Paleoenvironmental and Paleoecological Reconstruction of the Tyndall Stone, Selkirk Member, Red River Formation (Late Ordovician), Southern Manitoba

by

Simon Wong

A Thesis
Submitted to the Faculty of
Graduate Studies in Partial Fulfillment of
the Requirements for the Degree of

MASTER OF SCIENCE

Department of Geological Sciences
The University of Manitoba
Winnipeg, Manitoba

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

*****

COPYRIGHT PERMISSION PAGE

PALEOENVIRONMENTAL AND PALEOECOLOGICAL RECONSTRUCTION OF THE TYNDALL STONE, SELKIRK MEMBER, RED RIVER FORMATION (LATE ORDOVICIAN), SOUTHERN MANITOBA

BY

Simon Wong

A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University

of Manitoba in partial fulfillment of the requirements of the degree

of

MASTER OF SCIENCE

Abstract

Tyndall Stone is used extensively throughout North America as a building and framing stone, known for its distinctive mottled pattern and high diversity and abundance of well-preserved fossils, including solitary and colonial corals, brachiopods, cephalopods, gastropods, stromatoporoids, and receptaculitids. Stratigraphically, Tyndall Stone is found in the Selkirk Member of the Red River Formation (Late Ordovician). Tyndall Stone is mined exclusively from Gillis Quarries in the town of Garson, Manitoba. The quarry is also the location of this study. At first glance the homogeneous lithology suggests a static, unchanging paleoenvironment. Upon detailed examination of a 5 m study section, however, fossil data reveal obvious environmental fluctuations that are not detectable from lithology alone. An overall upward shallowing sequence is suggested by an increase in stromatoporoid and receptaculitid abundance over time. An increase in sedimentation rate accompanied the upward shallowing sequence, as evidenced by the overall decrease in encrusting relationships and percentage of highly abraded horn corals. A sudden deepening event is recorded between 1.5 and 2.0 m above the base of the study section (interval 4). Within this interval, a sudden decrease in stromatoporoids and receptaculitids is observed, along with a sharp increase in encrusting relationships and percentage of highly abraded horn corals. The mottled pattern of the Tyndall Stone is attributed to the feeding activity of shrimp-like organisms burrowing their way through the firm to hard sediment in search of food. This trace fossil is recognized as the ichnogenus *Thalassinoides*. Cluster and correlation analyses reveal close ecological relationships between various fossil groups. Most prominent among these relationships include 1) the gastropods and cephalopods, and 2) the stromatoporoids

and the encrusting coral, *Protrochiscolithus*. Statistical analyses also reveal similarities and dissimilarities between intervals in the study section. Most notable is the extreme dissimilarity between interval 4 and every other interval. The fossil assemblage found within the Tyndall Stone suggests a shallow marine environment, with warm to temperate water temperatures, normal salinity and an abundance of nutrients in the water column. A northerly flowing paleocurrent is inferred from the orientations of cephalopods and cardinal septa directions of horn corals. It can easily be shown that the Tyndall Stone fossils display an abundance of paleoenvironmental and paleoecological information, despite a homogeneous lithology which suggests otherwise. Interpretation of paleoenvironment, then, cannot be based solely on lithology, as fossil data can be much more sensitive to environmental change.

Acknowledgements

I would like to thank the following people for their assistance in the completion of this M.Sc. thesis project:

Dr. Robert J. Elias and Dr. Graham A. Young, my supervisors, for their guidance and support of my project, and for giving me invaluable knowledge and experience during my stay at the University of Manitoba. Ed Dobrzanski for his assistance in the field and his additional knowledge and enthusiasm for paleontology. Sasha Herwig, my trusty field assistant, for her help and her company in the field. Dr. Brenda J. Hann for serving as the external thesis examiner.

I owe a debt of gratitude to my family to whom each and every one of them I thank for their support and love. Also to the staff and students from the Geological Sciences Department for an experience of a lifetime, and friendships that will always be there.

Table of Contents

Chapter	Page

List of Figures

List of Tables

Chapter 1: Introduction

"Tyndall Stone" is a building stone derived from the Selkirk Member of the Red River Formation (Upper Ordovician; 440 Ma). It is currently quarried by Gillis Quarries Ltd. at Garson, Manitoba. Tyndall Stone is renowned throughout North America as a fine building material due to its unique and fascinating textured appearance and fossiliferous content. For example, Tyndall Stone is used in the Manitoba Provincial Legislative Building, the Parliament Buildings in Ottawa, the Canadian Museum of Civilization in Hull, Québec, the Empress Hotel in Victoria, B.C., the Lied Centre for the Performing Arts in Omaha, Nebraska, and the Walsh Centre for the Performing Arts at the Texas Christian University campus in Fort Worth, Texas.

Tyndall Stone is a uniquely patterned dolomitic limestone, featuring dark to medium-brown dolomite ($Ca/MgCO_3$) mottles within a light brown-to-yellow limestone ($CaCO_3$) matrix (Fig. 1.1). These mottles are generally considered to be trace fossils, created by shrimp-like organisms burrowing and eating their way through soft lime-mud sediment (Coniglio, 1999). Burrows were preferentially dolomitized while the surrounding host matrix remained as unaltered limestone, creating the intertwining patterns seen in the stone today. Fossils found in the Tyndall Stone are excellently preserved and represent many groups: solitary and colonial corals, brachiopods, bivalves, cephalopods, gastropods, stromatoporoids and the enigmatic receptaculitids, among others.

Upon initial inspection, the mottled Tyndall Stone appears uniform and homogeneous, representing a constant, unchanging depositional environment. Indeed, the limestone-dolostone lithofacies is virtually consistent throughout the entire Selkirk

Member of southern Manitoba. The fossil distribution, however, reveals subtle environmental fluctuations over time, even in the absence of obvious lithologic change.

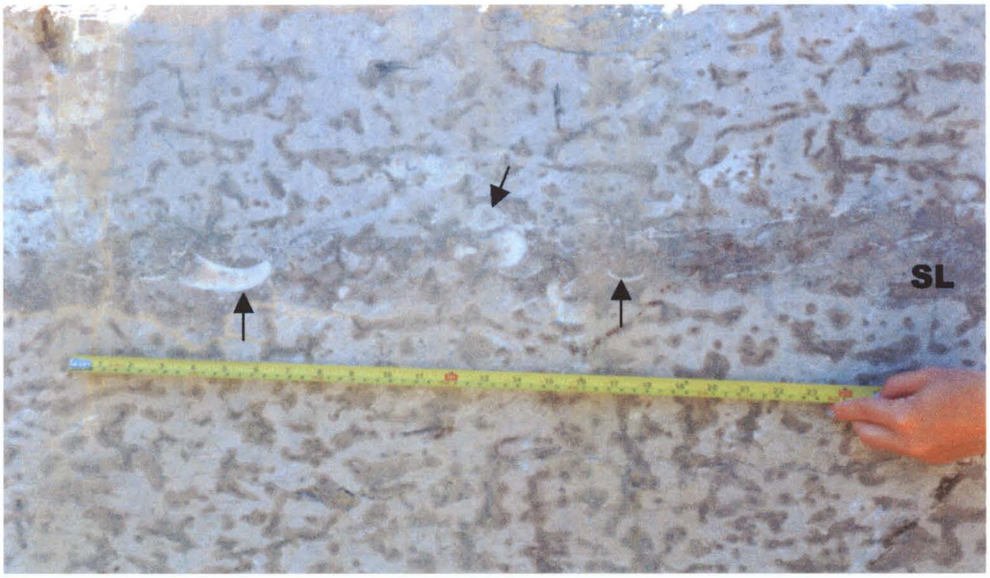


Fig. 1.1: Tyndall Stone section with typical mottling. Fossils (shown by arrows) occur commonly within storm lenses (SL).

It has long been established that paleoenvironmental control played a large role in fossil distribution. However, most studies have assessed cases in which lithofacies were obviously different from one another, making the recognition of facies control on fossils straightforward; this approach has led to the idea that an absence of changing lithofacies indicates a lack of paleoenvironmentally controlled fossil distribution (Holland et al., 2001). In recent years, several researchers have acknowledged that biofacies are *more* sensitive to environmental changes than lithofacies (Miller, 1997; Brett, 1998), stating that environmental controls on faunal distribution can exist without lithological fluctuation. Using fossils as indicators of environmental change is thus ideal for examination and analysis of the lithologically homogenous Tyndall Stone. The appearance of fossil groups, along with their interactions with each other, provides insight into the depositional environment and ecology of the Tyndall Stone. Combined with sedimentological data, a detailed paleo-reconstruction is possible.

The present study is a paleoenvironmental and paleoecological reconstruction of the Tyndall Stone, which has not previously been attempted in detail despite its high diversity and abundance of large (some displaying gigantism) and well-preserved fossils. Particular emphasis is placed on variation of fossil fauna along a vertical gradient (up-section) and its relation to the depositional environment. The aim of the study is to show environmental changes through time (despite an obvious lack of lithologic variation) using sedimentological data, and refine the information using shifts in fossil occurrences and interactions. The study is not unlike Walker's (1972a, 1972b) work on the Middle Ordovician Black River Group of New York State, Watkins' (1991) study on the Silurian Racine Formation of Wisconsin, and the Holland et al. (2001) study of the Upper Ordovician Kope Formation of the Cincinnati, Ohio region.

Chapter 2: Geological Setting

2.1 The Ordovician of Southern Manitoba

The sedimentary outcrop belt of southern Manitoba is located in the northeastern flank of the Williston Basin (Fig. 2.1). Paleozoic and Mesozoic strata form a wedge-like segment in this region, dipping and thickening southwesterly towards the center of the basin, located in northwestern North Dakota (McCabe, 1971).

The Ordovician of southern Manitoba is composed of four major units, listed here in ascending stratigraphical order: the Winnipeg, Red River, Stony Mountain, and Stonewall formations (Fig. 2.2).

Fig. 2.1: Southern Manitoba's position relative to the Williston Basin (modified from Elias, 1991).

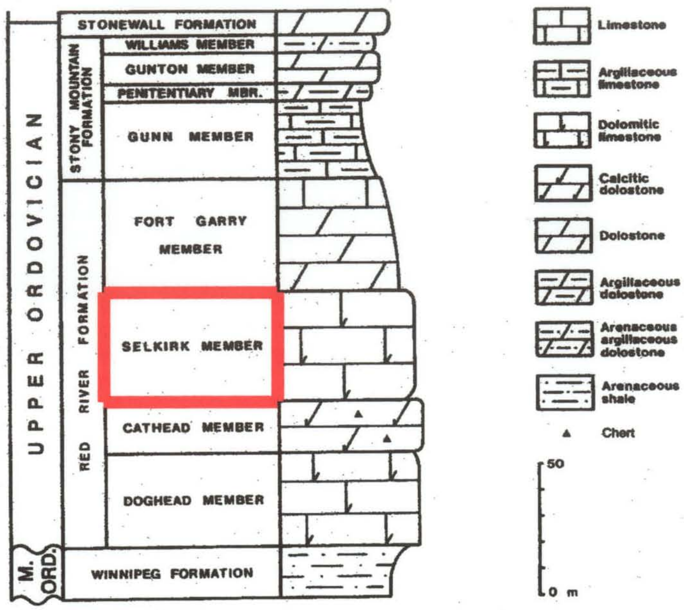


Fig. 2.2: Stratigraphic section of the Upper Ordovician near Winnipeg. Tyndall Stone is found in the Selkirk Member, outlined by box (from Elias, 1981).

The Winnipeg Formation is composed of interbedded sandstones and shales that rest upon an eroded and weathered Precambrian surface. Winnipeg sedimentation began in the Middle Ordovician, stemming from a marine transgression from the southwest (Andrichuk, 1959). The source of Winnipeg sediment may have been truncated Cambrian clastics (Andrichuk, 1959). Deposition of the unit stopped with the onset of a large-scale marine inundation, which either drowned or stripped the sediment source areas (Andrichuk, 1959). The Winnipeg Formation displays maximum thickness of approximately 60 m near the U.S. border, and thins to zero at its northern limit (McCabe and Barchyn, 1982).

The Red River Formation marks the onset of carbonate deposition during the Late Ordovician Period. Composed predominantly of dolostones and dolomitic limestones, the Red River includes the Tyndall Stone. The Red River is further described below.

The Stony Mountain Formation is divided into four members; the lithologically similar Gunn and Penitentiary members (which consist of a distinctively red and greyish red fossiliferous calcareous shale overlain by yellow argillaceous dolostone), and the overlying Gunton and Williams members (composed of a massive, faintly mottled sublithographic dolostone and argillaceous dolostone, respectively) (Cowan, 1971). McCabe (1971) suggested that the Gunn and Penitentiary members were deposited under maximum Ordovician transgression, whereas the Gunton and Williams members were deposited during a drop in sea level. The Stony Mountain thins from approximately 50 m in the south to about 30 m at its northern limit (McCabe and Barchyn, 1982).

While other Ordovician units in the southern Manitoba area appear to decrease in thickness northward, the Stonewall Formation retains a relatively uniform thickness, displaying a stabilization of the tectonic framework during latest Ordovician time (McCabe and Barchyn, 1982). Lithology of the Stonewall deviates minimally from the underlying units of the upper Stony Mountain (Gunton and Williams members), and consists of a mottled, sparsely fossiliferous dolostone.

A period of differential uplift and erosion occurred from the Late Paleozoic to Early Mesozoic time. This erosion resulted in the establishment of the present north-south trend of the Ordovician outcrop belts, which cut directly across the depositional trend of all Ordovician strata (McCabe and Barchyn, 1982). As a result, Ordovician outcrops are found from the north end of Lake Winnipeg to the U.S. border, with thicker, more "basinal" facies occurring to the south (McCabe and Barchyn, 1982).

2.2 The Red River Formation: Description and Previous Work

Winnipeg lay near the equator in the Late Ordovician, inundated by a shallow continental sea (Fig. 2.3). Deposition of the Red River Formation began as carbonate accumulation commenced during the Late Ordovician Period, initiated by a widespread marine inundation (Andrichuk, 1959). The formation thickens southwards towards the depocentre of the Williston Basin suggesting that deposition was probably initiated in the south (Andrichuk, 1959). Furthermore, thicker units of Red River strata in the south are related to the subsidence of the Williston Basin during Ordovician time (McCabe, 1971): increased subsidence in the central region of the basin resulted in thicker deposits basinward. Subsidence of the central basin area ceased in the Early Devonian (McCabe and Barchyn, 1982).

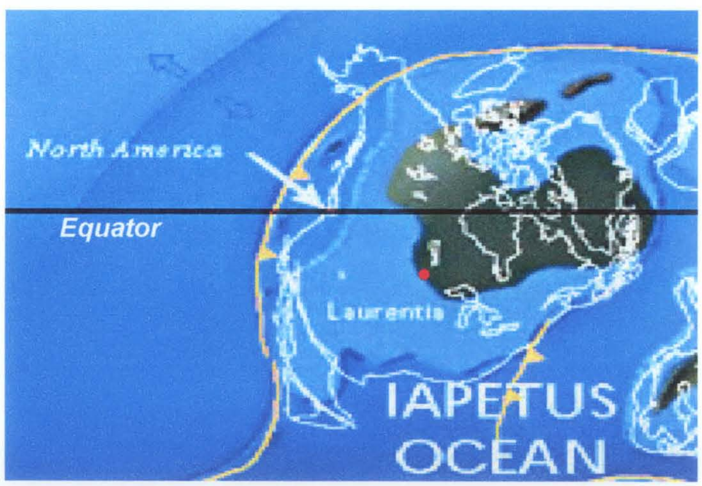


Fig. 2.3: Paleogeographic map of the North American craton during the Late Ordovician, prior to the transgression over the Canadian Shield (modified from Scotese, 2001). Winnipeg area denoted by red dot.

The basal contact of the Red River Formation is gradational, generally between a few centimetres to a few metres thick (Cowan, 1971); the upper contact, however, is found to be sharp at most localities (Andrichuk, 1959). Surficial exposure of the Red River Formation extends from southern Manitoba to north of Lake Winnipeg (Fig. 2.4).

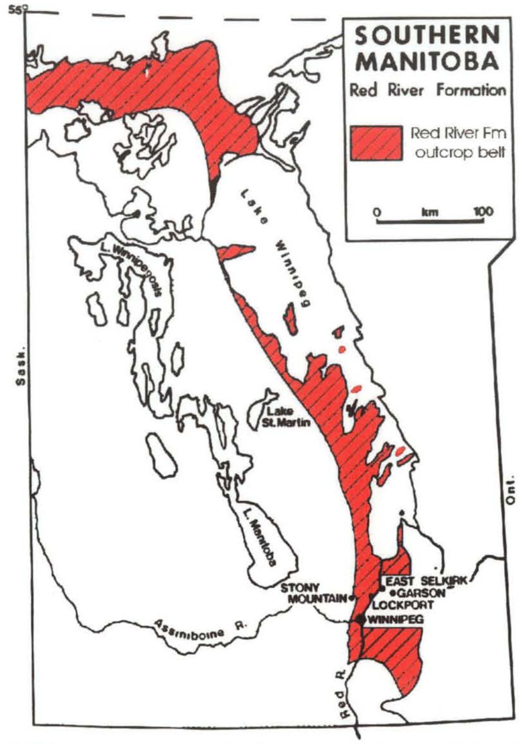


Fig. 2.4: The Red River outcrop belt of southern Manitoba (modified from Elias, 1981).

The four distinct members of the Red River Formation are described in ascending order: 1) The Dog Head Member is the lowest unit stratigraphically. It is composed of mottled dolomitic limestone and has been described as the "Lower Mottled limestone" (Dowling, 1895). The Dog Head Member is approximately 30 m thick in the Winnipeg area (Cowan, 1971).

2) The Cat Head Member is comprised of dolostone and highly dolomitized limestone that reaches a thickness of roughly 18 m in the Winnipeg area (Cowan, 1971).

The occurrence of chert in the Cat Head may have been the result of a decreased rate of subsidence during deposition (McCabe, 1971).

3) The Selkirk Member is a fossiliferous, partially dolomitized limestone that includes the Tyndall Stone. The Selkirk is marked by an abrupt increase in species diversity, along with the occurrence of large and abundant fossils (Jin and Zhan, 2000). Three-dimensional networks of dolomitized mottles produce the characteristically patterned lithology; Dowling (1895) originally called the unit the "Upper Mottled limestone". This was revised later by Foerste (1929), who introduced the name "Selkirk Member". The mottled lithology of the Tyndall Stone is extensive, and is known from Saskatoon to southeastern Montana, although varying degrees of dolomitization do occur (Porter and Fuller, 1959). For example: dolomitization in the Selkirk Member decreases northward from Winnipeg to Lake St. Martin, and increases northward from there (Cowan, 1971). The Selkirk Member was estimated by Cowan (1971) to be approximately 45 m thick in the Winnipeg area.

4) The Fort Garry Member is composed dominantly of dense lithographic dolostones, approximately 45 m thick (Cowan, 1971). Thin limestone beds occur at the top and near the middle of the member in some areas. Brindle (1960) described the member and noted the presence of anhydrites, suggesting a shallower and more restricted depositional environment than the underlying members of the Red River Formation.

Numerous studies on Red River fossils have been conducted, including work involving sponges (Rigby, 1971), colonial corals (Flower, 1961; Caramanica, 1973; Elias and Lee, 1993; Young, 1995), brachiopods (Jin and Zhan, 2001), cephalopods (Foerste, 1929; Flower, 1971) and trilobites (Westrop and Ludvigsen, 1983). Elias (1980, 1981,

1991) has studied various aspects of solitary rugose corals of the Red River Formation, from their use as paleoecologic tools to indicators of environmental cycles and bioevents. The paleobiological nature of the Tyndall Stone mottling has been investigated by Kendall (1977) and Coniglio (1999).

Chapter 3: Study Area

3.1 Garson, Manitoba

The Gillis Quarries are located in the town of Garson, Manitoba, approximately 40 km northeast of Winnipeg (Fig. 3.1). At present, a section of the Selkirk Member roughly 8 m thick is exposed at these quarries. The lowest units of the quarry begin approximately 10 m above the top of the Cat Head Member (Bannatyne, 1988); thus about 18 m of the lower Selkirk Member occurs in the Garson area.

Within the quarry, numerous pits have been excavated for dolomitized limestone (Tyndall Stone), revealing vertical walls containing abundant and well-preserved fossils. It is these vertical walls that were examined for paleoenvironmental and paleoecological evidence.

Two pits were chosen to be mapped for fossil and sedimentological data. These pits are referred to as pits 1 and 2 (Figs. 3.2a and 3.2b). Each pit had two walls: one wall ran north-south, and one ran east-west (total number of walls in the study area was thus four). Fig. 3.3 is an overhead view showing relative positions of the two pits. Quarry workers cut out walls in a step-like fashion, creating several beds of varying heights (between 0.54 and 0.89 m). Beds were cut out along planes of weakness within the dolomitic limestone. These planes were laterally extensive, and were ideal levels for breaking off and extracting Tyndall Stone.

Beds within the walls were identified in the field by the nomenclature used by quarry workers (A, B, C, etc., in descending stratigraphic order). Although there was an A-bed in the quarry, it did not extend to the two pits within the study area. In total, eight beds were exposed within the pits (J-bed was submerged in water, making it inaccessible).

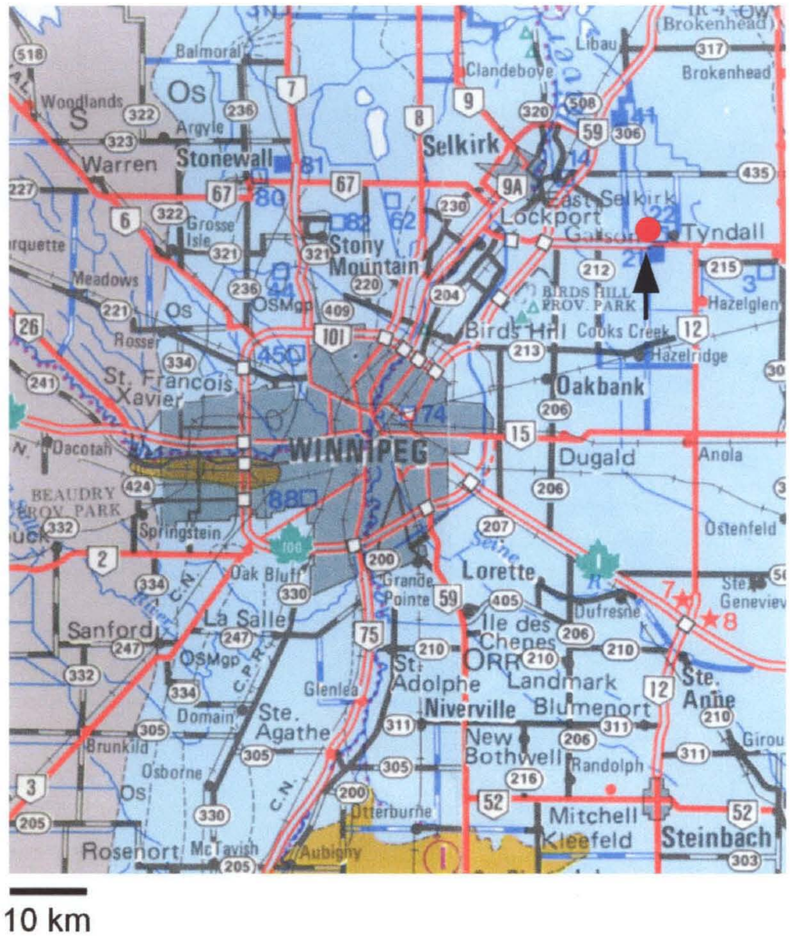


Fig. 3.1: Map of Winnipeg and surrounding area. Town of Garson denoted by arrow (modified from Corkery, 1994).

Fig. 3.2: a) Pit 1 and b) Pit 2 at Garson, Manitoba. Field assistant is 153 cm tall.

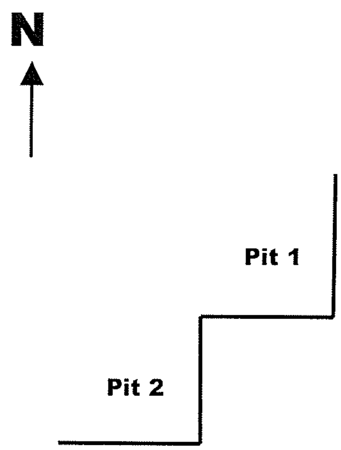


Fig. 3.3: Plan view showing locations of Pits 1 and 2 with respect to each other.

3.2 Pit Dimensions

Pit 2 consisted of beds B to I, and was deeper than pit 1, which extended only from beds B to F. The north-south wall of pit 1 measured a maximum of 38 m in length, while the east-west wall measured a maximum of 37 m. The north-south wall of pit 2 measured a maximum of 28 m in length, while the east-west wall measured a maximum of 27 m. The height of pit 2 (beds B-I) was 5.29 m, but pit 1 (due to its absence of beds G through I) was only 3.44 m high.

Chapter 4: Methodology

4.1 Identification and Classification of Fossils

Collection of fossil data was conducted in May and June 2000. Quarry wall surfaces were washed (to accentuate fossils) and specimens were counted in the field.

Fossils were identified to various levels based on the nature of their exposure in the vertical walls of the Garson quarry. For example: most of the colonial corals could be identified to the genus level, but most of the cephalopods were incomplete, and all of the trilobites were disarticulated, and were identified only to the class level.

Measurements of width, length and diameter were taken, when applicable, for every fossil over 1 cm across (fossils measuring less than 1 cm in width, length or diameter were excluded from the study). Thus, colonial corals, stromatoporoids, receptaculitids and bryozoans were measured at their widest points. Cephalopods, solitary rugose corals and the gastropods *Maclurina* and *Trochonema* were measured for diameter (or widest point of the ellipse if horn corals and apertures of the molluscs were not perfectly circular). The following is a list of fossil groups along with the size dimension measured for each:

Algal stromatolites	width	*Manipora* (colonial coral)	width
Brachiopods	diameter	*Palaeophyllum* (colonial coral)	width
Bryozoans	width	*Protrochiscolithus* (colonial coral)	width
Calapoecia (colonial coral)	width	*Rhabdotetradium* (colonial coral)	width
Catenipora (colonial coral)	width	Receptaculitids	width
Cephalopods	diameter	*Saffordophyllum* (colonial coral)	width
Crenulites (colonial coral)	width	Stromatoporoids	width
Favistina (colonial coral)	width	Solitary horn corals	diameter
Hormotoma (gastropod)	length	*Trochonema* (gastropod)	diameter
Maclurina (gastropod)	diameter		

Size measurements of fossil specimens were made on the cut faces of the Tyndall Stone walls, not from collected samples. As such, the actual size of specimens may have been larger than recorded. Average fossil size data is displayed in Appendix E (Table E-6).

The degree of abrasion to solitary rugose corals was documented using the following categories:

Well preserved:	wall is complete
Weakly abraded:	wall shows thinning and slight removal
Moderately abraded:	wall shows significant removal
Highly abraded:	wall completely removed; corallum interior damaged

Complete original fossil data may be found in Appendix A.

4.2 Bed Subdivisions and Fossil Mapping

Before mapping proceeded, each bed in the quarry was sectioned into areas 100 cm wide, resulting in numerous 100 cm-wide "rectangles" (Figs. 4.1a and 4.1b). Quarry nomenclature was retained throughout the rectangle-making process; the highest bed was named Bed B, while beds beneath were named C, D, E, etc., as they progressed lower. Rectangles were numbered from left to right on each of the four quarry walls (Fig. 4.2). Using this method, the stratigraphically highest rectangle to the extreme left on the north-south wall of pit 1 would be named rectangle "NS pit 1 B-1".

Fig. 4.1: Coordinate grid system used to map fossils in a) pit 1 and b) pit 2.

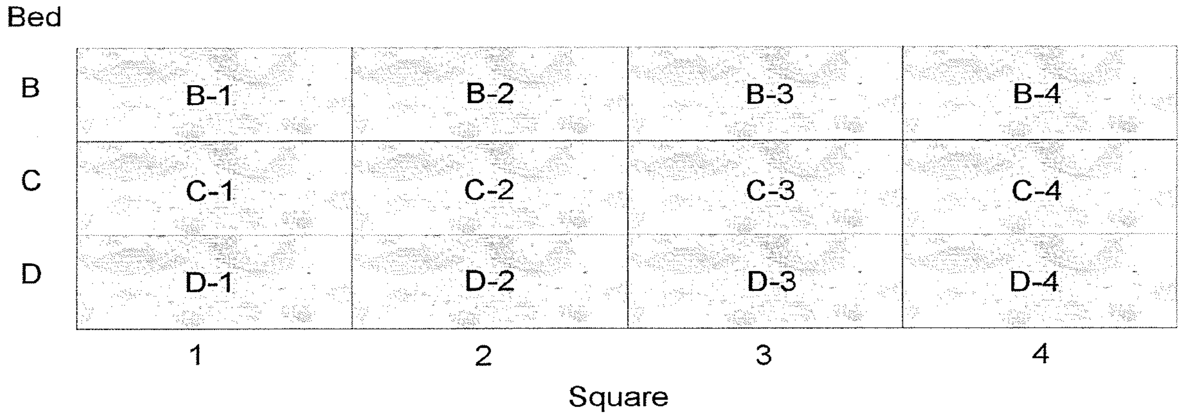


Fig. 4.2: Method for Tyndall Stone wall mapping. Each rectangle is one hundred centimeters wide. Heights vary according to thickness of individual beds.

Each rectangle was mapped individually for fossil data. Mapping was accomplished using an x-y coordinate grid system. Features within each rectangle were noted in the horizontal and vertical directions using this simple x-y grid. The origin (0, 0) of each individual rectangle was located in the lower left-hand corner. For example, two fossils in rectangle B-25 of the north-south wall in pit 1 are mapped below (Fig. 4.3). Using this system, fossil Q is located in rectangle B-25 (21, 50), and fossil Z is located in rectangle B-25 (82, 17). Coordinates were measured from the centre of each specimen.

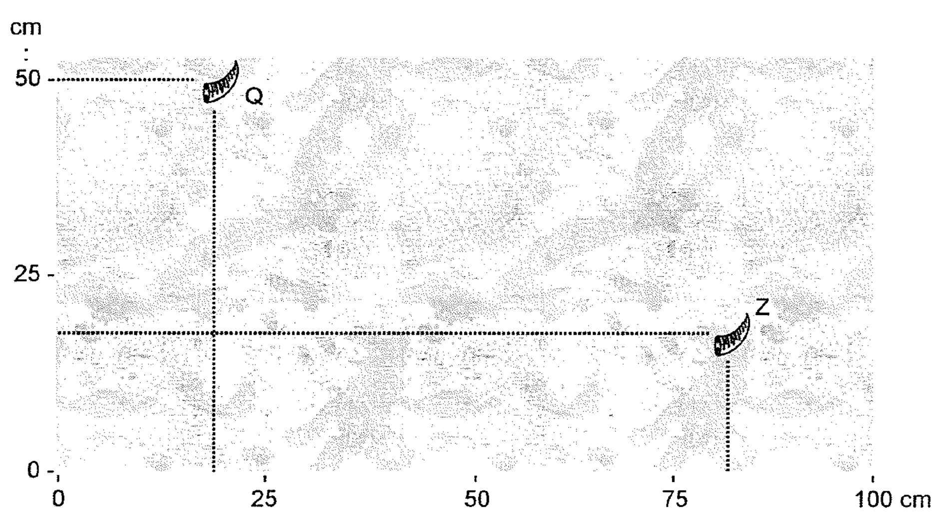


Fig. 4.3: Sample of single rectangle internal mapping (B-25, NS wall).

4.3 Revision of Mapped Data

Once all data had been gathered, the x-y coordinate system used in the field was revised, making data more manageable and analysis simpler. Data from the north-south walls of pits 1 and 2 were projected onto the same plane. This was also done with the east-west walls. Thus, there were now technically two walls, one running north-south and one east-west (Figs. 4.4a and 4.4b). Complete revised fossil data may be found in Appendix B.

Quarry nomenclature was also revised. Instead of eight beds, the entire section was divided into ten intervals, each 0.50 m high. These ten intervals were numbered 1 to 10, with interval 1 the lowest stratigraphically (Fig. 4.5). The top 0.29 m of the section was excluded from the study, as the surface area it covered was negligible (in addition, most upper beds were obscured by vegetation, gravel and boulders). Table 4.1 is a breakdown of the ten intervals within the study section.

Interval	**Vertical Distance (m)**	**Area (m^2)**
10	4.50-4.99	61.00
9	4.00-4.49	59.82
8	3.50-3.99	59.50
7	3.00-3.49	61.18
6	2.50-2.99	61.41
5	2.00-2.49	60.00
4	1.50-1.99	35.85
3	1.00-1.49	25.94
2	0.50-0.99	26.38
1	0.00-0.49	25.00

Table 4.1: Breakdown of combined intervals 1 through 10 of the Tyndall Stone study section.

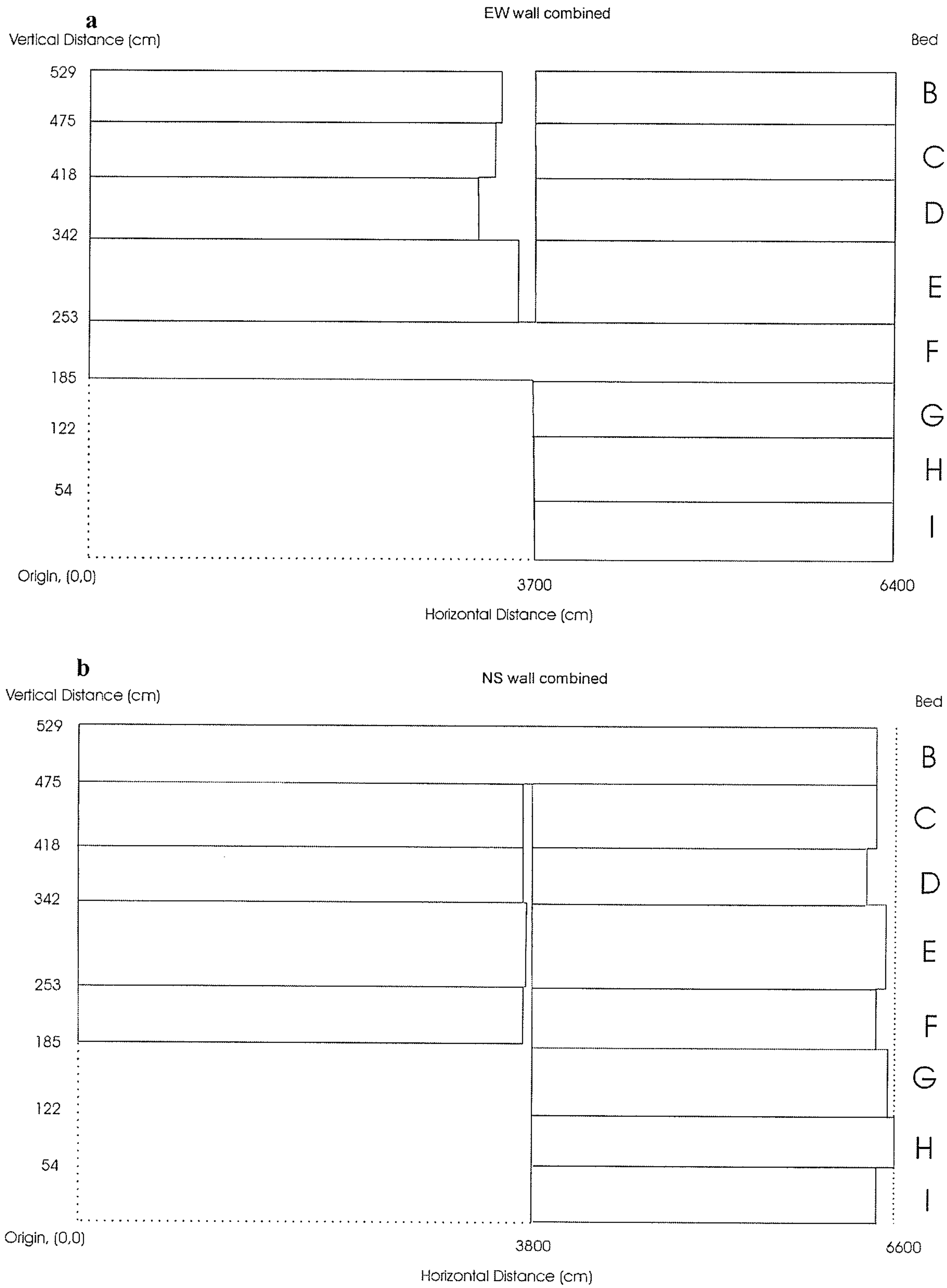


Fig. 4.4: Dimensions of combined a) east-west and b) north-south walls.

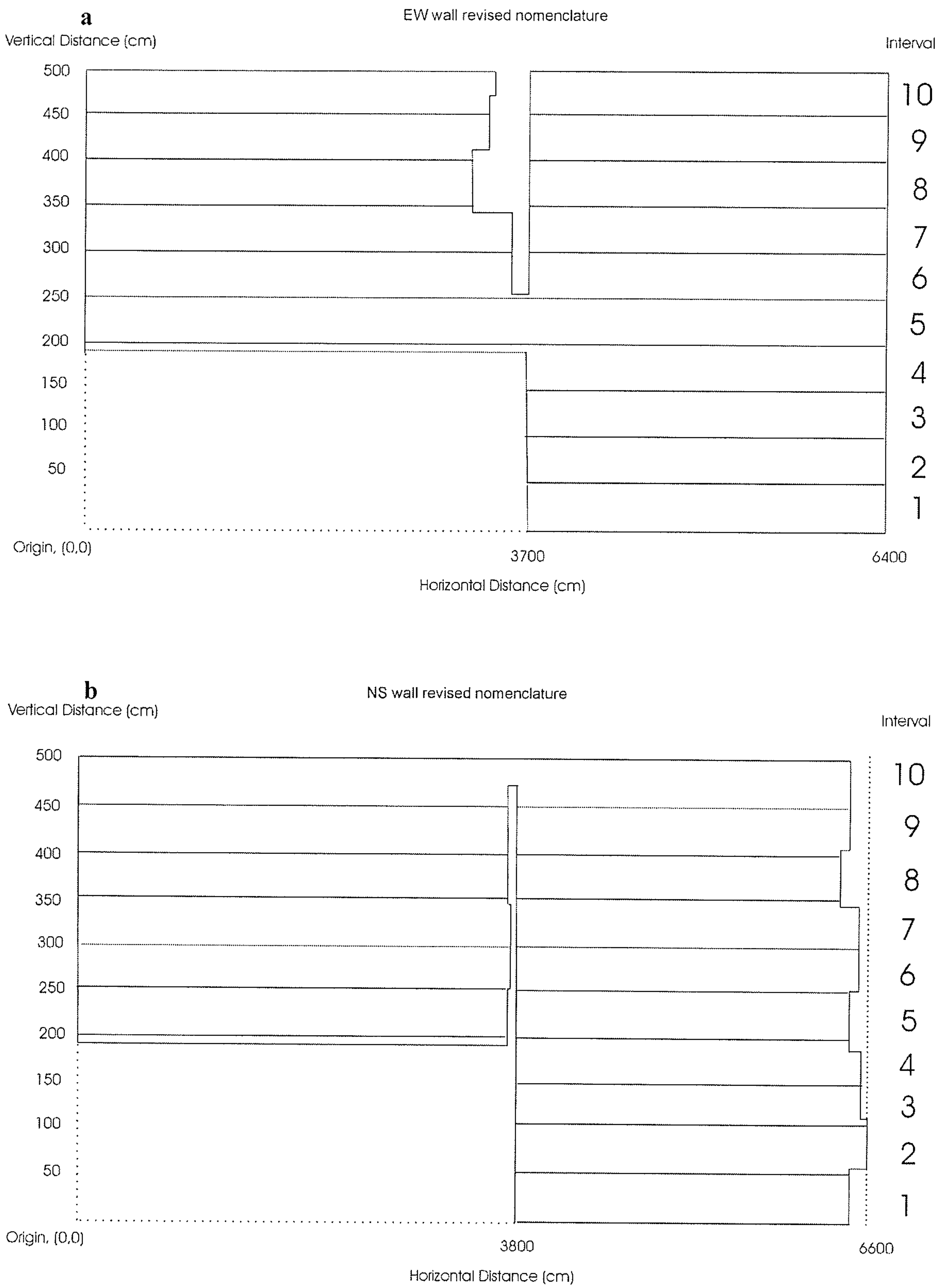


Fig. 4.5: Revised nomenclature for a) east-west and b) north-south walls.

