of similar shell architecture) are presented in the following section. While the same attributes were examined for the target taxa as with the pooled mollusc only a reduced set of taphonomic features will be reported here (encrustation, surface degradation, edge alterations, abrasion, color loss, and fragmentation) were the most diagnostic. Preliminary examination of each target taxon across stations showed patterns similar to those seen with the pooled molluscs. The luster, periostracum/ligament and the bioerosional data were not used in the

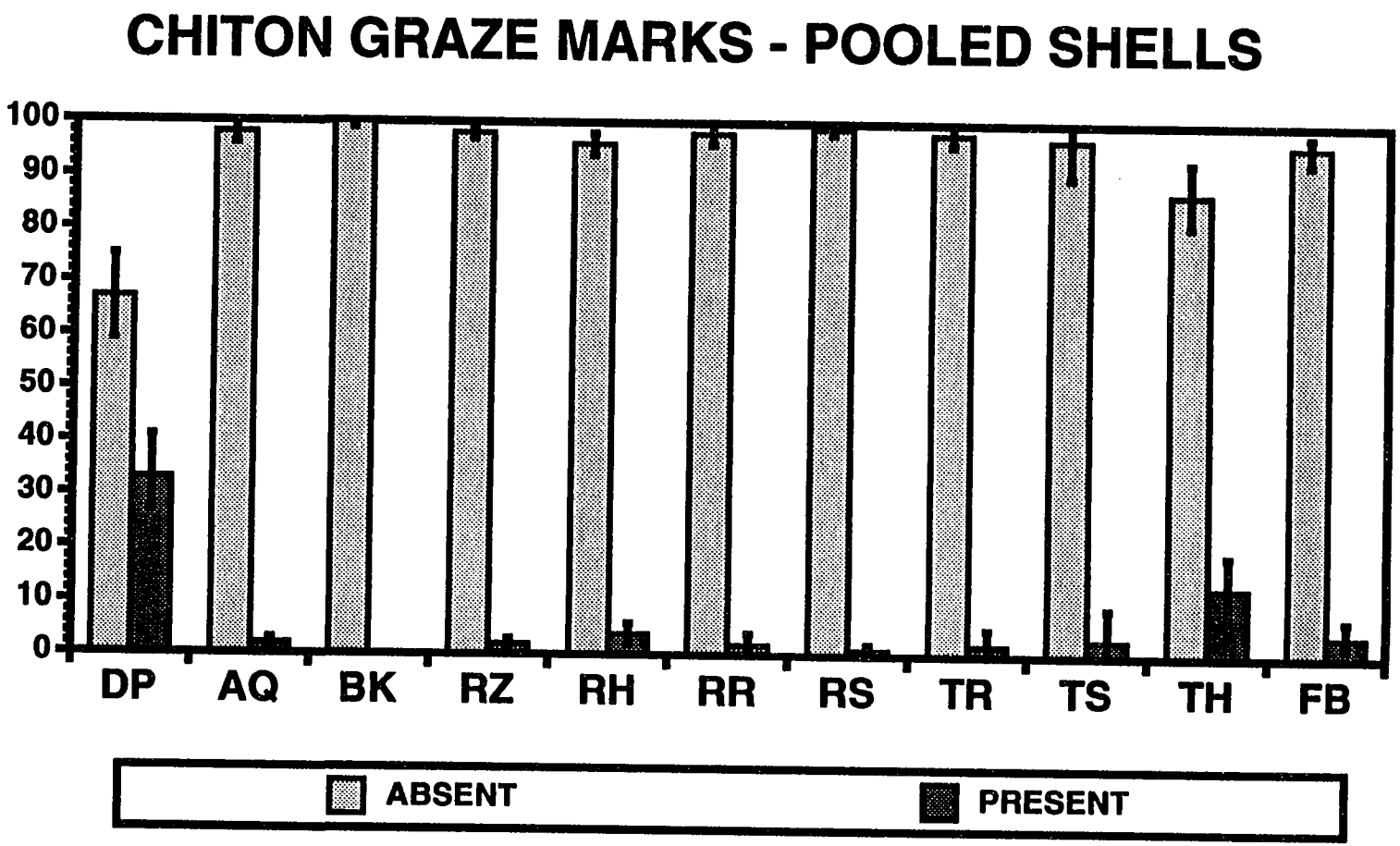


Figure 36. Proportion (percentage) of pooled shells at each station within the two taphonomic ranks (absent or present) forchiton graze marks. Error bars represent the 95% confidence intervals.

examination of the target taxa because these features not as useful with the pooled molluscs.

Cerithium

Encrustation

The majority of the stations (DP, AQ, BK, RZ, RH, RR, TS, TH and FB) fall entirely within the region of medium epibiont coverage in Figure 37. All these stations showed significantly greater numbers of shells with medium epibiont growth (Figure 38). Only the Florida Bay (FB), the backreef rippled sand (RS) and the reef flat (BK) stations exhibited different signatures. Both Florida Bay (FB) and the backreef rippled sand (RS) had significantly greater numbers of shells with low epibiont encrusting.

Surface Degradation

Cerithium shells in most environments exhibited significantly medium to high levels of surface degradation (Figures 39 and 40). Stations located on the outer shelf margin (DP, AQ, BK, RH, RR, and RS) plot close together and showed a general pattern of few to no shells with little degradation and a larger percentage of shells with medium damage to their surfaces and a majority of shells possessing highly damaged surfaces. Differences in percentages between shells with the least amount of damage and the intermediate and high levels were significant, but rarely were the differences between the medium and high levels significant. Both the Florida Bay (FB) and Hawk Channel unvegetated bottom (TS) produced significantly greater percentages of *Cerithium* shells in the medium range of surface damage. *Cerithium* in the rubble zone (RZ) displayed a mixed distribution of shells with approximately equal numbers of shells in each category. The mostly highly degraded shells

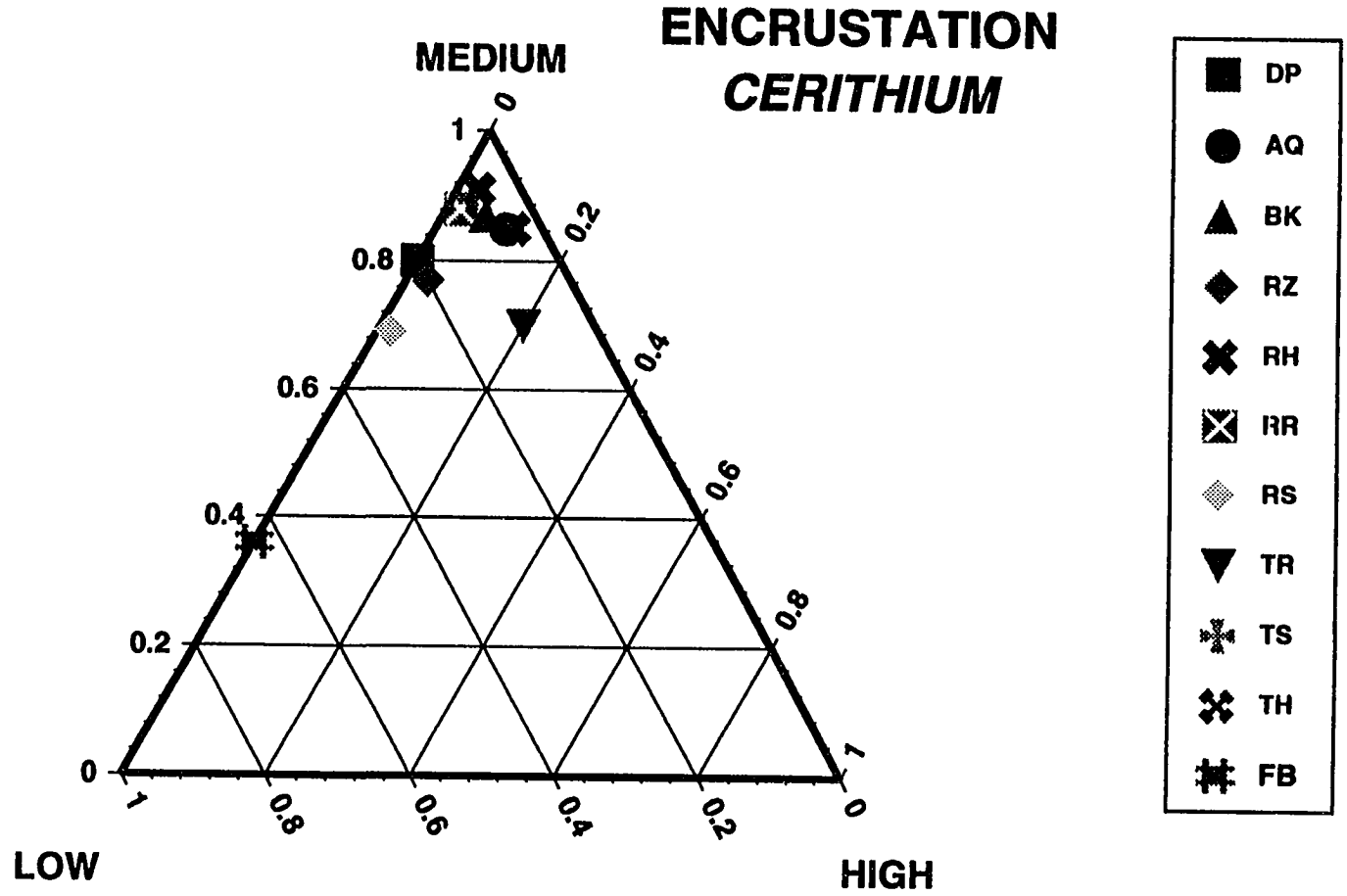


Figure 37. Ternary taphogram showing the proportion of *Cerithium* with low, medium, and high encrustation at each station.

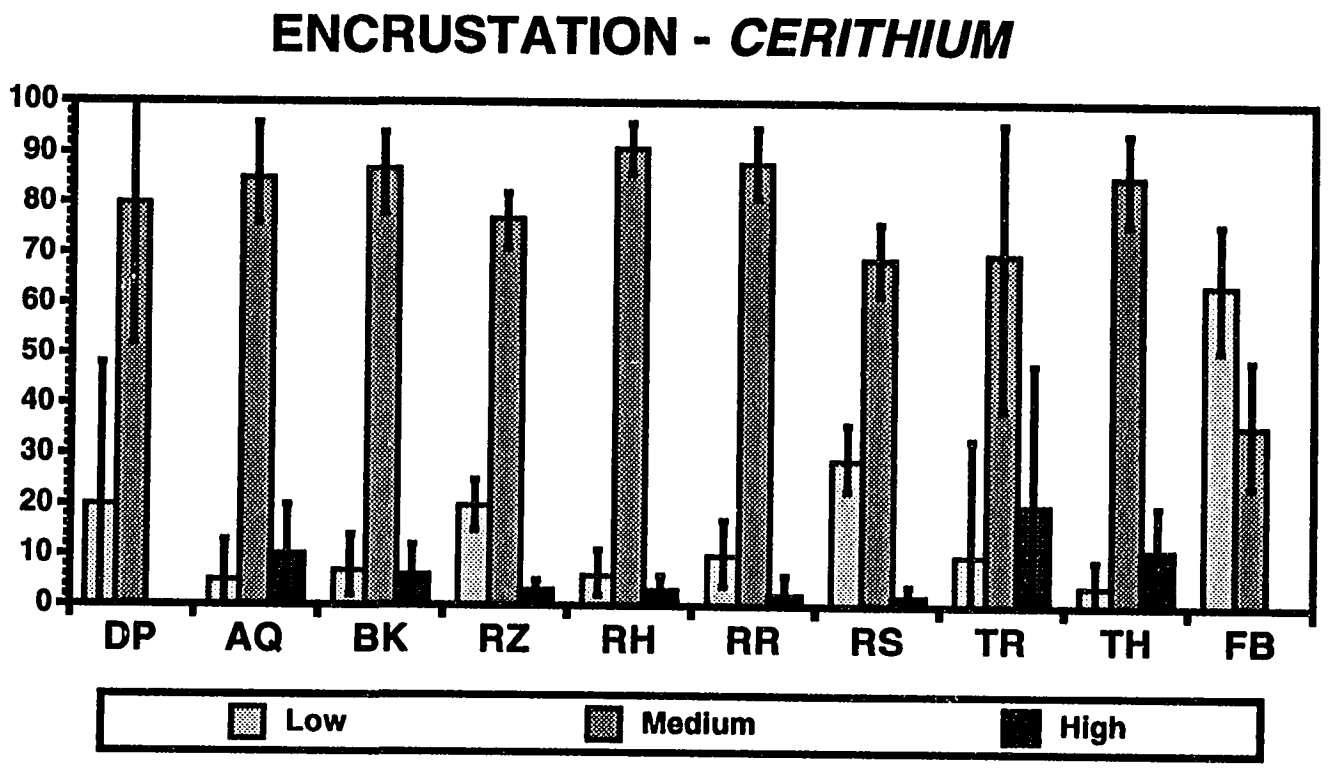


Figure 38. Proportion of the *Cerithium* from each stationwithin the three taphonomic ranks (Low, medium, and high) for encrustation. Error bars represent the 95% confidence limits.

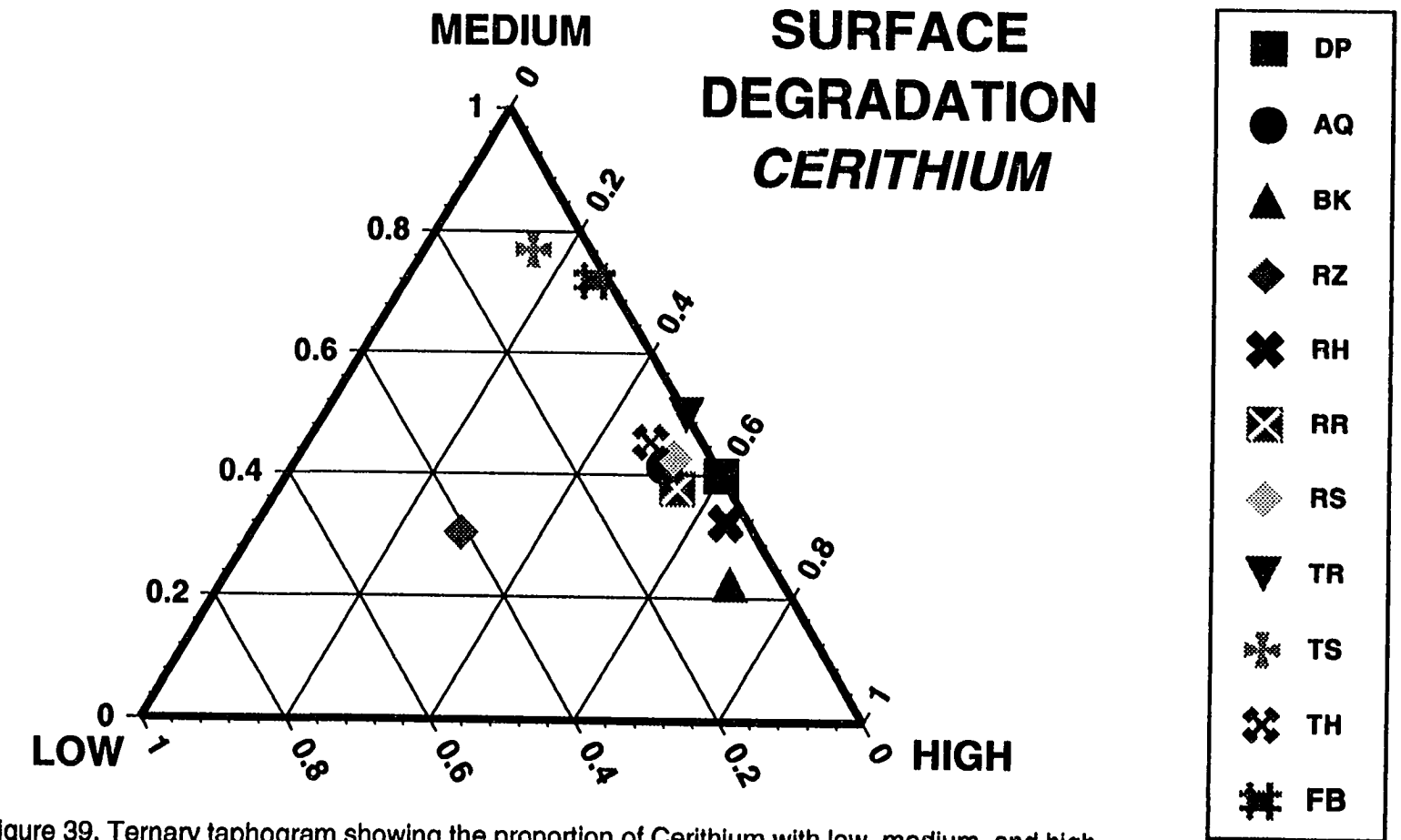


Figure 39. Ternary taphogram showing the proportion of Cerithium with low, medium, and high surface degradation at each station.

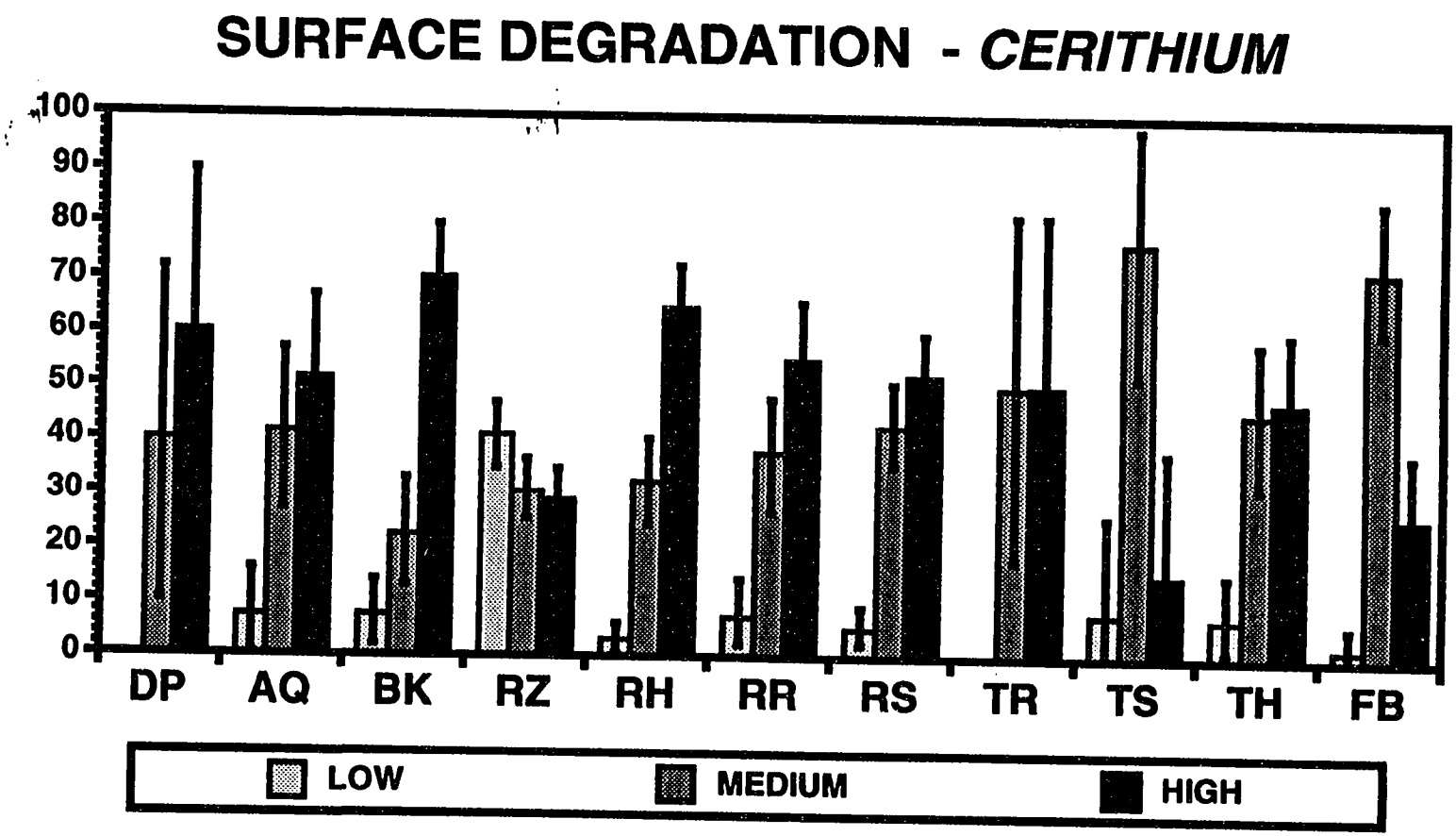


Figure 40. Proportion (percentage) of *Cerithium* at each station within the three taphonomic ranks (low, medium, or high) of surface degradation. Error bars represent the 95% confidence intervals.

came from the reef flat (BK), where their proportion of the total in medium category is far greater than the other categories.

Edge Alterations

The edge alteration data from *Cerithium* showed that most stations exhibited moderate to high altered regions signatures (Figure 41). The deep reef flat (DP) had a significantly greater percentage of shells with well rounded edges; shells with unaltered edges were not found in from this habitat (Figure 42). Both the forereef sand flat (AQ) and Florida Bay (FB) had large proportions of shells with unaltered edges. Their breakdowns differ, however, with respect to the proportion of moderately altered edges that occur at each station; Florida Bay had a greater percentage and the forereef sand flat relatively few. The reef flat, backreef, and patch reef (BK, RH, RR, RS, and TR) all had high proportions of shells with highly modified edges; these high proportions were significant in all but the patch reef (TR). The percentages of low and moderately altered edges at all these stations was low and were not significantly different from one another. The rubble zone (RZ) and the two Hawk channel stations exhibit nearly equal proportions of shells with both minor and major edge alterations.

Abrasion

Cerithium shells from the majority of the stations (DP, AQ, BK, RH, RR, RS, TR and TS) tended to exhibit minor abrasion (Figure 43). A few stations (RZ, TH and FB) were clumped together within the more minor portion of the no to minor region. All stations exhibit significantly greater percentages of abraded *Cerithium* shells than they did with no abrasion . Furthermore there were significant between - station differences; the proportions of both non and minor abraded shells from the rubble zone (RZ), Hawk Channel grassbed (TS), and Florida Bay (FB) were significantly different from the proportions seen

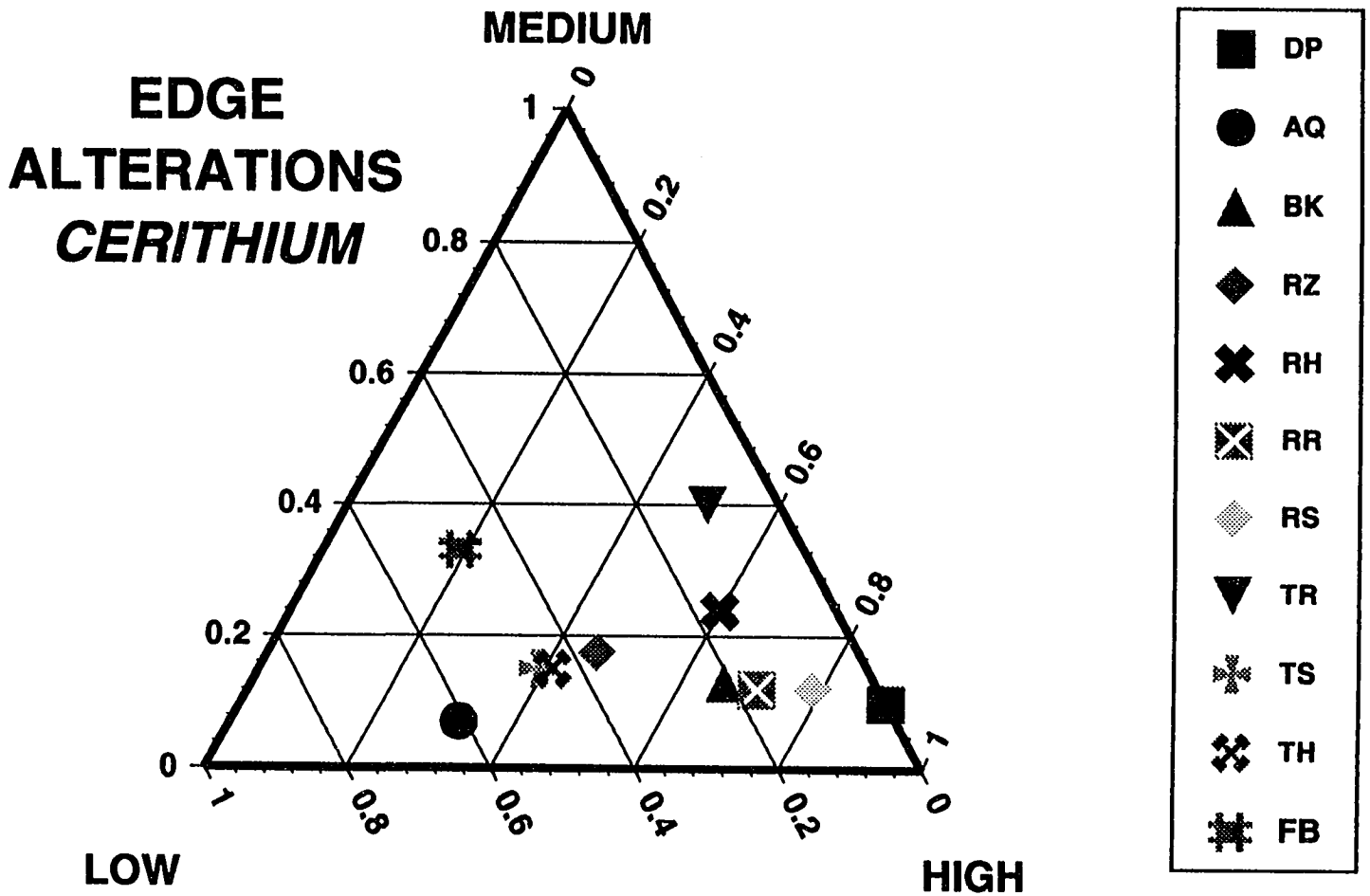


Figure 41 Ternary taphogram showing the proportion (percentage) of *Cerithium* with low, medium , and high edge alteration at each station

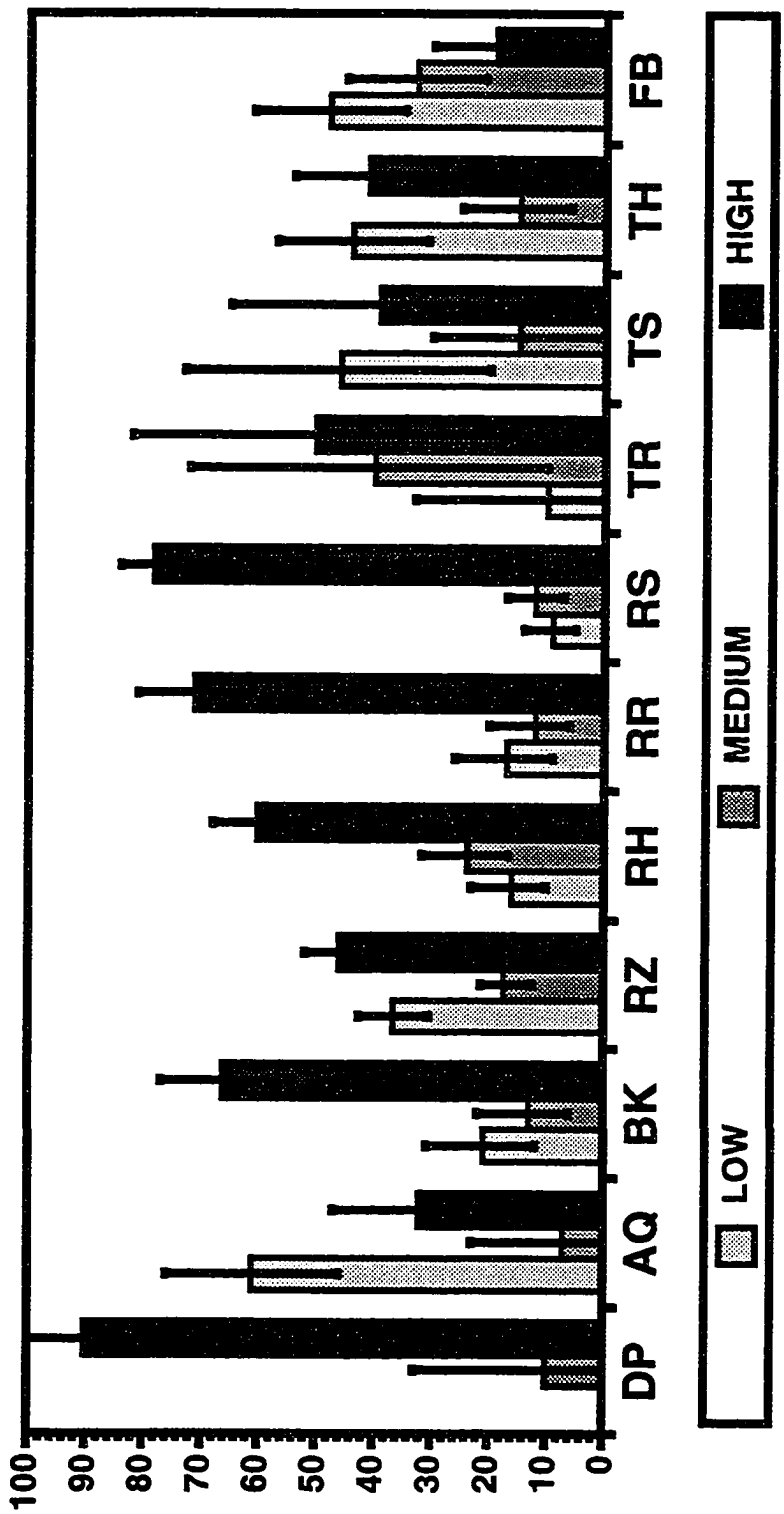


Figure 42. Proportion (percentage) of *Cerithium* at each station within the three taphonomic ranks (low, medium, or high) for edge alteration. Error bars represent the 95% confidence intervals.

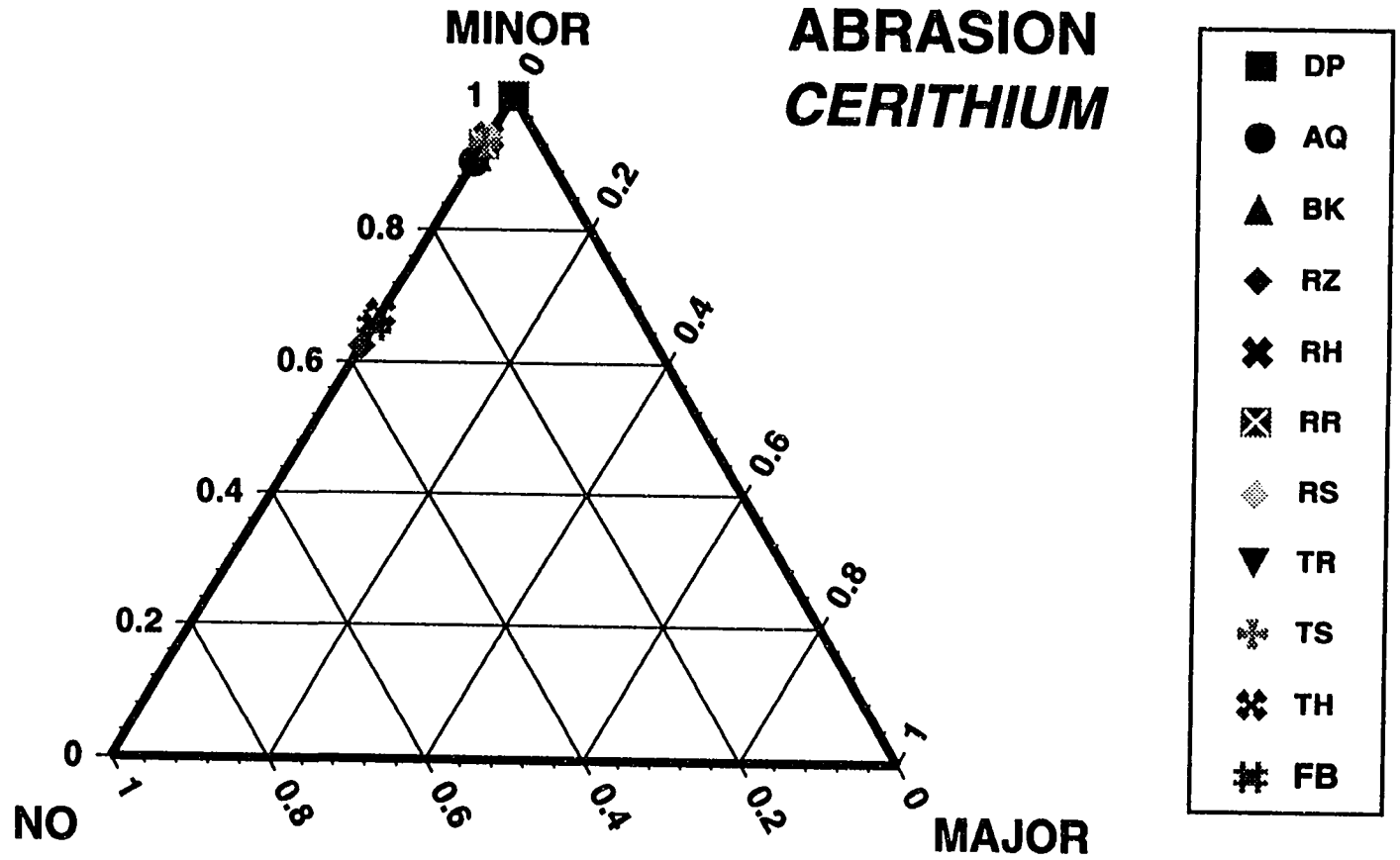


Figure 43. Ternary taphogram showing the proportion (percentage) of *Cerithium* with no, minor, and major abrasion at each station.

elsewhere (Figure 44). Specifically, there were fewer shells with minor abrasion and greater numbers of nonabraded shells from RZ, TS and FB. The unvegetated Hawk Channel bottom (TS) could not be placed definitively with either grouping because its error bars overlap the boundaries of both.

Color Loss

The majority of *Cerithium* shells at all stations had either retained their original colors or exhibited moderate fading (Figure 45). The only stations with significantly greater numbers of faded shells were the forereef sand flat (AQ) and backreef grassbed (RH; Figure 46). The other backreef stations (RZ, RR, and RS) had significantly fewer numbers of bleached shells than they do shells falling into the other two color categories.

Fragmentation

Cerithium shells at all stations occurred most commonly as fragments (Figure 47). These fragments were significantly more abundant than either whole or broken shells at all stations except the unvegetated bottom (TS) and in Florida Bay (FB; Figure 48). TS had a greater component of whole shells than other stations, but these differences were only statistically significant for the deep reef sand flat (DP), the backreef grassbed (RH) and the patch reef (TR). Two of these stations, the deep reef sand flat and the patch reef, yielded only fragments. Florida Bay had nearly as many broken shells as fragments; both are significantly more abundant than the proportion of whole shells.

Chamidae

Encrustation

Shells of the family Chamidae from all stations, except the backreef rippled sand (RS), were dominated by moderate epibiont coverage (Figure 49). The number of shells with moderate overgrowth was significantly greater at

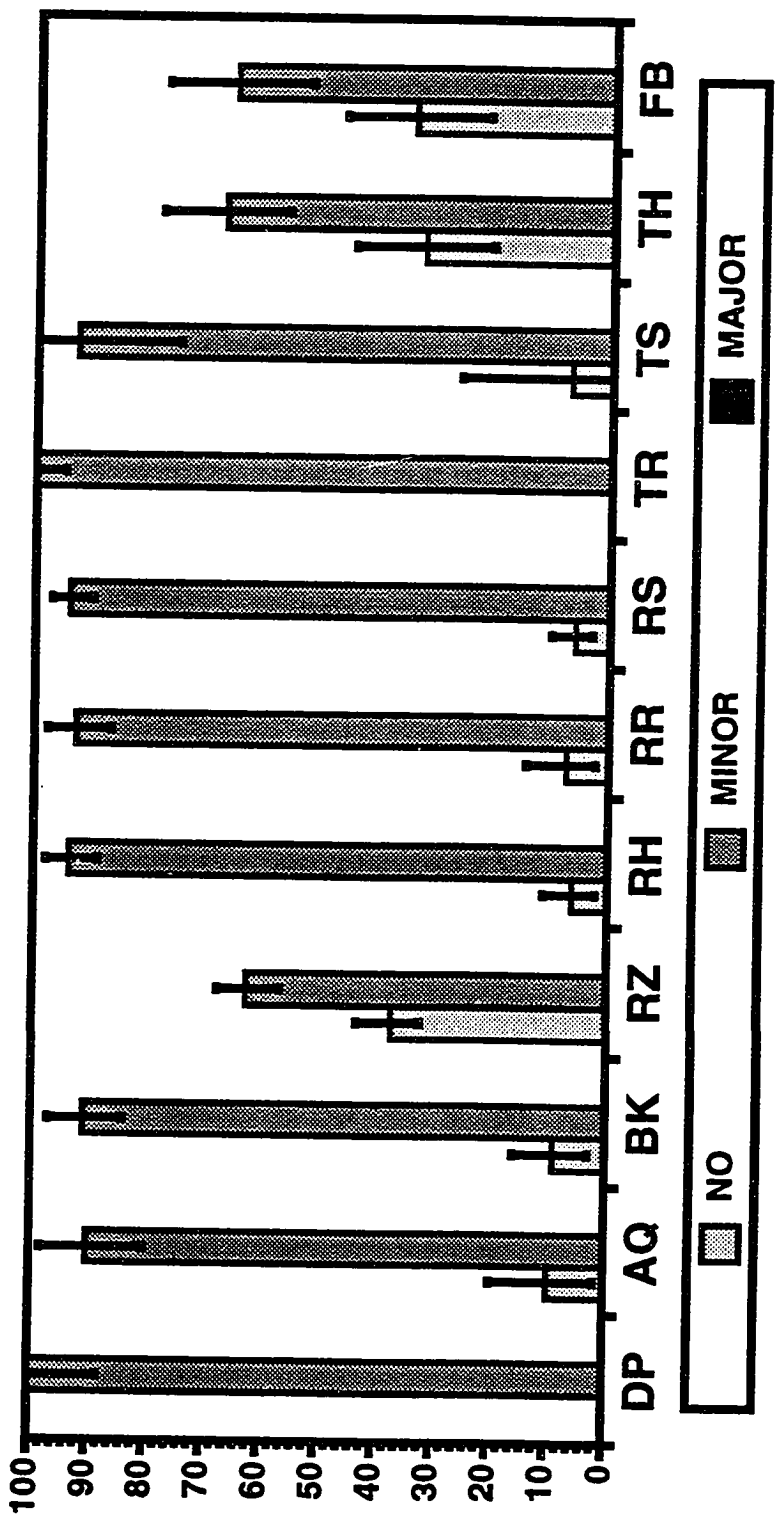


Figure 44. Proportion (percentage) of *Cerithium* at each station within the three taphonomic ranks (no, minor, and major) for abrasion. Error bars represent the 95% confidence intervals.

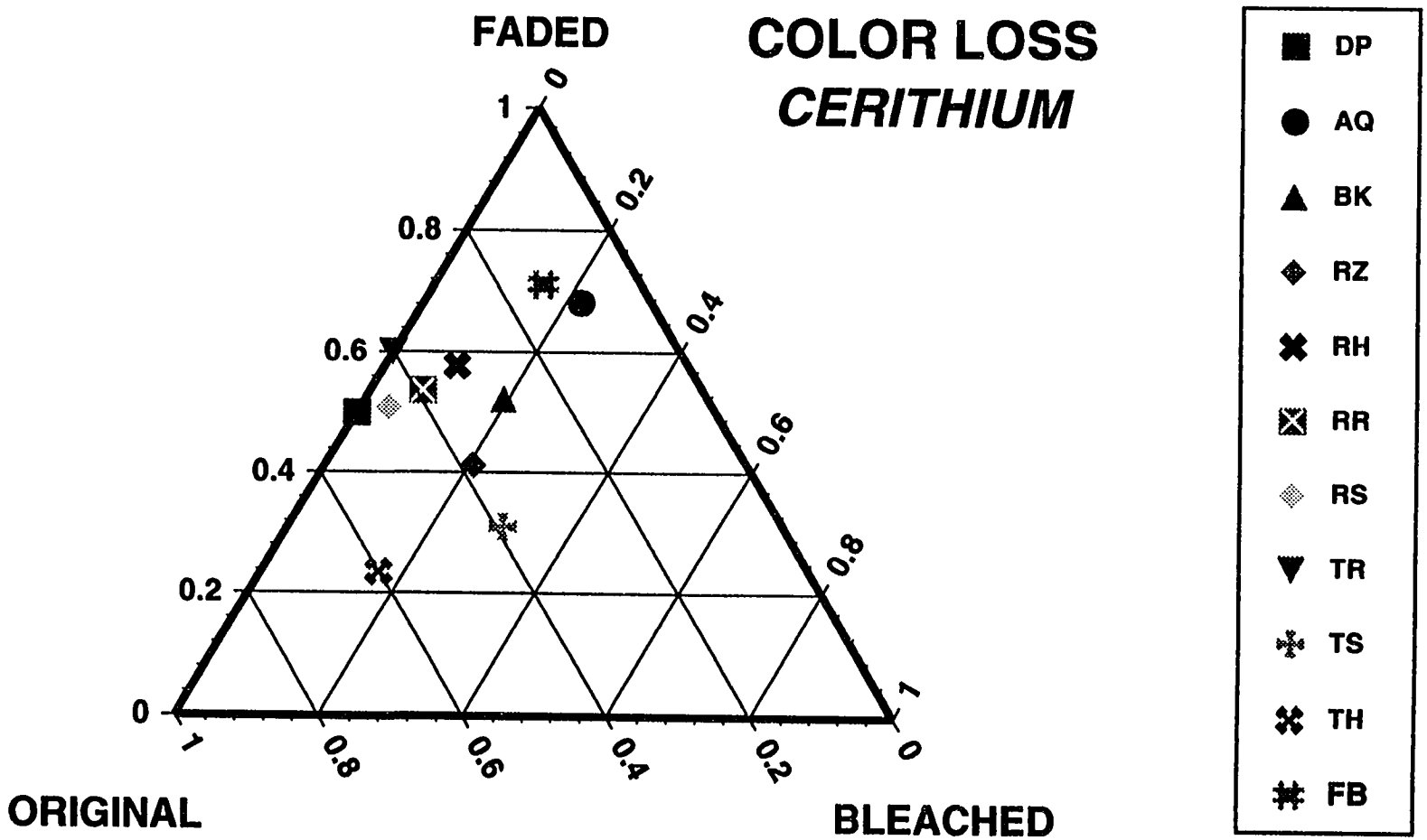


Figure 45. Ternary taphogram showing the proportion (percentage) of *Cerithium* with original, faded, and bleached color at each station.

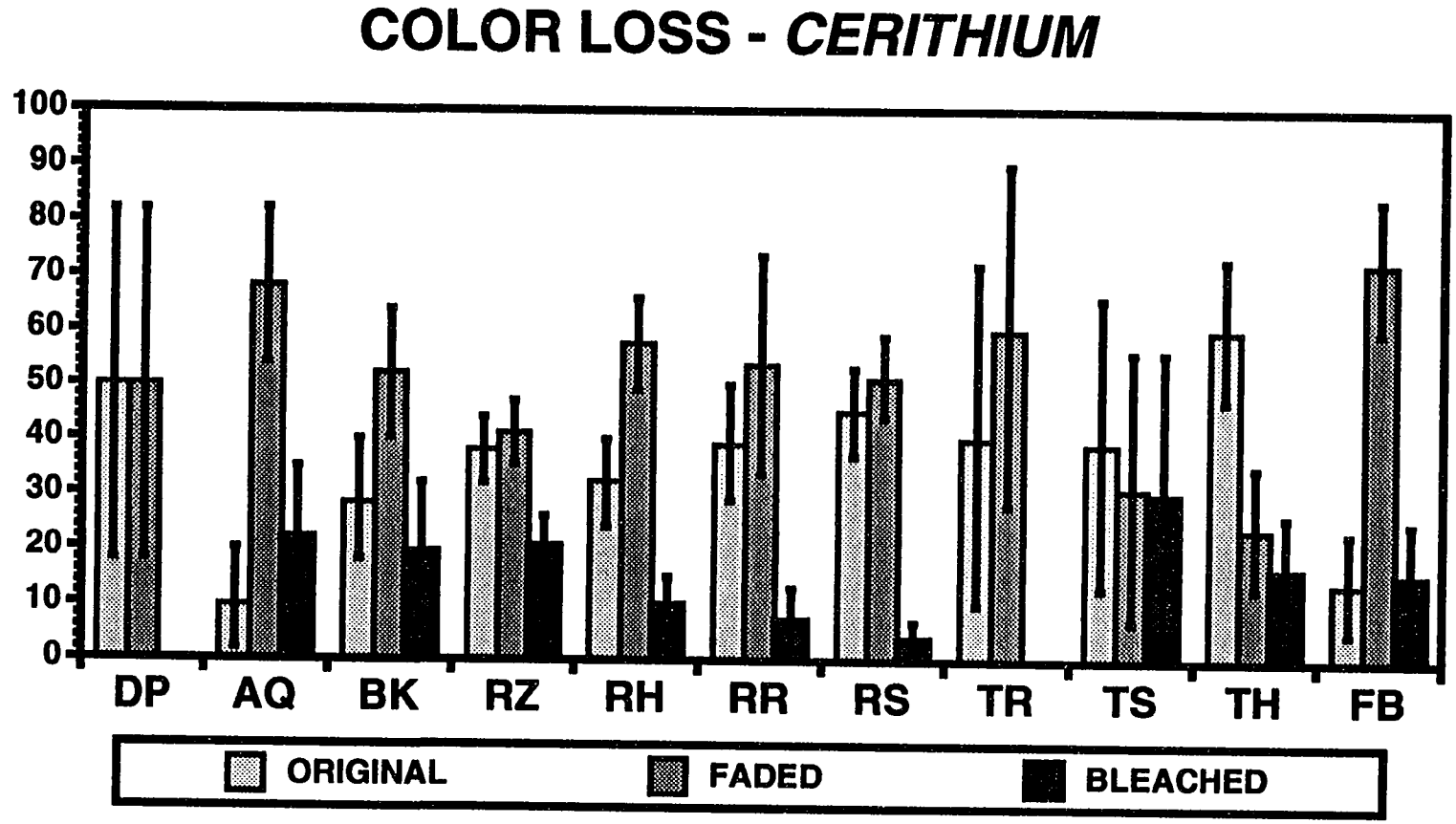


Figure 46. Proportion (percentage) of Cerithium at each station within the three taphonomic ranks (original, faded, and bleached) for color. Error bars represent the 95% confidence intervals.

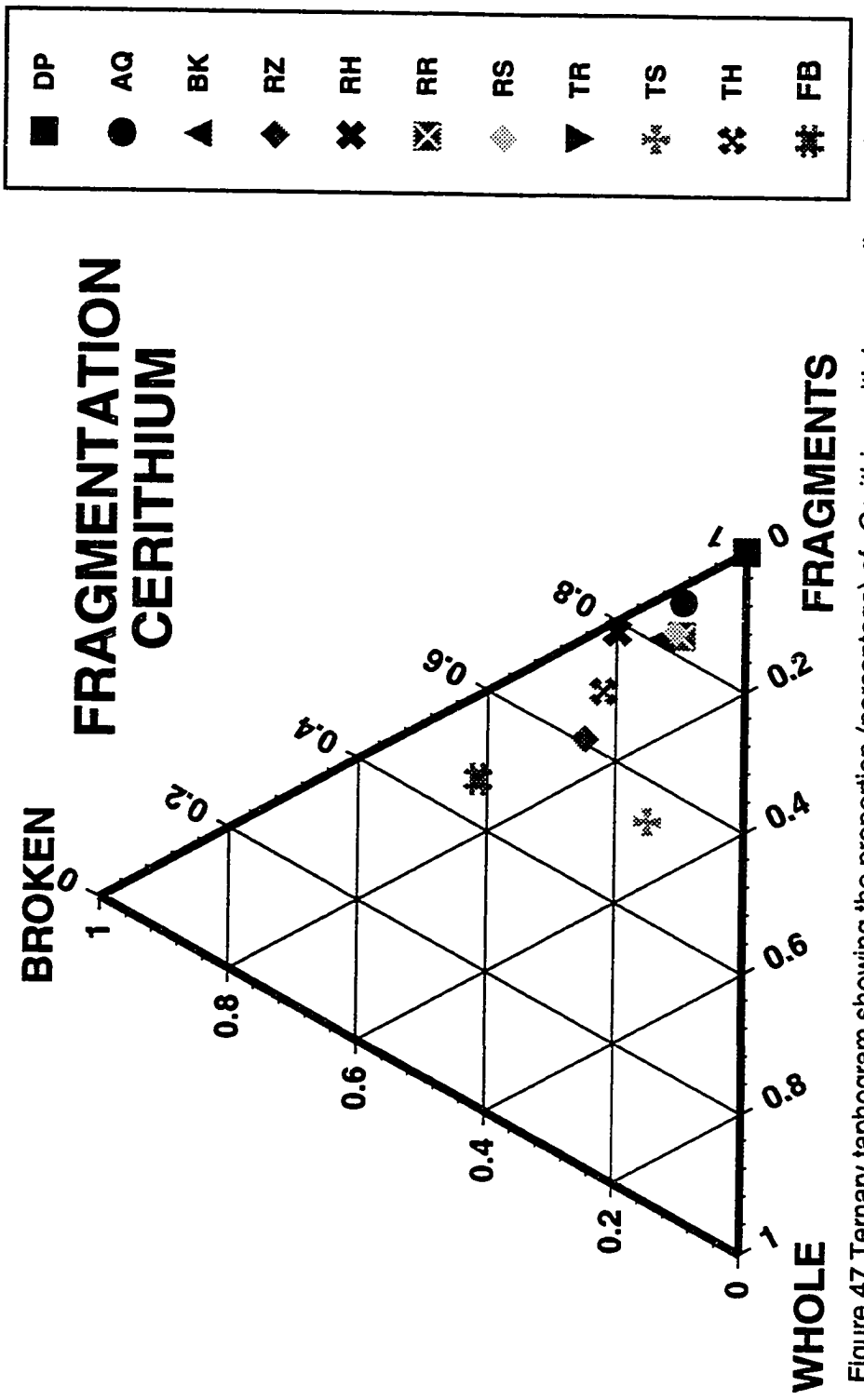


Figure 47 Ternary taphogram showing the proportion (percentage) of *Cerithium* with low, medium, and high fragmentation at each station.

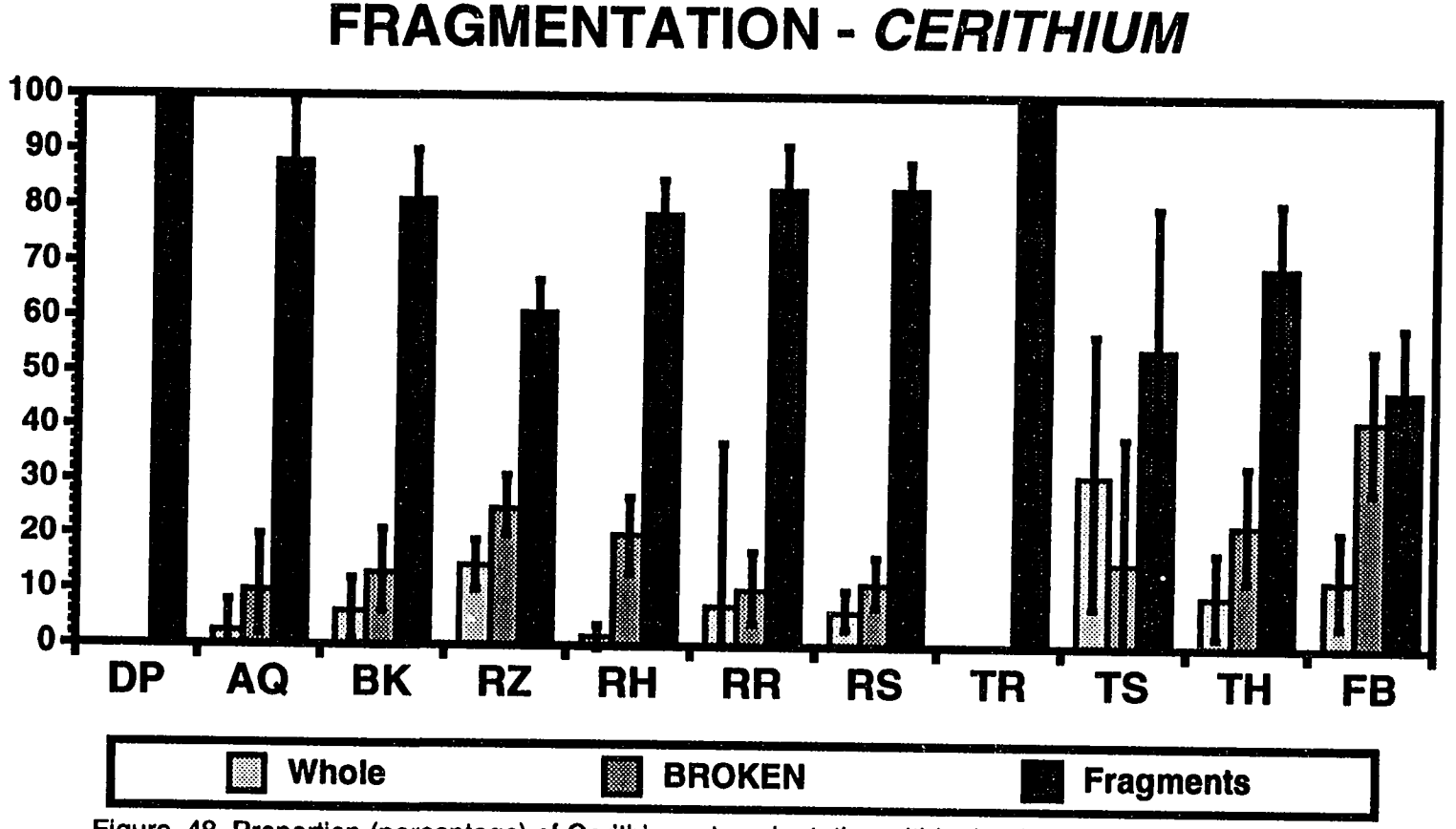


Figure 48. Proportion (percentage) of Cerithium at each station within the three taphonomic ranks (whole shells, broken shells, and shell fragments) for fragmentation. Error bars represent the 95% confidence intervals.

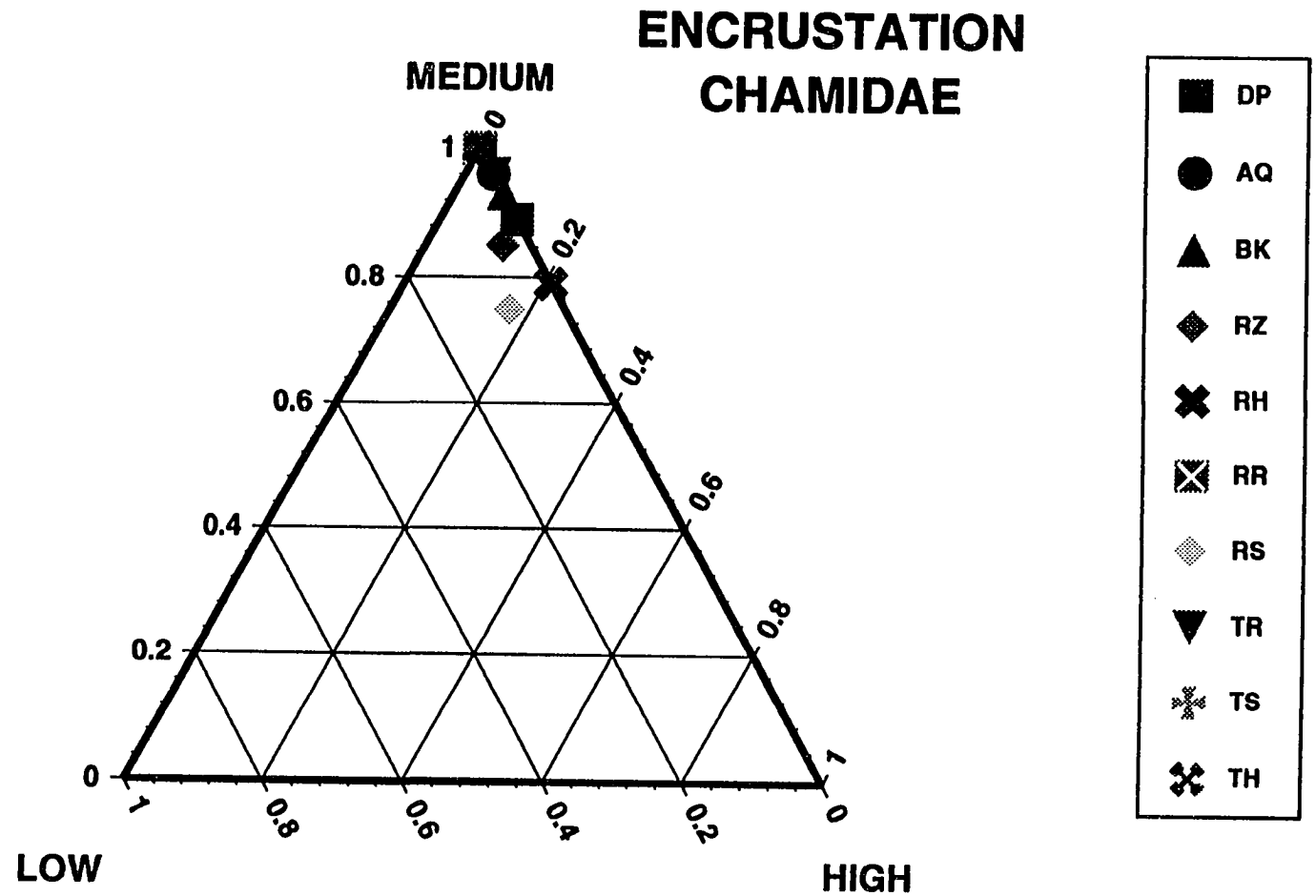


Figure 49. Ternary taphogram showing the proportion (percentage) of Chamidae with low, medium, and high encrustation at each station.

these stations (Figure 50). None of the other stations, except RS and RZ, yielded any shells with low epibiont grow. The majority of the stations had either a medium or high percentage of the shells coated with epibionts. The small proportion of shells with medium and high encrustation in RS marked it as the only station not dominated entirely by moderate encrustation.

Surface Degradation

Chamidae generally showed medium to high surface degradation with the majority sharing high deterioration (Figure 51). Shells with low levels of damage, if present, made up a very small percentage of the total number of Chamidae present (Figure 52). The two exceptions to this pattern were the backreef rubble zone (RZ) and the deep reef flat (DP). The rubble zone had a greater portion of shells with low and medium surface deterioration. Most within-station differences in the proportion of shells were not significant, except for the forereef sand flat (AQ) and transition zone (RR).

Edge Alterations

Figure 53 shows that Chamidae shell samples were concentrated in the area between the medium to high and uneven zones of the ternary diagram. The shells at these stations were mostly well rounded. Some stations, including the forereef sand flat (AQ), reef flat (BK), rubble zone (RZ) and patch reef (TR), had similar proportions of shells with low and moderately altered edges. The backreef stations (RH, RR, and RS) and the deep reef sand flat (DP) exhibited a similar pattern with approximately equal, but limited proportions of shells with slightly and moderately altered edges. Shells with highly altered edges occurred in slightly significantly greater proportions at most stations except the reef flat (BK), rubble zone (RZ), patch reef (TR) and Hawk Channel grassbed (TH; Figure 54).