Fossil abundance was expressed as density (specimens per m^2). Mapped fossil data were subsequently analyzed to interpret the paleoenvironment, and identify the presence of environmental and ecological change.

Chapter 5: Sedimentological Data

Paleoenvironmental interpretation of the Tyndall Stone was aided by examination of sedimentological data. This included examination of storm lens frequency and thickness, the nature of the dolomite mottling, and an instrumental analysis using transmitted light microscope, cathodoluminescence and electron microprobe techniques.

5.1 Storm Lenses

Storm lenses are well preserved throughout the Tyndall Stone. Lenses commonly exhibit graded (upward-fining) deposits, which consist predominantly of carbonate and broken fossil clasts embedded in finer-grained carbonate muds (Fig. 1.1)

The prevalence of storm lenses throughout the entire section suggests that the Tyndall Stone environment lay above storm wave base. The water was therefore shallower than 100 m (Boggs, 1995). This assumption is further supported by uniformitarian analysis of fossil data (see *Fossil Groups of the Tyndall Stone*). Shallow-water features such as oscillation ripples and mud-cracks are absent, suggesting the paleoenvironment was below fair-weather wave base.

The relationship between depth and sedimentological evidence of storm activity in marine environments was summarized by Clifton (1976 as cited in Boucot, 1981):

> "Most coasts are subject to intense but relatively infrequent storms or abnormally large swell. The shoreward sequence of structures produced under these conditions may resemble the normal sequence but generally reflects larger orbital velocities, and possibly velocity asymmetry. The large waves will rework sediment most deeply in shallow water; the thickness of the reworked layer should decrease in progressively deeper water until at some depth which

> waves normally have no effect on the bottom, only the sediment surface is disturbed."

Shallow water sediments record evidence of weak storms that deeper water environments would not (as they would not touch bottom in these deeper waters). It follows, then, that shallower environments should not only record thicker storm deposits than deeper ones, but also a greater number of deposits as well.

In the Tyndall Stone, storm lenses extend horizontally up to several metres and range in thickness from 2 to 40 cm. Because the horizontal extent of lenses is not an indication of storm intensity, only vertical thickness of lenses was measured. Complete and fragmented fossils, including solitary rugose corals, gastropods, cephalopods, and smaller colonial corals, receptaculitids and stromatoporoids are commonly found within storm lenses. The majority of colonial organisms are out of life orientation, either tilted or completely overturned. High-energy storm events undoubtedly removed the organisms from the substrate and redeposited them in various positions. Horn corals are particularly prevalent within storm lenses (see *Fossil Groups of the Tyndall Stone*).

Linear regression shows that storm lenses tended to increase in frequency and thickness over time. Maximum abundance and thickness are reached within intervals 8 and 9 (Figs. 5.1a and 5.1b). The thickest 10% of storm lenses in each interval were averaged; thus weaker storms that were recorded in shallower deposits (but not deeper ones) would not skew the distribution. It should be noted as well that the two thickest deposits were found within intervals 8 and 9 (32 and 40 cm, respectively). Fig. 5.2 is a plot of storm lens distribution and individual thickness from the entire section. Storm lens coordinates were measured to the middle of the lens (x-coordinate) and the base of the lens (y-coordinate). Complete storm lens data may be found in Appendix F (Tables F-7 and F-8).

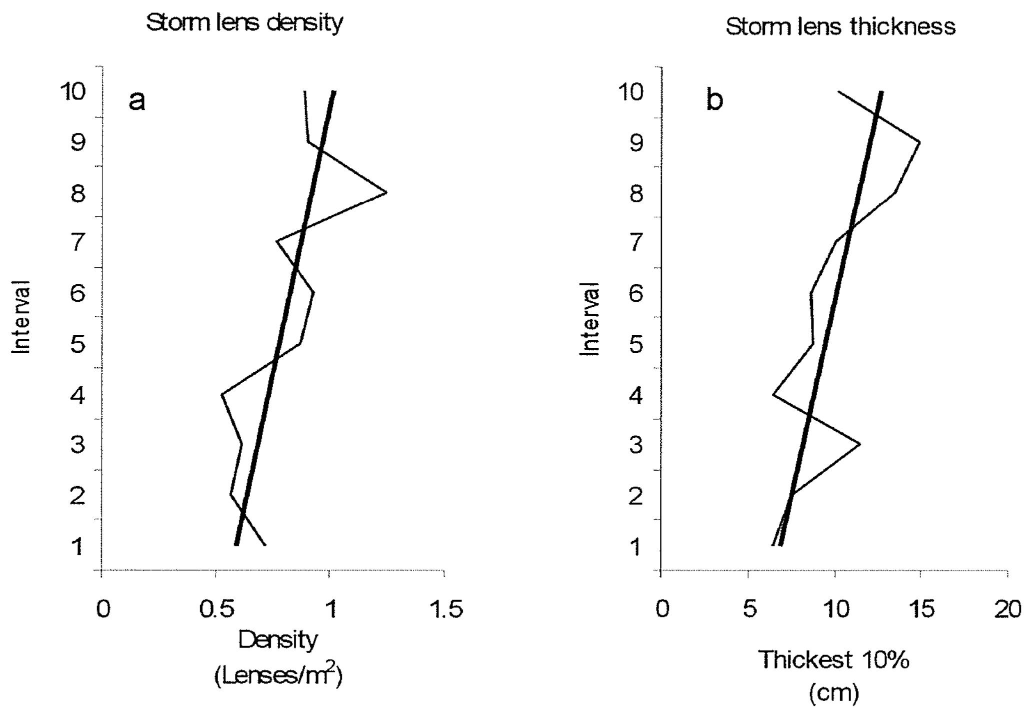


Fig. 5.1: a) Storm lens density with regression line (straight black line) and b) storm lens thickness with regression line. Thickest 10% of storm lenses are shown.

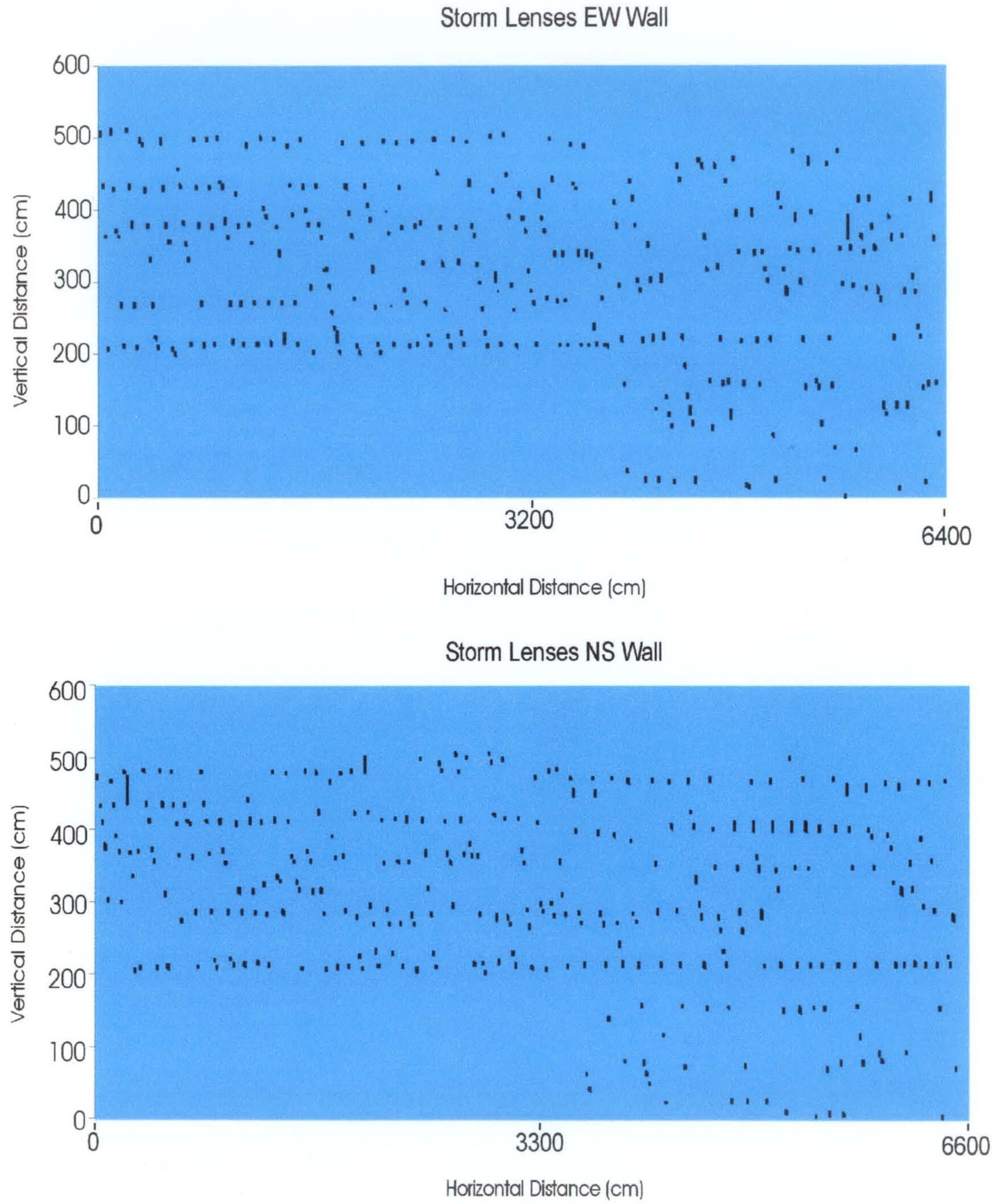


Fig. 5.2: a) Storm lens distribution and thickness on east-west and b) north-south walls.

A sharp drop in both storm lens density and average thickness was observed within interval 4. In fact both of these features reach section-minimums within interval 4. This suggests that interval 4 was deposited within a deeper environment than any of the other intervals. Combined with the upward-increasing frequency and thickness of storm lenses, it is inferred that an overall shallowing-upward paleoenvironmental change occurred, with a sudden deepening within interval 4.

Depending on the rate of sedimentation and lithification, it is possible that many more storms occurred within the Tyndall Stone environment, but were erased by the effects of bioturbation.

5.2 Mottling of the Tyndall Stone

Tyndall Stone mottling has always been believed to be biological in origin: however, a general consensus as to what organism -- or organisms -- created these mottles is still a matter of debate. Furthermore, the exact sedimentological and diagenetic processes that created these mottles (which are dolomitic, unlike the surrounding limestone matrix) are still unknown.

Wallace (1913) believed that the mottling in the Tyndall Stone was "fucoidal" in origin; the structure of the mottles -- and even the high magnesium content associated with the dolomitization -- was attributed to organisms such as algae. Birse (1928) subsequently rejected this theory, suggesting instead that burrowing animals were responsible.

At present, the most widely accepted cause of mottles is bioturbation by burrowing organisms -- probably the Ordovician equivalent of modern thalassinid shrimps, which are responsible for creating tube-like networks in sediment (Coniglio, 1999; Figs. 5.3a and 5.3b) known as the ichnogenus *Thalassinoides*. Indeed, the dimensions of the mottles closely resemble trace fossil, which were defined by Ehrenberg (1944, as cited in Bromley, 1990) as "dichotomously or T-branching boxworks, mazes and shafts, unlined and unornamented". Still, uncertainty exists as

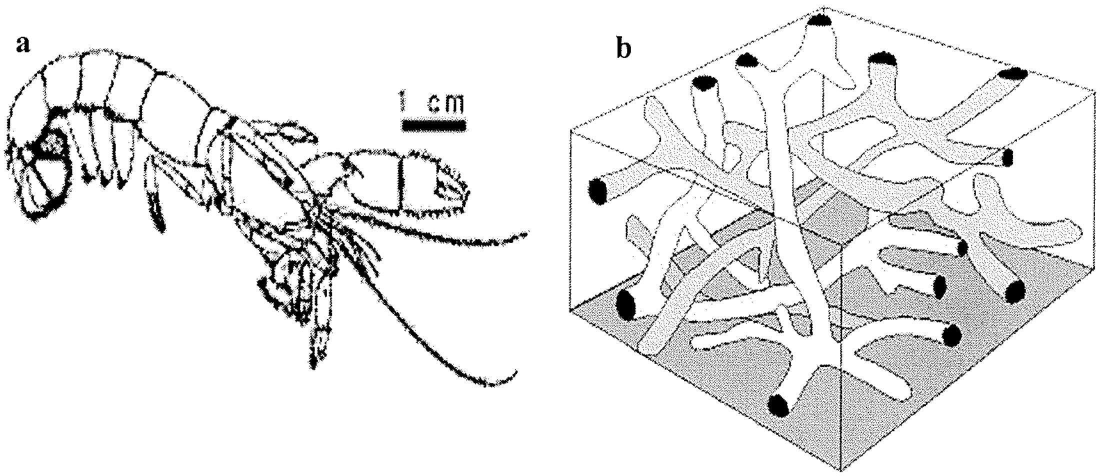


Fig. 5.3: a) Modern thalassinid shrimp and b) three-dimensional diagram of *Thalassinoides* tube network (from Coniglio, 1999).

thalassinids are unknown before the Jurassic, and decapods in general are unknown before the Devonian (Watkins, 1997). The burrowing of thalassinid shrimp in semi-firm sediment can result in the loss of primary lithofacies characteristics (Curran, 1994). This is clearly shown in the Tyndall Stone, where primary sedimentary structures are virtually unknown. It is thus highly possible that the traces within the Tyndall Stone are *Thalassinoides*.

Thalassinoides is an ideal trace fossil for recognizing shallow marine environments (Curran, 1994), and generally indicates that the organisms creating the burrows lived and fed within the sediment (burrows of this form are known as domichnia).

Burrows in the Tyndall Stone are preferentially dolomitized (the surrounding sediment, or matrix, is composed mostly of calcitic limestone). Smaller, secondary burrows are found within the larger primary burrows. In fact, these smaller tubules are exclusive to the larger dark brown mottles. Birse (1928) proposed that it was these smaller burrows that provided the pathway for dolomitizing fluids to penetrate the partially lithified sediment, creating the larger dark-brown mottles around the smaller tubules (thus only one episode of burrowing was proposed by Birse). However, Kendall (1977) disproved this theory, citing that many of the smaller tubules were not centrally located within the larger brown mottles. Kendall argued that mottling should have been equally distributed around the smaller tubes if the tubes were the pathways for dolomitizing fluids. Futhermore, many of the larger mottles were shown to contain no smaller burrows within them. Thus it was not possible, under Birse's theory, to channel dolomitizing fluids to these mottled regions.

It is now generally accepted that two episodes of burrowing occurred, and that the brown mottles are not dolomitized envelopes of burrowed sediment around the smaller tubules (Kendall, 1977). Secondary burrows are confined to dolomitic mottles because the host sediment (limestone matrix) had become sufficiently coherent to prevent bioturbation at the time of secondary burrow formation. Primary burrows were therefore not lithified during early diagenesis, thus allowing dolomitizing fluids to freely penetrate and preferentially dolomitize the softer sediment. It is thought that the primary burrows contained nutrients left by the shrimp-like organisms, possibly their feces, which caused secondary burrow-makers to excavate the primary sediment-filled tunnels for nutrients. It has been suggested that the organic content of the feces was responsible for keeping the burrows permeable enough for dolomitizing fluids to penetrate them (Coniglio, 1999).

Within the Tyndall Stone, shells of bivalves, cephalopods and gastropods, which were presumably aragonitic, are always dolomitized, while other fauna, such as colonial and solitary corals, remain as calcite. There are two theories proposed for this phenomenon (Kendall 1977): 1) dolomitization occurred before aragonite could be stabilized to calcite, and 2) the unstable aragonite dissolved out, and sediment infilled the void space where the organism's shell once existed; these secondary sediments were later dolomitized, along with primary burrows, by penetrating fluids. It would appear that the second theory is the more viable option, as evidence of fine sediment and even shell fragments within the space previously occupied by larger fossils has been found. Cementation of the sediment must have occurred before formation of large burrows to resist compaction.

Within the Tyndall Stone, no mottling was observed within storm lenses save for a few escape structures. Mottling shows marked decreases throughout the section directly above storm lenses, where they may constitute as little as 10 percent of the rock's surface area. They do, however, grade upward back to 'normal' levels within a few centimeters. Storm events may have produced two effects responsible for the apparent reduction and re-establishment of burrowing activity: 1) storms removed and re-deposited sediment at and near the sediment-water interface. Subsequent compaction of these loose, unconsolidated sediments would hide any evidence of tunnel networks; 2) high energy events such as storms would have thrown the upper surface of the sediment, along with any organisms dwelling there, into chaos, possibly killing a large majority. Burrowers would thus have had to re-establish themselves within the substrate, a process that would take time (rate of sedimentation was therefore faster than rate of bioturbation). The second theory relies on the assumption that Tyndall Stone burrowers were shallow infaunal organisms; modern thalassinid shrimp burrows have, however, been found extending down as far as one metre (Boucot, 1981).

Outlines of the larger brown burrows are sharp, with roughly circular cross-section, and deformation of the burrow margins is minimal. These features indicate the presence of a firm substrate (Westrop and Ludvigsen, 1983). Mottling appears to be reduced beneath larger colonial corals and stromatoporoids, suggesting that the large skeletons actually provided a barrier to bioturbation. This is referred to as "shielding".

According to Cowan (1971), the percentage of dolomite in Tyndall Stone varies from 10 to 50 percent (by area), the average being 35. Analysis of the entire section shows that mottling became more abundant up-section. Lower intervals exhibit mottling of approximately 35 percent by area (not including storm lenses), while the upper intervals boast mottles covering 45 percent of the vertical faces. This cannot be attributed to more frequent storm activity within the lower intervals than the higher ones, since sedimentological data suggests that storm activity was less prevalent in lower intervals (see *Storm Lenses*). It is more likely, then, that there were an increasing number of burrowing organisms in the sediment over time, due possibly to an increase in the distribution of nutrients. An overall increase in abundance of shelly fossils over time supports this hypothesis, as an increase in biomass would have provided more organic material to the sediment upon mortality (and thus increased sedimentation rates).

5.3 Instrumental Analysis of Sedimentological Data

Three instrumental techniques were used to analyze the dolomitic limestones Tyndall Stone: 1) transmitted light microscopy, 2) cathodoluminescence (CL) microscopy, and 3) electron microprobe analysis (EMPA). Transmitted light and CL microscopy are qualitative methods, while EMPA is quantitative. Seven thin sections from beds B to H were borrowed from Moffat's (2000) undergraduate dissertation.

Transmitted Light Microscopy

The transmitted light microscope allows for the inspection of thin section material. Prior to analysis, thin sections were etched with acid and then partially (half the slide) stained with Alizurin Red to test for dolomite; calcite is dyed red using the stain, while dolomite remains unmarked. Concentrations of calcite and dolomite were noted in both the matrix and the mottles, along with porosity and grain types.

Dolomite appears as euhedral rhombs in high concentrations (up to 95%) in the mottles, while calcite occurs abundantly in the matrix. Calcite is found dominantly in microcrystalline (micrite) and bioclastic form. The bioclasts include gastropod, ostracode, trilobite, bryozoan, and brachiopod fragments, but echinoderm debris (crinoid ossicles) predominates.

Mineralogical differences between beds were minimal, even between the stratigraphically lowest and highest sections. Porosity and grain type were consistent throughout all samples as well. Complete transmitted light microscope observations may be found in Appendix C (Table C-1).

Cathodoluminescence Microscopy

CL microscopy is a qualitative, non-destructive method of analysis, which involves the emission of light by a material via stimulation by electron bombardment. Only weakly bound outer electrons are involved in the cathodoluminescent process. Incident electrons from an electron beam raise bound electrons in a sample to higher energy levels (Yacobi and Holt, 1990). When these excited electrons return to their original state, the energy surplus is emitted as light quanta (photons). The emission of photons in luminescence is thus due to the electronic transition between an initial and final energy state. Different minerals have their own characteristic spectra, which we subsequently use for identification. The intensity and colour of light is affected by any defects in the crystal structure and by impurities in the atom; these behave as 'activators' because they give rise to additional energy levels (manganese is a common example) (Yacobi and Holt, 1990). Typical cathodoluminescent colours for common minerals are listed in Table 5.1.

CL microscopy was conducted with the main goal of identifying and differentiating dolomite and calcite occurrence. As expected, the mottled areas of the Tyndall Stone emitted a typical red colour, indicative of high dolomite content. The limestone matrix luminesced orange, suggesting high calcite content (Fig. 5.4). From visual observations, dolomite concentrations were estimated at approximately 95% in the mottles, while much lower (1-3%) in the matrix. These findings are consistent with those discovered through regular transmitted light microscopy. Concentrations of dolomite did not differ noticeably between slides B to H, and thus did not alter with age.

Mineral	Colour
Apatite	Orange
Calcite	Orange
Dolomite	Red
Enstantite	Blue
Plagioclase	Blue
Quartz	Orange
Wollastonite	Green

Table 5.1: Emission spectra for various minerals under CL light (from Yacobi and Holt, 1990).

Contacts between the limestone matrix and dolomite mottles, as observed through CL microscopy, show irregular transitions (Fig. 5.5). Minute traces of dolomite can be seen protruding into the limestone, and the reverse also occurs. In general, however, the contact is sharp, sudden, and distinct. These patterns are displayed in all beds (B to H), with no notable changes in the nature of the contacts between mottles and matrix stratigraphically. This corresponds to the trend obtained from transmitted light microscopy.

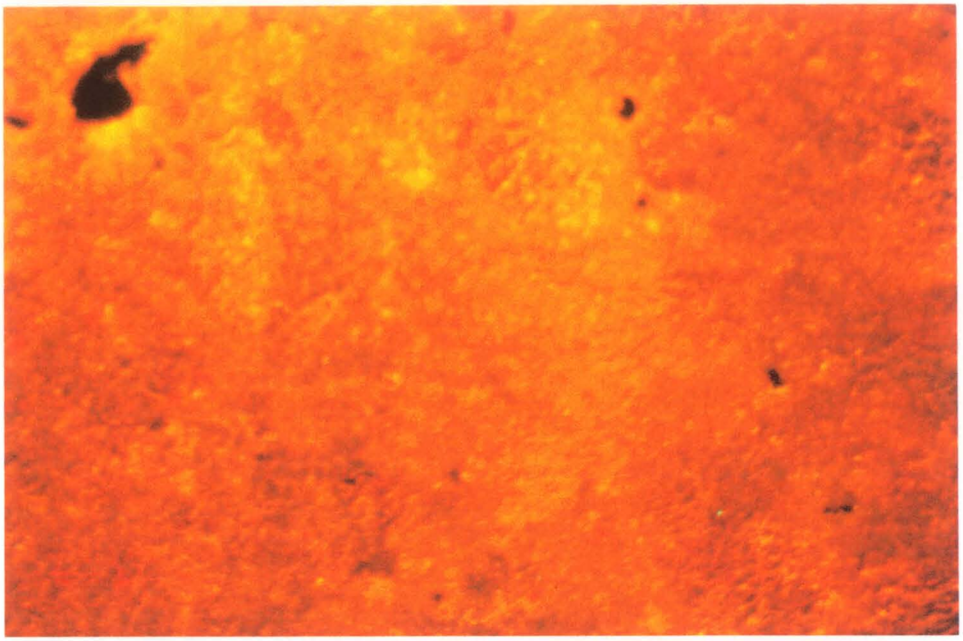


Fig. 5.4: Tyndall Stone matrix as seen under cathodoluminescence. Characteristic orange colour is displayed by the dominantly calcitic matrix.

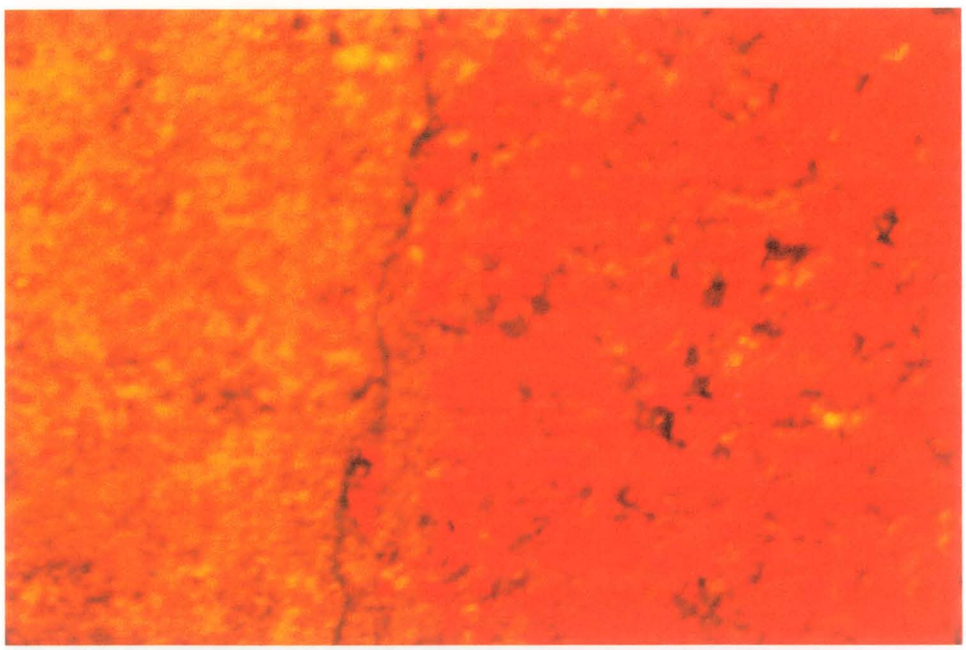


Fig. 5.5: Tyndall Stone mottle-matrix contact as viewed under cathodoluminescence. Note the irregular transition between dolomite mottle (red) and calcite matrix (orange).

Electron Microprobe Analysis

EMPA is used for analyzing the chemistry of small areas of solid samples using a small electron beam to stimulate inner electrons, which subsequently release x-rays (a standard beam width of 1 μm was selected for this study). The x-ray spectrum contains lines that are characteristic of the elements present. By comparing the line intensity with those emitted from standards, it is possible to determine precise concentrations of the elements present in the sample (Skoog, 1985). Thus EMPA is a quantitative technique, as opposed to the qualitative technique of CL.

Due to the likelihood that mineralogical and chemical changes between directly overlying/underlying beds were not substantial, only three of the seven thin sections were prepared for EMPA (representing beds B, E, and H). For each slide, three regions were specifically targeted for inspection: a) the matrix, b) the mottles, and c) the contact between the matrix and mottles. Single recording points were taken to examine the matrix and mottles. The contacts between the two, however, were studied by making transects (multiple recording points) along a line originating from the mottles, and into the matrix (across the mottle-matrix contact). Lengths of transects were less than 1 cm, with eight recording points for each line. Complete EMPA data and observations may be found in Appendix C (Tables C-2 and C-3).

EMPA showed that chemical and mineralogical differences were not significant between the upper (B), middle (E) and lower (H) beds. In all three beds, weight percents were similar, with magnesium occurring typically at $<1\%$ in the matrix and approximately 12% in the mottles. Manganese and iron were found strictly in trace amounts in both the matrix and mottles.

EMPA quantitatively confirms that mottles were dominantly composed of dolomite, while the matrix was largely made up of calcite. Probe transects made between the matrix and mottles show that chemically, contacts were sharp, not gradational, in nature. This is evident by the sharp drop in magnesium content across the contact.

Chapter 6: Fossil Distribution and Paleoecology

Using fossil specimens to determine environmental change is ideal for examination and analysis of the Tyndall Stone. Due to the seemingly homogeneous lithology, environmental fluctuations are difficult to determine without the aid of fossil data. The sensitivity of fauna to environmental change is thus believed to be greater than that of the lithofacies.

A total of 3173 fossil specimens were identified within the Tyndall Stone study area, encompassing members of six distinct phyla from kingdom Animalia (Arthropoda, Brachiopoda, Bryozoa, Cnidaria, Mollusca, and Porifera) and one representative from kingdom Monera (algal stromatolites). The assemblage is dominated, however, by the problematical receptaculitids (Fig. 6.1a), which remain unclassified. Horn corals represent the next most populous group, which far outnumber (in order of abundance) the gastropods, cephalopods, stromatoporoids, colonial corals, and other groups.

Fossils within the Tyndall Stone walls were found at a mean density of 6.66 specimens per m^2, and regression analysis showed an overall increase in density over time (Fig. 6.1b). Maximum density was displayed within interval 9 (8.88 specimens per m^2) and a marked low density was shown within interval 4 (3.60 specimens per m^2). Complete fossil count data is displayed in Appendix E (Tables E-2 to E-5).

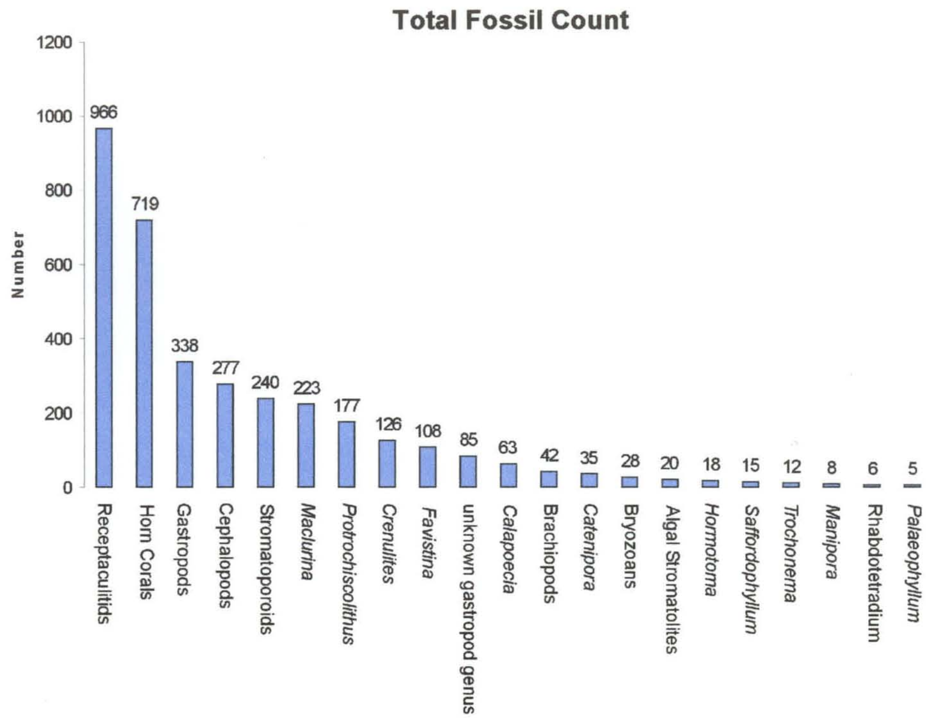


Fig. 6.1a: Absolute abundances of all Tyndall Stone fossils counted.

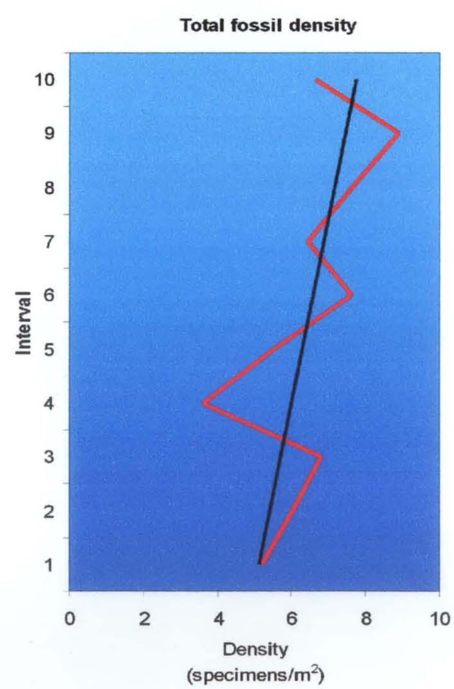


Fig. 6.1b: Density of all Tyndall Stone fossils through time. Linear regression (straight black line) displays increasing-upward trend.

6.1 Statistical Analysis

Interpretation of the Tyndall Stone paleoenvironment was facilitated by statistical analysis of the fossil assemblage. Three statistical techniques were utilized to assist in the interpretation: cluster analysis, correlation analysis, and linear regression. All three methods are described below.

Cluster Analysis

Cluster analysis is a multivariate technique that seeks to organize information about variables so that relatively homogeneous groups, or "clusters," can be recognized (Romesburg, 1984). The clusters formed with this family of methods should be highly internally homogeneous (members are similar to one another) and highly externally heterogeneous (members of one cluster are not like members of other clusters). Thus the purpose of cluster analysis is to discover a system of organizing observations into groups, where members of the groups share properties in common.

Two forms of cluster analysis were performed on Tyndall Stone data: r-mode and q-mode, using the computer program Clustid. R-mode cluster analysis grouped fossil taxa based on their tendency to occur together within intervals. The basic premise is as follows: counts of all fossil groups were taken from each of the ten intervals and compared with each other, within each interval. For example, the total number of horn corals within interval 1 was compared with the total number of all the gastropods, cephalopods, stromatoporoids, etc., from that interval. This process was repeated for intervals 2 to 10. Fossil groups that occur together the most frequently, by interval, were given the lowest values along a *dissimilarity index*, and were grouped together. Taxa that were most commonly occurring together were thus "clustered", establishing relationships that could be observed statistically.

Q-mode cluster analysis can be viewed as the reciprocal of an r-mode cluster analysis; instead of fossils being grouped together, the intervals were clustered based on the occurrence of fossil taxa within them. Thus, intervals with similar ratios of fossil groups (and, presumably, similar paleoenvironments) were clustered together.

Dendrograms of both r-mode and q-mode cluster analyses were created (Figs. 6.2 and 6.3), along with a combined q- and r-mode dendrogram, which displays both results within a single diagram (Fig. 6.4). Points at which branches connect in a dendrogram denote their degree of dissimilarity.

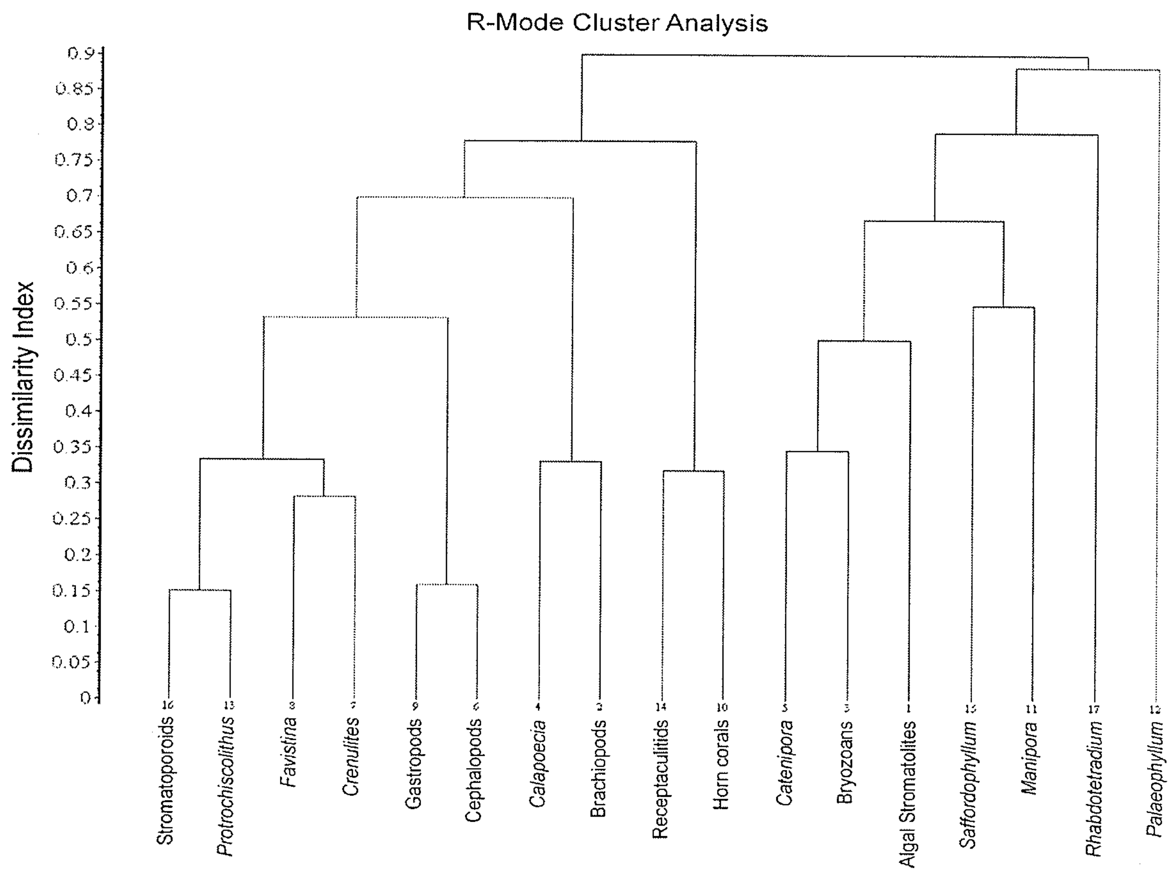


Fig. 6.2: R-mode cluster analysis dendrogram.

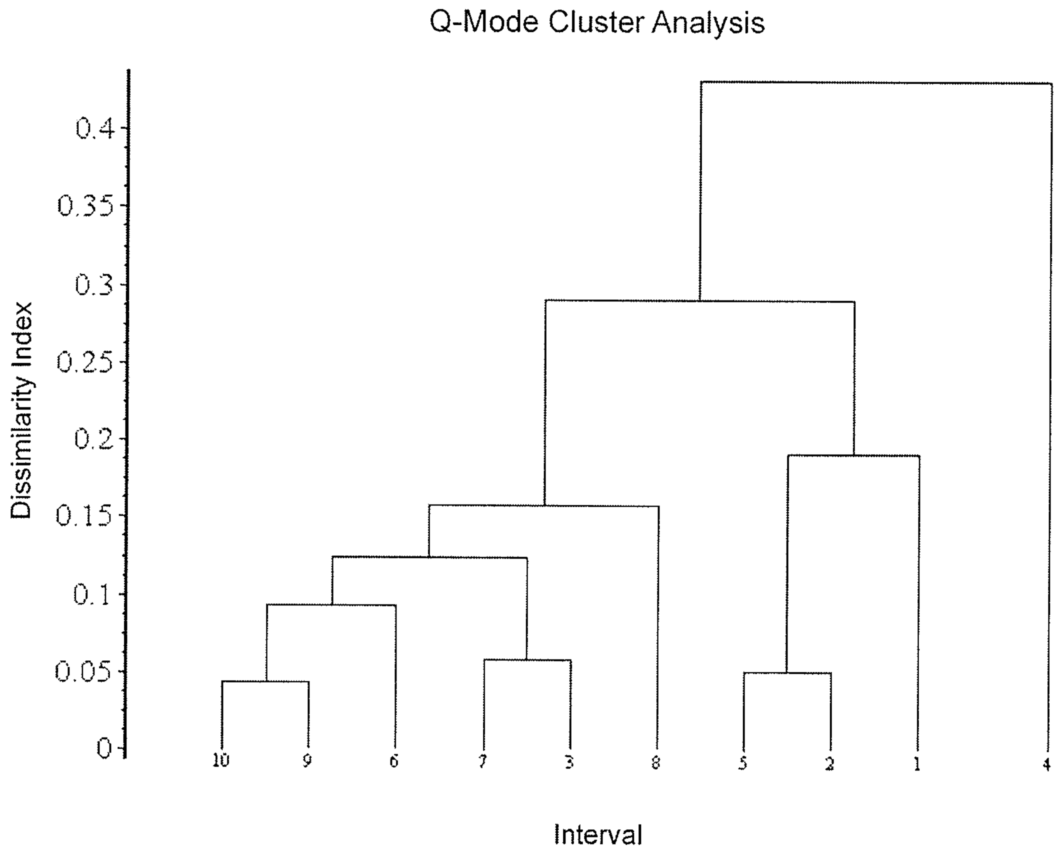


Fig. 6.3: Q-mode cluster analysis dendrogram.

Correlation Analysis

A correlation analysis measures the strength of association between two data sets, and returns a dimensionless value, the *correlation coefficient,* that ranges between -1.0 and 1.0 (McGarigal, et al., 2000). In brief, correlation analysis determines whether two ranges of data move together, or whether values in both sets are unrelated.

A correlation coefficient of -1.0 is a strong negative correlation; this shows that two sets of data move strongly in opposite directions (small values of one set are associated with large values of the other and vice-versa). A correlation coefficient of 1.0

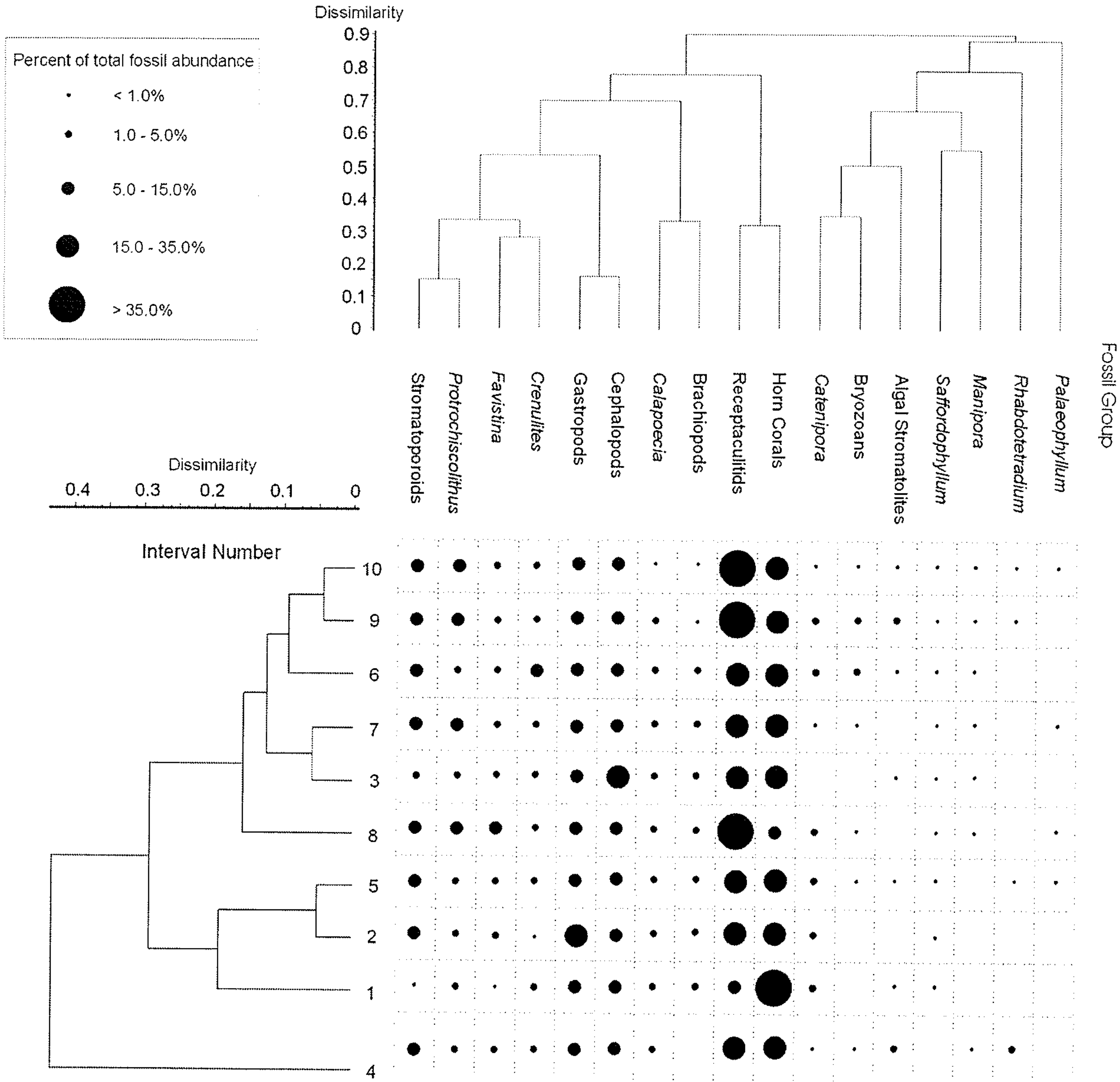


Fig. 6.4: Combined q- and r-mode cluster analysis dendrogram.

is a strong positive correlation; this shows that two sets of data move strongly in identical directions (small values of one set are mirrored by small values of the other, and strong values mirror strong values). Two completely unrelated data sets yield a correlation coefficient of zero.

Correlation analyses were performed on fossil groups based on their abundances and average size over time (up-section). Pertinent trends are individually described later (see *Fossil Groups of the Tyndall Stone*). The correlation method used in this study was the Pearson product-moment correlation, assisted by the computer program Microsoft Excel. Complete correlation analysis data is displayed in Appendix D (Tables D-1 and D-2).

Linear Regression

A simple linear regression was performed on all fossil groups to determine any increasing or decreasing trends in fossil abundance and/or size up-section (Figs. 6.5 and 6.6). Also analyzed were encrusting relationships (plates 14 and 15). The regression was based on the least squares method (see Bhattacharya and Johnson, 1977, p. 342-349 for thorough discussion), essentially fitting the data plots with a "best-fit line". This regression line was used to observe upward increasing and/or decreasing trends. Analysis was performed using the computer program Microsoft Excel. All linear regression analysis data is displayed in Appendix D (Tables D-3 to D-7).

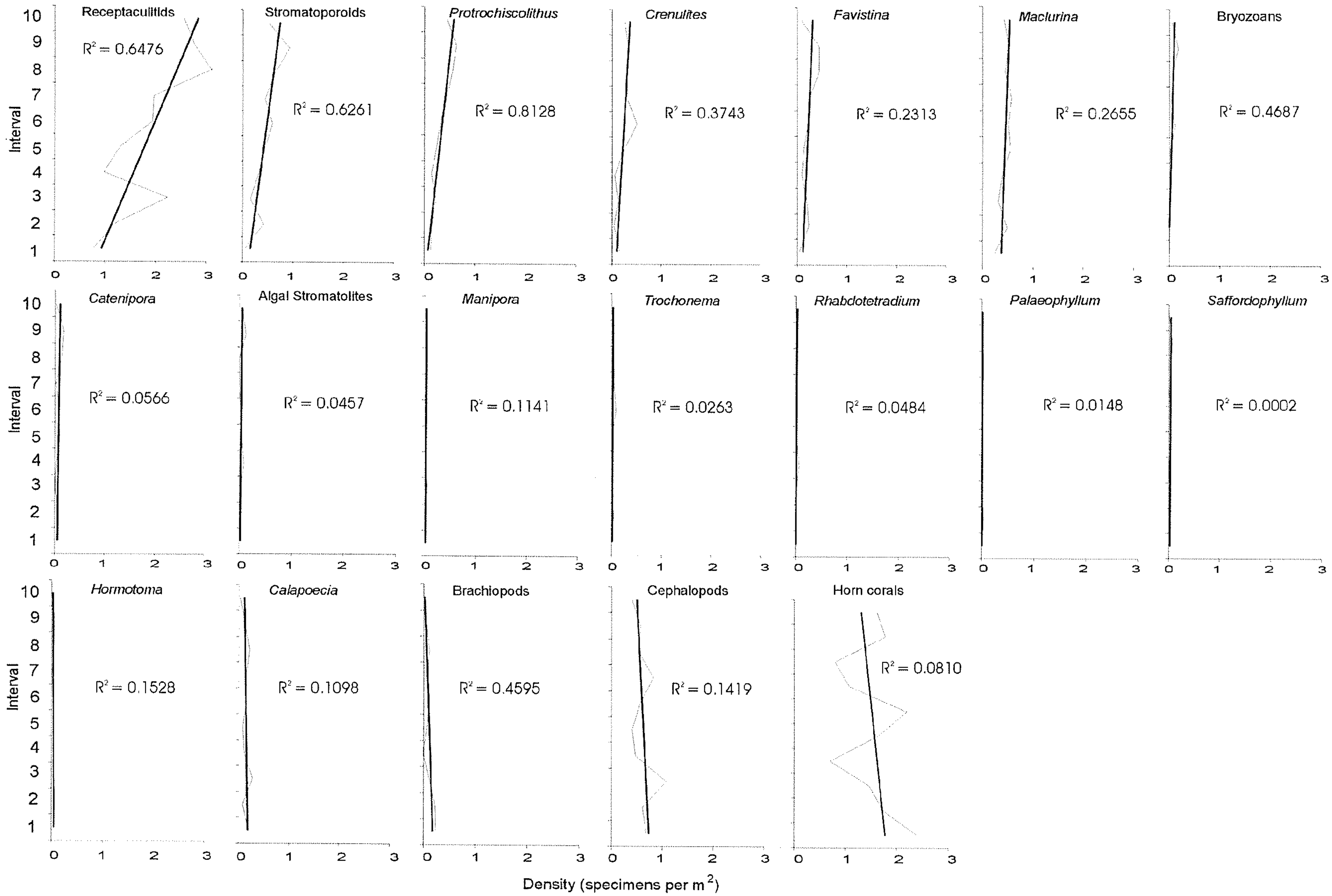


Fig. 6.5: Comparison of upward abundance trends between all fossil groups of the Tyndall Stone based on linear regression (straight black line). Greatest upward-increasing trends located in the top left. Greatest decreasing-upward trends located in the bottom right.

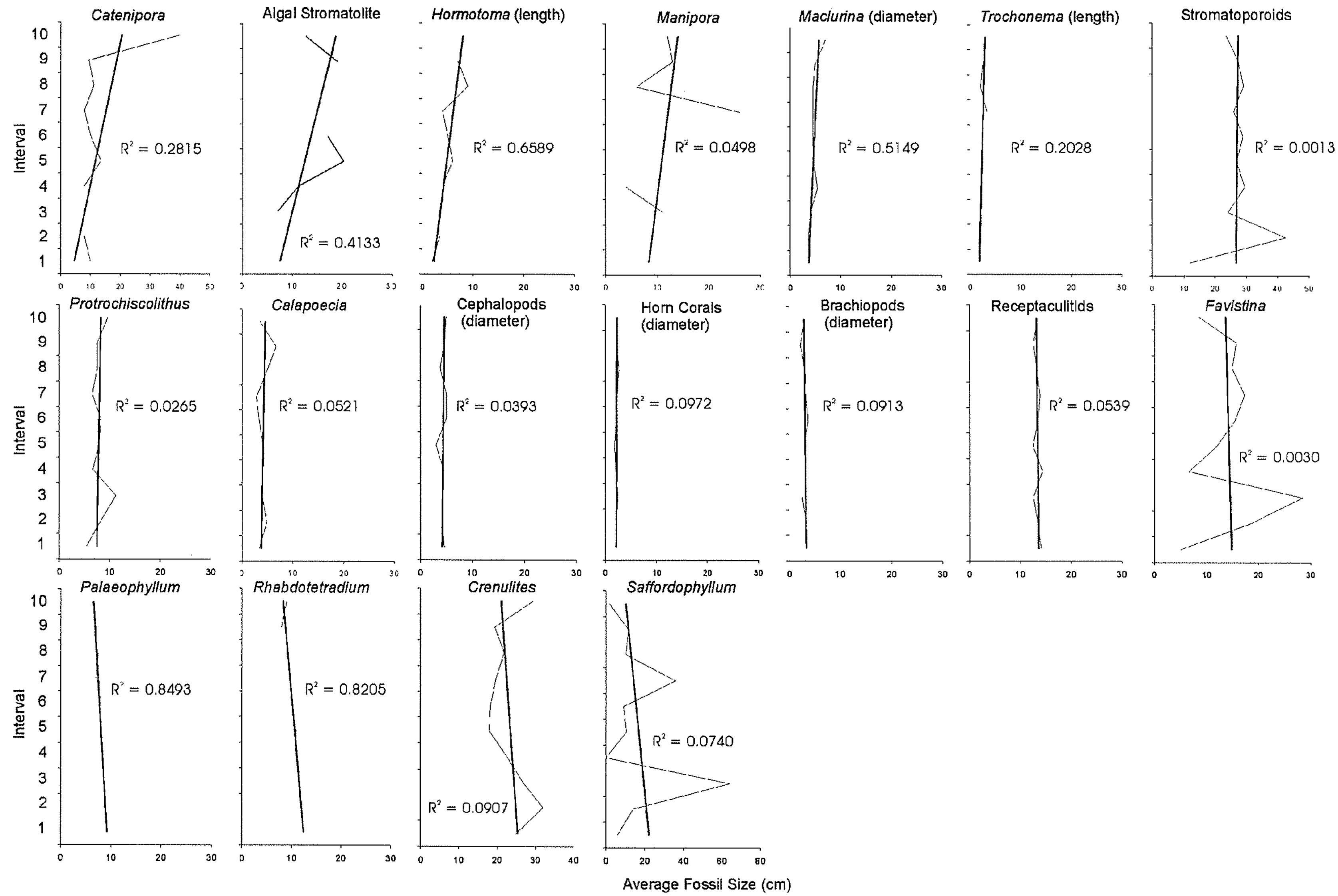


Fig. 6.6: Comparison of upward size trends between all fossil groups of the Tyndall Stone based on linear regression (straight black line). Greatest upward-increasing sizes located in the top left. Greatest decreasing-upward sizes located in the bottom right (note: unless stated otherwise, measurements indicate maximum width of fossil skeleton). Note: graphs are set to an x-axis minimum of 30 cm; some graphs were set higher due to a greater average fossil size in some intervals.

6.2 Fossil Groups of the Tyndall Stone

Kingdom Monera

Algal stromatolites

Stromatolites are multi-layered, finely laminated structures (Pl. 1, fig. 1), built upon sedimentary particles, which are usually composed of calcium carbonate. Microorganisms trap these particles, binding them together to form sedimentary layers. Individual layers are commonly a few millimeters thick, and layers may accumulate into structures several metres high. Morphologically, the stromatolite structure may be tabular, bulbous, or columnar.

Stromatolites have been described from the Precambrian to Recent, and superficial features throughout the span remain essentially unchanged (Davis, 1966). Modern stromatolites are composed of cyanobacteria (sometimes referred to as blue-green algae) that form a sticky surface, which traps debris that is washed over it. Debris is composed primarily of carbonate material from tests and shells of organisms, and minor amounts of quartz (Logan, 1961).

Stromatolites in the vertical walls of the Tyndall Stone appear similar to stromatoporoids. They are differentiated, however, by the lack of 'plates' within their laminae that stromatoporoids possess. In addition, stromatolites show small inclusions of sediment in their structure which stromatoporoids lack.

Algal stromatolites: observations

Twenty algal stromatolite specimens were identified at Garson. This translates into 0.04 specimens per m^2, and accounts for a mere 0.63% of the total fossil count.

Stromatolites show peak density within interval 9 (0.12 specimens per m^2; Fig. 6.7a), but no definite increasing or decreasing trend in abundance over time is observed (Fig. 6.5). Widths of stromatolites range from 4 to 47 cm, with an average of 14.64 cm. Heights of stromatolites reach 4 cm. An increasing trend in stromatolite size over time is seen (Figs. 6.6, 6.7b).

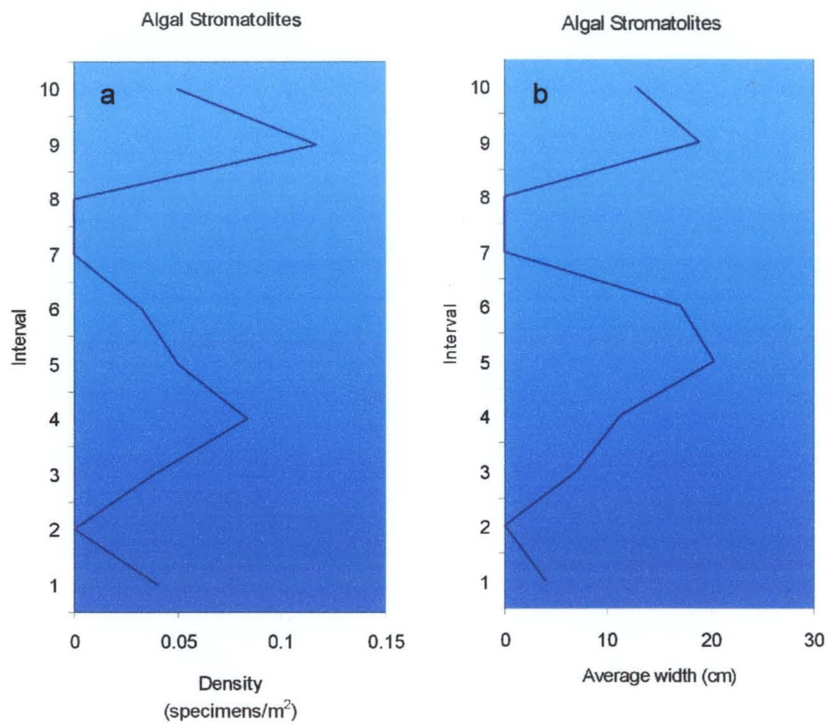


Fig. 6.7: a) Algal stromatolite density and b) average width over time.

Algal stromatolites: environmental significance and discussion

Modern stromatolites are predominantly built by photosynthetic cyanobacteria, and thus require light for growth. Therefore, a shallow water regime (within the photic zone) is required for optimal production of the microbial mats.

The range of growth forms shown by stromatolites shows adaptations to a range of environmental conditions controlled by current and wave energy together with sedimentation rates. Forms found at Garson are unvarying, however, and are strictly tabular.

The shallow marine, openly circulating Tyndall Stone paleoenvironment seems fit for stromatolite production. The low number of specimens counted, therefore, suggests that they were out-competed for space in the ecosystem by more complex organisms, such as corals and stromatoporoids. Consumption by molluscs or arthropods may have also kept the stromatolite population low.

The upward-increasing size displayed by algal stromatolites may be due to an upward-shallowing sequence throughout the section. This would have increased sunlight penetration to the seafloor and thus benefited cyanobacterial growth. The small sample size of stromatolites, however, makes generalizations about the paleoenvironment difficult, and other paleontological evidence is required.

Kingdom Animalia

Phylum Porifera

Class Stromatoporata

The Porifera, or sponges, are among the simplest of metazoans. Stromatoporoids (Pl. 1, fig. 2) appeared in the Middle Ordovician, and were common mound-forming components of Silurian and early mid Devonian shallow-water marine communities.

Many specialists in the past have regarded stromatoporoids not as Porifera but as hydrozoan cnidarians, due mainly to their superficial resemblance to some tabulate corals, and the absence of known spicules and presence of laminae (both features that are unknown in the sclerosponges, presumably the closest class; Rigby, 1987). However, the group has now been firmly emplaced within the phylum Porifera. Several features of the animal brought upon this conclusion: 1) similarity in gross skeletal pattern to the sclerosponges, 2) similarity of the astrorhizal canal system to the canal systems in sclerosponges (Rigby, 1987).

Genus identification was difficult to conduct from the vertical wall faces at Garson, thus stromatoporoid specimens were classified only to the class level.

Stromatoporoids: observations

Two hundred-forty stromatoporoids are identified in this study. This translates into a density of 0.50 specimens per m^2 and accounts for 7.56% of the total fossil population. Regression analysis of stromatoporoids shows a definite upward-increasing trend in abundance (Fig. 6.5). A sharp drop in the abundance of stromatoporoids within interval 3 is observed (0.15 specimens per m^2; Fig. 6.8a), and the peak of the sponge's abundance lay within interval 9 (0.92 specimens per m^2).

Stromatoporoids range between 5.5 and 114 cm in width, and up to 28 cm high. Regression analysis of stromatoporoids shows a relatively unchanging size trend (Figs. 6.6, 6.8b). Average width of all stromatoporoids in the Tyndall Stone is 27.72 cm.

R-mode cluster analysis shows that stromatoporoids are very closely associated with the tabulate coral *Protrochiscolithus* in occurrence (dissimilarity index of 0.15). In addition, correlation analysis reveals that fluctuations in stromatoporoid population over time (up section) are closely associated with fluctuations in the populations of *Protrochiscolithus*, *Favistina*, receptaculitids, *Crenulites*, and *Catenipora* (correlation coefficients of 0.82, 0.79, 0.68, 0.65 and 0.63, respectively).

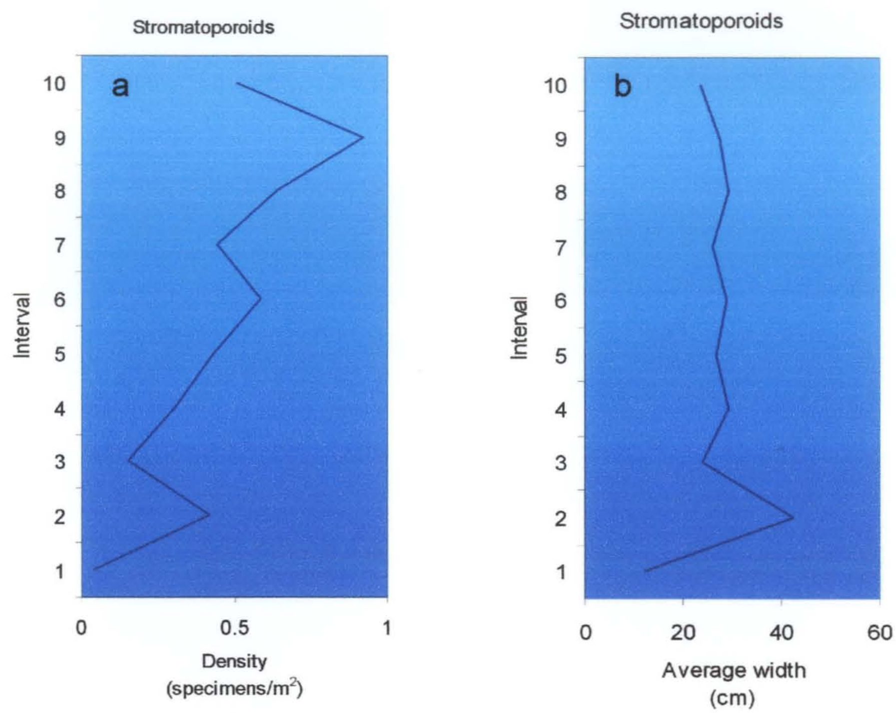


Fig. 6.8: a) Stromatoporoid density and b) average width over time.

Stromatoporoids: environmental significance and discussion

Modern sponges inhabit aqueous environments ranging from polar to tropical, fresh to marine, and shallow to abyssal (Rigby, 1987). Stromatoporoids, however, were exclusively marine. Stromatoporoids, like modern day sclerosponges, were probably stenohaline, and thrived in marine environments with normal salinity levels (34‰; Dodd and Stanton 1990).

The morphology of stromatoporoids provides evidence of the nature of the paleoenvironment (see *Colonial coral and stromatoporoid growth form*). Ordovician forms usually lived in fairly turbulent environments, and are associated with shallow-water carbonate facies (Benton and Harper, 1997). It is presumed that moderate water agitation was necessary to maintain suspended food in the water column and bring it to the animal, as they were sedentary filter feeders. The overall increase in abundance of stromatoporoids over time in the Tyndall Stone is therefore attributed to an increase in water agitation, providing suspended nutrients for the sponge. This was presumably brought about by an overall upward-shallowing sequence that would have increased wave energy near the sediment surface.

The sharp drop in stromatoporoid abundance within interval 3 may represent a sudden deepening event such as that suggested by the evidence provided by the horn corals (see *Horn corals: environmental significance and discussion).* The peak in the sponge's abundance within interval 9, meanwhile, may represent the shallowest depositional environment within the entire section.

The close association between *Protrochiscolithus* and stromatoporoids is not surprising, as the encrusting tabulate coral required hard substrates for attachment. Segars and Liddell (1988) showed that stromatoporoids were ideal choices for encrusting by many organisms, including bryozoans, tabulate and rugosan corals, pelmatozoans, brachiopods, and endolithic organisms. The sedentary nature of stromatoporoids, combined with a hard calcareous skeleton, made them ideal choices for *Protrochiscolithus* and other encrusting organisms.

Correlations between the stromatoporoid abundance and those of *Favistina,* receptaculitids, *Crenulites,* and *Catenipora*, meanwhile, are attributed to the sharing of similar environmental requirements. This includes a like feeding strategy, in which nutrients suspended in the water column are essential. Again, an upward shallowing sequence would benefit not only the stromatoporoids but also all groups that shared its trophic position.

Phylum Cnidaria

Corals found within the Tyndall Stone include members of the Tabulata and Rugosa, subclasses of class Anthozoa. Over 1300 specimens from the phylum Cnidaria were counted, including over 700 horn corals.

Subclass Tabulata

Members of the Tabulata, as the name suggests, have well-developed tabulae. Septa are usually reduced to short spines or absent entirely, and only colonial growth forms are recognized within the group. Tabulates first appeared in the Early Ordovician, became widespread during the Late Ordovician and Silurian, and became extinct at the end of the Permian (Benton and Harper, 1997).

Many growth forms characterize this group, including mound-like, erect branching and chain-like forms. Tabulates are also of various shapes and sizes.

For this study, six genera of tabulate corals were identified in the Tyndall Stone; *Calapoecia, Catenipora, Manipora, Protrochiscolithus, Saffordophyllum* and *Rhabdotetradium*.

Catenipora

Catenipora (Pl. 2, fig. 1) is one of two cateniform corals found at Garson, the other being *Manipora*. Corallites are linked laterally and form a palisade network that is usually one corallite thick (Hill, 1981). This gives the corallum a distinctive anastomosing chain-like appearance in cross-section, hence the common name 'chain coral'. *Catenipora* belongs to the family Halysitidae.

Catenipora: **observations**

Specimens of *Catenipora* are relatively few in the Tyndall Stone (35 coralla counted), accounting for only 1.12% of total fossils. The highest density displayed by *Catenipora* was shown in interval 9, where 0.18 specimens per m^2 are observed (Fig. 6.9a).

Corallum sizes range between 4 and 40 cm in width, and an increasing trend in size with stratigraphic position is observed (Figs. 6.6, 6.9b). However, a single 40 cm-wide skeleton found in interval 10 skews the regression line. Removal of the single

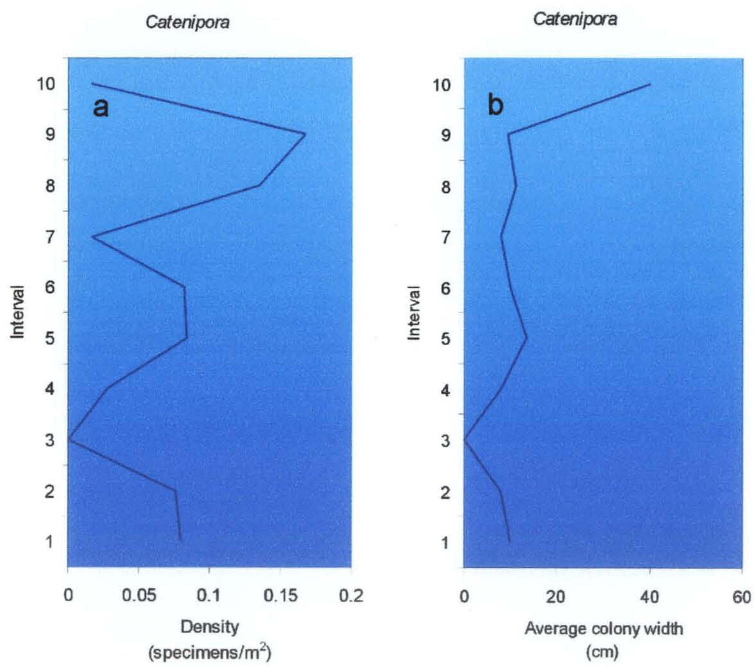


Fig. 6.9: a) *Catenipora* density and b) average colony width over time.

skeleton from the data set yields a relatively straight regression line, indicating no significant size trend. Average width is 11.5 cm, and heights of coralla reach 13 cm.

Changes in *Catenipora* abundance through time show a similar pattern to the colonial rugose coral *Favistina* (correlation coefficient of 0.66).

Manipora

Manipora (Pl. 6, fig. 2), like *Catenipora*, is a cateniform tabulate and also commonly recognized as a 'chain coral'. The two are similar in appearance, particularly in longitudinal section. *Manipora* is differentiated from *Catenipora*, however, by the presence of corallites rising in double and/or multiple ranks (as opposed to the single ranks displayed by *Catenipora*).

Manipora: observations

Manipora is very uncommon in the Tyndall Stone: only eight coralla have been identified (0.017 specimens per m^2), accounting for only 0.24% of the total fossil count. It is evident that the scarcity of *Manipora* yields insufficient data to interpret environmental and ecological aspects in the Tyndall Stone. *Manipora* density and average colony width are displayed in Figs. 6.10a and b.

Coralla are 4 to 26 cm across, but the small number of samples does not provide enough data to significantly show size trends over time. R-mode cluster analysis reveals that *Manipora* did not preferentially occur in the Tyndall Stone with any other fossil group. Correlation analysis, meanwhile, displays the absence of a shared abundance or size trend with any other taxa.

growth, intermittent storm events were strong enough to topple and even flip the largest coralla over: the largest *Catenipora* corallum found at Garson measured 40 cm wide and was completely overturned.

Lee and Elias (1991) described one species of *Catenipora* from Garson as living with the upper surface of the corallum often at or just above the sediment-water interface. This indicates that growth rates of the coral were barely sufficient to keep up with background sedimentation. This constant threat of smothering was compensated by rapid regeneration and lateral expansion. Coralla up to 40 cm wide and 13 cm high were found tilted over in the sediment; if these specimens indeed had their corallum surfaces at or just above the sediment-water interface throughout life, sediment deposited within the lacunae would have provided a broad, stable base (Lee and Elias, 1991). Substantial force, therefore, would have been required to lift it out of the sediment and overturn it. This may have been accomplished by strong storm events and/or scouring of the sediment.

Sinclair (1955) considered the cateniform growth pattern shared by *Catenipora* and *Manipora* to be an intermediary between the efficient feeding form in phaceloid colonies (where polyps are completely separated from one another) and the rigid cerioid colonies (in which corallites are contiguous). Although *Catenipora* and *Manipora* both display this distinct growth form, it is apparent that their environmental preferences were different: *Catenipora* seemingly thrived in comparison to *Manipora* within the Tyndall Stone. This disparity between the two cateniform corals was probably not due to taphonomy; *Manipora* possessed double and/or multiple ranks, and was thus probably more stable than the single-ranked structure of *Catenipora*. The moderate correlation between *Catenipora* and *Favistina* hints towards the sharing of specific environmental parameters, if not morphology, required by both the tabulate and colonial rugosan.

Saffordophyllum

The cerioid tabulate *Saffordophyllum* (Pl. 3, figs. 1, 3) appears morphologically similar in longitudinal section to the colonial rugose corals *Crenulites* and *Favistina*. It is discernable from the two, however, by its weak growth banding and very short septa. Also known as the "honeycomb coral", *Saffordophyllum* has corallites that are often distinctively hexagonal.

Saffordophyllum: observations

Saffordophyllum are not abundant in the Tyndall Stone: only 15 coralla were observed in this study. Coralla peaked in density within interval 9 (0.067 specimens per m^2), but in the whole section averaged only 0.032 specimens per m^2. This translates to a mere 0.46% of the total Tyndall Stone fossil count.

The variation of *Saffordophyllum* abundance over time (Fig. 6.11a) is moderately mirrored by solitary rugose corals, *Catenipora*, and *Favistina* (correlation coefficients of 0.67, 0.65 and 0.62, respectively), though the small sample size of *Saffordophyllum* limits the breadth of statistical significance. Coralla range from 2 to 64 cm in width, with a strong decreasing size trend over time (Figs. 6.6, 6.11b). However, as with *Catenipora*, the regression line is skewed by the presence of a single skeleton (a 64-cm wide corallum in interval 3). Removal of the skeleton from the data set reveals no significant size trend over time. Correlation analysis shows that changes in *Saffordophyllum* size move closely over time with changes in *Favistina* size (correlation coefficient of 0.86).

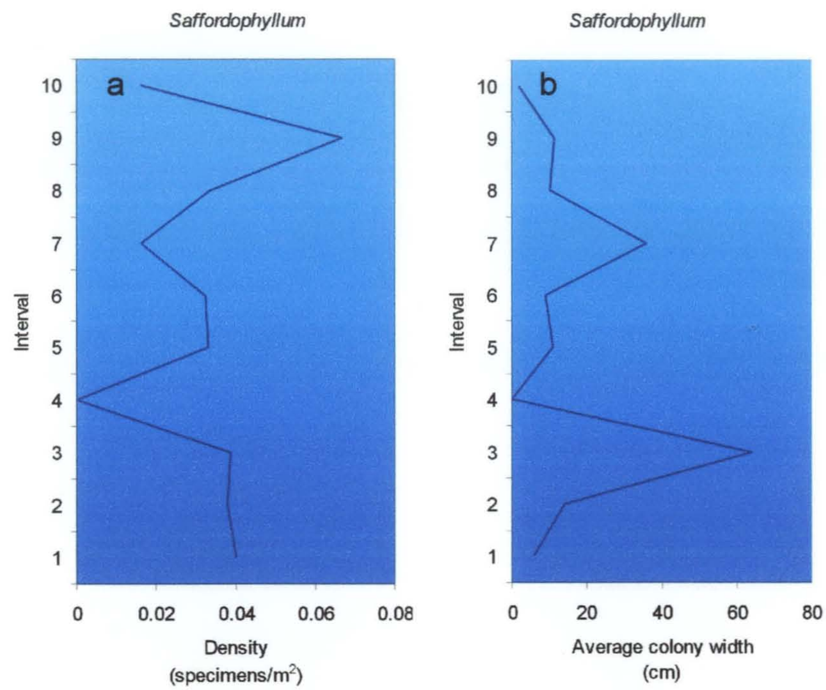


Fig. 6.11: a) *Saffordophyllum* density and b) average colony width over time.

Saffordophyllum: environmental significance and discussion

The strong correlation between *Saffordophyllum* and *Favistina* (with respect to both abundance and size changes over time) suggests that both shared specific environmental requirements. However, the low count of *Saffordophyllum* coralla shows that environmental requirements were probably not met for significant colony growth. Another possibility for the low number is competition. *Saffordophyllum* may have been out-competed within the ecosystem for food and space by other colonial corals and stromatoporoids.

Rhabdotetradium

The affinities of tetradiids are not well understood; the group is generally considered to be an order within Tabulata, but unlike other tabulates, tetradiids are distinguished by their tetragonal corallites, hence the name, which are initially fused to one another (Hill, 1981). Scrutton (1979) suggested that tetradiids were a specialized group within the tabulates.

The genus *Rhabdotetradium* (Pl. 2, fig. 2) is recognized at Garson as delicately branching ramose forms with corallite diameters commonly 0.6-1.1 mm (Young, 1995). With continued vertical growth, corallites develop into separate, broadly divergent, sub-circular corallites (Young and Elias, 1995). The poorly preserved microstructure of tetradiids as a group has led to the suggestion that their coralla may have been composed of aragonite instead of calcite (Yang, 1989). However, the poor but non-dolomitized preservation of *Rhabdotetradium* coralla at Garson indicates that their skeletons may have originally been composed of high-magnesium calcite (Tyndall Stone fossils that were originally calcitic are well preserved, while aragonitic fossils are commonly dolomitized) (Young, 1995).

***Rhabdotetradium*: observations**

Only six *Rhabdotetradium* coralla were observed in the Tyndall Stone walls (this is second only to the colonial rugosan *Palaeophyllum* at Garson in terms of scarcity). *Rhabdotetradium* can only be found at an average of 0.013 specimens per m^2, and constitutes 0.18% of the total fossil count. Density of *Rhabdotetradium* over time is displayed in Fig. 6.12a.

Coralla are virtually complete, and range from 6 to 12 cm in width. Size changes throughout intervals are, essentially, unwavering (Fig. 6.6, 6.12b), but the low count of coralla renders statistical methods practically useless.

Rhabdotetradium: environmental significance and discussion

The low count of *Rhabdotetradium* specimens at Garson implies that: 1) the environment was generally unsuitable for their growth, or 2) colonies lived in the environment, but their delicately constructed coralla made them susceptible to taphonomic processes such as physical destruction during storm events.