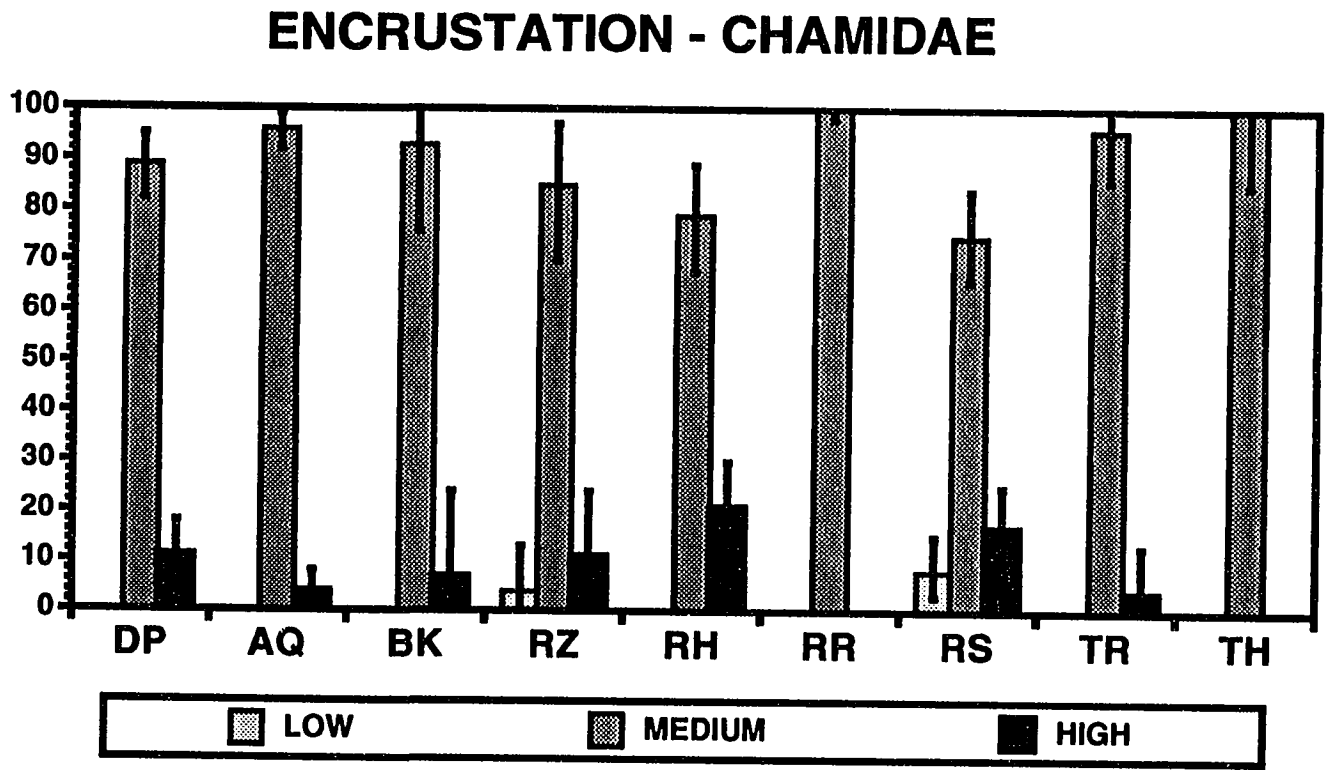


Figure 50. Proportion (percentage) of Chamidae at each station within the three taphonomic ranks (low, medium, or high) for encrustation. Error bars represent the 95% confidence intervals.

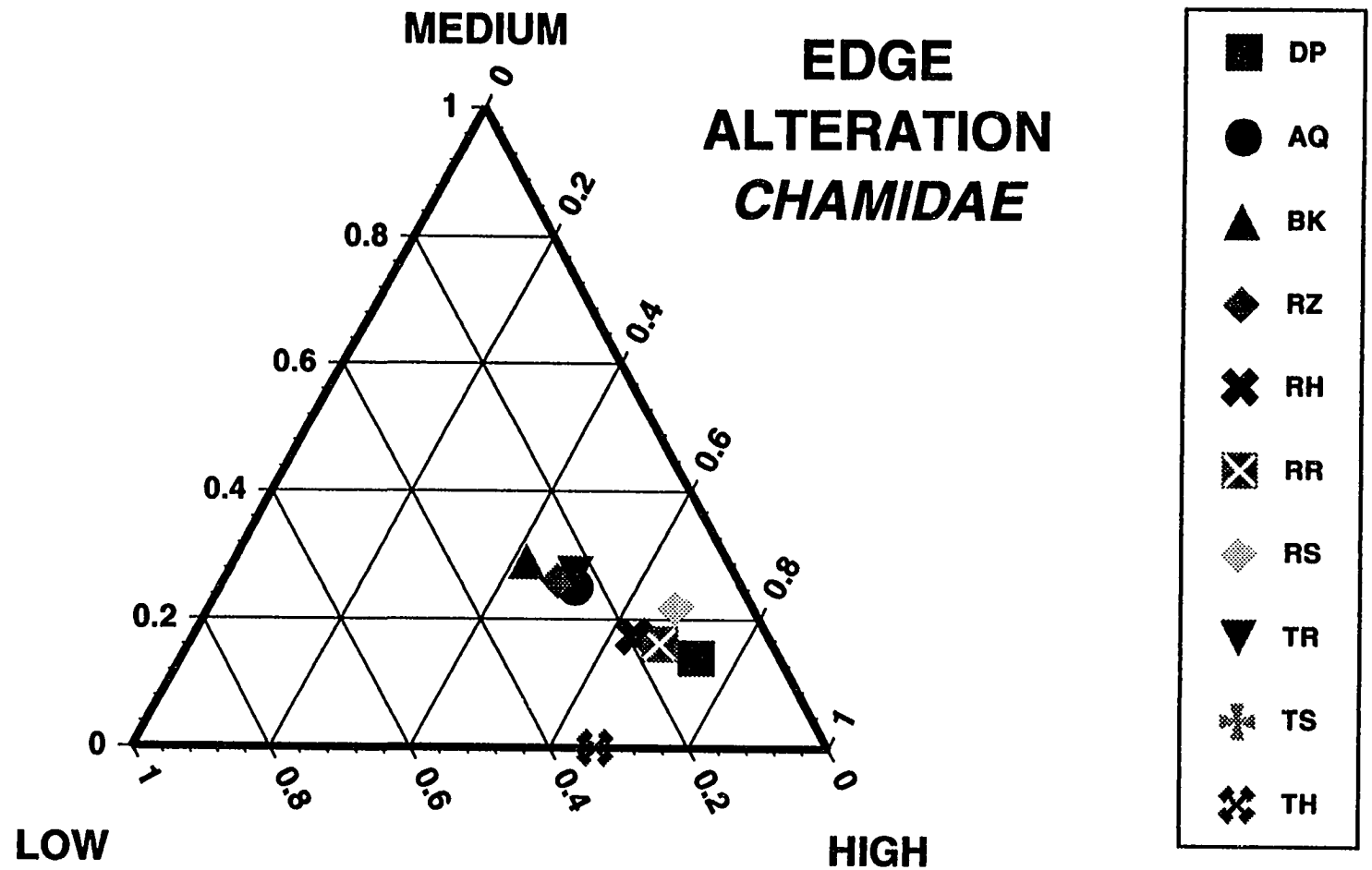


Figure 51. Ternary taphogram showing the proportion (percentage) of Cerithium with low medium, and high edge alteration at each station.

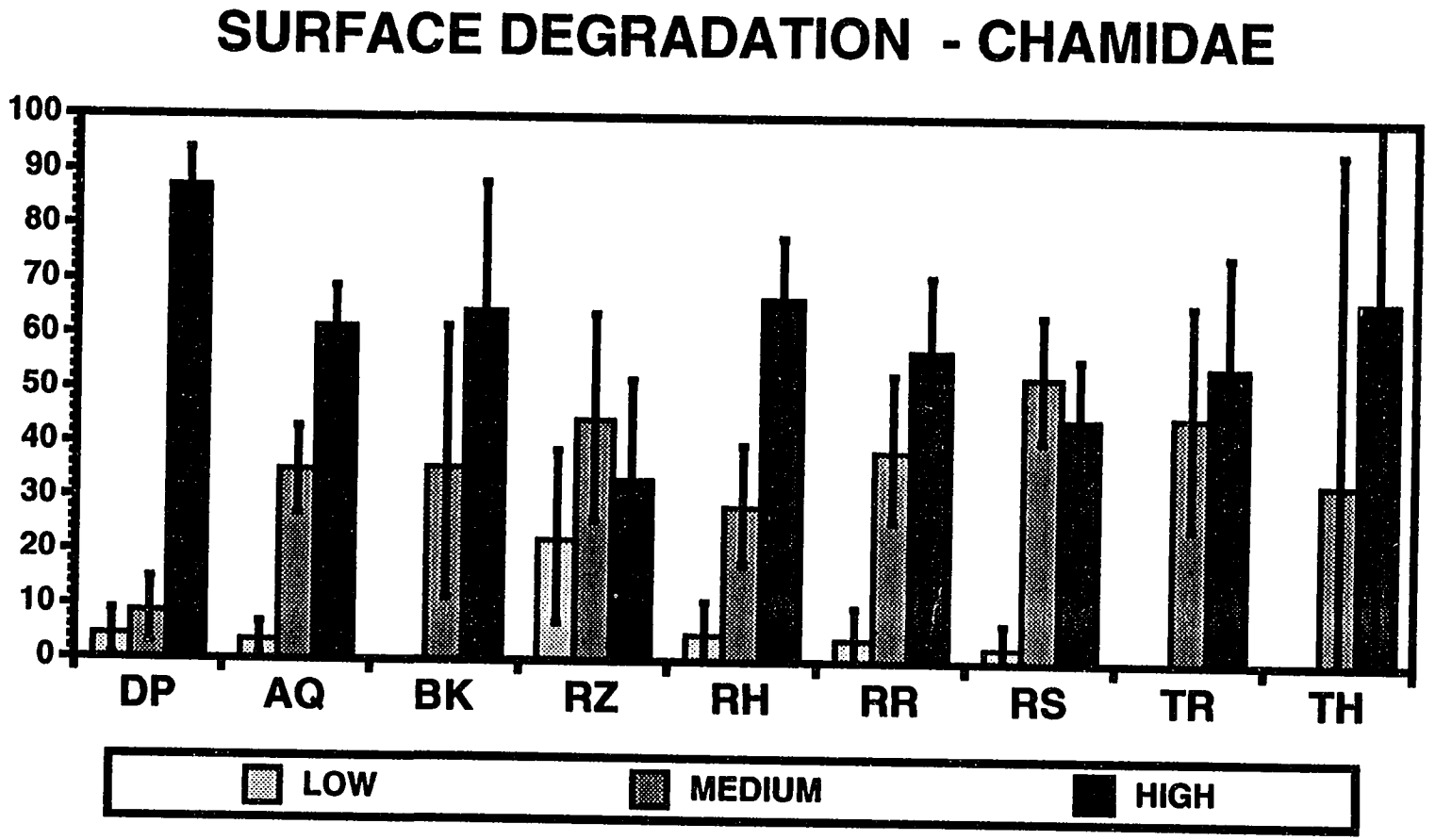


Figure 52. Proportion (percentage) of Chamidae at each station within the three taphonomic ranks (low, medium, or high) of surface degradation. Error bars represent the 95% confidence intervals.

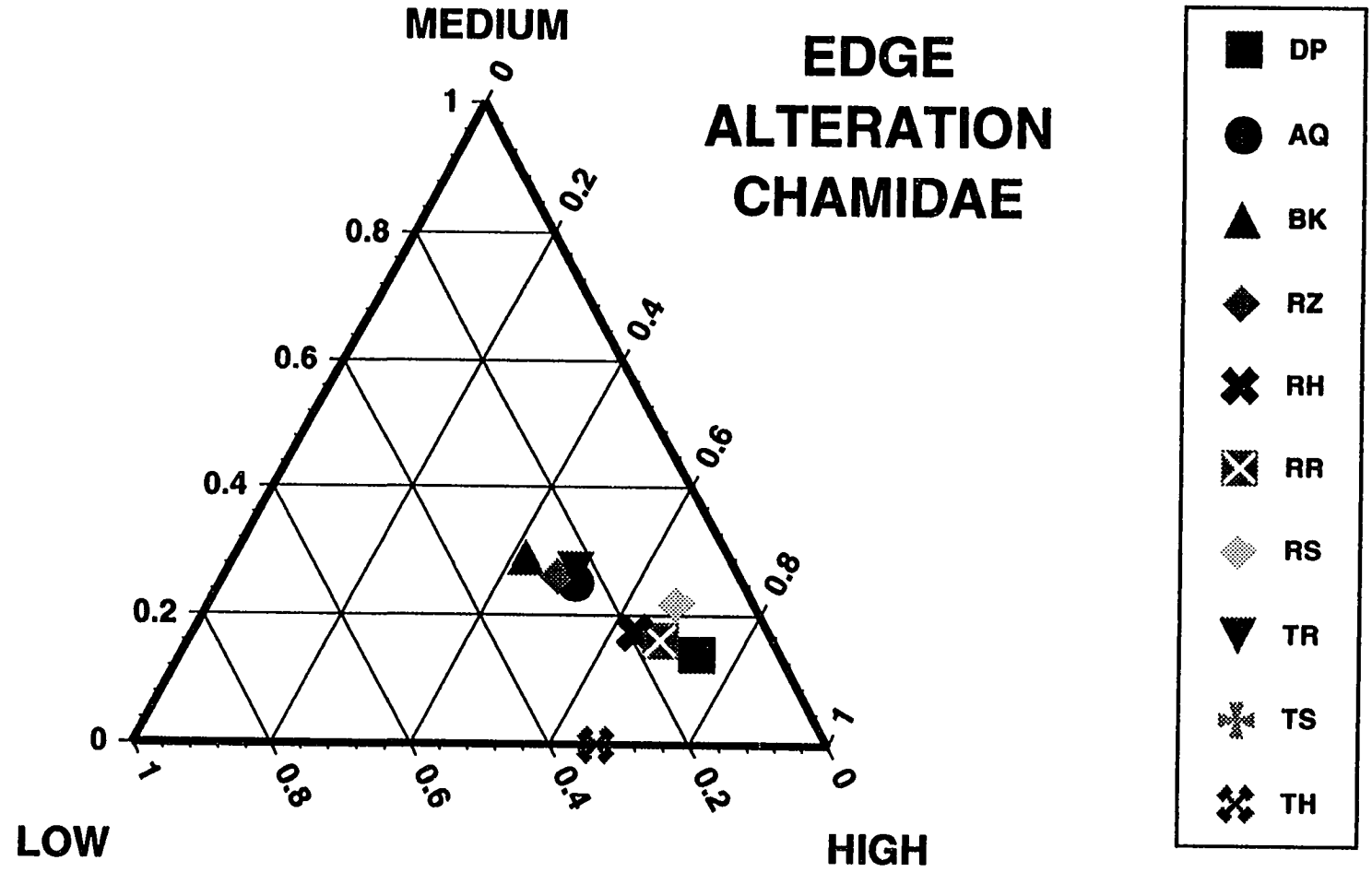


Figure 53. Ternary taphogram showing the proportion (percentage) of Chamidae with low medium, and high edge alteration at each station.

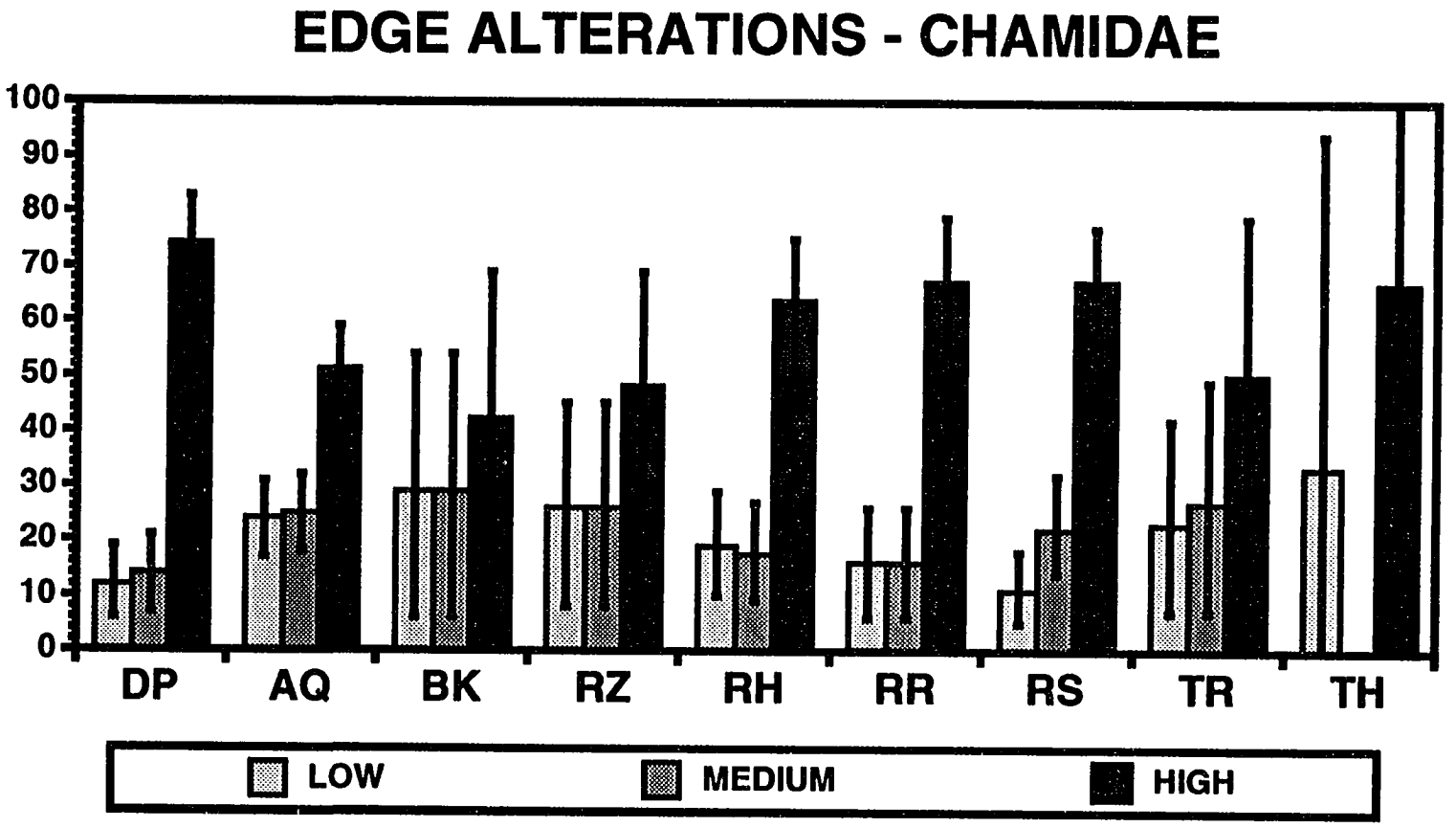


Figure 54. Proportion (percentage) of Chamidae at each station within the three taphonomic ranks (low, medium, or high) for edge alteration. Error bars represent the 95% confidence intervals.

Abrasion

Chamidae shells from the majority of the stations (DP, AQ, BK, RZ, RH, RR, RS, and TR) exhibited mainly minor abrasion (Figure 55). Only the Hawk Channel grassbed (TH) was located within the none to minor part of the taphogram, close to the minor apex. All stations exhibited significantly greater numbers of Chamidae valves with minor abrasion, except TH, where a small sample size (three individuals) prevented a more definitive interpretation (Figure 56).

Color Loss

Chamidae shells tended to retain some color, either in the state or at a faded level (Figure 57). There were significantly fewer shells with poorly preserved color in all outer shelf margin environments except the reef flat (BK) and rubble zone (RZ; Figure 58).

Fragmentation

There are significantly greater numbers of whole Chamidae than there are broken or fragmented shells at each station (Figure 59 and 60). The broken and fragment categories for most stations are statistically indistinguishable.

Tellina

Encrustation

Members of the genus*Tellina* show low to moderate levels of epibiont encrustation (Figure 61). Only a single station (TH) produced any shells with heavy epibiont grow and even there only a very small percentage (< 6%) of the shells were in that category (Figure 62). Four stations, AQ, RZ, RS, and TS have significantly higher proportions of *Tellina* shells with low epibiont grow, and the balance of locations have shells in the low to moderate range. Two

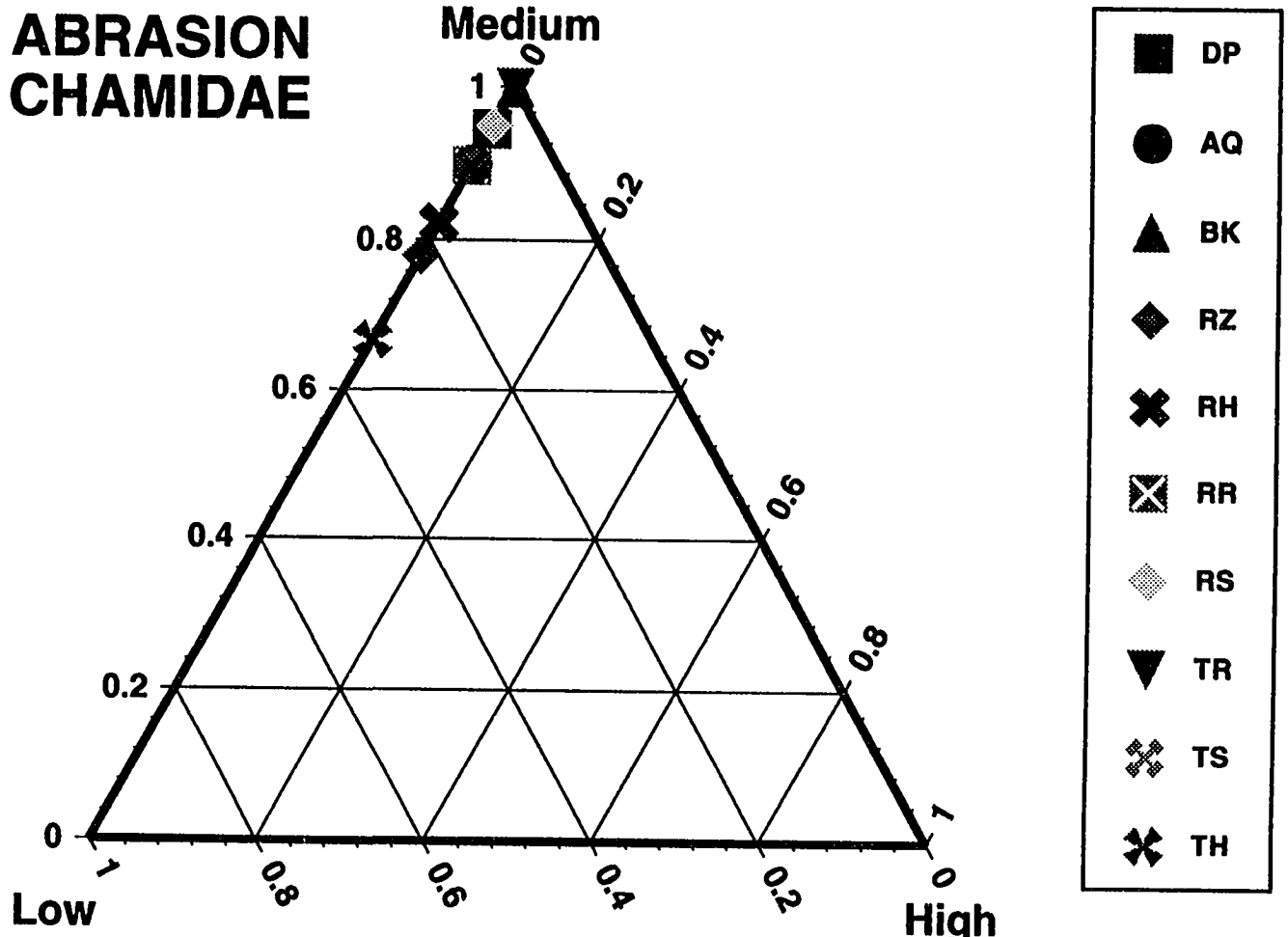


Figure 55. Ternary taphogram showing the proportion (percentage) of Chamidae with no, minor, and major abrasion at each station.

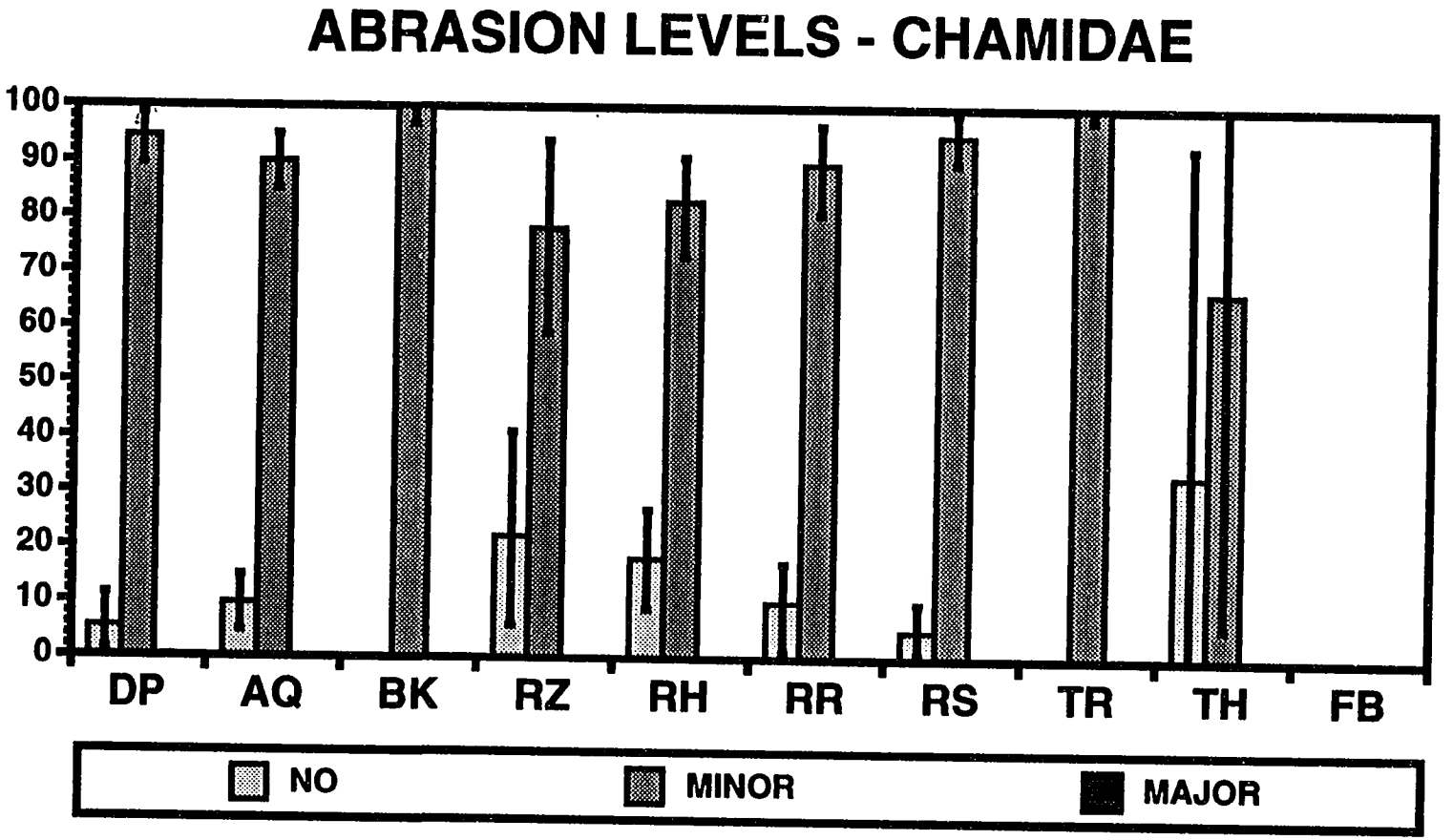


Figure 56. Proportion (percentage) of Chamidae at each station within the three taphonomic ranks (no, minor, and major) for abrasion. Error bars represent the 95% confidence intervals.

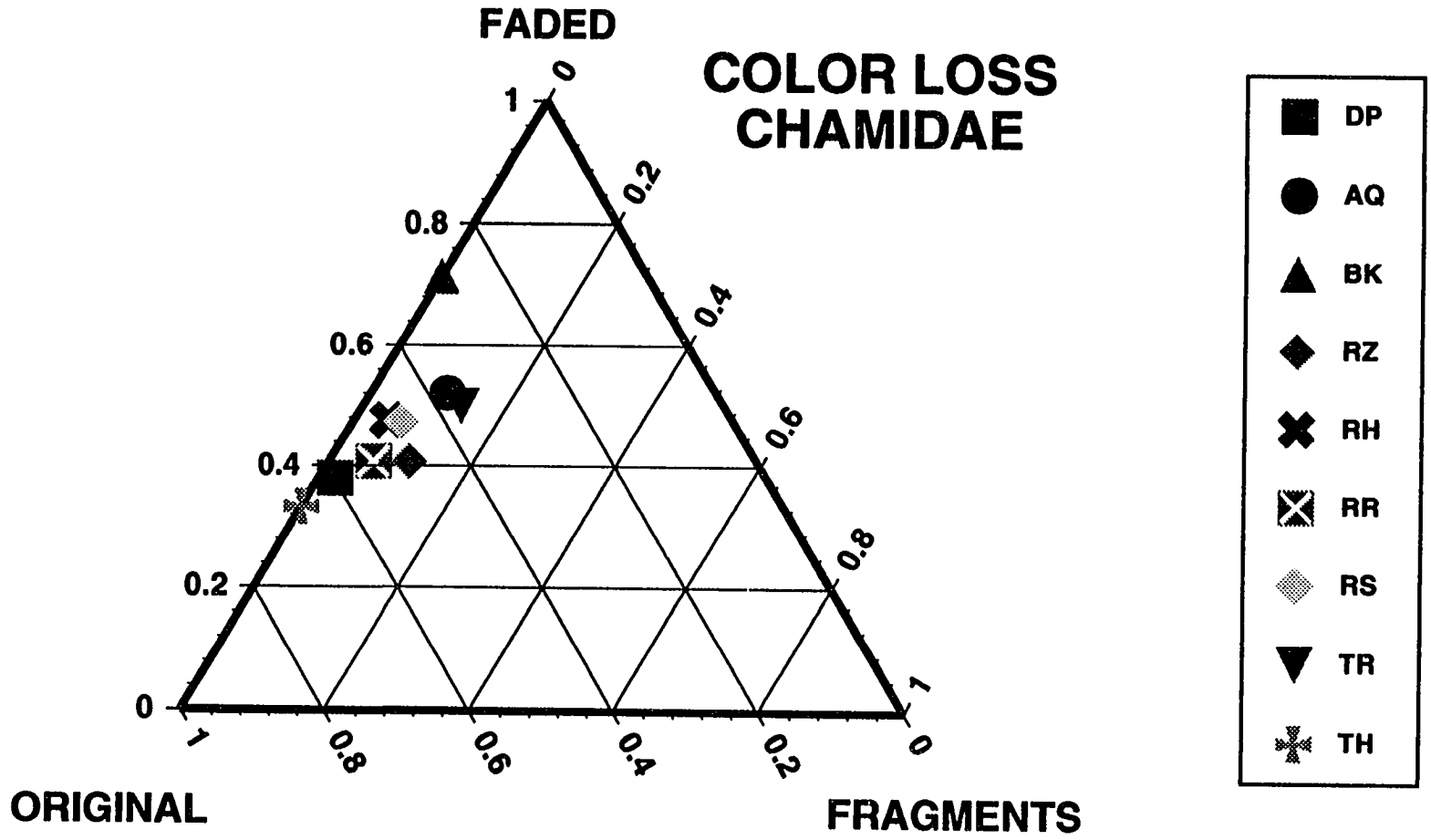


Figure 57. Ternary taphogram showing the proportion (percentage) of Chamidae with original, faded, and bleached color at each station.

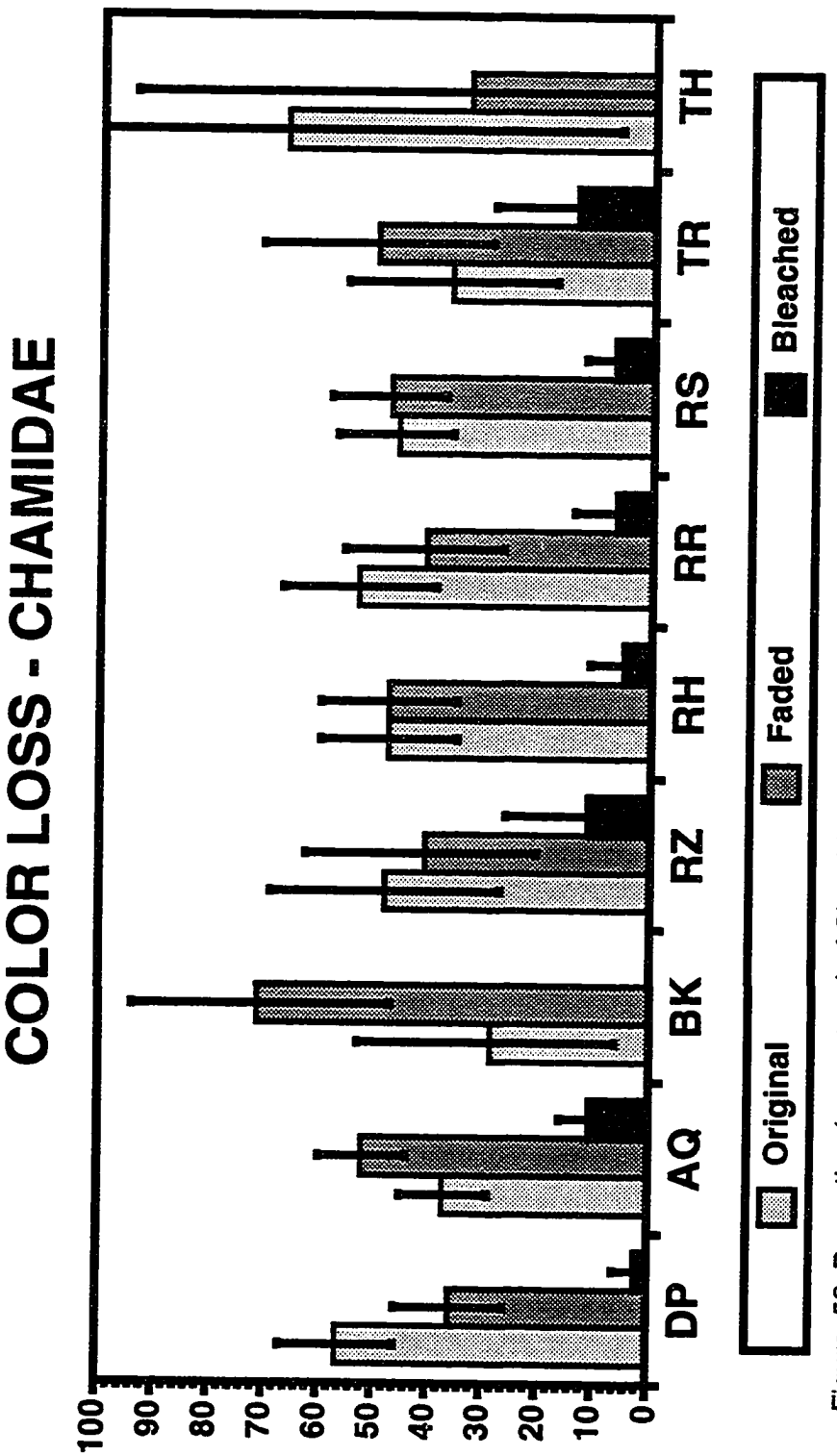


Figure 58. Proportion (percentage) of Chamidae at each station within the three taphonomic ranks (original, faded, and bleached) for color. Error bars represent the 95% confidence intervals.

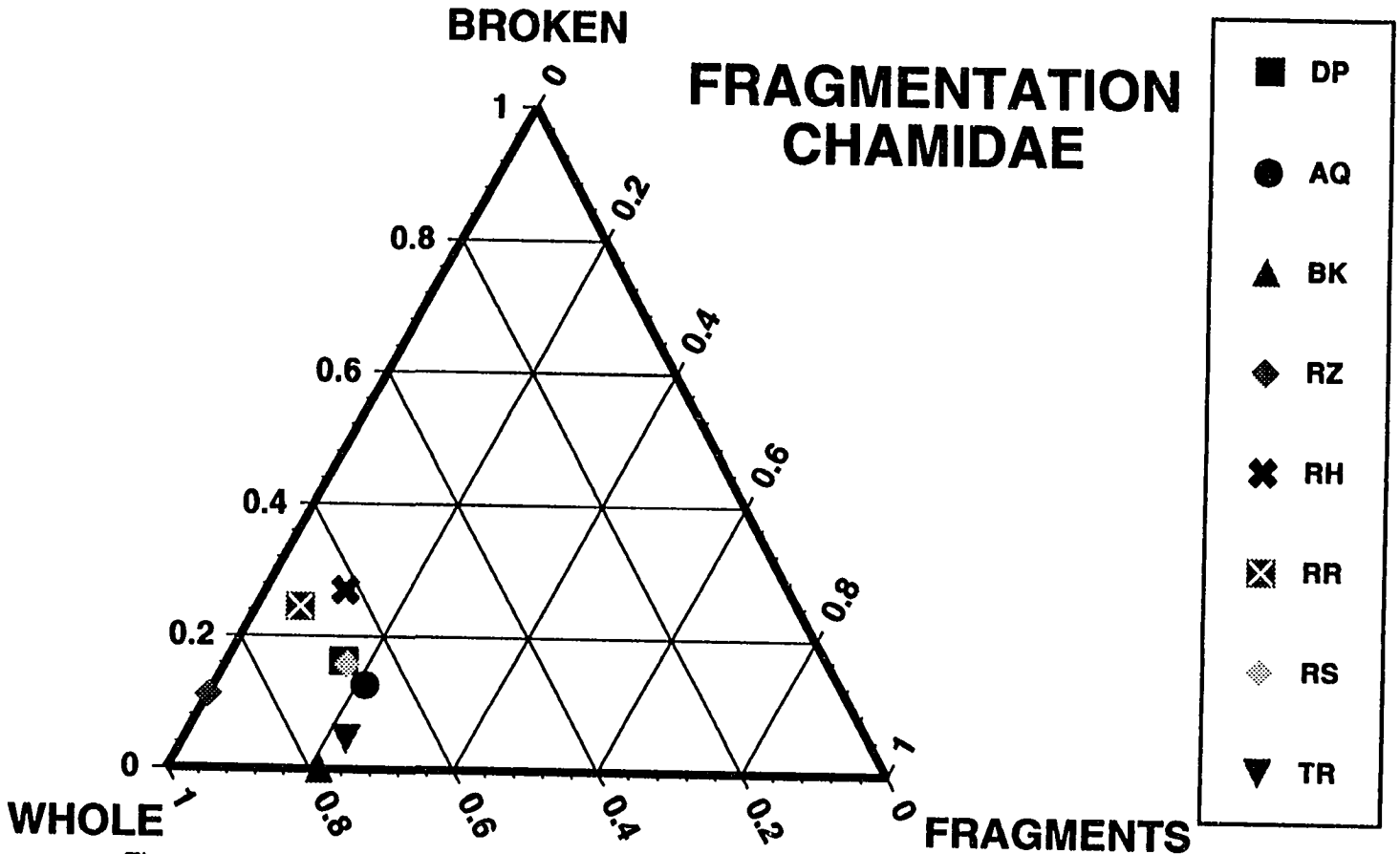


Figure 59. Ternary taphogram showing the proportion (percentage) of Chamidae with low, medium, and high fragmentation at each station.

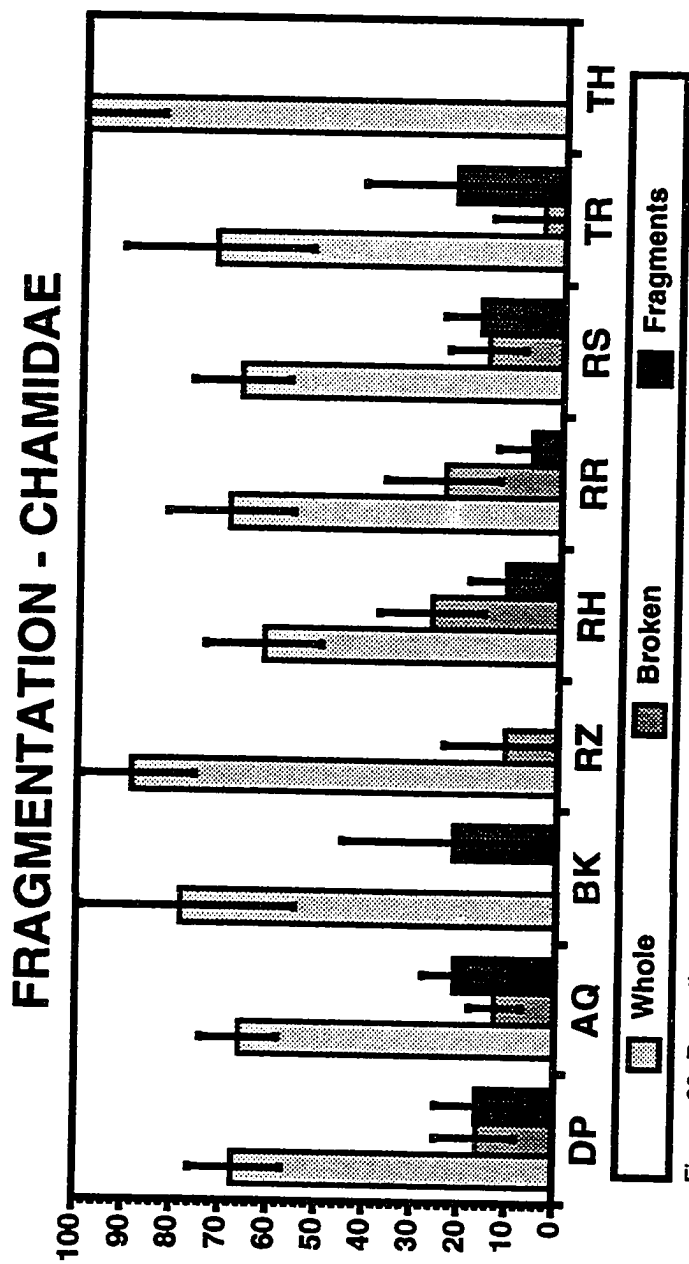


Figure 60. Proportion (percentage) of Chamidae at each station within the three taphonomic ranks (low, medium, and high) for fragmentation. Error bars represent the 95% confidence intervals.

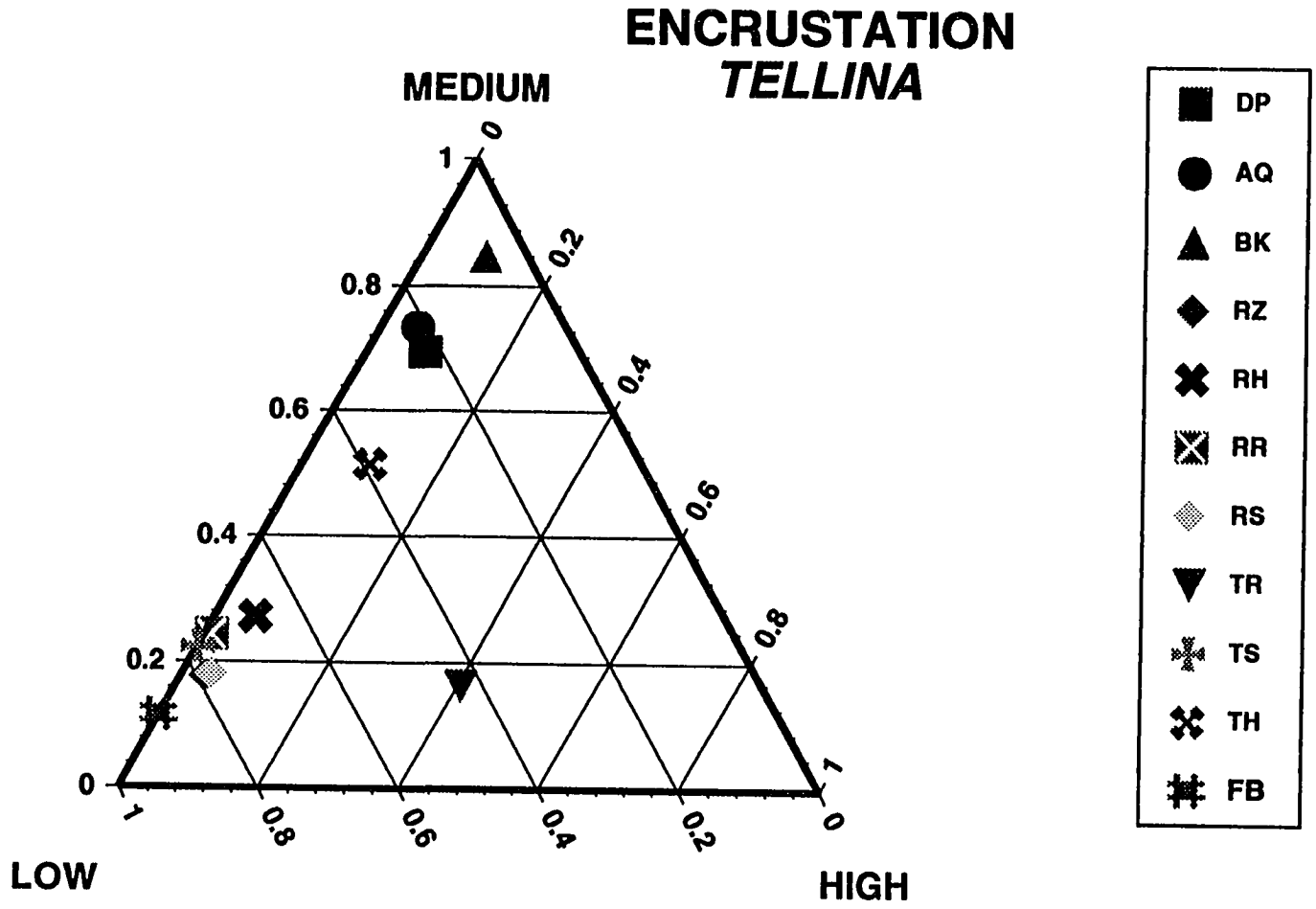


Figure 61. Ternary taphogram showing the proportion (percentage) of *Tellina with* low, medium, and high encrustation at each station.

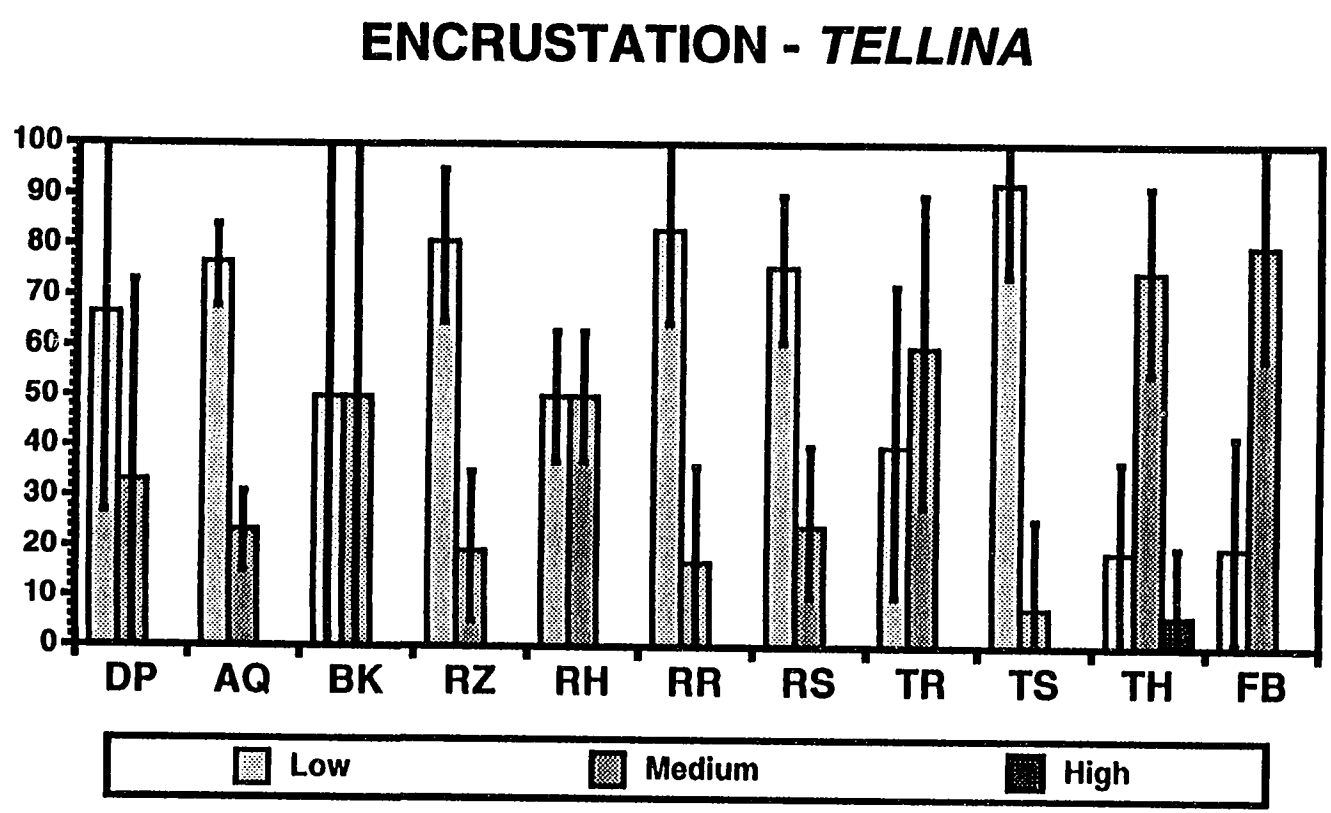


Figure 62. Proportion (percentage) of *Tellina* at each station within the three taphonomic ranks (low, medium, or high) for encrustation. Error bars represent the 95% confidence intervals.

stations, Florida Bay (FB) and the Hawk Channel grassbed (TH), predominately moderate encrustation.

Surface Degradation

The range of surface degradational states in tellin valves varied quite widely among stations (Figure 63). The forereef sand flat (AQ) had significantly greater percentages of shells with low and moderate surface damage; only a few shells had highly deteriorated surfaces (Figure 64). The backreef rubble zone (RZ) also had larger proportion of tellins with low surface degradation, with fewer shells in the other categories. These differences, however, were not significant . Shells from the adjacent stations (RH, RR and RS) tended to show moderate and high surface deterioration. There were significantly fewer shells with low levels of surface degradation at both the backreef grassbed (RH) and transition zone (RR). Moderate surface degradation dominates the remaining stations (TR, TH, and FB).

Figures 65 and 66 showed the results of separating *T. similis* and *T. gouldi* from the combined *Tellina* data. The two species had similar signatures of surface degradation at the forereef station (AQ) and the patch reef (TR), but exhibited different patterns at the remaining stations. *T. similis* had its greatest numerical abundance and shows significantly greater percentages of low and moderately deteriorated shells on the forereef sand flat (AQ; Figure 67). This bivalve was absent from the reef flat (BK) and backreef rippled sand (RS) stations and then reoccured in low numbers through the backreef and into Hawk Channel (Table 9). Where it was found, there was only low to moderate degradation of the shells surface, except for a small percentage of highly deteriorated shells form the unvegetated bottom in Hawk Channel (TS). *T. gouldi* occurred continuously from the forereef sand flat (AQ) to the patch reef

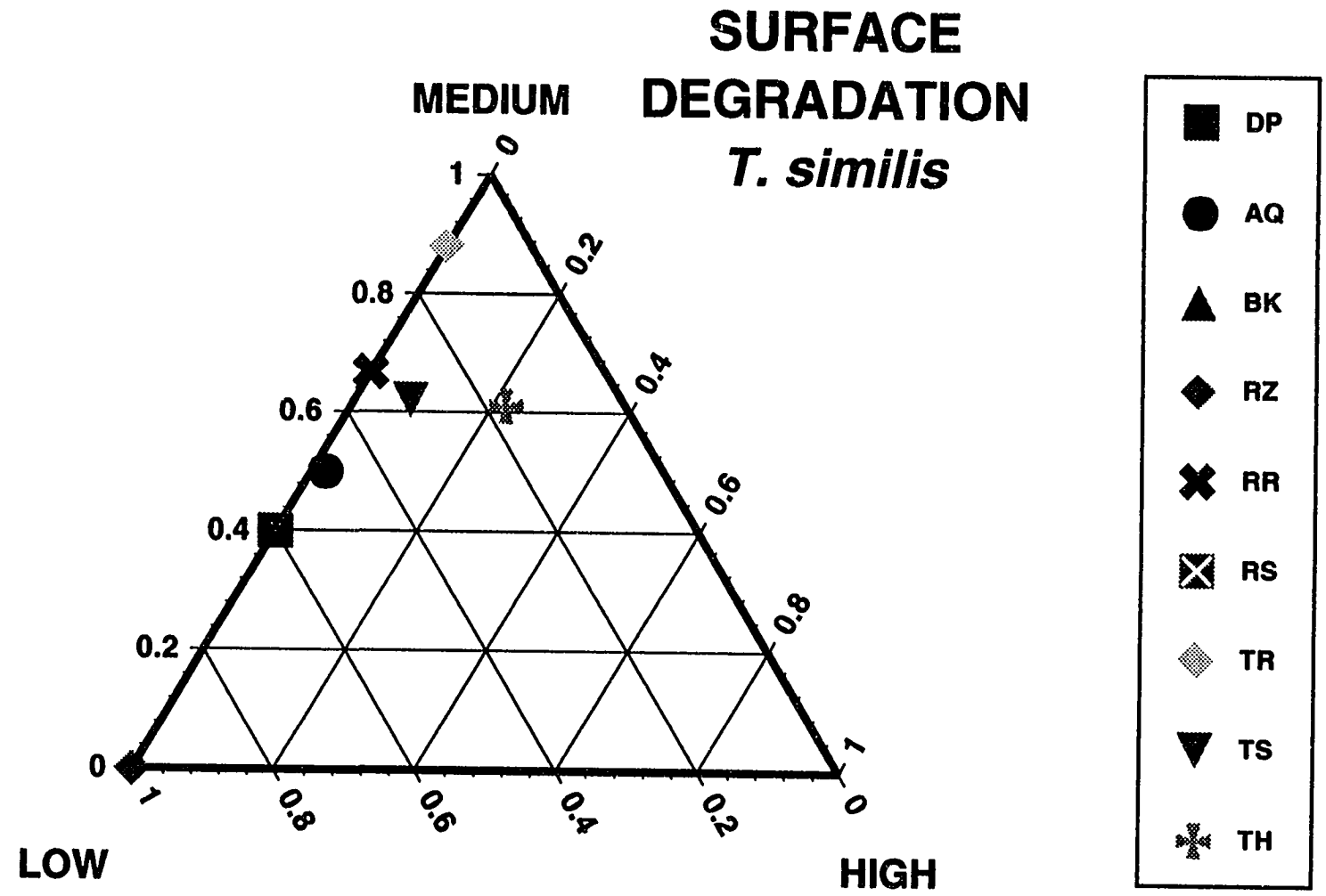


Figure 63. Ternary taphogram showing the proportion (percentage) of *Tellina* with low, medium , and high surface degradation at each station.

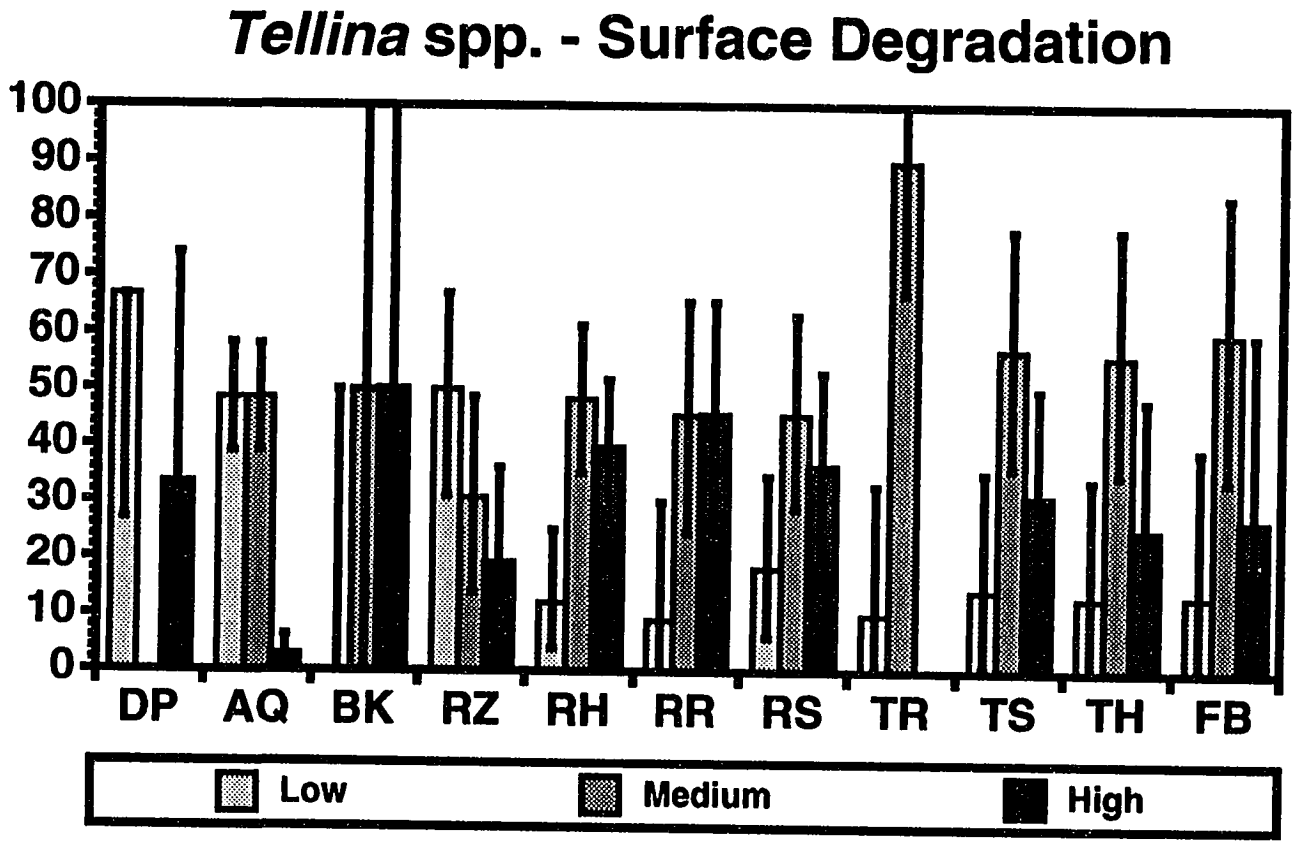


Figure 64. Proportion (percentage) of Tellina at each station within the three taphonomic ranks (low, medium, or high) of surface degradation. Error bars represent the 95% confidence intervals.