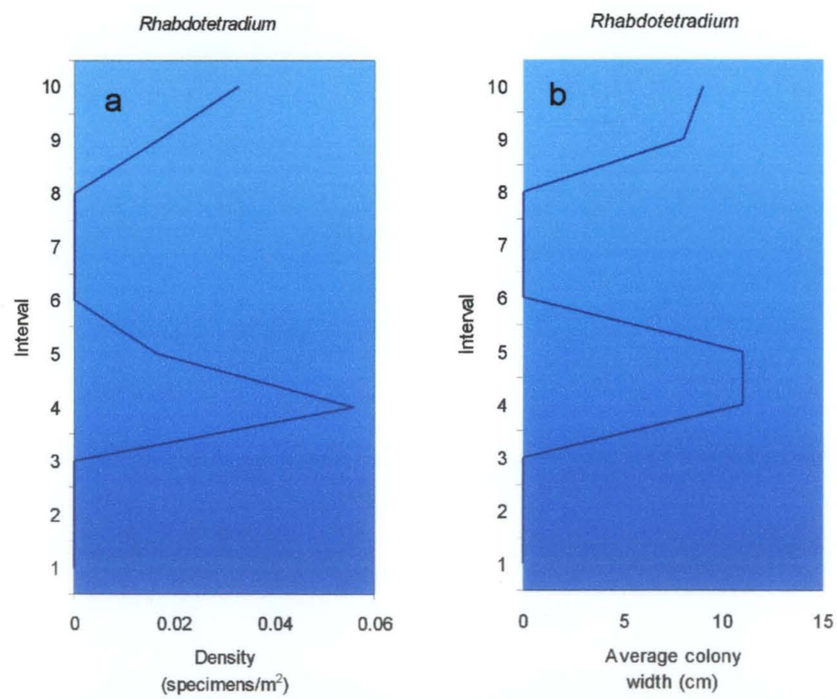


Fig. 6.12: a) *Rhabdotetradium* density and b) average colony width.

Yang (1989) has proposed that *Tetradium* could adapt its morphology in response to environmental stresses: a highly turbulent environment would warrant a strong, rigid structure, while lower turbulence would permit delicate forms. Thus if *Rhabdotetradium* did populate the Tyndall Stone environment to a greater extent than that shown by the preserved specimens in the quarry walls, it is most likely that they possessed delicate structures, suitable for the low-turbulent environment. Evidence of their existence would therefore be easily obliterated by storm events.

Calapoecia

Calapoecia (Pl. 3, fig. 2) is distinct in that individual corallites are circular, with centers of corallites spaced up to 0.5 cm apart. Corallites are separated by calcareous coenenchyme. Septal spines are noticeable to the unaided eye.

Calapoecia is one of two organisms that profusely show encrusting behaviour in the Tyndall Stone ecosystem (the other being *Protrochiscolithus*). *Calapoecia* required hard substrates for colonial propagation, and preferentially attached itself to the skeletons of other animals.

Calapoecia: observations

Sixty-three coralla of *Calapoecia* were identified at Garson. Density of coralla reaches a peak within interval 3 (0.27 specimens per m^2), and regression analysis reveals no upward increase or decrease in abundance (Fig. 6.5). *Calapoecia* represents only a small proportion of the overall Tyndall Stone assemblage, accounting for 1.91% of the total fauna and never exceeding 4% in any given interval (Fig. 6.13a). Coralla sizes are relatively small, ranging from 1 to 17 cm in width (average size of 4.34 cm). No significant overall trend in size is displayed over time (Figs. 6.6 and 6.13b).

Among all the encrusting relationships observed in the Tyndall Stone, *Calapoecia* accounts for 17% of all encrusters, second only to *Protrochiscolithus*, at 68% (see *Encrusting Relationships*). Correlation analysis shows that *Calapoecia* trends very similarly in abundance over time with cephalopods (correlation coefficient of 0.81).

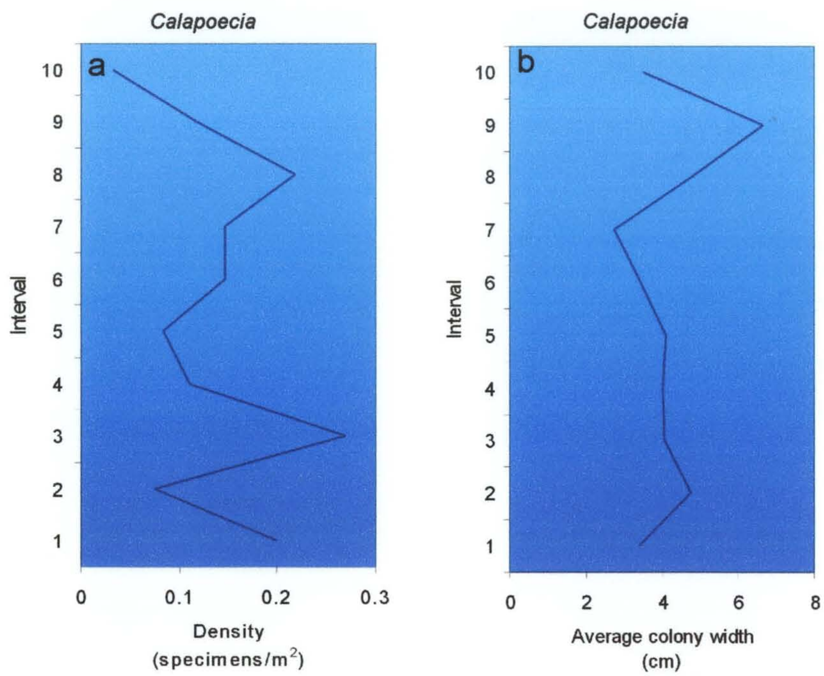


Fig. 6.13: a) *Calapoecia* density and b) average colony width over time.

Protrochiscolithus

Protrochiscolithus (Pl. 3, figs. 2, 3) is easily recognizable within the Tyndall Stone walls, due to its typically pure white appearance and thick common wall of trabecular elements (Flower, 1961). *Protrochiscolithus* also displays 12 long and rather thick septa extending towards the corallite center. The colonial coral is commonly found encrusting other fossil organisms within the Tyndall Stone walls.

***Protrochiscolithus*: Observations**

A total of 177 specimens of *Protrochiscolithus* were observed at Garson, with a definite upward-increasing trend in abundance (Figs. 6.5 and 6.14a). The tabulate shows peak density within interval 9 (0.64 specimens per m^2). *Protrochiscolithus* is the most abundant colonial coral found in the Tyndall Stone section, averaging 0.37 specimens per m^2, and accounting for 5.6% of all fossil biota. *Protrochiscolithus* ranges from 1.5 to 39 cm in width (average 7.92 cm), with no increasing or decreasing size trend that can be observed over time (Figs. 6.6 and 6.14b).

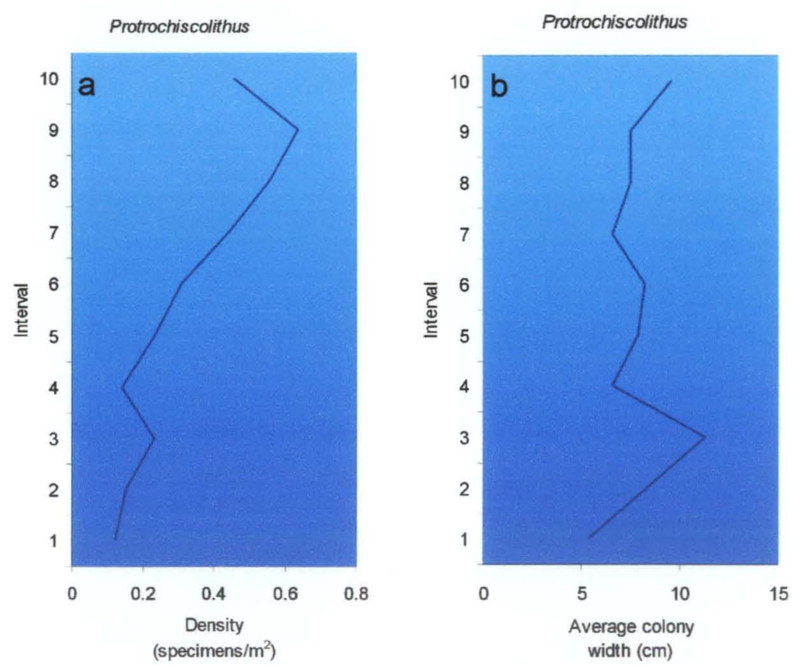


Fig. 6.14: a) *Protrochiscolithus* density and b) average colony width over time.

R-mode cluster analysis shows that *Protrochiscolithus* is very closely associated in occurrence with stromatoporoids (dissimilarity index of 0.15). Correlation analysis displays strong similar upward population trends between *Protrochiscolithus* and stromatoporoids (correlation coefficient of 0.82), receptaculitids (0.90) and bryozoans (0.75).

Calapoecia and *Protrochiscolithus*: Environmental significance and discussion

Calapoecia and *Protrochiscolithus* are paired together in this discussion based on their shared tendency to encrust other organisms (see *Encrusters*).

The increasing abundance trend over time displayed by *Protrochiscolithus* suggests that favourable conditions, namely large and plentiful substrates available to the encrusting coral, were also increasing. Stromatoporoids, along with cephalopod shells, were found from visual observations to be the preferred substrate for the encrusting *Protrochiscolithus* in the Tyndall Stone. Increases and decreases in stromatoporoid density over time are accompanied by comparable variations in *Protrochiscolithus* (as evidenced by a very strong correlation coefficient of 0.82 between the two groups). This is further shown from the close interrelationship inferred between the two fossils from r-mode cluster analysis. Although few receptaculitids were seen encrusted by *Protrochiscolithus*, the very high correlation between the two groups (0.90) suggests that 1) the environmental parameters for receptaculitids are identical to those for *Protrochiscolithus*, or 2) receptaculitids were encrusted by *Protrochiscolithus* at one time but the encruster was somehow later dislodged (unlikely). The same inferences are made for *Calapoecia* and cephalopods; these two groups also display a high correlation coefficient (0.81), but *Calapoecia* is not observed to be encrusting the mollusc to a high degree, as the correlation would suggest.

Caramanica (1973) suggested that *Protrochiscolithus* was intolerant of direct contact with the sediment, thus the size of the corallum was limited to that of the substrate chosen.

Order Rugosa

Rugose corals are calcitic forms with both colonial and solitary life modes. Rugose corals arose in the mid Ordovician and became extinct at the end of the Permian. Rugosans had well-organized septal arrangements with six protosepta; metasepta were inserted in four spaces around the corallum (Hill, 1981).

Although they are extinct, the ecology of rugosans may still be inferred through sedimentological data and uniformitarian techniques. On a regional scale, rugose corals can be separated into normal shallow marine and deeper marine assemblages (Oliver and Coates, 1987). This division of rugose corals is loosely analogous to the ecological division of the scleractinians, where the structurally complex and dominantly colonial encompass hermatypic forms, while ahermatypes are structurally simple and mostly solitary (Oliver and Coates, 1987). This analogy cannot be wholly extended to the extinct rugosans, however, as there is no evidence yet of zooxanthellae-bearing Paleozoic corals. Coates and Jackson (1987) have suggested that coral morphology may assist in the detection of symbionts in fossil tests

Three colonial genera are present in the Tyndall Stone: *Crenulites, Favistina*, and *Palaeophyllum*. Solitary forms could not be differentiated generically in the field and are herein identified only as horn corals.

Crenulites

Crenulites (Pl. 4, fig. 2) is one of three colonial rugose corals identified in the Tyndall Stone. *Crenulites* is identified by its thin and strongly crenulated (down-turned) edges of the tabulae and distinctive growth banding (Hill, 1981). Colonial coral growth in the Ordovician has been suggested through modern analogues to have been optimal in shallow marine, well-circulated, nutrient-rich environments.

Crenulites: observations

In total, 126 coralla of *Crenulites* were identified in the Garson quarry walls. *Crenulites* shows a peak density within interval 6, with 0.50 specimens per m^2 (Fig. 6.15a). An overall increase in the abundance of *Crenulites* up-section is clearly evident (Fig. 6.5). As a percentage of the overall Tyndall Stone fossil population, *Crenulites* plays a minor role, accounting for only 3.89% of all fossils and never attaining higher than 6.6% of the total biota in any given interval.

The size of coralla shows exceptional range, from 3 and 140 cm in width (most specimens were less than 50 cm, however) and a decreasing size trend over time can be observed (Figs. 6.6 and 6.15b). However, the regression line is skewed by a single 32-cm wide corallum within interval 2. Removal of the corallum from the data set reveals no significant size trend. Average size of *Crenulites* in the Tyndall Stone is 20.92 cm.

Cluster analysis shows that *Crenulites* appears concurrently with *Favistina* (dissimilarity index of 0.275). Both colonial rugosans are, in turn, closely associated in occurrence with stromatoporoids, and the encrusting tabulate coral, *Protrochiscolithus* (dissimilarity index of 0.375). Correlation analysis, meanwhile, shows that increases and decreases in *Crenulites* population are imitated by the bryozoans (correlation coefficient of 0.76).

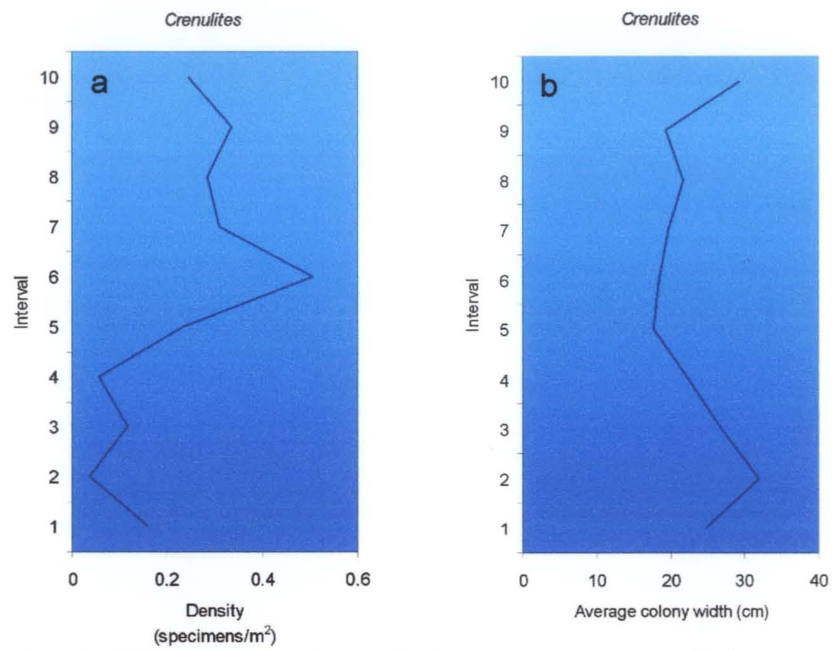


Fig. 6.15: a) *Crenulites* density and b) average colony width over time.

Favistina

Favistina (Pl. 4, fig. 1) is similar in form and appearance to *Crenulites*. It is differentiated, however, by smaller corallites and tabulae that are only slightly down-turned at the edges (Hill, 1981). Environmental conditions that favour the occurrence of *Favistina* are assumed to resemble those for *Crenulites*.

Favistina: observations

Favistina rivals *Crenulites* in abundance at Garson, with 108 coralla counted. *Favistina* density peaks in interval 8, with 0.44 specimens per m^2. As with *Crenulites*, *Favistina* shows an increasing abundance over time (Fig. 6.5), and represents a small percentage of the overall Tyndall Stone fossil biota (3.34%; *Favistina* never surpasses 5.8% within any interval; Fig. 6.16a). Colonies range from 3 to 56 cm in width, but show no definite trends over time (Figs. 6.6 and 6.16b). Average size of each coralla is 6.63 cm. Changes in abundance of *Favistina* through time are mimicked by the cateniform tabulate coral *Catenipora* (correlation coefficient of 0.66).

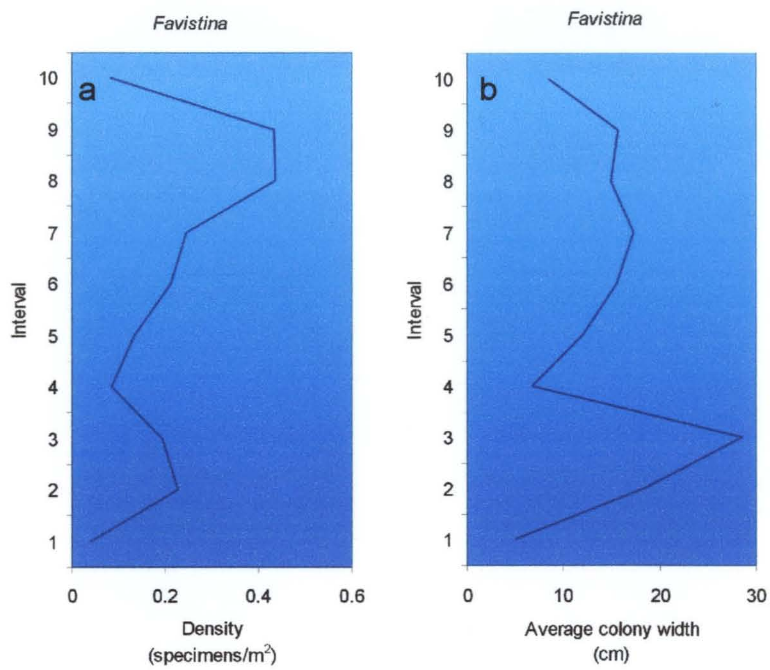


Fig. 6.16: a) *Favistina* density and b) average colony width over time.

Palaeophyllum

Palaeophyllum (Pl. 5, fig. 1) is the only phaceloid rugose coral found in the Tyndall Stone walls. Flower (1961) has speculated that the solitary horn coral *Streptelasma* was descended from *Palaeophyllum*. Indeed, the morphology of *Palaeophyllum* does seem to resemble numerous horn corals growing in close proximity.

***Palaeophyllum*: observations**

With only five specimens identified in this study, *Palaeophyllum* is the rarest fossil found in the Tyndall Stone. Its rarity (0.01 specimens per m^2, 0.15% of total fossil count) does not permit paleoenvironmental or paleoecological inferences.

Palaeophyllum coralla range from 6 to 9 cm in width, displaying up to 12 branching corallites, though more may have been present when alive. Regression shows a slight decrease in size over time, but statistical analyses are hindered by the small sample size. *Palaeophyllum* density and average colony width over time are displayed in Figs. 6.17a and b.

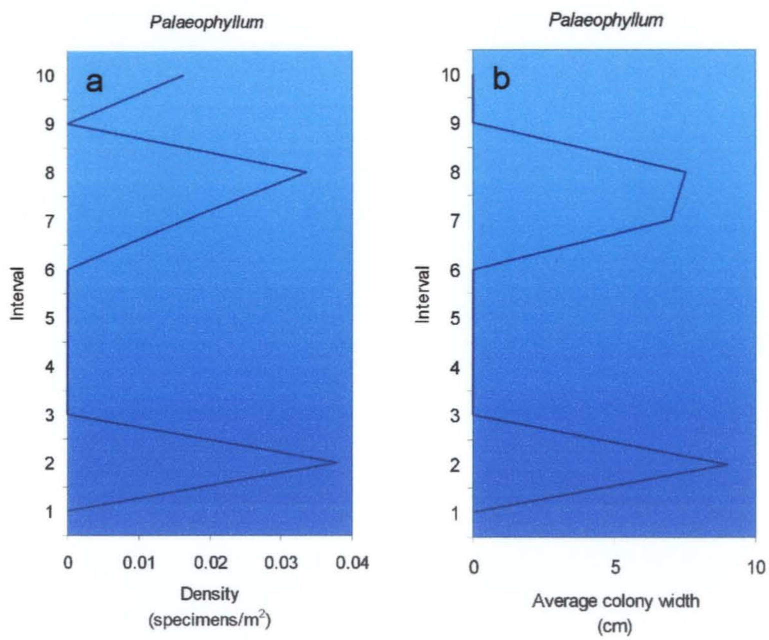


Fig. 6.17: a) *Palaeophyllum* density and b) average colony width over time.

***Crenulites*, *Favistina* and *Palaeophyllum*: environmental significance and discussion**

Colonial rugosan corals, for the most part, required similar environmental parameters as the tabulates, namely: warm-temperate to tropical temperatures, normal salinity levels, gently circulating and well oxygenated waters, a firm to hard substrate free from rapid accumulation of sediment and the presence of ample food in the water column. The increasing abundance trend with height in the quarry displayed by both *Crenulites* and *Favistina* suggests that conditions for colonial rugose coral growth had improved over time. The low dissimilarity index (0.275) between the two groups, and their combined close associations with stromatoporoids (dissimilarity index of 0.375) attests that all three shared the same required environmental conditions ideal for growth. It is not surprising to find that both of these colonial rugose genera are so closely associated in occurrence, since *Crenulites* and *Favistina* are nearly identical morphologically, and inferred evolutionary relationships indicate that *Crenulites* was derived from *Favistina* (Flower, 1961).

Some coralla of both *Crenulites* and *Favistina* display composite growth, showing one or more marked changes in the direction of colony development. Figure 18 displays the composite growth of a heliolitid coral, though the sample is not from the Tyndall Stone (Young and Elias, 1995). Composite growth indicates that colonies were toppled during development. This may have occurred by 1) scouring of the substrate, leading to decreased stability, and/or 2) toppling of coralla via storm events. Due to the highly cohesive nature of the substrate (mud), it is unlikely that stability was compromised through scouring. Thus toppling and the composite growth that ensued thereafter were probably propagated by high-energy storm events.

The infrequent nature of *Palaeophyllum* in the Tyndall stone makes paleoenvironmental and paleoecological assumptions based on its appearance very difficult. Its scarcity may suggest that the environmental conditions were not suitable for phaceloid growth.

Fig. 6.18: Composite growth exhibited by heliolitid coral; longitudinal section (from Young and Elias, 1995).

Solitary rugose corals

Solitary rugose corals (also known as horn corals; Pl. 5, fig. 2) are common fossils in the Early Paleozoic. Solitary rugosans were individual, independent organisms (one polyp per corallum; non-colonial). Ordovician horn corals were epifaunal, predominantly neritic filter feeders, and were seldomly significant in the process of reef building (Hill, 1981). In the Red River Formation, solitary corals are quite common and sufficiently preserved for detailed study, though only in the Selkirk Member (Elias, 1981). Samples collected in the past from the Selkirk Member include specimens from the family Streptelasmatidae (*Grewingkia*, *Salvadorea*, *Deiracorallium*, and *Bighornia*) and Complexophyllidae (*Complexophyllum*) (Elias, 1981).

Solitary rugose corals: observations

With 719 counted, solitary horn corals were far and away the most abundant corals at Garson, and are among the most populous taxa in the Tyndall Stone (1.51 specimens per m^2). Highest densities are found within intervals 1, 6 and 9 (2.40, 2.20 and 1.77 specimens per m^2, respectively; Fig. 6.19a). Marked drops in density are noted in intervals 4 and 8 (0.70 and 0.79 specimens per m^2, respectively). Regression analysis shows that horn corals decrease in abundance over time more than any other group identified (Fig. 6.5).

Expressed as a percentage of the total fossil count, solitary rugose corals are clearly dominant in the lowest units, accounting for 46% of all fossils counted in interval 1. However, horn coral percentage of total fossil population drops off in interval 4 (19%), rises again in units 5 to 7, and drops to an overall low in interval 8. Still, the sheer number of horn corals in the Tyndall Stone suggests that they played a significant role within the ecosystem (22.13% of all counted biota).

Horn corals range between 1 and 5.5 cm in diameter, with no overall size trend observed (Figs. 6.6 and 6.19b). Average diameter of coralla is 2.23 cm. Horizontal distribution of horn corals (Figs. 6.20a, 6.20b) shows a seemingly random positioning of coralla along both the EW and NS walls, but this may be misleading (see *Solitary horn corals: environmental significance and discussion)*. A comparison of storm lenses and horn coral distribution reveals that storm events recorded in the Tyndall Stone walls (Figs. 5.6a, 5.6b) show a very similar pattern to the distribution of solitary rugose coralla.

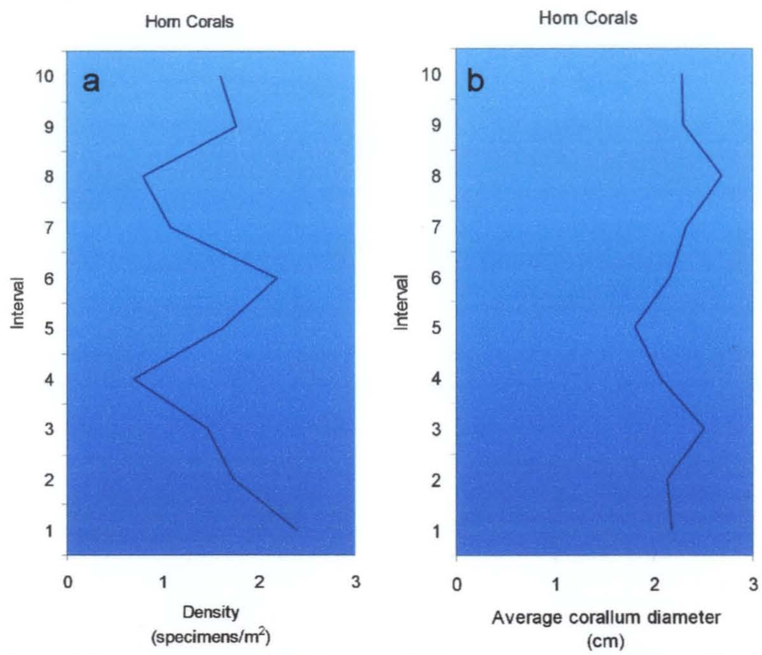


Fig. 6.19: a) Horn coral density and b) average corallum diameter over time.

A significant number of horn corals display a high degree of abrasion (near-complete to complete damage of the wall; damage to the corallum interior). The percentage of highly abraded corals ranges from 56% in interval 2 to a peak of 83% in interval 4 (Fig. 6.21). An average of 63% of all Tyndall Stone horn corals are highly abraded. Horn coral abrasion data is displayed in Appendix E (Table E-9).

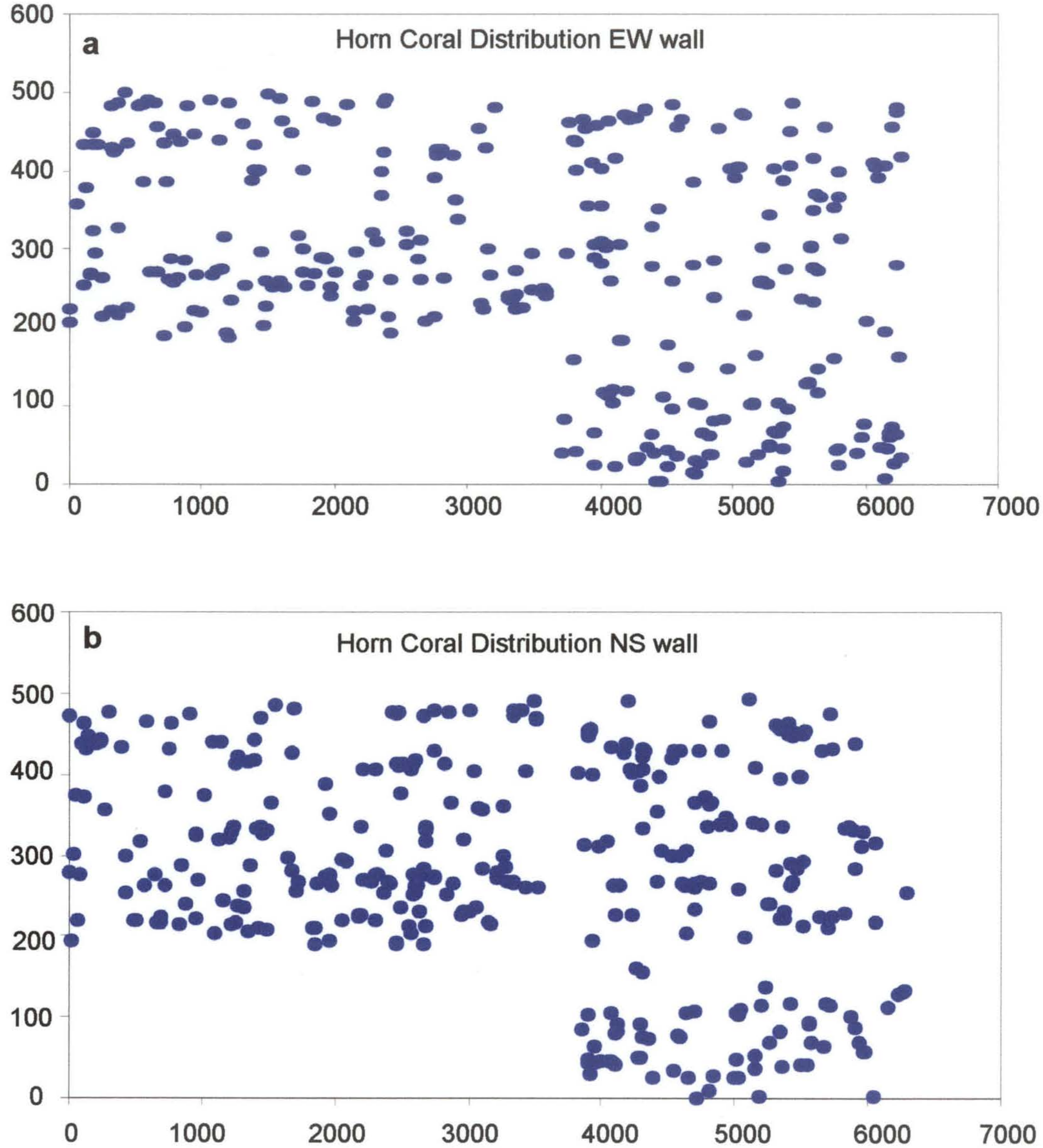


Fig. 6.20: Vertical and horizontal horn coral distribution on combined a) east-west and b) north-south walls. Note the similar pattern exhibited by storm lens distribution (Figs. 5.2a, 5.2b).

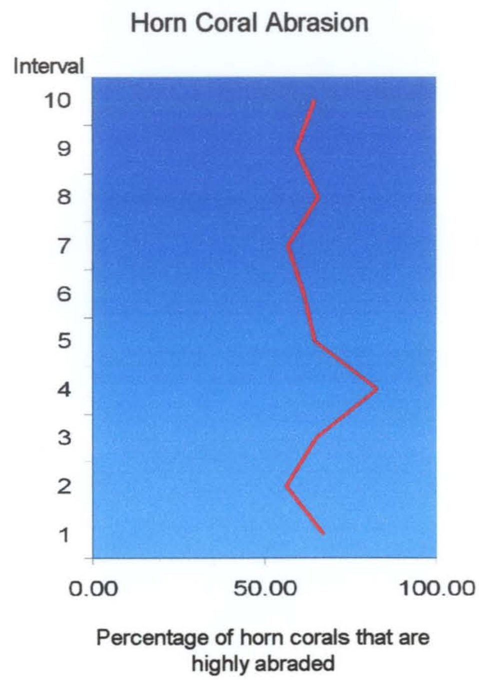


Fig. 6.21: Percentage of horn corals in the Tyndall Stone displaying a high degree of abrasion.

R-mode cluster analysis reveals that as a group, solitary horn corals are most closely associated in occurrence with the receptaculitids, as evidenced by a dissimilarity index of 0.3125.

Examination of 143 Tyndall Stone horn corals in cross section revealed that 86 of the rugosans (60%) were oriented such that their cardinal septum was within 45° of the horizontal plane (Appendix F, tables F-3, F-4; Fig. 6.22). These findings are comparable to Elias' (1980) study on horn corals of the Selkirk member, in which 77% of cardinal septa were found to be within 45° of the horizontal plane. Specimens were interpreted to have been out of life orientation, presumably influenced by hydraulic forces (see *Paleocurrents*). The remaining 40% of horn corals (with cardinal septa beyond 45° of the horizontal plane) were considered to be non-diagnostic (either in life orientation or unaffected by current flow).

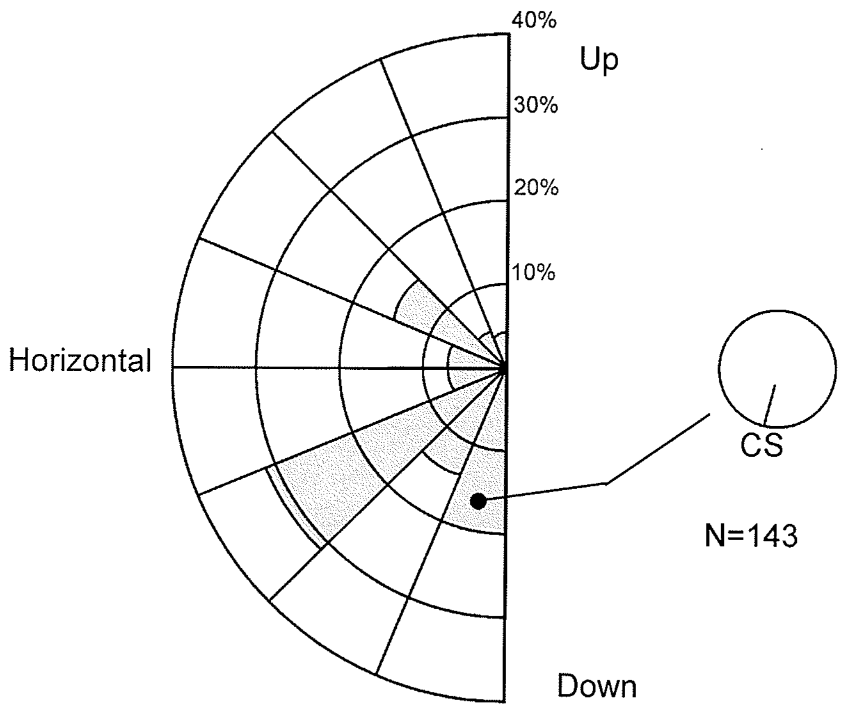


Fig. 6.22: Distribution of cardinal septum attitudes of solitary rugose corals. Cross-section of coral and position of cardinal septum (CS) shown at right, along with placement within distribution chart.

Solitary rugose corals: environmental significance and discussion

From modern analogues and sedimentological evidence, optimal conditions for the proliferation of Ordovician solitary rugose corals have been suggested to require well oxygenated, nutrient-rich and gently circulating water, with normal salinity and minimum mean annual temperatures between 16 and 21°C (Hill, 1981). Rapid accumulation of sediment was detrimental to horn coral growth, as the oral surface was prone to clogging. However, a clear, non-turbid environment was not essential. It is unknown if solitary rugose corals housed zooxanthellae (photosynthetic symbionts); whether or not they were restricted to the photic zone is a mystery. However, studies have shown that ideal depth for horn coral growth was shallower than 50 m (Hill, 1981).

The orientation of solitary rugose corals provides insight as to the nature of the substrate on which it lived: Bolton and Driese (1990) showed that curved corals preserved in mechanically stable positions were deposited on firm or hard substrates. Curved corals preserved in mechanically unstable positions, however, dwelled or were deposited on soft or soupy substrates.

Solitary rugose corals of the Selkirk Member began their lives initially attached to a hard or firm substrate (a sand grain or test of some sort), but became detached later on and assumed a recumbent position, resting free on the soft muddy substrate of a level sea bottom; this is known as a liberosessile mode of life. Neuman (1988) described a similar life mode in his study of Silurian horn corals of Gotland, Sweden.

The curved nature of horn corals is a result of the polyp attempting to bring the oral surface into a horizontal position after tilting of the corallum (Elias, 1982). Tilting was commonly caused by currents, and/or sinking into the substrate, thus current strength can be inferred from the degree of curvature of the corallum (Elias et al., 1988). Straight conical forms indicate a fixed, upright skeleton throughout most of the coral's life (Elias, 1982). Horn corals that appear highly curved, or "bent" probably toppled over while still alive. Upward growth ensued as the coral attempted to bring its oral surface parallel to the sediment, resulting in a "bent" growth form.

The degree of curvature is difficult to determine from observations along a planar vertical section, and thus an inference towards current strength is virtually impossible via the Elias et al. (1988) method. Furthermore, the mechanical stability of the corallum on the substrate is equally difficult to ascertain from vertical section alone, and thus determination of substrate conditions was not possible using Bolton and Driese's (1990) method. Determination of soft substrate conditions was therefore assumed from lithology, other fossil taxa, and thin section analysis.

Evidence of borings in horn corals was not observed in the vertical walls of the Garson quarry. However, Elias' (1980) study of solitary rugose corals of the Selkirk Member identified *Dictyoporus garsonensis* (produced by algae) and *Trypanites weisei* (produced by spionid polychaete annelids) as significant borings in horn corals. The presence of algae-produced *Dictyoporus* restricts the Tyndall Stone paleoenvironment to the photic zone (algae require light). Meanwhile, studies by Thayer (1974) and Pickerill (1976) have shown that annelids producing *Trypanites weisei* are restricted to depths shallower than 25 m. These two ichnotaxa are very significant to paleoenvironmental interpretation, suggesting that solitary corals of the Tyndall Stone lived in very shallow water.

Perhaps the most telling statistic from Garson horn corals is the percentage of highly abraded specimens. Degree of abrasion is a direct function of exposure time, water energy and size of the abrasive agent. The pronounced peak of highly abraded horn corals in interval 4 thus indicates 1) a deeper environment, where burial by accumulating sediment is significantly lower, or 2) a very shallow environment, where wave action and storm events would have provided advanced mechanical breakdown. Storm lens evidence (see *Storm Lenses*), combined with other fossil and sedimentological evidence, reveals that the first hypothesis is more likely, with interval 4 representing a sudden deepening within the overall sequence. It is perhaps this sudden deepening which also affected the horn coral density in this interval.

Horn corals are useful as paleocurrent indicators, and their role in deciphering the Tyndall Stone paleoenvironment is described later (see *Paleocurrents*).

Phylum Bryozoa

Bryozoans superficially resemble the corals, but are distinguished by their relatively smaller openings (zooecia), which are commonly between 0.15 and 0.30 mm in diameter (McKinney, 1981). Ordovician forms grew hemispherical, encrusting, and branching colonies (Stearn and Carroll, 1989).

Bryozoans found within the Tyndall Stone all belong to the order Trepostomata.

Bryozoa: observations

Twenty-eight bryozoan colonies were found at Garson. Of these, seven were branching forms, three were domical, and the remainders were fragmentary. Due to these different morphologies, a linear regression size analysis was not conducted. Bryozoans are found at a rate of 0.059 specimens per m^2 in the Tyndall Stone, and account for a mere 1.10% of the total fossil count.

Bryozoan abundance shows strong fluctuations over time, with peaks in density within intervals 6 (0.11 specimens per m^2) and 9 (0.17 specimens per m^2; Fig. 6.23). These fluctuations are strongly mirrored by the stromatoporoids, *Crenulites*, and *Protrochiscolithus* (correlation coefficients of 0.88, 0.76 and 0.75, respectively).

Bryozoa: Environmental significance and discussion

Bryozoans are strictly colonial organisms, and, like brachiopods, feed on particulate matter in the water column using a lophophore. Water motion, apart from destructive wave action and storm events, is thus generally desirable for bryozoans, which feed largely on phytoplankton in the water column (Blake, 1981). Thus a high abundance of bryozoans within interval 9 may indicate increased turbulence brought upon by a shallower environment.

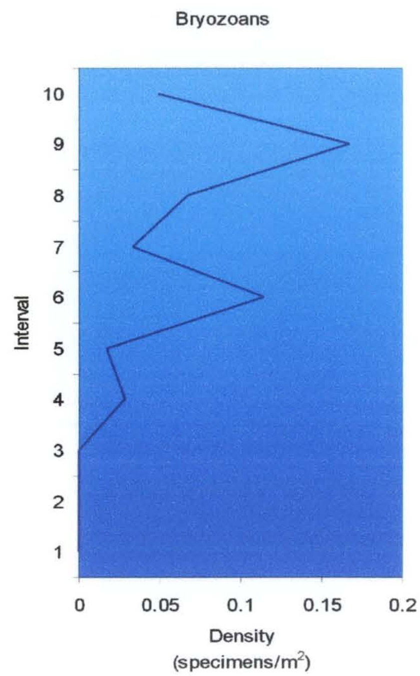


Fig. 6.23: Bryozoan density over time

Most species of bryozoans are sensitive to substrate type, turbulence, water depth, temperature and salinity (Benton and Harper, 1997). Most bryozoans attach to firm substrates and are therefore intolerant of either erosion or rapid sedimentation (Blake, 1981). Shape of colonies can be very plastic, adapting to environmental conditions (Benton and Harper, 1997). Thus, bryozoan morphology is very useful for paleoenvironmental reconstruction; branching and erect growth forms indicate low energy surroundings, while more massive, domical morphologies suggest higher energy (Schopf, 1969). The presence of dominantly branching and fragmentary specimens in the Tyndall Stone suggests that the environment was ordinarily low energy. As such, branching forms were able to live there. However, these forms were easily destroyed by occasional high-energy storm events.

The seemingly fluctuating nature of Tyndall Stone bryozoan abundance over time suggests that the environmental factors were also constantly changing. The strong correlation of the bryozoans with stromatoporoids, *Crenulites*, and *Protrochiscolithus* suggest that the four groups shared similar environmental parameters.

Phylum Brachiopoda

Brachiopods were among the most successful Paleozoic invertebrate marine phyla, dominating the low-level suspension feeding benthos throughout most of the era. Brachiopods are strictly marine, bilaterally symmetrical animals that use a ciliary feeding organ (lophophore) contained within a pair of calcareous shells or valves. Brachiopods first appeared at the base of the Cambrian, increasing greatly in abundance and diversity in the Early Ordovician and onwards.

Brachiopods within the vertical walls of the Tyndall Stone were difficult to recognize to even the family level in cross section, and are thus identified only to the phylum level in this study. However, Jin and Zhan's (2001) extensive study of brachiopods from the Red River and Stony Mountain formations identified 18 distinct species of brachiopod from the Selkirk Member, with several forms exhibiting gigantism.

Jin and Zhan named the high diversity and moderately abundant Selkirk assemblage the *Kjaerina hartae* community, after the strophomenid brachiopod.

Brachiopods: observations

A total of 42 brachiopod specimens were found within the Tyndall Stone walls. This translates into a population density of 0.088 specimens per m^2, and accounts for 1.32% of the total fossil assemblage at Garson. Linear regression reveals a slight decreasing abundance trend over time (Fig. 6.5). Shells are absent from interval 4 (Fig. 6.24). Shells range from 1.5 to 5 cm in diameter, but no significant size trend is observed from regression analysis (Figs. 6.6 and 6.24b). Increases and decreases in brachiopod abundance over time (up section) correlate moderately with the solitary rugose corals (correlation coefficient of 0.62).

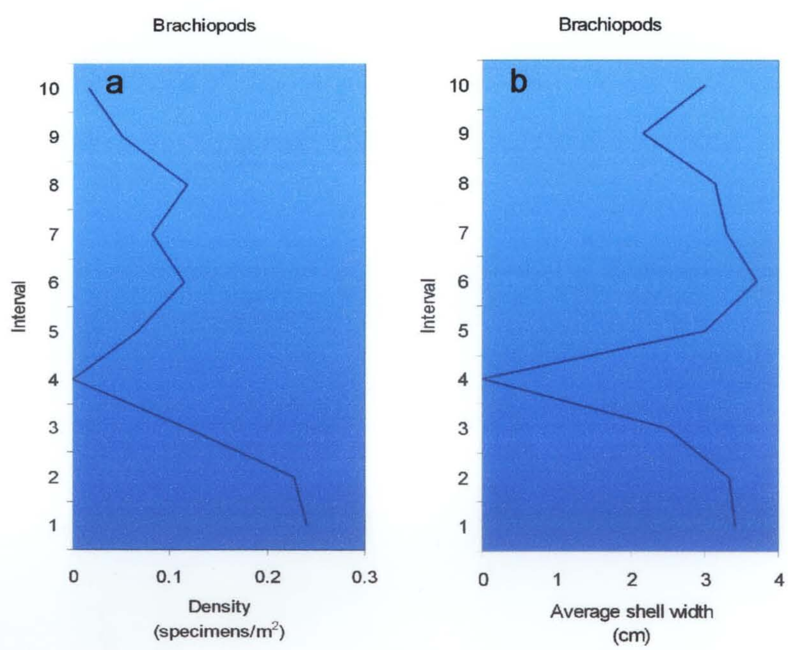


Fig. 6.24: a) Brachiopod density and b) average shell width over time.

Brachiopods: environmental significance and discussion

With only 42 specimens counted, brachiopods do not dominate the faunal assemblage at Garson as they do in most Paleozoic successions. Brachiopods are incapable of actively pursuing food, and their sessile mode of life imposes severe limits on potential feeding mechanisms and available trophic resources. The size of the lophophore has been shown to be directly related to the amount of food available: a smaller, moderately complex lophophore suggests an abundance of available food in the water column (McGee, 1979). The detrimental effect of sediment on the lophophore of brachiopods restricts them to areas of relatively slow sedimentation and low turbidity. Too much sediment in the water column can clog the lophophore and kill the brachiopod.

The majority of living brachiopods are epifaunal, attaching themselves by a fleshy stalk (pedicle) to a hard substrate on the sea floor. Substrates may include boulders, rock outcrops, or other shells. Most modern-day brachiopods are stenohaline (Rudwick, 1970), living in waters with salinity close to normal and occupy depths shallower than 500 m (Rowell and Grant, 1987).

There are several possible reasons for the complete absence of brachiopods within interval 4. These include: 1) food resources were insufficient, 2) the environment was lacking a hard substrate for attachment, 3) salinity levels in the water were inappropriate, 4) water was too turbid, or 5) brachiopods were present within the interval, but shells were completely destroyed through taphonomic processes. The slightly decreasing abundance of brachiopods up-section may also be attributed to the above factors.

The moderately strong correlation between brachiopods and solitary rugose corals is not too surprising, as both groups share many environmental requirements (among them: mildly turbulent waters, an abundance of nutrients in the water column and normal salinity).

Phylum Mollusca

Molluscs are non-colonial metazoans with a dorsal calcium carbonate (usually aragonite) exoskeleton that provides structural support for muscles and viscera (Pojeta et al., 1987). Molluscs have been diverse and abundant animals since the early Cambrian and are widespread as fossils. Molluscs of the Tyndall Stone include members of the classes Bivalvia, Gastropoda and Cephalopoda.

Class Bivalvia

Bivalves, also known as pelecypods, are a group of twin-valved molluscs that superficially resemble the brachiopods. Unlike the brachiopods, however, bivalve shells are usually composed of aragonite, and the plane of symmetry separates the left and right valves from each other. In other words, the two valves are basically mirror images of one another. Throughout their evolutionary development, bivalves adopted a wide variety of life strategies, encompassing epifaunal (attached, cemented, and free-lying), shallow and deep burrowing, boring, and even swimming modes of existence.

Bivalves collected in previous studies of the Selkirk Member include *Pterioida* and *Conocardium antiqueum* (Nelson, 1965). However, specimens were not recorded within the study section.

Bivalves: observations

Although bivalves were present at Garson, they were not considered in this study, as specimens (virtually all incomplete) were less than 1 cm in size. Bivalve shell fragments were, however, constituents of storm lenses and are observed in thin section.

Bivalves: environmental significance and discussion

Bivalves were present within the Tyndall Stone ecosystem, but the lack of complete shells suggests that they were disarticulated by storm events. As such, even a rough estimate of the abundance of bivalves is difficult to ascertain. Furthermore, post-mortem transport of shells and shell fragments makes paleoenvironmental inferences based on bivalves difficult, as it is highly unlikely that they were deposited in their original life habitat.

Class Gastropoda

The gastropods are the most abundant and varied of the molluscan classes, utilizing creeping, floating, and swimming strategies together with grazing, suspension feeding, predatory and parasitic trophic styles (Benton and Harper, 1997). Modern-day gastropods (snails and slugs) occur in marine, freshwater, and terrestrial environments, making them the most durable of the molluscan classes as well.

Gastropods appeared at the base of the Cambrian, becoming abundant during the early Ordovician radiation. Unlike the cephalopods, all orders of gastropods either maintained or increased their diversity through the Devonian, Permian, and Cretaceous mass extinctions that devastated other invertebrate groups (Stearn and Carroll, 1989).

In all, 362 gastropod specimens were counted at Garson. Of this total, 85 (23.4%) couldn't be identified to the genus level. Three genera of gastropods were recognized: *Maclurina, Hormotoma*, and *Trochonema*. All forms are from the order Archaeogastropoda.

Maclurina

Maclurina is recognized in the Tyndall Stone by its distinctively large and heavy shell that is strongly convex and hyperstrophic, with a depressed spire and flat bottom (Pl. 5, figs. 3a and b).

Maclurina: observations

Maclurina is by far the most common gastropod found within the Tyndall Stone. Two hundred twenty-three specimens were counted, representing 61.6% of all gastropods, and 6.78% of total fossils in the section. Its average density is 0.47 specimens per m^2, and it is densest within interval 7 (0.57 specimens per m^2; Fig. 6.25a). A slight overall increasing trend over time can be inferred from regression analysis of *Maclurina* (Fig. 6.5).

Along with being the most abundant, *Maclurina* is also the largest gastropod genus in the section. Specimens average 4.84 cm in diameter, with the largest shells reaching 21 cm across. Average size is observed to increase over time (Fig. 6.6), with a sharp peak displayed in interval 4 (Fig. 6.25b).

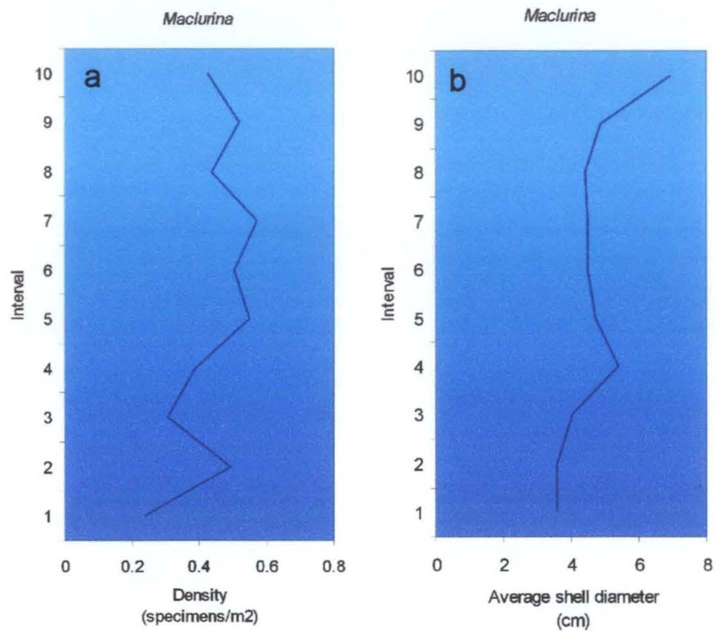


Fig. 6.25: a) *Maclurina* density and b) average shell diameter over time.

Hormotoma

Hormotoma is recognized in the vertical faces of the Tyndall Stone by its high conispiral morphology. This is distinctively different from the low conispiral forms of *Trochonema* and *Maclurina*. *Hormotoma* is also not nearly as large as *Maclurina*.

Hormotoma: observations

Eighteen specimens of *Hormotoma* were identified in this study, far fewer than *Maclurina*. This translates into 0.038 specimens per m^2 and accounts for 4.97% of all gastropods found in the Tyndall Stone, and 0.55% of the total fossil biota. Regression analysis reveals no trend in abundance over time (Figs. 6.5 and 6.26a). *Hormotoma* shells range from 2 to 11 cm in length, and an increasing size trend can be observed within the group (Figs. 6.6 and 6.26b).

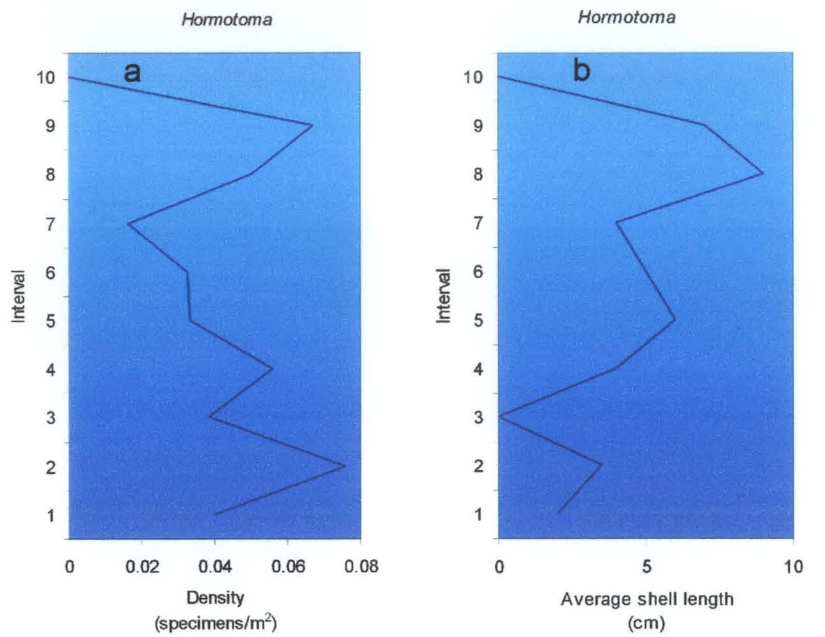


Fig. 6.26: a) *Hormotoma* density and b) average shell length over time.

Trochonema

Trochonema is differentiated in vertical section from *Hormotoma* by its low conispiral shell and relatively smaller size than both *Hormotoma* and *Maclurina*.

Trochonema: observations

Trochonema was the rarest gastropod found at Garson, numbering only 12 specimens. This translates into 0.025 specimens per m^2. *Trochonema* accounted for only 3.55% of the snail population and 0.36% of the total fossil content in the section. General increases or decreases over time are not observed (Figs. 6.5 and 6.27a). Shells of *Trochonema* range from 1.5 to 5 cm in diameter, with a slight increase over time (Figs. 6.6 and 6.27b). However, the regression line was likely affected by the small sample size.

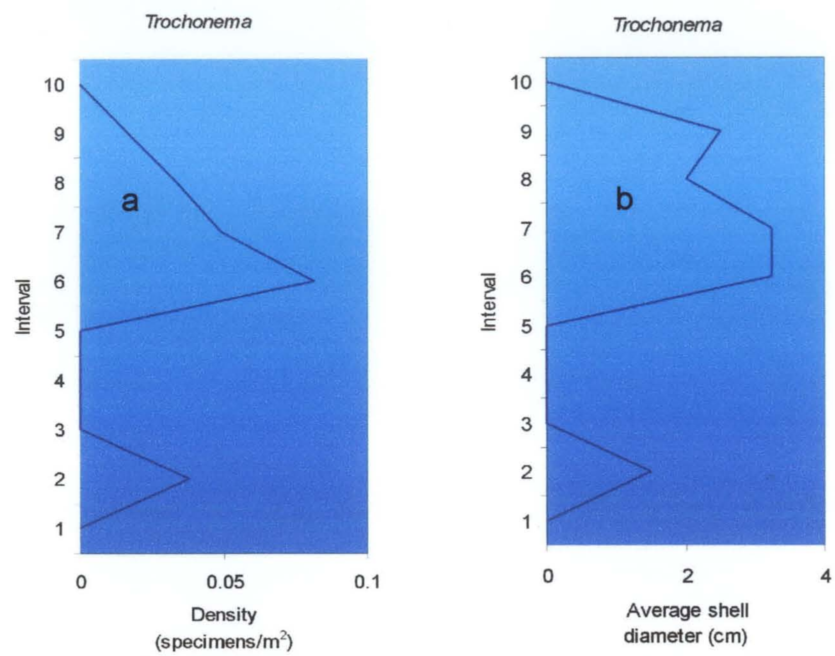


Fig. 6.27: a) *Trochonema* density and b) average shell diameter over time.

Gastropoda: environmental significance and discussion

Most living archaeogastropods are grazing herbivores or detritus feeders (Peel, 1987). Paleozoic forms are assumed to share these trophic patterns. Gastropods tolerate a broad salinity range, and have been known to survive in hypersaline waters in excess of $70^{o}/_{oo}$ (Dodd and Stanton, 1990).

Gastropods of the order Archaeogastropoda possess a delicate aspidobranch gill structure that deals with accumulating sediment very inefficiently. Removal of fine-grained sediments that could interfere with respiration is thus difficult (Stanley, 1977). Distribution of archaeogastropods, by deduction, should thus be to environments with less fine-grained sediment (Stanley, 1977). However, archaeogastropods are commonly found in Paleozoic mudstones, which suggest muddy paleoenvironments; much like that inferred within the Tyndall Stone. It is from these observations that Stanley (1977) suggested that given a soft substrate, it is the amount of turbidity rather than the existence of a soft substrate per se that is the major limiting factor for archaeogastropod distribution. Thus it can be suggested that although the Tyndall Stone depositional environment consisted of a muddy sediment bottom, turbidity was relatively low.

Maclurina's thick and heavy shell was well adapted to higher energy environments, but limited its mobility on the sea floor and restricted it to at least semi-firm substrates (*Maclurina*'s sheer size would cause it to sink into sediment which was softer). *Maclurina* was probably sedentary, practicing a suspension feeding lifestyle. The dominance of *Maclurina* throughout the section thus suggests that food resources were plentiful, and suggests a semi-firm substrate in the Tyndall Stone environment. Linsley (1977) suggested that an increase in *Maclurina* size may be attributed to increased food content in the water column and perhaps indicates higher energy conditions. Slower sedimentation rates would further allow prolonged growth of the snail to larger sizes, as evidenced within interval 4.

The small shells possessed by *Hormotoma* and *Trochonema* did not restrict them to a sessile life mode, allowing them to move freely along the sea floor. Some species of *Trochonema* fed on encrusting algae, while others are known to have been scavengers or feeders of crinoid feces (Peel, 1987).

Paleoecological and paleoenvironmental analysis using *Trochonema* and *Hormotoma*, for the most part, is difficult due to low counts of both genera. Inferences are limited to the hypothesis that 1) neither genus was suitably adapted to the environment, and/or 2) taphonomic processes erased the majority of the evidence of their existence.

Class Cephalopoda

Cephalopods are the most advanced of the molluscs, possessing high metabolic rates, well-developed nervous system, keen eyesight and advanced brain. Combined with superior mobility, these attributes made cephalopods well suited for a carnivorous predatory life mode. At least eight genera of cephalopods are known from the Selkirk Member of the Red River Formation: *Cyrtogomphoceras* sp., *Ephippiorthoceras formosum*, *Endoceras* sp., *Armenoceras* sp., *Narthecoceras* sp., *Selkirkoceras tyndallense*, *Lambeoceras* sp., and *Gorbyoceras* sp. (Foerste, 1929). However, only 12% of cephalopods could be recognized beyond the class level from the Tyndall Stone walls. Because of this, Tyndall Stone cephalopods (Pl. 5, fig. 4) are described only to the class level in this study.

Cephalopods: observations

Two hundred eighty-six cephalopod shells (Pl. 5, fig. 4) were found in the Tyndall Stone. An overall decreasing abundance trend over time is observed (Figs. 6.5 and 6.28a). Cephalopods are found at an average density of 0.58 specimens per m^2, accounting for of total fossils at Garson.

Cephalopod diameters found in the study area range between 1 and 16 cm, while preserved siphuncles are up to 50 cm long (some specimens in collections of the Manitoba Museum of Man and Nature exceed 1.0 m in length). Average diameter of cephalopod shells over time is displayed in Fig. 6.28b.

R-mode cluster analysis shows that the relationship in occurrence between cephalopods and gastropods is strong (dissimilarity index of 0.1625). Comparison of cephalopod and gastropod abundance over time reveals a similar pattern (Fig. 6.29). Fluctuations in abundance over time are strongly correlated with those of the encrusting tabulate coral *Calapoecia* (correlation coefficient of 0.81).

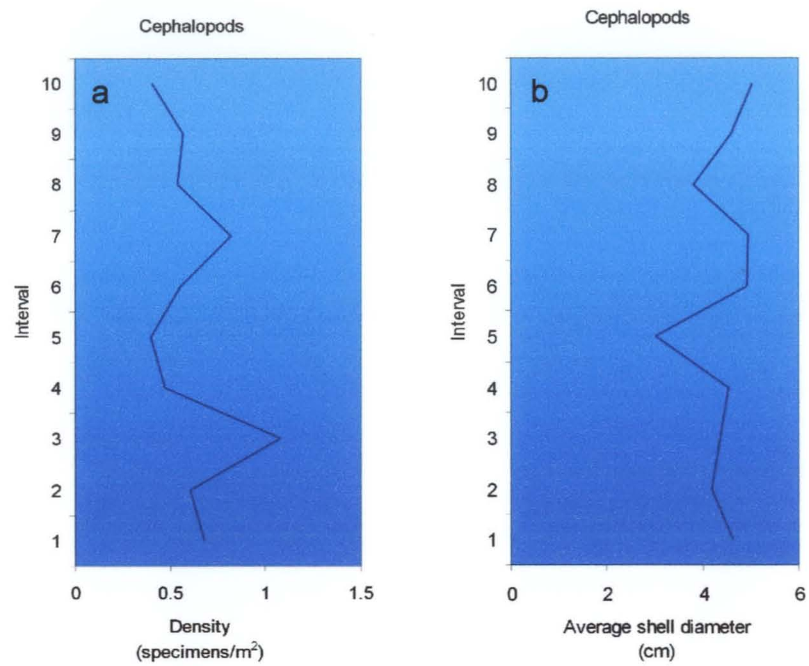


Fig. 6.28: a) Cephalopod density and b) average shell diameter over time.

Cephalopods: environmental significance and discussion

Cephalopods, particularly orthocone forms, are renowned for their usefulness as paleocurrent indicators (see *Current Indicators*). This same attribute makes them generally regarded as highly ineffectual as paleoenvironmental indicators. Chirat (2000) showed that the nautiloid genus *Aturia* was capable of trans-oceanic transport. However, he also stated that such extensive drifting was the exception, not the rule. Other recent studies have shown that post-mortem transport has a small impact on the fossil record, and the original distribution of cephalopods appears to be preserved in the majority of cases.

Crick (1988, 1990) and Frey (1989) showed that many Paleozoic nautiloids possessed phragmocones that were counterweighted against positive buoyancy and probably would have rapidly filled with water and sunk after death. Chamberlain et al. (1981) indicated that extensive postmortem drift of *Nautilus* is a relatively rare event. Instead, the cephalopod was shown more commonly sinking to the sea floor in the area near which it lived. In addition, ontogenic studies by Saunders and Spinosa (1978) and Landman et al. (1983) of living *Nautilus* indicate that these cephalopods lack a planktonic larval stage capable of being dispersed by oceanic currents.

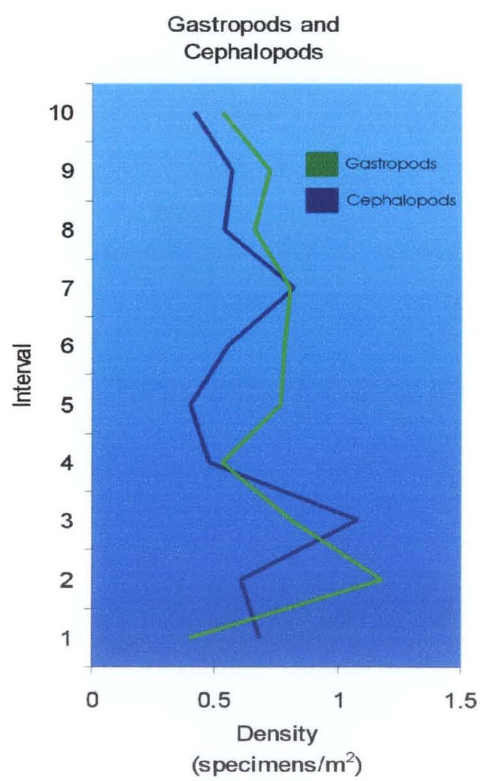


Fig. 6.29: Comparison of gastropod and cephalopod abundance over time.

The laterally extensive nature of the Tyndall Stone lithology (and, therefore, the paleoecosystem) suggests that cephalopods in this study are not drift-in products from different environments. Paleoecological and paleoenvironmental interpretations using cephalopods must still be cautiously made, however.

The strong correlation shown between cephalopods and *Calapoecia* abundance may suggest that cephalopod skeletons were ideal targets for *Calapoecia*, which required a hard substrate for colonization. The strong relationship between the occurrence of gastropods and cephalopods may be due to a predator-prey relationship. Inspection of the stomach contents of modern-day cephalopods (octopuses, squids) reveals that gastropods are indeed food sources for the pelagic carnivore (Nixon and Maconnachie, 1988; Daly, 1996). Thus a rise or fall in gastropod abundance would not surprisingly be accompanied by a similar response by the cephalopods.

Phylum Arthropoda

Class Trilobita

Trilobites possessed an exoskeleton, composed mainly of chitin and calcareous material, divided longitudinally into three-lobes. Trilobites are among the most useful biostratigraphic indicators in lower Paleozoic strata due to their abundance and diversity, and their presence may indicate particular environmental parameters.

Trilobites: observations

No complete or even semi-complete trilobites were found within the Tyndall Stone walls in the course of this study. Thus, identification beyond the class level is impossible. However, it must be pointed out that Westrop and Ludvigsen's (1983) study on trilobite groups within the Selkirk Member revealed the existence of several trilobite families. They showed that the dominant families of trilobites within the member included Illaenidae (49% of all specimens), Cheiruridae (23%), Lichidae (11%) and Asaphidae (7.3%).

Trilobites were found exclusively as fragments within the Tyndall Stone walls, and were identified from their characteristic pure-white segments and distinct "hooked" shape. Debris of the arthropod's exoskeleton is found commonly in storm lenses as "trilo-trash".

Trilobites: environmental significance and discussion

As a general rule, complete trilobites may be found in quiet-water facies, but more commonly, currents, scavengers, and molting have separated and scattered the skeletal parts. Although the exoskeleton was rigid, segments were joined by flexible organic connections that decayed relatively quickly upon death. Thus complete preservation required special sedimentological and environmental conditions such as abrupt burial and/or anoxia.

Trilobites are present in a variety of marine limestones, sandstones, and shales. The greatest diversity of taxa lies in deposits within shallow, normal marine environments with open circulation (Robison, 1987). The majority of trilobites are thought to have been benthic detritus feeders, though evidence of predation within the group has been found.

Substrate conditions may be inferred from trilobite groups; illaenid-cheirurid associations have been demonstrated to occur in environments with relatively firm, cohesive substrates, presumably related to an infaunal existence of the arthropod

(Westrop and Ludvigsen, 1983). These assumptions suggest that the Tyndall Stone substrate may have been relatively firm.

While there is no doubt that trilobites were a component of the paleoecosystem of the Tyndall Stone, the lack of well-preserved specimens and the effects of molting make estimations of the arthropod's true abundance impossible. As such, data on trilobite abundance has been excluded from this study.

Phylum Echinodermata

The role of crinoids in the Tyndall Stone paleoecosystem is uncertain. No calyces or holdfasts are found intact, but their ossicles are a significant component of the lithology; thin section analysis reveals their presence within all intervals. However, crinoid debris is well known for extensive post-mortem transport (Ager, 1963; Dodd and Stanton, 1990). Westrop and Ludvigsen (1983) considered the presence of pelmatozoan debris in the Selkirk Member to be largely transported and excluded them from the paleocommunity. A similar conclusion was made by Walker (1972b) in his work on the Black River Group paleocommunity of New York State. The role of crinoids in the paleocommunity is thus excluded here as well.

Problematica: Receptaculitids

Receptaculitids (Pl. 6, fig. 1) are characterized by their meroms, a distinctive mineralized skeletal element that is unknown in any other organism. These meroms are arranged in whorls around the central axis of symmetry, forming a distinct sunflower pattern on the surface of the fossil. It follows from this pattern that receptaculitids are commonly known as “sunflower fossils”. In the Ordovician, receptaculitids are known from limestones and dolostones, where they are major components of massive organic buildups and important rock-building elements (Nitecki et al., 1999).

The true nature and origin of receptaculitids have been under constant debate for over a century, beginning with Zittel’s (1878, as cited in Nitecki et al., 1999) and Hinde’s (1884, as cited in Nitecki et al., 1999) dispute as to the true original mineralogy of the fossil. Zittel believed that receptaculitid skeletons were calcareous, while Hinde insisted they were siliceous. Since then, receptaculitids have been interpreted as everything from algae, foraminifers, sponges, corals and cystoids to even pine cones (Fisher and Nitecki, 1983).

The failure of specialists to assign receptaculitids to a taxonomic group is attributed to 1) poor preservation of structures that suggest they belong within a particular major group, and 2) presence of structures that easily place them in another (Nitecki et al., 1999). Foster (1973) suggested that receptaculitids might represent an extinct phylum unrelated to either sponges or algae, while Beadle (1988) proposed that the arrangement of meroms on receptaculitids likened them, morphologically, to plants. He thus suggested that they were problematic calcareous algae. The most recent literature, based upon the unresolved conclusion as to the original mineralogy of meroms, proposes that receptaculitids remain unaffiliated with any modern analogues. Hence, they currently remain as problematica (Nitecki et al., 1999). Only one genus of receptaculitid is recognized from the Tyndall Stone: *Fisherites*.

Receptaculitids: observations

Receptaculitids were the most common fossils found within the Tyndall Stone walls, with 966 specimens counted. Receptaculitids were found at a rate of 2.03 specimens per m^2, and composed 30.44% of the total fossil count found at Garson. Linear regression shows a distinct increasing trend in abundance of receptaculitids over time (Fig. 6.5). The highest density was found within intervals 8 and 9 (3.09 and 2.76 specimens per m^2, respectively; Fig. 6.30a). Within interval 4, a sharp drop in receptaculitids was observed, with 0.98 specimens per m^2. This is a significantly lower than the underlying interval, which had 2.24 specimens per m^2.

Receptaculitids range between 12.5 and 14.33 cm in width, with an average size of 13.39 cm. There is no distinct upwardly increasing or decreasing trend in the fossil's size (Figs. 6.6 and 6.30b).

R-mode cluster analysis reveals that receptaculitids were closely associated with the solitary horn corals in occurrence (dissimilarity index of 0.3125). Correlation analysis shows that the occurrence of receptaculitids up-section are strongly imitated by *Protrochiscolithus*, *Favistina*, and stromatoporoids (correlation coefficients of 0.90, 0.73 and 0.68, respectively).

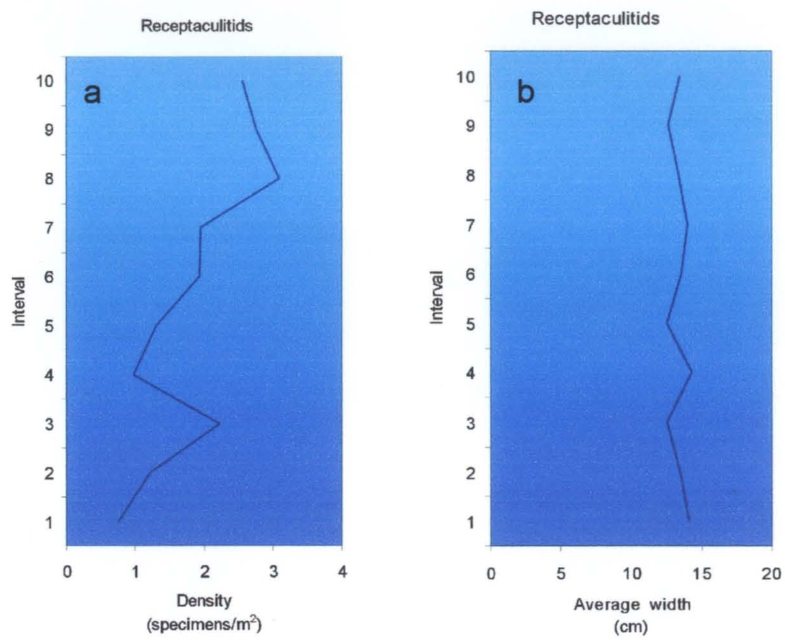


Fig. 6.30: a) Receptaculitid density and b) average width over time.

Receptaculitids: environmental significance and discussion

Because the affinity of receptaculitids to any fossil or living group is debatable, it is difficult to draw paleoenvironmental inferences from their occurrence. Instead, it is safer to find groups with which they are commonly associated, and hypothesize from there.

The strong correlation between the receptaculitids and stromatoporoids and *Favistina* may provide insight to the preferred paleoenvironment of the problematical fossil. Both stromatoporoids and the colonial rugosans were presumably stenohaline, preferring warm, moderately agitated waters that suspended nutrients within the water column. If the population trend of receptaculitids over time is mirrored by those of stromatoporoids and *Favistina* (as the correlation analysis suggests), it is conceivable that the receptaculitids shared the same specific environmental parameters. R-mode cluster analysis results suggest also that solitary horn corals shared these parameters with receptaculitids.

If the receptaculitids were indeed algal in origin, as many paleontologists have professed in the past, then their photosynthetic nature would restrict them to the photic zone. Thus an increase in their population over time may suggest upward-shallowing sequence (shallower waters provide more sunlight for photosynthetic processes), such as that implied both by the stromatoporoids and horn corals. The drop in receptaculitid population within interval 4 would thus represent a sudden deepening within the overall sequence of upward-shallowing waters. However, the status of receptaculitids as problematica makes any hypotheses difficult to test.

While receptaculitids are dominant in the Selkirk Member of the Red River Formation, they are virtually unknown in the Yeoman Formation of southeastern Saskatchewan (the lateral depositional equivalent of the Dog Head, Cat Head and Selkirk Members of the Red River Formation). Kendall (1976) proposed that this was due to the presence of a deeper water setting in the Yeoman Formation, as the depositional environment was closer to the Williston Basin center than its Red River counterpart, which lay at the basin margin. Furthermore, studies of the fossil from the Swedish island of Öland in the Baltic show that deposition was within a shallow sea, reinforced by the presence of cyanophytic algae and the bipolar orientation of the shells of orthoconic cephalopods (Nitecki et al., 1999).

6.3 Encrusting Relationships

Encrusting organisms, or epizoans, attach and develop themselves on other organisms. Hosts serve as hard substrates for the encrusters, particularly in depositional environments where sediment is soft, or competition for space is intense. Additional advantages of encrusting behaviour include 1) utilizing the feeding currents generated by certain hosts, and 2) ingestion of fecal wastes produced by the hosts (Morris and Felton, 1993). Interpreting these factors is hard, however, as it is often difficult to determine if overgrowth occurred contemporaneously with the growth of the host or following its death (Liddell and Brett, 1982). Encrusting behaviour is common within several groups, including bryozoans, inarticulate brachiopods, solitary and colonial corals, tubiculous worms, gastropods, bivalves, and sponges.

Analysis of encrusting relationships provides insight towards the exposure time of skeletons, and, as such, sedimentation rate, substrate availability, and stability (Young and Elias, 1995). They are thus quite useful as paleoenvironmental indicators. High incidences of encrusting behaviour suggest that substrates were stable and sedimentation rates were low, thus providing exposure times that were long enough for epizoans to attach themselves to hosts. Low incidences of encrusting behaviour suggest the opposite (unstable substrates and higher sedimentation rates).

The Tyndall Stone depositional environment provided abundant attachment sites for encrusters. In particular, colonial corals, cephalopod shells, receptaculitids and stromatoporoids were hard, sedentary substrates with ample surface area on which to attach. Table 6.1 displays the faunal distribution of encrusting and encrusted organisms at Garson.

Encrusting Organism	Number	Percent
Protrochiscolithus	56	68.29
Calapoecia	14	17.07
Favistina	4	4.88
Saffordophyllum	2	2.44
Stromatoporoids	2	2.44
Catenipora	1	1.22
Palaeophyllum	1	1.22
Receptaculitids	1	1.22
Rhabdotetradium	1	1.22
Total	82	100.00

Encrusted Organism	Number	Percent
Cephalopods	22	24.72
Maclurina	18	20.22
Stromatoporoids	18	20.22
Receptaculitids	8	8.99
Crenulites	7	7.87
Protrochiscolithus	4	4.49
Bryozoans	2	2.25
Calapoecia	2	2.25
Favistina	2	2.25
Solitary rugose corals	2	2.25
Saffordophyllum	2	2.25
Algal stromatolites	1	1.12
Brachiopods	1	1.12
Total	89	100.00

Table 6.1: Distribution of encrusting and encrusted organisms.

Several host organisms were encrusted by more than one epizoan, thus accounting for the unequal ratio of encrusting organisms to encrusted organisms (82 to 89). As the table shows, the tabulate coral *Protrochiscolithus* was the dominant epizoan within the Tyndall Stone depositional environment, accounting for over 68% of all encrusting organisms. Encrusted organisms were about evenly distributed among three dominant host groups: cephalopod shells (24.72%), the giant archaeogastropod *Maclurina* (20.22%) and stromatoporoids (also 20.22%).

Encrusters were found attached to host organisms (stromatoporoids, receptaculitids, corals and molluscs) in several ways: 1) to the oral surface of the host (eg., Pl. 3, fig. 3) in life orientation 2) to the oral surface of the host with both the host and encruster toppled (Pl. 3, fig. 2) or overturned (Pl. 6, fig. 2), suggesting deposition after a high-energy event, and 3) to the bottom side of tests, suggesting post-depositional colonization.

Bryozoans, commonly found as epizoans in several Ordovician and Silurian paleoenvironmental studies (Liddell and Brett, 1982; Elias, 1982; Segars and Liddell, 1988; McAuley and Elias, 1990), were not observed to play an encrusting role in the study section. However, a previous study by Elias (1981) on the Selkirk Member found that 75 percent of the encrusting organisms found on rugose corals were bryozoans. The apparent absence of encrusting bryozoans in this study may have been due to the nature of the study; fossil specimens were mapped but not extracted for examination.