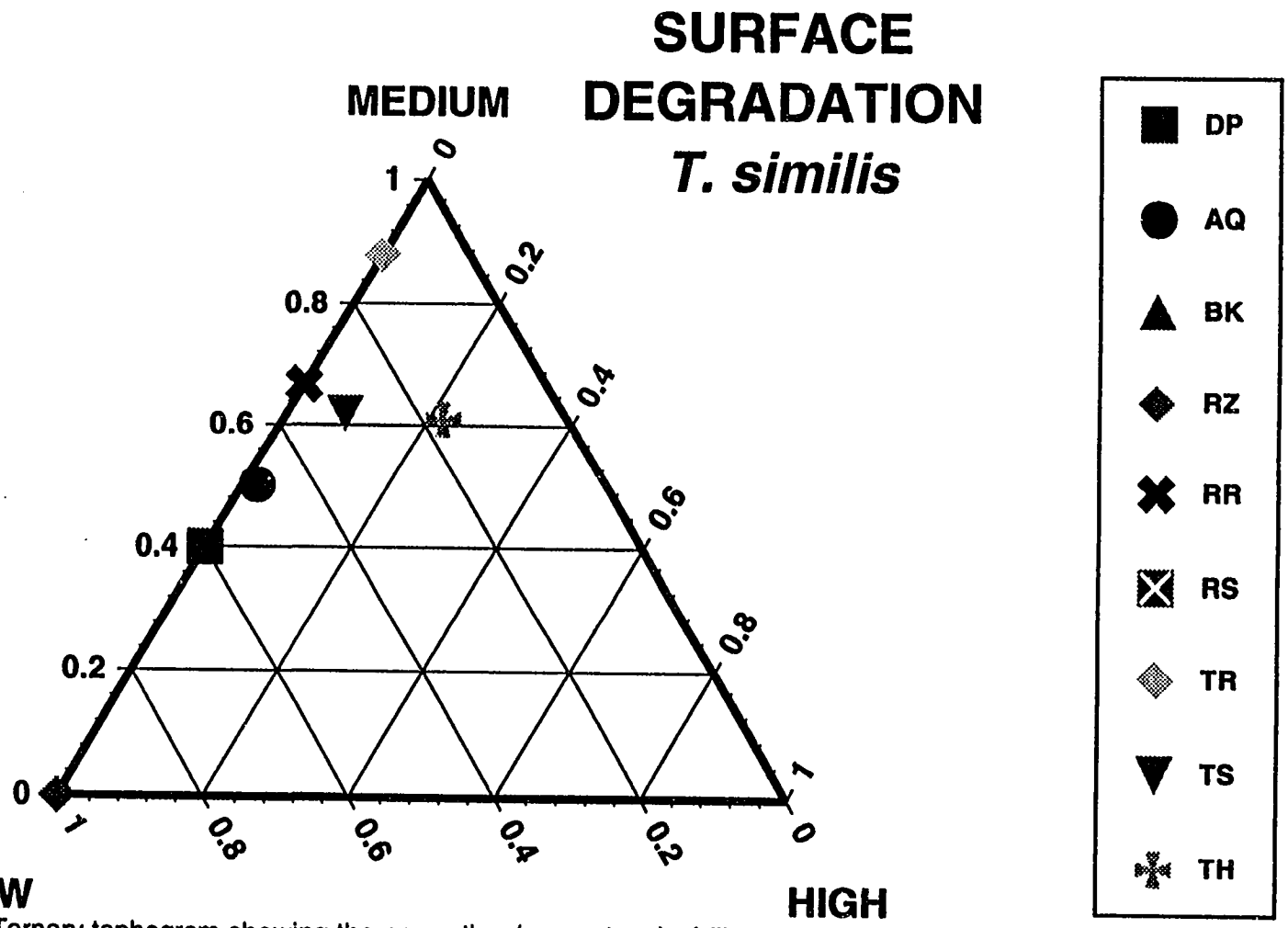


Figure 65. Ternary taphogram showing the proportion (percentage) of *T. similis* with low, medium, and high surface degradation at each station.

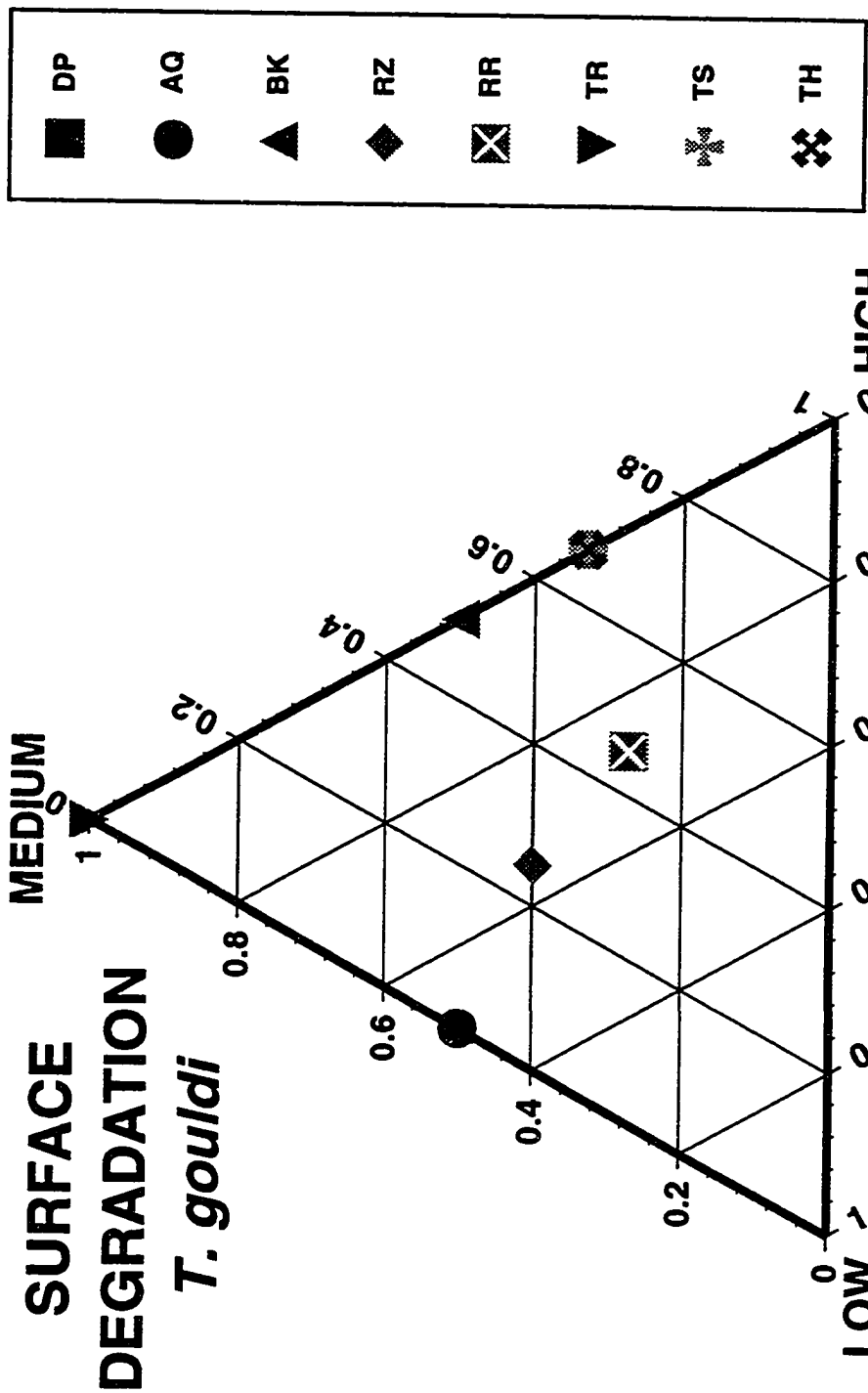


Figure 66. Ternary taphogram showing the proportion (percentage) of T. gouldi with low, medium, and high surface degradation at each station.

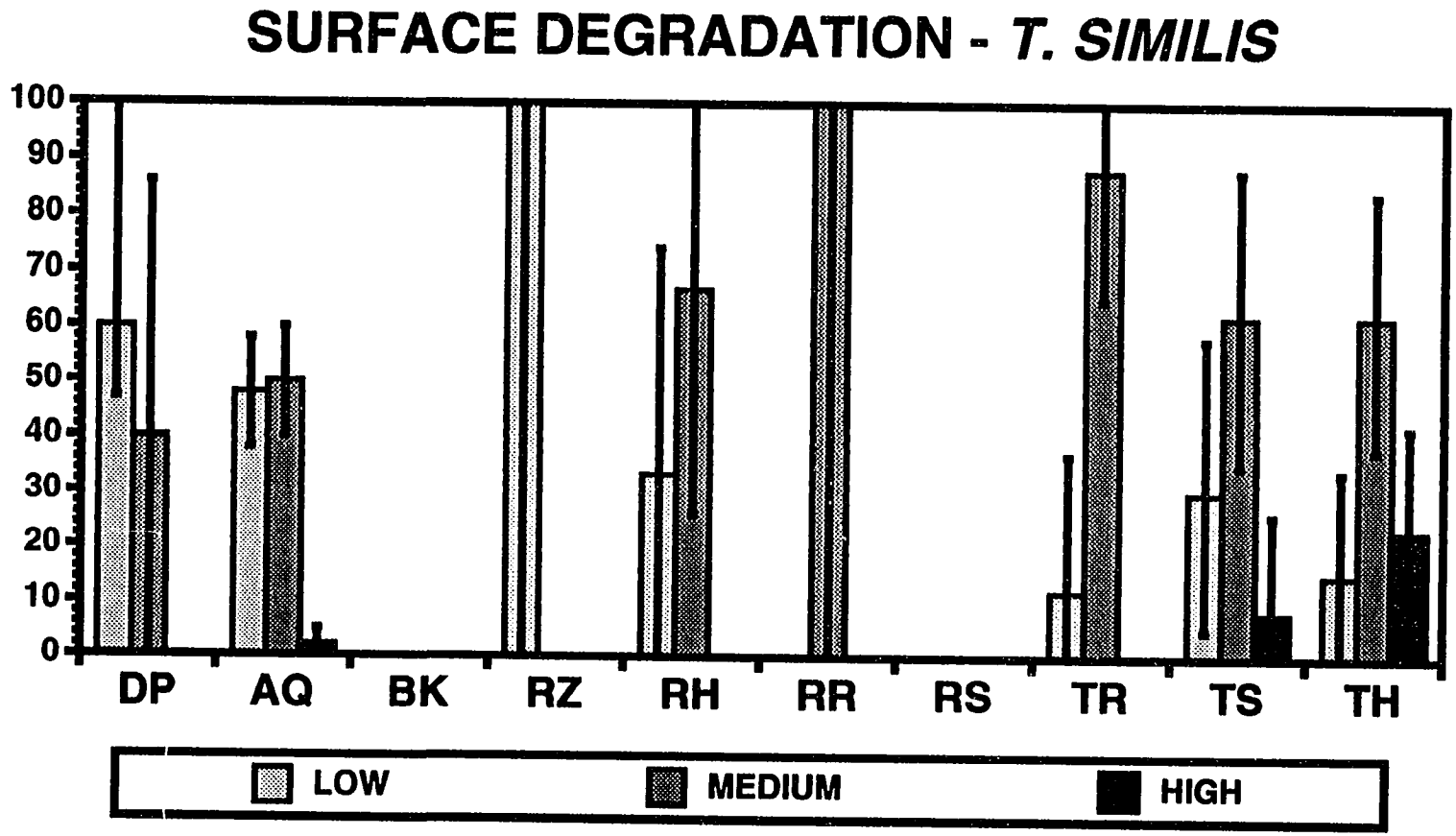


Figure 67. Proportion (percentage) of *T. similis* at each station within the three taphonomic ranks (low, medium, or high) of surface degradation. Error bars represent the 95% confidence intervals.

Table 9. Allochthonous mollusc species collected from the deep reef sand flat (DP). Depth ranges based on Abbott (1974), Andrews (1979) and Rehder (1981).

Species	Depth (m)
A. imbricata	0.6 - 6.0
A. zebra	0.6 - 6.0
B. domingensis	0.6 - 4.6
B. cancellaria	0.6 - 7.6
C. cancellata	0 - 20
Laevicardium laevigatum	0.6 - 20
Tellina mera	0.3 - 15
Hipponix antiquatus	"Intertidal on rocks and coral"
C. eburneum	"shallow, sandy water"
C. litteratum	"marine grass just below tidal level"

(TR) in Hawk Channel (Figure 68). This species showed low and moderate proportions of degradation in the forereef (AQ) and the backreef grassbed (TH), and a relatively even distribution of all conditions in the rubble zone (RZ), transition zone (RR), and rippled sand (RS). Reef flat (BK) specimens of *T. gouldi* had modeate to high levels of surface degradation. .

Edge Alterations

The forereef sand flat (AQ) had significantly greater numbers of shells with low edge alterations compared to the medium and high categories (Figure 69). The deep reef flat (DP) also has a nonsignificantly greater number of tellin valves with unaltered edges. The backreef stations show a similar pattern, plotting in the uneven and mixed regions of the taphogram (Figure 70). An intriguing, although nonsignificant, set of distribution patterns are seen in the Hawk Channel and Florida Bay samples. The patch reef (TR) showed a stepwise pattern in the proportions in the three categories with low surface degradation dominant. Moving closer to the Keys, the grassbed (TH), had equal proportion of shells in each category, while in Florida Bay (FB), there is a stepwise pattern with high degradation dominating.

When the two primary tellin species were evaluated separately (Figures 71 and 72) the shells of *T. gouldi* exhibited medium and or high degrees of edge alteration (e.g. AQ, RZ, and RH), indicating that *T. gouldi* shells were generally more degraded than those of *T. similis* in areas where they co-occurred. Figures 73 and 74 also illustrates these differences in the proportions of the three grades of edge rounding between the two species.

Abrasion

Tellina eshibited a spectrum of abrasion states along the no to minor continuum on the taphogram (Figure 75). However, the deep reef flat (DP) and

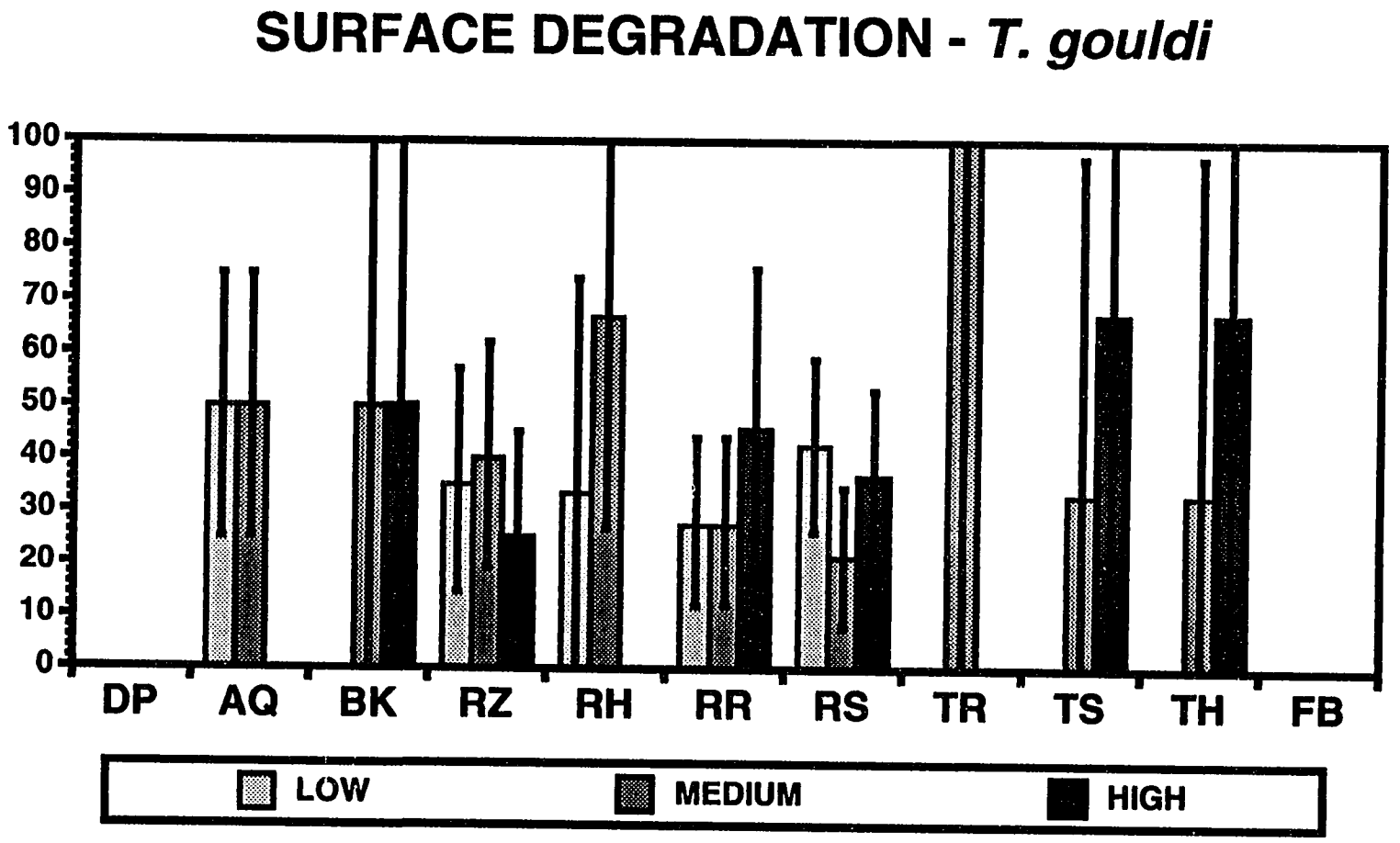


Figure 68. Proportion (percentage) of *T. gouldi* at each station within the three taphonomic ranks (low, medium, or high) of surface degradation. Error bars represent the 95% confidence intervals.

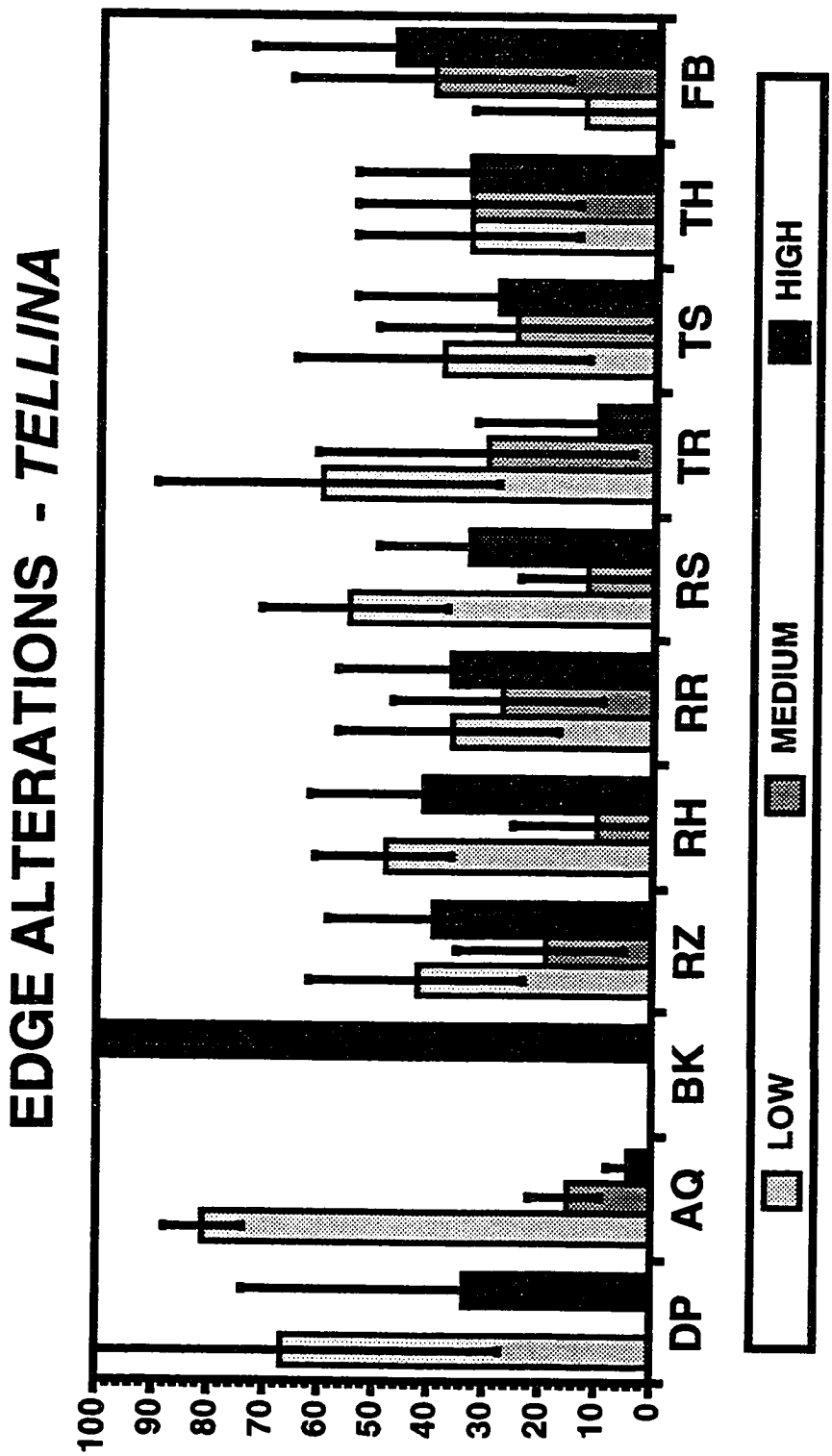


Figure 69. Proportion (percentage) of Tellina at each station within the three taphonomic ranks (low, medium, or high) for edge alteration. Error bars represent the 95% confidence intervals.

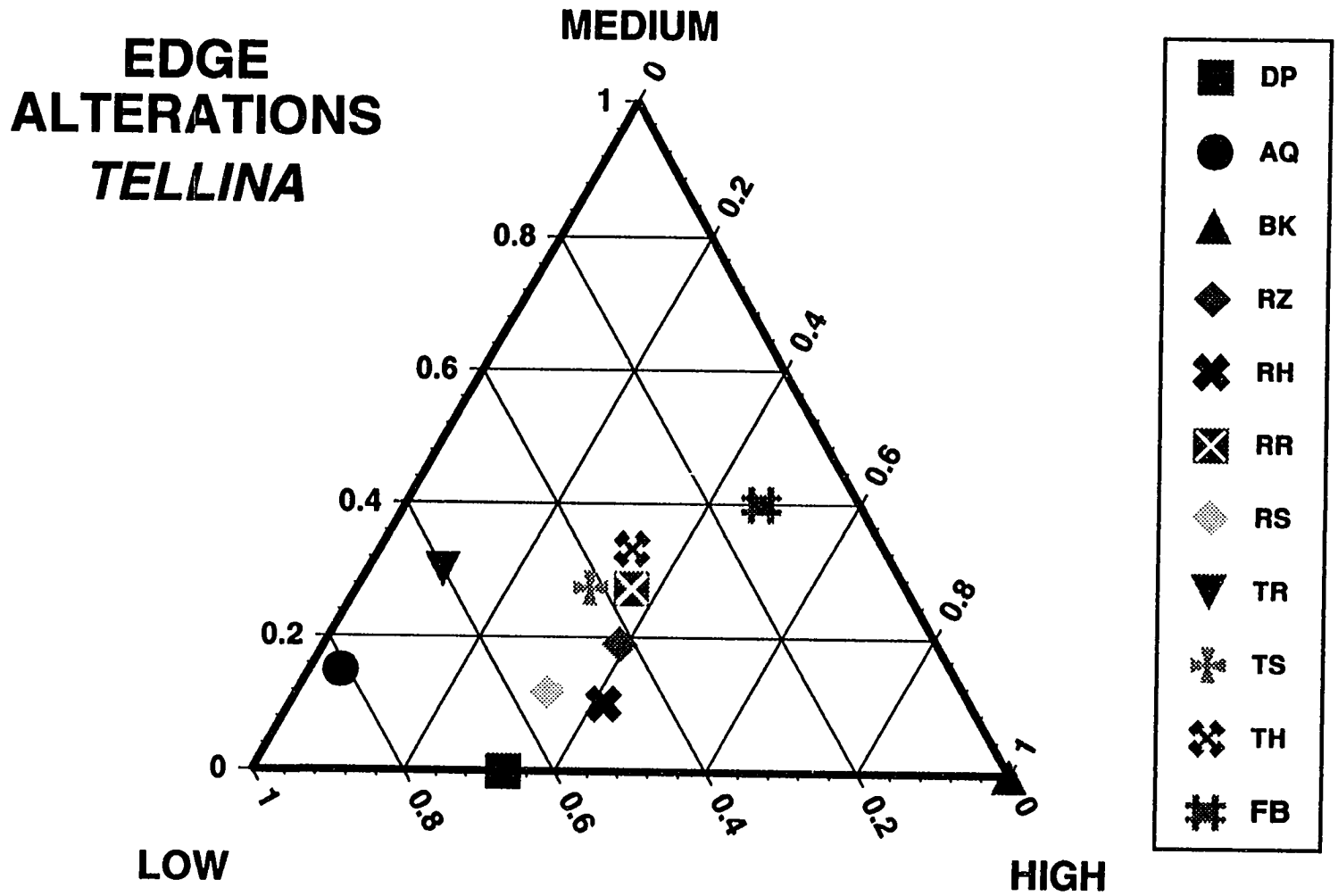


Figure 70. Ternary taphogram showing the proportion (percentage) of Tellina with low, medium, and high edge alteration at each station.

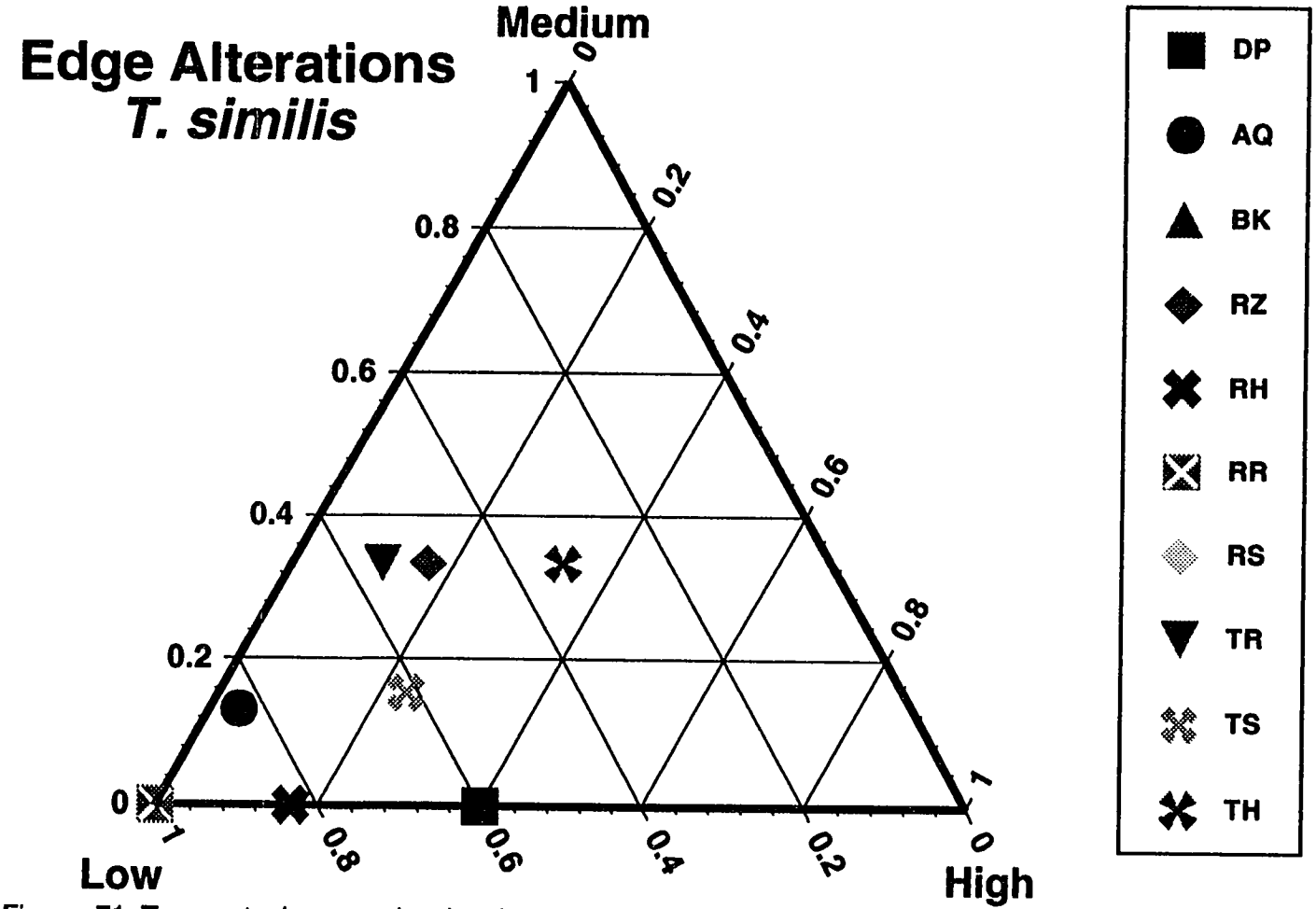


Figure 71. Ternary taphogram showing the proportion (percentage) of T. similis with low, medium , and high edge alteration at each station

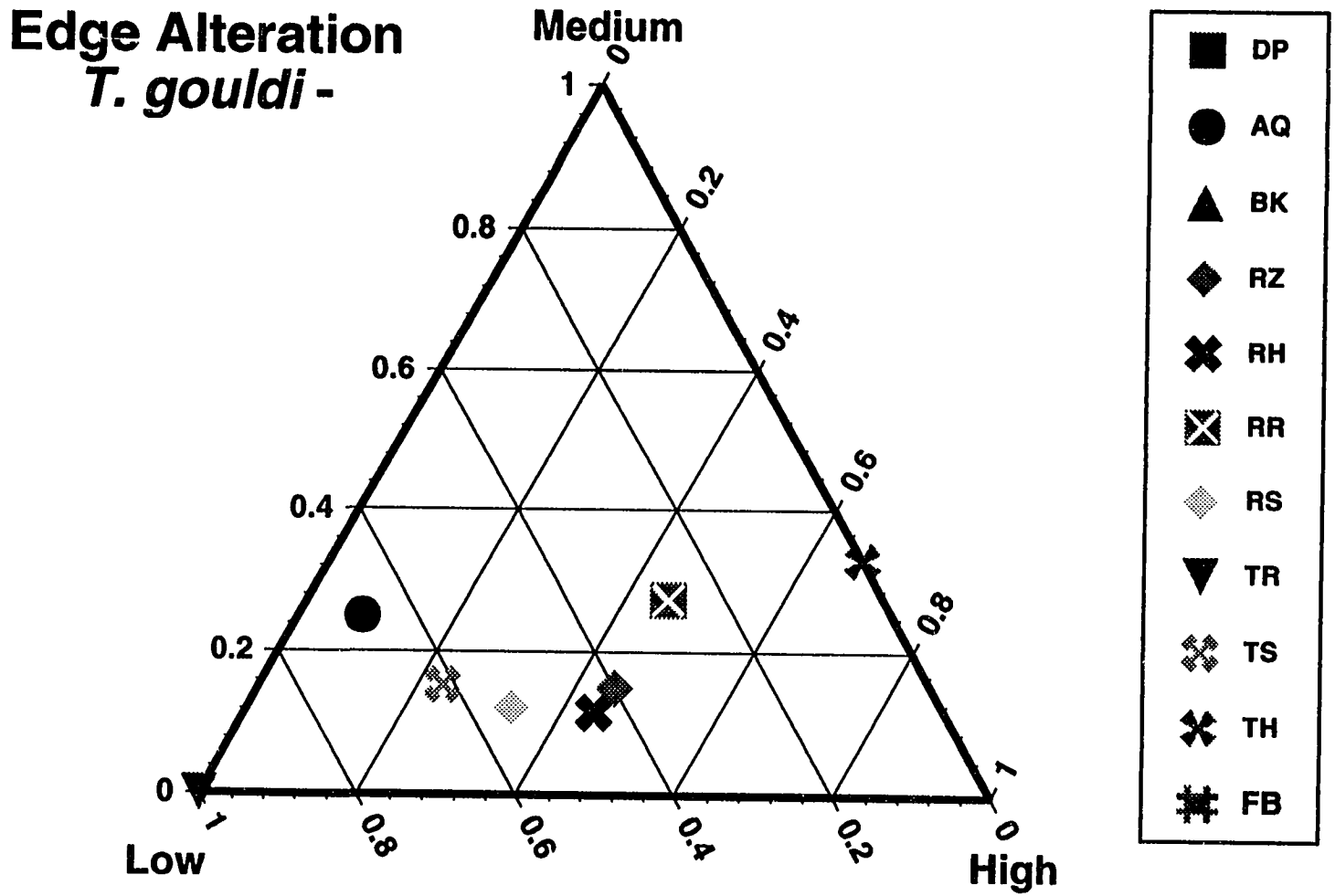


Figure 72 Ternary taphogram showing the proportion (percentage) of T. gouldi with low, medium , and high edge alteration at each station

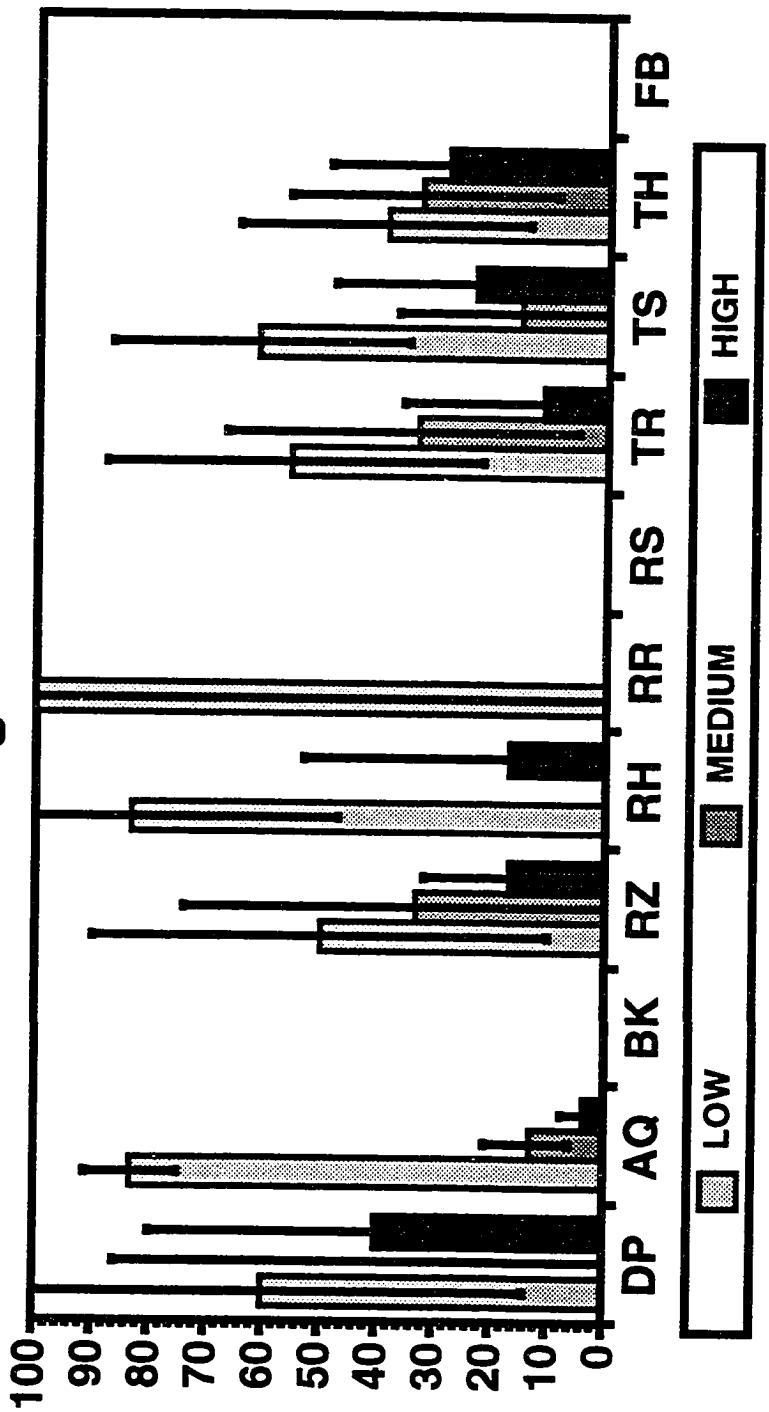


Figure 73. Proportion (percentage) of T. similis at each station within the three taphonomic ranks (low, medium, or high) of edge alteration. Error bars represent the 95% confidence intervals.

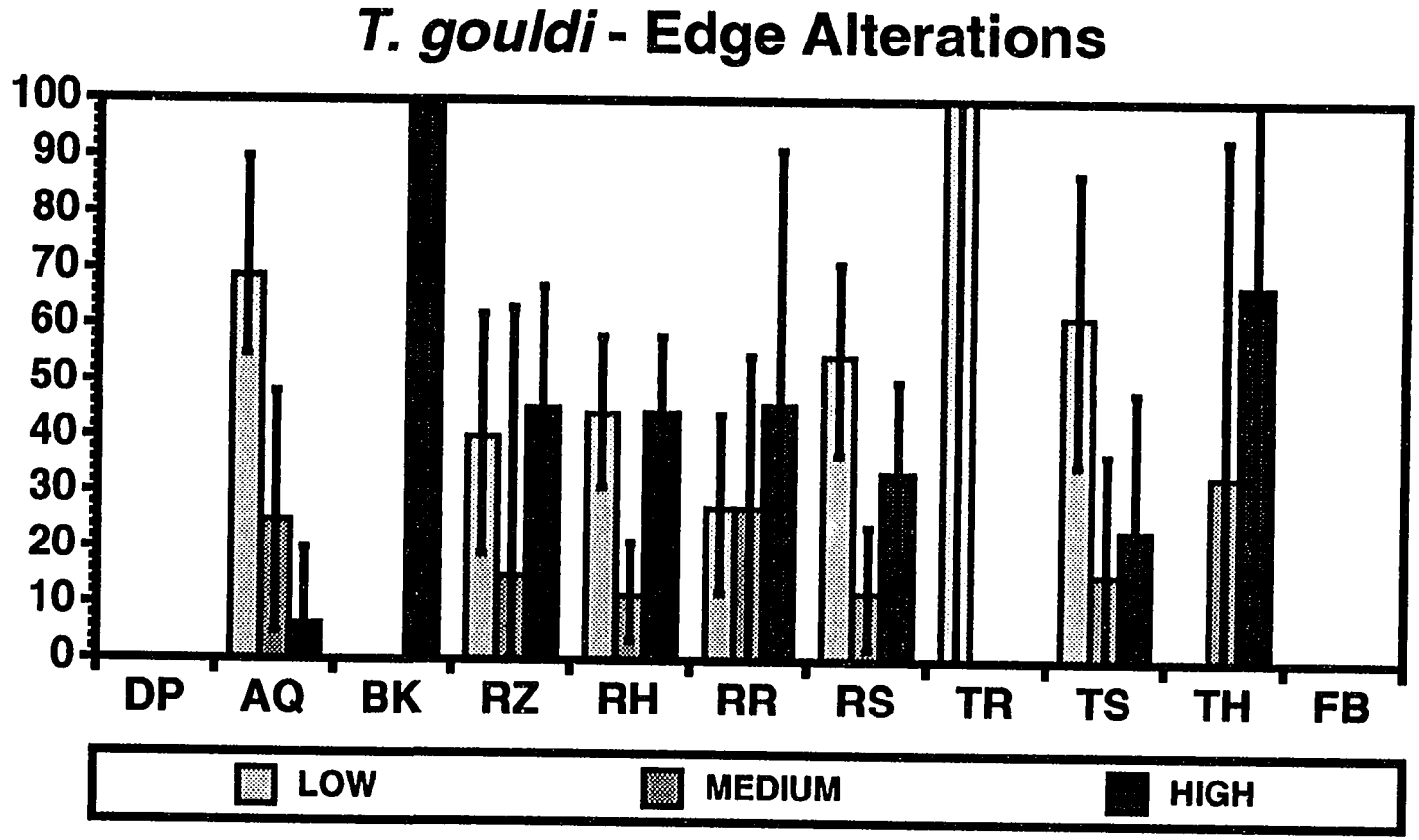


Figure 74. Proportion (percentage) of T. gouldi at each station within the three taphonomic ranks (low, medium, or high) of edge alteration. Error bars represent the 95% confidence intervals.

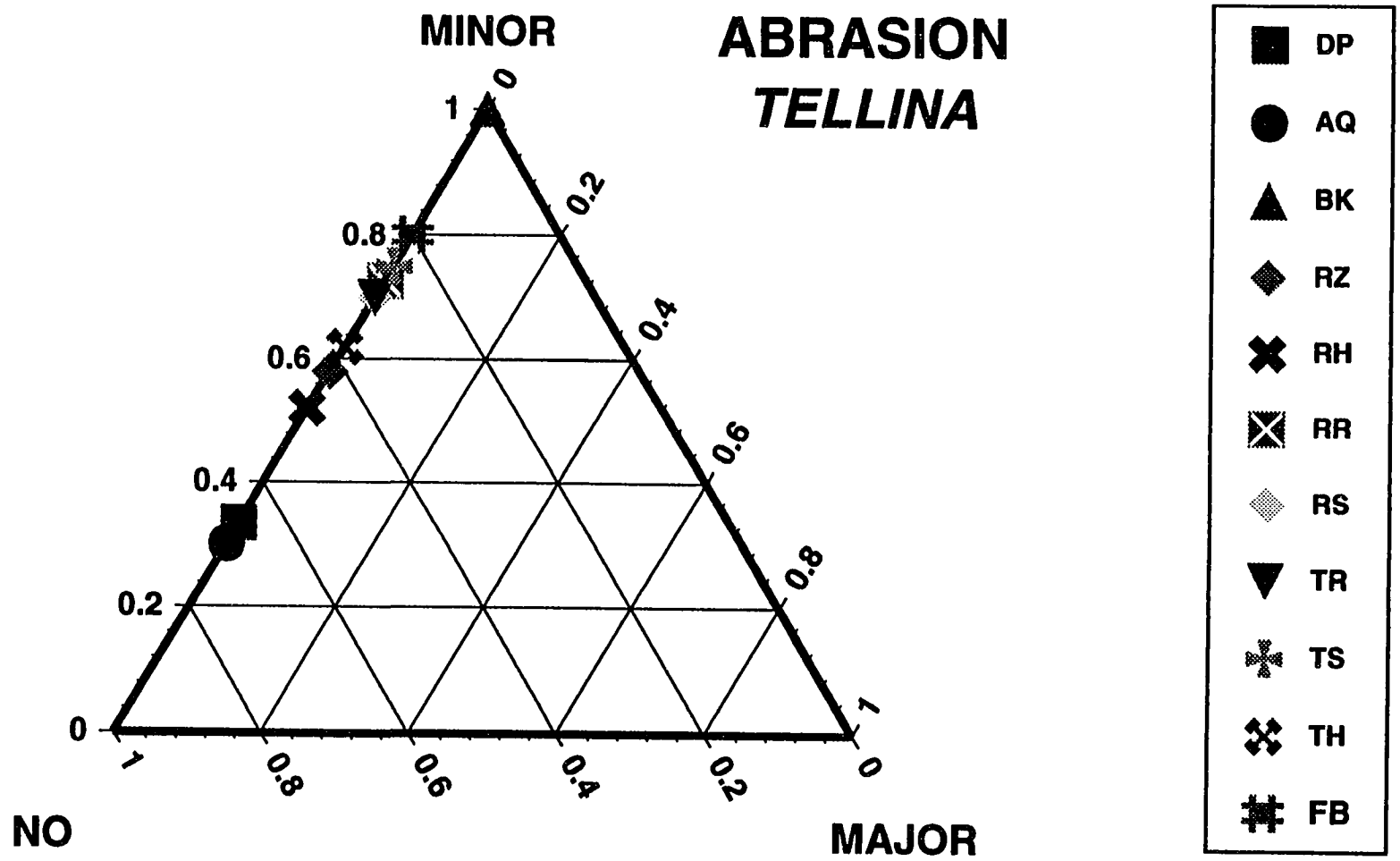


Figure 75. Ternary taphogram showing the proportion (percentage) of *Tellina* with no, minor, and major abrasion at each station.

forereef sand flat (AQ) were the only locations that showed a greater proportion of nonabraded shells than moderately abraded surfaces. These differences are significant only within the forereef reef sand flat (Bk; Figure 76). When the two major spcies were viewed individually, (Figures 77 and 78) the majority of *T. gouldi* stations were generally closer to the minor apex of the graph than their *T. similis* counterparts. Figures 79 and 80 show that very few of these differences in abrasion states are significantly different. One that does stand out, however, was *T. simils* on the forereef sand flat, where there were significantly greater numbers of unabraded valves. There was also a significantly greater proportion of *T. gouldi* with minor abrasion at the rippled sand station (RS), a location where *T. similis* was not collected.

Color Loss

The degree of color preservation exhibited by *Tellina* is quite varied (Figure 81). Higher percentages of shells with unaltered colors are seen in Florida Bay (FB), the backreef grassbed (RH), and rippled sand (RS), and the sand flats of the deep reef (DP) and forereef (AQ). However, these greater proportions were only statistically significant only at AQ and FB (Figure 82). Poor preservation of color occurred on the reef flat (BK), and to some extent, in the Hawk Channel grassbed (TH). Bleached shells were significantly fewer in the backreef grassbed (RH) and absent from the transition zone (RR).

Fragmentation

As with the Chamidae, *Tellina* had greater numbers of whole shells at most stations (DP, AQ, RZ, RH, RR, and RS; Figure 83). These differences were significant for the forereef sand flat (AQ), backreef rubble zone (RZ), grassbed (RH), transition zone (RR), and rippled sand (RS; Figure 84). Stations where whole shells were not the in the majority include those from Hawk Channel (TS,

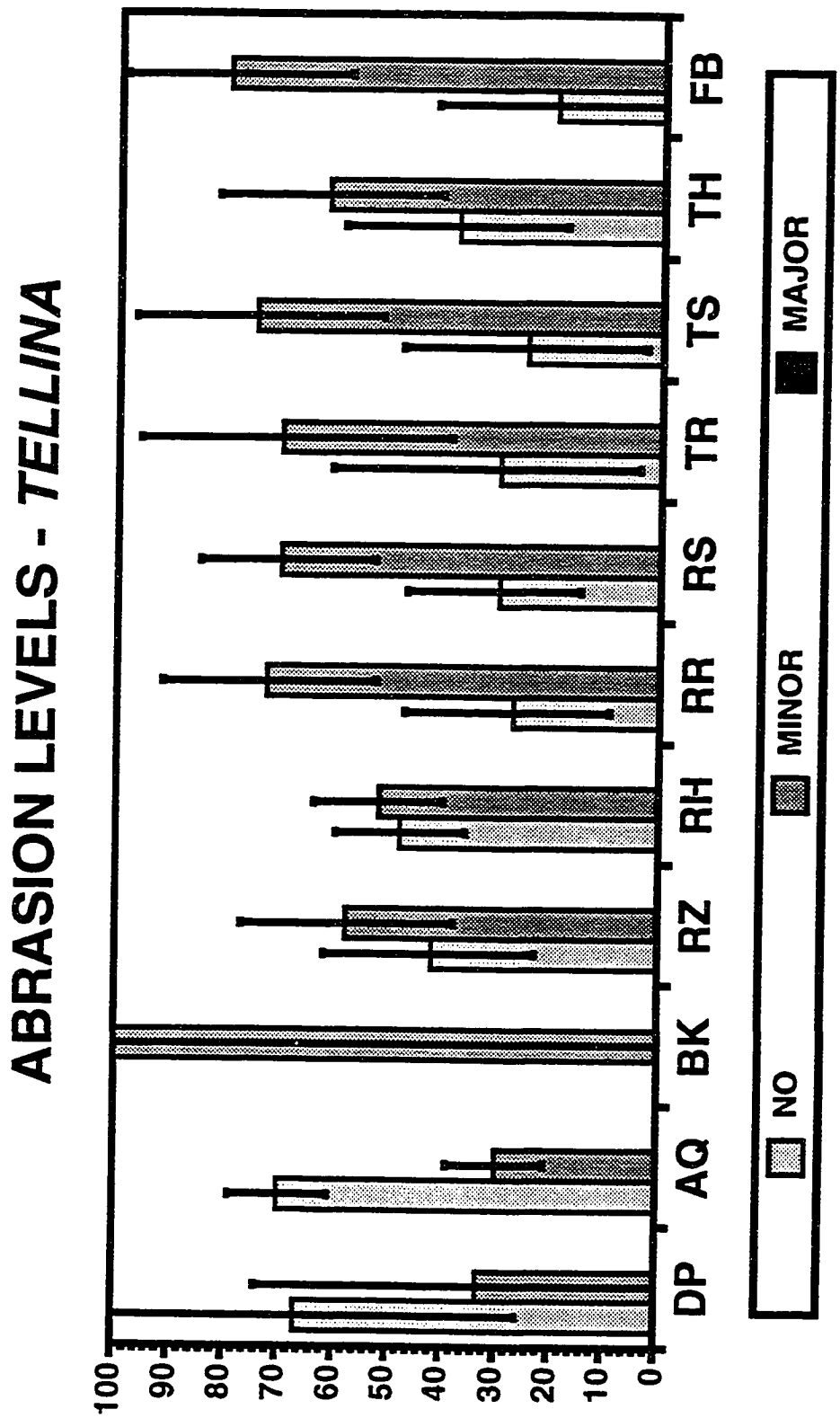


Figure 76. Proportion of *Tellina* at each station within the three taphonomic ranks (no, minor, and major) for abrasion. Error bars represent the 95% confidence intervals.

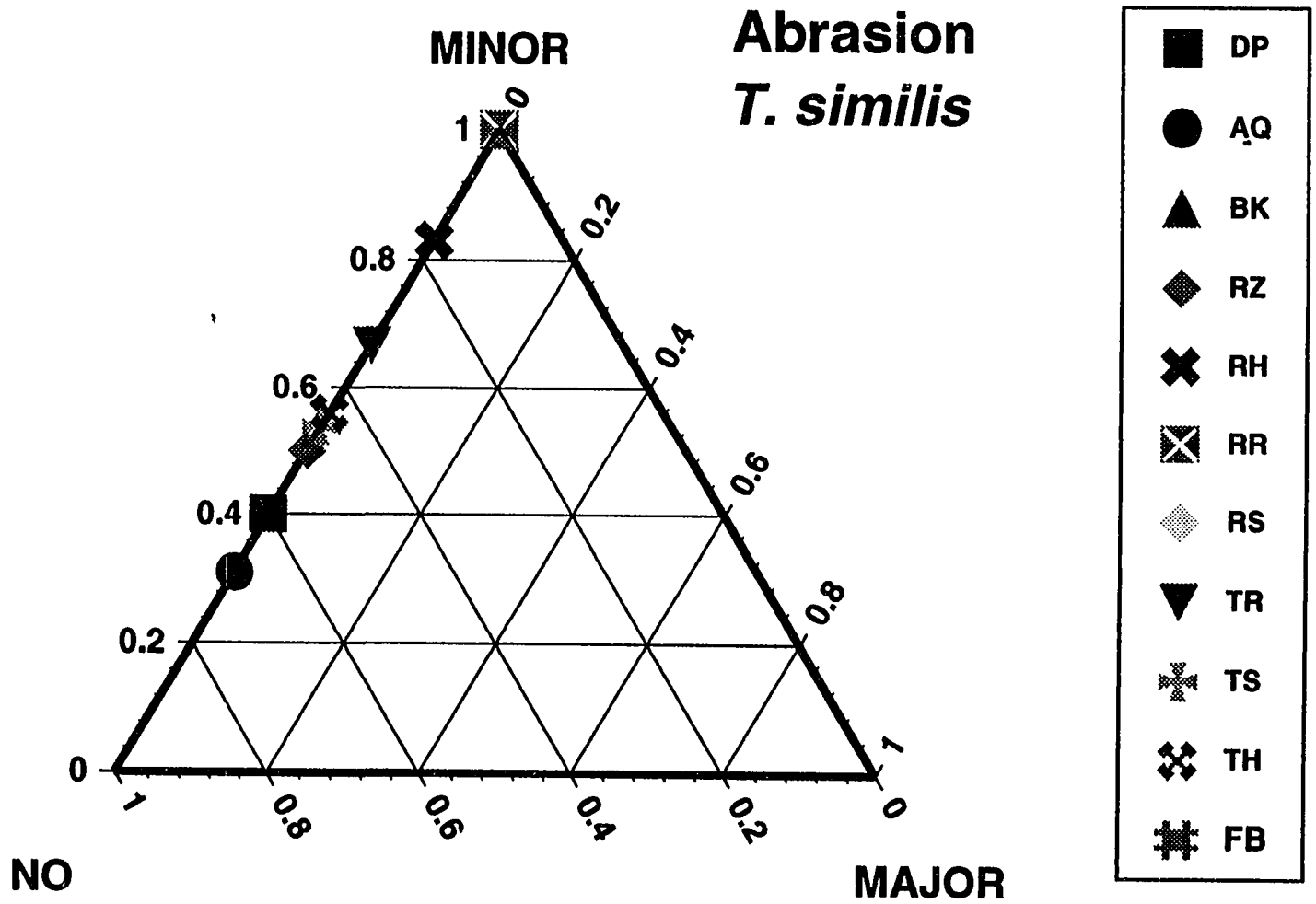


Figure 77. Ternary taphogram showing the proportion of *T. similis* with no, minor, and major abrasion at each station.

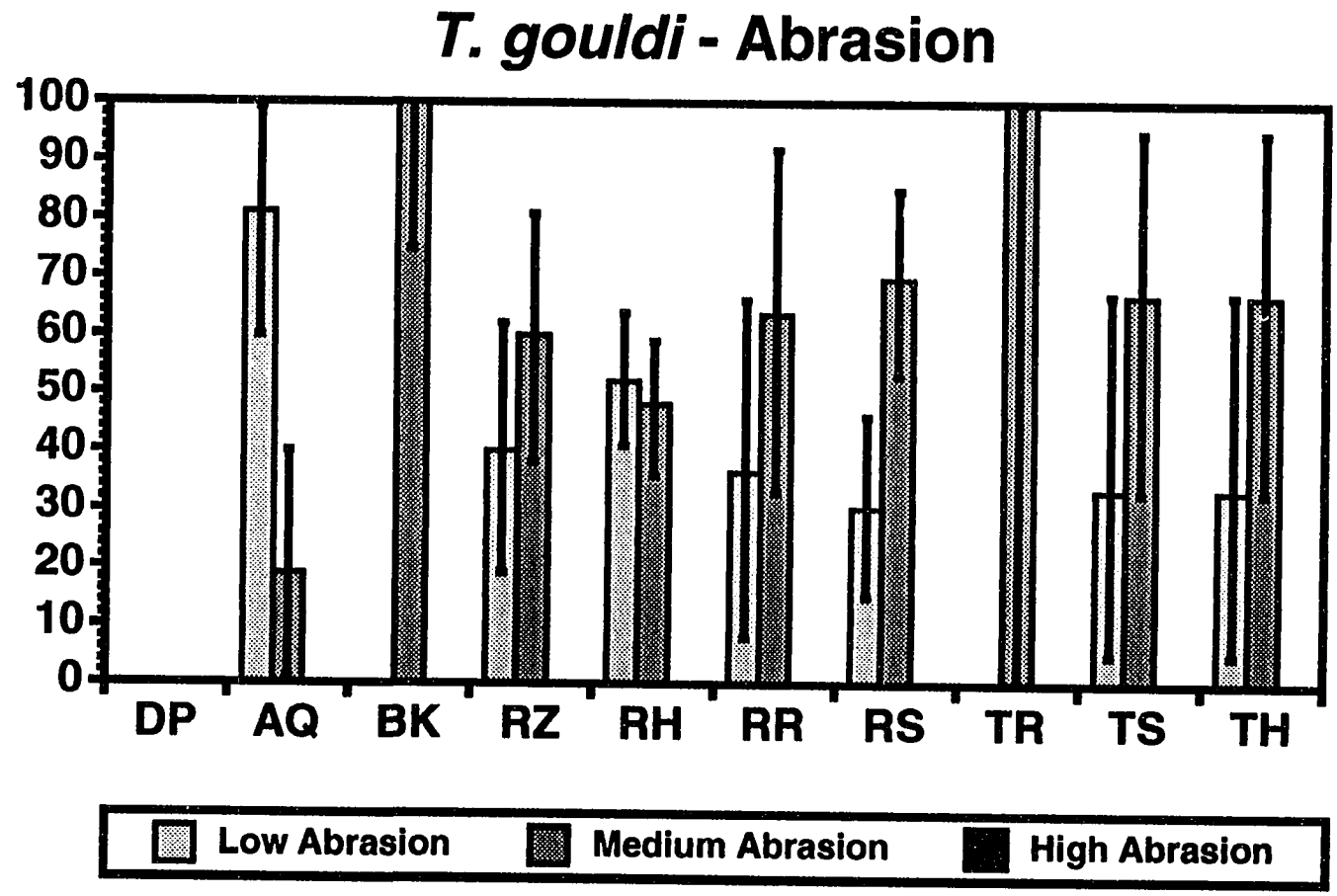


Figure 78 Ternary taphogram showing the proportion (percentage) of *T. gouldi* with no, minor, and major abrasion at each station.

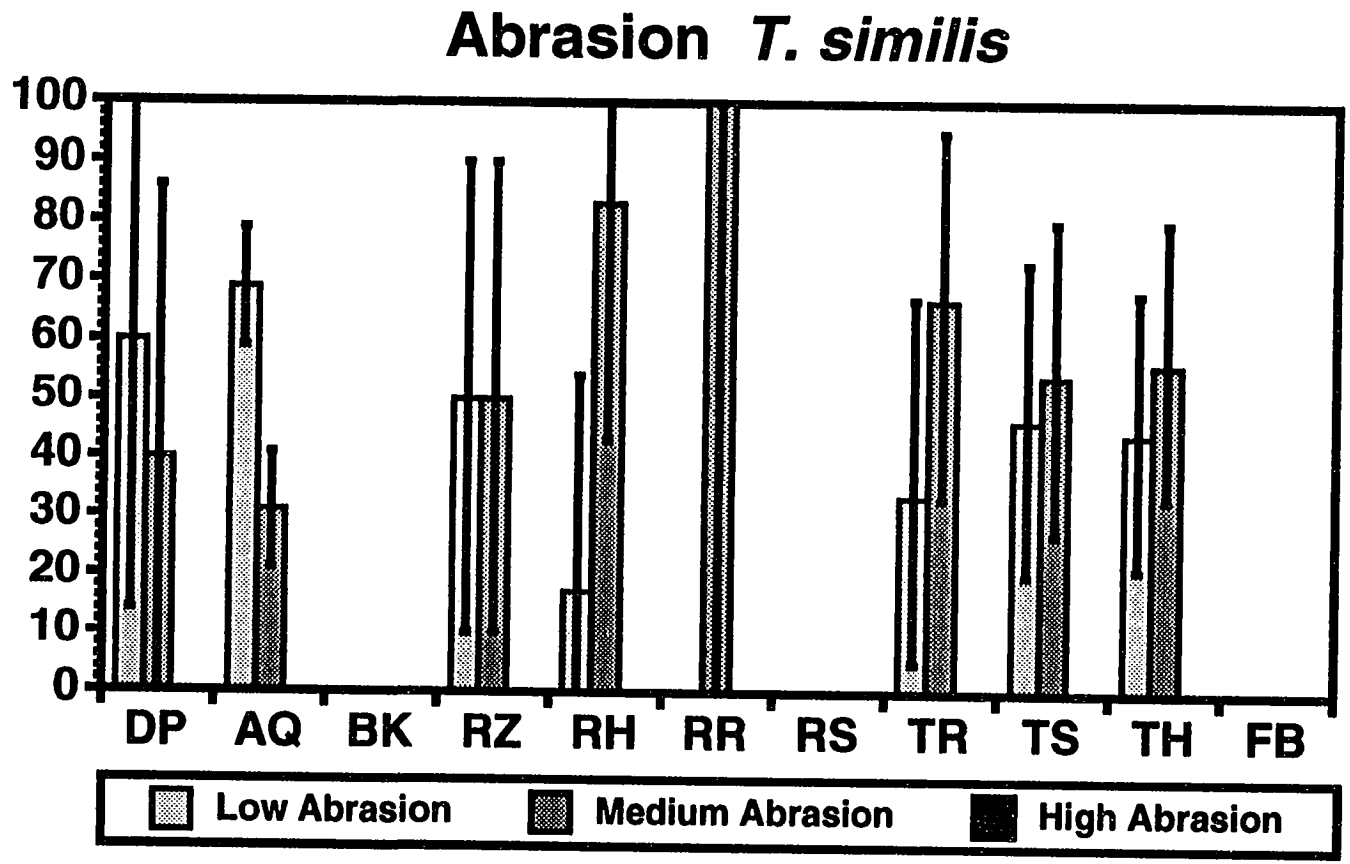


Figure 79. Proportion (percentage) of *T. similis* at each station within the three taphonomic ranks (no, minor, and major) for abrasion. Error bars represent the 95% confidence intervals.