An examination of the number of encrusting relationships in the Tyndall Stone over time (up-section) reveals significant aspects pertaining to the depositional environment. Fig. 6.31 displays the average number of encrusting relationships per fossil specimen within each interval. If, throughout the entire time of deposition, the Tyndall Stone was a stable and unchanging environment, the ratio of encrusting organisms to encrusted organisms would be expected to remain the same. However, this is clearly not the case, as interval 4 displays a clear peak in the number of encrusting relationships per fossil. Interval 4 is thus inferred to have been deposited in an environment of slower sedimentation, possibly in a deeper-water setting than any of the other intervals in the section. Regression analysis showed an upward-decreasing trend in the number of encrusting relationships (Fig. 6.31; straight black line), suggesting an increase in sedimentation rates over time (possibly from an overall upward-shallowing sequence) and/or a decrease in substrate stability. Complete encrusting density data is displayed in Appendix E (Table E-7).

In summary, the data from encrusting organisms in the Tyndall Stone suggests that an overall upward-shallowing sequence took place, with a sudden deepening accounting for the increase in encruster-to-fossil ratio within interval 4.

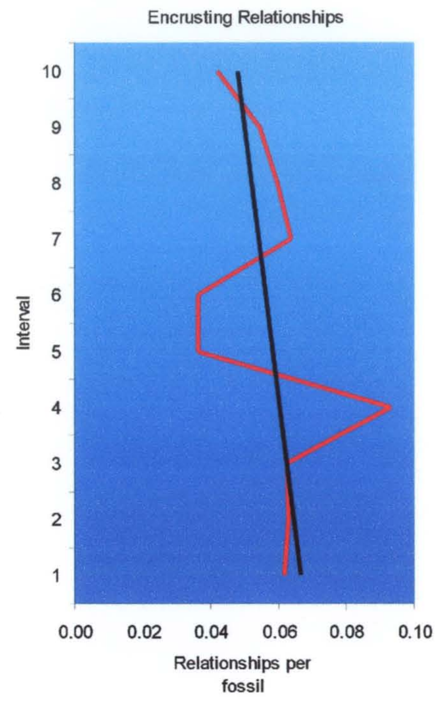


Fig. 6.31: Number of encrusting relationships per fossil over time. Note upward-decreasing trend displayed by linear regression line (black).

6.4 Paleocurrents

Cephalopods

Orthoconed cephalopods are perhaps the most well recognized tool for paleocurrent or wave indication in the fossil record. In one of the most extensive studies on fossil cephalopod orientation, Dixon (1970) examined 645 nautiloid specimens from Upper Ordovician limestones in Anticosti Island, Quebec. The majority of these cephalopods were aligned in a uniform direction, with tapered cones pointing the same way. These cephalopods were interpreted to have been oriented with apices pointing upstream, into the current. Nagle (1967) also found similar results for cone-like shells in flume experiments. In wave-tank trials, however, he found that the same conical shells aligned themselves parallel to wave crests. There is, therefore, a 90-degree difference in shell alignment for current and wave-dominated environments.

Skinner and Johnson (1987) found that the dominant arrangement of 189 siphuncular fragments in Late Ordovician limestones near Churchill, Manitoba was perpendicular to the trend of a well-defined ancient rocky shoreline. These orthoconic nautiloid shells were actually more cylindrical than conical, and were interpreted as being transported by long-shore currents rather than shoreward currents. There are thus two main factors that affect cephalopod orientation: current versus wave action, and conical versus cylindrical shell shape (Table 6.2). Interpretations of paleocurrent or wave action based on fossil cephalopod orientation should therefore be approached with caution.

	Conical Shell	**Cylindrical Shell**
Current-Dominated Setting	Shell parallel to current direction (apex points upstream, into current)	Shell perpendicular to current direction
Wave –Dominated Setting	Shell parallel to wave crests	Shell parallel to wave crests

Table 6.2: Long-axis orientation of cephalopods with respect to currents and waves.

Chenoweth's (1952) study of 158 endoceroids and orthoceratids in the Late Ordovician Trenton limestones of New York State revealed some possible mechanisms for current alignment. Chenoweth found that the smaller orthoceratids were lying (long axis) perpendicular to the trend of the larger endoceroids. The differences in orientation appear to be associated not with size, but with shape of siphuncle and location of the center of mass. The sharply tapered cones of the larger endoceroids apparently became rapidly filled with mud, moving the center of gravity to the apical region; thus the shell could pivot around this point, turning its long axis parallel to the current. The smaller orthoceratids possessed tubular siphuncles, which did not pivot; thus they rolled along the bottom, eventually becoming impeded and lying perpendicular to current direction.

Cephalopod orientations in the Tyndall Stone were measured by Ed Dobrzanski (pers. comm., 2000) from horizontal beds (steps) that were cut out of the quarry, away from the present study area. Trends of long axes (but not apical directions) were recorded. Measurements were recorded from beds of lateral equivalence to the study section, thus maintaining a temporal consistency. If a paleocurrent did indeed exist, sampling from sites away from the study section would not affect the results, as currents would most likely have existed within the entire area. Data from horizontal beds were plotted on an eight-area rose diagram (Fig. 6.32). Only the trends of the long axes were measured, so it is not known whether the apex faced away from or toward the measured orientation. Therefore, data is plotted on the rose diagram bilaterally (mirror images of orientations are plotted along with original orientations). Complete cephalopod data is displayed in Appendix F (Tables F-1 and F-2).

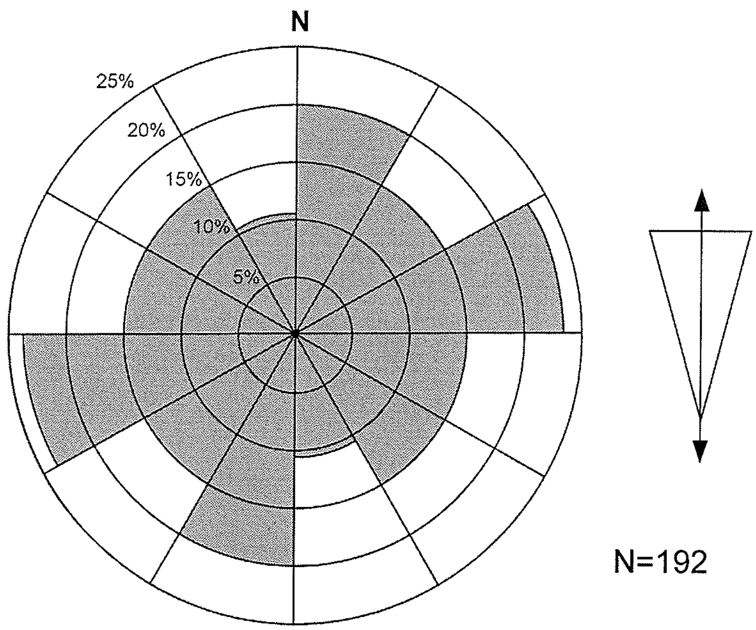


Fig. 6.32: Distribution of cephalopod trends, as taken from bedding planes in the Tyndall Stone. Orientation convention shown at right.

Strong peaks are shown from 0-30° and 180-210° (near north-south), and from 60-90° and 240-270°. These findings suggest one of three possibilities: 1) an east-west flow direction, 2) a north-south flow direction, or 3) both, if direction of paleocurrent changed during Tyndall Stone deposition.

Solitary Rugose Corals

While cephalopods have received the most scrutiny as paleocurrent indicators among the elongate, conical fossils, solitary rugose corals may also be beneficial tools in determining paleocurrent flow (Elias et al., 1987). Several studies have involved the use of solitary rugose corals as paleocurrent indicators: Nagle (1967) measured the directional orientation of Devonian horn corals and other fossils near Stroudsburg, Pennsylvania, though results were not particularly diagnostic; Hubbard (1970) measured and reported random orientation of geniculate (bent) solitary corals in Carboniferous strata of Ireland; and preferred orientations of free lying solitary rugosan corals were well demonstrated in the Elias et al. (1987) study of North American Upper Ordovician and Lower Silurian strata. In the Elias et al. study, slightly curved specimens having trochoid to ceratoid forms were aligned parallel to currents, with apices pointing upstream, and/or were rolled nearly perpendicular to currents or parallel to wave crests, with apices facing both way with equal frequency. Elias et al. (1988) noted that strongly curved forms of solitary rugose corals would be expected to become aligned with their convex sides pointing into the current (Fig. 6.33). The convex side of curvature is also the side where the cardinal septum is located, thus the attitude of the cardinal septum in solitary horn corals may be used to infer the resting position of coralla in the sediment. This, in turn may be used to infer paleocurrent.

The abundance of horn corals in cross-section along the vertical faces within the Tyndall Stone made the Elias et al. (1988) method ideal for this study. Because the walls ran in only two directions -- north-south and east-west -- only four possible paleocurrent directions could be inferred from the attitude of the cardinal septum: 0°, 90°, 180°, and

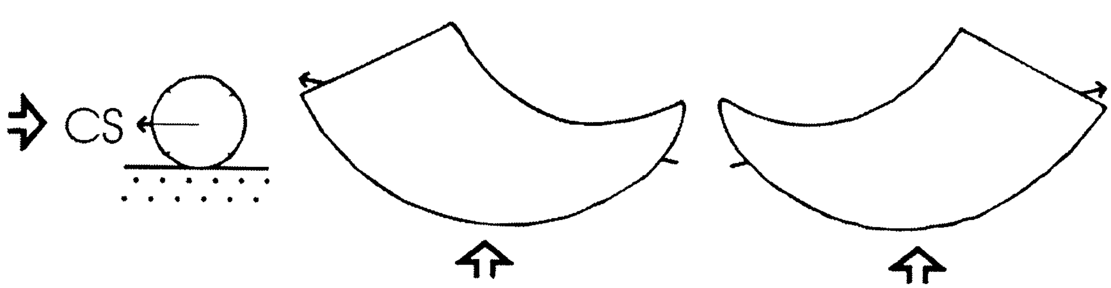


Fig. 6.33: Relationship between orientation of unattached, curved solitary horn corals and paleocurrent direction (arrows). Coral viewed in cross-section (left) shows cardinal septum (CS) oriented into current flow (arrow; modified from Elias et al., 1988).

270° (north, east, south and west, respectively). Horn corals which had their cardinal septum oriented within 45° of the horizontal plane (thus displaying preferential alignment in one direction) were used to infer paleocurrent direction.

Although 719 horn corals were counted within the Tyndall Stone walls, only 86 coralla were used to ascertain paleocurrent. Of these, 41 were found on the east-west wall, while 45 were on the north-south wall. This even distribution was ideal, as it did not significantly skew the data towards any direction. The majority of unused coralla were found within storm lenses, buried beneath storm-churned sediment. This rendered orientations random and therefore unusable. Poorly preserved specimens were also discarded as tools, as the position of the cardinal septum could not be defined. Furthermore, the cut vertical facing of the Tyndall Stone walls obviously could not provide ideal cross-sections for every horn coral, and thus the cardinal septum in such cases could not be determined. Fig. 6.34 displays the results of paleocurrent analysis, as inferred by cardinal septa of solitary rugose corals. Complete cardinal septum orientation data may be found in Appendix F (Tables F-5, F-6).

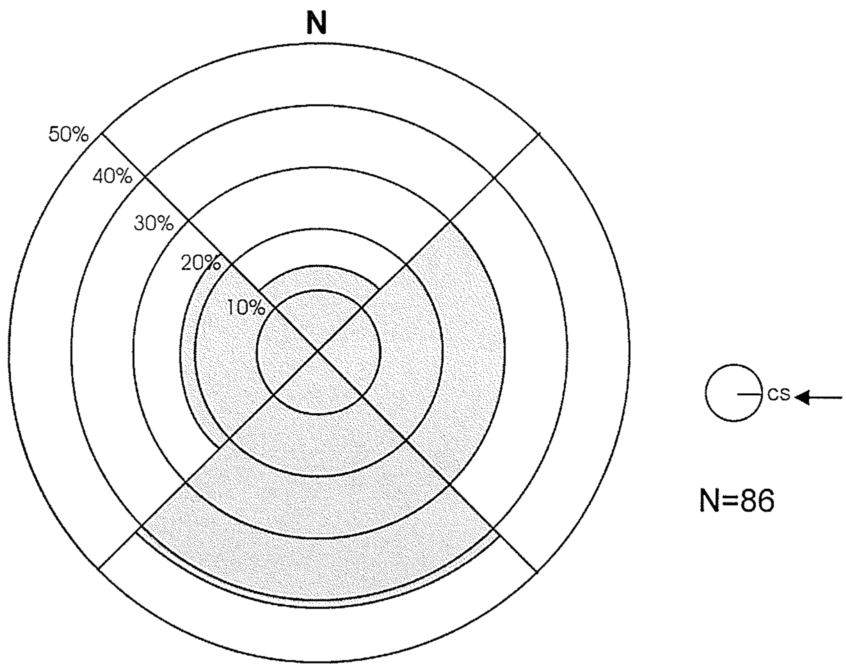


Fig. 6.34: Distribution of inferred paleocurrent directions, as determined by the attitude of cardinal septa of solitary rugose corals. Relationship between attitude of cardinal septum (CS) and paleocurrent direction (arrow) shown at right.

Horn corals within the Tyndall Stone walls display preferential orientation of their cardinal septa to the south, with 41% of the cardinal septa aligned towards this direction. These findings correspond well with the cephalopod data, which indicated either a north-south or east-west direction of flow. The cephalopod data, which gave the possibility of two paleocurrent directions, is therefore further refined by the cardinal septa data, which isolates a single northerly flowing current. It is thus inferred that a paleocurrent flowed from the south. Cephalopods which have their long axes oriented east-west are presumed to have rolled perpendicular to the direction of current flow.

6.5 Colonial Coral and Stromatoporoid Growth Form

Colonial coral growth form

General form of coral colonies may be similar in unrelated organisms because form represents a basic response to environmental pressures. Different growth forms of colonies have different ecologic properties with respect to space occupation, mechanical strength, and other characteristics. For example, modern hermatypic corals with tabular growth forms occupy surface area efficiently, and in low light conditions, all polyps are directed toward maximum light (Oliver and Coates, 1987). Columnar forms, on the other hand, are mechanically efficient in environments with high sedimentation rates, allowing many polyps to grow in the water column with only a small substrate perimeter to occupy and defend (Oliver and Coates, 1987).

The following parameters are used to measure coralla:

W = width
H = height
M = height of the widest point

From these measurements, Young and Scrutton (1991) defined growth forms of coralla using the following system:

Tabular	$W:H \geq 3:1$, base and upper surfaces sub-parallel
Domical	$W:H \geq 1:1$ but $< 3:1$, $M < 0.5H$
Bulbous	$W:H \geq 1:1$ but $< 3:1$, $M \geq 0.5H$
Columnar	$W:H < 1:1$, sides sub-parallel

In general, upward growth is necessary to keep the organism above the accumulating sediment on the sea floor. As a general rule, columnar or bulbous forms reflect high sedimentation rates, while low-domical to tabular forms suggest the opposite (Stearn and Carroll, 1989). Excessive sedimentation can be recognized, as it commonly smothers those individuals living at the basal periphery of the coralla. Later, these flanks are overgrown to produce distinctive digitate, or "fingering" margins (Scoffin et al., 1997).

In a study of latest Ordovician to earliest Silurian colonial corals of the east-central United States, Young and Elias (1995) showed that tall colonies shed sediment more readily than lower ones, although growth form must have combined with polyp morphology to keep surfaces sediment free. However, they also showed that colony growth may have been directed preferentially upward in order to compensate for sediment accumulation and/or subsidence of the colony into the substrate. In this manner, proportions of low, high and columnar coralla may reflect not only sedimentation rate, but also substrate stability. Low domical forms suggest a stable substrate and low sedimentation rate, while taller domical and bulbous forms suggest that substrates were less stable and/or sedimentation rates were higher.

Recent work by Young and Elias (1999) has shown that changes in some coral species during growth of the coralla were related to the shape of the growth surface. Coralla with conical bases grew more in the vertical plane while coralla with flattened bases showed little variation throughout their growth.

In terms of water energy, colonial growth forms have traditionally been assigned to a spectrum of water turbulence levels. Massive, tabular forms are proposed to have inhabited high-energy environments, such as fore-reef slopes, while delicately branching growth forms are thought to represent calmer waters (Benton and Harper, 1997).

Stromatoporoid growth form

Like the colonial corals, growth forms of stromatoporoids are indicative of sedimentation rates. Laminar and low-domical forms suggest slow sedimentation, while high-domical to bulbous forms suggest faster sedimentation.

Competition for space on the sea floor may also affect stromatoporoid shape, as it does in colonial corals. Extended domical forms, with their lower basal area, may reflect a struggle for attachment sites at the sediment-water interface. These forms may also display a tiering in trophic structure brought about by competition; extending growth further above the substrate may have opened up new feeding regimes for the filtering stromatoporoids. Other environmental parameters, however, such as distribution of light to the organism, do not apply to the sponge.

The following is the standard method of measuring stromatoporoid growth form, as taken from Kershaw and Riding (1978):

Laminar: V/B	≤ 0.1
Low-Domical: V/B	0.1 - 0.5
High-Domical: V/B	0.5 – 1.0
Extended-Domical: V/B	> 1.0

where	V = vertical height of the stromatoporoid
and	B = width of the stromatoporoid

However, considering that the same environmental restrictions pertain to both colonial corals and stromatoporoids, the method devised by Young and Scrutton (1991) was applied to both groups.

Growth Forms in the Tyndall Stone

Growth forms of colonial coral and stromatoporoids in the Tyndall Stone are of three varieties: tabular, domical-bulbous, and columnar. Tabular forms are clearly dominant, accounting for 69.9% of all coral and stromatoporoid shapes (Fig. 6.35).

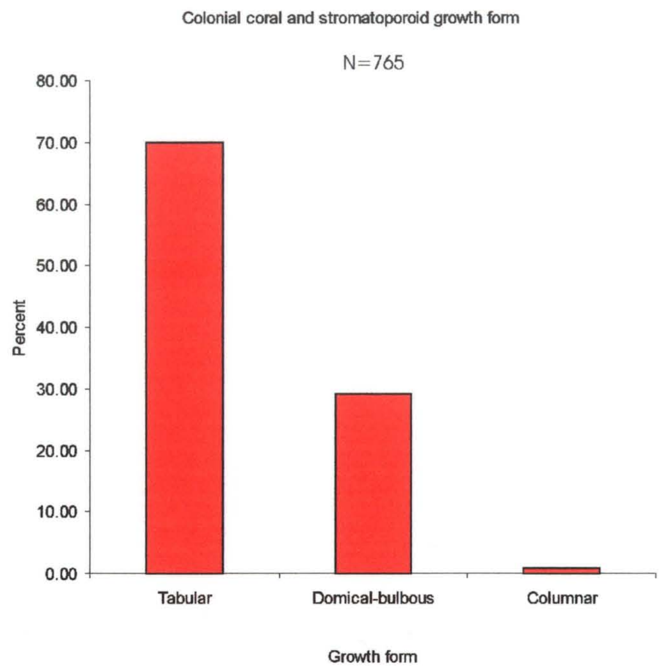


Fig. 6.35: Overall analysis (by percent) of colonial coral and stromatoporoid growth forms within the Tyndall Stone.

Domical-bulbous forms account for 29.1% of growth forms, while columnar forms constitute less than one percent. Complete growth form data is displayed in Appendix E (Table E-8).

The overall dominance of tabular growth forms and virtual absence of columnar growth forms in the Tyndall Stone suggest that sedimentation rates were moderately low and/or substrate stability was ideal. This is further displayed by individual analyses of each interval, wherein tabular forms never drop below 58% (Fig. 6.36). However, the decreasing percentages of tabular forms from intervals 6 to 9 may indicate a slight increase in sedimentation and/or a decrease in substrate stability. Increased

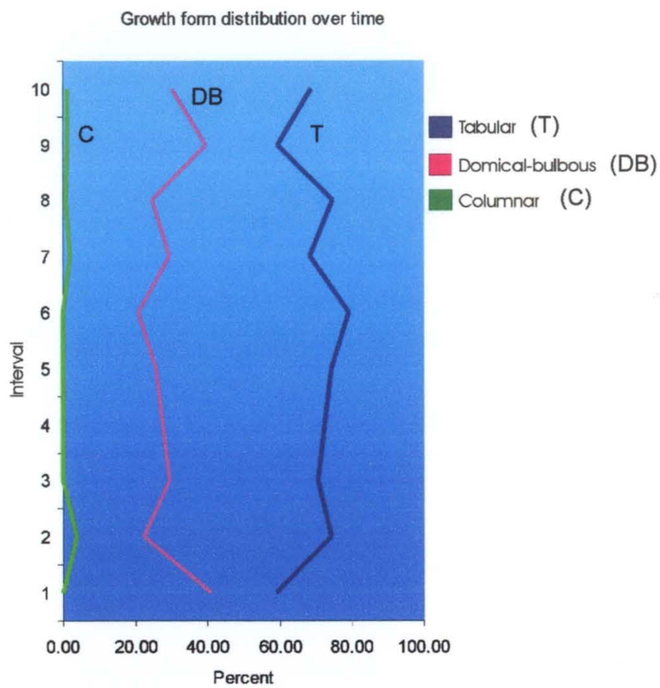


Fig. 6.36: Colonial coral and stromatoporoid growth form percentages over time.

sedimentation rates may be related to an upward-shallowing sequence. Of particular note is the complete lack of columnar forms within intervals 3 and 4. These intervals may represent a deeper environment in the section, a hypothesis supported by other fossil evidence in the Tyndall Stone (see *Fossil Groups of the Tyndall Stone*).

The presence of a dominantly tabular growth form also suggests that competition for space and food was not urgent within the ecosystem. Corals and stromatoporoids were thus allowed to expand outward instead of being forced upward to exploit new feeding levels.

If the tabulate and colonial rugose corals of the Selkirk Member had zooxanthellae, tabular growth form may also suggest that turbidity in the water column was moderate to high, and light penetration to the colonies needed to be maximized.

6.6 Trophic Analysis

The usefulness of trophic analysis lies in the information it gives about the feeding structure of fossil communities. This feeding structure may then be used to infer aspects of the paleoenvironment, including depth, turbulence, and food abundance. Changes in the trophic structure of communities, no matter how subtle, imply a shift in environmental parameters. Trophic analysis is particularly effective when utilized in tandem with sedimentology, ichnofacies and taphonomy to create a complete reconstruction of a paleocommunity (Watkins, 1991). Extensive studies on the trophic structures of level-bottom communities include work by Walker (1972a), Watkins (1991) and Holland (2001).

Analysis of the benthic community at Garson reveals four main guilds within the paleoecosystem: 1) sessile epifaunal suspension-feeders, including stromatoporoids, solitary and colonial corals, bryozoans and brachiopods; 2) vagile scavenging epifauna represented by gastropods and trilobites; 3) vagile deposit feeding infauna, represented by burrowing trilobites and the organisms responsible for the distinctive Tyndall Stone mottles; and 4) predators, represented by cephalopods. Overall, the dominant guild in the Tyndall Stone is the suspension-feeders. Rhoads et al. (1972) noted that the presence of a community dominated by suspension feeders implies a suspended food source, a firm stable surface for attachment of sedentary organisms, and low turbidity to avoid clogging of feeding and respiratory mechanisms.

Three tiers of trophism were prevalent in the paleocommunity. Stromatoporoids and colonial corals probably occupied the upper-tier feeding niche. Low-tier feeders were represented mainly by solitary rugose corals and gastropods. Infaunal deposit feeding organisms were definitely present, but it is difficult to determine their raw abundance as no body fossils remain. Thus the degree of mottling is the sole evidence remaining of their existence. A high-tier feeding niche is suggested by the presence of pelmatozoan debris, but is dismissed due to the strong possibility they were transported after death into the ecosystem (see *Fossil Groups of the Tyndall Stone*).

It can be seen that a strong vertical tiering structure is not observed within the paleocommunity, as feeding levels range from just below the sediment-water interface to several centimeters above the sea bottom. Feeding competition thus probably was minimal, due not to tiering, but to abundant food resources. Nutrient content in the water column (particularly near the bottom) and in the sediment must have been sufficient to prevent stratification of feeding levels, and extensive vertical growth forms were not crucial for survival. A similar conclusion was reached by Byers and Gavlin (1979), who studied faunally similar communities from the Ordovician of Wisconsin.

6.7 Taphonomy, Taphofacies and Time-Averaging

Taphonomy

Taphonomy is the study of all the processes affecting the preservation of fossils from the moment of an organism's death to its discovery as a fossil. Such processes include physical, chemical, and biological reworking, and have been shown to cause significant loss to the fossil record (Kidwell and Flessa, 1996). In fact, fossils that are preserved in sedimentary sequences probably represent only a small proportion of the original shelled fauna (Brenchley and Harper, 1998). Breakdown of skeletons produces significant quantities of carbonate mud in low-energy environments (Martin, 1999), a scenario that probably accounted for the high content of mud-sized carbonate sediment in the Tyndall Stone.

Physical taphonomic processes include abrasion, fragmentation, hydraulic sorting, and transportation and deposition of skeletal material away from the original habitat. Abrasion is the physical grinding and polishing of skeletons resulting in the rounding of skeletal elements and loss of surficial details. The degree of abrasion is related to environmental energy, exposure time and the particle size of the abrasive agent (larger particles produce more abrasion). Fragmentation occurs from physical impact of skeletons (indicative of high energy environments) and may also be caused by biological agents (see below).

The geological setting of chemical destruction varies with sedimentation rate, pore water chemistry and bottom water oxygenation (Martin, 1999). Hard parts of different taxa typically have unique properties that hinge on their mineralogy and microstructure. In limestones, aragonite is typically converted to calcite, high-magnesium calcite is converted to low-magnesium calcite, and all three are subject to dissolution, pyritization, silification, and dolomitization (Walter and Morse, 1984), as we see in Tyndall Stone fossils. In shallow, open marine benthic environments, chemical dissolution does not play a heavy role in post-mortem destruction of calcite parts. The likelihood of shells being dissolved on the sediment surface depends largely on the degree of saturation of water with respect to calcium carbonate ($CaCO_3$). Most Recent shallow marine waters are saturated or over-saturated with respect to calcium carbonate, so there is little dissolution of calcitic shell material (Brenchley and Harper, 1998). In addition, lithification commonly occurs at an early stage, prior to compaction in carbonate sediments; this prevents any undersaturated or acidic pore fluids from seeping into the sediment during burial (thus dissolution of shell material is minimized; Brenchley and Harper, 1998). The dissolution of aragonitic mollusc shells but not calcitic tests in the Tyndall Stone is not a peculiarity; calcite shells in limestones commonly retain their original shell structure, but aragonite shells are generally dissolved away and the resulting cavity is filled. This is due mostly to the instability of aragonite in normal marine environments (Brenchley and Harper, 1998). Tyndall Stone fossils that were originally aragonitic are thus dolomitized, while calcitic forms remain well preserved in their original mineralogy. Poorly preserved calcite skeletons were probably originally composed of high-magnesium calcite.

Organisms may act as taphonomic agents by redistributing skeletal material through predation or burrowing. Biofragmentation can be caused by predators and scavengers that 1) crush shells, or 2) ingest them, leaving fecal accumulations. Burrowing by organisms (bioturbation) can also redistribute the fossil remains included within sediments as well as alter internal primary structures like cross-stratification or bedding. Watkins (1997) suggested that production of *Thalassinoides* could cause mixing of skeletal material through vertical sediment intervals of several decimeters. Differences in proportions of fossil taxa accumulating on the sea floor, layer by layer, may be smoothed out, or obliterated altogether (Newton and Laporte, 1989).

In addition to being taphonomic agents, organisms themselves may be directly affected by taphonomic processes. Animals can modify the substrate on or in which they live. For example, shelly fauna can modify the substrate by generating dead shells and fragments that provide other organisms with hard colonization sites in an otherwise fine-grained sediment (Brett, 1991). This process is known as *taphonomic feedback*. Bioturbation of the substrate by deposit feeders can produce soft, fecal-rich sediment that is prone to resuspension, resulting in turbidity that may inhibit the occurrence of suspension feeders (Brenchley and Harper, 1998). In addition, it provides nutrients for other deposit feeding organisms. While taphonomic feedback was not observed to be a major taphonomic process in the Tyndall Stone, bioturbation was abundant. The smaller secondary burrows within the mottled sediments prove that bioturbation prompted secondary deposit feeders to scour the nutrient-rich sediment. Whether or not turbidity was enhanced due to resuspension of fecal matter is unknown.

Taphofacies

Taphofacies are suites of sedimentary rock delineated by the preservational features of contained fossils (Brett and Baird, 1986). By studying the degree of preservation of various fossils, the paleoenvironment can be interpreted. This is in contrast to the traditional partitioning of rock suites into biofacies, which are defined by fossil taxa within them. Taphofacies are based on consistent preservational properties, including 1) orientation of fossils, 2) relative degree of articulation, 3) relative degree of fragmentation, 4) degree and type of abrasion 5) type of shell fillings or coatings, 6) evidence of early dissolution of skeletons, and 7) any special features of preservation (Brett and Speyer, 1990).

Brett and Speyer (1990) related the degree of preservation of various skeletal types to sedimentation rate (Table 6.3). From comparison with the preservation of Tyndall Stone fossil groups, it is evident that sedimentation rates during deposition of the Selkirk Member were low to intermediate, on a scale of 1-10 cm/10^3 years. Since the study section is approximately 5 m in height, this translates into a total depositional timeframe of between fifty thousand and five hundred thousand years. This does not take into account the thickness of storm lenses, which represent periods of rapid deposition.

		Sedimentation rates		
Environmental energy	Skeletal type	Episodic, very rapid (10–50 cm/10^2 years)	Intermediate–rapid (10–100/cm/10^3 years)	Low–intermediate (1–10 cm/10^3 years)
High	Fragile; ramose	Minor fragmentation	Strong fragmentation	Absent
	Bivalved shells	Mostly articulated; rarely *in situ*	Partially articulated; some fragmented	Disarticulated; fragmented; abraded
	Multielement skeletons	Mostly articulated; rarely *in situ*	Partially articulated; pieces sorted	Disarticulated; pieces sorted
Low	Fragile; ramose	Intact; not fragmented	Some fragmentation	Strong fragmentation; corrosion
	Bivalved shells	Articulated; some *in situ*	Mostly disarticulated; complete valves	Disarticulated; minor fragmentation; corrosion
	Multielement skeletons	Completely articulated; some *in situ*; intact moults	Partially articulated; non-sorted	Disarticulated; non-sorted

Table 6.3: Sedimentation rates, as inferred from preservation of skeletal material (from Brett and Speyer, 1990).

The combination of sedimentation rate and turbulence (water energy) directly affects taphonomic processes: generally speaking, prolonged exposure on the sea floor subjects organisms to extended periods of taphonomic processes. Relatively rapid burial, on the other hand, enhances preservation potential.

Time-Averaging

Time-averaging, or temporal mixing, is the accumulation of fossil material over a period of time. The fossil population is a mixture of many successive populations, resulting from multiple (often seasonal) inputs of shells and skeletons to the sediment (Martin, 1999). Time-averaged assemblages are recognized by the occurrence of ecologically incompatible species, the presence of fossils of different preservational states, or changes in ichnofacies or other benthos from soft-sediment to firmground (Kidwell, 1991).

Fürsich (1978) stated that condensation phenomena caused by environmental, biotic, or diagenetic factors are widespread in the fossil record, particularly in shallow shelf sediments. Fürsich further stated that these factors may alter the composition of ancient communities, even without large-scale transport being involved, leaving only time-averaged units available for paleoecological studies. Time-averaging may thus be the result of several taphonomic processes. However, Kidwell and Behrensmeyer (1993) showed that even without biostratinomic factors such as physical reworking, transport, dissolution, and bioturbation (see above), there is an inherent bias toward time-averaging because biological generation times are typically much shorter relative to net rates of sediment accumulation.

While it is almost a certainty that the Tyndall Stone was subjected to time-averaging processes, the degree to which fossil condensation occurred is difficult to determine. Martin (1999) stated that unless an ecosystem is rapidly buried (i.e., Lägerstatten), a fossil assemblage may represent a minimal duration of a few decades up to likely hundreds to thousands of years or more. The Tyndall Stone fossil assemblage thus probably consists of an incomplete and biased sampling of many temporally distinct populations and communities. However, the persistent occurrence of the fossil groups throughout the entire section suggests that the community was relatively stable over time.

Chapter 7: Synthesis and Discussion

7.1 Sedimentological Interpretation of Paleoenvironment

The abundance of mudstone in the Tyndall Stone suggests that relatively quiet waters were predominant during the deposition of the study section. Fossils and bioclastic fragments most likely represent organisms from the autochthonous paleocommunity. Storm-generated waves and currents, however, occasionally interrupted the normally calm environment. Storm lenses found within the Tyndall Stone walls show an increase in both frequency and thickness through time, suggesting an overall upward-shallowing sequence. A marked drop in frequency and thickness within interval 4 records a sudden deepening in the sequence. The abundance of storm lenses and lack of shallow-water features in the Tyndall Stone proves that the depositional environment was situated above storm wave base and below fairweather wave base (between approximately 10 and 100 m deep).

The mottling pattern that characterizes Tyndall Stone was probably created by ancient analogues to modern thalassinoidean shrimp. Burrows were of the domichnia-type, indicating dwelling and feeding behaviour of the ancient tube-makers. Burrows most closely resemble the trace fossil *Thalassinoides*, found frequently in shallow, subtidal marine environments. Persistence of the mottling pattern in the Tyndall Stone shows that organic matter and nutrients were abundant within the sediment. The sharp outlines and minimal deformation of dolomite burrow-mottles suggests the presence of a firm substrate during the time of deposition; the burrows were probably a network of open tubes, and a firm substrate would be essential to prevent collapse of the structures. Lithification of burrows was slower than the surrounding matrix, allowing dolomitizing fluids to penetrate and alter the mineralogy of the tunneled sediment. The smaller tunnels found running through the original mottles were the result of secondary burrowers excavating the softer, mottled sediment for nutrients left behind by the primary burrowers. An increase in the mottling density over time (up-section) suggests an increase in burrowing organisms in the sediment. This may have occurred due to 1) more nutrient availability within the sediment (this is supported by the overall increase in fossil abundance over time) or 2) a preference of shallower water by the burrowers.

7.2 Refinement of Paleoenvironmental Interpretation Using Fossil Evidence

Paleoenvironmental interpretation based solely on sedimentology and lithology of the Tyndall Stone may be refined via examination of the paleocommunity. Indeed, an environmental interpretation based on biofacies (which can be more sensitive towards environmental change) is essential, considering the homogeneous Tyndall Stone lithology.

An openly circulating marine environment is evident from the paleocommunity identified at Garson. In addition, cephalopod and solitary rugose coral orientations suggest a northerly flowing paleocurrent. The fossil components of the Tyndall Stone paleocommunity (which includes several stenohaline groups) suggest that salinity was not far from normal (34‰). Algal borings found in solitary rugose corals place the Tyndall Stone paleocommunity strictly within the photic zone (Elias, 1980; Elias and Lee, 1993), while annelid borings indicate depths of no more than 25 m (Thayer, 1974; Pickerill, 1976).

The abundance of suspension feeders such as corals and stromatoporoids implies several environmental parameters. These include: 1) a firm to hard substrate free from rapid accumulation of sediment, 2) normal salinity levels, 3) warm to temperate water temperatures, 4) gently circulating and well oxygenated waters, 5) ample food in the water column and 6) turbulence levels strong enough to maintain organic matter and other nutrients in the water column, but weak enough as to be unable to suspend sediment for extensive periods (high turbidity) and cause clogging of feeding and respiratory mechanisms.

Archaeogastropods in the Tyndall Stone further show that despite a muddy sea floor environment, turbidity was low enough to permit proliferation of the snails. Dominance of the sedentary *Maclurina* suggests that organic detritus was generous in the water column, and bolsters the hypothesis that sedimentation rates were relatively low. The increased average size of *Maclurina* within interval 4 may be due to the deeper environment, which would receive less sedimentation.

The decrease in encrusting relationships over time is a strong indication of increasing sedimentation rates, most likely brought about by an upward-shallowing sequence. The sharp increase in encrusting relationships within interval 4 records a sudden deepening; this is corroborated by storm lens data (see above). Furthermore, q-mode cluster analysis shows that in terms of fossil content and abundance, interval 4 is clearly the most different of the ten intervals, with a dissimilarity index of 0.475 (Fig. 6.3). This disparity is attributed to the deepening event within the interval.

Further evidence of an upward-shallowing sequence may be found from observations of horn coral abrasion. The percentage of highly abraded solitary corals (like the number of encrusting relationships) decreases up-section, suggesting an increase in sedimentation rates over time. Exposed horn corals, unburied by sediment, are subjected to prolonged taphonomic processes; this is clearly displayed in interval 4, which records a sudden deepening and also the greatest percentage of highly abraded horn corals. An upward shallowing is also presumed to be responsible for the increase in algal stromatolite size; a lowering of sea level would have increased the amount of sunlight penetrating to the sea floor, thus enhancing algal growth.

Stromatoporoids show a marked increase in abundance over time. This is also attributed to upward-shallowing, which increased turbulence levels near the bottom and allowed more nutrients to be held in the water column. Stromatoporoids show a sudden population drop within intervals 3 and 4 indicating a sudden deepening within the overall shallowing sequence; the drop in abundance suggests weaker turbulence and therefore less food held in the water column, while the absence of columnar growth forms suggests slower sedimentation rates.

An upward-shallowing theory for the Tyndall Stone is supported by previous work of Brindle (1960), McCabe and Bannatyne (1970), Elias (1991) and Jin and Zhan (2000). Brindle identified the presence of evaporite deposits in the overlying Fort Garry Member, indicating a shallower, more restricted environment than the Selkirk Member. McCabe and Bannatyne noticed sedimentary breccias within the Fort Garry Member (not present in the Selkirk Member) that they proposed were the result of evaporite solution in a shallower depositional environment. Elias, through the use of presence/absence data of various groups of solitary horn corals and other (sedimentological) evidence, suggested that the three lower members of the Red River Formation (Dog Head, Cat Head and

Selkirk) were deposited under open marine conditions, with the maximum transgressive stage recorded in the Cat Head Member. After this maximum, a regressive phase is thought to have occurred throughout the time of Selkirk Member deposition and into the Fort Garry Member. Elias showed that the solitary coral *Salvadorea randi* is the only species known to range into the Fort Garry Member, reflecting comparatively shallower and restricted conditions within that unit. Jin and Zhan recognized the presence of a faunally-rich and diverse *Kjaerina hartae* community within the Selkirk Member, and the sudden absence of that same community in the overlying Fort Garry beds. This faunal shift was also attributed to a drastic regression and episodic restriction to a salina or sabkha-dominated depositional setting.

It must be noted that the lack of lithofacies variation (yet existence of fossil abundance variation) within the Selkirk suggests that depth control on fossil assemblages may be more significant than currently recognized.