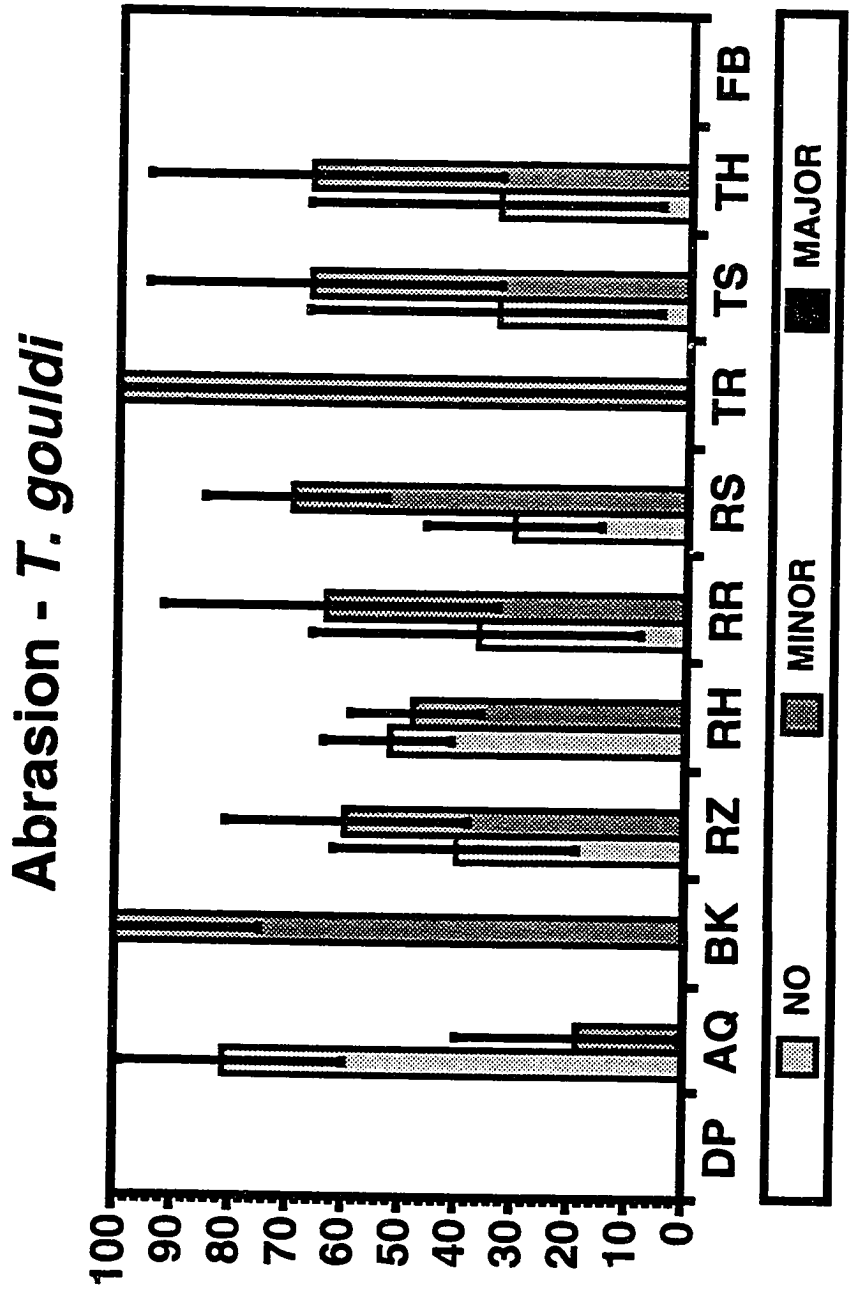


Figure 80. Proportion of T. gouldi at each station within the three taphonomic ranks (no, minor, and major) for abrasion. Error bars represent the 95% confidence intervals.

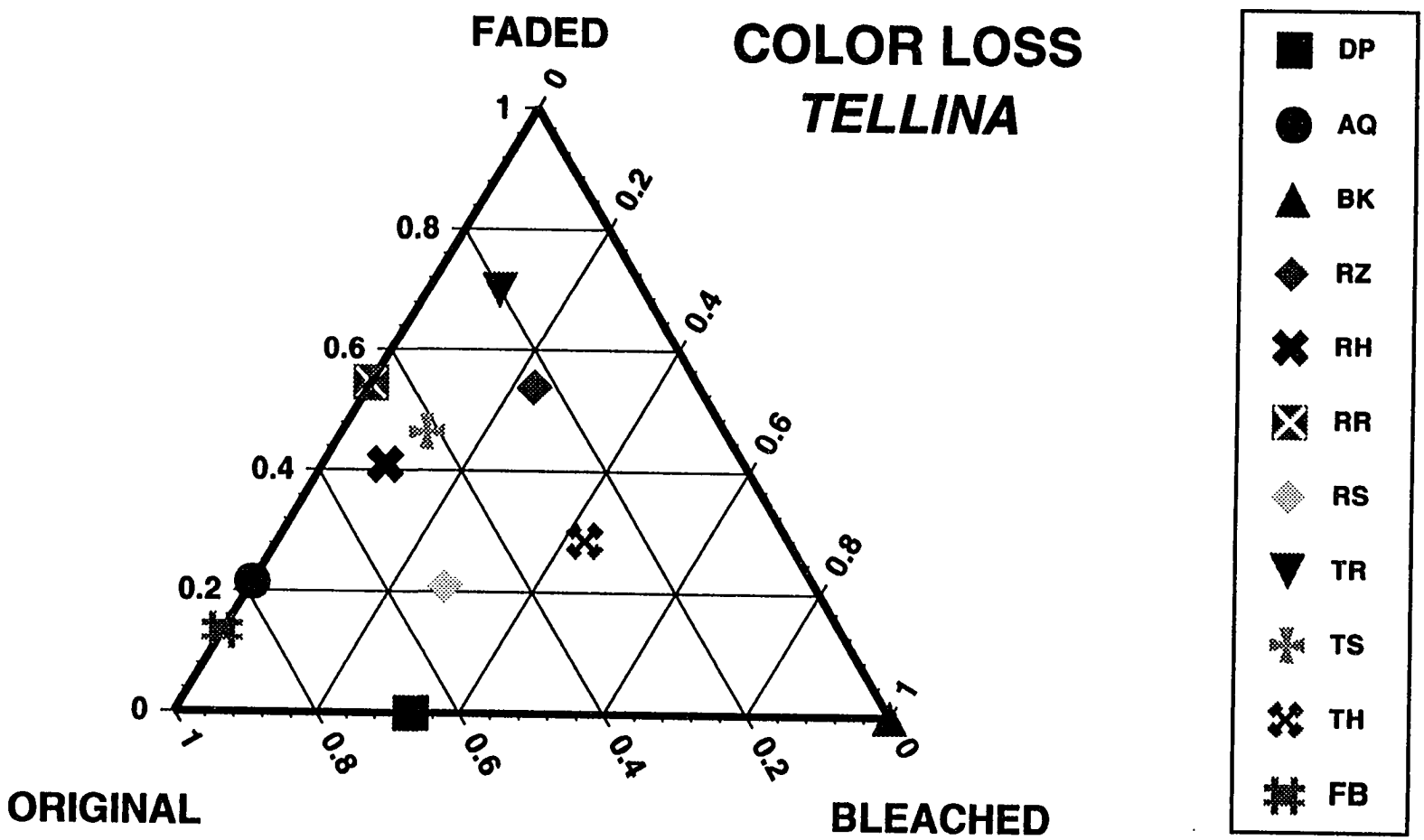


Figure 81. Proportion (percentage) of *Tellina* within the three taphonomic ranks (original, faded, and bleached) for color. Error bars represent the 95% confidence intervals.

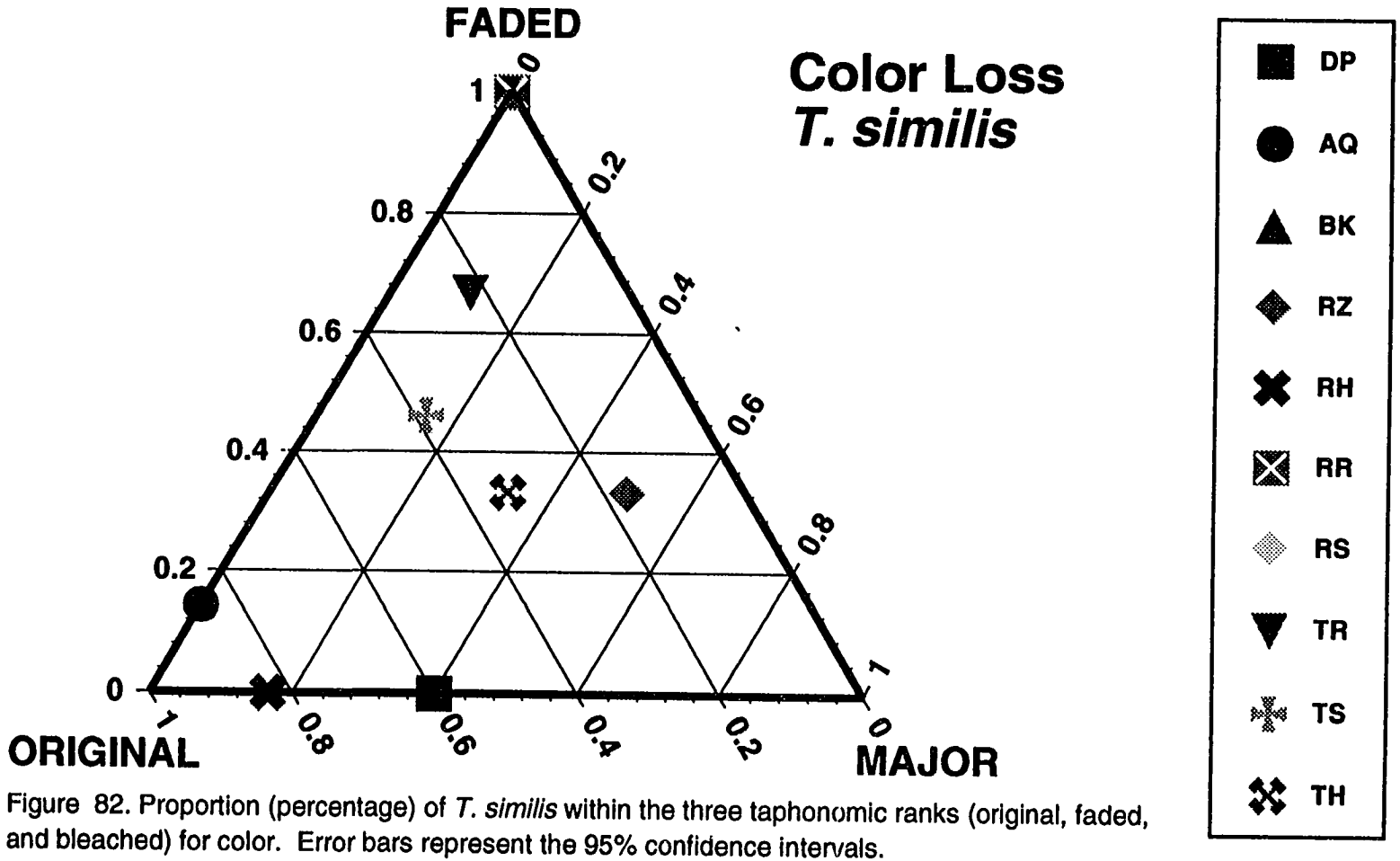


Figure 82. Proportion (percentage) of *T. similis* within the three taphonomic ranks (original, faded, and bleached) for color. Error bars represent the 95% confidence intervals.

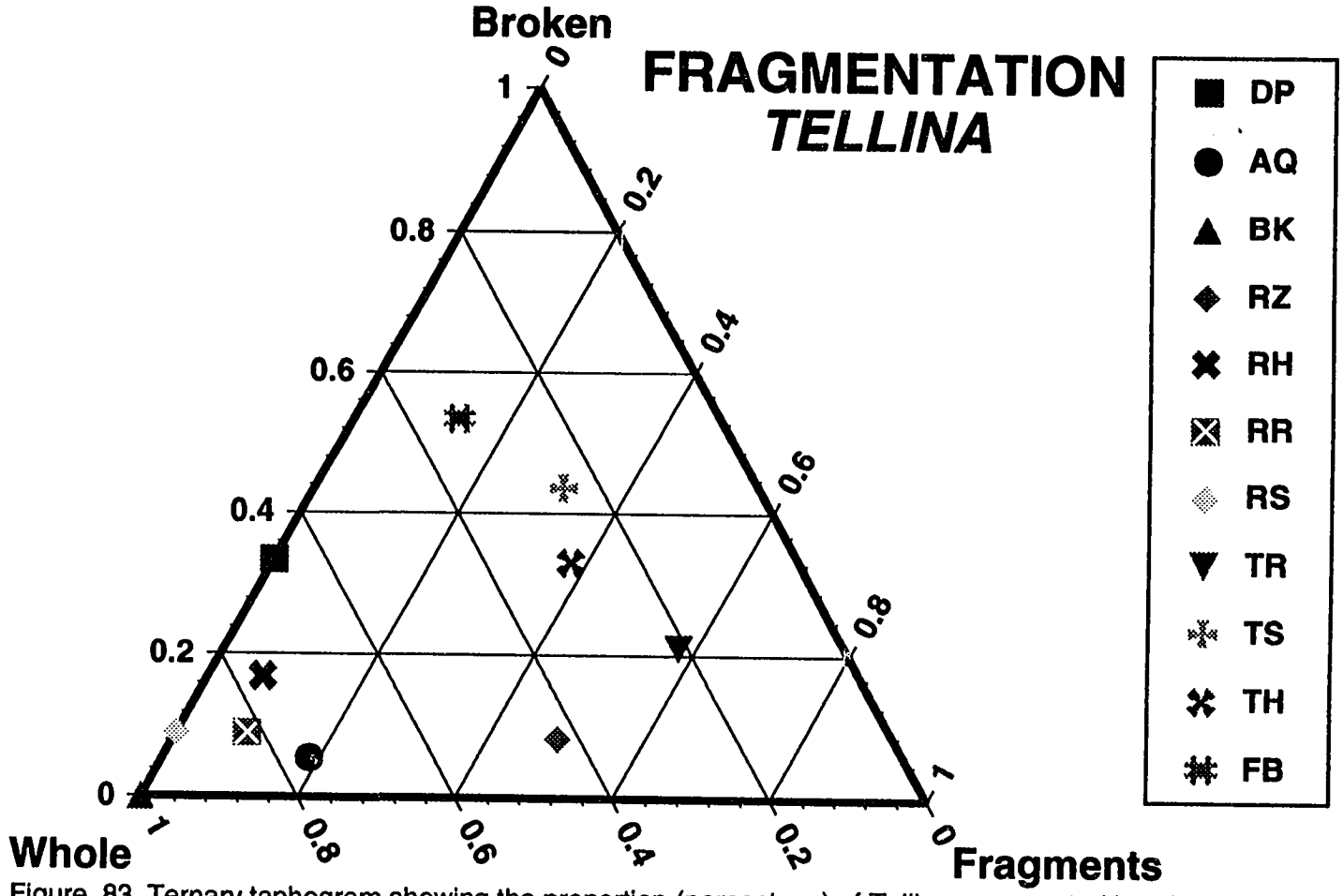


Figure 83. Ternary taphogram showing the proportion (percentage) of Tellina represented by whole shells, broken shells, and shell fragments at each station.

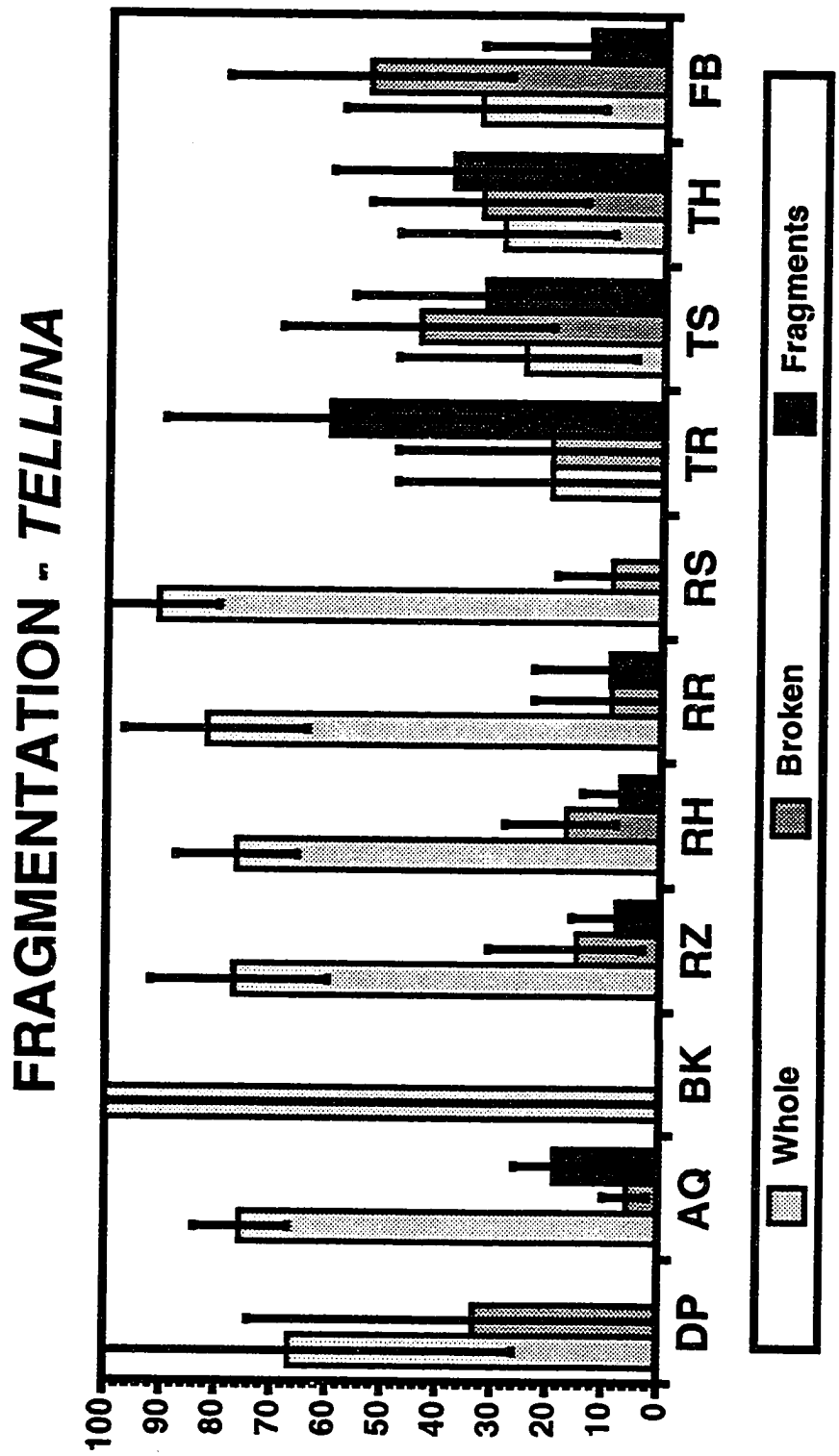


Figure 84. Proportion (percentage) of Tellina at each station within the three taphonomic ranks (whole shells, broken shells, and shell fragments) for fragmentation. Error bars represent the 95% confidence intervals.

TH) and Florida Bay (FB). The grassbed (TH) had the majority of its *Tellina* represented as fragments while the unvegetated bottom (TS) has equal proportions in all categories. The majority of Florida Bay (FB) shells were broken.

Differences in the fragmentation of *T. similis* and *T. gouldi* appear separately in Figures 85 and 86. *T. similis* had an increase in the frequency of broken valves and fragments (RH, RR), followed by the complete absence from the rippled sand (RS; Figure 87A). The patch reef (TR) had a greater percentage of *T. similis* fragments, while the unvegetated bottom contained a greater number of whole and broken shells. Whole shells of *T. gouldi* occurred in significantly greater numbers from the backreef stations (Figure 87B).

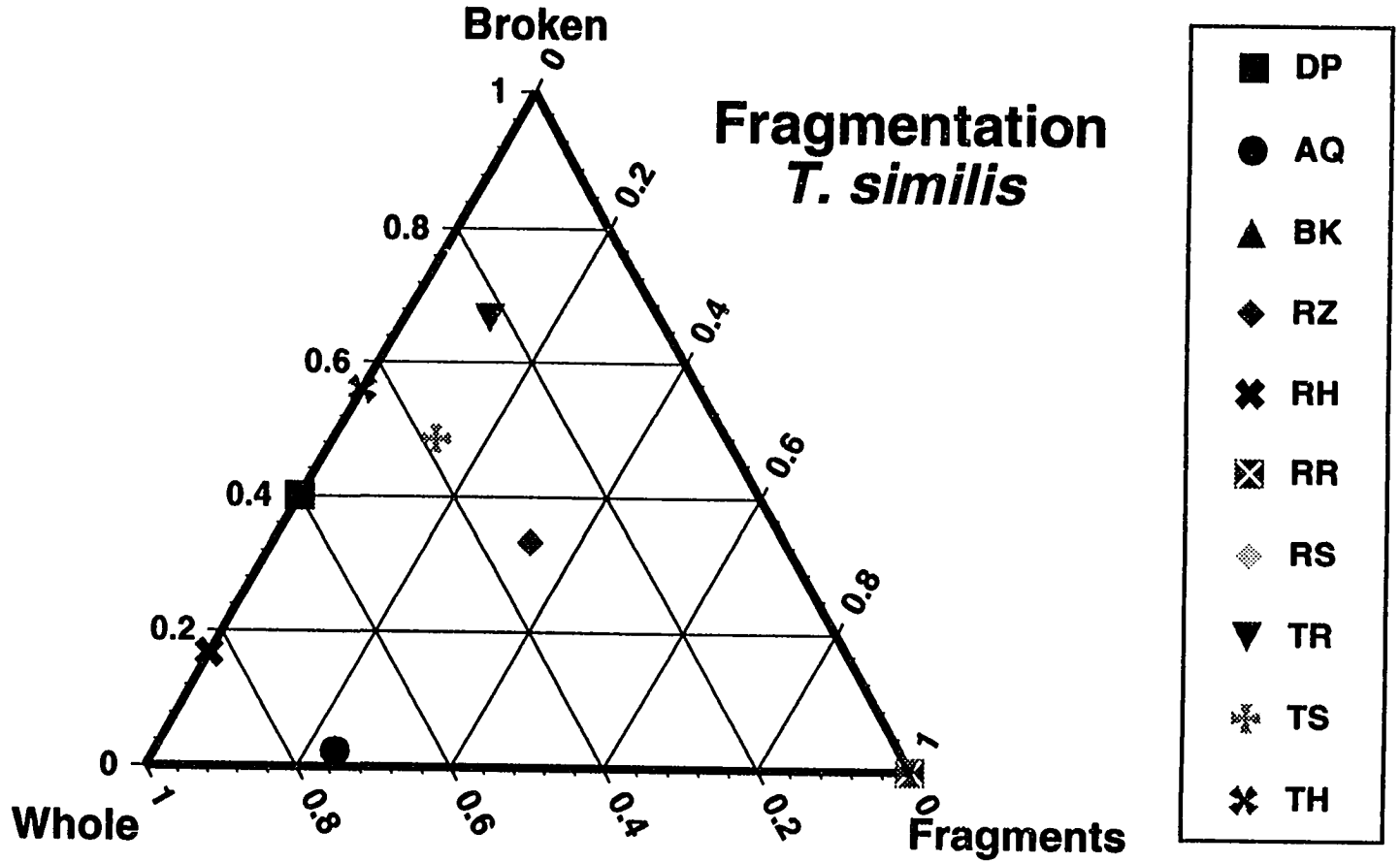


Figure 85. Ternary taphogram showing the proportion (percentage) of *T. similis* represented by whole shells, broken shells, and shell fragments at each station.

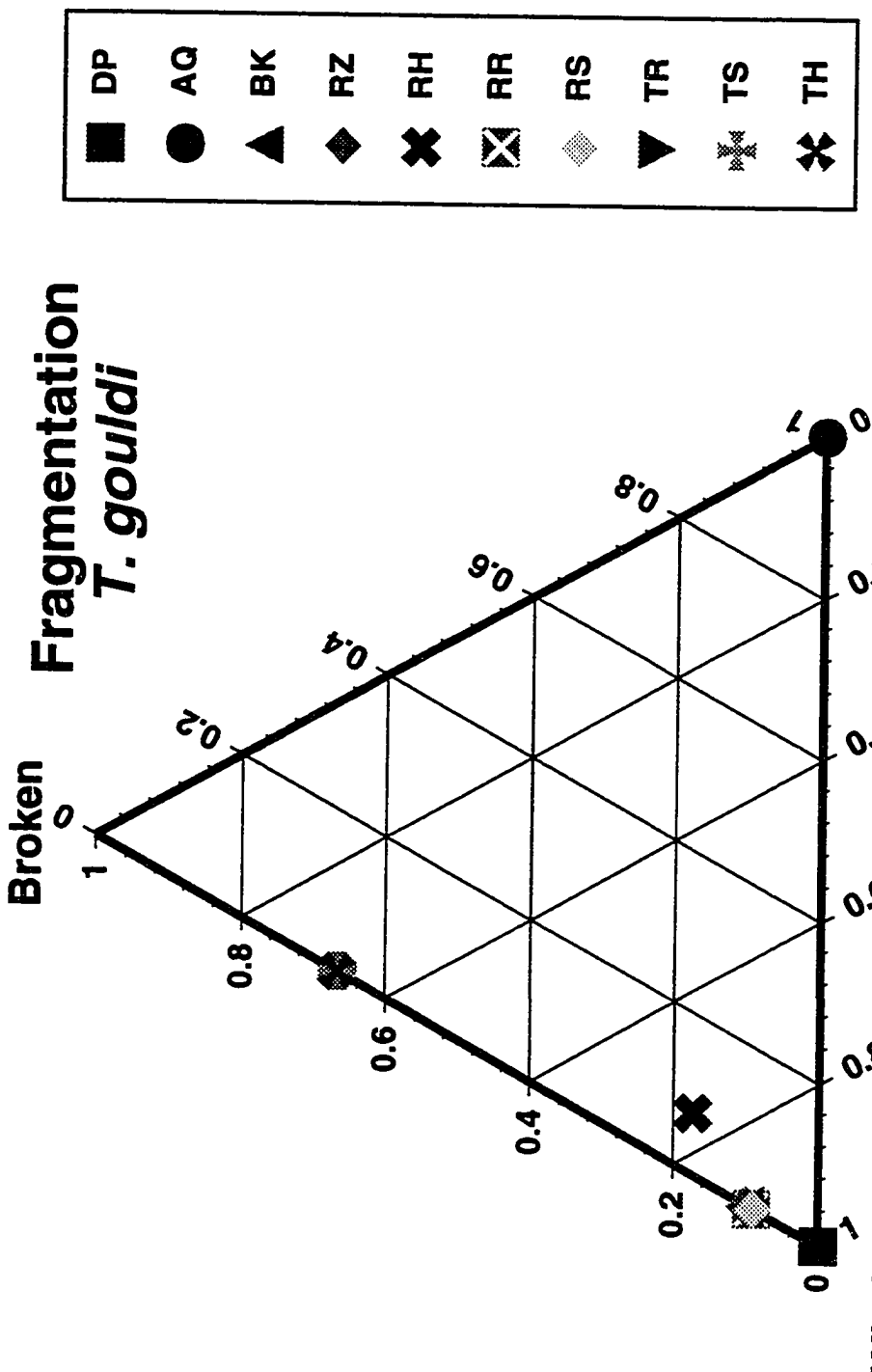


Figure 86 Ternary taphogram showing the proportion (percentage) of T. gouldi represented by whole shells, broken shells, and shell fragments at each station

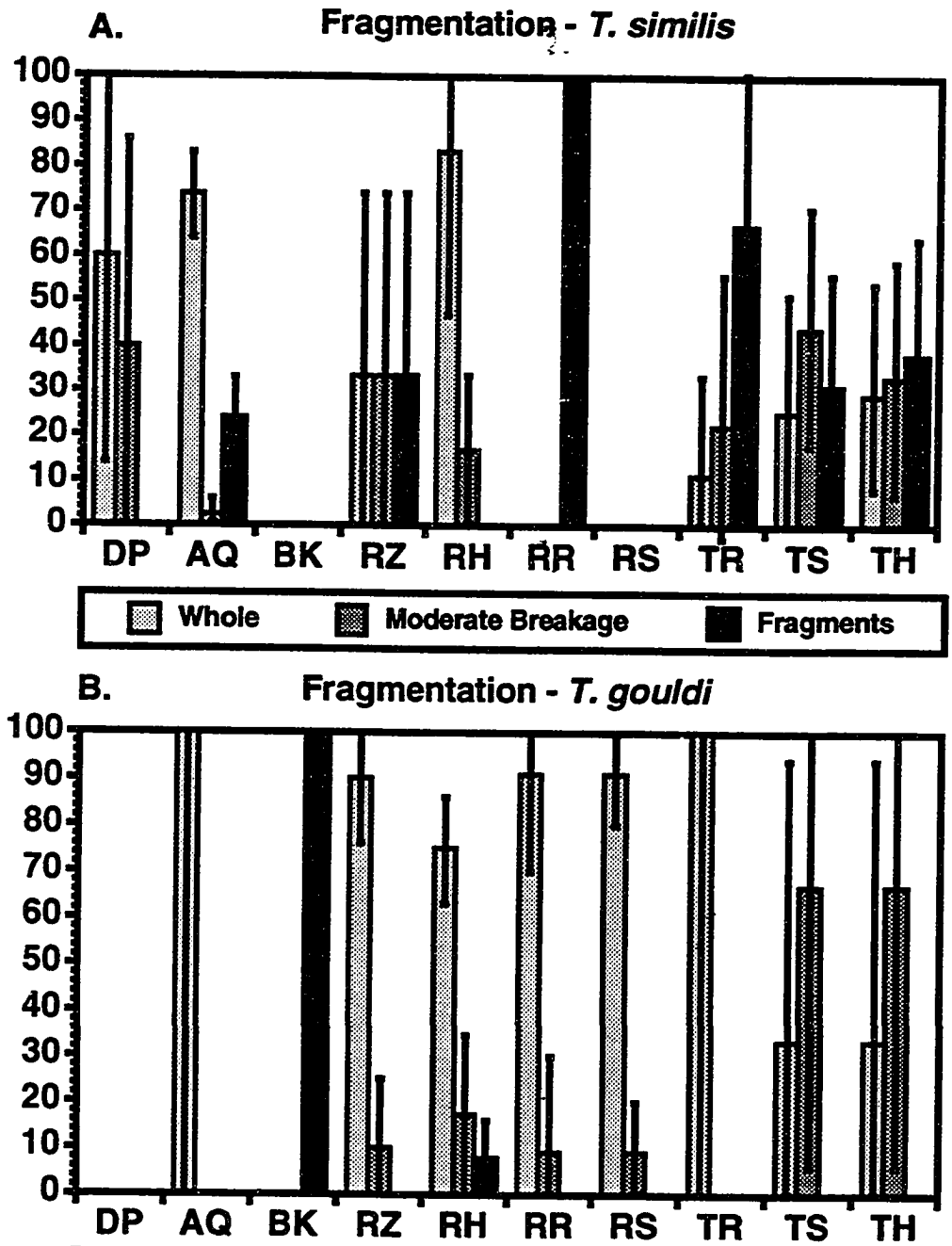


Figure 87. Proportion (percentage) of (A) *T. similis* and (B) *T. gouldi* at each station within the three taphonomic ranks for fragmentation. Error bars represent the 95% confidence intervals.

DISCUSSION

Pooled Mollusc Taphofacies

This section focuses on the taphonomic signatures determined for each station and evaluates each signature in light of the prevailing environmental conditions. Adjectives used to describe the level of a taphonomic attribute (e. g., low frequency of encrustation) are based on the results of the ternary taphogram analysis and an examination of the confidence interval - bounded percent distribution of each taphonomic attribute within individual stations. These descriptions provide a more detailed picture than the terminology used for characterizing the single, averaged value derived from pooled data. Such average values may well be useful as evidenced by cluster analysis, which produced results that complemented those generated with ternary diagrams and frequency distributions.

Deep Reef Sand Flat - Station DP

The deep reef sand flat, located in 33 m, was a hardground covered with five to six cm of coarse to fine sands. It started at the base of the Conch Reef and there were small coral colonies scattered around the periphery. The bottom was hummocky as a result of fish feeding traces and scattered tilefish burrows. Associated with these burrows were rather large (≈ 0.3 m high by 1 m wide) middens of coral debris, shells and rock (Plate 13).

Shells from the deep reef sand flat tended to be highly modified. These modifications are the result of many processes, some of which probably occurred elsewhere. Transport of shells onto the flat from shallower depths is evidenced by low abundances of common shallow water species (Table 9). Minor amounts of abrasion (Figure 27) probably occurred during this downward movement. Fragmentation is low here (Figure 34) , possibly reflecting the flat's

Plate 13. Tilefish and associated 'midden' on deep reef sand flat (DP). 'Midden' is approximately 0.5 m high and 2 m in diameter.

location below normal wave base. Breakage can and does occur during transport, but once a shell arrives on the flat its two potential sources of disturbance are currents or storm waves. Data from a National Oceanic and Atmospheric Administration current meter on the flat will be available in the near future that will allow this subject to be more fully explored (S. Miller, pers. com). If bottom currents are not active on the flat then shells are probably not disturbed for long periods between major storms.

Sedimentation rates here are slow, based on the thin (5-6 cm) sediment cover on the flat and high percentage of shells showing a high degree of damage across a range of features. Delays in burial keep the shell in the taphonomically active zone (Davies et al. 1989a), where its deterioration continues unabated. The activities of the burrowing tilefish and their associated middens may also re - expose shells on the surface. Shells from this station exhibit the highest levels of surface degradation, greatest frequency of sponge borings, high levels of chiton graze marks, and medium to high encrusting of epibionts (Figures 21, 23, 35, and 36,). All these processes are promoted by the bioeroders' unrestricted access to the shells' surface. Severe edge alteration, the result of abrasion, surface degradation and/or encrustation is another distinctive feature of this flat (Figure 25). Parsons (1992) has demonstrated experimentally that exposure time is "a major control on the level of encrustation," a finding that confirms the suggestions of Brett and Baird (1986) and others.

Long exposures on the seafloor contribute to the loss of luster and color in shells (Figures 28 and 30) as a result of microborer activity. Microbial decay breaks down the organic materials found in the periostracum and ligament (Parsons 1992).

Forereef Sand Flat - Station AQ

This station has a thick accumulation of sand bounded by actively growing reefs in 21 m of water. Its location on the shelf break places it in the area of highest carbonate production on the south Florida shelf (Enos 1977). The sediment surface was covered by a very light coat of algal 'fuzz' and showed evidence of biotic disturbance (tilefish burrows and feeding depressions created by other fishes). The majority of the shells here were unbroken (Figure 34) and maintained their luster (Figure 30), had low to medium color loss (Figure 28), and exhibited the greatest tendency of any station to maintain their periostracum and/or ligament (Figure 31). They show low levels of edge alteration, medium epibiont coverage, minor abrasion, and medium to high levels of surface degradation (Figures 21, 23, and 25).

The presence of whole shells with periostracum and /or ligament and low edge alteration are indicative of less energetic environments where rapid burial prevents edges from becoming abraded, encrusted, or degraded (Davies et al. 1990, Parsons 1992). This could be accomplished by the high rates of carbonate production on the reef and within the sand flat that constantly introduce new shells and other sedimentary particles into the flat with minimal transport. A constant input of fresh shells would prevent the deteriorating ones from becoming the majority. The lower levels of abrasion, epibiont coverage and surface degradation (Figures 21, 23 and 27) point to other factors acting on these accumulating shells. Low levels of reworking by fish and other organisms can keep shells moving up and down within the sediment, causing some abrasional damage to them. Microborers are active while shells are on and near the surface and contribute to the higher levels of surface degradation. So too are epibionts, especially if the sediment surface is stable for extended periods, as the carpet of algal 'fuzz' would indicate. Another factor that plays a

role in the level of encrusting is the shell's life habitat. While alive, epifaunal organisms provide settlement sites for epibionts that are retained upon the death of the mollusc (Parsons 1992).

Reef Flat - Station BK

This is the shallowest (1-1.5 m) part of the reef, composed of dead, cemented coral cobbles interspersed with living colonies. Water movement can be quite active and constant in this environment. Shells were collected from pockets of coarse sediment among the cobbles. These shells can generally be characterized as lusterless, faded, moderately encrusted fragments that show a minor amount of abrasion and high frequencies of surface degradation (Figures 21 and 23). The physical conditions that contribute to this type of shell include bright light and active water movement among the coral cobbles. Active water movement is responsible for abrasion, fragmentation, and some degree of the edge alterations. Prolonged exposure to sunlight, abrasion, bacterial action and endolithic borers all contribute to the breakdown of shell pigments (Hollingworth and Barker 1991). High light levels also promote the growth of epibionts and microborers, although the amount of encrustation can be checked by abrasion.

Backreef Stations

The stations comprising the backreef suite (rubble zone, grassbed, transition zone and rippled sand) are located in lateral succession and cover a distance of ≈ 160 m (Figure 4). Stations within this transect vary with regards to bottom compostion and vegetation density, but the taphonomic signatures they inscribe on the mollusc shells are quite similar, generally resembling the shells of the nearby reef flat (Figures 23, 25, 27, 29, 30, 31, 32, 34, 35, and 36) except in the level of epibionts. Backreef stations all have significantly fewer

individuals with moderate encrustation, in contrast to the reef flat. In fact, low levels of encrustation typify all of the backreef stations. Two other features common to all backreef areas are shells with highly altered edges and a bimodal fragmentation distribution (Figures 25 and 34). Most backreef shells are either whole or fragments with 10 - 20 % present as broken shells. Shells in these environments are dull and either faded or bleached.

Another possibility for the lack of clear taphonomic signtures in the backreef subenvironments may be smearing of the taphonomic "signal" by local transport of shells from another, adjacent subenvironments.

The rubble zone (RZ) is in shallow water (4.3 m) immediately behind the reef flat. The bottom is a mixture of sand and broken pieces of heavily encrusted coral. Brown algae were quite abundant, growing on exposed rubble. Shells from the rubble zone tended to have an even distribution of low, medium and high surface degradational states (Figure 23). They also had significantly fewer shells with minor abrasion and significantly more unabraded shells (Figure 27) . This unusual pattern is probably an artifact created by including data from shells that held live *C. litteratum* at the time of collection. These shells were in pristine condition and made up approximately 15% of the total shells examined for RZ.

Patch Reef - TR

The patch reef was located on the inner shelf margin near an area referred to as "Triangles". The area sampled had a veneer of fine sediment over a hardground with pockets of thicker sediment accumulation. Soft corals and an occasional hard coral were growing in the area, and off to one side there was a lush grassbed. The majority of shells from this environment were at the two extremes of epibiont growth, either low levels of encrustation or heavily

overgrown (Figure 21). Shell surfaces were moderately to heavily degraded and the majority of their edges were also moderately to highly altered (Figure 25). Most shells were lusterless and faded, showing minor levels of abrasion. Shells were found either whole or in fragments. This taphonomic signature was in many ways similar to that seen in the backreef stations, except for the level of encrusting and edge alterations. These differences could be the result of storm - mediated, postmortem mixing of shells from different, adjacent habitats (describe above) and low sedimentation rates (Enos 1977). The low rate of sediment accumulation would prevent the shell from moving out of the taphonomically active zone, resulting in high levels of encrustation and edge alteration.

Fragments are also possibly the result of fish predation on molluscs. The level of predator activity in the vicinity of all reefs can be quite intense and may be one of the primary mechanisms driving the structure of invertebrate communities in and around reefs (Jones et al. 1991).

Hawk Channel Unvegetated Bottom - TS

This station was located in one of the mud-filled rock depressions (6.8 m) that make up the inner shelf margin. Enos (1977) attributes the lack of seagrass cover in these depressions to turbidity and the resultant reduction of sunlight. These high turbidity conditions are probably the result of sediment suspended by the feeding activities of organisms combined with restricted circulation (Enos 1977). The sampling area has a 30 cm thick layer of muddy sediment over the rock bottom. Gorgonians were also present in the sampling area.

Low numbers of shells were collected from this station, despite collecting twice the normal sample volume at site TS-20 (Table 5). Shells that were collected had low levels of epibiont growth, medium levels of surface

degradation, a bimodal distribution of edge alteration states, low fragmentation, minor abrasion without much luster and an equal distribution of color loss (Figures 23, 25, 27, 29, and 30). The dual nature of this taphonomic signature could be the result of the low sedimentation rates combined with high turbidity conditions: shells that die *in situ* were buffered from processes that produce post-mortem damage. Shells on the sediment surface that might otherwise be exposed to a high level of degradation and encrusting might have limited levels of encrustation in this instance because of low light levels that limit epibiont productivity. On the other hand, shells may be swept periodically into this depression during hurricanes, carrying with them the taphonomic signature received in their former location. Miller et al. (1992) found evidence of minimal storm transport into a similar mud-filled depression off St. Croix. Their comparison of pre-storm and post-storm samples, however, showed an increase in overall species richness and an abundance of species not characteristic of the mud environment.

Hawk Channel Grassbed - TH

This station was in shallower (4.3 m) water and closer to shore than its muddy counterpart (TS). The sandy - mud bottom was covered with the seagrass *Thalassia testudinum*, and the calcareous green algae *Halimeda* sp. and *Penicillus* sp. Shells from this environment tend to be bleached and highly fragmented. Their surfaces show medium to high degradation, low to medium epibiont coverage, a higher frequency of bioeroders (chiton graze marks and sponge borings), zero to minor abrasion and a nearly equal distribution of unaltered and altered edges (Figures 23, 25, 27, 29, 30, 31, 32, 34, 35, and 36). Predator activity is generally higher within seagrass beds (Zieman 1982)

and this may be the source of large numbers of fragmented shells (Cate and Evans 1994).

Sedimentation rates and current velocity are reduced in much of Hawk Channel (Enos 1977). This, in turn, should promote loss of shell color and luster and growth of encrusters and microborers. However, epibiont growth may be moderated by low light levels from both turbidity and the shade provided by grasses. Indirect evidence for this includes reports showing that shading by seagrass epiphytes has been shown to decrease the host plant's photosynthesis by 31% (Sand-Jensen 1975 cited in Zieman 1982). Additionally, Zieman (1982) reported that "the upper leaf surface experiences much greater water motion than the lower surface. This not only provides a much greater volume of water to be swept by suspension feeding animals, but also reduces the gradients for photosynthetic organisms." Another source of the high degree of surface degradation may be chemical dissolution, given the much higher levels of organic matter present in grassbeds (Zieman 1982).

Florida Bay - FB

The Florida Bay station is located within the region classified by Turney and Perkins (1972) as the interior subenvironment. Sampling was done within 100 m of a small boat channel in shallow water (1.8 m). The bottom was composed of mud and shell debris (Figure 10), and covered with *Thalassia*. The physical conditions present here during sampling (high turbidity induced by winds and much lower water temperatures) were very different from those experienced on the inner shelf margin. The bay's restricted circulation manifests itself in terms of greater environmental extremes that are reflected in a decreased number of species (Turney and Perkins 1972; Miller and Dent 1995, in prep). This reduction of species richness, however, does not limit the number

of individuals. These samples contained the greatest numbers of shells of all samples collected, sometimes having five to six times the number of the next most abundant station.

Shells collected were faded, but the majority had maintained their luster and were present as either whole shells or fragments (Figures 28,30, and 33). Their surfaces had a low percentage of epibiont coverage, medium to high levels of surface degradation, minor abrasion, and uneven distributions of edge alteration states and fragmentation (Figures 23, 25, 27, 29, and 30). Low epibiont coverage, like reduced number of mollusc species, may be a reflection of the stressful physical environment. Shell surface degradation was different in Florida Bay. Approximately 10% had soft, flaky surfaces which could have resulted from maceration or dissolution; high summer temperatures and abundant organic matter may accelerate decomposition of the shell's organic matrix (Swinchatt 1965) and/or induce chemical dissolution (Walter and Burton 1990). The mixture of shells to fragments can result from predation and/or a slow breakdown of the large numbers produced here. The low hydrodynamic regime in this area would preclude size sorting of shell fragments. The bimodal distribution of edge alteration states may be tracking fragmentation; more broken shells provide a greater surface area for surface degradation to proceed.

Target Taxa Taphofacies

This section focuses on the taphonomic patterns seen within specific, target taxa. The general environmental conditions causing these signatures were discussed in the previous section and will not be reiterated, except where the target taxon's signature departs from that described for the pooled molluscs.

The predatory boring and bioerosional data were not used in the examination of the target taxa because these features provided little useful information for the pooled molluscs. Preliminary examination of each target taxon across stations showed patterns similar to those seen with the pooled molluscs. The generally low frequencies of the bioeroder characters (sponge borings, grazing marks, rhizome etchings) limited the value of these features on the south Florida shelf (Figures 35 and 36). Predatory borings were statistically insignificant across all environments and were therefore not examined (Figure 32).

Cerithium spp.

Epifaunal gastropods of the genus *Cerithium* are abundant members of tropical shallow water marine communities (Rehder 1981). *C. eburneum* has an elongate shell (1.9 to 4.1 cm tall) that is white to yellow-white with irregular reddish-brown patches. Its sculpture consists of several large axial varices and several rows of separated, small round beads. They are common in sandy areas among seagrasses in the shallow subtidal zone. *C. muscarum* is smaller (10-25 cm) and thinner with whitish to yellowish and dark spots occuring in spiral rows. Sculpture consists of numerous regular, strong axial ribs that are made knobby by three or four weaker spiral cords. These ceriths are always found in seagrasses in estuaries and bays. *C. litteratum* (1.9 to 3.5 cm) is a stocky shell, almost half as wide as it is tall. Its white shell is distinctly marked with spiral rows of reddish brown to black spots. Whorls are straight - sided with numerous irregular knobby spiral cords (Rehder 1981).

Deep Reef Sand Flat - DP

The low abundance (eight individuals) of *Cerithium* shells from this site, coupled with knowledge about the life habitats of this genus, suggests that the

shells found here were transported onto the deep reef sand flat from shallower water. These shells consist of originally colored or faded fragments (apices and apertures) with well rounded edges (Figures 46 and 48). The shell surfaces are highly degraded and show signs of minor abrasion and encrustation (Figure 38, 42, and 43). Compared to the pooled sample, the ceriths had greater color retention and a higher level of fragmentation (Figures 29, 34, 46 and 48). Transport would be the most likely explanation for the higher fragmentation. Color retention is likely an intrinsic characteristic of *Cerithium*, Parsons (1992) reported that shells of this genus had deep color penetration and were therefore resistant to color loss.

Forereef Sand Flat - AQ

Cerithium were more abundant on the forereef sand flat (41 individuals). Their shells were mostly faded fragments whose surfaces were moderately to highly degraded with low edge alterations (Figures 40, 42, and 46). The surfaces were also covered moderately with epibionts and showed minor abrasion (Figure 38 and 40). This apparently odd mixture of fragments and low edge alteration is an artifact of combining edge alterations categories for ternary diagram plotting. The combination process involve grouping the original shell edge category with that of chipped edges. The low edge alteration state seen here reflects the fact that the fragments were largely apices with fresh break-marks around the edges. These fragments resulted from predation on ceriths at shallower levels of the reef, followed by transport onto the sand flat.

Reef Flat - BK

Cerithium appears to be responding to the clear, energetic water of the reef flat in a manner similar to the pooled mollusc material, occurring as faded

fragments with highly altered edges and a degraded shell surface that shows minor abrasion and medium encrustation (Figures 25, 29, 34, 42, 46, and 48).

Backreef Stations

Rubble Zone - RZ

The majority of the cerith shells from the rubble zone were fragments with low amounts of edge alteration and low to medium color loss. Their surfaces had low levels of epibiont growth and zero to minor amounts of abrasion (Figures 38, 40, 42, 44, 46 and 48). Approximately 15 % of the *Cerithium* shells examined here were collected while the organism was alive. Removal of the live data and re-examination of the data set revealed that the results had been skewed toward the low level of most taphonomic attributes by both the presence of live shells and the reduction of edge alteration categories that was discussed previously.

Grassbed , Transition Zone, Rippled Sand

The taphonomic signatures for *Cerithium* shells from these backreef environments have very similar patterns. Generally there are high percentages of fragments that largely retain their colors (Figures 46 and 48). Surface conditions of the shells show medium to high degradation with highly altered edges (Figures 40 and 42). Abrasion and epibiont encrustation are in the medium range (Figures 28 and 44). It is interesting to note the subtle, mostly nonsignificant patterns of changing surface conditions seen across these stations. As sediment mobility increases from the grassbed to the rippled sand, the percentage of shells with high surface degradation decreases (Figure 40), edge alterations increase (significantly from RH to RS; Figure 42), and there are decreases in the proportion of high color loss (Figure 46). This pattern is

significant with regard to the level of epibiont coverage (Figure 38). Significant increases in the proportion of ceriths with low epibiont coverage occur as one moves from grassbed to rippled sand, while the percentage with medium coverage decreases and the percentage with high levels does not change. These patterns probably result from stronger scouring of the shell surface such that the degraded shell surface is removed, epibionts are abraded off, and edges are made rounder.

Patch Reef - TR

The patch reef samples contain only 10 individuals whose taphonomic attributes (Figures) are similar in most respects to those seen in the pooled molluscs from this station (e. g., highly altered edges, low to medium color loss, medium surface degradation, and minor abrasion: Figures 38, 40, 42, 44, 46, and 48)). *Cerithium* varied from the pooled shells, occurring largely as fragments with medium levels of encrustation. The moderate level of encrustation could have been acquired prior to the organisms death while predators or storm transport may have broken the shells, giving these results an artifact resulting from small sample size.

Hawk Channel Unvegetated Bottom - TS

The thirteen individuals from this station were either whole shells or fragments, the majority of which had medium amounts of surface degradation. Epibiont encrustation was medium and abrasion minor. There were nearly equal numbers of shells in all color loss categories and an equal number of low and high alterations to the edges (Figures 38, 40, 42, 44, 46 and 48).

The presence of higher epibiont coverage of these ceriths compared to the 'pooled' sample is not surprising given that these organisms are epifaunal and probably acquire some epibionts during their lives.

Hawk Channel Grassbed - TH

Cerithium abundance was higher in this grassbed (53 individuals). Taphonomic signatures expressed by the pooled sample and the*Cerithium* were similar with the exception of color loss (Figures 38, 40, 42, 44, 46 and 48). The majority of ceriths have retained their original color, probably due to a combination of lower light within the grassbed and intrinsic properties of the Cerithium shell pigments (Parsons 1992).

Florida Bay - FB

Shells collected were faded and either broken or fragmented (Figures 46 and 48). The surfaces had a low percentage of epibiont coverage, medium to high levels of surface degradation, minor abrasion, and low to medium levels of edge alteration. The *C. muscarum* shells varied from the pooled molluscs by having more broken shells (as opposed to fragments in the pooled sample) than whole and a smaller percentage of severely rounded edges. These differences may be the result of the composition of the pooled Florida Bay sample. Only four species were used in the pooled taphonomic analyses; *C.*

muscarum and three bivalves. These bivalves may be more prone to breaking into fragments, as opposed to the more compact shell of *C. muscarum*.

Chamidae

The bivalve family Chamidae contains the genera *Chama* and *Pseudochama*. These bivalves, commonly know as jewelbox shells, are epifaunal organisms that cement their lower valve to hard substrates (Abbott 1974). Both valves are nearly circular and quite thick with the lower one being deeply cupped. The shells studied ranged in size from 4 mm to 36 mm. Colors varied from brown to red and yellow. Chamids also have strong, variable sculpture ranging from concentric to leafy or plate-like ridges, often with flattened spines. These are reported as "often covered with coralline algae, brown algae, worm tubes or other marine growth" (Rehder 1981). The chamids occur from the intertidal zone to subtidal depths greater than 50 m (Abbott 1974).

Deep Reef Sand Flat - Station DP

Chamid shells were very abundant (92) on the deep reef sand flat. Most frequently they were collected whole with their original color or a faded version of it, the latter characteristic being quite distinct from the pooled shells' high level of color loss (Figure 29 and 58). The chamids' levels probably result from the constant input of valves produced by local residents. This would maintain the low to medium color proportions above those of the bleached, older chamid shells. Several facts in favor of this include: (1) the flat is well within the depth range of the chamids; (2) Miller and Dent (1995, in prep), using cluster analysis, found the chamids to be the defining members of the deep reef sand flat; and (3) the physical appearance of the flat, with peripheral coral stands and debris from tilefish burrow middens, supplied a variety of substrata suitable for living jewelbox shells.

Encrustation was the other taphonomic attribute where the pooled shells differed from the chamids (Figure 50). Medium levels of encrustation in the

chamids can again be related to higher input of resident chamids, as opposed to the lower levels of allochthonous shells and/or other flat residents that are not as productive as the chamids.

Forereef Sand Flat - Station AQ

Chamid valves were very abundant (138 individuals) here. Chamid shell surfaces exhibited higher levels of edge alteration than did the pooled shells, but this may be an artifact resulting from the pooling of several species of *Chama* into a composite sample. During the identification process a decision was made not to identify members of this genus to the species level due to problems with recognizing individual species. Measurements of edge alteration for this group were largely based on the condition of crenulations on the inner edges of the valves. Unfortunately, there is a reef species, *Chama sinuosa*, that has no inner crenulations (Abbott 1974). *C. sinuosa* individuals with moderate surface degradation would have a similar edge state as other *Chama* spp. with worn crenulations, thereby skewing the results.

Another possibility reflects epibiont overgrowth these epifaunal animals accrued while alive. Upon their death, the chamids already had greater epibiont coverage than do infaunal molluscs. Parsons (1992) found that the *Chama* sp. from reefs of the northeastern Caribbean had a level of encrustation equal to those from this study. Additionally, these *Chama* spp. had significantly greater epibiont coverage than four out of nine species of molluscs whose life histories prevented epibiont growth while the organism was alive.

Reef Flat - Station BK

Fourteen individuals were collected from the reef flat. The majority of shells are whole and show a high degree of edge alteration and surface degradation. Moderate levels of color loss, epibiont coverage and abrasion

were also seen. The pooled shells differ from this description in that they are largely represented as fragments (Figures 50, 52, 54, 56, 58, and 60). This discrepancy is most likely the result of the chamids possessing a thick, robust valve; broken and fragmented chamid shells were rarely more than 30 % of the total collected.

Backreef Stations

Rubble Zone, Grassbed, Transition Zone, Rippled Sand

The majority of chamid shells from backreef environments were whole with low to medium color loss and highly altered edges. Moderate levels of epibiont coverage, abrasion and medium to surface degradation characterize the valve surfaces of backreef chamids. The pooled, backreef shells differ from the chamids by having low level of epibiont encrustation and higher levels of breakage (Figures 50, 52, 54, 56, 58, and 60); differences have already been discussed in the two preceding sections.

Chamids valves also show nonsignificant changes in proportion of taphonomic characters as one moves from the backreef rubble zone (RZ) to the rippled sand (RS). Edge alterations increase, the percentage of moderate epibiont coverage decreases very slightly, and the proportion of moderately abraded valves increases. The proportion of valves with highly degraded surfaces shows a significant increase from the rubble zone to the grassbed.

Patch Reef - TR

This station is typified by whole valves of chamids that show medium color loss and high levels of edge alteration . Moderate levels of color loss, epibiont coverage and abrasion were also seen. Surface degradation was almost evenly divided between the medium and high categories (Figure 50, 52, 54, 56, 58, and 60). The chamids signature matches that of the pooled mollusc

rather well, the only exception being the level of encrusting. Here the pooled sample is split between shells with low and high levels while the majority of the chamids are at the level they have consistently shown in all other environments.

Hawk Channel Grassbed - TH

The extremely small sample size (3 individuals; one live and 2 dead) at this site makes any interpretations drawn from it highly suspect, although the general taphonomic characteristics seen for the chamid group are generally exhibited here (Figures 50, 52, 54, 56, 58, and 60). These shells were whole with original to faded colors. Two had edges that were highly altered and one displayed low levels of alteration. Their surfaces were moderately to highly degraded with medium levels of abrasion and epibiont coverage.

Tellina spp.

Members of the bivalve genus *Tellina* are infaunal suspension/deposit feeders with thin shells. Three species (*T. similis, T. gouldi* and *T.* sp. FB) were combined for this portion of the study because their abundance was not sufficiently high individually in a majority of the stations (Table 9). *Tellina similis* is a small (<3 cm), elongate bivalve whose valves are very thin; this shell is distinguished by its color pattern and surface sculpture. The exterior of the shell is opaque white to pink with a yellow blush and 6 to 12 red rays on the exterior and solid yellow to pink on the interior; additionally a distinctive red spot occurs on the hinge just posterior to the umbo (Abbott 1974). The surface to the shell is "traversed by extremely fine asymmetrical ridges (with steep dorsal slopes)" that assist this species in rapid burrowing (Stanley 1970). Abbott (1974) noted that it is "common on sand flats" while Stanley (1970) reported *T. similis* prefers shallow subtidal bottoms of barren muddy sand. Rehder (1981) gave its habitat as sand in water 0.3 to 46 m deep.

Tellina gouldi is smaller (6 - 10 mm), more oval and inflated, and has thicker valves than *T. similis*. It occurs in "sandy, weedy areas" at depths from 1.8 to 512 m deep (Abbott 1974; Rehder 1981). The third tellin was an unidentified species collected only in Florida Bay. It was white with valves as thin as *T. similis*.

Deep Reef Sand Flat - DP

Like the ceriths, the tellins were also under-represented on the deep reef sand flat (six individuals - all *T similis*). Four of the valves were in very good condition. They were unbroken with their original color. Shell edges were unaltered and the surfaces showed no abrasion and only low levels of degradation and epibiont coverage. The remaining two valves were fragmented and bleached whith surfaces displaying medium levels of epibiont coverage, high surface degradation, minor abrasion and high levels of edge alteration (Figures 62, 64, 69, 76, 82, and 84).

Based on very tenuous data, I consider the four pristine valves to be local residents only recently exposed on the surface. This is supported by the lack of damage seen in the specimens. Valves that have been on the flat for longer periods of time will tend to show more surface degradation and encrustation. Additionally, the thinness of these shells makes them more susceptible to fragmentation, making it less likely they were transported from shallower environments or had been subjected to a high degree of bioturbation.

Forereef Sand Flat - Station AQ

Tellina were very abundant on the forereef sand flat (Table 10). A significant majority of these shells are whole and have their original color. Surface degradation was low to medium. Epibiont coverage, abrasion, and

edge alterations were all at significantly low levels (Figures 62, 64, 69, 76, 82, and 84).

The tellins were in superior condition compared to the pooled molluscs in terms of color retention, abrasion, epibiont coverage, surface degradation, and edge alteration (Figures 21, 23, 25, 29, 62, 64, 69, and 76).. This may be the result of high tellin production, death within the sediment, rapid burial or some combination of these factors. Another possibility is that taphonomic processes rapidly exact a heavy toll on these shells, resulting in a mixed assemblage that contains relatively pristine shells or a few deteriorated remnants.