Kendall's (1976) work on the Ordovician carbonate succession (Bighorn Group) of southeastern Saskatchewan revealed beds of dominantly mud-supported sediments in the Yeoman Formation (the lateral equivalent of the Red River Formation), indicating a depositional environment effectively below wave base. In the uppermost beds of the Yeoman Formation and lowermost beds of the Herald Formation (lateral equivalent of the Fort Garry Member), however, Kendall noticed hardgrounds with corrosional surfaces, minor cross-stratification and the appearance of algal pisoliths. This suggests a shallower depositional environment than underlying Yeoman units, and an upward-shallowing sequence overall.

Progressively decreasing tabular forms of colonial corals and stromatoporoids from intervals 6 to 9 suggests that 1) sedimentation rates became increasingly greater in those intervals and/or 2) the substrate was less stable. Provided with the evidence from other fossil groups and storm lens data, it would appear that both hypotheses are likely. It can be interpreted, then, that sedimentation and substrate stability fluctuated over time in the Tyndall Stone, and subsidence of colonial corals, combined with increasing sedimentation rates, prompted an increase in domical and bulbous growth forms. Walker and Diehl (1986) stated that synsedimentary substrate modification could occur from 1) water loss from the substratum producing a gradual change in consistency from fluid to soft, and ultimately to firm, and 2) early marine cementation of the substratum. These changes could be observed by a mix of morphotypes, each adapted to a different substrate consistency. Furthermore, Walker and Diehl proposed that changes in substrate modification of this nature occurred under relatively constant conditions of external environment (such as that proposed for the Tyndall Stone), and over a short time interval.

Statistical analysis identifies a close relationship between the gastropods and cephalopods that is clearly observable from their density comparison chart (Fig. 6.29) and cluster analysis (Fig. 6.2). Previous studies have shown that gastropods were food resources for the carnivorous cephalopods, which may account for their similar abundance patterns up-section (Nixon and Maconnachie, 1988; Daly, 1996). The close relationship between the tabulate coral *Protrochiscolithus* and the receptaculitids, stromatoporoids and cephalopods is evident: the encrusting coral utilized these skeletons and shells as hard substrates for attachment and growth. The close relationship between receptaculitids and stromatoporoids, however, is attributed to similar environmental requirements. Table 7.1 summarizes the major trends and events in the Tyndall Stone paleoenvironment that could be deduced from sedimentological and paleontological evidence.

Trend/event	Sedimentological evidence	Paleontological evidence
Upward shallowing sequence	-Overall increase in storm activity -Overall increase in storm lens thickness	-Overall increase in stromatoporoid abundance -Overall increase in receptaculitid abundance -Overall decrease in encrusting relationships -Overall slight decrease in tabular growth forms -Overall increase in algal stromatolite size
Sudden deepening in interval 4	-Marked drop in storm activity -Decreased storm lens thickness	-Drop in stromatoporoid abundance -Drop in receptaculitid abundance -Marked increase in percentage of highly abraded horn corals -Marked increase in encrusting relationships -Increased Maclurina size -Most dissimilar, faunally, of all intervals (as revealed through cluster analysis)
Firm substrate	-Sharp outline on burrow-mottles	-Dominance of suspension feeders (stromatoporoids & corals)
Increasing sedimentation rate		-Overall increase in tabular growth forms (decrease in domical & bulbous growth forms)
Cephalopod predation of gastropods		-Low dissimilarity index (0.1625) -Similar abundance trend pattern
Northerly flowing paleocurrent		-Orientation of cephalopod shells on horizontal bedding planes -Orientation of cardinal septa in solitary horn corals

Table 7.1: Summary of trends and events that occurred within the Tyndall Stone paleoenvironment, as displayed by sedimentological and paleontological evidence.

Chapter 8: Conclusions

The fossils of the Tyndall Stone paleocommunity display not only the type of environment in which they existed, but also subtle facies controls that are not detectable by merely studying the homogeneous mottled lithology. Fluctuations in fossil abundance, interactions and taphonomic processes indicate paleoenvironmental changes that are otherwise undetectable by lithological interpretation. This clearly shows that examination of biofacies, and the organisms associated with them, can be used as more sensitive tools for environmental interpretation than lithofacies.

The paleontological and sedimentological evidence at Garson shows that the depositional environment of the Tyndall Stone was a quiet, fairly shallow, subtidal setting. Depth was below fair-weather wave base but definitely within the photic zone (probably no deeper than 25 m). Occasional storm events were strong enough to topple and overturn even the largest skeletons. Sedimentation rates were low, as was turbidity. Nutrient content in the water column and within the sediment was ample, and extensive tiering of feeding structure was not necessary. Water temperatures were warm (southern Manitoba lay near the equator), and salinity was normal. The substrate was firm, occasionally undergoing minor synsedimentary modifications. A northerly flowing paleocurrent was present, evidenced by preferential alignment of cephalopods and solitary rugose corals. The current was not only strong enough to align skeletons, but also to suspend and transport food and nutrients to sessile fauna.

An overall upward-shallowing sequence was interrupted by a sudden deepening, recorded within interval 4. The paleocommunity as a whole was not drastically affected by these fluctuations in sea level, which were probably no more than several metres in scale. The paleocommunity was therefore relatively stable, further evidenced by the dominance of suspension feeders throughout the entire section, and the constant presence of almost all of the various fossil groups.

Physical and biological reworking were the major taphonomic processes, although chemical dissolution of aragonitic mollusc shells did occur. Calcareous algae were not a large component of the Tyndall Stone, thus the abundance of carbonate mud may have resulted from taphonomic breakdown of calcareous tests and shells. A pioneer stage was not observed, although it may have occurred stratigraphically lower (earlier), with the accumulation of bivalve shells. Taphonomic feedback was, however, present in the form of primary bioturbation providing nutrients for ensuing secondary burrowers.

References Cited

Ager, D.V. 1963. Principles of Paleoecology. McGraw-Hill, 371 p.

Andrichuk, J.M. 1959. Ordovician and Silurian stratigraphy and sedimentation in southern Manitoba, Canada. Bulletin of the American Association of Petroleum Geologists, vol. 41, no. 10, pp. 2333-2398.

Bannatyne, B.B. 1988. Dolomite resources of southern Manitoba. Manitoba Energy and Mines Economic Geology Report ER85-1, 39 p.

Beadle, S.C. 1988. Dasyclads, cyclocrinitids and receptaculitids: comparative morphology and paleoecology. Lethaia, vol. 21, pp. 1-12.

Benton, M. and Harper, D. 1997. Basic palaeontology. Addison Wesley Longman Limited, Edinburgh Gate, England. 342 p.

Birse, D.J. 1928. Dolomitization processes in the Paleozoic horizons of Manitoba. Proceedings and Transactions of the Royal Society of Canada no. 22, pp. 215-221.

Bhattacharyya, G.K. and Johnson, R.A. 1977. Statistical concepts and methods. John Wiley and Sons, Inc., New York, New York. 639 p.

Blake, D.B. 1981. Paleoecology of Bryozoa: *in* Dutro, J. T. and Boardman, R. S. (eds.). Lophophorates: notes for a short course. University of Tennessee Department of Geological Sciences: Studies in Geology 5, pp. 37-51.

Boggs Jr., S. 1995. Principles of sedimentology and stratigraphy. Prentice-Hall, Inc., Upper Saddle River, New Jersey. 774 p.

Bolton, J.C. and Driese, S.G. 1990. The determination of substrate conditions from the orientations of solitary rugose corals. Palaios, vol. 5, pp. 479-483.

Boucot, A.J. 1981. Principles of benthic marine paleoecology. Academic Press, Inc., New York, New York. 463 p.

Brenchley, P.J. and Harper, D.A.T. 1998. Palaeoecology: ecosystems, environments and evolution. Chapman and Hall, London. 402 p.

Brett, C.E. 1991. Organism-sediment relationships in Silurian marine environments: *in* Bassett, M.G., Lane, P.D., and Edwards, D. (eds.). The Murchison Symposium: Proceedings of an International Conference on the Silurian System. Palaeontological Association: Special Papers in Palaeontology No. 44, pp. 301-344.

Brett, C.E. 1998. Sequence stratigraphy, paleoecology, and evolution; biotic clues and responses to sea-level fluctuations. Palaios, vol. 13, no. 3, pp. 241-262.

Brett, C.E. and Baird, G.C. 1986. Comparative taphonomy: a key to paleoenvironmental interpretation based on fossil preservation. Palaios, vol. 1, pp. 207-227.

Brett, C.E. and Speyer, S.E. 1990. Taphofacies: *in* Briggs, D.E.G. and Crowther, P.R. (eds.). Palaeobiology: a synthesis. Blackwell Scientific Publications, Oxford, pp. 258-263.

Brindle, J.E. 1960. The faunas of the Lower Palaeozoic carbonate rocks in the subsurface of Saskatchewan. Saskatchewan Department of Mineral Resources: Report no. 52, 45 p.

Bromley, R.G. 1990. Trace fossils: biology and taphonomy. Unwin Hyman Ltd., London. 280 p.

Byers, C.W. and Gavlin, S. 1979. Two contemporaneous equilibrium communities in the Ordovician of Wisconsin. Lethaia, vol. 12, pp. 297-305.

Caramanica, F. 1973. Ordovician corals of the Williston Basin periphery. University of North Dakota Ph.D. dissertation. 570 p.

Chamberlain, J.A., Ward, P.D. and Weaver, J.S. 1981. Postmortem ascent of *Nautilus* shells: implications for cephalopod paleobiogeography. Paleobiology, vol. 7, pp. 494d-509.

Chenoweth, P.A. 1952. Statistical methods applied to Trentonian stratigraphy in New York. Bulletin of the Geological Society of America, vol. 63, pp. 521-560.

Chirat, R. 2000. The so-called "cosmopolitan palaeobiogeographic distribution" of Tertiary Nautilida of the genus *Aturia* Bronn 1838; the result of post-mortem transport by oceanic palaeocurrents. Palaeogeography, Palaeoclimatology, Palaeoecology, vol. 157, pp. 59-77.

Coates, A.G. and Jackson, J.B.C. 1987. Clonal growth, algal symbiosis, and reef formation by corals. Paleobiology, vol. 13, pp. 363-378.

Coniglio, M. 1999. Manitoba's Tyndall Stone. Wat on Earth, vol. 12, no.2, pp. 15-18.

Corkery, M.T. 1994. Geological Highway Map of Manitoba 1994. Geological Survey of Canada, Manitoba Minerals Division.

Cowan, J. 1971. Ordovician and Silurian stratigraphy of the Interlake area, Manitoba. Geological Association of Canada Special Paper no. 9, pp. 235-241.

Crick, R.E. 1988. Buoyancy regulation and macroevolution in nautiloid cephalopods. Senckenbergiana Lethaea, vol. 69, pp. 13-42.

Crick, R.E. 1990. Cambro-Devonian biogeography of nautiloid cephalopods: *in* McKerrow, W.S. and Scotese, C.R. (eds.). Palaeozoic paleogeography and biogeography. Geological Society Memoir no. 12, pp. 147-161.

Curran, H.A. 1994. Paleobiology of carbonate ichnocoenoses in Quaternary, Bahamian-style carbonate environments: the modern to fossil transition: *in* Donovan, S.K. (ed.). The Palaeobiology of Trace Fossils. John Wiley and Sons, Chichester, United Kingdom, pp. 83-104.

Daly, H.I. 1996. Ecology of the Antarctic octopus *Parledone* from the Scotia Sea. Aberdeen University Ph.D thesis. 162 p.

Davis Jr., R.A.1966. Willow River Dolomite: Ordovician analogue of modern algal stromatolite environments. Journal of Geology, vol. 74, pp. 908-923.

Dixon, O.A. 1970. Nautiloids and current ripples as paleocurrent indicators in Upper Ordovician limestones, Anticosti Island, Canada. Journal of Sedimentology, vol. 40, no. 2, pp. 682-687.

Dodd, J.R. and Stanton Jr., R.J. 1990. Paleoecology; concepts and applications. John Wiley and Sons, Inc., New York, New York. 502 p.

Dowling, D.B. 1895. Notes on the stratigraphy of the Cambro-Silurian rocks of eastern Manitoba. The Ottawa Naturalist, vol. 9, pp. 65-74.

Elias, R.J. 1980. Borings in solitary rugose corals of the Selkirk Member, Red River Formation (late Middle or Upper Ordovician), southern Manitoba. Canadian Journal of Earth Sciences, vol. 17, pp. 272-277.

Elias, R.J. 1981. Solitary rugose corals of the Selkirk Member, Red River Formation (late Middle or Upper Ordovician), southern Manitoba. Geological Survey of Canada Bulletin no. 344. 53 p.

Elias, R.J. 1982. Paleoecology and biostratinomy of solitary rugose corals in the Stony Mountain Formation (Upper Ordovician), Stony Mountain, Manitoba. Canadian Journal of Earth Sciences, vol. 19, no. 8, pp. 1582-1598.

Elias, R.J. 1988. The Canadian Paleontology and Biostratigraphy Seminar (field trip leaflet). Department of Geological Sciences, University of Manitoba. 11 p.

Elias, R.J. 1991. Environmental cycles and bioevents in the Upper Ordovician Red River-Stony Mountain solitary rugose coral province of North America. Geological Survey of Canada Paper 90-9, pp. 205-211.

Elias, R.J. and Lee, D.J. 1993. Microborings and growth in Late Ordovician halysitids and other corals. Journal of Paleontology, vol. 67, no. 6, pp. 922-934.

Elias, R.J., McAuley, R.J. and Mattison, B.W. 1987. Directional orientations of solitary rugose corals. Canadian Journal of Earth Sciences, vol. 24, no. 4, pp. 806-812.

Elias, R.J., Zeilstra, R.G. and Bayer, T.N. 1988. Paleoenvironmental reconstruction based on horn corals, with an example from the Late Ordovician of North America. Palaios, vol. 3, pp. 22-34.

Fisher, D.C. and Nitecki, M.H. 1983. Standardization of the anatomical orientation of receptaculitids. Paleontological Society Memoir 13. 40 p.

Flower, R.H. 1961. Montoya and related colonial corals. New Mexico Bureau of Mines and Mineral Resources Memoir 7. 229 p.

Flower, R.H. 1971. Cephalopods of the Ordovician Cat Head Member, Lake Winnipeg, Manitoba: *in* Contributions to Canadian Paleontology, Geological Survey of Canada, Bulletin 202, pp. 13-33.

Foerste, A.F. 1929. The cephalopods of the Red River Formation of southern Manitoba. Denison University, Scientific Laboratories, Bulletin 29, vol. 7, pp.129-235.

Foster, M. 1973. Ordovician receptaculitids from California and their significance. Lethaia, vol. 5, pp. 35-65.

Frey, R.C. 1989. Paleoecology of a well-preserved nautiloid assemblage from a Late Ordovician shale unit, southwest Ohio. Journal of Paleontology, vol. 63, no. 5, pp. 604-620.

Fursich, F.T. 1978. The influence of faunal condensation and mixing on the preservation of fossil benthic communities. Lethaia, vol. 11, pp. 243-250.

Hill, D. 1981. Coelenterata; Supplement 1, Rugosa and Tabulata; Volume 1: *in* Teichert, C. (ed.). Treatise on invertebrate paleontology part F: Coelenterata. University of Kansas and the Geological Society of America, Inc. 378 p.

Holland, S.M., Miller, A.I., Meyer, D.L. and Dattilo, B.F. 2001. The detection and importance of subtle biofacies within a single lithofacies: the Upper Ordovician Kope Formation of the Cincinnati, Ohio region. Palaios, vol. 16, pp. 205-217.

Hubbard, J.A.E.B. 1970. Sedimentological factors affecting the distribution and growth of Visean caninioid corals in north-west Ireland. Palaeontology, vol. 13, part 2, pp. 191-209.

Jin, J. and Zhan, R. 2000. Evolution of the Late Ordovician orthid brachiopod *Gnamptorhynchos* Jin, 1989 from *Platystrophia* King, 1850 in North America. Journal of Paleontology, vol. 74, no. 6, pp. 983-991.

Kendall, A.C. 1976. The Ordovician carbonate succession (Bighorn Group) of southeastern Saskatchewan. Department of Mineral Resources, province of Saskatchewan, Report no. 180. 186 p.

Kendall, A.C. 1977. Origin of dolomite mottling in Ordovician limestones from Saskatchewan and Manitoba. Bulletin of Canadian Petroleum Geology, vol. 25, no. 3, pp. 480-504.

Kershaw, S. and Riding, R. 1978. Parameterization of stromatoporoid shape. Lethaia, vol. 11, pp. 233-242.

Kidwell, S.M. 1991. The stratigraphy of fossil concentrations: *in* Allison, P.A. and Briggs, D.E.G. (eds.). Taphonomy: Releasing the Data Locked in the Fossil Record. Univ. Reading, Reading, United Kingdom, pp. 212-290.

Kidwell, S.M. and Behrensmeyer, A.K. 1993. Taphonomic approaches to time resolution in fossil assemblages: *in* Kidwell, S.M. and Behrensmeyer, A.K. (eds.). Taphonomic Approaches to Time Resolution in Fossil Assemblages. Paleontological Society Short Courses in Paleontology, Pittsburgh, no. 6, pp. 1-8.

Kidwell, S.M. and Flessa, K.W. 1996. The quality of the fossil record; populations, species, and communities. Annual Review of Earth and Planetary Sciences, vol. 24, pp. 433-464.

Landman, N.H., Rye, D.M. and Shelton, K.L. 1983. Early ontogeny of *Eutrephoceras* compared to Recent Nautilus and Mesozoic ammonites: evidence from shell morphology and light stable isotopes. Paleobiology, vol. 9, pp. 269-279.

Lee, D.J. and Elias, R.J. 1991. Mode of growth and life-history strategies of a Late Ordovician halysitid coral. Journal of Paleontology, vol. 65, no. 2, pp. 191-199.

Lee, D.J. and Noble, J.P.A. 1990. Colony development and formation in halysitid corals. Lethaia, vol. 23, pp. 179-193.

Liddell, W.D. and Brett, C.E. 1982. Skeletal overgrowths among epizoans from the Silurian (Wenlockian) Waldron Shale. Paleobiology, vol. 8, no. 1, pp. 67-78.

Linsley, R. M. 1977. Some "laws" of gastropod shell form. Paleobiology, vol. 3, no. 2, p. 196-206.

Logan, B.W. 1961. Cryptozoan and associate stromatolites from the Recent of Shark Bay, Western Australia. Journal of Geology, vol. 69, pp. 517-533.

Martin, R.E. 1999. Taphonomy: a process approach. Cambridge University Press, Cambridge. 507 p.

McAuley, R.J. and Elias, R.J. 1990. Latest Ordovician to Earliest Silurian solitary rugose corals of the east-central United States. Bulletins of American Paleontology, vol. 98, no. 333. 82 p.

McCabe, H.R. 1971. Stratigraphy of Manitoba, an introduction and review. Geological Association of Canada, Special Paper no. 9, pp.167-187.

McCabe, H.R. and Bannatyne, B.B. 1970. Lake St. Martin crypto-explosion crater and geology of the surrounding area. Geological Survey of Canada Geological Paper 3/70. 79 p.

McCabe, H.R. and Barchyn, D. 1982. Paleozoic stratigraphy of southwestern Manitoba. Geological Association of Canada and Mineralogical Association of Canada, Field Trip 10. 48 p.

McGarigal, K., Cushman, S. and Stafford, S. 2000. Multivariate statistics for wildlife and ecology research. Springer-Verlag New York, Inc., New York. 283 p.

McGee Jr., G.R. 1979. Geometric analysis of biconvex brachiopod shell morphology; ordinal distributions and stability strategies. Abstracts with Programs, Geological Society of America, vol. 11, no. 1, p. 44.

McKinney, F.K. 1981. Evolutionary trends of zooidal shape: *in* Dutro, J.T. and Boardman, R.S. (eds.). Lophophorates: notes for a short course. University of Tennessee Department of Geological Sciences: Studies in Geology 5, pp. 52-69.

Miller, A.I. 1997. Coordinated stasis or coincident relative stability? Paleobiology, vol. 23, no. 2, pp. 155-164.

Morris, R.W. and Felton, S.H. 1993. Symbiotic association of crinoids, platyceratid gastropods, and *Cornulites* in the Upper Ordovician (Cincinnatian) of the Cincinnati, Ohio region. Palaios, vol. 8, pp. 465-476.

Nagle, J.S. 1967. Wave and current orientation of shells. Journal of Sedimentary Petrology, vol. 37, no.4, pp. 1124-1138.

Nelson, S.J. 1965. Field methods in paleontology. Bulletin of Canadian Petroleum Geology, vol. 13, no.1, pp. 1-138.

Neuman, B.E.E. 1988. Some aspects of life strategies of Early Palaeozoic rugose corals. Lethaia, vol. 21, pp. 97-114.

Newton, C. and Laporte, L. 1989. Ancient environments. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 178 p.

Nitecki, M.H., Mutvei, H. and Nitecki, D.V. 1999. Receptaculitids: a phylogenetic debate on a problematic fossil taxon. Kluwer Academic/Plenum Publishers, New York, New York. 241 p.

Nixon, M. and Maconnachie, E. 1988. Drilling by *Octopus vulgaris* (Mollusca, Cephalopoda) in the Mediterranean. Journal of Zoology, vol. 216, pp. 587-716.

Oliver Jr., W.A. and Coates, A.G. 1987. Phylum Cnidaria: phylum overview: *in* Boardman, S., Cheetham, A.H. and Rowell, A.J. (eds.). Fossil invertebrates. Blackwell Scientific Publications, Palo Alto, California, pp. 140-193.

Peel, J.S. 1987. Class Gastropoda: *in* Boardman, S., Cheetham, A.H. and Rowell, A.J. (eds.). Fossil invertebrates. Blackwell Scientific Publications, Palo Alto, California. pp. 304-329.

Pickerill, R.K. 1976. *Vermiforichnus* borings from the Ordovician of central Wales. Geological Magazine, vol. 113, pp. 159-164.

Pojeta, Jr., J., Runnegar, B., Peel, J.S. and Gordon Jr., M. 1987. Phylum Mollusca: *in* Boardman, S., Cheetham, A.H. and Rowell, A.J. (eds.). Fossil invertebrates. Blackwell Scientific Publications, Palo Alto, California, pp. 270-435,

Porter, J.W. and Fuller, J.G.C.M. 1959. Lower Paleozoic rocks of northern Williston Basin and adjacent areas. Bulletin of the American Association of Petroleum Geologists, vol. 43, no. 1, pp. 124-189.

Rhoads, D.C., Speden, I.G. and Waage, K.M. 1972. Trophic group analysis of Upper Cretaceous bivalve assemblages from South Dakota. American Association of Petroleum Geologists Bulletin, vol. 56, pp. 1100-1113.

Rigby, J.K. 1971. Sponges of the Ordovician Cat Head Member, Lake Winnipeg, Manitoba: *in* Contributions to Canadian Paleontology. Geological Survey of Canada, Bulletin 202, pp. 35-79.

Rigby, J.K. 1987. Phylum Porifera: Phylum overview: *in* Boardman, S., Cheetham, A.H. and Rowell, A.J. (eds.). Fossil invertebrates. Blackwell Scientific Publications, Palo Alto, California, pp. 116-139.

Robison, R.A. 1987. Superclass Trilobitomorpha: *in* Boardman, S., Cheetham, A.H. and Rowell, A.J. (eds.). Fossil invertebrates. Blackwell Scientific Publications, Palo Alto, California, pp. 221-241.

Romesburg, C. 1984. Cluster analysis for researchers. Lifetime Learning Publications, Belmont, California. 334 p.

Rowell , A.J. and Grant, R.E. 1987. Phylum Brachiopoda: phylum overview: *in* Boardman, S., Cheetham, A.H. and Rowell, A.J. (eds.). Fossil invertebrates. Blackwell Scientific Publications, Palo Alto, California, pp. 445-496.

Rudwick, M.J.S. 1970. Living and fossil brachiopods. Hutchinson University Library, London. 199 p.

Saunders, W.B. and Spinosa, C. 1978. Sexual dimorphism in *Nautilus* from Palau. Paleobiology, vol. 4, pp. 349-358.

Schopf, T.J.M.1969. Paleoecology of ectoprocts (bryozoans). Journal of Paleontology, vol. 43, pp. 234-244.

Scoffin, T.P., Brown, B.E., Dunne, R.P. and Le Tissier, M.D.A. 1997. The controls on growth form of intertidal massive corals, Phuket, South Thailand. Palaios, vol. 12, pp. 237-248.

Scotese, C.R. 2001. Middle Ordovician 458 Ma [Map: http://www.scotese.com/newpage1.htm] *in* Paleomap Project [http://www.scotese.com].

Scrutton, C.T. 1979. Early fossil cnidarians: *in* M.R. House (ed.). The origin of major invertebrate groups. Systematics Association, Special Volume 12, Academic Press Limited, London, pp. 161-207.

Segars, M.T. and Liddell, W.D. 1988. Microhabitat analyses of Silurian stromatoporoids as substrata for epibionts. Palaios, vol. 3, pp. 391-403.

Sinclair, G. W. 1955. Some Ordovician halysitoid corals (Manitoba and Quebec). Transactions of the Royal Society of Canada, no. 49, pp. 95-103.

Skinner, D.F. and Johnson, M.E. 1987. Nautiloid debris oriented by long-shore currents along a Late Ordovician-Early Silurian rocky shore. Lethaia, vol. 20, pp. 157-164.

Skoog, D.A. 1985. Principles of instrumental analysis. Saunders College Publishing, New York, New York. 509 p.

Stanley Jr., G.D. 1977. Paleoecology of *Subulites*: a gastropod in the Middle Ordovician of central Tennessee. Journal of Paleontology, vol. 51, no. 1, pp. 161-168.

Stearn, C. and Carroll, R. 1989. Paleontology: the record of life. John Wiley and Sons, Inc., New York, New York. 453 p.

Thayer, C.W. 1974. Substrate specificity of Devonian epizoa. Journal of Paleontology, vol. 48, pp. 881-894.

Walker, K.R. 1972a. Trophic analysis: a method for studying the function of ancient communities. Journal of Paleontology, vol. 46, no. 1, pp. 82-93.

Walker, K.R. 1972b. Community ecology of the Middle Ordovician Black River Group of New York State. Geological Society of America Bulletin, vol. 83, pp. 2499-2524.

Walker, K.R. and Diehl, W.W. 1986. The effect of synsedimentary substrate modification on the composition of paleocommunities: paleoecologic succession revisited. Palaios, vol. 1, pp. 65-74.

Wallace, R.C. 1913. Pseudobrecciation in Ordovician limestones in Manitoba. Journal of Geology, pp. 402-421.

Walter, L.M. and Morse, J.W. 1984. Reactive surface area of skeletal carbonates during dissolution: effect of grain size. Journal of Sedimentary Petrology, vol. 54, pp. 1081-1090.

Watkins, R. 1991. Guild structure and tiering in a high-diversity Silurian community, Milwaukee County, Wisconsin. Palaios, vol. 6, pp. 465-478.

Watkins, R. 1997. Silurian *Thalassinoides* in an offshore carbonate community, Wisconsin, USA. Palaeogeography, Palaeoclimatology, Palaeoecology, vol. 129, pp.109-117.

Westrop, S.R. and Ludvigsen, R. 1983. Systematics and paleoecology of Upper Ordovician trilobites from the Selkirk Member of the Red River Formation, southern Manitoba. Manitoba Department of Energy and Mines, Mineral Resources Division Geological Report GR 82-2. 51 p.

Yacobi, B.G. and Holt, D.B. 1990. Cathodoluminescence microscopy of inorganic solids. Plenum Press, New York, New York. 292 p.

Yang, L. 1989. Paleobiology and paleoecology of *Tetradium* in Ordovician rocks of eastern Canada. M.Sc. Thesis, McGill University, Montreal, Quebec. 99 p.

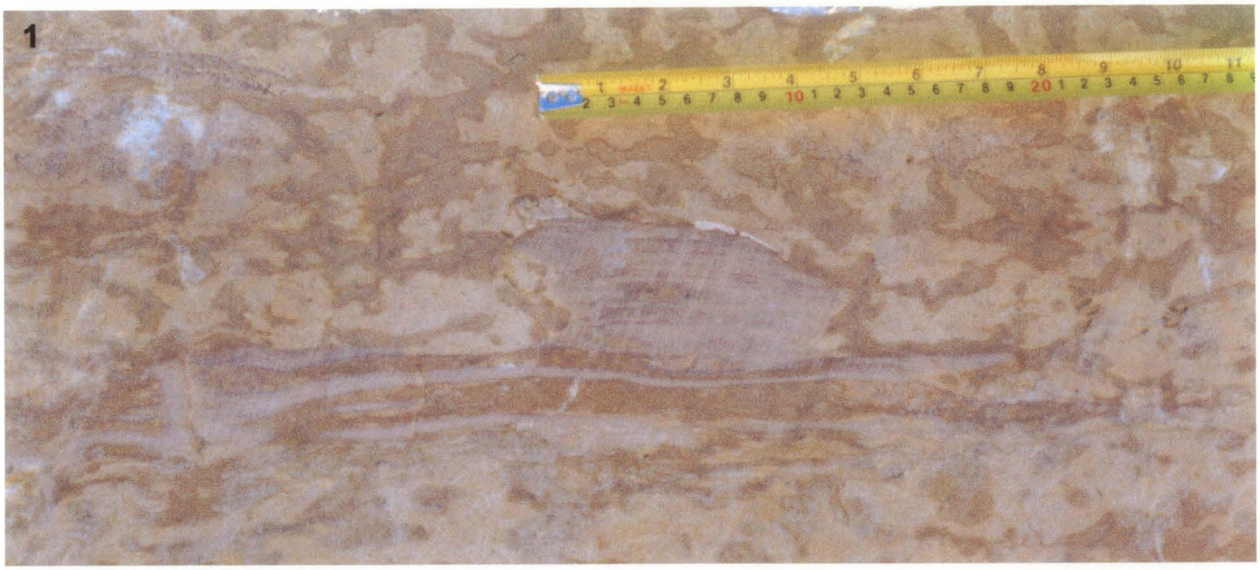
Young, G.A. 1995. A new tetradiid coral from the Late Ordovician of Manitoba, Canadian Journal of Earth Sciences, vol. 32, no. 9, pp. 1393-1400.

Young, G.A. and Elias, R.J. 1995. Latest Ordovician to earliest Silurian colonial corals of the east-central United States. Bulletins of American Paleontology, vol. 108, no. 347. 153 p.

Young, G.A. and Elias, R.J. 1999. Relationships between internal and external morphology in *Paleofavosites* (Tabulata): the unity of growth and growth form. Journal of Paleontology, vol. 73, no. 4, pp. 580-597.

Young, G.A. and Scrutton, C.T. 1991. Growth form in Silurian heliolitid corals: the influence of genetics and environment. Paleobiology, vol. 17, pp. 369-387.

Plates



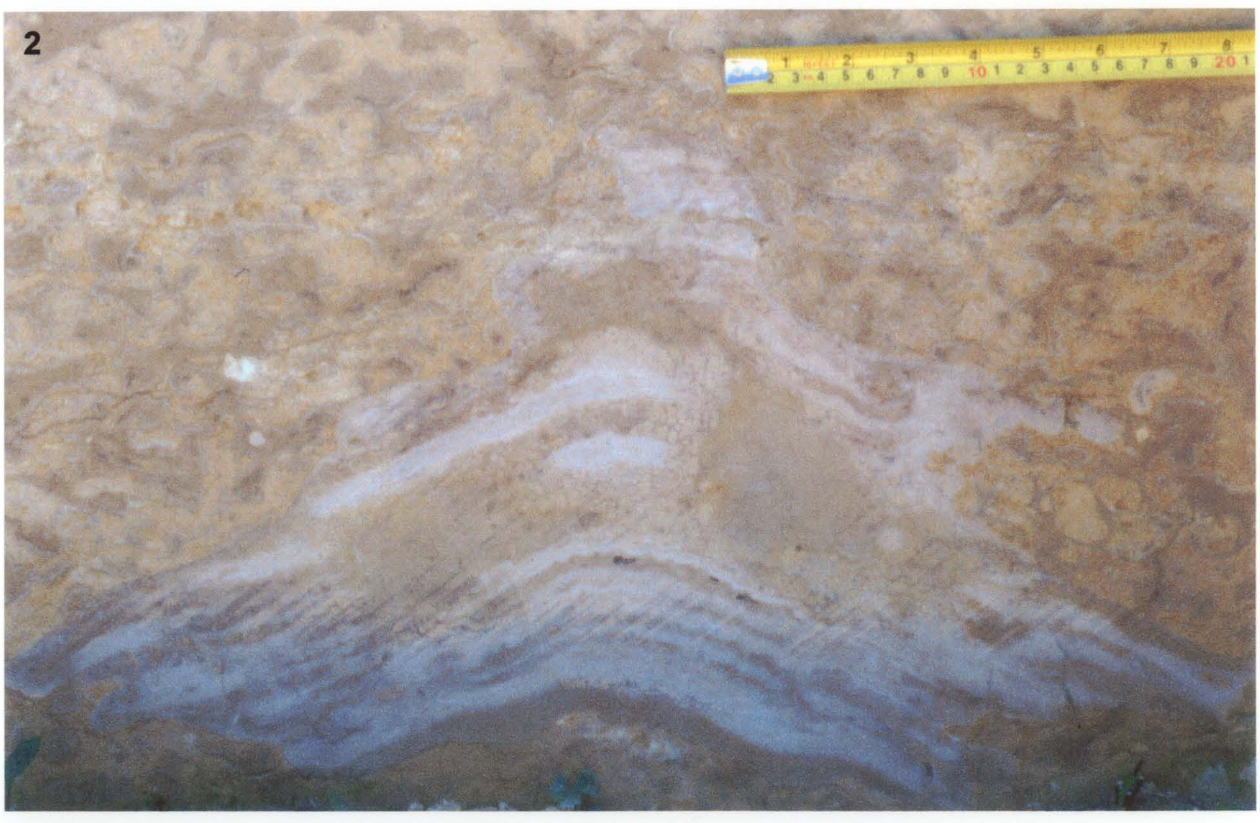


Plate 1

Fig. 1: Photograph of algal stromatolite.

Fig. 2: Photograph of stromatoporoid.

Plate 2

Fig. 1: Photograph of *Catenipora* colony.

Fig. 2: Photograph of *Rhabdotetradium* colony.

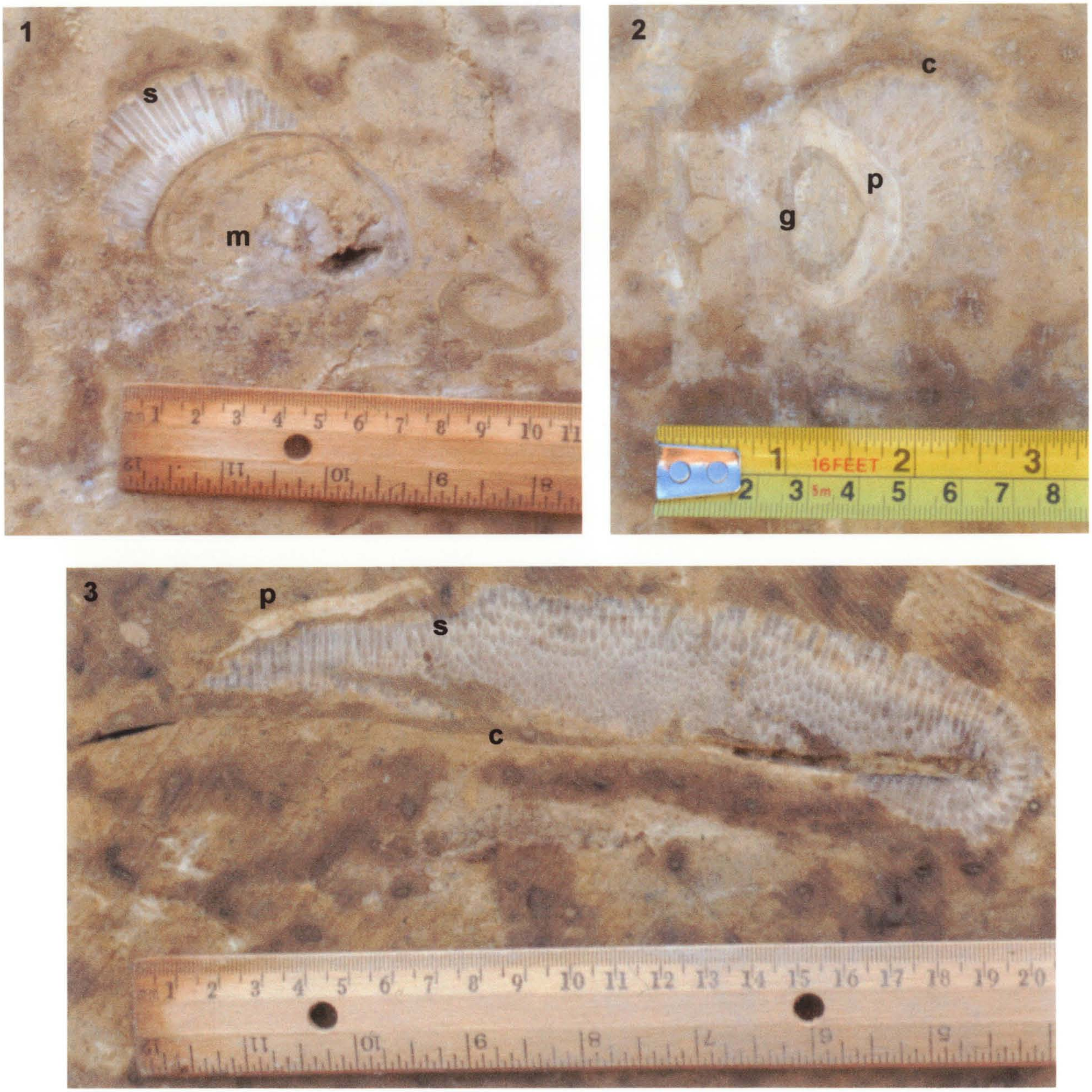


Plate 3

Fig. 1: Photograph of *Saffordophyllum* (s) colony encrusting gastropod *Maclurina* (m).

Fig. 2: Photograph of *Calapoecia* colony (c) encrusting *Protrochiscolithus* colony (p) which, in turn, is encrusting a gastropod (g).

Fig. 3: Photograph of *Protrochiscolithus* colony (p) encrusting *Saffordophyllum* colony (s) which, in turn, is encrusting a cephalopod shell (c).

Plate 4

Fig. 1: Photograph of *Favistina* colony (f) encrusted by *Crenulites* colony (c). Note position of encruster, indicating the host was overturned.

Fig. 2: Photograph of *Crenulites* colony.