Reef Flat - Station BK

Only two *T. gouldi* valves were collected on the reef flat. Given its habitat preferences, it would seem logical to assume the valves were transported onto the reef flat. Both were whole and bleached with strongly rounded edges and moderate abrasion. Each shell showed a different level of surface degradation and epibiont coverage, one medium and the other high. This profile matched that of the pooled shells from this station except these shells are whole while the pooled shells were largely fragments (Figures 62, 64, 69, 76, 82, and 84).

Backreef Stations

The major difference between the backreef *Tellina* valves and those in the pooled fraction was their frequency of fragmentation. Backreef tellins had significantly greater numbers of whole shells when compared to the percentages that were broken or fragmented. The broken fraction was significantly greater than in the pooled samples, reflecting the more fragile nature of *Tellina* valves (Figure 84). There is evidence, however, leading to the conclusion that T. *similis* shells are likely to be destroyed rapidly in the backreef (see below). This preferential destruction of all *Tellina* valves skews the

distribution toward the more recently deposited whole valves. These percentages (≈ 75 – 90%) of unbroken shells are well outside the range (5 – 50%) found by Parsons (1992) in all but two of her thirty sampling localities (shelf, reef, grassbed, sand, beach and mud).

Backreef *Tellina* sp. shows a range of color loss, in contrast to the pattern (significantly greater numbers of faded) exhibited by pooled shells. Both groups showed significantly greater numbers of shells with low encrustation compared to the those with moderate encrustation. Backreef tellins show no significant differences in the proportions of shells where both edge alteration and surface degradation are concerned, unlike the pooled shells.

Tellina had an interesting distribution of abrasional states in the backreef. The rubble zone and grassbed both had statistically indistinguishable proportions of low and medium-abraded valves. The transitional zone and rippled sand had significantly greater numbers of moderately abraded shells versus those showing little evidence of abrasion. Additionally, both the tellins and pooled shells at these stations had greater proportions of minor abrasion shells, but the tellins had a consistently lower percentage. This percentage was never significantly different than the percentages seen in the pooled shells.

Literature sources show the distribution of both identified *Tellina* species as being within the range of environments sampled. Abundance data collected for this dissertation (Table 10) show live*T. gouldi* present in the environments present from the forereef sandflat through to the Hawk Channel grassbed with low numbers in the reef flat and the inner shelf margin. *T. similis* is present at all stations except the reef flat and rippled sand stations. Even if *T. similis* cannot inhabit the rippled sand, some of its valves should be found in this environment due to the close proximity to where it does occur (RZ and RH).

Table 10. *Tellina* raw abundance data by station.

Species	DP	AQ	BK	RZ	RH	RR	RS	TR	TS	TH	FB
T. sp. FB	0	0	0	0	0	0	0	0	0	0	15
T. gouldi	0	16	2	20	52	11	33	1	3	3	0
T. similis	5	84	0	6	6	1	0	9	10	18	0

The two stations BK, and RS represent the most energetic subenvironments in terms of water movement, the former being the shallowest, atop the reef and the latter with the most unstable sediment. On several occasions I viewed particles in traction in the area of migrating ripples. The progression of backreef environments from rubble zone through rippled sand represents a continuum of increasingly unstable sediment. The rubble zone's coral cobbles lock together and hold pockets of sand between them and on their downcurrent side. The grassbed is stabilized by the rhizome mat while the transition zone has large patches of grass within it that provide stable sediment.

Patch Reef - TR

Tellina shells at the patch reef differed taphonomically from the pooled shells in degree of surface degradation, edge alterations, fragmentation, abrasion, and encrustation. *T. similis* valves dominated this station (9) and showed significantly greater numbers of shells with medium surface degradation, whereas the pooled shells had their greatest numbers almost equally divided between medium and high levels of surface deterioration (Figure 23 and 67). *T. similis* had the majority of its valves with low to medium edge alterations compared to the medium to high edge rounding recorded for the majority of the pooled shells (Figures 25 and 73). Pooled shells had equally high numbers of whole shells and fragments while the majority of *T. similis* were represented as fragments in these samples (Figures 34 and 87). *T. similis* has lower percentages of moderately abraded shells compared to the pooled specimens (Figures 27 and 79). All *T. simils* shells appear in the low and medium levels of epibiont coverage while greater than 40 % of the pooled specimens have high levels of encrustation (Figures 21 and 62)..

T. *similis* valves reflect the moderate energy regime and low sedimentation rate of this area through the presence of fragments with moderate abrasion, low to medium degrees of edge rounding and epibiont coverage, and higher levels of surface degradation than in the outer reef margin stations.

Hawk Channel and Florida Bay

Unvegetated Bottom and Grassbeds

Tellina and the pooled shells show little difference in their overall taphonomic condition, reflecting the low energy and sedimentation rates of the inner shelf margin. Nearly equal proportions of the three fragmentation classes and edge alterations were collected from here, as with the pooled shells (Figures 69 and 84). Patterns of surface degradation and encrustation are similar between the tellins and pooled shells (Figures 21, 23, 67, and 69). These frequencies imply that the tellin valves persist longer on the seafloor here, acquiring more epibionts, endolithic borers, and/or undergoing dissolution over a longer period than their counterparts on the more energetic outer shelf margin.

Comparison Between Pooled and Target Taxa

Taphonomic signatures (based on ternary taphograms) carried by two of the target taxa (*Cerithium* and the Chamidae) generally tracked the pooled molluscan taphonomic characters quite well across the environments studied (Table 11). This was corroborated by cluster analysis of averaged features from all three groups, which showed comparable clustering in all three cases. *Cerithium* varied most often from the pooled data in what was commonly represented as fragments (mainly apices) in areas where the pooled shells did not reflect as high a degree of breakage. This was especially true for the two

Table 11. Comparison between the taphonomic signatures of pooled molluscs and target taxa by sampling station.

DP	Pooled	*Cerithium*	Chamidae	*Tellina*
Color Loss	H	M	L-M	L
Edge Alteration	H	H	H	L
Fragmentation	L	H	L	L
Abrasion	M	M	M	L
Encrustation	H-M	M	M	L
Sur. Degrad.	H	H	M-H	L

AQ	Pooled	*Cerithium*	Chamidae	*Tellina*
Color Loss	M	M	L-M	L
Edge Alteration	L	L	H	L
Fragmentation	L	H	L	L
Abrasion	M	M	M	L
Encrustation	M	M	M	L
Sur. Degrad.	M-H	M-H	H	L

RF	Pooled	*Cerithium*	Chamidae	*Tellina*
Color Loss	M	M	M	L
Edge Alteration	H	H	H	H
Fragmentation	H	H	L	L
Abrasion	M	M	M	M
Encrustation	M	M	M	M-H
Sur. Degrad.	H	H	H	M-L

RZ, RH, RR, RS	Pooled	*Cerithium*	Chamidae	*Tellina*
Color Loss	M	M	M	VARIABLE
Edge Alteration	H	H	H	L-H
Fragmentation	L-H	H	L	L
Abrasion	M	L-M	M	L-M
Encrustation	L	L	M	L
Sur. Degrad.	M-H	H	H	M-H

TR	Pooled	*Cerithium*	Chamidae	*Tellina*
Color Loss	M	L-M	M	M
Edge Alteration	M-H	H	H	L-M
Fragmentation	L-H	H	L	H
Abrasion	M	M	M	M
Encrustation	L-H	M	M	L-M
Sur. Degrad.	M-H	M	M-H	M

Table 11. (Continued) Comparison between the taphonomic signatures of pooled molluscs and target taxa by sampling station.

TR	Pooled	*Cerithium*	Chamidae	*Tellina*
Color Loss	M	L-M	M	M
Edge Alteration	M-H	H	H	L-M
Fragmentation	L-H	H	L	H
Abrasion	M	M	M	M
Encrustation	L-H	M	M	L-M
Sur. Degrad.	M-H	M	M-H	M

TS	Pooled	*Cerithium*	Chamidae	*Tellina*
Color Loss	L-H	L-H	M	M
Edge Alteration	L-H	L-H	H	L
Fragmentation	L	L-H	L	L-H
Abrasion	M	M	M	L-M
Encrustation	L	M	M	M
Sur. Degrad.	M	M	M-H	M

TH	Pooled	*Cerithium*	Chamidae	*Tellina*
Color Loss	H	L	L-M	L-H
Edge Alteration	L-H	L-H	H	L-H
Fragmentation	H	H	L	L-H
Abrasion	L-M	L-M	M	L-M
Encrustation	M-L	M	M	M
Sur. Degrad.	M-H	M-H	M	M

FB	Pooled	*Cerithium*	Chamidae	*Tellina*
Color Loss	M	M	—	L
Edge Alteration	L-H	L-M	—	M-H
Fragmentation	L-H	M-H	—	L-H
Abrasion	M	M	—	M
Encrustation	L	L	—	M
Sur. Degrad.	M-H	M-H	—	

deeper water sand flat environments. Two possible sources of bias that may account for this higher level of *Cerithium* fragmentation are: 1) apices may persist in the environment for a longer time than other types of shell fragments because of their compact form and thick walls; and 2) apices are easily distinguished by researchers, compared to fragments created when other types of shells fracture. This would tend to over-represent them in the sample.

Similarly, chamids also differed from the pooled molluscs in the degree of fragmentation, but in a direction opposite that of the ceriths. The overwhelming majority of chamid valves (> 85%) were the "top" valve of this asymmetrical bivalve. The top shells are generally flatter in profile and quite thick, which almost certainly retarded breakage. Chamids were often found as whole valves in environments (reef flat, backreef) dominated by pooled mollusc fragments. They also differed from the pooled shells in having higher levels of encrustation and surface degradation, probably a consequence of the organism's life history as an epifaunal bivalve and its resistance to breakage. Parsons (1992) demonstrated that such differences are common when comparing epifaunal and infaunal molluscs within the same environment. Furthermore, she found that "the total epibiont cover on one genus versus another varied greatly from one environment to another." Finally, the chamids taphofacies exhibited a consistent pattern of similar taphonomic states within each category regardless of the environment (Table 11), a situation possibly resulting from its resistance to breakage and epifaunal life habit.

Tellin taphonomic signatures presented the greatest departure from those of the pooled molluscs, primarily in the two deep water sand flats (DP and AQ). There and at other stations the direction of variation of the attributes was toward the less degraded, 'fresher' end of the taphonomic continuum.

Examples include less edge rounding, lower abrasion, greater percentages of whole shells, and low coverage by epibionts.

These bivalves also produced a different ordering of stations when their average values were clustered (Figure18); one cluster consisting of deep water stations (DP and AQ), the Hawk Channel grassbed (TH) and patch reef (TR) and the other containing the backreef stations (BK, RZ, RH, RR, and RS), Hawk Channel unvegetated bottom (TS), and the Florida Bay grassbed (FB). The majority of the segregating features (Table 11) for the two groups were what might be called 'freshness' characteristics; minor edge alterations, low to moderate surface degradation, a high degree of luster and the retention of the shells' ligament. This suggests that the thinner valved tellins are more vulnerable to the taphonomic processes associated with higher levels of hydrodynamic energy.

Regional Comparison of Taphofacies Using Averaged Indices from Pooled Molluscs

Six south Florida carbonate taphofacies were defined here with the use of averaged data from the pooled collection of molluscs to facilitate a comparison with taphofacies defined in a similar manner by Parsons (1992) for the northeastern Caribbean. The south Florida study area includes general reef, reef sands, back reef, mud, grassbed and restricted - circulation grassbed taphofacies. Table 12 summarizes these taphofacies with a composite ranking of each taphonomic attribute. Terminology describing the level of alteration may be different from that used for the individual station taphofacies because, there, the ternary taphogram was being used to define the level of an attribute whereas here the average value of the attribute is the key piece of information.

Taphonomic Attribute	General Reef	Reef Sands	Backreef	Mud	Grassbed	
					Normal Marine	Restricted Circulation
Encrustation	H	H	M	L	H	L
Surface Degradation	H	M	M	H	M	M
Edge Alteration	H	H	H	M	M	M
Abrasion	L	L	M	—	—	—
Color Loss	M	L	H	M	H	L
Fragmentation	M	M	H	M	H	M
Luster Loss	L	M	M	H	L	M
Periostracum Ligament Retention	L	L	L	M	L	—

Table 12. Taphofacies from south Florida based on averaged pooled molluscs and combination

Parsons (1992) provided taphofacies descriptions for six carbonate environments, open shelf, general reef, grassbeds, bioturbated sand, and mud (Table 13). Note that the general reef taphofacies of south Florida are similar to that of the northeast Caribbean in most attributes, except for surface degradation. Surface degradation appears to be greater off south Florida than at St. Croix and Isla de Mona. This difference may have to do with the fact Parsons (1992) examined a wider variety of reef sites (ten in all) at various depths. The low fragmentation rate is probably

The muddy taphofacies from the Keys and the Caribbean were almost completely different with only one of the attributes having the same ranking: shells from both are characterized as unabraded. The unvegetated site from Hawk Channel had a low level of encrustation, high surface degradation, medium levels of fragmentation and edge alteration, color and luster loss and ligament / periostracum retention. The St. Croix mud taphofacies had only three attributes moderate fragmentation, high levels of periostracum / ligament preservation and low levels of articulation. These differences may again be related to sedimentation rates. Parsons (1992) used shells from the muddy bottom of Salt River Bay, which is "at the terminus of the second largest watershed on St. Croix." The bay has two arms formed from drowned distributaries of Salt River. Freshwater runoff from the streams occurs when there has been a major storm and sediments here are fine siliciclastic particles associated with this input. In general, turbidity is quite high (Parsons 1992). As mentioned previously, Hawk Channel covers a much larger area, receives no freshwater inflow from rivers, has a carbonate mud bottom, and has low sedimentation rate (Enos 1977).

As Parsons noted, shells in the mud at Salt River Bay are from a "quiet environment in which the mollusks were infaunal and remained *in situ* , rarely

Taphonomic Attribute	General Reef		Sands			Backreef	Mud		Grassbed		
			Reef	Biotur	Shelf				Normal Marine		Restricted Circulation
	SF	NEC	SF	NEC	NEC	SF	SF	NEC	SF	NEC	SF
Encrustation	H	*H*	M	*L*	*M*	M	L	—	H	*M*	L
Surface Degradation	H	*M*	M	*L*	*M*	M	H	—	M	*L*	M
Edge Alteration	H	*H*	M	*L*	*H*	H	M	—	M	*M*	M
Abrasion	L	*L*	—	—	*L*	M	—	—	—	—	—
Color Loss	M	*L*	L	—	*H*	H	M	—	H	*L*	L
Fragmentation	M	*M*	L	*M*	*H*	H	M	*H*	H	*L*	M
Luster Loss	L	*M*	L	—	*H*	M	H	—	L	*L*	M
Periostracum Ligament Retention	L	*L*	H	*L*	*L*	L	M	—	L	*M*	—
Sponge Borings	L	*M*		—	*L*	L	—	—	L	*L*	L
Rhizome Etching	—	—		—	—	—	—	—	—	*H*	—

Table 13. A comparison of the taphofacies from south Florida with those described by Parsons (1992) for the northeastern Caribbean. Biotur = Bioturbated.

being exposed to the sediment surface where most taphonomic processes act. " (Parsons 1992). By contrast, shells in Hawk Channel might well have been subject to the combined effects of transport and low sedimentation rates. Shells from other habitats transported into the muddy area would have already had the taphonomic signature of the former environment. That signature would then be overprinted by the new muddy environment where low sedimentation rates might prevent burial.

The Hawk Channel mud bottom signature described above was based on averaged values of the pooled shell sample. An examination of the ternary taphograms and frequency distributions for the same shells shows that they have some features in common with those reported by Parsons (1992); large numbers of whole shells showing high levels of unaltered edges and retaining their original color, or a faded version of it. This suggests that , in this instance, averaging reduced the mixed character of the Hawk Channel site into a number that may have had very little meaning.

Taphonomic signatures produced by grassbeds from within south Florida were different from one another; as a group they were also quite different from the northeast Caribbean. The biggest surprise from south Florida was the rather low level of rhizome etchings; a key diagnostic feature of the grassbed taphonomic signature in St. Croix (Parsons, 1992). Comparison of the two locations shows that St. Croix had 1.5 times greater seagrass density than south Florida (Table 14). The greater rhizome density on St. Croix may have increased the likelihood of etching.

Because the taphonomic characteristics of the south Florida grassbed stations showed a high degree of variability over five of the eight features examined (encrustation, edge alteration, abrasion, color and luster loss, and fragmentation) they do not behave as a cohesive taphonomic group.

Table 14. Comparison of seagrass densities (blades/ m^2) between South Florida Stations and Parsons (1992) St. Croix locations.

South Florida			St. Croix		
Station	*Thalassia*	*Syringodium*	Station	*Thalassia*	*Syringodium*
RR	1062.5	0	E750	687.5	656.3
RH	889.06	309.38	E810	1612.5	1150
TH	895.31	0	GPB1	1500	754
FB*	862.5		SC90	16	104
			SC1	1352	504

*Based on only two drops rather than eight

Hawk Channel's grassbed was chosen as the representative grassbed from the south Florida shelf because, taxonomically and taphonomically, it most resembled the shelf stations as opposed to Florida Bay, an area that is quite unlike the shelf margin. The backreef grassbed was retained with the other backreef environments because the signatures of these stations are almost identical. Florida Bay was placed by itself in the restricted circulation grassbed category because it exhibited medium levels of fragmentation and luster loss and low levels of color loss and encrustation, characteristics it did not share with either the other Florida Keys grassbeds nor those of St. Croix.

The south Florida grassbed differed from Caribbean grassbeds by having a higher level of encrustation, high loss of color and luster and high fragmentation rates. The probable causes for these differences was not known.

The reef sands taphofacies and backreef taphofacies are areas with unique combinations of taphonomic attributes. The backreef is taphonomically distinct from the general reef because the former has consistent medium encrustation, surface degradation, abrasion, and fragmentation whereas the south Florida general reef has high levels of encrustation and surface degradation and lower amounts of abrasion and fragmentation. The northeast Caribbean general reef taphofacies is similar to that of south Florida in all respects except for surface degradation. It has a medium level of degradation similar to that found in the south Florida reef sands. The backreef also shows higher levels of color and luster loss as contrasted with medium levels in the general reefs.

The reef sands taphofacies had the most interesting mixture of taphonomic features of all the stations. The high proportion of shells retaining partial ligaments and showing no abrasion, low loss of color and fragmentation

and medium amounts of encrustation, surface degradation, and edge alterations were not expected to be found in the forereef zone.

CONCLUSIONS

1. Cluster analyses of averaged (mean) taphonomic indices from pooled molluscs and two target taxa (ceriths and chamids) produced associations of stations that resembles each other based on similarities between specific taphonomic signatures (high surface degradation and abrasion). The dendrogram generated by the averaged tellin taphonomic indices was quite different from the others. This analysis clustered adjacent stations together based upon higher levels of edge alteration, surface degradation and abrasion.

2. Averaged taphonomic indices of pooled shells produced taphofacies models that distinguished between geographically distant sampling stations, but could not segregate different, immediately adjacent backreef environments.

3. The use of ternary taphograms and confidence interval - bounded proportions produced a more detailed picture of the distribution of taphonomic scores making the description of taphofacies more accurate as opposed the use of a single averaged value.

4. Cluster analysis of single averaged indices from pooled molluscs and ternary diagrams and frequency distributions of pooled data all produced taphofacies that complemented each other.

5. Pooled mollusc taphonomic attributes provided enough information for the construction of distinct taphofacies for all geographically distant environments sampled. The different backreef subenvironments produce similar taphofacies. There the close lateral spacing of sampling stations (≈ 160 m) prevented clear taphonomic signals from being expressed, despite

dramatic differences in the surface composition and vegetation cover within the backreef subenvironments.

6. In its native habitats, Cerithium generally has taphonomic signatures that closely correspond to those found on the pooled molluscs. Taphonomically, Cerithium showed greater variability from the pooled molluscs in areas where they were likely to be allochthonous.

7. The thick, oval valves of the epifaunal Chamidae displayed a consistent taphonomic pattern despite changing environmental conditions. This pattern is probably a combination of its sedentary, epifaunal mode of life and the robust nature of the valve that enables it to persist despite the different post-mortem taphonomic processes.

8. Thin shelled tellins produced taphofacies that differed the most from the pooled shells in that they clustered together as adjacent stations based on "freshness" related factors such as high luster and color, retention of ligament, minor edge alterations and low to medium surface degradation. This suggests that the distribution of thinner shelled tellins are controlled by the level of hydrodynamic energy present.

9. Three new carbonate taphofacies were defined for the south Florida shelf; reef sands, back reef and restricted circulation grassbed. The reef sands are areas where high carbonate production and low to moderate hydrodynamic energy conditions produce shells with low to moderate levels of taphonomic attributes evaluated in this study except surface degradation, that was found to be moderate to high here. The shallow backreef taphofacies is characterized by higher levels of hydrodynamic energy which

is responsible for the medium levels of encrustation, surface degradation, and abrasion. The shell edges were highly altered and there was a bimodal distribution of whole shells and fragments, both of which were lacking in color and luster. The restricted circulation grassbed had shells with low levels of epibiont encrustation and color loss. Fragmentation, loss of luster, surface degradation, and edge alteration were in the medium range and there was neither evidence of abrasion nor conchiolin structures (periostracum, ligament) present.

10. A comparison of the northeastern Caribbean taphofacies (Parson 1992) shows environments that were similar enough to be comparable. These included the general reef, grassbeds and mud bottoms. The general reef taphofacies from both locations were similar in all ways with the exception of higher levels of surface degradation occurring on the south Florida shells. Grassbeds in south Florida were quite variable in their taphonomic signature and all had extremely low numbers of rhizome etchings. The taphonomic signature of the normal marine conditions grassbed from south Florida was different from the northeastern Caribbean grassbeds in the levels of all attributes except edge alterations, loss of luster and sponge borings and the reasons for these differences can be explained. Likewise, the two regions had very different signatures attached to mud bottoms. These differences are probably attributable to differences in the rate of sedimentation and level of hydrodynamic energy.

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Site	Species	% Cove	Size	Color	Luster	Periostr	Predbo	Shell	Break	EdgAlt	Dissol	Abras	Spon g	Graze
FB-0	Chione cancellata	1	32	2	1	1	0	L	0	2	1.1	1.1	0	0
FB-0	Chione cancellata	1	29	2	0	1	0	L	2	2	2.1	1.1	0	0
FB-0	Chione cancellata	1	24	2	0	0	0	L	2	3	2.21	1.1	0	0
FB-0	Chione cancellata	1	20	2	0	1	0	L	2	2	2.1	1.1	0	0
FB-0	Chione cancellata	2	20	0	0	0	0	L	1	3	2.22	1.1	0	0
FB-0	Chione cancellata	0	18	2	1	0	1	L	0	2	2.1	1.1	0	0
FB-0	Chione cancellata	1	18	0	0	0	0	L	0	2	2.21	1.1	0	0
FB-0	Chione cancellata	2	13	2	1	0	0	L	0	2	2.1	1.1	0	0
FB-0	Chione cancellata	1	13	2	1	0	0	L	0	2	1.2	1.1	0	0
FB-0	Chione cancellata	1	11	2	1	1	0	L	0	1	1.1	1.1	0	0
FB-0	Chione cancellata	1	11	2	1	0	0	L	0	1	1.1	1.1	0	0
FB-0	Chione cancellata	2	10	0	1	0	2	L	0	2	1.1	1.1	1	0
FB-0	Chione cancellata	1	9	2	1	1	0	L	0	1	0	0	0	0
FB-0	Chione cancellata	1	10	3	1	0	0	L	0	1	0	1.1	0	0
FB-0	Chione cancellata	0	9	3	1	1	0	L	0	0	0	0	0	0
FB-0	Chione cancellata	1	8	2	0	0	0	L	0	1	2.22	1.1	0	0
FB-0	Chione cancellata	0	9	2	1	0	0	L	0	2	2.1	1.1	0	0
FB-0	Chione cancellata	2	10	0	0	0	0	L	1	3	2.41	1.2	0	0
FB-0	Chione cancellata	1	9	2	1	0	0	L	1	3	2.21	1.2	0	0
FB-0	Chione cancellata	0	7	3	1	0	0	L	0	2	1.2	1.1	0	0
FB-0	Chione cancellata	0	6	2	1	0	2	L	0	2	1.2	1.1	0	0
FB-0	Chione cancellata	0	7	2	0	0	0	L	0	3	2.21	0	0	0
FB-0	Chione cancellata	0	7	2	1	0	0	L	0	2	1.2	0	0	0
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FB-0	Chione cancellata	1	10	0	1	0	0	L	2	2	1.2	1.1	0	0
FB-0	Chione cancellata	2	12	0	0	0	0	L	2	2	2.41	1.2	0	0
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FB-0	Chione cancellata	1	9	0	0	0	0	L	2	2	2.21	1.2	0	0
FB-0	Chione cancellata	2	11	0	0	0	0	L	2	3	2.23	1.2	0	0
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FB-0	Chione cancellata	2	29	2	1	1	0	R	0	1	1.1	1.1	0	0
FB-0	Chione cancellata	1	22	2	1	0	0	R	1	2	2.1	1.1	0	0
FB-0	Chione cancellata	0	20	2	1	1	0	R	1	1	1.2	1.1	0	0
FB-0	Chione cancellata	0	20	2	1	1	0	R	0	2	2.1	1.1	0	0
FB-0	Chione cancellata	0	19	2	0	0	4	R	0	2	2.1	1.1	0	0
FB-0	Chione cancellata	1	13	2	1	0	0	R	0	2	1.2	1.1	0	0
FB-0	Chione cancellata	1	12	2	1	0	2	R	0	2	2.1	1.1	0	0
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FB-0	Chione cancellata	2	11	0	0	0	4	R	0	3	2.41	1.2	0	0
FB-0	Chione cancellata	1	12	0	0	0	0	R	0	3	2.21	1.1	1	0
FB-0	Chione cancellata	1	11	3	1	0	0	R	0	1	1.1	0	0	0
FB-0	Chione cancellata	1	11	0	0	0	0	R	0	2	2.21	1.1	1	1
FB-0	Chione cancellata	2	11	0	0	0	0	R	1	3	2.21	1.1	0	0
FB-0	Chione cancellata	1	10	0	1	1	0	R	0	2	2.1	1.2	0	0
FB-0	Chione cancellata	1	9	3	1	1	0	R	0	0	0	1.1	0	0
FB-0	Chione cancellata	1	8	2	1	0	0	R	0	1	1.2	1.1	0	0
FB-0	Chione cancellata	0	8	0	1	0	0	R	0	2	2.1	1.1	0	0
FB-0	Chione cancellata	1	8	2	1	0	0	R	1	2	2.21	1.1	0	0
FB-0	Chione cancellata	1	8	0	0	0	0	R	0	3	2.22	1.2	0	1
FB-0	Chione cancellata	0	7	2	1	1	4	R	0	2	1.1	1	0	0
FB-0	Chione cancellata	1	7	0	1	0	0	R	0	2	2.21	1.1	1	0
FB-0	Chione cancellata	0	7	3	1	1	4	R	0	0	0	0	0	0
FB-0	Chione cancellata	1	6	2	1	0	0	R	0	2	2.1	1.1	0	0
FB-0	Chione cancellata	1	6	2	1	0	0	R	0	2	2.1	1.2	1	1
FB-0	Chione cancellata	0	6	3	1	1	3	R	0	0	0	0	0	0
FB-0	Chione cancellata	0	11	0	0	0	1	R	2	2	2.21	1.2	0	1
FB-0	Chione cancellata	1	22	0	0	0	0	R	2	3	2.21	1.2	0	1
FB-0	Chione cancellata	1	20	2	1	0	0	R	2	2	1.2	1.1	0	0
FB-0	Chione cancellata	2	18	0	0	0	0	R	2	3	2.21	1.2	0	1
FB-0	Chione cancellata	2	17	0	0	0	0	R	2	3	2.21	1.2	1	0
FB-0	Chione cancellata	0	15	2	1	0	0	R	2	0	1.1	1.2	0	0
FB-0	Chione cancellata	1	13	0	0	0	0	R	2	3	2.41	1.2	0	1
FB-0	Chione cancellata	1	13	0	0	0	0	R	2	3	2.21	1.2	0	0

FB-0	Chione cancellata	1	12	0	0	0	0	R	2	3	2.41	1.2	0	1
FB-0	Chione cancellata	1	11	0	0	0	0	R	2	2	2.1	1.1	0	0
FB-0	Chione cancellata	1	11	0	0	0	0	R	2	3	2.21	1.1	0	0
FB-0	Chione cancellata	0	10	3	1	0	2	R	2	0	1.1	1.1	0	0
FB-0	Chione cancellata	1	10	2	1	0	0	R	2	2	2.21	1.1	0	0
FB-0	Chione cancellata	0	8	0	1	0	0	R	2	2	1.1	1.1	0	0
FB-0	Chione cancellata	1	9	0	0	0	0	R	2	3	2.22	1.1	0	0
FB-0	Chione cancellata	0	7	3	1	0	0	R	2	0	1.1	1	0	0
FB-0	Chione cancellata	1	8	2	1	1	0	R	2	2	2.1	1.1	0	0
FB-0	Chione cancellata	1	7	2	1	0	0	R	2	2	2.1	1.1	0	0
FB-0	Chione cancellata	0	8	0	0	1	0	R	2	2	2.22	1.2	0	0
FB-0	Chione cancellata	0	6	0	0	1	0	R	2	2	1.1	1.2	0	0
FB-0	Tellina FB	1	13	N/A	1	0	0	L	0	3	2.1	0	0	0
FB-0	Tellina FB	0	11	N/A	1	0	0	L	2	1	1.2	0	0	0
FB-0	Tellina FB	1	10	N/A	1	1	0	L	1	3	2.1	1.1	0	0
FB-0	Tellina FB	2	9	N/A	1	0	0	L	0	3	2.22	1.1	1	0
FB-0	Tellina FB	2	13	N/A	0	0	0	R	1	3	2.22	1.1	0	1
FB-0	Tellina FB	1	10	N/A	1	0	0	R	0	2	2.1	1.1	0	0
FB-0	Tellina FB	0	9	N/A	1	1	0	R	1	2	0	1.1	0	0
FB-0	Tellina FB	1	8	N/A	1	0	0	R	2	3	2.1	1.1	0	0
FB-0	Tellina FB	1	12	N/A	0	0	0	L	1	3	2.21	1.1	0	0
FB-10	Tellina FB	0	16	N/A	1	0	0	L	0	0	0	0	0	0
FB-10	Tellina FB	2	12	N/A	0	0	0	L	0	2	2.1	1.1	0	0
FB-10	Tellina FB	1	13	N/A	1	0	0	L	1	2	2.1	1.1	0	0
FB-10	Tellina FB	1	9	N/A	1	0	0	L	1	2	2.1	1.1	0	0
FB-10	Tellina FB	1	9	N/A	1	0	0	L	1	2	2.1	1.1	0	0
FB-10	Tellina FB	1	8	N/A	1	0	0	L	1	3	2.21	1.1	0	0

Site	Species		% Cove	Size	Color	Luster	Periostr	Pred bc	Shell	Breaka	EdgeAl	Dissolu	Abrasic	Sponge	Graze
BK-1	Arca imbricata		3	26	0	0	0	0	L	0	3	2.23	1.2	0	0
BK-1	Arca imbricata		3	22	0	0	0	0	R	0	3	2.23	1.2	0	0
BK-1	Arca sp.		3	12	2	0	0	0	R	2	3	2.23	1.2	0	0
BK-2	Arca sp.		2	23	0	0	0	0	L	3	3	2.21	1.2	0	0
BK-1	Barbatia cancellaria		2	15	2	0	0	0	R	2	3	2.21	1.2	0	0
BK-1	Barbatia cancellaria		2	15	2	0	0	0	L	3	3	2.23	1.2	0	1
BK-2	Barbatia cancellaria		1	17	2	0	0	0	T	1	3	2.21	1.2	0	0
BK-2	Barbatia cancellaria		2	19	2	0	0	0	T	1	3	2.21	1.2	0	0
BK-2	Barbatia domingensis		1	11	3	1	3	0	Live	0	0	0	0	0	0
BK-2	Barbatia domingensis		2	15	2	0	0	0	R	2	3	2.41	1.2	0	0
BK-1	Cerithium litteratum		1	10	0	0	0	0	A	3	3	2.23	1.2	0	0
BK-1	Cerithium litteratum		1	10	2	0	0	0	A	3	3	2.23	1.2	0	0
BK-1	Cerithium litteratum		1	7	0	0	0	0	A	3	3	2.23	1.2	0	0
BK-1	Cerithium litteratum		1	10	2	0	0	0	A	3	3	2.23	1.2	0	0
BK-1	Cerithium litteratum		1	10	2	0	0	0	A	3	3	2.21	1.2	0	0
BK-1	Cerithium litteratum		1	8	0	0	0	0	A	3	3	2.23	1.2	0	0
BK-1	Cerithium litteratum		1	6	3	1	0	0	A	3	1	0	0	0	0
BK-1	Cerithium litteratum		1	6	0	0	0	0	A	3	3	2.21	1.2	0	0
BK-1	Cerithium litteratum		0	2	11	2	0	0	A	3	2	2.21	1.2	0	0
BK-1	Cerithium litteratum		1	6	0	0	0	0	A	3	3	2.21	1.2	0	0
BK-1	Cerithium litteratum		1	9	2	0	0	0	A	3	3	2.21	1.2	0	0
BK-1	Cerithium litteratum		1	9	2	0	0	0	A	3	3	2.21	1.2	0	0
BK-1	Cerithium litteratum		1	7	2	0	0	0	A	3	3	2.21	1.2	0	0
BK-1	Cerithium litteratum		1	10	2	0	0	0	A	3	3	2.21	1.2	0	0
BK-1	Cerithium litteratum		2	10	2	0	0	0	A	3	3	2.21	1.2	0	0
BK-1	Cerithium litteratum		1	7	0	0	0	0	A	3	3	2.21	1.2	0	0
BK-1	Cerithium litteratum		1	11	3	1	0	0	W	2	1	1.2	1.2	0	0
BK-1	Cerithium litteratum		1	9	2	1	0	0	A	3	3	2.1	1.2	0	0
BK-1	Cerithium litteratum		2	9	2	0	0	0	W	1	1	2.21	1.2	0	0
BK-1	Cerithium eburneum		1	18	3	1	0	0	Live	0	0	0	0	0	0
BK-1	Cerithium eburneum		1	10	2	0	0	0	A	3	3	2.21	1.2	0	0
BK-1	Cerithium eburneum		2	21	3	1	0	0	W	0	0	1.2	1.1Â	0	0
BK-1	Cerithium eburneum		1	17	3	1	0	0	Live	0	0	0	0	0	0
BK-1	Cerithium eburneum		3	18	0	0	0	0	W	1	3	2.21	1.1	0	0
BK-1	Cerithium eburneum		1	8	2	0	0	2	W	2	3	2.21	1.1	0	0
BK-1	Cerithium eburneum		1	11	3	1	0	0	A	3	1	0	0	0	0
BK-2	Cerithium eburneum	•		10	0	0	0	0	W	2	3	2.42	1.2	0	0
BK-2	Cerithium eburneum		1	10	3	1	0	0	W	3	2	1.2	1.1	0	0
BK-2	Cerithium eburneum		1	8	2	1	0	0	A	3	2	2.1	1.1	0	0
BK-2	Cerithium eburneum		1	10	0	0	0	0	A	3	3	2.21	1.2	0	0
BK-2	Cerithium eburneum		2	9	0	0	0	0	W	1	3	2.23	1.2	0	0
BK-2	Cerithium eburneum		1	19	0	0	0	0	W	1	3	2.21	1.2	0	0
BK-2	Cerithium eburneum		1	10	0	0	0	0	W	2	2	2.21	1.1	0	0
BK-2	Cerithium eburneum	•		12	2	0	0	0	W	2	1	2.1	1.1	0	0
BK-2	Cerithium eburneum		1	18	3	1	0	0	W	1	0	0	0	0	0

BK-2	Cerithium eburneum	2	19	2	0	0	0	W	2	3	2.21	1.2	0	0
BK-2	Cerithium eburneum	3	19	0	0	0	0	W	2	3	2.41	1.2	0	0
BK-2	Cerithium eburneum	2	28	3	1	0	0	W	0	1	1.1	0	0	0
BK-2	Cerithium litteratum	1	10	2	0	0	2	A	3	3	2.21	1.2	0	0
BK-2	Cerithium litteratum	1	7	2	0	0	0	A	3	3	2.21	1.2	0	0
BK-2	Cerithium litteratum	1	11	2	0	0	0	W	2	3	2.21	1.2	0	0
BK-2	Cerithium litteratum	1	12	2	0	0	0	A	3	2	2.21	1.2	0	0
BK-2	Cerithium litteratum	1	10	2	0	0	0	W	1	2	2.1	1.1	0	0
BK-2	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.23	1.2	0	0
BK-2	Cerithium litteratum	1	11	2	0	0	2	A	1	2	2.1	1.1	0	0
BK-2	Cerithium litteratum	2	10	2	0	0	0	A	3	3	2.21	1.2	0	0
BK-2	Cerithium litteratum	3	10	2	0	0	0	A	3	3	2.41	1.2	0	0
BK-2	Cerithium litteratum	1	13	2	1	0	0	A	3	2	2.1	1.1	0	0
BK-2	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.41	1.2	0	0
BK-2	Cerithium litteratum	1	8	2	0	0	0	A	3	3	2.21	1.2	0	0
BK-2	Cerithium litteratum	1	7	2	0	0	0	A	3	3	2.23	1.2	0	0
BK-2	Cerithium litteratum	1	12	0	0	0	0	W	2	3	2.23	1.2	0	0
BK-2	Cerithium litteratum	1	8	2	0	0	2	W	1	3	2.21	1.2	0	0
BK-2	Cerithium litteratum	1	10	3	1	0	0	W	1	1	1.1	1.1	0	0
BK-2	Cerithium litteratum	1	13	2	0	0	0	W	2	2	2.21	1.2	0	0
BK-2	Cerithium litteratum	2	13	2	0	0	0	W	2	3	2.23	1.2	0	0
BK-2	Cerithium litteratum	1	10	0	0	0	0	A	3	3	2.41	1.2	0	0
BK-2	Cerithium litteratum	0	7	3	1	0	0	A	3	1	1.2	1.1	0	0
BK-2	Cerithium litteratum	1	7	2	0	0	0	A	3	3	2.21	1.2	0	0
BK-2	Cerithium litteratum	1	8	2	0	0	0	A	3	3	2.21	1.2	0	0
BK-2	Cerithium litteratum	1	8	3	1	0	0	A	3	1	1.2	1.1	0	0
BK-2	Cerithium litteratum	0	7	3	1	0	0	A	3	1	2.1	1.2A	0	0
BK-2	Cerithium litteratum	1	9	0	0	0	0	A	3	3	2.41	1.2	0	0
BK-2	Cerithium litteratum	2	9	2	0	0	2	A	3	3	2.23	1.2	0	0
BK-2	Cerithium litteratum	3	8	2	0	0	2	A	3	3	2.23	1.2	0	0
BK-2	Cerithium litteratum	1	7	0	0	0	0	A	3	3	2.23	1.2	0	0
BK-2	Cerithium litteratum	1	7	2	1	0	0	A	3	3	2.1	1.2	0	0
BK-1	Chama spp.	3	17	0	0	0	0	T	0	3	2.23	1.2	0	0
BK-1	Chama spp.	2	8	2	0	0	0	T	0	3	2.21	1.2	0	0
BK-2	Chama spp.	2	7	2	0	0	0	T	2	3	2.21	1.2	0	0
BK-2	Chama spp.	2	9	2	0	0	0	T	0	2	2.21	1.1	0	0
BK-2	Chama spp.	2	18	2	0	0	0	B	2	3	2.21	1.1	0	0
BK-2	Chama spp.	2	11	2	1	1	0	T	0	0	2.1	1.1	0	0
BK-2	Chama spp.	1	8	2	1	0	0	T	0	2	2.1	1.2	0	0
BK-2	Chama spp.	2	17	0	0	0	0	T	0	2	2.21	1.2	0	0
BK-2	Chama spp.	2	8	2	1	0	0	T	0	1	2.1	1.1	0	0
BK-2	Chama spp.	2	9	0	0	0	0	T	2	2	2.21	1.2	0	0
BK-2	Chione canellata	2	7	2	1	0	4	R	0	2	2.1	1.1	0	0
BK-2	Chione canellata	2	8	2	1	0	0	L	0	2	2.1	1.1	0	0
BK-1	Chione grus	1	7	3	1	1	0	Art	0	0	•	•	0	0
BK-1	Chione grus	3	10	2	0	0	0	R	0	3	2.21	1.1	0	0

BK-1	Chione grus	2	8	2	1	0	0	L	1	3	2.1	1.1	0	0
BK-1	Pseudochama sp.	2	10	0	0	0	0	T	0	3	2.21	1.2	0	0
BK-2	Pseudochama sp.	2	15	2	1	0	0	T	0	0	2.1	1.1	0	0
BK-2	Pseudochama sp.	2	18	2	0	0	0	T	0	3	2.21	1.2	0	0
BK-2	Pseudochama sp.	2	8	2	1	1	1	T	0	0	2.1	1.1	0	0
BK-1	Tellina gouldi	1	8	0	0	0	0	L	0	3	2.21	1.1	0	0
BK-1	Tellina gouldi	0	8	0	1	0	0	L	0	3	2.1	1.1	0	0

Site	Species	% Cove	Size	Color	Luster	Periosti	Pred bc	Shell	Breaka	Edge	Dissolu	Abrasic	Sponge	Graze
DP-30	Acra imbricata	2	13	0	0	0	0	Art	2	3	2.21	1.2	0	1
DP-30	Acra imbricata	3	21	N/A	N/A	N/A	N/A	L	N/A	N/A	N/A	N/A	0	1
DP-30	Acra imbricata	2	18	0	0	0	0	L	2	3	2.23	1.2	0	1
DP-30	Acra imbricata	2	21	2	0	0	0	R	2	3	2.23	1.1	0	1
DP-30	Acra imbricata	2	13	2	0	0	0	R	2	3	2.23	1.2	0	1
DP-30	Acra imbricata	2	15	2	0	0	0	R	2	3	2.23	1.2	0	1
DP-20	Arca imbricata	2	26	0	0	0	0	L	3	3	2.42	1.1	1	0
DP-20	Arca zebra	1	9	2	1	0	0	R	1	2	1.2	1.1	0	0
DP-20	Arca zebra	2	6	2	1	0	0	R	0	2	2.1	1.1	0	0
DP-20	Arca zebra	2	7	0	0	0	0	L	2	3	2.23	1.2	0	0
DP-20	Arca zebra	2	9	0	0	0	0	L	2	3	2.23	1.1	0	0
DP-20	Arca zebra	2	6	2	1	0	0	L	2	1	2.1	1.1	0	0
DP-0	Arcidae	1	9	2	0	0	0	L-um	3	3	2.1	1.2	0	0
DP-0	Arcopis adamsi	1	8	3	1	3	0	Art	2	0	1.1	0	0	0
DP-20	Arcopis adamsi	0	5	2	1	3	2\3	Art	0	0	0	1.1	0	0
DP-0	Barbatia cancellaria	2	26	0	0	0	0	R	0	3	2.21	1.1	0	0
DP-10	Barbatia cancellaria	3	25	2	0	0	0	L	1	3	2.42	1.2	0	1
DP-10	Barbatia cancellaria	1	12	3	1	0	0	L	0	0	1.2	0	0	0
DP-10	Barbatia cancellaria	2	8	2	0	0	0	L	3	3	2.23	1.2	0	1
DP-10	Barbatia cancellaria	2	10	2	0	0	0	L	3	3	2.23	1.2	0	1
DP-10	Barbatia cancellaria	2	15	2	0	0	0	R	2	3	2.23	1.2	0	1
DP-10	Barbatia cancellaria	2	21	0	0	0	0	R	2	3	2.41	1.2	0	1
DP-20	Barbatia cancellaria	2	12	2	0	0	0	L	3	3	2.23	1.2	0	0
DP-30	Barbatia cancellaria	2	17	2	0	0	0	L	1	3	2.23	1.2	0	1
DP-30	Barbatia cancellaria	2	12	2	0	0	0	L	2	3	2.23	1.2	0	0
DP-30	Barbatia cancellaria	2	11	2	0	0	0	L	2	3	2.23	1.2	0	1
DP-30	Barbatia cancellaria	2	12	2	0	0	0	L	2	3	2.41	1.2	0	1
DP-30	Barbatia cancellaria	2	11	2	0	0	0	R	2	3	2.41	1.2	0	0
DP-10	Barbatia domingensis	2	17	2	0	0	0	L	0	3	2.21	1.1	0	1
DP-10	Barbatia domingensis	2	11	2	0	0	0	L	0	3	2.41	1.2	0	1
DP-30	Barbatia domingensis	2	11	0	0	0	0	L	2	3	2.21	1.2	0	1
DP-30	Barbatia domingensis	2	9	2	0	0	0	R	2	3	2.23	1.2	0	0
DP-30	Barbatia domingensis	2	11	2	0	0	0	R	2	3	2.23	1.2	0	1
DP-20	Barbatia sp.	1	13	0	0	0	0	R	2	3	2.42	1.2	1	0
DP-20	Barbatia tenera	1	11	2	0	0	0	R	0	1	2.21	1.1	0	0
DP-0	Cerithium eburneum	1	9	2	0	0	0	A	3	3	2.1	1.1	0	0
DP-30	Cerithium eburneum	1	9	2	1	0	0	Aper	3	2	2.1	1.2	0	0
DP-0	Cerithium litteratum	1	7	2	1	0	0	Aper	3	3	2.1	1.1	0	0
DP-10	Cerithium litteratum	0	6	0	0	0	0	A	3	3	2.41	1.2	0	1
DP-10	Cerithium litteratum	0	8	2	1	0	0	Aper	3	3	2.1	1.2	0	0
DP-20	Cerithium litteratum	2	9	0	0	0	0	A	3	3	2.41	1.2	0	0
DP-20	Cerithium litteratum	2	8	0	0	0	0	W	2	3	2.42	1.1	0	0
DP-30	Cerithium litteratum	1	9	2	0	0	0	Aper	3	3	2.23	1.2	0	0
DP-30	Cerithium sp.	2	6	0	0	0	0	A	3	3	2.41	1.2	0	0
DP-30	Cerithium sp.	2	9	0	0	0	0	A	3	3	2.42	1.2	0	0
DP-0	Chama spp.	2	20	0	0	0	0	T	0	3	2.23	1.2	0	1
DP-0	Chama spp.	2	22	0	0	0	0	T	0	3	2.23	1.2	0	0
DP-0	Chama spp.	2	20	2	0	0	0	T	0	3	2.21	1.2	0	1
DP-0	Chama spp.	2	19	2	0	0	0	T	0	3	2.42	1.2	1	1
DP-0	Chama spp.	2	17	0	0	0	0	T	2	3	2.42	1.2	0	1
DP-0	Chama spp.	2	16	2	1	0	0	T	0	2	2.23	1.2	0	0
DP-0	Chama spp.	2	16	0	0	0	0	T	0	3	2.23	1.2	0	0
DP-0	Chama spp.	2	16	2	0	0	0	T	0	3	2.21	12	0	0
DP-0	Chama spp.	2	14	0	0	0	0	T	0	2	2.21	1.1	0	0
DP-0	Chama spp.	2	13	0	1	0	0	T	0	2	2.1	1.1	0	0
DP-0	Chama spp.	1	16	0	1	0	0	T	3	1	2.1	1.1	0	0
DP-0	Chama spp.	1	14	0	0	0	0	T	2	2	2.23	1.2	0	0
DP-0	Chama spp.	2	12	2	1	0	0	T	0	2	2.1	1.2	0	0
DP-0	Chama spp.	1	17	0	0	0	0	T	2	3	2.21	1.1	0	1
DP-0	Chama spp.	2	11	0	0	0	0	T	2	3	2.21	1.2	0	0
DP-0	Chama spp.	2	10	2	0	0	0	T	0	3	2.21	1.2	0	1
DP-0	Chama spp.	2	9	2	0	0	0	T	2	3	2.23	1.2	0	1
DP-0	Chama spp.	1	6	2	0	0	0	T	0	3	2.41	12	0	0
DP-0	Chama spp.	1	8	2	0	0	0	T	2	2	2.21	1.2	0	0
DP-0	Chama spp.	2	8	0	0	0	0	T	2	3	2.23	1.2	0	0
DP-0	Chama spp.	2	7	0	0	0	0	T	0	3	2.21	1.2	0	0
DP-0	Chama spp.	2	9	2	0	0	0	T	0	3	2.41	1.1	0	1
DP-0	Chama spp.	2	10	2	0	0	0	T	0	3	2.21	1.2	0	0
DP-0	Chama spp.	2	7	0	0	0	0	T	0	3	2.41	1.1	0	0
DP-0	Chama spp.	3	7	N/A	N/A	0	0	T	0	N/A	N/A	N/A	0	0

DP-0	Chama spp.	1	7	2	0	0	0	T	0	3	2.21	1.1	0	0
DP-10	Chama spp.	2	22	2	0	1	0	T	0	3	2.21	1.2	0	1
DP-10	Chama spp.	2	19	0	0	0	0	T	0	3	2.23	1.2	0	0
DP-10	Chama spp.	2	17	0	0	0	0	T	0	3	2.41	1.2	1	1
DP-10	Chama spp.	2	16	0	0	0	0	T	0	3	2.23	1.2	0	0
DP-10	Chama spp.	3	11	2	0	0	0	T	0	0	2.21	1.1	0	0
DP-10	Chama spp.	2	12	0	0	0	0	T	2	3	2.21	1.2	0	0
DP-10	Chama spp.	2	11	2	0	0	0	T	2	3	2.21	1.2	0	0
DP-10	Chama spp.	1	11	0	0	0	0	T	1	3	2.23	1.2	0	0
DP-10	Chama spp.	1	8	0	0	0	0	T	1	3	2.23	1.2	0	0
DP-10	Chama spp.	2	7	0	0	0	0	T	0	3	2.21	1.2	0	0
DP-10	Chama spp.	2	8	0	0	0	0	T	0	3	2.41	1.2	0	0
DP-10	Chama spp.	2	9	0	0	0	0	T	0	3	2.21	1.1	0	0
DP-10	Chama spp.	2	7	0	0	0	0	T	0	3	2.21	1.2	0	0
DP-10	Chama spp.	2	7	3	1	1	0	T	0	0	1.2	1.1	0	0
DP-10	Chama spp.	2	6	2	0	0	0	T	0	3	2.23	1.2	0	0
DP-10	Chama spp.	2	6	2	0	0	0	T	0	0	2.42	1.2	1	0
DP-10	Chama spp.	1	18	0	0	0	0	B	2	3	2.21	1.2	0	1
DP-10	Chama spp.	3	6	N/A	N/A	N/A	N/A	B	N/A	N/A	N/A	N/A	0	0
DP-10	Chama spp.	2	5	0	0	0	0	B	0	3	2.42	1.2	0	1
DP-10	Chama spp.	2	10	0	0	0	0	T	0	3	2.23	1.2	0	1
DP-20	Chama spp.	2	3	3	1	0	0	B	0	2	1.2	1.1	0	0
DP-20	Chama spp.	2	15	0	0	0	0	T	0	3	2.23	1.2	0	0
DP-20	Chama spp.	2	15	0	0	0	0	T	0	3	2.41	1.2	1	1
DP-20	Chama spp.	2	13	0	0	0	0	T	0	3	2.41	1.2	0	1
DP-20	Chama spp.	2	15	0	0	0	0	T	1	3	2.41	1.1	0	0
DP-20	Chama spp.	2	13	0	0	0	0	T	0	3	2.23	1.2	0	0
DP-20	Chama spp.	2	12	0	0	0	0	T	1	3	2.42	1.2	1	1
DP-20	Chama spp.	1	12	0	0	0	0	T	0	3	2.23	1.2	0	0
DP-20	Chama spp.	3	9	N/A	N/A	N/A	N/A	T	1	N/A	2.21	N/A	0	0
DP-20	Chama spp.	2	11	0	0	0	0	T	1	3	2.23	1.2	0	0
DP-20	Chama spp.	2	10	0	0	0	0	T	0	3	2.41	1.2	1	0
DP-20	Chama spp.	2	8	0	0	0	0	T	0	3	2.41	1.2	0	0
DP-20	Chama spp.	2	8	0	0	0	0	T	0	3	2.42	1.2	0	0
DP-20	Chama spp.	2	7	0	0	0	0	T	0	3	2.21	1.2	0	0
DP-20	Chama spp.	3	6	2	1	0	0	T	0	2	2.21	1.1	0	0
DP-20	Chama spp.	3	9	N/A	N/A	N/A	N/A	T	N/A	N/A	N/A	N/A	0	0
DP-20	Chama spp.	2	9	0	0	0	0	T	0	3	2.41	1.2	0	1
DP-20	Chama spp.	2	7	2	0	0	0	T	0	3	2.41	1.2	0	0
DP-30	Chama spp.	2	15	2	0	1	0	B	1	1	1.2	1.1	0	0
DP-30	Chama spp.	2	8	0	0	1	0	B	1	2	2.21	1.2	0	0
DP-30	Chama spp.	1	5	0	0	0	0	B	2	3	2.23	1.2	0	0
DP-30	Chama spp.	1	14	2	0	0	0	T	0	3	2.21	1.2	0	1
DP-30	Chama spp.	2	14	2	0	0	0	T	0	3	2.23	1.2	0	1
DP-30	Chama spp.	2	11	2	0	0	0	T	0	2	2.21	1.2	0	0
DP-30	Chama spp.	2	12	2	0	0	0	T	0	3	2.23	1.2	0	1
DP-30	Chama spp.	2	12	2	1	0	0	T	1	2	2.21	1.2	0	0
DP-30	Chama spp.	2	11	0	0	0	0	T	0	3	2.23	1.2	0	1
DP-30	Chama spp.	2	12	2	0	0	0	T	2	3	2.23	1.2	0	0
DP-30	Chama spp.	2	10	2	0	0	0	T	1	3	2.23	1.2	0	1
DP-30	Chama spp.	1	8	2	1	1	0	T	0	2	2.1	1.1	0	1
DP-30	Chama spp.	1	8	0	0	0	0	T	0	3	2.23	1.2	0	0
DP-30	Chama spp.	2	6	0	0	0	0	T	1	3	2.23	1.2	0	1
DP-30	Chama spp.	2	5	2	0	0	0	T	0	3	2.21	1.2	0	0
DP-30	Chama spp.	2	5	2	0	0	0	T	0	3	2.21	1.2	0	0
DP-0	Chione cancellata	2	7	0	0	0	0	R	2	2	2.21	1.1	0	0
DP-0	Pseudochama spp.	2	10	2	0	0	0	T	0	3	2.41	1.2	0	1
DP-0	Pseudochama spp.	1	8	2	1	0	3	T	0	0	1.2	1.1	0	0
DP-10	Pseudochama spp.	2	21	0	0	0	0	T	1	2	2.41	1.2	1	1
DP-20	Pseudochama spp.	3	33	0	0	0	0	T	1	3	2.22	1.2	1	1
DP-20	Pseudochama spp.	2	16	0	0	0	0	T	0	3	2.41	1.2	0	0
DP-20	Pseudochama spp.	3	10	0	0	0	0	T	0	3	2.23	1.2	0	0
DP-20	Pseudochama spp.	2	11	0	0	0	0	T	2	3	2.42	1.2	1	0
DP-20	Pseudochama spp.	2	10	2	0	0	0	T	1	3	2.41	1.2	0	0
DP-20	Pseudochama spp.	3	13	N/A	N/A	N/A	N/A	T	0	N/A	N/A	N/A	0	0
DP-20	Pseudochama spp.	2	9	0	0	0	0	T	1	3	2.42	1.1	0	1
DP-20	Pseudochama spp.	3	17	0	0	0	0	T	0	3	2.23	1.2	0	1
DP-30	Pseudochama spp.	2	12	0	0	0	0	B	2	3	2.42	1.2	0	0
DP-20	Tellina caribbea	0	12	3	1	1	0	L	0	1	0	0	0	0
DP-10	Tellina similis	0	7	3	1	1	0	R	0	1	0	0	0	0
DP-20	Tellina similis	2	12	0	0	0	0	R	1	3	2.21	1.1	0	0

DP-20	Tellina similis	2	15	0	0	0	4	R	1	3	2.21	1.1	1	0
DP-30	Tellina similis	0	16	3	1	1	1	R	0	1	0	0	0	0
DP-30	Tellina similis	0	17	3	1	1	0	L	0	0	0	0	0	0

Site	Species	% Cove	Size	Color	Luster	Periosti	Pred bc	Shell P.	Breaka	EdgeAl	Dissolu	Abrasic	Sponge	Graze
AQ-10	Acropis adamsi	1	7	0	0	0	0	L	0	0	2.1	1.1	0	0
AQ-10	Acropis adamsi	1	8	0	0	0	0	R	0	2	2.21	1.2	0	0
AQ-10	Acropis adamsi	1	6	0	0	0	0	R	0	2	2.21	1.2	0	0
AQ-10	Acropis adamsi	0	6	0	0	0	0	L	0	0	1.2	1.1	0	0
AQ-0	Arca imbricata	3	11	0	0	0	0	R	1	3	2.21	1.2	0	0
AQ-0	Arca imbricata	2	11	2	0	0	0	R	1	3	2.21	1.2	0	0
AQ-0	Arca imbricata	3	10	0	1	0	0	L	1	3	2.21	1.1	0	0
AQ-0	Arca imbricata	2	11	0	1	0	0	L	1	3	2	1.1	0	0
AQ-10	Arca imbricata	2	23	2	0	0	0	R	1	2	2.21	1.2	0	0
AQ-10	Arca imbricata	2	14	2	0	0	0	R	1	3	2.1	1.2	0	0
AQ-10	Arca imbricata	1	9	2	1	0	0	L	0	1	1.2	0	0	0
AQ-10	Arca imbricata	2	16	2	0	0	0	L	2	2	2.21	1.2	0	0
AQ-10	Arca imbricata	2	9	2	0	0	0	R	1	1	2.1	1.2	0	0
AQ-20	Arca imbricata	1	9	2	1	0	0	R	0	2	2.1	1.1	0	0
AQ-20	Arca imbricata	2	6	0	1	0	0	L	2	0	2.1	1.1	0	0
AQ-20	Arca imbricata	1	10	0	0	0	4	R	0	3	2.21	1.1	0	0
AQ-20	Arca imbricata	1	12	2	1	0	0	R	2	0	2.1	0	0	0
AQ-20	Arca imbricata	2	8	2	1	0	0	R	0	2	2.21	1.2	0	0
AQ-20	Arca imbricata	2	9	0	1	0	0	L	2	0	2.1	1.1	0	0
AQ-20	Arca imbricata	1	10	2	0	0	0	L	0	2	2.1	1.1	0	0
AQ-20	Arca imbricata	1	11	2	1	0	0	L	1	0	2.1	1.2	0	0
AQ-20	Arca imbricata	2	10	2	1	0	0	L	0	2	2.1	1.1	0	0
AQ-20	Arca imbricata	2	11	2	0	0	0	R	1	2	2.21	1.1	0	0
AQ-40	Arca imbricata	2	9	2	1	0	0	L	1	0	2.1	1.1	0	0
AQ-40	Arca imbricata	2	11	2	0	0	0	L	1	2	2.21	1.1	0	0
AQ-40	Arca imbricata	1	11	2	1	0	0	R	0	2	2.21	1.1	0	0
AQ-40	Arca imbricata	1	12	2	0	0	0	L	1	3	2.21	1.1	0	0
AQ-40	Arca imbricata	1	8	2	1	0	0	R	0	2	2.1	1.1	0	0
AQ-40	Arca imbricata	2	18	2	1	0	0	R	2	0	2.1	1.1	0	0
AQ-50	Arca imbricata	1	10	2	1	0	0	R	3	0	2.1	1.1	0	0
AQ-20	Arcopis adamsi	1	9	2	0	0	0	L	0	2	2.1	1.1	0	0
AQ-20	Arcopis adamsi	1	9	2	1	1	0	L	0	0	1.1	1.1	0	0
AQ-20	Arcopis adamsi	1	9	2	1	1	0	L	0	2	2.1	1.1	0	0
AQ-40	Arcopis adamsi	2	10	2	0	0	0	L	0	3	2.21	1.1	0	0
AQ-0	Barbatia cancellaris	1	13	3	1	0	0	L-FRAC	3	1	2.1	1.1	0	0
AQ-0	Barbatia cancellaris	1	12	3	1	0	0	L	0	1	0	0	0	0
AQ-0	Barbatia cancellaris	2	14	2	0	0	0	R	2	3	2.23	1.2	0	0
AQ-0	Barbatia cancellaris	2	12	2	0	0	0	R	2	3	2.41	1.2	0	0
AQ-0	Barbatia cancellaris	1	21	3	1	0	0	R	0	1	2.1	1.1	0	0
AQ-0	Barbatia cancellaris	1	14	2	0	0	0	R	1	3	2.21	1.2	0	1
AQ-0	Barbatia cancellaris	1	14	3	1	0	0	R	0	0	1.2	0	0	0
AQ-10	Barbatia cancellaris	1	8	2	0	0	0	R	2	3	2.21	1.2	0	0
AQ-10	Barbatia cancellaris	1	8	3	0	0	0	L	0	1	2.23	1.1	0	0
AQ-10	Barbatia cancellaris	2	10	0	0	0	0	L	1	3	2.23	1.2	0	0
AQ-20	Barbatia cancellaris	2	13	2	0	0	0	R	2	3	2.21	1.2	0	0
AQ-20	Barbatia cancellaris	1	11	2	0	0	0	R	2	3	2.21	1.2	0	0
AQ-20	Barbatia cancellaris	1	10	2	0	0	0	R	1	3	2.21	1.2	0	0
AQ-20	Barbatia cancellaris	1	11	3	1	0	0	R	0	1	2.1	1.11	0	0
AQ-20	Barbatia cancellaris	2	14	2	0	0	0	R	0	3	2.21	1.2	0	0
AQ-20	Barbatia cancellaris	3	13	2	0	0	0	R	0	3	2.21	1.2	0	0
AQ-20	Barbatia cancellaris	1	11	3	1	0	0	R	0	1	2.1	1.1	0	0
AQ-20	Barbatia cancellaris	2	12	2	0	0	0	R	2	3	2.23	1.2	0	0
AQ-40	Barbatia cancellaris	2	12	2	0	0	0	R	2	3	2.21	1.2	0	0
AQ-40	Barbatia cancellaris	1	8	2	0	0	0	R	2	3	2.21	1.2	0	0
AQ-40	Barbatia cancellaris	1	15	3	1	0	0	R	1	1	1.2	1.1	0	0
AQ-40	Barbatia cancellaris	1	19	3	1	0	0	R	0	2	2.1	1.1	0	0
AQ-40	Barbatia cancellaris	1	10	3	1	0	0	R	0	2	1.2	1.1	0	0
AQ-50	Barbatia cancellaris	2	11	2	0	0	0	R	0	3	2.23	1.2	0	0
AQ-50	Barbatia cancellaris	1	9	2	0	0	0	R	0	3	2.21	1.1	0	0
AQ-50	Barbatia cancellaris	1	11	2	0	0	0	R	2	3	2.23	1.2	0	0
AQ-50	Barbatia cancellaris	1	10	2	0	0	0	L	0	3	2.23	1.1	0	0
AQ-0	Barbatia domingen:	3	9	0	0	0	0	R	2	3	2.23	1.2	0	0
AQ-0	Barbatia domingen:	1	8	0	1	0	0	R	0	0	2.1	1.1	0	0
AQ-0	Barbatia domingen:	3	11	0	0	1	0	L	0	3	2.21	1.1	0	0
AQ-0	Barbatia domingen:	1	9	0	1	1	0	L	0	1	2.1	0	0	0
AQ-0	Barbatia domingen:	3	8	0	0	0	0	R	2	3	2.21	1.2	0	0
AQ-0	Barbatia domingen:	1	10	0	0	0	0	L	0	3	2.21	1.2	0	0
AQ-0	Barbatia domingen:	1	9	0	1	0	0	L	0	2	2.1	1.1	0	0
AQ-0	Barbatia domingen:	1	11	0	1	0	4	L	0	2	2.1	1.1	0	0
AQ-0	Barbatia domingen:	1	12	1	1	0	0	L	2	1	2.1	1.1	0	0

AQ-0	Barbatia domingen:	2	11	0	0	0	0	L	2	3	2.22	0	0	0
AQ-10	Barbatia domingen:	3	18	2	1	0	0	R	0	3	2.21	0	0	0
AQ-10	Barbatia domingen:	1	6	3	1	0	0	L	2	0	1.2	0	0	0
AQ-10	Barbatia domingen:	2	16	3	0	0	0	R	0	2	2.1	0	0	0
AQ-10	Barbatia domingen:	1	8	3	1	0	0	L	0	2	2.1	1.1	0	0
AQ-10	Barbatia domingen:	2	11	0	0	0	0	R	0	3	2.21	1.1	0	0
AQ-10	Barbatia domingen:	1	10	2	0	0	0	L	0	2	2.21	1.1	0	0
AQ-10	Barbatia domingen:	1	9	0	0	0	0	R	1	3	2.21	1.2	0	0
AQ-10	Barbatia domingen:	0	10	3	1	0	0	L	0	0	1.1	0	0	0
AQ-10	Barbatia domingen:	1	9	0	0	0	0	R	1	3	2.21	1.1	0	0
AQ-10	Barbatia domingen:	1	9	1	0	0	0	R	0	1	0	0	0	0
AQ-10	Barbatia domingen:	2	8	0	0	0	0	R	0	3	2.21	1.1	0	0
AQ-10	Barbatia domingen:	2	8	0	0	0	0	R	0	2	2.23	1.1	0	0
AQ-20	Barbatia domingen:	2	12	2	0	1	0	L	0	2	2.21	1.1	0	0
AQ-20	Barbatia domingen:	1	10	2	0	0	0	L	1	3	2.21	1.1	0	1
AQ-20	Barbatia domingen:	2	9	2	1	1	0	L	2	3	2.21	1.2	0	0
AQ-20	Barbatia domingen:	2	9	2	0	0	0	L	1	1	2.1	1.1	0	0
AQ-20	Barbatia domingen:	2	6	2	0	0	0	L	1	3	2.1	1.1	0	0
AQ-20	Barbatia domingen:	2	9	2	1	1	0	L	0	2	1.2	1.1	0	0
AQ-20	Barbatia domingen:	1	10	2	0	0	0	L	0	3	2.21	1.1	0	0
AQ-20	Barbatia domingen:	1	10	2	1	1	0	R	0	2	2.1	1.1	0	0
AQ-50	Barbatia domingen:	2	13	2	0	0	0	R	1	2	2.21	1.1	0	0
AQ-50	Barbatia domingen:	3	10	2	0	0	0	R	2	3	2.41	0	0	0
AQ-50	Barbatia domingen:	2	10	2	0	0	0	R	1	3	2.21	1.2	0	0
AQ-50	Barbatia domingen:	3	10	2	0	0	0	R	1	2	2.21	1.1	0	0
AQ-0	Cerithium eburneur	1	7	0	0	0	0	A	3	3	2.21	1.1	0	0
AQ-0	Cerithium eburneur	1	12	2	0	0	0	A	3	3	2.21	1.2	0	0
AQ-20	Cerithium eburneur	1	7	2	1	0	0	A	3	1	2.1	1.1	0	0
AQ-20	Cerithium eburneur	1	6	2	1	0	0	A	3	1	2.1	1.1	0	0
AQ-20	Cerithium eburneur	1	7	2	0	0	0	A	3	3	2.21	1.2	0	0
AQ-20	Cerithium eburneur	0	14	3	1	0	0	W	1	1	2.1	1.1	0	0
AQ-40	Cerithium eburneur	3	8	2	0	0	0	A	3	3	2.23	1.1	0	0
AQ-0	Cerithium litteratum	1	10	2	0	0	0	A	3	1	2.1	1.1	0	0
AQ-0	Cerithium litteratum	1	15	2	0	0	0	A	3	1	2.21	1.1	0	0
AQ-0	Cerithium litteratum	1	10	3	1	0	1	W	1	1	2.1	1.2	0	0
AQ-0	Cerithium litteratum	1	12	3	0	0	0	A	3	1	1.2	0	0	0
AQ-10	Cerithium litteratum	1	13	3	1	0	0	A	3	1	2.1	1.1	0	0
AQ-10	Cerithium litteratum	3	9	0	0	0	0	W	2	0	0	0	0	0
AQ-10	Cerithium litteratum	1	23	2	0	0	2	W	1	2	2.21	1.2	0	0
AQ-10	Cerithium litteratum	1	8	2	1	0	0	A	3	1	1.2	1.1	0	0
AQ-10	Cerithium litteratum	1	9	3	1	0	0	W	0	1	2.1	1.1	0	0
AQ-10	Cerithium litteratum	1	6	3	1	1	22	A	3	1	0	0	0	0
AQ-10	Cerithium litteratum	2	9	2	0	0	0	A	3	2	2.21	1.2	0	0
AQ-20	Cerithium litteratum	1	11	2	1	0	0	A	3	1	2.1	1.1	0	0
AQ-20	Cerithium litteratum	2	10	2	1	0	0	A	3	1	2.23	1.1	0	0
AQ-20	Cerithium litteratum	2	10	2	0	0	0	A	3	3	2.21	1.2	0	0
AQ-20	Cerithium litteratum	2	7	0	0	0	0	A	3	3	2.21	1.2	0	0
AQ-20	Cerithium litteratum	2	8	2	1	0	0	A	3	1	2.1	1.2	0	0
AQ-20	Cerithium litteratum	1	7	2	0	0	0	A	3	1	2.21	1.2	0	0
AQ-20	Cerithium litteratum	3	8	2	0	0	0	A	3	3	2.23	1.2	0	0
AQ-20	Cerithium litteratum	1	8	2	1	0	0	A	3	1	2.1	1.1	0	0
AQ-20	Cerithium litteratum	2	10	2	1	0	0	A	3	1	2.21	1.2	0	0
AQ-20	Cerithium litteratum	2	6	2	0	0	0	A	3	1	2.1	1.2	0	0
AQ-20	Cerithium litteratum	1	9	2	1	0	0	A	3	1	2.1	1.1	0	0
AQ-20	Cerithium litteratum	0	9	3	1	0	0	W	2	1	2.1	1.1	0	0
AQ-20	Cerithium litteratum	1	7	2	0	0	0	A	3	3	2.21	1.1	0	0
AQ-20	Cerithium litteratum	2	10	2	1	0	0	A	3	1	2.1	1.2	0	0
AQ-20	Cerithium litteratum	2	15	2	0	0	0	A	3	3	2.23	1.2	0	0
AQ-40	Cerithium litteratum	1	8	3	1	0	0	A	3	1	1.2	1.1	0	0
AQ-40	Cerithium litteratum	2	8	0	0	0	0	A	3	3	2.23	1.2	0	0
AQ-40	Cerithium litteratum	1	8	2	0	0	0	A	3	2	2.21	1.1	0	0
AQ-40	Cerithium litteratum	2	8	2	0	0	0	A	3	3	2.21	1.2	0	0
AQ-40	Cerithium litteratum	3	16	2	1	0	0	A	3	1	2.23	1.2	0	0
AQ-40	Cerithium litteratum	2	8	2	0	0	0	A	3	3	2.23	1.2	0	0
AQ-40	Cerithium litteratum	1	8	3	1	0	0	A	3	1	0	0	0	0
AQ-50	Cerithium litteratum	1	15	2	2	0	2	W	1	3	2.21	1.2	0	0
AQ-0	Chama spp.	2	5	2	1	0	1	T	0	2	2.1	1.2	0	0
AQ-0	Chama spp.	2	5	2	1	0	0	T	2	2	2.21	1.1	0	0
AQ-0	Chama spp.	3	5	2	0	0	0	T	0	3	2.21	2.21	0	0
AQ-0	Chama spp.	2	5	2	0	0	0	T	0	3	2.21	1.2	0	0
AQ-0	Chama spp.	2	5	2	0	0	0	T	1	3	2.21	1.2	0	0

AQ-0	Chama spp.	3	7	2	0	0	0	T	2	3	2.23	1.2	0	0
AQ-0	Chama spp.	1	5	2	0	0	1	T	2	3	2.1	1.1	0	0
AQ-0	Chama spp.	1	6	2	1	0	0	T	0	2	1.2	1.1	0	0
AQ-0	Chama spp.	1	5	3	1	0	4	T	1	0	1.1	1.1	0	0
AQ-0	Chama spp.	1	6	3	1	1	1	T	0	0	1.2	0	0	0
AQ-0	Chama spp.	1	5	2	1	0	0	T	0	2	1.2	1.1	0	0
AQ-0	Chama spp.	2	8	2	0	0	0	T	2	3	2.21	1.2	0	0
AQ-0	Chama spp.	1	6	3	1	0	0	T	0	1	1.2	0	0	0
AQ-0	Chama spp.	1	5	3	1	0	0	T	0	0	1.2	0	0	0
AQ-0	Chama spp.	1	6	2	0	0	0	T	0	2	2.1	0	0	0
AQ-0	Chama spp.	1	4	3	1	0	2	T	0	0	2.1	1.1	0	0
AQ-0	Chama spp.	2	5	2	1	0	0	T	0	0	1.2	1.1	0	0
AQ-0	Chama spp.	2	6	2	0	0	0	T	2	3	2.21	1.2	0	0
AQ-0	Chama spp.	1	5	2	0	0	1	T	0	2	2.1	1.2	0	0
AQ-0	Chama spp.	2	8	0	0	0	0	T	0	3	2.21	1.1	0	0
AQ-0	Chama spp.	2	7	2	1	0	0	T	0	0	2.1	1.1	0	0
AQ-0	Chama spp.	2	6	0	0	0	0	T	0	3	2.21	1.2	0	0
AQ-0	Chama spp.	1	9	0	0	0	0	T	1	3	2.21	1.2	0	0
AQ-0	Chama spp.	1	6	2	0	0	0	T	0	3	2.21	1.1	0	0
AQ-0	Chama spp.	2	10	2	1	0	2	T	0	0	2.1	1.1	0	0
AQ-0	Chama spp.	2	8	2	0	0	0	T	0	2	2.21	1.2	0	0
AQ-0	Chama spp.	2	8	0	0	0	0	T	0	2	2.1	1.1	0	0
AQ-0	Chama spp.	2	7	2	0	0	4	T	0	3	2.21	1.2	0	0
AQ-0	Chama spp.	2	6	2	0	0	0	T	0	3	2.21	1.2	0	0
AQ-0	Chama spp.	1	5	3	1	0	0	T	1	0\1	1.2	0	0	0
AQ-0	Chama spp.	1	5	2	0	0	2	T	0	2	2.1	1.1	0	0
AQ-0	Chama spp.	1	7	2	1	0	1	T	2	1	1.2	1.1	0	0
AQ-0	Chama spp.	2	6	2	0	0	2	T	0	2	2.1	1.2	0	0
AQ-0	Chama spp.	1	6	2	0	0	0	T	2	3\1	2.21	1.2	0	0
AQ-0	Chama spp.	1	11	3	1	0	4	T	0	2	1.2	1.2	0	0
AQ-0	Chama spp.	3	7	2	0	0	0	T	2	3	2.21	1.2	0	0
AQ-0	Chama spp.	3	6	2	0	0	0	T	2	3	2.21	1.2	0	0
AQ-0	Chama spp.	1	6	2	0	0	0	T	3	3	2.21	1.2	0	0
AQ-10	Chama spp.	1	6	2	0	0	0	T	1	3	2.21	1.1	0	0
AQ-10	Chama spp.	1	6	2	0	0	0	T	0	3	2.21	1.1	0	0
AQ-10	Chama spp.	1	10	0	0	0	0	T	2	3	2.21	1.2	0	0
AQ-10	Chama spp.	2	7	2	0	0	0	T	0	2	2.21	•	0	0
AQ-10	Chama spp.	1	9	3	1	1	0	T	2	2	1.2	1.1	0	0
AQ-10	Chama spp.	1	7	2	0	0	0	T	2	2	2.1	1.2	0	0
AQ-10	Chama spp.	2	6	2	0	0	0	T	2	0	2.1	1.1	0	0
AQ-10	Chama spp.	1	7	2	0	0	0	T	2	2	2.1	1.1	0	0
AQ-10	Chama spp.	2	8	2	0	0	0	T	0	3	2.23	•	0	1
AQ-10	Chama spp.	2	6	2	0	0	0	T	0	3	2.21	1.1	0	0
AQ-10	Chama spp.	2	16	3	1	1	0	T	1	1	2.1	1.1	0	0
AQ-10	Chama spp.	1	6	2	0	0	0	T	0	0	2.1	1.1	0	0
AQ-10	Chama spp.	2	6	2	0	0	0	T	2	3	1.2	1.2	0	0
AQ-10	Chama spp.	1	6	2	0	0	0	T	0	2	2.1	1.1	0	0
AQ-10	Chama spp.	2	7	3	1	0	0	T	0	2	2.1	1.1	0	0
AQ-10	Chama spp.	2	9	2	1	0	0	T	1	2	2.1	1.1	0	0
AQ-10	Chama spp.	1	8	2	0	0	0	T	0	2	2.1	0	0	0
AQ-10	Chama spp.	3	6	2	0	0	0	T	0	3	0	0	0	0
AQ-10	Chama spp.	2	8	0	0	0	0	T	0	3	2.21	1.1	0	0
AQ-10	Chama spp.	1	6	2	1	0	0	T	0	2	1.2	0	0	0
AQ-10	Chama spp.	1	9	3	1	0	0	T	0	0	0	1.1	0	0
AQ-10	Chama spp.	2	11	0	0	0	0	T	0	2	1.2	1.1	0	0
AQ-10	Chama spp.	2	10	0	0	0	0	T	0	2	2.1	1.1	0	0
AQ-10	Chama spp.	2	5	2	0	0	0	T	0	3	2.23	1.2	0	0
AQ-10	Chama spp.	2	9	2	1	0	0	T	0	2	2.1	1.1	0	0
AQ-10	Chama spp.	2	6	2	0	0	0	T	0	2	2.21	1.1	0	0
AQ-10	Chama spp.	3	6	2	1	1	0	T	2	2	1.2	1.1	0	0
AQ-10	Chama spp.	1	6	2	0	0	0	T	0	2	2.21	1.1	0	0
AQ-10	Chama spp.	2	15	3	1	1	0	T	0	0	1.2	1.1	0	0
AQ-10	Chama spp.	1	12	0	0	0	0	T	0	2	2.1	1.2	0	1
AQ-10	Chama spp.	1	10	2	0	0	0	T	0	3	2.21	1.2	0	0
AQ-10	Chama spp.	1	10	2	0	0	0	T	0	2	2.21	1.1	0	0
AQ-10	Chama spp.	1	11	3	1	0	0	T	0	0	2	1.1	0	0
AQ-10	Chama spp.	1	19	2	1	1	0	T	0	0	1.2	1.1	0	0
AQ-10	Chama spp.	2	6	2	0	0	0	T	0	3	2.21	1.2	0	0
AQ-20	Chama spp.	1	7	3	1	1	0	B	0	1	2.1	1.2	0	0
AQ-20	Chama spp.	1	16	0	0	0	0	T	1	3	2.23	1.2	0	0
AQ-20	Chama spp.	1	7	3	1	1	0	B	2	1	1.1	1.1	0	0

AQ-20	Chama spp.	2	7	0	0	0	0	T	1	3	2.21	1.21	0	0
AQ-20	Chama spp.	2	5	2	0	0	0	T	2	0	1.2	0	0	0
AQ-20	Chama spp.	3	5	2	0	0	4	T	0	2	2.21	0	0	0
AQ-20	Chama spp.	1	9	3	1	0	0	B	0	1	1.1	1.1	0	0
AQ-20	Chama spp.	1	19	0	0	0	2	B	2	3	2.21	1.2	0	0
AQ-20	Chama spp.	1	5	2	1	0	0	T	0	2	2.21	1.1	0	0
AQ-20	Chama spp.	1	14	0	0	0	0	T	0	3	2.21	1.2	0	0
AQ-20	Chama spp.	2	7	0	0	0	0	B	1	3	2.23	1.2	0	0
AQ-20	Chama spp.	1	11	0	0	0	0	T	1	2	2.21	1.2	0	0
AQ-20	Chama spp.	2	6	2	1	0	0	T	2	0	2.1	1.2	0	0
AQ-20	Chama spp.	2	7	2	0	1	4	T	1	2	2.21	1.2	0	0
AQ-20	Chama spp.	2	2	12	2	0	0	T	1	3	2.41	1.2	0	0
AQ-20	Chama spp.	2	6	2	0	0	0	T	0	3	2.21	1.2	0	0
AQ-20	Chama spp.	2	6	2	1	1	0	T	0	1	1.1	0	0	0
AQ-40	Chama spp.	2	11	2	1	1	2	B	1	0	2.1	1.2	0	0
AQ-40	Chama spp.	2	17	2	0	0	0	T	0	2	2.1	1.2	0	0
AQ-40	Chama spp.	2	7	2	0	0	0	T	0	0	2.1	1.1	0	0
AQ-40	Chama spp.	2	6	2	0	0	3	T	0	2	2.21	1.2	0	0
AQ-40	Chama spp.	2	14	0	0	0	0	T	2	2	2.21	1.2	0	1
AQ-40	Chama spp.	2	6	2	0	0	0	T	0	3	2.23	1.1	0	0
AQ-40	Chama spp.	2	7	2	0	0	0	T	0	3	2.21	1.2	0	0
AQ-40	Chama spp.	2	7	2	1	0	0	T	2	2	2.1	1.1	0	0
AQ-40	Chama spp.	2	8	2	0	0	0	T	0	3	2.21	1.2	0	0
AQ-40	Chama spp.	2	7	0	0	0	0	T	2	3	2.23	1.2	0	0
AQ-40	Chama spp.	2	7	2	0	0	0	T	0	3	2.21	1.2	0	0
AQ-40	Chama spp.	1	7	2	0	0	0	T	2	3	2.21	1.2	0	0
AQ-40	Chama spp.	2	7	2	1	0	3	T	0	0	2.1	1.2	0	0
AQ-40	Chama spp.	2	19	2	1	0	0	T	0	0	2.1	1.1	0	0
AQ-50	Chama spp.	2	9	3	1	1	0	Art	0	0	2.1	1.2	0	0
AQ-50	Chama spp.	2	8	2	0	0	0	T	0	3	2.21	1.1	0	0
AQ-50	Chama spp.	2	7	2	1	0	0	T	2	2	2.21	1.1	0	0
AQ-50	Chama spp.	2	7	3	1	1	0	Art	0	0	N/A	1.2	0	0
AQ-0	Chione cancellata	1	6	3	1	0	0	R	0	1	0	1.1	0	0
AQ-0	Chione cancellata	1	8	3	1	0	0	L	0	0	1.2	1.1	0	0
AQ-0	Chione cancellata	1	5	3	1	0	0	L	1	1	2.1	1.1	0	0
AQ-10	Chione cancellata	1	6	2	0	0	0	L	0	3	2.21	1.1	0	0
AQ-10	Chione cancellata	1	5	3	1	0	0	L	0	2	2.1	1.1	0	0
AQ-10	Chione cancellata	2	7	2	0	0	0	L	0	3	2.21	1.1	0	0
AQ-10	Chione cancellata	1	6	2	0	0	0	L	0	3	2.21	1.2	0	0
AQ-10	Chione cancellata	1	7	3	1	0	0	L	2	2	2.1	1.1	0	0
AQ-10	Chione cancellata	1	6	2	0	0	0	L	0	0	1.2	0	0	0
AQ-20	Chione cancellata	2	8	2	1	0	0	R	0	2	2.1	1.2	0	0
AQ-20	Chione cancellata	1	7	2	1	0	0	R	2	2	2.1	1.1	0	0
AQ-20	Chione cancellata	1	8	0	0	0	0	L	0	3	2.21	1.2	0	1
AQ-20	Chione cancellata	2	6	2	0	0	0	L	0	2	2.1	1.2	0	0
AQ-40	Chione cancellata	1	8	3	1	0	0	R	0	1	1.2	1.1	0	0
AQ-40	Chione cancellata	1	7	2	1	0	0	L	0	2	2.1	1.1	0	0
AQ-40	Chione cancellata	7	2	1	0	0	0	R	2	2	2.1	1.1	0	0
AQ-40	Chione cancellata	1	6	2	0	0	0	L	1	3	2.21	1.2	0	0
AQ-40	Chione cancellata	1	6	0	1	0	0	R	2	2	2.1	1.1	0	0
AQ-40	Chione cancellata	1	6	2	0	0	0	R	0	2	2.1	1.1	0	0
AQ-40	Chione cancellata	1	8	2	1	0	0	R	0	2	2.1	1.1	0	0
AQ-40	Chione cancellata	0	6	3	1	0	0	R	0	1	1.2	0	0	0
AQ-0	Pseudochama spp.	2	8	0	0	0	0	T	2	3	2.23	1.2	0	0
AQ-0	Pseudochama spp.	1	6	0	0	0	1	T	0	3	2.21	1.2	0	1
AQ-0	Pseudochama spp.	2	11	0	0	0	0	T	2	0	2.23	1.2	0	0
AQ-0	Pseudochama spp.	1	7	0	0	0	0	T	0	3	2.21	1.1	0	0
AQ-0	Pseudochama spp.	2	7	0	0	0	0	T	2	3	2.21	1.2	0	0
AQ-0	Pseudochama spp.	2	9	0	0	0	0	T	1	3	2.23	1.2	0	0
AQ-0	Pseudochama spp.	2	8	0	0	0	0	T	2	3	2.23	1.2	1	0
AQ-10	Pseudochama spp.	2	25	2	0	0	0	T	1	3	2.21	1.2	0	0
AQ-10	Pseudochama spp.	3	19	0	0	0	0	T	0	3	2.21	1.2	0	0
AQ-10	Pseudochama spp.	2	10	0	0	0	0	T	0	3	2.21	1.2	0	1
AQ-10	Pseudochama spp.	2	10	0	0	0	0	T	0	3	2.21	1.2	0	0
AQ-20	Pseudochama sp.	1	6	2	1	1	0	T	0	0	1.2	0	0	0
AQ-20	Pseudochama sp.	2	8	2	0	1	0	T	0	3	2.21	1.2	0	0
AQ-20	Pseudochama sp.	1	7	0	0	0	0	T	0	3	2.21	1.2	0	0
AQ-20	Pseudochama sp.	2	7	2	0	0	0	T	0	3	2.21	1.2	0	0
AQ-20	Pseudochama sp.	1	7	2	1	1	0	T	0	0	1.2	1.1	0	0
AQ-20	Pseudochama sp.	1	5	2	1	1	0	T	0	0	0	1.1	0	0
AQ-20	Pseudochama sp.	2	8	0	1	1	0	T	2	2	2.1	1.2	0	0

AQ-20	Pseudochama sp.	2	13	0	0	0	1	T	0	3	2.21	1.2	0	0
AQ-20	Pseudochama sp.	2	8	0	0	0	2	T	0	3	2.21	1.2	0	0
AQ-20	Pseudochama sp.	2	7	2	0	0	0	T	1	3	2.21	1.1	0	0
AQ-20	Pseudochama sp.	2	12	0	0	0	0	T	0	3	2.21	1.2	0	0
AQ-20	Pseudochama sp.	2	8	2	0	0	2	T	0	3	2.21	1.1	0	0
AQ-20	Pseudochama sp.	2	10	0	0	0	0	T	0	3	2.21	1.2	0	0
AQ-20	Pseudochama sp.	1	9	2	1	0	0	T	0	2	2.1	1.1	0	0
AQ-40	Pseudochama sp.	2	12	0	0	0	0	T	2	3	2.21	1.2	0	0
AQ-40	Pseudochama sp.	2	7	0	0	0	0	T	0	3	2.21	1.2	0	0
AQ-40	Pseudochama sp.	2	8	2	0	0	0	T	0	3	2.21	1.2	0	0
AQ-40	Pseudochama sp.	1	18	0	0	0	0	B	0	0	2.21	1.2	0	0
AQ-40	Pseudochama sp.	2	17	0	0	0	0	T	1	3	2.21	1.2	0	0
AQ-0	Tellina gouldi	0	6	3	1	0	0	R	0	0	0	1.1	0	0
AQ-10	Tellina gouldi	1	7	2	1	0	0	R	0	1	1.1	0	0	0
AQ-10	Tellina gouldi	0	8	2	1	0	0	R	0	1	1.2	0	0	0
AQ-10	Tellina gouldi	0	8	2	1	0	0	R	0	0	0	0	0	0
AQ-10	Tellina similis	1	12	3	1	0	0	R	2	1	2.1	0	0	0
AQ-10	Tellina similis	0	8	3	1	1	0	L	2	0	0	0	0	0
AQ-10	Tellina similis	0	10	3	1	0	0	R	2	1	0	0	0	0
AQ-10	Tellina similis	0	12	3	1	1	0	R	0	1	0	0	0	0
AQ-10	Tellina similis	0	13	3	1	1	0	R	2	1	0	0	0	0
AQ-10	Tellina similis	1	12	3	1	0	0	L	0	0	2.1	0	0	0
AQ-10	Tellina similis	1	15	3	1	1	0	L	0	0	0	0	0	0
AQ-40	Tellina caribbea	0	10	3	1	1	0	Live	0	0	0	0	0	0
AQ-40	Tellina caribbea	1	9	2	1	0	0	L	1	1	2.1	1.1	0	0
AQ-40	Tellina caribbea	1	15	2	1	0	0	L	1	2	2.1	1.1	0	0
AQ-50	Tellina caribea	0	10	2	1	1	0	R	1	1	0	0	0	0
AQ-50	Tellina caribea	0	11	3	1	0	0	R	1	1	0	0	0	0
AQ-50	Tellina caribea	0	10	3	1	1	0	L	0	1	0	0	0	0
AQ-50	Tellina caribea	0	13	3	1	0	0	R	0	1	1.1	1.1	0	0
AQ-20	Tellina gouldi	0	8	2	1	0	2	L	0	2	0	0	0	0
AQ-20	Tellina gouldi	1	7	2	0	0	0	R	0	3	2.1	0	0	0
AQ-20	Tellina gouldi	0	8	2	1	0	3	L	0	1	1.2	0	0	0
AQ-20	Tellina gouldi	1	8	2	1	0	0	L	0	2	1.2	0	0	0
AQ-20	Tellina gouldi	0	8	2	1	0	0	R	0	1	0	0	0	0
AQ-40	Tellina gouldi	0	8	3	1	0	3	L	0	1	0	0	0	0
AQ-40	Tellina gouldi	0	8	3	1	0	3	R	0	2	2.1	1.1	0	0
AQ-40	Tellina gouldi	0	8	3	1	0	3	R	0	2	2.1	0	0	0
AQ-50	Tellina gouldi	0	7	3	1	0	0	R	0	1	1.1	1.1	0	0
AQ-50	Tellina gouldi	0	7	3	1	1	4	L	0	1	0	0	0	0
AQ-50	Tellina gouldi	0	8	3	1	0	3	R	0	1	0	0	0	0
AQ-50	Tellina gouldi	0	6	3	1	0	0	R	0	1	0	0	0	0
AQ-0	Tellina similis	1	11	2	1	0	4	R	2	1	2.1	1.1	0	0
AQ-0	Tellina similis	0	8	3	1	0	0	R	2	1	1.1	0	0	0
AQ-0	Tellina similis	1	9	2	1	0	0	R	2	0	1.1	1.1	0	0
AQ-0	Tellina similis	0	10	3	1	0	0	R	2	2	2.1	1.1	0	0
AQ-0	Tellina similis	0	13	3	1	4	4	L	0	1	0	0	0	0
AQ-0	Tellina similis	0	11	3	1	0	0	R	0	0	0	1.1	0	0
AQ-0	Tellina similis	0	17	3	1	1	0	R	0	1	0	0	0	0
AQ-0	Tellina similis	0	8	3	1	1	0	Live	0	0	1.1	0	0	0
AQ-0	Tellina similis	0	9	3	1	0	0	L	0	1	1.1	1.1	0	0
AQ-20	Tellina similis	0	13	3	1	0	0	R	0	1	2.1	1.1	0	0
AQ-20	Tellina similis	1	16	3	1	1	0	R	0	0	0	0	0	0
AQ-20	Tellina similis	0	12	2	1	0	0	R	0	3	2.1	1.1	0	0
AQ-20	Tellina similis	0	12	3	1	1	0	L	0	1	0	0	0	0
AQ-20	Tellina similis	1	15	3	1	1	1	L	0	1	0	0	0	0
AQ-20	Tellina similis	0	12	2	1	0	0	L	1	1	2.1	1.1	0	0
AQ-20	Tellina similis	0	15	3	1	1	0	L	0	2	1.2	1.1	0	0
AQ-20	Tellina similis	1	9	3	1	1	0	R	2	1	0	0	0	0
AQ-20	Tellina similis	0	11	2	0	0	0	R	2	2	2.21	1.1	0	0
AQ-20	Tellina similis	1	15	3	1	0	0	R	0	2	2.1	1.1	0	0
AQ-20	Tellina similis	0	10	3	1	0	0	L	2	1	0	0	0	0
AQ-20	Tellina similis	0	10	3	1	0	0	L	2	2	2.1	1.2	0	0
AQ-20	Tellina similis	0	16	3	1	1	0	L	0	0	0	0	0	0
AQ-20	Tellina similis	0	14	3	1	1	0	L	0	1	0	0	0	0
AQ-20	Tellina similis	0	10	3	1	1	0	L	0	1	0	0	0	0
AQ-20	Tellina similis	1	13	3	1	1	0	R	0	1	0	0	0	0
AQ-20	Tellina similis	0	16	3	1	1	0	L	0	1	1.1	0	0	0
AQ-20	Tellina similis	0	11	3	1	0	0	R		1	1.1	0	0	0
AQ-20	Tellina similis	0	14	3	1	0	0	R	0	1	0	0	0	0
AQ-20	Tellina similis	0	10	3	1	0	1	R	0	1	0	0	0	0

AQ-20	Telina similis	0	16	3	1	1	0	L	0	0	0	0	0	0
AQ-20	Telina similis	0	9	3	1	0	0	R	0	3	1.2	1.2	0	0
AQ-20	Telina similis	0	10	3	1	0	1	R	0	1	0	0	0	0
AQ-20	Telina similis	1	15	3	1	1	0	R	0	1	1.2	1.1	0	0
AQ-40	Telina similis	0	9	3	1	1	0	L	0	1	1.1	0	0	0
AQ-40	Telina similis	1	11	2	0	0	3	L	0	2	2.1	1.1	0	0
AQ-40	Telina similis	0	9	3	1	0	0	L	2	0	0	0	0	0
AQ-40	Telina similis	0	9	3	1	0	0	R	2	2	1.2	0	0	0
AQ-40	Telina similis	1	10	2	1	0	0	L	0	2	1.2	1.2	0	0
AQ-40	Telina similis	0	8	2	1	0	0	L	0	1	1.2	1.1	0	0
AQ-40	Telina similis	0	9	3	1	1	0	L	0	1	1.2	0	0	0
AQ-40	Telina similis	0	9	3	1	1	0	L	0	1	1.2	0	0	0
AQ-40	Telina similis	0	10	3	1	1	4	L	0	1	0	0	0	0
AQ-40	Telina similis	0	9	3	1	1	4	L	0	1	0	0	0	0
AQ-40	Telina similis	0	10	3	1	0	0	R	2	2	2.1	0	0	0
AQ-40	Telina similis	0	16	3	1	1	0	R	0	1	1.1	0	0	0
AQ-40	Telina similis	8	3	1	0	0	0	R	2	0	1.1	0	0	0
AQ-40	Telina similis	2	12	2	0	0	0	L	1	2	2.21	1.2	0	0
AQ-40	Telina similis	0	15	3	1	1	0	L	0	1	0	0	0	0
AQ-40	Telina similis	0	11	3	1	1	0	R	0	1	1.2	0	0	0
AQ-40	Telina similis	0	13	3	1	1	0	R	0	1	0	0	0	0
AQ-40	Telina similis	1	14	3	1	1	0	L	0	1	2.1	1.1	0	0
AQ-40	Telina similis	1	12	3	1	0	0	R	0	1	2.1	1.1	0	0
AQ-40	Telina similis	0	11	3	1	0	0	R	2	0	1.2	0	0	0
AQ-40	Telina similis	1	11	2	0	0	0	R	0	0	1.2	1.1	0	0
AQ-40	Telina similis	0	13	3	1	1	0	R	0	1	0	0	0	0
AQ-40	Telina similis	0	10	3	1	1	0	L	0	1	0	0	0	0
AQ-40	Telina similis	0	13	3	1	1	0	L	0	1	2.1	0	0	0
AQ-40	Telina similis	0	16	3	1	1	0	R	0	1	1.2	0	0	0
AQ-40	Telina similis	0	11	3	1	0	0	L	0	2	2.1	0	0	0
AQ-40	Telina similis	0	14	3	1	1	0	L	0	1	1.2	1.1	0	0
AQ-40	Telina similis	0	14	3	1	1	0	L	0	1	0	0	0	0
AQ-40	Telina similis	1	6	2	0	0	0	L	2	3	2.21	1.2	0	0
AQ-40	Telina similis	0	14	3	1	1	0	L	0	0	0	0	0	0
AQ-40	Telina similis	0	8	3	2	0	0	L	2	1	0	0	0	0
AQ-40	Telina similis	0	14	3	1	1	0	Live	0	0	0	0	0	0
AQ-40	Telina similis	0	11	3	1	1	0	L	0	1	1.2	0	0	0
AQ-40	Telina similis	1	14	3	1	1	0	L	0	1	2.1	1.1	0	0
AQ-40	Telina similis	1	11	2	1	1	0	L	0	1	2.1	1.1	0	0
AQ-50	Telina similis	0	10	3	1	0	0	R	2	1	0	0	0	0
AQ-50	Telina similis	0	17	3	1	1	0	L	0	0	0	0	0	0
AQ-50	Telina similis	0	14	3	1	0	0	R	0	0	0	0	0	0
AQ-50	Telina similis	0	13	3	1	1	0	L	0	1	0	0	0	0
AQ-50	Telina similis	0	13	3	1	1	0	R	0	1	0	0	0	0
AQ-50	Telina similis	0	13	3	1	1	0	L	0	0	0	0	0	0
AQ-50	Telina similis	0	17	3	1	1	0	R	0	0	1.1	1.1	0	0
AQ-50	Telina similis	0	10	3	1	1	0	L	0	1	0	0	0	0
AQ-50	Telina similis	0	15	3	1	1	0	L	0	0	0	0	0	0

Site	Species	% Cover	Size	Color	Lustr	Peric	Pred	Shell	Brea	EdgeAlter	Dissolution	Abrasion	Sponge	Graze
TR-1	Acra imbricata	3	28	2	0	0	0	L	2	3	2.42	1.1	0	0
TR-1	Acra imbricata	1	23	2	0	0	0	L	0	2	2.21	1.1	0	0
TR-1	Acra imbricata	2	12	2	0	0	0	L	1	3	2.23	1.2	0	0
TR-1	Acra imbricata	2	12	2	0	0	0	L	2	3	2.23	1.2	0	0
TR-1	Acra imbricata	1	11	2	0	0	0	L	1	1	2.1	1.1	0	0
TR-1	Acra imbricata	2	10	2	0	0	0	L	3	3	2.21	1.2	0	0
TR-1	Acra imbricata	2	9	2	0	0	0	L	2	3	2.21	1.2	0	0
TR-1	Acra imbricata	1	12	2	0	0	0	R	0	2	2.1	1.1	1	0
TR-1	Acra imbricata	2	11	2	1	0	0	R	2	3	2.21	1.2	0	0
TR-2	Acra imbricata	2	13	2	0	0	0	L	2	3	2.21	1.2	0	0
TR-2	Acra imbricata	1	7	2	0	0	0	R	3	2	2.1	1.1	0	0
TR-2	Acra imbricata	2	8	2	0	0	0	R	0	3	2.21	1.1	0	0
TR-2	Acra imbricata	3	12	2	0	0	0	R	2	3	2.23	1.2	0	0
TR-2	Acra imbricata	2	13	0	0	0	0	R	2	3	2.23	1.1	0	0
TR-2	Acra imbricata	2	17	2	0	0	0	R	1	3	2.23	1.1	0	0
TR-1	Acra zebra	1	27	2	1	0	0	R	0	1	1.2	1.1	0	0
TR-2	Acra zebra	2	16	2	0	0	0	L	2	3	2.1	1.1	0	0
TR-2	Acra zebra	2	9	2	0	0	0	L	0	3	2.21	1.1	0	0
TR-2	Acra zebra	2	15	2	0	0	0	R	3	3	2.21	1.1	0	0
TR-1	Arcopis adamsi	1	7	2	1	3	0	Art	0	0	1.1	1.1	0	0
TR-1	Arcopis adamsi	2	9	2	1	0	0	L	0	2	2.1	1.1	0	0
TR-1	Arcopis adamsi	2	9	2	1	0	0	R	0	0	1.1	1.2	0	0
TR-1	Arcopis adamsi	1	8	2	0	0	0	R	0	2	1.2	1.1	0	0
TR-2	Arcopis adamsi	2	9	2	0	0	0	L	2	3	2.21	1.2	0	0
TR-2	Arcopis adamsi	1	8	2	1	0	0	L	0	0	2.1	1.1	0	0
TR-2	Arcopis adamsi	1	8	2	0	0	0	R	0	2	2.21	1.1	0	0
TR-2	Arcopis adamsi	1	8	2	1	3	0	R	0	0	2.1	1.1	0	0
TR-2	Arcopis adamsi	2	8	2	1	0	0	L	0	2	2.1	1.1	0	0
TR-2	Arcopis adamsi	2	7	0	1	0	0	R	1	3	2.1	1.1	0	0
TR-1	Barbatia cancellaria	2	32	2	0	1	0	R	0	2	2.21	1.2	0	0
TR-1	Barbatia cancellaria	1	11	2	0	0	0	R	0	2	2.21	1.1	0	0
TR-1	Barbatia cancellaria	2	9	2	0	0	0	R	1	3	2.21	1.1	0	0
TR-1	Barbatia cancellaria	3	8	2	0	0	0	R	2	3	2.23	1.2	0	0
TR-1	Barbatia cancellaria	2	8	0	0	0	0	R	2	3	2.23	1.2	0	0
TR-1	Barbatia cancellaria	2	18	2	0	0	0	L	2	3	2.21	1.2	0	0
TR-1	Barbatia cancellaria	1	16	3	1	1	0	L	0	0	1.2	0	0	0
TR-1	Barbatia cancellaria	2	12	2	0	0	0	L	0	3	2.21	1.1	0	0
TR-1	Barbatia cancellaria	1	11	2	0	0	0	L	1	3	2.21	1.1	0	0
TR-1	Barbatia cancellaria	2	8	2	0	0	0	L	2	3	2.23	1.2	0	0
TR-1	Barbatia cancellaria	2	8	0	0	0	0	L	2	3	2.23	1.2	0	0
TR-1	Barbatia cancellaria	2	10	2	0	0	0	L	1	3	2.21	1.1	0	0
TR-1	Barbatia cancellaria	2	8	2	0	0	0	L	2	3	2.23	1.2	0	0
TR-1	Barbatia cancellaria	2	11	0	0	0	0	L	2	3	2.23	1.2	0	0
TR-1	Barbatia cancellaria	2	9	2	0	0	0	L	2	3	2.21	1.2	0	0
TR-1	Barbatia cancellaria	2	18	2	0	0	0	R	3	3	2.23	1.2	0	0
TR-2	Barbatia cancellaria	2	28	2	0	0	0	L	1	3	2.23	1.2	0	0
TR-2	Barbatia cancellaria	2	23	2	0	0	0	L	2	3	2.23	1.2	0	0
TR-2	Barbatia cancellaria	1	21	0	0	0	0	L	2	3	2.21	1.2	0	0
TR-2	Barbatia cancellaria	2	14	2	0	0	0	L	2	3	2.21	1.2	0	0
TR-2	Barbatia cancellaria	3	13	0	0	0	0	L	1	3	2.41	1.2	0	0
TR-2	Barbatia cancellaria	1	15	2	0	0	0	L	0	3	2.21	1.2	0	0
TR-2	Barbatia cancellaria	2	14	2	0	0	0	L	0	2	2.21	1.2	0	0
TR-2	Barbatia cancellaria	1	16	2	1	0	0	L	0	2	2.1	1.1	0	0
TR-2	Barbatia cancellaria	1	9	3	1	0	0	L	0	2	2.1	1.1	0	0
TR-2	Barbatia cancellaria	2	9	2	1	0	0	L	2	2	2.1	1.1	0	0
TR-2	Barbatia cancellaria	1	8	0	0	0	0	L	1	2	2.1	1.1	0	0
TR-2	Barbatia cancellaria	2	8	0	0	0	0	L	2	3	2.21	1.2	0	0
TR-2	Barbatia cancellaria	0	7	3	0	0	0	L	2	2	2.1	1.1	0	0
TR-2	Barbatia cancellaria	2	12	2	0	1	0	L	0	0	1.2	1.1	0	0
TR-2	Barbatia cancellaria	1	9	3	1	0	0	L	0	0	1.1	1.1	0	0
TR-2	Barbatia cancellaria	2	9	2	0	0	0	L	1	3	2.21	1.1	0	0
TR-2	Barbatia cancellaria	2	9	2	0	0	0	L	0	3	2.21	1.2	0	0
TR-2	Barbatia cancellaria	0	8	2	1	1	0	L	2	2	2.1	1.1	0	0
TR-2	Barbatia cancellaria	1	9	2	1	1	0	R	2	2	1.2	1.1	0	0
TR-2	Barbatia cancellaria	1	10	2	1	0	0	R	0	2	2.1	1.2	0	0
TR-2	Barbatia cancellaria	1	9	2	1	1	0	R	1	2	1.2	1.1	0	0
TR-2	Barbatia cancellaria	2	16	2	0	0	0	R	2	2	2.23	1.1	0	0
TR-2	Barbatia cancellaria	2	15	2	0	0	0	R	0	2	2.21	1.1	0	0
TR-2	Barbatia cancellaria	2	12	2	0	0	0	R	0	2	2.21	1.2	0	0
TR-2	Barbatia cancellaria	1	11	2	1	0	0	R	0	3	2.1	1.1	0	0

TR-2	Barbatia cancellaria	1	10	3	1	1	0	R	0	2	2.1	1.1	0	0
TR-2	Barbatia cancellaria	1	10	2	0	0	0	R	0	2	2.1	1.2	0	0
TR-1	Barbatia domingensis	2	14	2	0	0	0	L	1	3	2.23	1.1	0	1
TR-1	Barbatia domingensis	1	12	2	0	0	0	L	0	2	2.1	1.1	0	0
TR-1	Barbatia domingensis	2	10	2	0	0	0	L	2	1	2.1	1.1	0	0
TR-1	Barbatia domingensis	2	8	2	0	0	0	L	0	3	2.21	1.1	0	0
TR-1	Barbatia domingensis	2	13	2	0	0	0	R	1	3	2.21	1.1	0	0
TR-1	Barbatia domingensis	2	12	2	0	1	0	R	2	3	2.23	1.1	0	1
TR-1	Barbatia domingensis	2	13	2	0	0	0	R	2	3	2.23	1.1	0	0
TR-1	Barbatia domingensis	2	14	2	0	0	0	R	2	3	2.21	1.1	0	0
TR-1	Barbatia domingensis	3	10	2	0	0	0	R	1	3	2.23	1.1	0	0
TR-1	Barbatia domingensis	1	10	2	1	1	0	R	0	2	2.1	C	0	0
TR-2	Barbatia domingensis	2	19	2	0	0	0	L	1	3	2.21	1.2	0	0
TR-2	Barbatia domingensis	2	18	2	0	1	0	L	1	2	2.1	1.1	0	0
TR-2	Barbatia domingensis	3	14	2	0	0	0	L	1	3	2.23	1.2	0	0
TR-2	Barbatia domingensis	2	11	2	0	0	0	L	2	3	2.23	1.2	0	0
TR-2	Barbatia domingensis	1	10	2	0	0	0	L	1	2	2.21	1.1	0	0
TR-2	Barbatia domingensis	2	11	2	0	0	0	L	0	2	2.21	1.1	0	0
TR-2	Barbatia domingensis	1	8	2	0	0	0	L	1	2	2.21	1.1	0	0
TR-2	Barbatia domingensis	2	10	2	0	0	0	R	2	3	2.21	1.1	0	0
TR-2	Barbatia domingensis	2	10	2	0	0	0	R	1	3	2.21	1.1	0	0
TR-2	Barbatia domingensis	2	12	2	0	0	0	R	0	2	2.21	1.1	0	0
TR-2	Barbatia domingensis	1	12	2	1	0	0	R	0	2	2.1	1.1	0	0
TR-2	Barbatia domingensis	3	14	2	0	0	0	R	2	3	2.23	1.1	0	0
TR-2	Barbatia domingensis	3	12	2	0	0	0	R	2	3	2.23	1.2	0	0
TR-1	Cerithium eburneum	1	8	2	1	0	0	Aper	3	2	2.1	1.1	0	0
TR-1	Cerithium litteratum	3	12	0	0	0	0	A	3	3	2.23	1.2	0	0
TR-1	Cerithium litteratum	1	13	2	1	0	0	A	3	1	2.1	1.1	0	0
TR-1	Cerithium litteratum	1	7	0	0	0	0	A	3	3	2.23	1.2	0	0
TR-1	Cerithium litteratum	3	8	0	0	0	0	A	3	3	2.23	1.2	0	0
TR-1	Cerithium litteratum	2	5	2	0	0	0	A	3	3	2.23	1.2	0	0
TR-1	Cerithium litteratum	2	6	0	0	0	0	A	3	3	2.23	1.2	0	0
TR-1	Cerithium litteratum	0	7	2	0	0	0	A	3	2	2.1	1.1	0	0
TR-2	Cerithium litteratum	1	8	2	0	0	0	A	3	2	2.1	1.1	0	0
TR-2	Cerithium litteratum	1	7	2	1	0	0	Frag	3	2	2.1	1.1	0	0
TR-1	Chama spp.	2	26	0	0	0	0	B	0	3	2.23	1.2	0	1
TR-1	Chama spp.	2	15	0	0	0	0	B	0	3	2.21	1.1	0	0
TR-1	Chama spp.	2	20	0	0	0	0	T	2	3	2.41	1.2	0	0
TR-1	Chama spp.	2	14	2	1	0	0	T	0	2	2.1	1.1	0	0
TR-1	Chama spp.	2	14	2	1	1	1	T	0	2	2.1	1.1	0	0
TR-1	Chama spp.	1	13	2	0	0	0	T	0	2	2.21	1.2	0	0
TR-1	Chama spp.	2	8	3	1	1	0	T	0	0	2.1	1.1	0	0
TR-1	Chama spp.	2	7	0	0	0	4	T	0	3	2.21	1.2	0	0
TR-1	Chama spp.	3	6	2	0	0	0	T	1	3	2.1	1.1	0	0
TR-1	Chama spp.	2	5	2	1	0	0	T	2	3	2.1	1.2	0	0
TR-2	Chama spp.	2	13	2	1	1	0	B	0	1	2.1	1.1	0	0
TR-2	Chama spp.	2	26	3	1	0	0	T	3	1	2.1	1.1	0	0
TR-2	Chama spp.	2	20	0	0	0	0	T	0	3	2.23	1.2	0	0
TR-2	Chama spp.	2	8	0	0	0	0	T	0	2	2.21	1.2	0	0
TR-2	Chama spp.	2	7	2	0	0	0	T	0	2	2.21	1.1	0	0
TR-2	Chama spp.	2	9	2	0	0	0	T	0	3	2.21	1.1	0	0
TR-2	Chama spp.	2	10	2	0	0	0	T	3	3	2.21	1.2	0	0
TR-1	Chione cancellata	1	11	2	1	0	0	L	0	2	2.1	1.1	0	0
TR-1	Chione cancellata	1	6	3	1	0	0	L	0	0	1.2	1.1	0	0
TR-1	Chione cancellata	2	7	0	0	0	4	R	0	3	2.1	1.1	0	0
TR-1	Chione cancellata	1	7	2	1	0	0	R	0	2	2.1	1.1	0	0
TR-1	Chione cancellata	2	6	2	1	0	0	R	0	3	2.21	1.1	0	0
TR-2	Chione cancellata	2	9	0	0	0	0	L	0	2	2.21	1.1	0	0
TR-1	Chione grus	2	8	2	0	0	0	L	0	1	2.21	1.1	0	0
TR-2	Chione sp.	1	10	3	1	0	0	L	0	1	1.1	1.1	0	0
TR-2	Chione sp.	1	8	2	1	0	0	R	0	1	1.2	1.1	0	0
TR-2	Pseudochama spp.	2	19	0	0	0	0	B	0	3	2.23	1.2	0	0
TR-2	Pseudochama spp.	2	13	1	0	0	0	T	0	2	2.1	1.2	0	0
TR-2	Pseudochama spp.	2	12	0	0	0	0	T	2	3	2.21	1.2	0	0
TR-2	Pseudochama spp.	2	9	2	1	0	0	T	0	0	2.1	1.1	0	0
TR-2	Pseudochama spp.	1	7	3	1	0	3	L	0	0	1.1	1.1	0	0
TR-1	Tellina gouldi	1	7	2	1	0	0	R	0	1	2.1	1.1	0	0
TR-1	Tellina similis	0	17	3	1	0	0	R	1	1	1.1	0	0	0
TR-1	Tellina similis	1	9	0	1	0	0	R	1	3	2.1	1.1	0	0
TR-1	Tellina similis	1	11	2	0	1	0	R	2	2	2.1	1.1	0	0
TR-1	Tellina similis	0	15	2	1	1	0	L	2	1	0	0	0	0

TR-1	Tellina similis	1	12	2	1	1	0	L	2	1	1.2	1.1	0	0
TR-1	Tellina similis	0	12	2	1	1	0	L	0	1	1.1	0	0	0
TR-2	Tellina similis	1	13	3	1	1	0	L	2	1	1.1	1.1	0	0
TR-2	Tellina similis	1	12	2	1	0	2	L	2	2	2.1	1.1	0	0
TR-2	Tellina similis	0	12	2	1	1	0	R	2	2	2.1	1.1	0	0

Site	Species	% Cover	Size	Color	Luster	Periostra	Pred bc	Shell	Breaka	EdgeAl	Dissolution	Abrasion	Sponge	Graze
TH-10	Acra zebra	2	57	2	0	0	0	L	2	3	2.21	1.2	0	1
TH-10	Acra zebra	2	23	2	0	1	0	L	1	2	2.1	1.1	0	1
TH-10	Anadara notabilis	1	8	0	0	0	0	R	0	2	2.21	1.1	0	0
TH-20	Arca zebra	2	43	0	0	0	0	L	1	3	2.41	1.2	1	0
TH-20	Arca zebra	2	47	0	0	0	0	R	2	3	2.41	1.2	0	1
TH-20	Arca zebra	2	29	0	0	0	0	R	1	3	2.41	1.2	0	0
TH-10	Arcopis adamsi	1	8	0	1	2	0	Live	0	0	1.2	1.1	0	0
TH-0	Barbatia domingensis	2	13	0	0	0	0	Frag	3	3	2.21	1.2	0	0
TH-10	Barbatia sp.	3	5	0	0	0	0	L	2	3	2.21	1.1	0	0
TH-0	Cerithium eburneum	2	17	2	1	0	0	W	1	1	2.1	1.1	0	0
TH-0	Cerithium eburneum	1	10	3	1	0	0	W	2	1	0	0	0	0
TH-0	Cerithium eburneum	2	7	0	0	0	2	W	2	3	2.21	1.1	0	0
TH-0	Cerithium eburneum	2	8	0	0	0	0	A	3	3	2.21	1.1	0	0
TH-0	Cerithium eburneum	2	9	0	0	0	0	Aper	3	1	2.1	1.1	0	0
TH-0	Cerithium eburneum	2	10	0	0	0	0	Aper	3	2	2.21	1.1	0	0
TH-0	Cerithium eburneum	1	8	2	1	0	0	Aper	3	1	2.1	1.1	0	0
TH-10	Cerithium eburneum	1	10	2	1	0	0	W	1	1	1.1	1	0	0
TH-10	Cerithium eburneum	1	12	2	0	0	2	W	2	3	1.1	1	0	0
TH-10	Cerithium eburneum	1	16	2	1	0	0	W	3	1	1.2	0	0	0
TH-10	Cerithium eburneum	0	10	3	1	0	0	W	1	1	0	0	0	0
TH-10	Cerithium eburneum	1	9	2	0	0	2	W	1	1	1.1	0	0	0
TH-10	Cerithium eburneum	1	8	2	0	0	2	W	1	2	1.1	0	0	0
TH-10	Cerithium eburneum	1	10	0	0	0	1	A	3	1	1.1	0	0	0
TH-10	Cerithium eburneum	2	7	0	1	0	1	A	3	1	1.1	0	0	0
TH-10	Cerithium eburneum	2	8	0	0	0	2	A	3	3	1.1	0	0	0
TH-10	Cerithium eburneum	1	7	0	0	0	0	A	3	3	2.23	1.1	0	0
TH-10	Cerithium eburneum	2	6	0	0	0	0	A	3	3	2.21	1.1	0	0
TH-10	Cerithium eburneum	1	5	0	0	0	2	A	3	3	2.1	1.1	0	0
TH-10	Cerithium eburneum	3	7	0	0	0	2	A	3	3	2.23	1.2	0	0
TH-10	Cerithium eburneum	2	7	0	0	0	2	A	3	3	2.1	1.1	0	0
TH-10	Cerithium eburneum	2	17	3	1	0	2	W	1	0	2.1	1.1	1	0
TH-10	Cerithium eburneum	2	18	2	1	0	0	W	0	0	2.1	1.1	0	0
TH-10	Cerithium eburneum	1	19	3	1	0	0	W	0	0	1.1	1	0	0
TH-10	Cerithium eburneum	1	18	3	1	0	0	W	0	0	1.1	1	0	0
TH-10	Cerithium eburneum	1	19	0	0	0	2	W	2	2	2.21	1	0	0
TH-10	Cerithium eburneum	2	20	2	1	0	0	W	1	2	2.1	1	0	0
TH-10	Cerithium eburneum	3	17	0	0	0	0	W	2	3	2.21	1.1	0	0
TH-10	Cerithium eburneum	2	17	2	0	0	0	W	2	1	2.21	1.1	0	0
TH-10	Cerithium eburneum	2	14	0	0	0	0	W	2	3	2.21	1.1	0	0
TH-10	Cerithium eburneum	2	13	0	0	0	0	A	3	2	2.1	1.1	0	0
TH-10	Cerithium eburneum	3	13	0	0	0	0	A	3	3	2.41	1.2	0	0
TH-10	Cerithium eburneum	1	11	3	1	0	0	A	3	1	0	0	0	0
TH-10	Cerithium eburneum	1	9	0	0	0	0	A	3	2	2.21	1.1	0	0
TH-10	Cerithium eburneum	2	7	0	0	0	1	A	3	3	2.21	1.2	0	0
TH-10	Cerithium eburneum	1	7	0	0	0	1	A	3	2	2.1	1.1	0	0
TH-20	Cerithium eburneum	0	17	3	1	0	0	W	0	0	0	0	0	0
TH-20	Cerithium eburneum	1	17	0	0	0	0	W	1	1	2.21	1.1	0	0
TH-20	Cerithium eburneum	2	16	0	0	0	0	W	1	1	2.21	1.1	0	0
TH-20	Cerithium eburneum	3	13	0	0	0	0	A	3	3	2.21	1.2	0	1
TH-20	Cerithium eburneum	2	9	0	0	0	0	A	3	3	2.21	1.2	0	0
TH-20	Cerithium eburneum	1	8	0	0	0	0	A	3	3	2.21	1.1	0	0
TH-20	Cerithium eburneum	1	7	3	1	0	0	A	3	1	1.1	0	0	0
TH-20	Cerithium eburneum	2	10	0	0	0	0	Aper	3	3	2.21	1.1	0	1
TH-20	Cerithium eburneum	2	12	0	0	0	0	Aper	3	3	2.21	1.1	0	0
TH-30	Cerithium eburneum	2	18	2	1	0	0	W	0	0	2.1	1.1	0	0
TH-30	Cerithium eburneum	2	20	0	1	0	0	W	1	2	2.21	1.1	0	0
TH-30	Cerithium eburneum	3	16	0	0	0	0	W	2	3	2.21	1.1	0	0
TH-30	Cerithium eburneum	1	11	2	1	0	0	Aper	2	1	1.2	1.1	0	0
TH-30	Cerithium eburneum	2	7	0	0	0	0	Aper	2	3	2.2	1.1	0	0
TH-30	Cerithium eburneum	3	8	0	0	0	0	Aper	2	3	2.41	1.2	0	0
TH-30	Cerithium eburneum	2	8	0	0	0	0	Aper	2	3	2.21	1.1	0	0
TH-30	Cerithium eburneum	2	7	0	0	0	0	Aper	2	3	2.21	1.1	0	0
TH-10	Cerithium litteratum	1	17	2	1	0	2	W	1	0	2.1	1.2	0	0
TH-20	Cerithium litteratum	1	8	3	1	0	0	W	1	1	1.2	0	0	0
TH-10	Chama spp.	2	25	2	1	3	0	Live	0	0	2.1	1.2	0	0
TH-20	Chama spp.	2	7	0	0	0	0	T	0	3	2.22	0	0	1
TH-30	Chama spp.	2	21	0	0	0	0	T	0	3	2.23	1.2	0	0
TH-0	Chione cancellata	2	8	0	0	0	0	R	0	3	2.21	1.2	0	0
TH-0	Chione cancellata	2	11	0	0	0	0	L	1	3	2.23	1.2	0	0
TH-10	Chione cancellata	1	9	2	1	0	2	L	1	2	2.1	1.1	0	0

TH-10	Chione cancellata	2	4	2	0	0	0	L	1	2	2.21	1.1	0	0
TH-10	Chione cancellata	1	5	2	0	0	0	L	2	2	2.21	1.2	0	0
TH-10	Chione cancellata	3	7	0	0	0	0	L	0	3	2.21	1.2	0	0
TH-10	Chione cancellata	2	7	0	0	0	0	R	1	3	2.21	1.1	0	0
TH-10	Chione cancellata	1	7	0	0	0	0	R	1	3	2.21	1.2	0	0
TH-10	Chione cancellata	1	6	0	0	0	0	R	1	3	2.1	1.1	0	0
TH-10	Chione cancellata	1	20	0	0	0	0	R	0	3	2.23	1.2	1	1
TH-10	Chione cancellata	1	19	0	0	0	0	R	0	3	2.23	1.2	0	1
TH-10	Chione cancellata	3	19	0	0	0	0	R	0	3	2.23	1.2	0	0
TH-10	Chione cancellata	1	17	0	0	0	0	R	1	3	2.23	1.2	0	1
TH-10	Chione cancellata	2	23	0	0	0	0	L	0	3	2.21	1.2	0	1
TH-10	Chione cancellata	2	22	0	0	0	0	L	0	3	2.21	1.2	0	0
TH-10	Chione cancellata	2	22	2	0	0	0	L	0	3	2.21	1.2	0	0
TH-10	Chione cancellata	2	21	0	0	0	0	L	0	2	2.22	1.2	0	1
TH-10	Chione cancellata	3	20	0	0	0	0	L	2	3	2.22	1.2	1	1
TH-10	Chione cancellata	2	17	2	0	0	0	L	1	3	2.1	1.1	0	0
TH-10	Chione cancellata	2	14	2	0	0	0	L	1	3	2.21	1.2	0	1
TH-10	Chione cancellata	2	10	2	0	0	0	L	1	3	2.23	1.1	0	1
TH-10	Chione cancellata	1	9	2	1	0	0	L	0	2	2.1	1.1	0	0
TH-10	Chione cancellata	2	8	2	1	0	0	L	3	3	2.1	1.1	0	0
TH-20	Chione cancellata	1	20	2	0	0	0	L	0	3	2.23	1.2	1	0
TH-20	Chione cancellata	1	18	2	0	1	0	L	2	2	1.2	1.1	0	0
TH-20	Chione cancellata	3	12	0	0	0	0	L	0	3	2.21	1	0	0
TH-20	Chione cancellata	1	7	0	0	0	0	L	0	3	2.22	1.1	0	0
TH-20	Chione cancellata	1	7	3	1	0	4	L	0	0	1.1	1.1	0	0
TH-20	Chione cancellata	2	19	0	0	0	0	R	1	3	2.23	1.1	0	1
TH-20	Chione cancellata	3	20	0	0	0	0	R	2	3	2.23	1.2	1	0
TH-20	Chione cancellata	2	12	0	0	0	0	R	2	3	2.23	1.2	1	0
TH-30	Chione cancellata	2	18	0	0	0	0	L	0	3	2.22	1.1	0	1
TH-30	Chione cancellata	2	15	0	0	0	0	L	0	3	2.22	1.1	0	0
TH-30	Chione cancellata	2	18	0	0	0	0	R	0	3	2.22	1.1	0	0
TH-10	Tellina gouldi	2	8	0	0	0	0	L	0	3	2.21	1.1	0	0
TH-10	Tellina gouldi	3	6	0	0	0	0	R	1	2	2.21	1.1	0	0
TH-10	Tellina gouldi	1	7	0	0	0	0	R	1	3	2.1	1.1	0	0
TH-0	Tellina similis	1	15	3	1	1	0	Art	1	1	1.1	0	0	0
TH-0	Tellina similis	0	17	3	1	1	0	Art	2	0	1.1	0	0	0
TH-0	Tellina similis	0	11	3	1	1	0	Art-u	3	0	0	0	0	0
TH-0	Tellina similis	1	15	3	1	1	0	R	1	2	1.2	1.1	0	0
TH-0	Tellina similis	2	18	2	0	1	0	R	1	2	2.1	1.1	0	0
TH-0	Tellina similis	1	13	2	1	1	0	L	1	2	2.1	1.1	0	0
TH-0	Tellina similis	1	13	2	1	0	0	L	0	1	2.1	1.1	0	0
TH-0	Tellina similis	2	17	2	1	0	0	L	0	1	2.21	1.1	0	0
TH-0	Tellina similis	2	8	2	0	1	0	L	2	3	2.21	1.2	0	0
TH-10	Tellina similis	0	9	3	1	3	0	Live	0	0	0	0	0	0
TH-10	Tellina similis	1	10	0	0	0	0	R	1	3	2.1	1.1	0	0
TH-10	Tellina similis	2	10	0	0	0	0	L	3	3	2.1	1.1	0	0
TH-10	Tellina similis	2	10	0	0	0	0	L	3	3	2.21	1.1	0	0
TH-20	Tellina similis	1	9	0	1	1	0	R	2	2	1.2	0	0	0
TH-20	Tellina similis	1	9	0	1	1	0	R	2	2	1.2	0	0	0
TH-20	Tellina similis	1	10	0	1	1	0	R	2	2	2.1	1	0	0
TH-30	Tellinal similis	2	16	2	0	1	0	R	0	3	2.21	1.1	0	0
TH-30	Tellinal similis	0	10	3	1	3	0	Live	0	0	0	0	0	0

Site	Species	% Cove	Size	Color	Luster	Periosti	Predbc	Shell	Brea	Edge	dissol		Abrasion	Sponge	Graz
RZ-0	Arca imbricata	3	25	0	0	0	0	L	2	3	2.23		0	0	0
RZ-0	Arca imbricata	2	12	0	0	0	0	L	0	2	2.21		0	0	0
RZ-10	Arca imbricata	2	19	2	0	0	0	L	1	3	2.1		1.2	0	0
RZ-10	Arca imbricata	1	12	0	0	0	0	L	1	3	2.1		1.2	0	0
RZ-10	Arca imbricata	1	11	2	0	0	0	R	2	3	2.21		2.2	1	0
RZ-10	Arca imbricata	3	17	0	0	0	0	R	1	3	2.41		2.2	0	0
RZ-20	Arca imbricata	1	7	0	0	0	0	W	2	3	2.23	•		0	0
RZ-30	Arca imbricata	1	10	2	0	0	0	L	2	3	1.1		1.2	0	0
RZ-30	Arca imbricata	1	8	0	0	0	3	L	2	3	1.2		1.2	0	0
RZ-20	Arca sp.	1	10	0	0	0	0	L	3	3	2.22	•		0	1
RZ-20	Arca zebra	1	8	0	0	0	0	R	2	3	2.23	•		0	0
RZ-10	Arcopis adamsi	0	7	3	1	2	0	L	1	0	0		0	0	0
RZ-10	Arcopis adamsi	1	9	2	1	2	4	L	0	0	1.1		0	0	0
RZ-10	Arcopis adamsi	2	8	0	0	0	0	R	0	3	2.23		1.2	0	0
RZ-10	Arcopis adamsi	1	7	3	1	2	0	R	1	0	0		0	0	0
RZ-20	Arcopis adamsi	1	8	2	0	0	0	R	0	3	2.23		1.2	0	0
RZ-30	Arcopis adamsi	1	11	2	0	0	0	R	0	2	1.1		1.1	0	0
RZ-0	Barbatia cancellaria	1	12	2	0	0	0	L	0	1	2.1		1.2	0	0
RZ-0	Barbatia cancellaria	1	28	2	0	0	0	L	1	1	2.21		1.2	0	0
RZ-0	Barbatia cancellaria	1	26	2	0	0	0	R	1	3	2.21		1.2	0	0
RZ-0	Barbatia cancellaria	2	14	2	0	0	0	R	1	3	2.21		1.2	0	0
RZ-0	Barbatia cancellaria	2	13	2	0	0	0	L	3	3	2.23		1.2	0	0
RZ-0	Barbatia cancellaria	1	15	0	0	0	0	R	3	3	2.41		0	0	1
RZ-0	Barbatia cancellaria	2	17	2	0	0	0	R	3	3	2.23		0	0	0
RZ-0	Barbatia cancellaria	1	15	0	0	0	0	L	2	3	2.41		0	0	0
RZ-0	Barbatia cancellaria	2	7	2	0	0	0	L	1	3	2.21		1.2	0	0
RZ-20	Barbatia cancellaria	1	13	2	0	0	1	R	0	2	1.1		1.1	0	0
RZ-20	Barbatia cancellaria	2	19	2	0	0	0	L	1	3	2.2		1.2	0	0
RZ-20	Barbatia cancellaria	1	8	2	0	0	0	L	1	3	2.21		1.2	0	0
RZ-20	Barbatia cancellaria	2	12	2	0	0	0	L	1	3	2.41		1.2	0	0
RZ-20	Barbatia cancellaria	1	10	2	0	0	0	L	0	3	2.21		1.2	0	0
RZ-20	Barbatia cancellaria	1	11	2	0	0	0	L	3	3	2.21		1.2	1	0
RZ-20	Barbatia cancellaria	1	11	2	0	0	0	L	1	3	2.21		1.2	0	0
RZ-30	Barbatia cancellaria	1	18	2	0	0	0	R	0	2	1.2		1.2	0	0
RZ-30	Barbatia cancellaria	1	13	2	0	0	0	R	1	2	1.2		1.2	0	0
RZ-30	Barbatia cancellaria	1	10	2	0	0	0	L	0	3	2.1		1.2	0	0
RZ-30	Barbatia cancellaria	3	9	0	0	0	0	L	1	3	2.41		1.1	0	0
RZ-30	Barbatia cancellaria	1	17	2	0	0	0	R	2	3	2.21		1.2	0	0
RZ-30	Barbatia cancellaria	1	11	2	0	0	0	R	2	3	2.21		1.2	1	0
RZ-30	Barbatia cancellaria	1	10	2	0	0	0	L	3	3	2.21		1.2	1	0
RZ-30	Barbatia cancellaria	2	9	2	0	0	0	R	3	3	2.21		1.2	1	0
RZ-30	Barbatia cancellaria	2	10	2	0	0	0	R	3	3	2.21		1.2		0
RZ-0	Barbatia domingensis	2	12	0	0	0	0	R	1	3	2.21		0	0	0
RZ-10	Barbatia domingensis	1	12	0	0	0	0	R	0	3	2.21		1.2	1	0
RZ-10	Barbatia domingensis	1	12	0	0	0	4	R	0	2	0		1.2	0	0
RZ-10	Barbatia domingensis	1	8	0	0	0	0	R	1	3	2.3		2.2	0	0
RZ-10	Barbatia domingensis	1	10	0	0	0	0	L	1	3	1.1		1.2	0	1
RZ-20	Barbatia domingensis	0	12	2	0	0	0	L	0	3	2.23		1.2	0	0
RZ-20	Barbatia domingensis	1	11	2	1	0	0	L	0	2	0		1.2	0	0
RZ-20	Barbatia domingensis	2	10	2	0	0	0	R	3	3	2.21		1.2	0	0
RZ-30	Barbatia domingensis	2	9	2	0	0	0	R	3	3	2.21		1.2	0	0
RZ-0	Cerithium eburneum	1	17	3	1	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	20	3	1	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	18	3	1	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	18	3	1	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	2	20	3	1	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	17	3	1	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	16	3	1	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	16	0	0	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	20	0	0	0	0	Live	0	0	0		0	0	0
RZ-0	Cerithium eburneum	1	15	0	0	0	0	Live	0	0	1.1A		1.1	0	0
RZ-0	Cerithium eburneum	2	21	0	0	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	20	0	0	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	20	0	0	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	17	0	0	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	2	22	0	0	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	2	19	0	0	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	17	0	0	0	0	Live	0	0	0		0	0	0
RZ-0	Cerithium eburneum	2	21	0	0	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	16	0	0	0	0	Live	0	0	1.1A		0	0	0

RZ-0	Cerithium eburneum	1	18	0	0	0	0	Live	0	0	0		0	0	0
RZ-0	Cerithium eburneum	1	21	0	0	0	0	Live	0	0	2.1		0	0	0
RZ-0	Cerithium eburneum	2	21	0	0	0	0	Live	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	23	0	0	0	0	W	0	0	1.1A		0	0	0
RZ-0	Cerithium eburneum	2	9	3	1	0	0	A	3	1	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	12	2	0	0	0	A	3	1	1.1A		0	0	0
RZ-0	Cerithium eburneum	1	10	0	0	0	0	A	3	2	2.21		0	0	0
RZ-0	Cerithium eburneum	1	23	3	1	0	0	W	0	0	0		0	0	0
RZ-0	Cerithium eburneum	2	17	3	1	0	0	W	0	0	1.1A	1.1A		0	0
RZ-0	Cerithium eburneum	1	18	3	1	0	0	W	0	0	1.1A	1.1A		0	0
RZ-0	Cerithium eburneum	1	18	3	1	0	0	W	1	1	0		0	0	0
RZ-0	Cerithium eburneum	3	20	2	0	0	0	W	1	1	2.1		0	0	0
RZ-0	Cerithium eburneum	1	12	2	0	0	1	W	1	1	1.1		1.1	0	0
RZ-0	Cerithium eburneum	1	9	0	0	0	0	W	1	1	1.1		0	0	0
RZ-0	Cerithium eburneum	0	12	3	1	0	0	A	2	1	0		0	0	0
RZ-0	Cerithium eburneum	1	13	3	1	0	0	A	2	2	0		0	0	0
RZ-0	Cerithium eburneum	3	13	0	0	0	0	A	2	3	2.21		1.2	0	0
RZ-0	Cerithium eburneum	1	7	0	0	0	0	A	2	3	2.21		1.2	0	0
RZ-0	Cerithium eburneum	2	15	0	0	0	0	A	2	2	1.2		1.1	0	0
RZ-0	Cerithium eburneum	2	8	2	0	0	0	A	2	3	1.1		1.1	0	0
RZ-0	Cerithium eburneum	3	15	0	0	0	0	W	2	3	1.2		1.2	0	0
RZ-10	Cerithium eburneum	1	0	3	1	0	10	W	0	0	1.2A		0	0	0
RZ-10	Cerithium eburneum	1	20	2	0	0	1	W	1	2	0		1.1	0	0
RZ-10	Cerithium eburneum	2	16	0	0	0	0	W	1	3	2.21		1.2	0	0
RZ-10	Cerithium eburneum	1	10	2	1	0	0	W	1	2	0		1.1	0	0
RZ-10	Cerithium eburneum	0	10	3	1	0	0	W	1	1	1.1		0	0	0
RZ-10	Cerithium eburneum	1	10	0	0	0	0	A	3	3	2.42		1.2	0	0
RZ-10	Cerithium eburneum	1	9	0	0	0	0	A	2	3	2.21		1.2	0	0
RZ-10	Cerithium eburneum	1	8	0	0	0	0	A	2	3	0		1.1	0	0
RZ-10	Cerithium eburneum	0	10	2	1	0	0	W	1	1	0		0	0	0
RZ-10	Cerithium eburneum	0	9	3	1	0	0	A	2	1	0		0	0	0
RZ-10	Cerithium eburneum	0	10	2	1	0	0	A	2	1	0		1	0	0
RZ-10	Cerithium eburneum	0	6	3	1	0	0	A	2	1	0		0	0	0
RZ-10	Cerithium eburneum	1	7	3	1	0	0	A	2	2	1.1		1.1	0	0
RZ-10	Cerithium eburneum	1	8	2	1	0	2	W	1	1	0		0	0	0
RZ-10	Cerithium eburneum	1	8	2	0	0	0	W	1	2	1.1		1.1	0	0
RZ-10	Cerithium eburneum	2	9	2	0	0	0	A	2	3	1.2		1.2	0	0
RZ-10	Cerithium eburneum	1	8	0	0	0	0	A	2	3	2.21		1.2	0	0
RZ-10	Cerithium eburneum	0	5	0	0	0	0	A	2	2	0		1.1	0	0
RZ-10	Cerithium eburneum	0	9	0	0	0	0	A	2	3	2.23		1.2	1	0
RZ-10	Cerithium eburneum	1	6	0	0	0	0	A	2	3	2.21		1.2	0	0
RZ-10	Cerithium eburneum	1	5	2	0	0	0	A	2	2	0		1.1	0	0
RZ-10	Cerithium eburneum	1	9	0	0	0	0	A	3	3	2.42		1.2	1	0
RZ-10	Cerithium eburneum	1	10	0	0	0	0	A	3	3	2.42		1.2	0	0
RZ-10	Cerithium eburneum	1	7	0	0	0	0	A	3	3	1.1		1.1	0	0
RZ-10	Cerithium eburneum	1	10	0	0	0	0	A	3	3	1.2		1.2	0	0
RZ-10	Cerithium eburneum	1	11	2	0	0	0	W	1	3	1.1		1.1	0	0
RZ-10	Cerithium eburneum	1	10	2	0	0	1	W	1	3	2.1		1.2	0	0
RZ-10	Cerithium eburneum	0	9	0	0	0	1	W	1	3	2.21		1.2	0	0
RZ-10	Cerithium eburneum	1	8	2	0	0	0	W	1	3	2.23		1.2	0	0
RZ-10	Cerithium eburneum	2	8	0	0	0	0	W	1	3	2.23		1.2	0	0
RZ-10	Cerithium eburneum	0	6	2	0	0	0	W	2	2	0		1.1	0	0
RZ-10	Cerithium eburneum	1	12	0	0	0	0	W	1	3	2.42		1.2	0	1
RZ-10	Cerithium eburneum	1	7	2	0	0	0	W	1	2	1.1	1.2A		0	0
RZ-10	Cerithium eburneum	3	12	0	0	0	1	W	1	3	2.21		1.2	0	0
RZ-10	Cerithium eburneum	1	10	1	1	0	1	W	1	2	1.2		1.1	0	0
RZ-10	Cerithium eburneum	2	11	1	0	0	1	W	2	3	2.1		1.2	0	0
RZ-10	Cerithium eburneum	1	8	1	0	0	0	W	1	3	2.1		1.2	0	0
RZ-10	Cerithium eburneum	0	7	3	1	0	0	W	1	1	0		0	0	0
RZ-10	Cerithium eburneum	1	7	2	0	0	0	W	1	1	0		1.1	0	0
RZ-10	Cerithium eburneum	0	7	2	0	0	0	W	1	3	2.1		12	0	0
RZ-10	Cerithium eburneum	1	8	0	0	0	0	W	1	3	2.1		1.2	0	0
RZ-10	Cerithium eburneum	0	9	2	0	0	0	A	2	2	2.1		1.1	0	0
RZ-10	Cerithium eburneum	0	8	2	0	0	0	W	1	2	1.2A		1	0	0
RZ-10	Cerithium eburneum	1	7	2	0	0	1	W	1	2	12A		1.1	0	0
RZ-10	Cerithium eburneum	1	7	3	1	0	1	A	2	2	0		0	0	0
RZ-10	Cerithium eburneum	0	6	2	0	0	0	W	2	3	2.1		1.2	0	0
RZ-10	Cerithium eburneum	0	6	2	0	0	0	W	2	3	2.21		1.2	0	0
RZ-10	Cerithium eburneum	0	8	0	0	0	0	A	3	3	2.23		1.2	0	0
RZ-10	Cerithium eburneum	0	7	0	0	0	0	A	3	3	2.1		1.2	0	0
RZ-10	Cerithium eburneum	0	7	2	1	0	0	A	3	2	1.2		0	0	0

RZ-10	Cerithium eburneum	1	8	0	0	0	0	A	3	3	1.1	1.2	0	0
RZ-10	Cerithium eburneum	3	9	0	0	0	0	A	3	3	2.1	0	0	0
RZ-10	Cerithium eburneum	0	11	3	1	0	0	A	3	1	1.2A	0	0	0
RZ-10	Cerithium eburneum	1	11	1	0	0	0	A	3	2	1.2A	1.1	0	0
RZ-10	Cerithium eburneum	0	12	3	1	0	0	A	3	1	1.2A	0	0	0
RZ-10	Cerithium eburneum	0	7	2	0	0	0	A	3	3	2.23	1.2	0	0
RZ-10	Cerithium eburneum	1	8	2	0	0	1\1	A	2	3	2.23	1.2	0	0
RZ-10	Cerithium eburneum	3	12	0	0	0	0	A	3	3	2.23	1.2	0	0
RZ-10	Cerithium eburneum	2	8	0	0	0	0	A	3	3	2.21	1.2	0	0
RZ-10	Cerithium eburneum	1	10	1	0	0	0	A	3	3	2.1	1.2	0	0
RZ-10	Cerithium eburneum	0	9	1	0	0	1	A	3	3	2.21	1.2	0	0
RZ-10	Cerithium eburneum	0	6	1	0	0	0	A	3	3	2.1	1.2	0	0
RZ-10	Cerithium eburneum	0	5	0	0	0	0	A	3	2	1.1	1.2	0	0
RZ-10	Cerithium eburneum	1	11	3	1	0	0	A	3	2	1.2A	0	0	0
RZ-10	Cerithium eburneum	2	8	0	0	0	0	A	3	2	2.21	0	0	0
RZ-10	Cerithium eburneum	1	8	1	0	0	0	A	3	3	2.21	1.2	0	0
RZ-10	Cerithium eburneum	1	6	1	0	0	0	A	3	3	2.21	1.2	0	0
RZ-10	Cerithium eburneum	1	8	0	0	0	1	A	3	3	2.23	0	0	0
RZ-10	Cerithium eburneum	1	8	1	0	0	0	A	3	3	1.1	1.2	0	0
RZ-10	Cerithium eburneum	•	5	1	0	0	0	A	3	1	1.1	0	0	0
RZ-10	Cerithium eburneum	1	6	0	0	0	0	A	3	3	2.1	0	0	0
RZ-10	Cerithium eburneum	1	7	0	0	0	0	A	3	3	2.21	1.2	0	0
RZ-10	Cerithium eburneum	1	10	0	0	0	0	A	3	3	1.1	1.2	0	0
RZ-10	Cerithium eburneum	2	6	0	0	0	0	A	3	3	2.1	1.2	0	0
RZ-10	Cerithium eburneum	1	10	0	0	0	0	A	3	3	21	1.2	0	0
RZ-10	Cerithium eburneum	1	8	0	0	0	0	A	3	3	2.21	1.2	0	0
RZ-10	Cerithium eburneum	1	10	2	0	0	0	A	3	2	1.1	1.1	0	0
RZ-10	Cerithium eburneum	1	7	2	0	0	0	A	3	3	1.1	1.2	0	0
RZ-10	Cerithium eburneum	0	6	3	1	0	0	A	3	1	1.1A	0	0	0
RZ-10	Cerithium eburneum	1	7	3	1	0	0	A	3	1	1.1A	0	0	0
RZ-10	Cerithium eburneum	0	7	3	1	0	0	A	3	1	1.1A	0	0	0
RZ-10	Cerithium eburneum	0	6	2	0	0	0	A	3	1	1.2A	0	0	0
RZ-10	Cerithium eburneum	1	7	3	1	0	0	A	3	1	1.1A	0	0	0
RZ-10	Cerithium eburneum	1	8	3	1	0	0	A	3	1	1.1A	0	0	0
RZ-10	Cerithium eburneum	0	5	3	0	0	0	A	3	1	1.2A	0	0	0
RZ-10	Cerithium eburneum	0	5	3	0	0	0	A	3	1	1.2A	0	0	0
RZ-10	Cerithium eburneum	0	4	3	0	0	0	A	3	1	1.1A	0	0	0
RZ-20	Cerithium eburneum	1	22	2	0	0	4	W	1	1	0	0	0	0
RZ-20	Cerithium eburneum	3	21	0	0	0	4	W	2	3	2.23	1.2	0	0
RZ-20	Cerithium eburneum	1	15	0	0	0	4	W	2	3	2.1	1.1	0	0
RZ-20	Cerithium eburneum	1	11	0	0	0	0	W	2	2	1.1	1.2	0	0
RZ-20	Cerithium eburneum	0	13	0	0	0	0	W	2	2	1.1	0	0	0
RZ-20	Cerithium eburneum	2	10	0	0	0	0	A	3	3	2.21	1.1	0	0
RZ-20	Cerithium eburneum	2	10	0	0	0	0	W	3	2	1.2	0	0	0
RZ-20	Cerithium eburneum	1	8	3	1	0	4	W	1	1	0	0	0	0
RZ-20	Cerithium eburneum	1	7	3	1	0	0	A	1	1	0	0	0	0
RZ-20	Cerithium eburneum	1	9	0	0	0	0	A	3	3	2.1	1.2	0	0
RZ-20	Cerithium eburneum	1	13	0	0	0	0	A	3	3	2.42	1.2	0	0
RZ-20	Cerithium eburneum	2	10	0	0	0	0	W	3	3	2.42	1.2	0	0
RZ-30	Cerithium eburneum	1	11	3	1	0	2	W	0	1	0	0	0	0
RZ-30	Cerithium eburneum	1	10	0	0	0	0	A	3	1	1.2A	0	0	0
RZ-30	Cerithium eburneum	0	8	3	1	0	0	W	1	1	0	0	0	0
RZ-30	Cerithium eburneum	0	8	3	1	0	2	W	3	1	0	0	0	0
RZ-30	Cerithium eburneum	1	8	2	0	0	2	W	2	3	1.1	1.2	0	0
RZ-30	Cerithium eburneum	2	8	0	0	0	0	A	3	3	2.21	1.2	0	0
RZ-30	Cerithium eburneum	1	7	0	0	0	0	A	3	3	2.21	1.2	0	0
RZ-30	Cerithium eburneum	2	10	0	0	0	2	A	3	3	2.21	1.2	0	0
RZ-30	Cerithium eburneum	1	6	0	0	0	0	A	3	3	1.1	1.1	0	0
RZ-0	Cerithium litteratum	1	22	3	1	0	0	Live	1	1	1.1A	0	0	0
RZ-0	Cerithium litteratum	1	23	3	1	0	0	W	1	1	1.1A	0	0	0
RZ-0	Cerithium litteratum	2	21	3	1	0	0	W	1	1	1.1A	0	0	0
RZ-0	Cerithium litteratum	2	18	3	0	0	0	W	1	1	1.1	0	0	1
RZ-0	Cerithium litteratum	1	20	2	0	0	0	W	0	2	1.1A	1.2A	0	0
RZ-0	Cerithium litteratum	0	18	2	0	0	0	W	0	2	1.1A	1.2A	0	0
RZ-0	Cerithium litteratum	1	13	2	0	0	2	W	1	2	1.2	1.2A	0	0
RZ-0	Cerithium litteratum	0	10	3	1	0	0	W	1	1	1.1A	0	0	0
RZ-0	Cerithium litteratum	0	9	3	1	0	2	W	1	1	1.1A	0	0	0
RZ-0	Cerithium litteratum	0	8	3	1	0	0	W	1	1	1.1A	0	0	0
RZ-0	Cerithium litteratum	1	10	2	0	0	2	A	2	3	2.21	0	0	0
RZ-0	Cerithium litteratum	1	10	2	0	0	0	W	2	3	1.1	0	0	0
RZ-0	Cerithium litteratum	1	10	0	0	0	0	W	2	3	1.1	0	0	0

RZ-20	Cerithium litteratum	1	7	2	0	0	0	A	3	1	0	0	0	0
RZ-20	Cerithium litteratum	0	7	2	0	0	0	A	3	2	1.1	0	0	0
RZ-20	Cerithium litteratum	1	8	2	0	0	0	A	3	3	2.1	1.1	0	0
RZ-20	Cerithium litteratum	1	11	2	0	0	0	A	3	2	2.1	1.1	0	0
RZ-20	Cerithium litteratum	1	9	2	0	0	0	A	3	1	1.1	0	0	0
RZ-20	Cerithium litteratum	0	10	0	0	0	4	A	3	3	2.1	1.1	0	0
RZ-20	Cerithium litteratum	1	8	2	0	0	0	A	3	1	2.1	1.1	0	0
RZ-20	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.42	1.2	0	0
RZ-20	Cerithium litteratum	2	8	2	0	0	0	A	3	3	2.23	1.2	0	0
RZ-20	Cerithium litteratum	1	7	2	0	0	0	A	3	3	2.21	1.2	0	0
RZ-20	Cerithium litteratum	1	8	2	0	0	0	A	3	3	2.21	1.2	0	0
RZ-20	Cerithium litteratum	2	12	0	0	0	0	A	3	3	2.22	1.1	0	0
RZ-20	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.23	1.2	0	0
RZ-20	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.22	1.2	0	0
RZ-20	Cerithium litteratum	1	8	2	0	0	0	A	3	3	2.21	1.2	0	0
RZ-20	Cerithium litteratum	1	7	0	0	0	0	A	3	3	2.23	1.2	0	0
RZ-20	Cerithium litteratum	1	6	2	0	0	0	A	3	3	2.22	1.2	0	0
RZ-30	Cerithium litteratum	1	24	2	1	0	0	W	1	1	0	0	0	0
RZ-30	Cerithium litteratum	1	15	2	0	0	0	W	0	1	0	ERR	0	0
RZ-30	Cerithium litteratum	2	23	3	1	0	1	W	0	1	0	ERR	0	0
RZ-30	Cerithium litteratum	1	17	3	1	0	0	W	0	1	0	ERR	0	0
RZ-30	Cerithium litteratum	1	11	3	1	0	1	W	0	0	0	ERR	0	0
RZ-30	Cerithium litteratum	1	11	3	1	0	0	W	0	1	ERR	ERR	0	0
RZ-30	Cerithium litteratum	1	8	2	0	0	0	W	1	1	0	1.2	0	0
RZ-30	Cerithium litteratum	1	9	2	0	0	1	W	1	1	0	1.2	0	0
RZ-30	Cerithium litteratum	1	10	2	0	0	0	W	1	1	0	1.1	0	0
RZ-30	Cerithium litteratum	0	9	3	2	0	0	W	1	1	0	0	0	0
RZ-30	Cerithium litteratum	1	10	2	0	0	0	W	1	3	2.21	1.2	0	0
RZ-30	Cerithium litteratum	1	10	2	0	0	0	W	2	2	1.1	1.2	0	0
RZ-30	Cerithium litteratum	1	10	3	1	0	0	W	2	1	0	1.1	0	0
RZ-30	Cerithium litteratum	1	7	2	0	0	0	W	1	1	0	1.1	0	0
RZ-30	Cerithium litteratum	1	8	2	0	0	0	A	3	1	0	1.1	0	0
RZ-30	Cerithium litteratum	2	8	0	0	0	2	W	1	3	2.21	0	0	0
RZ-30	Cerithium litteratum	2	7	0	0	0	0	A	3	3	2.21	0	0	0
RZ-30	Cerithium litteratum	2	12	0	0	0	0	W	1	0	2.21	1.2	0	0
RZ-30	Cerithium litteratum	0	11	0	0	0	0	W	1	3	2.21	1.2	0	0
RZ-30	Cerithium litteratum	1	8	0	0	0	0	W	3	3	2.21	1.2	0	0
RZ-30	Cerithium litteratum	1	7	0	0	0	0	W	3	3	2.21	1.2	1	0
RZ-30	Cerithium litteratum	1	7	0	0	0	0	W	3	3	2.21	1.2	0	0
RZ-30	Cerithium litteratum	1	6	0	0	0	0	A	3	3	0	1.2	0	0
RZ-30	Cerithium litteratum	2	6	0	0	0	0	A	3	3	0	1.2	0	0
RZ-30	Cerithium litteratum	1	6	0	0	0	0	A	3	3	2.1	1.2	0	0
RZ-30	Cerithium litteratum	2	7	2	0	0	0	A	3	3	2.21	1.1	0	0
RZ-30	Cerithium litteratum	1	11	0	0	0	0	A	3	3	2.21	1.1	0	0
RZ-30	Cerithium litteratum	1	7	2	0	0	0	A	3	3	2.1	1.1	0	0
RZ-30	Cerithium litteratum	1	13	2	0	0	0	A	3	2	1.2A	1.1	0	0
RZ-30	Cerithium litteratum	1	6	2	0	0	0	A	3	1	0	0	0	0
RZ-30	Cerithium litteratum	1	6	2	0	0	0	A	3	1	2.21	1.1	0	0
RZ-30	Cerithium litteratum	1	9	2	0	0	0	A	3	2	1.2	1.2	0	0
RZ-30	Cerithium litteratum	0	8	2	0	0	0	A	3	3	1.2	1.1	0	0
RZ-30	Cerithium litteratum	0	8	2	0	0	0	A	3	3	1.1	1.2A	0	0
RZ-30	Cerithium litteratum	2	14	2	0	0	0	A	3	3	2.23	1.2	0	0
RZ-30	Cerithium litteratum	1	11	2	0	0	0	A	3	2	0	1.2	0	0
RZ-30	Cerithium litteratum	1	11	2	0	0	0	A	3	3	2.23	1.21	0	0
RZ-30	Cerithium litteratum	1	6	2	1	0	0	A	3	1	0	1.2	0	0
RZ-30	Cerithium litteratum	1	9	2	0	0	0	A	3	2	2.21	1.2	0	0
RZ-30	Cerithium litteratum	1	9	2	0	0	0	A	3	3	2.21	1.2	0	0
RZ-30	Cerithium litteratum	1	7	2	0	0	1	A	3	3	2.21	1.2	0	0
RZ-30	Cerithium litteratum	1	7	2	0	0	0	A	3	3	1.2	0	0	0
RZ-30	Cerithium litteratum	1	5	2	0	0	0	A	3	3	2.1	0	0	0
RZ-0	Chama spp.	1	23	2	0	0	0	T	0	2	2.21	1.2	0	1
RZ-0	Chama spp.	2	22	0	0	0	0	T	0	2	2.1	1.1	0	1
RZ-0	Chama spp.	2	18	2	0	0	0	T	0	2	2.1	1.1	0	0
RZ-0	Chama spp.	3	13	0	0	0	0	T	0	3	2.23	0	0	0
RZ-0	Chama spp.	3	26	0	0	0	0	T	1	3	2.23	0	0	0
RZ-0	Chama spp.	3	24	0	0	0	0	T	0	3	2.23	0	0	0
RZ-0	Chama spp.	2	11	0	0	0	0	T	0	3	2.21	1.2	0	0
RZ-0	Chama spp.	2	10	0	0	0	0	T	0	3	2.21	1.2	0	0
RZ-0	Chama spp.	2	7	0	0	0	0	T	0	3	2.1	1.2	0	0
RZ-0	Chama spp.	1	7	2	0	0	0	T	0	3	2.1	1.2	0	0
RZ-0	Chama spp.	2	9	0	0	0	4	T	0	3	2.1	1.2	0	0

RZ-0	Cerithium litteratum		0	10	0	0	0	0	W	2	3	2.21	1.2	0	0
RZ-0	Cerithium litteratum		0	20	0	0	0	0	W	1	3	2.21	0	0	0
RZ-0	Cerithium litteratum		2	22	2	0	0	0	W	1	2	1.1	0	0	0
RZ-0	Cerithium litteratum		3	19	0	0	0	0	W	2	3	2.21	0	0	0
RZ-0	Cerithium litteratum		0	8	0	0	0	2	W	1	3	2.23	1.2	0	0
RZ-0	Cerithium litteratum		1	8	0	0	0	2	W	1	3	2.23	1.2	0	0
RZ-0	Cerithium litteratum		1	14	0	0	0	0	W	2	3	2.23	1.2	0	0
RZ-0	Cerithium litteratum		1	14	0	0	0	0	A	3	3	2.23	1.2	0	0
RZ-0	Cerithium litteratum		1	14	0	0	0	0	A	3	3	2.23	1.2	0	0
RZ-0	Cerithium litteratum		2	17	0	0	0	0	A	3	3	2.23	1.2	0	0
RZ-0	Cerithium litteratum		0	8	0	0	0	0	A	3	3	2.21	0	0	0
RZ-0	Cerithium litteratum		1	12	2	0	0	0	A	3	3	2.23	1.2	0	0
RZ-0	Cerithium litteratum		2	12	2	0	0	0	A	3	3	2.21	1.2	0	0
RZ-0	Cerithium litteratum		0	7	0	0	0	0	A	3	3	2.21	0	0	0
RZ-0	Cerithium litteratum	•		12	3	1	0	0	A	3	3	2.21	1.2	0	0
RZ-0	Cerithium litteratum		0	6	0	0	0	0	A	3	1	1.1A	0	0	0
RZ-0	Cerithium litteratum		1	8	2	0	0	0	A	3	3	2.41	1.2	0	0
RZ-0	Cerithium litteratum		1	10	3	1	0	0	A	3	3	2.23	1.1	0	0
RZ-0	Cerithium litteratum		1	7	0	0	0	0	A	3	1	0	0	0	0
RZ-0	Cerithium litteratum		1	11	2	0	0	0	A	3	3	2.21	1.2	0	0
RZ-0	Cerithium litteratum		1	12	2	0	0	0	Aper	3	3	2.21	1.1	0	0
RZ-0	Cerithium litteratum		3	12	2	0	0	0	Aper	3	2	2.21	1.1	0	0
RZ-0	Cerithium litteratum		2	10	0	0	0	0	Aper	3	3	2.23	1.2	0	0
RZ-10	Cerithium litteratum	•		18	3	1	0	0	W	0	1	0	0	0	0
RZ-10	Cerithium litteratum	•		13	3	1	0	0	W	0	1	0	0	0	0
RZ-10	Cerithium litteratum	•		13	2	0	0	0	W	0	1	1.2A	0	0	0
RZ-10	Cerithium litteratum	•		14	3	1	0	0	W	0	1	1.2	0	0	0
RZ-10	Cerithium litteratum		2	19	2	0	1\0	0	W	0	2	1.1	1.2A	0	0
RZ-10	Cerithium litteratum	•		8	3	1	0	1	W	0	1	0	0	0	0
RZ-10	Cerithium litteratum	•		10	3	1	0	1	W	0	1	0	0	0	0
RZ-10	Cerithium litteratum		1	12	3	1	0	0	W	0	1	1.2A	0	0	0
RZ-10	Cerithium litteratum		0	8	3	1	0	0	W	0	1	1.1A	0	0	0
RZ-10	Cerithium litteratum		0	10	3	1	0	1	W	0	1	0	0	0	0
RZ-10	Cerithium litteratum		0	8	3	1	0	0	A	2	1	0	0	0	0
RZ-10	Cerithium litteratum		0	12	3	1	0	0	W	0	1	0	0	0	0
RZ-10	Cerithium litteratum		0	10	2	0	0	1	W	0	1	1.1	0	0	0
RZ-10	Cerithium litteratum		0	7	3	0	0	0	W	1	1	1.1	1.1A	0	0
RZ-10	Cerithium litteratum		1	8	3	0	0	0	W	2	1	1.1	1.1A	0	0
RZ-10	Cerithium litteratum		1	5	3	0	0	0	W	0	1	0	0	0	0
RZ-10	Cerithium litteratum		0	6	3	0	0	0	W	0	1	0	0	0	0
RZ-10	Cerithium litteratum		1	7	2	1	0	2	W	1	2	1.1	1.1A	0	0
RZ-10	Cerithium litteratum		1	8	2	1	0	0	W	1	3	1.1A	1.1	0	0
RZ-10	Cerithium litteratum		0	9	3	1	0	1	W	1	1	0	0	0	0
RZ-10	Cerithium litteratum		1	6	2	0	0	1	W	0	1	1.1A	1.1	0	0
RZ-10	Cerithium litteratum		0	11	2	0	0	0	W	1	3	1.2	1.2	0	0
RZ-10	Cerithium litteratum		1	19	2	0	0	0	W	1	3	2.1	1.2	0	0
RZ-10	Cerithium litteratum		1	13	2	0	0	1	W	1	2	0	1.2A	0	0
RZ-10	Cerithium litteratum		1	16	2	0	0	0	W	1	2	1.1	1.1	0	0
RZ-10	Cerithium litteratum		1	14	2	0	0	0	W	1	2	0	0	0	0
RZ-10	Cerithium litteratum		2	18	2	0	0	0	W	2	3	2.21	1.2	0	0
RZ-10	Cerithium litteratum		1	11	2	0	0	0	W	1	3	1.2A	1.2	0	0
RZ-10	Cerithium litteratum		1	12	2	0	0	1	W	2	3	1.2	1.2	0	0
RZ-10	Cerithium litteratum		1	13	2	0	0	1	W	1	2	1.1A	1.1	0	0
RZ-10	Cerithium litteratum		1	10	0	0	0	1	W	1	3	1.1	1.2	0	0
RZ-10	Cerithium litteratum		1	11	1	0	0	1	W	1	3	2.21	1.2	0	0
RZ-20	Cerithium litteratum		2	20	2	1	0	0	W	1	1	1.1	1.1	0	0
RZ-20	Cerithium litteratum		2	16	2	1	0	0	W	2	2	1.1	1.1	0	0
RZ-20	Cerithium litteratum		0	10	3	1	0	4	W	1	1	0	0	0	0
RZ-20	Cerithium litteratum		2	12	2	0	0	0	W	2	3	1.1	1.2	0	0
RZ-20	Cerithium litteratum		0	8	3	1	0	4	W	0	2	0	0	0	0
RZ-20	Cerithium litteratum		1	9	2	0	0	0	A	3	2	1.1	1.2	0	0
RZ-20	Cerithium litteratum		2	8	0	0	0	4	A	3	2	1.1	1.1	0	0
RZ-20	Cerithium litteratum		1	9	2	0	0	0	A	3	2	1.1	1.1	0	0
RZ-20	Cerithium litteratum		1	9	0	0	0	1	A	3	3	1.1	1.1	0	0
RZ-20	Cerithium litteratum		1	12	2	0	0	1	A	3	3	1.1	1.2	0	0
RZ-20	Cerithium litteratum		1	11	2	0	0	0	A	3	3	1.2	1.2	0	0
RZ-20	Cerithium litteratum		1	10	2	0	0	0	A	3	3	1.1	1.1	0	0
RZ-20	Cerithium litteratum		1	8	2	1	0	0	A	3	1	0	0	0	0
RZ-20	Cerithium litteratum		1	8	0	0	0	1	A	3	3	2.21	1.2	0	0
RZ-20	Cerithium litteratum		1	11	3	1	0	0	A	3	1	0	0	0	0
RZ-20	Cerithium litteratum		1	8	3	1	0	0	A	3	1	0	0	0	0

RZ-10	Chama spp.	2	43	0	0	0	1	T	0	3	2.21	1.2	0	1
RZ-10	Chama spp.	1	5	3	1	0	0	B	0	1	0	0	0	0
RZ-10	Chama spp.	2	7	3	1	0	0	T	0	0	0	1.1	0	0
RZ-10	Chama spp.	1	6	2	0	0	1	T	0	3	0	1.2	0	0
RZ-10	Chama spp.	1	7	2	0	1	0	T	0	0	1.2	1.2	0	0
RZ-10	Chama spp.	1	6	0	0	0	0	T	0	3	2.21	2.1	1	0
RZ-20	Chama spp.	2	13	3	2	1	0	T	0	0	0	0	0	0
RZ-20	Chama spp.	1	10	2	2	0	0	T	1	1	1.1A	1.1	0	0
RZ-20	Chama spp.	2	6	0	0	0	0	T	0	2	1.1	1.1	0	0
RZ-20	Chama spp.	2	8	2	0	1	4	T	0	2	1.1	1.1	0	0
RZ-30	Chama spp.	2	12	2	0	0	0	T	0	0	1.1	1.1	0	0
RZ-30	Chama spp.	1	11	2	0	0	0	T	0	2	1.2	1.2	0	0
RZ-30	Chama spp.	1	5	2	1	0	0	T	0	0	0	0	0	0
RZ-10	Chione cancellata	1	8	3	1	0	4	L	0	0	0	0	0	0
RZ-10	Chione cancellata	2	6	2	0	0	1	L	0	3	2.1	1.2	0	0
RZ-10	Chione cancellata	1	6	0	0	0	0	R	0	2	0	1.2	0	0
RZ-10	Chione cancellata	1	7	2	0	0	0	L	0	2	0	1.2	0	0
RZ-10	Chione cancellata	1	7	0	0	0	0	L	0	2	0	1.1	0	0
RZ-10	Chione cancellata	1	7	2	0	0	0	L	0	2	1.2	1.2	0	0
RZ-10	Chione cancellata	1	17	2	0	0	2	R	1	3	2.21	1.2	1	0
RZ-10	Chione cancellata	1	13	2	0	0	0	R	2	3	2.23	1.2	0	0
RZ-10	Chione cancellata	2	10	2	0	0	3	L	0	3	2.41	2.2	0	0
RZ-10	Chione cancellata	1	8	2	0	0	0	L	1	3	2.21	1.2	0	0
RZ-10	Chione cancellata	1	14	2	0	0	0	L	2	3	1.2	1.2	0	0
RZ-10	Chione cancellata	2	18	2	0	0	0	R	2	3	221	2.2	1	0
RZ-20	Chione cancellata	1	9	2	0	0	0	R	0	3	21.1	1.1	0	0
RZ-20	Chione cancellata	1	8	2	0	0	4	R	0	2	1.1	1.1	0	0
RZ-20	Chione cancellata	1	8	3	1	0	0	R	0	0	0	0	0	0
RZ-20	Chione cancellata	1	7	2	0	0	0	R	1	3	1.1	1.2	0	0
RZ-20	Chione cancellata	1	8	2	0	0	0	L	2	3	1.1	1.2	0	0
RZ-20	Chione cancellata	1	8	2	0	0	4	L	3	2	1.1	1.2	0	0
RZ-30	Chione cancellata	1	9	2	0	0	0	L	1	3	1.1	1.2	0	0
RZ-30	Chione cancellata	1	7	2	0	0	3	L	0	3	2.1	1.2	0	0
RZ-30	Chione cancellata	1	8	0	0	0	3	L	0	2	2.1	1.2	0	0
RZ-30	Chione cancellata	1	6	2	0	0	3	R	0	2	1.1	1.1	0	0
RZ-30	Chione cancellata	1	6	0	0	0	0	R	1	2	1.1	1.2	0	0
RZ-20	Chione grus	1	11	2	0	0	0	L	1	3	1.1	1.1	0	0
RZ-20	Chione grus	1	8	2	0	0	0	L	0	0	0	1.2	0	0
RZ-30	Chione grus	1	11	2	0	0	0	R	0	2	1.1	U1.2	1	0
RZ-30	Chione grus	1	7	0	0	0	0	R	0	3	1.2	U1.2	0	0
RZ-30	Chione grus	2	9	0	0	0	0	R	1	3	2.23	1.1	0	0
RZ-10	Pseudochama spp.	2	7	0	0	0	0	T	1	3	2.1	1.2	0	0
RZ-0	Pseudochama sp.	0	7	0	0	0	0	T	0	3	2.21	1.2	0	0
RZ-20	Pseudohama spp.	2	9	2	0	0	0	T	0	2	0	1.1	0	0
RZ-0	Tellina gouldi	1	10	0	1	0	0	R	0	2	1.1	0	0	0
RZ-0	Tellina gouldi	0	8	0	0	0	4	L	0	1	2.1	1.1	0	0
RZ-0	Tellina gouldi	1	7	0	0	0	0	L	0	1	2.21	0	0	0
RZ-10	Tellina gouldi	0	7	3	1	0	0	R	0	0	0	0	0	0
RZ-10	Tellina gouldi	0	9	2	0	0	0	L	0	3	2.1	1.1	0	0
RZ-10	Tellina gouldi	0	9	3	1	0	0	R	0	1	0	0	0	0
RZ-10	Tellina gouldi	1	8	2	0	0	0	R	0	3	2.1	1.2	0	0
RZ-10	Tellina gouldi	0	7	2	0	0	3	R	1	1	0	1.1	0	0
RZ-10	Tellina gouldi	0	7	3	1	0	0	L	0	0	0	0	0	0
RZ-10	Tellina gouldi	0	6	2	0	0	0	L	1	3	2.1	1.2	0	0
RZ-10	Tellina gouldi	0	7	3	1	0	0	R	0	2	0	1.1	0	0
RZ-20	Tellina gouldi	0	8	2	0	0	4	L	0	1	0	0	0	0
RZ-20	Tellina gouldi	0	8	2	0	0	0	R	0	3	2.21	1.1	0	0
RZ-20	Tellina gouldi	0	8	2	0	0	0	R	0	3	1.1	1.1	0	0
RZ-20	Tellina gouldi	0	8	2	0	0	4	R	0	3	1.1	1.2	0	0
RZ-20	Tellina gouldi	0	8	2	0	0	0	R	0	3	2.1	1.1	0	0
RZ-30	Tellina gouldi	0	6	3	1	0	0	L	0	0	0	0	0	0
RZ-30	Tellina gouldi	0	8	2	0	0	0	L	0	2	2.21	0	0	0
RZ-30	Tellina gouldi	1	7	2	0	0	0	R	0	3	2.23	1.1	1	0
RZ-30	Tellina gouldi	1	7	2	0	0	0	R	0	3	2.21	1.1	0	0
RZ-10	Tellina similis	0	8	2	1	0	0	L	0	1	0	0	0	0
RZ-10	Tellina similis	0	8	2	0	0	0	R	1	2	0	1.1	0	0
RZ-10	Tellina similis	0	10	0	0	0	0	L	2	3	0	1.1	0	0
RZ-10	Tellina similis	0	10	0	1	0	4	L	2	2	0	1	0	0
RZ-20	Tellina similis	0	15	3	2	1	0	L	0	1	0	0	0	0
RZ-20	Tellina similis	0	11	0	0	0	0	R	1	1	0	1.1	0	0

Site	Species	%Cover	Size	Color	Luster	Periostr	Predbore	Shell	Break	EdgAlt	Dissol	Abras	Spon ge	Graze
TS-0	Tellina similis	0	16	3	1	1	0	L	0	0	0	0	0	0
TS-0	Tellina similis	0	16	3	1	1	0	R	0	0	0	0	0	0
TS-0	Tellina similis	0	9	2	1	0	0	R	1	2	1.2	1.1	0	0
TS-0	Tellina similis	0	12	3	1	1	0	R	0	1	0	0	0	0
TS-0	Tellina similis	0	11	3	1	0	0	Frag	3	1	0	0	0	0
TS-0	Chione cancellata	0	17	0	0	0	0	R	1	3	2.41	1.2	0	1
TS-0	Chione cancellata	2	10	0	1	0	0	L	1	3	2.22	1.2	0	0
TS-0	Chione cancellata	2	9	0	0	0	0	L	0	3	2.22	1.2	0	0
TS-0	Cerithium eburneum	1	20	3	1	0	0	W	0	0	1.2	1.1	0	0
TS-0	Cerithium eburneum	1	17	2	1	0	0	W	0	0	0	0	0	0
TS-0	Cerithium eburneum	1	15	3	1	0	0	W	1	1	1.2	1.1	0	0
TS-0	Cerithium eburneum	2	18	0	0	0	0	W	2	3	2.22	1.2	0	0
TS-0	Cerithium eburneum	1	14	0	0	0	0	W	0	3	2.21	1.1	0	0
TS-0	Cerithium eburneum	1	8	0	0	0	0	Aper	0	3	2.1	1.2	0	0
TS-10	Chama spp.	1	17		0	0	0	T	0	0	1.1	1.1	0	0
TS-10	Pseudochama sp.	1	18	0	0	0	0	B	0	3	2.21	1.1	0	0
TS-10	Chione cancellata	0	21	2	0	0	4	R	0	1	1.1	1.1	0	0
TS-10	Chione cancellata	2	23	0	0	0	0	L	0	3	2.23	1.2	0	0
TS-10	Barbatia cancellaria	2	17	1	0	0	0	L	0	3	2.21	1.1	0	0
TS-20	Tellina similis	2	13	2	0	0	0	L	0	1	2.21	1.1	0	0
TS-20	Tellina similis	1	11	0	1	0	0	L	1	3	2.1	1.1	0	0
TS-20	Tellina similis	1	10	2	1	0	0	L	1	3	2.1	1.1	0	0
TS-20	Tellina similis	0	11	2	1	0	0	R	1	1	1.2	1.1	0	0
TS-20	Tellina similis	0	9	2	1	1	0	R	2	3	2.1	1.1	0	0
TS-20	Cerithium eburneum	0	9	2	1	0	0	Aper	3	1	2.1	1.1	0	0
TS-20	Cerithium eburneum	0	8	3	1	0	0	Aper	3	1	1.2	1.1	0	0
TS-20	Cerithium eburneum	1	11	2	1	0	0	Aper	3	2	2.1	1.1	0	0
TS-20	Cerithium eburneum	2	11	0	0	0	0	Aper	3	3	2.1	1.1	0	0
TS-20	Cerithium eburneum	1	8	2	1	0	0	Aper	3	3	2.1	1.1	0	0
TS-30	Anadara sp.	2	8	0	0	0	0	R	0	2	2.21	1	0	0
TS-30	Tellina similis	1	19	2	1	0	0	L	1	2	1.2	1.1	0	0
TS-30	Tellina similis	0	12	0	1	1	0	L	0	1	1.1	0	0	0
TS-30	Tellina similis	0	12	3	1	1	0	R	1	1	1.1	0	0	0
TS-30	Chione cancellata	1	6	3	1	0	0	L	1	0	1.1	1.1	0	0
TS-30	Chione cancellata	1	9	0	1	0	0	L	1	2	21	1.1	0	0
TS-30	Chione cancellata	1	10	2	0	0	0	R	1	1	2.22	1.1	0	0
TS-30	Chione cancellata	1	10	3	1	0	0	R	3	2	2.1	1.1	0	0
TS-30	Arcopis adamsi	1	10	0	1	0	0	L	0	3	2.21	1.1	0	0
TS-30	Cerithium eburneum	1	14	3	1	0	0	W	1	1	1.2	1.1	0	0
TS-30	Cerithium eburneum	2	8	0	0	0	0	Aper	3	2	2.1	1.1	0	0

Site	Species	% Cover	Size	Colo	Luster	Periosti	Pred bx	Shell	Breaka	EdgeAlter	Dissolutio	Abrasion	Sponge	Grazi
RS-10	Arca imbricata	2	8	0	0	0	0	R	1	3	2.21	1.2	0	0
RS-10	Arca imbricata	1	12	2	0	0	0	R	2	3	2.21	1.2	0	0
RS-10	Arca imbricata	3	19	0	0	0	0	L	1	3	2.23	1.2	0	0
RS-10	Arca imbricata	1	15	0	0	0	0	L	2	3	2.23	1.2	0	0
RS-30	Arca imbricata	1	8	2	0	0	1	R	0	2	1.2	1.2	0	0
RS-30	Arca imbricata	1	9	0	0	0	0	R	1	3	1.2	1.2	0	0
RS-30	Arca zebra	2	16	0	0	0	1	L	2	3	2.23	1.2	0	0
RS-30	Arca zebra	1	12	2	0	0	0	R	3	2	2.1	1.1	0	0
RS-30	Arca zebra	2	11	2	0	0	0	L	1	3	2.1	1.2	0	0
RS-30	Arca zebra	2	9	0	0	0	0	L	2	2	2.1	1.2	0	0
RS-10	Arca zebra	2	14	2	0	0	0	L	1	3	2.1	1.1	0	0
RS-0	Arcopis adamsi	2	9	2	0	0	0	L	1	3	2.21	1.1	0	0
RS-30	Arcopis adamsi	1	9	0	0	0	0	R	1	3	1.2	1.2	0	0
RS-0	Barbatia cancellaria	2	9	2	0	0	0	R	4	3	2.21	1.2	0	0
RS-0	Barbatia cancellaria	1	15	2	0	0	0	R	0	3	2.21	1.1	0	0
RS-0	Barbatia cancellaria	1	10	2	0	0	0	R	1	3	2.42	•	0	0
RS-0	Barbatia cancellaria	1	8	2	0	0	0	L	3	3	2.41	•	0	0
RS-10	Barbatia cancellaria	1	10	2	0	0	0	L	2	3	2.23	1.2	0	0
RS-10	Barbatia cancellaria	1	9	2	0	0	0	R	1	3	2.23	1.2	0	0
RS-10	Barbatia cancellaria	0	9	2	0	0	0	R	3	3	2.23	1.2	0	0
RS-10	Barbatia cancellaria	1	13	2	0	0	0	L	2	3	2.23	1.2	0	0
RS-10	Barbatia cancellaria	1	12	2	0	0	0	R	3	3	2.21	1.2	0	0
RS-10	Barbatia cancellaria	1	11	2	0	0	0	L	3	3	2.23	1.1	0	0
RS-10	Barbatia cancellaria	2	13	2	0	0	0	L	2	3	2.21	0	0	0
RS-10	Barbatia cancellaria	1	11	2	0	0	0	L	3	3	2.23	1.1	0	0
RS-10	Barbatia cancellaria	2	13	2	0	0	0	L	3	3	2.23	1.2	0	0
RS-10	Barbatia cancellaria	1	8	2	0	0	0	L	3	3	2.23	1.1	0	0
RS-10	Barbatia cancellaria	1	7	2	0	0	0	L	3	3	2.21	1.2	0	0
RS-10	Barbatia cancellaria	1	9	2	0	0	0	L	1	3	2.21	1.2	0	0
RS-10	Barbatia cancellaria	2	9	2	0	0	0	L	3	3	2.21	1.1	0	0
RS-10	Barbatia cancellaria	1	8	2	0	0	0	L	1	3	2.21	1.2	0	0
RS-10	Barbatia cancellaria	1	9	2	0	0	0	L	0	2	2.21	1.2	0	0
RS-10	Barbatia cancellaria	1	5	2	0	0	0	L	3	3	2.23	1.1	0	0
RS-10	Barbatia cancellaria	1	10	2	0	0	0	R	4	3	2.23	1.2	0	0
RS-10	Barbatia cancellaria	1	7	2	0	0	0	R	4	3	2.21	1.2	0	0
RS-10	Barbatia cancellaria	2	12	2	0	0	0	R	3	3	2.23	1.2	0	0
RS-10	Barbatia cancellaria	0	6	2	0	0	0	R	4	3	2.23	1.2	0	0
RS-10	Barbatia cancellaria	0	10	3	1	0	0	L	1	0	0	0	0	0
RS-20	Barbatia cancellaria	1	9	2	0	0	0	R	2	3	2.21	1.2	0	0
RS-20	Barbatia cancellaria	1	13	2	0	0	0	R	2	3	2.23	1.2	0	0
RS-20	Barbatia cancellaria	2	11	2	0	0	0	R	1	3	2.21	1.2	0	0
RS-20	Barbatia cancellaria	1	10	2	0	0	0	Frag	3	3	2.21	1.2	0	0
RS-20	Barbatia cancellaria	1	12	2	0	0	0	L	1	3	2.21	1.1	0	0
RS-20	Barbatia cancellaria	2	10	0	0	0	0	L	1	3	2.41	1.2	0	0
RS-20	Barbatia cancellaria	1	9	2	0	0	0	L	1	3	2.23	1.2	0	0
RS-0	Barbatia domingensis	2	12	2	0	0	0	L	1	3	2.21	1.2	0	0
RS-0	Barbatia domingensis	2	16	2	0	0	0	R	1	3	2.21	1.2	0	0
RS-10	Barbatia domingensis	2	15	2	0	0	0	L	3	3	2.1	1.1	0	0
RS-10	Barbatia domingensis	2	9	2	0	0	4	R	0	3	1.2	1.2	0	0
RS-10	Barbatia domingensis	1	10	2	0	0	0	L	0	3	2.1	1.1	0	0
RS-10	Barbatia domingensis	1	5	2	0	0	0	L	3	3	2.1	1.1	0	0
RS-10	Barbatia domingensis	1	11	2	0	0	0	L	3	3	2.41	1.2	0	0
RS-20	Barbatia domingensis	1	9	2	0	0	0	L	1	3	2.1	1.1	0	0
RS-20	Barbatia domingensis	1	11	2	0	0	0	R	1	3	2.1	1.2	0	0
RS-30	Barbatia domingensis	2	13	0	0	0	0	R	2	3	2.1	1.2	0	0
RS-30	Barbatia domingensis	2	12	2	0	0	0	L	2	3	2.21	1.2	0	0
RS-30	Barbatia domingensis	1	9	2	0	0	0	L	3	3	2.23	1.2	0	0
RS-30	Barbatia domingensis	1	13	0	0	0	0	R	0	2	2.21	1.2	0	0
RS-30	Barbatia domingensis	1	8	2	0	0	0	L	3	3	2.23	1.2	0	0
RS-30	Barbatia domingensis	2	12	0	0	0	0	R	1	3	2.1	1.2	0	0
RS-30	Barbatia domingensis	1	10	2	0	0	0	L	3	3	2.23	1.2	0	0
RS-30	Barbatia domingensis	1	9	0	0	0	0	R	0	2	2.1	1.1	0	0
RS-30	Barbatia domingensis	2	9	2	0	0	0	L	3	3	2.23	1.2	0	0
RS-30	Barbatia domingensis	2	9	2	0	0	0	R	2	3	2.21	1.2	0	0
RS-30	Barbatia domingensis	1	11	2	0	0	0	L	0	3	2.1	1.1	0	0
RS-30	Barbatia domingensis	1	10	3	1	0	0	R	0	1	1.2	1.1	0	0
RS-30	Barbatia domingensis	2	9	2	0	0	0	R	3	3	2.23	1.2	0	0
RS-30	Barbatia domingensis	2	8	2	0	0	0	R	1	3	2.21	1.2	0	0
RS-30	Barbatia domingensis	2	7	2	0	0	0	R	3	3	2.23	1.2	0	0
RS-30	Barbatia domingensis	1	11	2	0	0	0	R	3	3	2.21	1.2	0	0

RS-30	Barbatia domingensis	1	9	0	1	0	0	R	0	0	0	0	0	0
RS-30	Barbatia domingensis	1	9	2	0	0	0	R	2	3	2.21	1.2	0	0
RS-0	Cerithium eburneum	1	8	0	0	0	1	A	3	3	2.21	1.1	0	0
RS-0	Cerithium eburneum	1	12	2	0	0	0	A	3	2	1.2A	1.1	0	0
RS-0	Cerithium eburneum	0	12	2	0	0	0	A	3	1	1.2A	1.1	0	0
RS-0	Cerithium eburneum	1	10	0	0	0	0	A	3	3	2.21	0	0	0
RS-0	Cerithium eburneum	1	10	0	0	0	0	A	3	3	2.23	0	0	0
RS-0	Cerithium eburneum	1	8	3	1	0	0	A	3	1	2.21	1.1	0	0
RS-10	Cerithium eburneum	0	10	3	1	0	1	W	1	1	0	0	0	0
RS-10	Cerithium eburneum	1	9	2	0	0	0	W	1	3	2.42	0	0	0
RS-10	Cerithium eburneum	0	9	2	0	0	1	W	0	2	1.2	1.1	0	0
RS-10	Cerithium eburneum	1	11	2	0	0	1	W	2	3	2.21	1.2	0	0
RS-10	Cerithium eburneum	1	12	0	0	0	1	W	1	3	2.1	1.1	0	0
RS-10	Cerithium eburneum	1	10	0	0	0	1	W	2	3	2.21	1.2	0	0
RS-10	Cerithium eburneum	1	7	2	0	0	0	A	3	2	0	1.2	0	0
RS-10	Cerithium eburneum	0	9	0	0	0	0	A	3	3	2.1	1.2	0	0
RS-10	Cerithium eburneum	1	8	0	0	0	0	A	3	3	2.1	1.2	0	0
RS-10	Cerithium eburneum	0	10	0	0	0	0	A	3	3	1.2	1.1	0	0
RS-10	Cerithium eburneum	1	7	2	0	0	0	A	3	3	2.1	1.1	0	0
RS-10	Cerithium eburneum	2	6	0	0	0	1	A	3	3	2.21	1.1	0	0
RS-30	Cerithium eburneum	0	8	2	0	0	0	A	3	1	1.1	1.1	0	0
RS-30	Cerithium eburneum	1	8	2	0	0	0	A	3	2	1.1	1.1	0	0
RS-30	Cerithium eburneum	0	13	2	1	0	1	W	2	1	1.1	1.1	0	0
RS-30	Cerithium eburneum	1	12	3	1	0	1	W	1	1	1.1	1.1	0	0
RS-30	Cerithium eburneum	2	11	0	0	0	1	W	2	3	2.1	1.2	0	0
RS-30	Cerithium eburneum	1	9	2	0	0	1	W	2	2	1.1	1.1	0	0
RS-30	Cerithium eburneum	0	11	3	1	0	0	W	1	1	0	0	0	0
RS-30	Cerithium eburneum	1	9	2	0	0	0	W	0	1	1.2	1.1	0	0
RS-30	Cerithium eburneum	1	10	0	0	0	0	W	1	3	2.21	1.2	0	0
RS-30	Cerithium eburneum	1	10	0	0	0	0	A	3	3	2.1	1.2	0	0
RS-30	Cerithium eburneum	1	8	0	0	0	0	A	3	3	2.1	1.2	0	0
RS-30	Cerithium eburneum	1	7	0	0	0	1	W	2	3	2.1	1.2	0	0
RS-0	Cerithium litteratum	1	6	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-0	Cerithium litteratum	0	10	0	0	0	1	W	1	3	2.41	1.2	0	0
RS-0	Cerithium litteratum	0	9	2	0	0	0	A	3	3	1.1	1.1	0	0
RS-0	Cerithium litteratum	1	8	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-0	Cerithium litteratum	1	7	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-0	Cerithium litteratum	1	8	0	0	0	0	W	1	3	2.21	1.1	0	0
RS-0	Cerithium litteratum	1	6	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-0	Cerithium litteratum	2	8	0	0	0	0	A	3	3	2.41	•	0	0
RS-0	Cerithium litteratum	0	10	2	0	0	0	W	3	3	2.21	1.2	0	0
RS-0	Cerithium litteratum	1	9	2	0	0	0	A	3	3	2.23	1.2	0	0
RS-0	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.23	1.2	0	0
RS-0	Cerithium litteratum	0	8	3	1	0	0	A	3	1	0	0	0	0
RS-0	Cerithium litteratum	0	12	2	0	0	1	W	0	1	1.2A	1.1	0	0
RS-0	Cerithium litteratum	1	7	0	0	0	0	A	3	3	2.23	1.2	0	0
RS-0	Cerithium litteratum	1	8	2	0	0	0	A	3	2	2.21	1.2	0	0
RS-0	Cerithium litteratum	0	8	2	0	0	0	A	3	2	2.1	0	0	0
RS-0	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-0	Cerithium litteratum	1	9	0	0	0	1	W	1	3	2.21	1.2	0	0
RS-0	Cerithium litteratum	1	6	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-0	Cerithium litteratum	1	8	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-0	Cerithium litteratum	1	7	0	0	0	0	A	3	3	2.23	1.2	0	0
RS-0	Cerithium litteratum	1	13	0	0	0	1	W	1	3	2.41	1.2	0	0
RS-0	Cerithium litteratum	1	6	2	0	0	0	A	3	2	2.1	1.2	0	0
RS-0	Cerithium litteratum	0	8	0	0	0	0	A	3	3	2.23	1.2	0	0
RS-0	Cerithium litteratum	1	7	2	0	0	0	W	3	3	2.21	1.2	0	0
RS-0	Cerithium litteratum	1	13	2	0	0	0	A	3	2	2.23	1.2	0	0
RS-10	Cerithium litteratum	0	7	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	1	5	0	0	0	0	A	3	3	2.23	1.2	0	0
RS-10	Cerithium litteratum	1	10	0	0	0	0	A	3	3	2.1	1.2	0	0
RS-10	Cerithium litteratum	0	6	0	0	0	0	A	3	3	1.2	1.2	0	0
RS-10	Cerithium litteratum	1	6	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	0	7	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	1	10	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	0	7	2	0	0	0	A	3	3	2.1	1.2	0	0
RS-10	Cerithium litteratum	0	10	0	0	0	1	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	0	6	2	0	0	0	A	3	2	1.1	1.1	0	0
RS-10	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	0	11	0	0	0	1	W	2	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	2	9	0	0	0	1	W	2	3	2.21	1.2	0	0

RS-10	Cerithium litteratum	1	8	2	0	0	0	W	0	1	1.1	1.2A\1.1	0	0
RS-10	Cerithium litteratum	1	12	2	0	0	0	W	2	3	2.1	1.2	0	0
RS-10	Cerithium litteratum	1	5	0	0	0	0	A	3	3	2.23	1.2	0	0
RS-10	Cerithium litteratum	1	6	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	1	5	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	1	7	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	0	8	0	0	0	1	W	2	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	0	7	2	0	0	0	A	3	3	1.2	1.1	0	0
RS-10	Cerithium litteratum	1	5	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	0	7	0	0	0	0	A	3	3	1.1	1.1	0	0
RS-10	Cerithium litteratum	1	9	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	1	9	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	1	10	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	1	10	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	1	10	2	0	0	0	A	3	3	2.1	1.2	0	0
RS-10	Cerithium litteratum	1	10	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	1	7	0	0	0	0	W	2	3	2.1	1.2	0	0
RS-10	Cerithium litteratum	1	10	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	1	12	0	0	0	0	A	3	3	2.22	1.2	0	0
RS-10	Cerithium litteratum	0	7	0	0	0	0	A	3	3	2.23	•	0	0
RS-10	Cerithium litteratum	1	9	2	0	0	0	A	3	3	2.1	1.2	0	0
RS-10	Cerithium litteratum	1	11	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	2	6	2	0	0	0	A	3	3	2.1	1.2	0	0
RS-10	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.1	1.2	0	0
RS-10	Cerithium litteratum	0	8	2	0	0	0	A	3	3	1.2	1.1	0	0
RS-10	Cerithium litteratum	0	10	0	0	0	0	A	3	3	2.23	1.2	0	0
RS-10	Cerithium litteratum	1	8	2	0	0	1	A	3	2	2.1	1.2	0	0
RS-10	Cerithium litteratum	0	6	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	0	10	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-10	Cerithium litteratum	1	8	2	0	0	0	A	3	2	1.2	1.1	0	0
RS-10	Cerithium litteratum	0	8	2	0	0	0	A	3	3	2.1	1.2	0	0
RS-20	Cerithium litteratum	0	7	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-20	Cerithium litteratum	1	8	2	0	0	0	A	3	3	1.2	1.1	0	0
RS-20	Cerithium litteratum	1	8	2	0	0	0	A	3	3	1.2	1.2	0	0
RS-20	Cerithium litteratum	1	7	0	0	0	0	A	3	3	1.1	1.1	0	0
RS-20	Cerithium litteratum	1	7	0	0	0	0	A	3	3	2.42	1.2	0	0
RS-20	Cerithium litteratum	1	9	0	0	0	0	W	2	3	2.42	1.2	0	0
RS-20	Cerithium litteratum	0	7	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-20	Cerithium litteratum	1	12	2	0	0	0	A	3	2	1.2	1.1	0	0
RS-20	Cerithium litteratum	1	9	0	0	0	0	A	3	3	2.41	1.2	0	0
RS-20	Cerithium litteratum	0	6	2	0	0	1	A	3	3	1.1	1.2	0	0
RS-20	Cerithium litteratum	0	7	2	0	0	0	A	3	2	1.1	1.1	0	0
RS-20	Cerithium litteratum	1	11	2	0	0	1	W	0	2	1.1	1.1	0	0
RS-20	Cerithium litteratum	1	8	2	0	0	1	W	1	2	1.1	1.1	0	0
RS-20	Cerithium litteratum	1	10	0	0	0	0	W	2	3	2.42	1.2	0	0
RS-20	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.23	1.2	0	0
RS-20	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.1	1.1	0	0
RS-20	Cerithium litteratum	1	6	2	0	0	0	A	3	3	2.1	1.1	0	0
RS-20	Cerithium litteratum	0	7	0	0	0	0	A	3	3	2.41	1.2	0	0
RS-20	Cerithium litteratum	0	8	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-20	Cerithium litteratum	3	9	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-20	Cerithium litteratum	1	7	2	0	0	1	W	2	3	2.23	1.2	0	0
RS-20	Cerithium litteratum	0	10	2	0	0	0	W	1	3	2.21	1.2	0	0
RS-20	Cerithium litteratum	0	8	2	0	0	0	W	1	3	1.1	1.1	0	0
RS-20	Cerithium litteratum	1	11	2	0	0	1	W	1	3	2.1	1.2	0	0
RS-20	Cerithium litteratum	0	8	3	1	0	0	W	1	1	1.2A	0	0	0
RS-20	Cerithium litteratum	1	10	0	0	0	1	W	2	3	2.41	1.2	0	0
RS-20	Cerithium litteratum	0	8	0	0	0	0	W	2	3	2.41	1.2	0	0
RS-20	Cerithium litteratum	1	8	2	0	0	1	W	2	3	2.1	1.2	0	0
RS-20	Cerithium litteratum	1	8	0	0	0	1	W	1	3	2.23	1.2	0	0
RS-20	Cerithium litteratum	3	10	2	0	0	1	A	3	3	2.21	1.2	0	0
RS-20	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-20	Cerithium litteratum	0	9	2	0	0	1	A	3	3	2.21	1.2	0	0
RS-20	Cerithium litteratum	0	8	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-20	Cerithium litteratum	1	8	2	0	0	1	A	3	3	2.21	1.2	0	0
RS-20	Cerithium litteratum	0	7	0	0	0	0	A	3	3	2.1	1.2	0	0
RS-20	Cerithium litteratum	2	9	2	0	0	0	W	2	3	1.2	1.2	0	0
RS-20	Cerithium litteratum	0	10	0	0	0	0	W	2	3	2.23	1.2	0	0
RS-20	Cerithium litteratum	0	10	2	0	0	0	W	1	2	1.1	1.1	0	0
RS-30	Cerithium litteratum	1	8	0	0	0	0	W	2	3	2.21	1.2	0	0
RS-30	Cerithium litteratum	1	8	2	0	0	0	W	2	3	2.21	1.2	0	0

RS-30	Cerithium litteratum	1	10	2	0	0	0	W	1	2	2.1	1.2	0	0
RS-30	Cerithium litteratum	2	7	2	0	0	0	A	3	3	2.1	1.2	0	0
RS-30	Cerithium litteratum	0	6	2	0	0	0	A	3	3	2.21	1.2	0	0
RS-30	Cerithium litteratum	2	5	0	0	0	0	A	3	3	2.1	1.2	0	0
RS-30	Cerithium litteratum	3	6	0	0	0	0	A	3	3	2.41	1.2	0	0
RS-30	Cerithium litteratum	2	10	0	0	0	0	A	3	3	2.42	1.2	0	0
RS-30	Cerithium litteratum	1	9	2	0	0	0	A	3	3	2.1	1.2	0	0
RS-30	Cerithium litteratum	1	9	2	0	0	0	A	3	3	2.1	1.2	0	0
RS-30	Cerithium litteratum	2	7	2	0	0	0	A	3	3	2.1	1.2	0	0
RS-30	Cerithium litteratum	1	8	2	0	0	0	A	3	3	2.1	1.2	0	0
RS-30	Cerithium litteratum	1	10	2	1	0	1	A	3	2	1.1	1.2A	0	0
RS-30	Cerithium litteratum	2	9	0	0	0	0	A	3	3	2.23	1.2	0	0
RS-30	Cerithium litteratum	1	6	2	0	0	0	A	3	3	2.1	1.2	0	0
RS-30	Cerithium litteratum	0	7	0	0	0	0	A	3	3	2.23	1.2	0	0
RS-30	Cerithium litteratum	1	9	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-30	Cerithium litteratum	0	6	2	0	0	0	A	3	3	2.1	1.2	0	0
RS-30	Cerithium litteratum	1	7	0	0	0	0	A	3	3	2.21	1.2	0	0
RS-30	Cerithium litteratum	2	9	0	0	0	0	A	3	3	2.23	1.2	0	0
RS-30	Cerithium litteratum	1	8	2	0	0	1	A	3	3	2.1	1.2	0	0
RS-30	Cerithium litteratum	1	7	2	0	0	0	A	3	2	2.1	1.1	0	0
RS-30	Cerithium litteratum	0	9	2	0	0	1	W	1	2	2.1	1.2	0	0
RS-30	Cerithium litteratum	1	14	3	1	0	1	W	0	1	1.1A	0	0	0
RS-30	Cerithium litteratum	1	13	2	0	0	1	W	0	3	2.1	1.2	0	0
RS-30	Cerithium litteratum	2	9	2	0	0	0	A	3	3	2.1	1.2	0	0
RS-30	Cerithium litteratum	1	14	2	1	0	1	W	0	1	1.1	1.1	0	0
RS-30	Cerithium litteratum	1	12	2	1	0	0	W	0	1	1.1	1.1	0	0
RS-30	Cerithium litteratum	1	10	2	0	0	0	W	3	3	2.1	1.2	0	0
RS-30	Cerithium litteratum	2	8	0	0	0	0	A	3	3	2.41	1.2	0	0
RS-30	Cerithium litteratum	2	7	0	0	0	0	A	3	3	2.1	1.2	0	0
RS-30	Cerithium litteratum	1	11	2	0	0	1	W	0	1	1.2	1.1	0	0
RS-30	Cerithium litteratum	1	8	2	0	0	0	A	3	3	1.2	1.2	0	0
RS-30	Cerithium litteratum	2	12	2	0	0	1	W	2	3	2.21	1.2	0	0
RS-0	Chama spp.	1	7	2	0	0	0	T	0	3	1.2	1.2	0	0
RS-0	Chama spp.	2	7	2	0	0	0	T	0	3	2.21	1.2	0	0
RS-0	Chama spp.	0	6	3	1	0	0	T	0	0	1.1	0	0	0
RS-0	Chama spp.	2	10	2	0	0	0	T	0	3	2.21	1.2	0	0
RS-0	Chama spp.	2	8	2	0	1	0	T	0	3	2.1	1.2	0	0
RS-0	Chama spp.	3	8	0	0	1	1	T	0	3	2.21	1.2	0	0
RS-0	Chama spp.	1	8	2	0	0	0	T	0	3	2.1	1.2	0	0
RS-0	Chama spp.	3	7	0	0	0	0	T	0	3	2.21	1.2	0	0
RS-0	Chama spp.	1	11	2	0	0	0	T	0	2	2.1	1.2	0	0
RS-10	Chama spp.	3	6	0	0	0	4	T	0	2	1.1	1.1	0	0
RS-10	Chama spp.	3	7	0	0	0	0	T	0	3	2.41	1.2	0	0
RS-10	Chama spp.	1	7	2	0	0	0	T	1	3	2.42	1.2	0	0
RS-10	Chama spp.	1	8	0	0	0	0	T	0	2	2.21	1.1	0	0
RS-10	Chama spp.	0	6	0	0	0	4	T	0	3	1.2	1.2	0	0
RS-10	Chama spp.	3	7	1	0	1	0	T	0	2	2.21	1.2	0	0
RS-10	Chama spp.	1	6	0	0	0	0	T	0	3	2.21	1.2	0	0
RS-10	Chama spp.	2	7	2	0	0	0	T	0	3	2.21	1.2	0	0
RS-10	Chama spp.	2	8	2	0	0	0	T	0	3	2.21	1.2	0	0
RS-10	Chama spp.	2	7	0	0	0	0	T	0	3	2.21	1.2	0	0
RS-10	Chama spp.	2	7	2	0	0	0	T	0	2	1.1	1.2	0	0
RS-10	Chama spp.	1	10	2	0	1	0	T	0	0	1.2	1.1	0	0
RS-10	Chama spp.	0	6	3	1	0	1\2	T	0	0	0	0	0	0
RS-10	Chama spp.	1	9	0	0	0	0	T	0	3	2.1	1.2	0	0
RS-10	Chama spp.	3	12	0	0	0	0	T	0	3	2.1	1.2	0	0
RS-10	Chama spp.	2	6	2	0	0	0	T	0	3	2.41	1.2	0	0
RS-10	Chama spp.	2	13	0	0	0	0	T	1	3	2.1	1.2	0	0
RS-10	Chama spp.	1	6	2	0	0	0	T	2	2	1.2	1.1	0	0
RS-10	Chama spp.	2	7	0	0	0	0	T	0	3	2.21	1.2	0	0
RS-10	Chama spp.	2	7	0	0	0	0	T	0	3	2.23	1.2	0	0
RS-20	Chama spp.	1	10	2	0	1	0	T	0	2	1.2	1.2	0	0
RS-20	Chama spp.	2	14	3	1	1	0	T	0	0	2.1	1.1	0	0
RS-20	Chama spp.	0	10	0	0	0	0	T	0	3	1.2	1.2	0	0
RS-20	Chama spp.	3	15	0	0	0	0	B	0	3	2.41	1.2	0	0
RS-20	Chama spp.	1	4	3	1	0	0	B	0	0	1.1	1.1	0	0
RS-20	Chama spp.	0	11	3	1	1	0	B	0	0	0	0	0	0
RS-20	Chama spp.	3	7	2	0	0	0	T	0	2	1.2	1.2	0	0
RS-20	Chama spp.	1	11	0	0	0	0	T	0	3	1.2	1.2	0	0
RS-20	Chama spp.	1	6	2	0	0	0	T	2	3	2.21	1.2	0	0
RS-20	Chama spp.	2	12	0	0	0	0	T	0	3	2.1	1.2	0	0

RS-20	Chama spp.	1	8	2	1	0	0	T	0	0	1.2	1.1	0	0
RS-20	Chama spp.	1	12	2	0	0	0	T	1	3	2.1	1.2	0	0
RS-20	Chama spp.	2	6	2	0	0	0	T	2	2	2.21	1.2	0	0
RS-20	Chama spp.	3	7	0	0	0	0	T	2	3	1.1	1.2	0	0
RS-20	Chama spp.	3	7	0	0	0	0	T	1	3	2.1	1.2	0	0
RS-20	Chama spp.	3	55	0	0	0	0	B	1	3	2.41	1.2	0	0
RS-20	Chama spp.	1	10	2	0	0	0	T	2	3	2.23	1.2	0	0
RS-20	Chama spp.	1	7	2	0	0	0	T	2	1	1.1	1.1	0	0
RS-20	Chama spp.	3	10	0	0	0	0	T	2	3	2.41	1.2	0	0
RS-20	Chama spp.	1	9	0	0	0	0	T	0	2	1.2	1.2	0	0
RS-20	Chama spp.	3	55	0	0	1	0	B	1	3	2.41	1.1	0	0
RS-30	Chama spp.	2	8	0	0	0	0	T	0	2	2.1	1.2	0	0
RS-30	Chama spp.	1	6	2	0	0	0	T	0	3	2.1	1.2	0	0
RS-30	Chama spp.	1	7	0	0	0	0	B	2	2	1.2	1.1	0	0
RS-30	Chama spp.	1	8	2	0	0	4	T	0	3	2.21	1.2	0	0
RS-30	Chama spp.	1	8	2	0	0	0	T	0	2	2.1	1.2	0	0
RS-30	Chama spp.	2	8	2	0	0	0	T	0	3	2.21	1.2	0	1
RS-30	Chama spp.	2	10	0	0	0	0	T	1	3	2.21	1.2	0	0
RS-30	Chama spp.	2	8	0	0	0	0	T	0	3	2.21	1.2	0	0
RS-30	Chama spp.	1	7	0	0	0	0	T	1	3	2.21	1.2	0	0
RS-30	Chama spp.	1	6	2	0	0	0	T	3	3	2.1	1.2	0	0
RS-30	Chama spp.	2	6	2	0	0	0	T	0	2	2.1	1.2	0	0
RS-30	Chama spp.	2	10	0	0	0	0	T	0	3	2.21	1.2	0	0
RS-30	Chama spp.	2	7	2	0	0	0	T	2	3	2.21	1.2	0	0
RS-30	Chama spp.	2	7	2	0	0	2	T	0	3	2.1	1.1	0	0
RS-30	Chama spp.	1	10	2	0	0	0	T	1	3	2.21	1.2	0	0
RS-0	Chione cancellata	1	7	0	0	0	0	R	0	3	2.21	1.2	0	0
RS-0	Chione cancellata	0	8	0	0	0	0	R	0	2	1.1	1.2	0	0
RS-0	Chione cancellata	1	7	2	0	0	3	R	0	2	2.21	1.1	0	0
RS-0	Chione cancellata	1	7	0	0	0	4	R	0	3	2.23	0	0	0
RS-0	Chione cancellata	1	7	2	0	0	0	R	0	2	1.1	1.2	0	0
RS-0	Chione cancellata	1	10	2	1	0	4	L	0	2	2.1	1.2	0	0
RS-0	Chione cancellata	2	7	0	0	0	0	L	0	3	2.21	1.2	0	0
RS-0	Chione cancellata	1	8	0	0	0	0	R	0	3	2.21	1.2	0	0
RS-0	Chione cancellata	0	8	0	0	0	0	L	0	3	2.21	1.2	0	0
RS-0	Chione cancellata	1	8	2	1	0	0	L	0	1	1.1	1.2	0	0
RS-10	Chione cancellata	1	6	2	1	0	0	R	0	0	1.1	1.1	0	0
RS-10	Chione cancellata	0	7	2	0	0	0	R	0	0	1.1	1.2	0	0
RS-10	Chione cancellata	1	7	2	1	0	0	R	0	0	1.1	1.2	0	0
RS-10	Chione cancellata	2	7	0	0	0	0	R	1	3	2.42	1.2	0	0
RS-10	Chione cancellata	1	8	0	0	0	0	R	0	3	2.21	1.2	0	0
RS-10	Chione cancellata	0	6	0	0	0	0	L	0	2	1.2	1.1	0	0
RS-10	Chione cancellata	1	7	1	0	0	0	L	0	2	1.2	1.2	0	0
RS-10	Chione cancellata	1	6	0	0	0	0	R	0	3	2.21	1.2	0	0
RS-10	Chione cancellata	0	7	1	0	0	0	L	0	2	2.1	1.1	0	0
RS-10	Chione cancellata	1	6	0	0	0	0	L	1	3	2.21	0	0	0
RS-10	Chione cancellata	1	7	2	0	0	0	R	1	2	1.2	1.2	0	0
RS-10	Chione cancellata	1	6	0	0	0	0	R	0	1	2.21	1.2	0	0
RS-10	Chione cancellata	1	23	0	0	0	0	R	0	3	2.23	1.2	0	0
RS-10	Chione cancellata	0	6	2	1	0	0	R	0	3	2.1	1.2	0	0
RS-10	Chione cancellata	1	7	0	0	0	0	R	1	3	2.21	1.2	0	0
RS-10	Chione cancellata	0	7	0	0	0	3	L	0	2	2.1	1.1	0	0
RS-20	Chione cancellata	1	7	0	0	0	0	L	0	3	2.1	1.1	0	0
RS-20	Chione cancellata	1	6	3	1	0	0	L	0	0	1.2	0	0	0
RS-20	Chione cancellata	1	7	2	0	0	0	L	0	2	2.1	1.1	0	0
RS-20	Chione cancellata	1	7	2	0	0	0	L	0	2	2.1	1.1	0	0
RS-20	Chione cancellata	1	7	2	0	0	0	L	1	3	2.1	1.2	0	0
RS-20	Chione cancellata	1	7	2	0	0	0	L	0	2	1.1	1.1	0	0
RS-20	Chione cancellata	2	7	2	0	0	4	L	1	1	2.1	1.1	0	0
RS-20	Chione cancellata	1	7	0	0	0	4\3	L	0	1	2.21	1.1	0	0
RS-20	Chione cancellata	1	6	2	0	0	0	R	0	2	1.2	1.2	0	0
RS-20	Chione cancellata	1	6	3	1	0	0	L	0	0	2.1	1.1	0	0
RS-20	Chione cancellata	1	7	2	0	0	3	L	0	1	2.1	1.1	0	0
RS-20	Chione cancellata	1	10	0	0	0	0	R	2	3	2.23	1.2	0	0
RS-20	Chione cancellata	1	7	2	0	0	4	R	0	2	1.2	1.2	0	0
RS-20	Chione cancellata	1	6	0	0	0	0	R	0	1	2.21	1.2	0	0
RS-20	Chione cancellata	0	6	3	1	0	4	R	0	1	0	1.1	0	0
RS-20	Chione cancellata	1	6	3	0	0	0	R	0	1	1.1	1.1	0	0
RS-20	Chione cancellata	0	6	3	1	0	3	L	1	1	0	0	0	0
RS-20	Chione cancellata	2	7	0	0	0	0	R	0	3	2.23	1.2	0	0
RS-20	Chione cancellata	1	9	2	0	0	4	R	0	2	2.21	1.2	0	0

RS-20	Chione cancellata	1	6	0	0	0	4	R	0	2	1.2	1.2	0	0
RS-20	Chione cancellata	1	9	0	0	0	4	R	0	3	2.21	1.2	0	0
RS-30	Chione cancellata	2	6	0	0	0	0	R	2	3	2.1	1.2	0	0
RS-30	Chione cancellata	1	6	2	1	0	4	L	0	1	1.1	1.1	0	0
RS-30	Chione cancellata	2	7	0	0	0	0	R	3	3	2.23	1.2	0	0
RS-30	Chione cancellata	1	9	2	0	0	0	L	1	2	2.1	1.1	0	0
RS-30	Chione cancellata	1	6	0	0	0	0	L	0	3	2.21	1.2	0	0
RS-30	Chione cancellata	1	7	2	0	0	0	R	0	1	2.1	1.1	0	0
RS-30	Chione cancellata	1	8	0	0	0	1	R	0	2	2.21	1.1	0	0
RS-30	Chione cancellata	1	6	0	0	0	0	R	1	3	2.23	1.2	0	0
RS-30	Chione cancellata	0	7	2	1	0	0	R	0	1	1.2	1.1	0	0
RS-30	Chione cancellata	1	8	0	1	0	0	R	2	2	2.1	1.1	0	0
RS-30	Chione cancellata	2	7	0	0	0	4	L	0	2	2.1	1.2	0	0
RS-30	Chione cancellata	1	5	2	1	0	0	L	0	1	1.2	0	0	0
RS-30	Chione cancellata	1	6	0	0	0	0	R	0	2	2.21	1.1	0	0
RS-30	Chione cancellata	1	7	0	0	0	1	L	0	2	2.1	1.1	0	0
RS-30	Chione cancellata	1	6	2	1	0	4	R	0	2	2.1	1.1	0	0
RS-30	Chione cancellata	1	8	0	0	0	0	L	3	3	2.21	1.2	0	0
RS-30	Chione cancellata	1	6	0	0	0	1	R	0	2	2.1	1.1	0	0
RS-30	Chione cancellata	1	7	0	0	0	0	R	0	2	2.1	1.1	0	0
RS-30	Chione cancellata	2	7	0	0	0	0	R	0	3	2.23	1.2	0	0
RS-30	Chione cancellata	1	9	0	0	0	4	L	1	2	2.1	1.2	0	0
RS-30	Chione cancellata	1	7	0	0	0	0	R	2	3	2.23	1.2	0	0
RS-30	Chione cancellata	3	7	0	0	0	0	R	2	3	2.41	1.2	0	0
RS-30	Chione cancellata	1	7	1	1	0	4	L	0	0	1.1	1.1	0	0
RS-30	Chione cancellata	0	8	2	1	0	4	L	0	1	1.1	0	0	0
RS-30	Chione cancellata	2	7	0	0	0	4	R	2	3	2.21	2.1	0	0
RS-30	Chione cancellata	1	6	0	0	0	0	R	2	3	2.23	1.1	0	0
RS-0	Chione grus	1	7	2	0	0	0	R	0	3	2.21	1.2	0	0
RS-0	Chione grus	1	9	0	0	0	0	L	1	3	2.1	1.1	0	0
RS-0	Chione grus	1	8	3	1	0	0	R	1	1	0	0	0	0
RS-10	Chione grus	1	6	2	1	0	0	R	0	0	1.2	0	0	0
RS-30	Chione grus	1	7	2	1	0	0	R	0	0	1.1	0	0	0
RS-30	Chione grus	1	12	2	1	0	0	R	0	2	2.1	1.1	0	0
RS-30	Chione grus	1	9	2	1	0	0	R	2	0	1.1	0	0	0
RS-0	Pseudochama spp.	1	11	2	0	0	0	T	0	2	1.1	1.1	0	0
RS-0	Pseudochama spp.	2	11	2	0	0	0	T	1	3	2.42	•	0	0
RS-10	Pseudochama spp.	1	6	0	0	0	0	T	2	3	1.2	1.2	0	0
RS-10	Pseudochama spp.	0	6	0	0	0	0	T	2	3	2.21	1.2	0	0
RS-10	Pseudochama spp.	1	6	0	0	0	0	T	2	3	2.1	1.2	0	0
RS-20	Pseudochama spp.	1	8	2	0	0	0	T	0	2	2.1	1.1	0	0
RS-20	Pseudochama spp.	2	7	2	0	0	0	T	0	3	2.41	1.2	0	0
RS-20	Pseudochama spp.	1	12	0	0	0	0	T	0	3	2.1	1.2	0	0
RS-30	Pseudochama spp.	2	9	0	0	0	3	T	1	3	2.1	1.2	0	1
RS-30	Pseudochama spp.	1	6	2	1	0	0	T	0	2	1.2	1.1	0	0
RS-30	Pseudochama spp.	2	8	0	0	0	0	T	1	3	2.21	1.2	0	0
RS-30	Tellina gouldi	2	9	0	0	0	4	R	0	3	2.21	1.1	0	0
RS-0	Tellina gouldi	0	8	3	1	0	0	L	0	0	0	0	0	0
RS-0	Tellina gouldi	0	8	1	0	0	0	L	0	3	2.21	1.1	0	0
RS-0	Tellina gouldi	0	10	0	0	0	4	L	0	1	2.21	1.1	0	0
RS-10	Tellina gouldi	0	8	3	1	0	0	R	0	0	0	0	0	0
RS-10	Tellina gouldi	0	6	0	0	0	4	R	0	3	2.21	1.1	0	0
RS-10	Tellina gouldi	0	7	3	1	0	0	R	0	1	1.1	0	0	0
RS-10	Tellina gouldi	0	9	3	1	0	0	L	0	0	1.1	1.1	0	0
RS-10	Tellina gouldi	0	7	3	1	0	0	L	0	0	1.1	0	0	0
RS-10	Tellina gouldi	0	5	2	0	0	0	L	0	1	2.21	1.1	0	0
RS-10	Tellina gouldi	0	7	3	1	0	0	L	0	1	1.2	1.1	0	0
RS-10	Tellina gouldi	0	8	3	1	0	3	L	0	0	1.1	1.1	0	0
RS-10	Tellina gouldi	0	7	0	0	0	4	L	0	3	2.21	1.1	0	0
RS-10	Tellina gouldi	0	8	0	0	0	0	L	0	3	2.21	1.2	0	0
RS-10	Tellina gouldi	2	8	0	0	0	0	L	1	3	2.23	1.2	0	0
RS-20	Tellina gouldi	0	7	3	1	0	0	R	0	1	1.1	0	0	0
RS-20	Tellina gouldi	0	8	2	0	0	4	R	0	1	2.21	1.1	0	0
RS-20	Tellina gouldi	0	8	3	1	0	4	L	0	1	0	0	0	0
RS-20	Tellina gouldi	0	9	3	1	0	0	L	0	1	1.1	0	0	0
RS-20	Tellina gouldi	0	7	3	1	0	4	L	0	2	1.1	0	0	0
RS-20	Tellina gouldi	0	8	2	0	0	4	L	0	2	2.21	1.1	0	0
RS-20	Tellina gouldi	0	7	2	0	0	0	L	1	3	2.21	1.1	0	0
RS-20	Tellina gouldi	1	7	3	1	0	0	R	0	1	0	1.1	0	0
RS-30	Tellina gouldi	0	8	3	1	0	1	ART	0	2	1.2	1.1	0	0
RS-30	Tellina gouldi	0	8	3	1	0	0	L	0	2	1.1	1.1	0	0

RS-30	Tellina gouldi	1	9	2	0	0	0	L	0	3	1.2	1.1	0	0
RS-30	Tellina gouldi	1	9	2	0	0	4	L	0	3	1.2	1.1	0	0
RS-30	Tellina gouldi	0	7	3	1	0	0	L	0	1	0	0	0	0
RS-30	Tellina gouldi	0	7	3	1	0	0	L	1	1	0	0	0	0
RS-30	Tellina gouldi	0	6	3	1	0	0	R	0	1	1.2	1.1	0	0
RS-30	Tellina gouldi	1	7	0	1	0	0	R	0	1	2.1	1.1	0	0
RS-30	Tellina gouldi	1	8	0	0	0	4	R	0	3	2.1	1.1	0	0
RS-30	Tellina gouldi	1	7	0	0	0	4	R	0	3	2.21	1.2	0	0

Site	Species	% Cover	Size	Color	Periosti	Pred bc	Luster	Shell	Brea	EdgeAl	Dissolu	Abrasic	Graze	Sponge
RR-20	Arca imbricata	2	10	2	0	0	0	L	2	3	2.1	1.1	0	0
RR-20	Arca imbricata	1	8	2	0	0	0	L	2	3	2.1	1.1	0	0
RR-30	Arca imbricata	2	10	0	0	0	0	L	1	3	2.1	1.2	0	0
RR-30	Arca imbricata	1	10	0	0	0	0	R	2	3	2.21	1.2	0	0
RR-10	Arca zebra	1	10	2	0	0	1	L	2	1	0	1.1	0	0
RR-10	Arca zebra	1	12	2	0	0	1	L	1	3	2.1	1.2	1	0
RR-10	Arca zebra	2	9	0	0	0	0	R	3	3	2.41	1.2	0	0
RR-10	Arca zebra	2	20	2	2	0	0	L	0	2	2.1	1.1	0	0
RR-10	Arca zebra	2	10	2	2	0	1	L	2	1	2.1	1.1	0	0
RR-20	Arca zebra	1	10	2	0	0	0	L	2	3	2.1	1.2	0	0
RR-20	Arca zebra	1	54	3	3	0	1	R	0	0	1.1	1.1	0	0
RR-20	Arca zebra	2	11	2	0	0	0	L	1	3	2.1	1.2	0	0
RR-10	Arcopis adamsi	1	5	2	0	0	0	L	2	3	1.2	1.1	0	0
RR-20	Arcopis adamsi	1	9	3	0	0	1	L	0	0	1.1	•	0	0
RR-20	Arcopis adamsi	2	8	2	0	0	0	R	0	2	2.1	1.2	0	0
RR-20	Arcopis adamsi	2	7	2	0	0	0	L	0	2	2.21	1.2	0	0
RR-30	Arcopis adamsi	1	9	2	0	0	0	R	0	2	1.2	1.1	0	0
RR-10	Barbatia cancellaria	1	7	2	0	0	0	R	1	3	2.23	1.2	0	0
RR-10	Barbatia cancellaria	2	9	2	0	0	0	R	1	3	2.23	1.1	0	0
RR-20	Barbatia cancellaria	1	8	2	0	0	0	R	1	3	2.21	1.2	0	0
RR-20	Barbatia cancellaria	1	8	2	0	0	0	L	0	3	2.21	1.2	0	0
RR-20	Barbatia cancellaria	1	10	2	0	0	0	R	1	3	2.21	1.2	0	0
RR-20	Barbatia cancellaria	1	8	2	0	0	0	R	2	3	2.23	1.2	0	0
RR-20	Barbatia cancellaria	1	13	2	0	0	0	R	2	3	2.21	1.2	0	0
RR-20	Barbatia cancellaria	2	17	2	0	0	0	L	2	3	2.21	1.2	0	0
RR-20	Barbatia cancellaria	2	18	2	0	0	0	L	2	3	2.23	1.2	0	0
RR-30	Barbatia cancellaria	1	8	2	0	0	0	L	2	3	2.41	1.2	0	0
RR-10	Barbatia domingensis	1	9	2	0	0	0	R	3	3	2.21	1.1	0	0
RR-20	Barbatia domingensis	1	12	3	0	0	1	L	0	2	1.2	1.1	0	0
RR-20	Barbatia tenera	1	10	2	0	0	0	L	2	2	2.1	1.2	0	0
RR-20	Barbatia tenera	1	11	2	0	0	0	L	1	3	2.23	1.2	0	0
RR-10	Cerithium eburneum	1	8	0	0	0	0	W	2	3	2.21	1.1	0	0
RR-10	Cerithium eburneum	1	9	0	0	0	0	A	2	3	2.21	1.1	0	0
RR-10	Cerithium eburneum	1	19	2	0	0	0	A	2	2	1.1	1.1	0	0
RR-10	Cerithium eburneum	2	8	0	0	0	0	A	2	3	2.23	1.2	0	0
RR-10	Cerithium eburneum	2	14	0	0	1	0	W	2	3	2.41	•	0	0
RR-10	Cerithium eburneum	0	6	3	0	0	1	A	2	1	•	•	0	0
RR-20	Cerithium eburneum	2	10	0	0	1	0	W	2	3	2.21	1.2	0	0
RR-20	Cerithium eburneum	1	10	1	0	1	0	W	0	1	1.1	1.1	0	0
RR-20	Cerithium eburneum	2	15	0	0	0	0	W	2	3	2.1	1.2	0	0
RR-20	Cerithium eburneum	1	14	1	0	1	0	W	0	3	2.1	1.2	0	0
RR-20	Cerithium eburneum	2	10	0	0	0	0	W	2	3	2.1	1.2	0	0
RR-20	Cerithium eburneum	1	12	0	0	0	0	W	3	3	2.42	1.2	0	0
RR-20	Cerithium eburneum	1	13	0	0	1	0	W	2	1	1.2	1.1	0	0
RR-20	Cerithium eburneum	1	10	2	0	1	1	W	2	1	•	•	0	0

RR-30	Cerithium eburneum	1	4	2	0	0	0	A	3	3	2.41	1.2	0	0
RR-30	Cerithium eburneum	2	10	2	0	0	0	W	1	3	2.21	1.1	0	0
RR-30	Cerithium eburneum	2	20	2	0	0	1	W	2	2	1.1A	1.1	0	0
RR-30	Cerithium eburneum	1	10	3	0	0	1	W	3	3	1.2	1.1	0	0
RR-30	Cerithium eburneum	2	28	3	0	0	1	W	1	1	1.1	1.1	0	0
RR-30	Cerithium eburneum	2	13	0	0	0	0	W	1	1	1.1A	1.1A	0	0
RR-30	Cerithium eburneum	2	10	0	0	0	0	W	3	3	2.21	1.2	0	0
RR-30	Cerithium eburneum	3	13	2	0	0	0	Aper	3	3	2.21	1.2	0	0
RR-10	Cerithium litteratum	1	8	0	0	0	0	A	2	3	2.1	1.2	0	0
RR-10	Cerithium litteratum	0	5	2	0	0	0	A	2	3	2.23	1.2	0	0
RR-10	Cerithium litteratum	0	7	2	0	0	0	A	2	3	2.1	1.2	0	0
RR-10	Cerithium litteratum	0	7	0	0	1	0	A	2	3	2.21	1.2	0	0
RR-10	Cerithium litteratum	1	8	2	0	0	0	A	2	3	2.21	1.2	0	0
RR-10	Cerithium litteratum	1	9	2	0	0	0	A	2	3	2.1	1.2	0	0
RR-10	Cerithium litteratum	0	9	2	0	0	0	A	2	2	2.21	1.2	0	0
RR-10	Cerithium litteratum	1	8	2	0	0	0	A	2	3	2.1	1.2	0	0
RR-10	Cerithium litteratum	1	7	2	0	0	0	A	2	3	1.2	1.2	0	0
RR-10	Cerithium litteratum	0	9	3	0	0	1	A	2	1	0	0	0	0
RR-20	Cerithium litteratum	1	9	2	0	0	0	A	3	3	2.21	1.2	0	0
RR-20	Cerithium litteratum	1	10	3	0	0	1	A	3	1	1.1	1.1	0	0
RR-20	Cerithium litteratum	1	9	2	0	0	0	A	3	2	2.1	1.1	0	0
RR-20	Cerithium litteratum	1	6	2	0	0	0	A	3	3	2.23	1.2	0	0
RR-20	Cerithium litteratum	1	6	0	0	0	0	A	3	3	2.23	1.2	0	0
RR-20	Cerithium litteratum	1	6	2	0	0	0	A	3	3	2.1	1.2	0	0
RR-20	Cerithium litteratum	2	10	0	0	1	0	A	3	3	2.23	1.2	0	0
RR-20	Cerithium litteratum	1	7	2	0	1	0	A	3	3	2.21	1.2	0	0
RR-20	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.23	1.2	0	0
RR-20	Cerithium litteratum	1	8	2	0	0	0	A	3	3	2.23	1.2	0	0
RR-20	Cerithium litteratum	1	7	2	0	0	0	A	3	3	2.21	1.2	0	0
RR-20	Cerithium litteratum	2	7	2	0	1	0	A	3	3	2.21	1.2	0	0
RR-20	Cerithium litteratum	1	8	2	0	0	0	A	3	3	2.21	1.2	0	0
RR-20	Cerithium litteratum	1	8	2	0	0	0	A	3	3	2.23	1.2	0	0
RR-20	Cerithium litteratum	1	8	2	0	0	0	A	3	3	2.21	1.2	0	0
RR-20	Cerithium litteratum	1	9	2	0	0	0	A	3	3	2.1	1.2	0	0
RR-20	Cerithium litteratum	1	6	0	0	0	0	A	3	3	2.21	1.2	0	0
RR-20	Cerithium litteratum	0	8	2	0	0	0	A	3	3	2.1	1.1	0	0
RR-20	Cerithium litteratum	1	13	2	0	0	0	W	2	1	1.2	1.1	0	0
RR-20	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.23	1.2	0	0
RR-20	Cerithium litteratum	1	8	2	0	0	0	W	1	1	2.1	1.1	0	0
RR-20	Cerithium litteratum	1	20	3	0	1	1	W	0	1	1.2A	•	0	0
RR-20	Cerithium litteratum	1	8	2	0	0	0	A	3	3	2.21	1.2	0	0
RR-20	Cerithium litteratum	1	20	2	0	1	0	W	2	2	2.21	1.2	0	0
RR-20	Cerithium litteratum	1	14	2	0	0	0	W	1	3	2.21	1.2	0	0
RR-20	Cerithium litteratum	2	12	2	0	0	0	W	2	3	2.1	1.2	0	0
RR-20	Cerithium litteratum	1	10	0	0	1	0	W	1	2	2.1	1.1	0	0
RR-20	Cerithium litteratum	1	9	2	0	0	0	W	2	3	2.1	1.2	0	0

RR-20	Cerithium litteratum	2	8	0	0	1	0	W	3	3	2.23	1.2	0	0
RR-20	Cerithium litteratum	1	8	0	0	1	0	W	2	3	2.21	1.1	0	0
RR-20	Cerithium litteratum	1	7	2	0	1	0	W	2	3	2.21	1.1	0	0
RR-20	Cerithium litteratum	1	7	2	0	1	0	A	3	3	2.21	1.2	0	0
RR-20	Cerithium litteratum	0	8	2	0	0	1	W	1	1	1.1	1.1	0	0
RR-20	Cerithium litteratum	1	9	2	0	1	0	A	2	2	2.21	1.1	0	0
RR-30	Cerithium litteratum	1	10	0	0	2	0	W	1	2	2.21	1.2	0	0
RR-30	Cerithium litteratum	2	8	2	0	2	0	W	2	2	1.2	1.2	0	0
RR-30	Cerithium litteratum	1	17	2	0	0	0	W	0	3	1.2	1.1	0	0
RR-30	Cerithium litteratum	1	7	0	0	0	0	A	3	3	2.41	1.2	0	0
RR-30	Cerithium litteratum	1	8	0	0	0	0	A	3	3	2.41	1.2	0	0
RR-30	Cerithium litteratum	1	7	0	0	0	0	A	3	3	2.21	1.2	0	0
RR-30	Cerithium litteratum	2	7	0	0	0	0	A	3	3	2.41	1.2	0	0
RR-30	Cerithium litteratum	1	9	2	0	0	0	A	3	3	2.21	1.2	0	0
RR-30	Cerithium litteratum	1	7	0	0	1	0	A	3	3	2.41	1.2	0	0
RR-30	Cerithium litteratum	2	6	2	0	0	0	A	3	3	2.21	1.2	0	0
RR-30	Cerithium litteratum	3	7	0	0	0	0	W	2	•	2.42	•	0	1
RR-30	Cerithium litteratum	1	11	2	0	2	0	W	0	2	1.2	1.1	0	0
RR-10	Chama spp.	1	8	0	0	0	0	R	0	3	2.21	1.2	0	0
RR-10	Chama spp.	2	8	0	0	0	0	R	0	3	2.21	1.2	0	0
RR-10	Chama spp.	2	10	0	0	0	0	R	0	3	2.21	1.2	0	0
RR-10	Chama spp.	1	7	2	1	0	1	R	0	0	1.1	1.1	0	0
RR-20	Chama spp.	2	22	0	0	0	0	R	1	3	2.23	1.2	1	0
RR-20	Chama spp.	1	6	2	1	0	1	R	0	0	1.2	1.1	0	0
RR-20	Chama spp.	2	7	0	0	0	0	R	0	3	2.21	1.2	0	0
RR-20	Chama spp.	1	7	0	0	4	0	R	0	2	2.1	1.1	0	0
RR-20	Chama spp.	2	10	2	1	0	0	R	0	2	2.1	1.2	0	0
RR-20	Chama spp.	2	7	0	0	0	0	R	0	3	2.21	1.2	0	0
RR-20	Chama spp.	2	12	0	0	0	0	R	1	3	2.23	1.2	0	0
RR-20	Chama spp.	1	5	3	1	0	1	L	0	0	0	0	0	0
RR-20	Chama spp.	1	8	2	0	0	1	R	0	0	1.2	0	0	0
RR-20	Chama spp.	2	10	0	0	0	0	R	0	3	2.23	1.2	0	0
RR-20	Chama spp.	1	6	2	0	0	0	R	0	3	2.1	1.2	0	0
RR-20	Chama spp.	1	8	2	0	0	0	R	1	2	2.21	1.2	0	0
RR-20	Chama spp.	2	6	2	0	0	0	R	0	3	2.1	1.2	0	0
RR-20	Chama spp.	2	8	2	0	0	0	R	0	3	2.21	1.2	0	0
RR-30	Chama spp.	1	7	0	0	0	0	R	1	3	2.41	•	0	0
RR-30	Chama spp.	1	5	2	0	0	0	R	0	3	2.21	1.2	0	0
RR-30	Chama spp.	2	16	0	0	4	0	R	1	3	2.41	1.2	0	0
RR-30	Chama spp.	1	7	2	0	0	0	R	1	3	2.1	1.1	0	0
RR-30	Chama spp.	1	8	0	0	0	0	R	0	3	2.21	1.2	0	0
RR-30	Chama spp.	2	7	2	0	1	0	R	0	2	2.1	1.1	0	0
RR-30	Chama spp.	2	34	0	0	4	0	R	1	3	2.41	1.2	1	0
RR-30	Chama spp.	1	10	3	1	1	1	R	0	0	1.2	1.1	0	0
RR-30	Chama spp.	1	17	2	1	0	0	R	0	3	2.1	1.1	0	0
RR-30	Chama spp.	1	10	0	0	0	0	R	2	3	2.41	1.2	0	0

RR-30	Chama spp.	2	9	0	0	0	0	R	0	3	2.21	1.1	0	0
RR-10	Chione cancellata	1	12	2	0	1	0	W	1	3	2.21	1.2	1	0
RR-10	Chione cancellata	1	15	2	0	1	1	W	1	3	1.2	1.2	0	0
RR-10	Chione cancellata	1	8	2	0	0	0	W	2	3	2.1	1.2	0	0
RR-10	Chione cancellata	1	9	2	0	0	0	W	2	3	2.21	1.2	0	0
RR-10	Chione cancellata	0	8	2	0	0	0	W	2	3	2.1	1.2	0	0
RR-10	Chione cancellata	1	10	3	0	0	1	W	2	1	1.1A	•	0	0
RR-10	Chione cancellata	1	7	2	0	4	1	R	0	0	1.1	1.1	0	0
RR-10	Chione cancellata	1	12	2	0	0	0	W	2	3	1.2	1.2	0	0
RR-20	Chione cancellata	1	7	2	0	4	1	R	0	0	1.1	1.1	0	0
RR-20	Chione cancellata	1	7	2	0	4	1	R	0	0	1.1	1.1	0	0
RR-20	Chione cancellata	1	8	0	0	4	0	R	0	2	2.1	1.1	0	0
RR-20	Chione cancellata	1	6	0	0	0	0	R	2	3	2.42	1.2	0	0
RR-20	Chione cancellata	1	7	0	0	0	1	R	0	2	2.21	1.2	0	0
RR-20	Chione cancellata	1	6	0	0	0	1	R	2	1	1.2	1.1	0	0
RR-20	Chione cancellata	1	8	2	0	0	1	L	0	1	1.2	1.1	0	0
RR-20	Chione cancellata	1	7	0	0	4	1	R	0	0	2.1	1.2	0	0
RR-20	Chione cancellata	2	6	2	0	0	0	L	0	3	2.21	1.2	0	0
RR-20	Chione cancellata	1	6	2	0	0	0	R	1	3	2.23	1.2	0	0
RR-20	Chione cancellata	1	7	0	0	0	0	R	1	3	2.23	1.2	0	0
RR-20	Chione cancellata	1	6	2	0	0	1	R	0	0	1.2	1.1	0	0
RR-20	Chione cancellata	1	6	2	0	0	0	R	0	3	2.21	1.2	0	0
RR-20	Chione cancellata	1	7	0	0	0	0	L	0	3	2.21	1.2	0	0
RR-20	Chione cancellata	1	7	2	0	2	1	R	0	0	2.1	1.1	0	0
RR-20	Chione cancellata	1	7	0	0	0	0	R	0	1	2.1	1.1	0	0
RR-20	Chione cancellata	1	8	2	0	0	0	L	0	2	2.1	1.1	0	0
RR-20	Chione cancellata	1	6	0	0	3	0	L	0	3	2.21	1.2	0	0
RR-20	Chione cancellata	1	8	2	0	0	0	L	0	3	2.21	1.2	0	0
RR-20	Chione cancellata	1	7	2	0	3	0	L	0	3	2.21	1.1	0	0
RR-20	Chione cancellata	1	7	0	0	4	0	L	0	3	2.21	1.2	0	0
RR-20	Chione cancellata	1	7	0	0	4	0	L	3	3	2.21	1.2	0	0
RR-20	Chione cancellata	1	9	2	0	1	0	L	1	2	2.1	1.1	0	0
RR-20	Chione cancellata	1	7	2	0	0	1	R	0	1	1.2	1.2	0	0
RR-20	Chione cancellata	2	7	2	0	0	0	L	0	3	2.21	1.2	0	0
RR-20	Chione cancellata	1	7	2	0	0	0	R	0	2	2.21	1.2	0	0
RR-20	Chione cancellata	1	7	0	0	3	0	L	1	3	2.21	1.2	0	0
RR-30	Chione cancellata	1	5	0	0	0	0	R	1	3	2.41	1.2	0	0
RR-30	Chione cancellata	1	7	0	0	4	0	R	0	2	2.1	1.1	0	0
RR-30	Chione cancellata	1	7	2	0	0	0	L	0	3	2.41	1.2	0	0
RR-30	Chione cancellata	2	10	2	0	0	0	L	1	3	2.21	1.1	0	0
RR-30	Chione cancellata	1	7	0	0	3	0	R	0	2	2.21	1.1	0	0
RR-20	Chione grus	1	8	2	0	0	0	R	0	3	2.21	1.2	0	0
RR-20	Chione grus	1	7	2	0	2	0	R	1	3	2.1	1.2	0	0
RR-20	Chione grus	1	6	2	0	0	0	Art	0	2	2.1	1.1	0	0
RR-20	Chione grus	1	10	0	0	0	0	R	1	3	2.21	1.2	0	0
RR-20	Chione grus	1	6	2	0	0	1	L	2	2	2.1	1.1	0	0

RR-20	Chione grus	1	9	2	0	0	0	L	2	1	1.2	1.1	0	0
RR-20	Chione grus	1	8	0	0	0	0	L	2	3	2.21	1.2	0	0
RR-20	Chione grus	1	7	2	0	0	1	L	2	3	2.1	1.1	0	0
RR-20	Chione grus	2	8	0	0	0	0	L	1	3	2.21	1.1	0	0
RR-20	Chione grus	1	7	2	0	4	1	L	0	1	1.2	1.1	0	0
RR-10	Pseudochama sp.	1	16	2	1	0	0	L	0	2	1.1	1.1	0	0
RR-10	Pseudochama sp.	2	15	0	1	0	0	L	0	2	2.1	1.2	1	0
RR-20	Pseudochama sp.	1	8	0	0	0	0	L	2	3	2.21	1.2	0	0
RR-30	Pseudochama sp.	2	22	0	0	0	0	L	1	3	2.22	1.2	0	0
RR-30	Pseudochama sp.	1	12	0	1	0	0	L	1	2	2.21	1.1	0	0
RR-10	Tellina gouldi	0	7	3	0	0	1	L	0	3	1.1	•	0	0
RR-10	Tellina gouldi	0	8	3	0	0	1	L	0	3	1.2	•	0	0
RR-20	Tellina gouldi	1	7	2	0	0	0	L	0	3	2.23	1.1	0	0
RR-20	Tellina gouldi	0	6	3	0	0	1	R	0	0	•	•	0	0
RR-20	Tellina gouldi	0	7	3	0	0	1	R	0	1	1.1	•	0	0
RR-20	Tellina gouldi	1	8	2	0	1	0	R	0	2	2.23	1.1	0	0
RR-20	Tellina gouldi	2	8	2	0	0	0	L	1	3	2.23	1.2	0	0
RR-20	Tellina gouldi	1	8	3	0	0	1	L	0	2	2.1	1.1	0	0
RR-20	Tellina gouldi	1	6	3	0	6	1	L	0	1	2.1	1.1	0	0
RR-20	Tellina gouldi	2	8	2	0	0	0	L	0	3	2.23	1.2	0	0
RR-20	Tellina gouldi	1	8	2	0	0	0	L	0	2	2.21	1.1	0	0
RR-20	Tellina similis	1	12	2	0	0	1	L	2	1	1.2	1.1	0	0