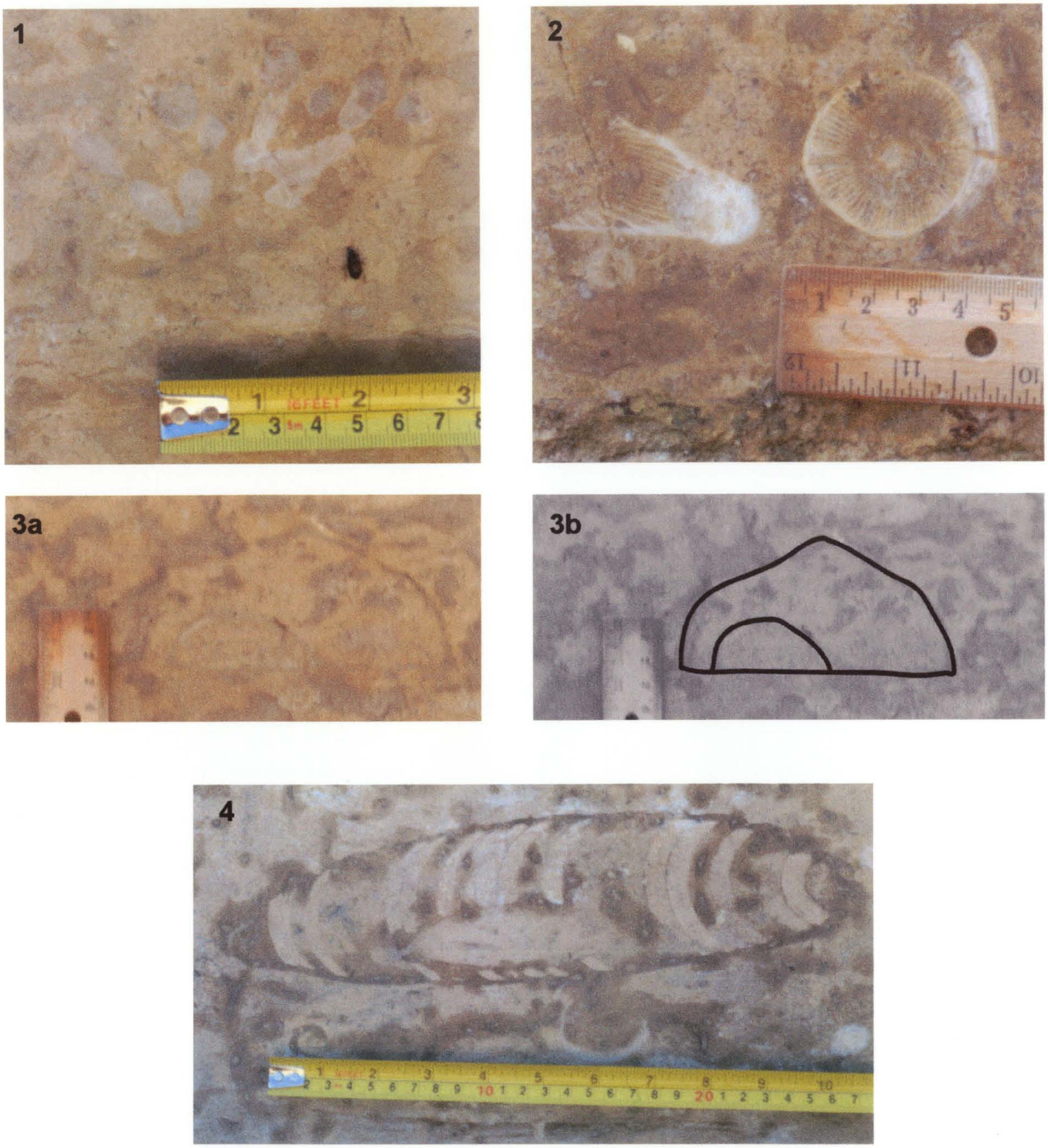


Plate 5

Fig. 1: Photograph of *Palaeophyllum* colony. Note branching (phaceloid) morphology of the corallum (arrows).

Fig. 2: Photograph of solitary rugose corals.

Fig. 3: a) Photograph of gastropod *Maclurina*, b) outline of gastropod *Maclurina* in cross section.

Fig. 4: Photograph of cephalopod.

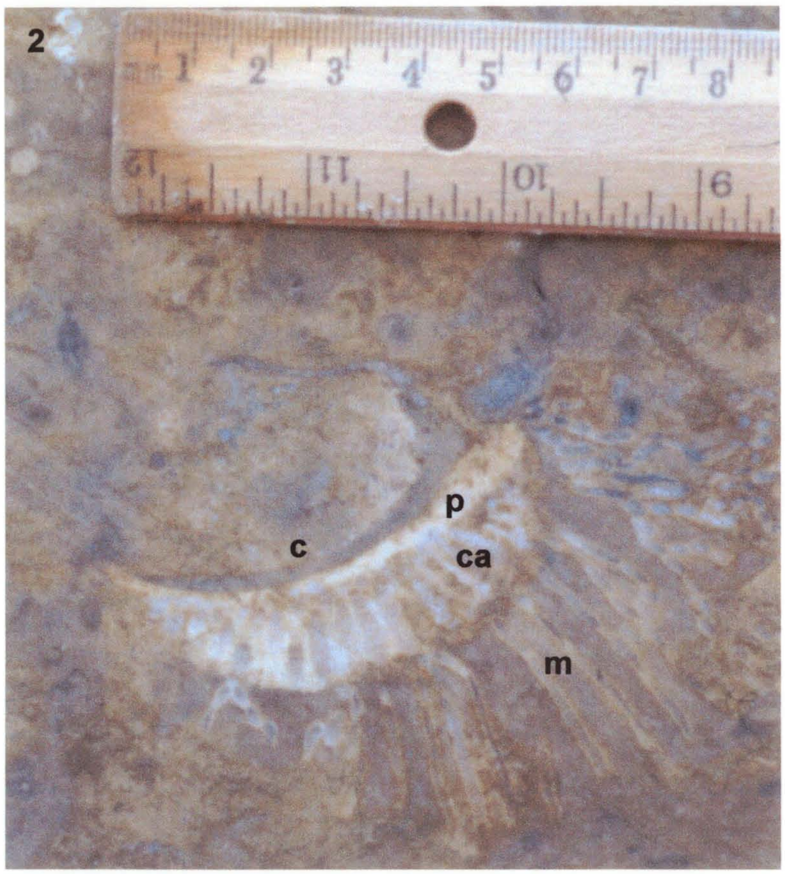


Plate 6

Fig. 1: Photograph of receptaculitid.

Fig. 2: Photograph of *Manipora* colony (m) encrusting *Calapoecia* (ca) colony, which is encrusting a *Protrochiscolithus* colony (p) which, in turn, is encrusting a cephalopod shell (c).

Appendix A-1: Original Fossil Data

Pit 1: East-West Wall

Note:
1. "Shielding" refers to the lack of mottling and/or bioturbation found underneath certain organisms
2. W = width at widest point in cm; H = height in cm; D = diameter in cm
3. x = horizontal distance from origin (0,0) in cm; y = vertical distance from base of section in cm

B1	Comments	x	y	W	H	D
receptaculitid		6	23	17	1	
receptaculitid		20	37	10	1	
Protrochiscolithus		6	17	9.5	2.5	
Protrochiscolithus		11	53	14	5	
receptaculitid		46	11	13	1.5	
storm lens	weak		23		6	
B2	Comments	x	y	W	H	D
Protrochiscolithus	overturned	24	53	4.5	2.5	
storm lens	weak		26		8	
stromatoporoid		38	55	5.5	2.5	
Catenipora	overturned; burrowed extensively	15	5	40	7	
algal stromatolite		39	12	12	2.5	
B3	Comments	x	y	W	H	D
storm lens	weak		31		3	
B4	Comments	x	y	W	H	D
receptaculitid	good shielding	12	27	12	1	
receptaculitid	good shielding	29	32	10	1	
receptaculitid	good shielding	51	27	10.5	1	
storm lens	highly burrowed		9		4	
horn coral	fragment	64	8			
gastropod		67	40			1.5
cephalopod		91	20			2.5
horn coral	highly abraded	22	3			1.5
storm lens			14		7	
B5	Comments	x	y	W	H	D
horn coral		12	20	1.5		1.5
storm lens			12		8	
gastropod	*Maclurina*	37	48			7.5
receptaculitid		73	37	13	1.5	
B6	Comments	x	y	W	H	D
Crenulites	tabular	12	10	81	7	
receptaculitid		37	27	17	1	
receptaculitid		50	18	18	1	
receptaculitid		62	33	11	1	
horn coral	apex points east	56	6	4		2.5
horn coral	highly abraded	89	12			2.5
horn coral	epitheca abraded	31	4			1
horn coral	epitheca abraded	40	5			1
B7	Comments	x	y	W	H	D
receptaculitid	good shielding	2	22	11	1	
receptaculitid		42	19	8	1	

storm lens	strong		16		4	
cephalopod		51	18	6		3
receptaculitid		62	18	9	1	
horn coral	highly abraded	39	7			2.5
B8	Comments	x	y	W	H	D
gastropod	*Maclurina*; encrusted by *Protrochiscolithus*	9	39			7
Protrochiscolithus	encrusting gastropod	6.5	40	5	0.5	
storm lens			16		4	
gastropod		66	23			3
stromatoporoid	good shielding	75	46	14	4	
receptaculitid		69	20	21	1.5	
B9	Comments	x	y	W	H	D
storm lens			19		4	
cephalopod		16	19			3
cephalopod		22	19			2.5
stromatoporoid	domical; highly burrowed	80	26	54	20	
horn coral	highly abraded	92	4			4
B10	Comments	x	y	W	H	D
receptaculitid		16	10	15	1	
receptaculitid		66	14	13	1	
receptaculitid	good shielding	81	28	15	1	
receptaculitid		82	16	17	1	
B11	Comments	x	y	W	H	D
storm lens	weak		8		5	
horn coral	epitheca abraded; cardinal septum 30 degrees up from east	65	11			1
receptaculitid		87	13	16	1	
receptaculitid		97	15	8	1	
B12	Comments	x	y	W	H	D
receptaculitid	good shielding	45	13	16	1	
receptaculitid		55	28	9	1	
storm lens			18		4	
Favistina	domical; on top of storm lens	94	24	25	6	
horn coral	highly abraded	98	7			2.5
B13	Comments	x	y	W	H	D
storm lens			18		3	
gastropod	*Maclurina*	40	41			11.5
receptaculitid	good shielding	70	16	13	1	
B14	Comments	x	y	W	H	D
receptaculitid		72	13	28	2	
storm lens	weak		7		4	
B15	Comments	x	y	W	H	D
cephalopod	*Orthoceras*	4	37			5
storm lens	weak		16		4	
receptaculitid		29	21	10	1	
horn coral	cardinal septum 30 degrees down from west	90	19			1
B16	Comments	x	y	W	H	D
receptaculitid	good shielding	8	44	16	1.5	
receptaculitid		23	21	23	1.5	
receptaculitid		8	16	8	1	
receptaculitid		22	6	14	1	

receptaculitid		20	2	16	1	
algal stromatolite		54	35	11	2	
receptaculitid		60	40	15	1	
horn coral	highly abraded	91	14			3
B17	Comments	x	y	W	H	D
storm lens	strong		12		4	
algal stromatolite		13	24	10	1	
receptaculitid	in storm lens	35	14	11	1	
B18	Comments	x	y	W	H	D
storm lens	weak		13		4	
receptaculitid	on top of storm lens	27	17	9	1	
gastropod		35	15			3.5
receptaculitid		43	15	7	1	
receptaculitid		63	13	10	1	
stromatoporoid	domical	56	38	10	3	
receptaculitid	good shielding	73	37	14	1	
gastropod		96	20			3.5
B19	Comments	x	y	W	H	D
storm lens	moderate		15		3	
horn coral	epitheca abraded	27	9			3
gastropod	*Maclurina*	54	13			7
B20	Comments	x	y	W	H	D
receptaculitid		15	33	15	1.5	
Calapoecia	tilted on side	32	17	4	4	
stromatoporoid	tabular	12	12	23	4	
gastropod		13	14			2.5
gastropod		33	14			5
storm lens	weak		12		4	
horn coral	epitheca abraded; cardinal septum 50 degrees down from west	82	28			1.5
B21	Comments	x	y	W	H	D
receptaculitid		15	26	18	1	
receptaculitid	good shielding	49	24	21	2	
storm lens	weak		15		3	
horn coral	cardinal septum 50 degrees down from west	92	6			2.5
B22	comments	x	y	W	H	D
gastropod		32	27			3.5
receptaculitid		18	25	9	1	
receptaculitid	good shielding	84	18	15	1	
B23	Comments		y	W	H	D
Catenipora	domical	33	35	23	9	
storm lens	moderate		17		3	
receptaculitid		57	24	13	1	
receptaculitid		64	27	9	1	
receptaculitid		72	17	13	1	
receptaculitid		83	3	9	0.5	
B24	Comments	x	y	W	H	D
receptaculitid	good shielding	4	15	15	1	
storm lens	weak		16		4	
receptaculitid	good shielding	44	38	8	1	
gastropod	*Maclurina*	49	4			5

horn coral	highly abraded	61	7			1.5
horn coral	highly abraded	87	13			1
B25	Comments	x	y	W	H	D
receptaculitid		3	38	15	1	
stromatoporoid		46	4	19	7	
Rhabdotetradium	domical	59	2	12	3.5	
storm lens			14		3	
gastropod	*Maclurina*	94	27			8
cephalopod		99	26			1.5
B26	Comments	x	y	W	H	D
algal stromatolite		23	34	10	2	
horn coral	highly abraded; cardinal septum 30 degrees down from west	10	27			3.5
receptaculitid		45	3	11	1	
gastropod	*Hormotoma*	87	27			1.5
storm lens	weak		22		3	
B27	Comments	x	y	W	H	D
gastropod	*Maclurina*	14	24			7
cephalopod		3	24	9		4
gastropod		27	26			3
storm lens			23		4	
Crenulites		70	17	8	2.5	
receptaculitid		95	33	8	1	
gastropod	*Maclurina*	80	28			4.5
B28	Comments	x	y	W	H	D
horn coral	well preserved; cardinal septum 20 degrees down from west	0	30			2.5
Crenulites		15	31	20	4	
receptaculitid		3	3	10	1	
Protrochiscolithus	domical	64	40	15	5	
B29	Comments	x	y	W	H	D
gastropod	*Maclurina*	3	29			12
receptaculitid	good shielding	13	21	15	1	
receptaculitid		66	14	9	2	
B30	Comments	x	y	W	H	D
storm lens	weak		18		2	
cephalopod		90	38	1.5		
B31	Comments	x	y	W	H	D
Catenipora	domical	62	28	12	6	
gastropod	encrusted by *Protrochiscolithus*	66	19			5
Protrochiscolithus	encrusting gastropod; bored	66	22	5	1	
B32	Comments	x	y	W	H	D
storm lens			11		3	
receptaculitid		92	1	14	1	
B33	Comments	x	y	W	H	D
horn coral		10	1			2
receptaculitid	good shielding	26	18	10	1	
gastropod		39	14			3.5
storm lens			8		3	
C1	Comments	x	y	W	H	D
receptaculitid	good shielding	1	35	17	1	
storm lens	strong		13		3	

gastropod		91	14			4
horn coral	highly abraded; cardinal septum pointing west	100	15			2
receptaculitid		93	3	11	1	
C2	Comments	x	y	W	H	D
receptaculitid		77	30	17	1	
horn coral	epitheca abraded; cardinal septum 40 degrees down from east	70	30			1.5
receptaculitid		82	27	12	1	
storm lens	strong		8		4	
Catenipora	fragmented; tilted on side	21	17	4	2	
horn coral	epitheca gone; cardinal septum 30 degrees down from west	67	15			1
Favistina		95	23	7	2.5	
C3	Comments	x	y	W	H	D
storm lens	very strong		10		5	
horn coral	highly abraded	17	14			2.5
gastropod	*Maclurina*	83	17	5	3	
C4	Comments	x	y	W	H	D
receptaculitid		27	42	14	1	
receptaculitid		62	40	12	1	
receptaculitid		77	40	19	1	
storm lens	strong		6		6	
horn coral	highly abraded; on top of storm lens	12	10			2.5
horn coral	highly abraded	39	5			1
bryozoan	fragmented in storm lens	49	6	1.5	1	
horn coral	highly abraded	47	9			2.5
gastropod		70	7			4
receptaculitid	on top of storm lens	80	12	19	1	
C5	Comments	x	y	W	H	D
stromatoporoid	domical	4	41	31	6	
receptaculitid	good shielding	78	41	23	1	
storm lens			8		5	
horn coral	moderately abraded	42	17			2
Calapoecia	in storm lens	41	10	3.5	2.5	
Crenulites	encrusted by *Favistina*	23	5	3	1	
C6	Comments	x	y	W	H	D
Crenulites		11	35	13	4	
Crenulites		6	40	4	2	
receptaculitid		29	32	16	1	
storm lens			12		3	
storm lens	weak		36		3	
C7	Comments	x	y	W	H	D
receptaculitid	good shielding	93	6	18	1	
storm lens			11		3	
horn coral	epitheca abraded; cardinal septum 30 degrees down from east	68	38			1
cephalopod	fragment	47	36			
C8	Comments	x	y	W	H	D
cephalopod	*Cyrtogomphoceras*; encrusted by *Protrochiscolithus*	3	27			7
Protrochiscolithus	encrusting cephalopod	4	29	10	0.5	
stromatoporoid	domical	6	20	8	3	
horn coral	highly abraded	11	16			2
horn coral	highly abraded	15	16			2.5

receptaculitid		23	43	9.5	1	
gastropod		49	10			4
storm lens	weak		10		4	
horn coral	highly abraded	77	27			4
stromatoporoid	tabular	95	27	14	3	
C9	Comments	x	y	W	H	D
storm lens	strong		18		3	
stromatoporoid	domical; on top of storm lens	26	26	18	8	
horn coral	highly abraded	41	19			3
receptaculitid		40	1	14	1	
gastropod		49	27			3
receptaculitid	on top of storm lens	88	18	10	0.5.	
storm lens			10		6	
algal stromatolite		78	18	10	1	
cephalopod		68	18	5		1.5
C10	Comments	x	y	W	H	D
algal stromatolite		24	19			
storm lens	weak		1		4	
horn coral	cardinal septum 45 degrees down from west	45	28			3.5
receptaculitid		55	17	16	1	
Protrochiscolithus		64	43	7	1	
C11	Comments	x	y	W	H	D
receptaculitid		76	29	11	1	
C12	Comments	x	y	W	H	D
horn coral	epitheca abraded	37	20			3
receptaculitid		68	22	6.5	1	
receptaculitid		100	38	8	1	
cephalopod	fragment	74	4			
C13	Comments	x	y	W	H	D
storm lens	strong; sharp lower contact		12		4	
Protrochiscolithus	partially bored	82	50	9	5	
C14	Comments	x	y	W	H	D
horn coral	epitheca abraded; cardinal septum 30 degrees down from west	4	41			3
cephalopod	shell; good shielding; encrusted by *Protrochiscolithus*	3	40			
Protrochiscolithus	encrusting cephalopod	3	41	8	0.5	
Crenulites	overturned	17	22	14	2	
storm lens	strong		14		3	
Catenipora	overturned	35	18	4	2	
Rhabdotetradium		65	32	6	4	
receptaculitid		82	5	24	1	
horn coral	apex points west	92	14	3.5		2
stromatoporoid	domical	80	49	39	7	
C15	Comments	x	y	W	H	D
stromatoporoid		18	34	37	9	
storm lens	strong		11		4	
receptaculitid		55	18	11	1	
receptaculitid	good shielding	20	30	15	1	
receptaculitid		100	43	12	1	
C16	Comments	x	y	W	H	D
Protrochiscolithus		23	18	5	2.5	

storm lens	strong		13		3	
Crenulites		20	10	22	4	
Protrochiscolithus		32	5	9	5	
stromatoporoid	domical	52	19	32	12	
Favistina	tabular; overturned	2	16	4	1	
gastropod	*Maclurina*	70	16			7.5
gastropod	*Hormotoma*	85	7	7		3.5
horn coral	epitheca abraded	94	45			1.5
C17	Comments	x	y	W	H	D
storm lens	strong		11		5	
cephalopod	in storm lens	9	16	6		2.5
gastropod	in storm lens	14	11			3
receptaculitid	fragment in storm lens	10	11	3	1	
receptaculitid		29	14	10	0.5	
receptaculitid	fragment in storm lens	20	12	5	1	
Saffordophyllum	domical; on top of storm lens; good shielding	43	18	16	4	
horn coral	epitheca abraded; cardinal septum 50 degrees down from west	72	30			2.5
receptaculitid	good shielding	75	21	18	1.5	
Calapoecia	domical; killed by storm lens; good shielding	75	9	17	3	
C18	Comments	x	y	W	H	D
receptaculitid		20	43	7	1	
storm lens	weak		12		3	
receptaculitid	on top of storm lens; good shielding	38	16	9	1	
stromatoporoid	domical	82	26	14	4	
stromatoporoid	domical	83	36	21	8	
C19	Comments	x	y	W	H	D
algal stromatolite		14	7	21	2	
receptaculitid		27	22	14	1	
cephalopod		44	23	18		5
receptaculitid		53	8	9	1	
receptaculitid		65	7	12	1	
Protrochiscolithus	domical	50	50	13	6	
C20	Comments	x	y	W	H	D
horn coral	epitheca abraded	18	49			2.5
receptaculitid		53	6	14	1	
stromatoporoid		68	28	11	4	
receptaculitid		54	40	14	1	
horn coral	epitheca abraded	85	45			1.5
horn coral	well preserved; cardinal septum 30 degrees down from east	91	45			4
receptaculitid	good shielding	86	14	16	1	
storm lens	weak		11		3	
C21	Comments	x	y	W	H	D
receptaculitid		2	3	12	1	
receptaculitid	good shielding	52	45	10	1	
receptaculitid		53	25	11	1	
stromatoporoid		73	32	12	5	
Crenulites		67	12	61	11	
receptaculitid		35	16	13	1	
C22	Comments	x	y	W	H	D
receptaculitid		34	48	10	1	

Calapoecia	domical	66	24	6	2.5	
stromatoporoid		91	32	19	6	
C23	Comments	x	y	W	H	D
Protrochiscolithus		30	44	9	2.5	
storm lens	weak		29		4	
receptaculitid		67	27	10	1	
C24	Comments	x	y	W	H	D
stromatoporoid	domical; burrowed; storm lens in middle	12	14	46	16	
cephalopod	*Armenoceras*	40	36			8
cephalopod	*Armenoceras*	48	36			5
cephalopod		60	5	12		3.5
horn coral	epitheca gone	66	5			1
C25	Comments	x	y	W	H	D
cephalopod	*Endoceras*	30	20			10
stromatoporoid	tabular	32	11	22	6	
Crenulites	tabular; overturned	43	8	16	4	
stromatoporoid	entire top encrusted by *Protrochiscolithus*	51	28	14	3	
Protrochiscolithus	encrusting stromatoporoid	51	28			
storm lens			15		8	
stromatoporoid	overturned in storm lens	47	21	12	6	
gastropod		46	17			2.5
receptaculitid		39	23	5	1	
C26	Comments	x	y	W	H	D
receptaculitid		17	8	13	1	
receptaculitid		15	4	9	1	
algal stromatolite		29	1	18	2	
stromatoporoid	domical	49	30	27	5	
Protrochiscolithus		45	10	10	3	
cephalopod		69	8	8		3.5
storm lens	weak		6		3	
receptaculitid		89	8	9	1	
C27	Comments	x	y	W	H	D
Crenulites		3	6	15.5	8	
bryozoan	domical; encrusted by *Protrochiscolithus*	25	10	3	1.5	
Protrochiscolithus	encrusting bryozoan	21	10	8.5	0.5	
receptaculitid		14	30	8	1	
storm lens	weak		28		3	
receptaculitid		93	41	8	1	
C28	Comments	x	y	W	H	D
cephalopod	apex points east	13	43	8		3.5
gastropod	*Maclurina*	21	6			7.5
Crenulites		38	5	8	4	
storm lens			0		4	
receptaculitid		53	4	10	1	
cephalopod	*Endoceras*	22	15			12.5
receptaculitid		60	3	12	1	
horn coral	highly abraded	70	4			1
horn coral	weakly abraded	73	2			4
horn coral	highly recrystallized	70	8			4.5
horn coral	weakly abraded; cardinal septum 30 degrees down from west	75	7			1

horn coral	cardinal septum straight down	84	4			3.5
gastropod		86	9			2.5
gastropod		91	4			3
cephalopod	*Armenoceras*	96	6			3.5
receptaculitid		84	2	12	1	
C29	comments	x	y	W	H	D
cephalopod		8	55	3		1.5
storm lens			0		9	
horn coral	in storm lens	4	8	5.5		4
stromatoporoid		26	8	33	11	
stromatoporoid		60	4	19	4	
gastropod		68	2			4
horn coral	highly abraded	88	2			1.5
C30	Comments	x	y	W	H	D
receptaculitid		3	7	7	1	
receptaculitid		4	5	9	1	
receptaculitid		5	3	11	1	
gastropod		8	2			5
receptaculitid		55	31	12	1	
gastropod	*Hormotoma*	62	29	11		3.5
gastropod	*Maclurina*	62	26			8
storm lens			22		6	
Catenipora	tilted on side; domical	100	27	38	13	
C31	Comments	x	y	W	H	D
receptaculitid		30	22	14	1	
receptaculitid		49	32	5	1	
gastropod	*Maclurina*	59	27			7
horn coral	highly abraded; cardinal septum 30 degrees down from west	82	35			2
bryozoan	branching	87	19			1.5
C32	Comments	x	y	W	H	D
receptaculitid		25	26	7	1	
gastropod	*Maclurina*	27	10			5
horn coral	moderately abraded	30	10			1
receptaculitid		77	24	11	1	
receptaculitid		75	24	11	1	
storm lens	weak		9		3	
storm lens	weak		16		3	
D1	Comments	x	y	W	H	D
gastropod	*Maclurina*	60	30			5
receptaculitid		86	23	19	1	
receptaculitid	on top of storm lens	63	14	12	1	
Calapoecia		34	7	2	3	
receptaculitid		10	10	6	1.5	
cephalopod	coiled; top of bed; *Cyrtogomphoceras*	13				
trilobite	shell	9	7			
horn coral	epitheca gone; cardinal septum 45 degrees up from west	47	9			1
storm lens	faint		13		3	
D2	Comments	x	y	W	H	D
horn coral	highly abraded; cardinal septum straight down	15	29			3
receptaculitid		70	47	14	1	

storm lens	weak		13		3	
storm lens	strong		21		4	
D3	Comments	x	y	W	H	D
receptaculitid		35	36	11	1.5	
Crenulites	tabular	77	42	25	4.5	
cephalopod	apex points west	80	28	7		4
storm lens	strong		26		9	
receptaculitid		80	8	12	1	
D4	Comments	x	y	W	H	D
receptaculitid	gastropod directly on top	33	11	27	1	
gastropod	directly on top of receptaculitid	29	12	4		1
gastropod	*Maclurina*	70	15			4.5
cephalopod	*Endoceras*	53	46			9.5
Favistina	domical	76	43	16	7	
receptaculitid		19	40	9	1	
storm lens	strong; large fragments		26		5	
D5	Comments	x	y	W	H	D
Favistina	domical	24	40	24	7	
receptaculitid		10	20	11	1	
receptaculitid	36	22	7	1		
Protrochiscolithus	domical	62	52	7	6	
receptaculitid		77	44	11	1	
receptaculitid		77	17	8	1	
storm lens	weak		27		5	
storm lens	weak		4		4	
D6	Comments	x	y	W	H	D
storm lens	strong		32		4	
receptaculitid	directly on top of trash that is not burrowed; great shielding	80	34	31	2.5	
horn coral	highly abraded	59	37			3
receptaculitid		52	33	10	1	
gastropod		74	8			3
storm lens			3		4	
receptaculitid		97	8	15	1	
cephalopod	shell	37	33			
D7	Comments	x	y	W	H	D
receptaculitid		3	39	10	1	
receptaculitid		24	40	13	1.5	
receptaculitid		23	18	9	1	
receptaculitid		54	10	13	1.5	
receptaculitid		88	5	8	1.5	
receptaculitid		5	34	12	1	
stromatoporoid		70	4	12	3	
stromatoporoid	domical; good shielding	24	10	47	5	
storm lens	weak		26		7	
D8	Comments	x	y	W	H	D
stromatoporoid		10	37	114	13	
horn coral	highly abraded	40	37			5
gastropod		4	8			3
receptaculitid		4	27	13	1	
stromatoporoid		78	2	29	4	

storm lens	weak		25		5	
D9	Comments	x	y	W	H	D
Protrochiscolithus	encrusting a receptaculitid	26	46	15	12	
receptaculitid	encrusted by *Protrochiscolithus*; on top of storm lens	26	41	23	1	
stromatoporoid		85	45	38	8	
storm lens	weak		31		9	
receptaculitid	directly on top of storm lens	53	14	14	1	
stromatoporoid		85	45	38	8	
storm lens	weak; receptaculitid on top		12		2	
Crenulites	growing on top of stromatoporoid	70	51	16	10	
D10	Comments	x	y	W	H	D
receptaculitid		32	40	20	1	
stromatoporoid		97	34	30	1.5	
storm lens	weak		27		4	
D11	Comments	x	y	W	H	D
receptaculitid	good shielding	50	58	19	1	
stromatoporoid		50	45	21	4	
Crenulites	dissolved in middle	94	19	25	6	
storm lens	weak		4		3	
storm lens	weak		28		4	
D12	Comments	x	y	W	H	D
Favistina		26	30	14	5	
receptaculitid	good shielding	44	24	10	1	
receptaculitid	moderate shielding	53	43	14	1	
cephalopod		61	53			3
storm lens	weak		41		3	
storm lens	weak		51		4	
D13	Comments	x	y	W	H	D
stromatoporoid	killed by storm lens; higher growth in middle	7	45	20	5	
receptaculitid	below storm lens	43	45	19	1	
receptaculitid		80	42	17	1	
receptaculitid		34	22	23	1	
storm lens	weak		27		2	
receptaculitid		97	46	6	1	
D14	Comments	x	y	W	H	D
storm lens	weak		43		4	
horn coral	moderately abraded	78	39			3
trilobite	shell	66	50			
horn coral	highly abraded	88	52			1.5
D15	Comments	x	y	W	H	D
gastropod	coiled	5	50			2.5
horn coral	highly abraded	19	50			2
horn coral	highly abraded	24	52			3
storm lens	weak		48		5	
storm lens			28		4	
cephalopod	shell; encrusted by *Protrochiscolithus*	21	31			
Protrochiscolithus	encrusting cephalopod	46	29	6	0.5	
receptaculitid		45	28	23	1	
gastropod		32	25			2
receptaculitid		22	13	15	2	

stromatoporoid		50	20	57	10	
stromatoporoid	tilted	72	18	15	5	
receptaculitid	good shielding	93	51	16	1	
D16	Comments	x	y	W	H	D
storm lens	strong		28		5	
gastropod	*Maclurina*	30	30			3.5
receptaculitid		45	36	19	1	
receptaculitid		57	15	10	1.5	
receptaculitid	possibly same as above	40	15	10	1.5	
gastropod		7	12			4.5
storm lens	weak		12		3	
D17	Comments	x	y	W	H	D
storm lens			14		3	
receptaculitid		40	51	22	1	
receptaculitid		42	33	19	0.5	
receptaculitid		77	38	11	1	
Protrochiscolithus	borings	99	55	4	3	
storm lens	weak		45		3	
receptaculitid		6	32	9	1.5	
D18	Comments	x	y	W	H	D
gastropod	*Maclurina*	23	55			5.5
cephalopod		57	57			2.5
stromatoporoid	on top of storm lens	36	58	23	9	
storm lens	weak		55		4	
Catenipora	fallen on side	70	49	11	5	
cephalopod		93	40			4
receptaculitid	encrusted by *Protrochiscolithus*	99	52	17	1.5	
Protrochiscolithus	encrusting receptaculitid	97	53	5	0.5	
horn coral	cardinal septum 45 degrees up from west	57	52			1
storm lens	weak		36		4	
D19	Comments	x	y	W	H	D
stromatoporoid	encrusting receptaculitid from D18; encrusted by *Protrochiscolithus*	8	54	8	3	
Protrochiscolithus	encrusting stromatoporoid	8	56	5	3.5	
receptaculitid	on top of storm lens; encrusted by *Protrochiscolithus*	78	51	41	1.5	
Protrochiscolithus		50	62	4	3	
Protrochiscolithus	overturned	78	51	10	8	
receptaculitid		20	34	19	1	
storm lens	weak		18		2	
storm lens			48		2	
D20	Comments	x	y	W	H	D
Favistina		20	29	5	2	
Calapoecia		62	54	5	3	
Crenulites	domical; directly above storm lens	75	30	30	8	
storm lens	weak		24		5	
receptaculitid		40	22	8	1	
D21	Comments	x	y	W	H	D
receptaculitid		9	44	9	1	
Catenipora	on side	8	40	6	3	
gastropod		47	29			3.5
storm lens	strong		27		3	

Protrochiscolithus		59	53	3	1	
D22	Comments	x	y	W	H	D
stromatoporoid	domical	20	52	12	6	
Favistina	tabular	27	40	22	4	
trilobite	shell	7	31			
storm lens	strong		31		3	
D23	Comments	x	y	W	H	D
storm lens	strong		24		4	
cephalopod	*Endoceras*; encrusted by *Protrochiscolithus*	73	29			5.5
Protrochiscolithus	encrusting *Endoceras*	69	33	4	0.5	
Calapoecia	on side	70	32	2	1.5	
Calapoecia		85	26	4.5	2.5	
D24	Comments	x	y	W	H	D
storm lens	strong		25		4	
stromatoporoid		24	24	20	6	
receptaculitid		44	22	10	1	
horn coral		43	50			3.5
horn coral		53	21			3
receptaculitid	top of bed	58	70			
D25	Comments	x	y	W	H	D
Favistina		7	47	23	4	
receptaculitid		28	36	18	1	
storm lens	weak		27		4	
storm lens	weak		14		3	
Protrochiscolithus		84	12	5	0.5	
D26	Comments	x	y	W	H	D
D27	Comments	x	y	W	H	D
receptaculitid		52	42	17	1.5	
receptaculitid		90	43	11	1	
storm lens	weak		41		3	
D28	Comments	x	y	W	H	D
receptaculitid	good shielding	21	30	11	1	
storm lens			38		4	
Calapoecia	overturned	34	38	5	3	
Catenipora		48	38	13	5	
Protrochiscolithus	overturned; encrusting *Saffordophyllum*	56	39	13	1.5	
Saffordophyllum	overturned; growing on horn coral	57	40	8	3	
horn coral	encrusted by *Saffordophyllum*	58	43			2.5
receptaculitid		60	32	11	1	
storm lens	weak		20		3	
D29	Comments	x	y	W	H	D
storm lens	weak		38		4	
storm lens	weak		20		4	
Favistina		92	23	11	2	
D30	Comments	x	y	W	H	D
receptaculitid		3	40	8	1	
receptaculitid		40	40	18	2.5	
receptaculitid		30	22	12.5	1	
horn coral	epitheca abraded; cardinal septum due east	7	14			4

E1	Comments	x	y	W	H	D
gastropod		9	72			2
gastropod		7	83			3
gastropod	*Maclurina*	16	84			8
cephalopod		64	54			8
stromatoporoid		50	57	26	10	
cephalopod	ventral siphuncle	43	40			3
stromatoporoid		2	47	19	5	
Crenulites		54	12	12	2	
Crenulites	maybe same one as above	63	23	5	1	
receptaculitid	overturned	70	31	15	1	
gastropod		95	35			3
horn coral	epitheca abraded	97	8			3
gastropod	*Trochonema*	17	44			3
gastropod		67	23			2
E2	Comments	x	y	W	H	D
cephalopod	apex pointing east; encrusted by *Protrochiscolithus* on bottom	84	61			7
cephalopod		64	77			2
horn coral	highly abraded	77	78			3
Protrochiscolithus	encrusting cephalopod	86	58	7	1	
horn coral	moderately abraded	91	50			2
stromatoporoid	encrusted by receptaculitid	56	30	74	7	
receptaculitid	encrusting stromatoporoid above	60	33	10	1	
horn coral	epitheca abraded; cardinal septum due west	58	23			2
horn coral	epitheca abraded	59	21			1
receptaculitid		42	82	6	1	
storm lens			18		6	
E3	Comments	x	y	W	H	D
stromatoporoid	encrusted by *Protrochiscolithus*	95	28	17	4	
Protrochiscolithus	encrusting stromatoporoid above	92	33	10	1	
horn coral	apex pointing west	38	17	4		3
cephalopod	siphuncle	33	15			1
cephalopod		20	62			5
cephalopod	fragment	27	78			
cephalopod	fragment	18	52			
receptaculitid		66	13	10	1	
storm lens	large clasts: strong		18		6	
E4	Comments	x	y	W	H	D
horn coral		66	82			4
cephalopod	fragment	17	83			
Crenulites	thins to east; dissolved and filled with sediment	30	25	30	9	
Calapoecia		51	26	4	2	
cephalopod		10	22			5
gastropod	encrusted by *Protrochiscolithus*	70	35			4
stromatoporoid	good shielding	95	38	13	3	
Protrochiscolithus	encrusting gastropod	70	35			4.5
storm lens	heavily burrowed		18		6	
storm lens	weakly burrowed		83		3	
Crenulites	overturned	100	10	7	3	
E5	Comments	x	y	W	H	D

Favistina		68	54	3	1	
receptaculitid		40	4	19	1	
Catenipora	fragment directly on top of receptaculitid	32	4			
E6	Comments	x	y	W	H	D
receptaculitid		50	84	12	1	
gastropod		99	31			3
gastropod		95	30			5
Catenipora	fragment in storm lens	98	25			
Saffordophyllum		69	7	4	1	
chain coral	domical	53	54	8	3	
receptaculitid		58	72	12	1	
storm lens	highly burrowed		83		3	
E7	Comments	x	y	W	H	D
horn coral	burrowed into; bryozoan inside	4	24			4
horn coral	apex pointing west	69	24			4
Saffordophyllum	good shielding	46	32	14	2	
storm lens	heavily burrowed		21		5	
E8	Comments	x	y	W	H	D
cephalopod	*Endoceras*; apex points east	36	78	5	?	
horn coral	well preserved; cardinal septum 30 degrees down from west	48	15			4
receptaculitid	good shielding	48	5	10	1	
horn coral	epitheca abraded	59	42			2
Crenulites		70	34	5	2	
cephalopod		22	44			
cephalopod		25	45			
receptaculitid	good shielding	36	49	10	1	
cephalopod	apex up	50	22			9
horn coral	highly abraded; cardinal septum 50 degrees up from west	79	12			2
E9	Comments	x	y	W	H	D
Crenulites	heavily burrowed beneath	53	40	29	4	
horn coral	epitheca abraded; cardinal septum 60 degrees up from west	67	39			2
receptaculitid	good shielding	56	33	10	1	
gastropod	*Maclurina*	21	45			9
gastropod		21	28			5
gastropod		22	28			2
receptaculitid		18	16	7	1	
horn coral	epitheca abraded; cardinal septum 60 degrees down from west	12	18			2
receptaculitid		13	10	20	1	
receptaculitid		49	17	2	1	
Crenulites	reverse shielding; whole rock overturned?	60	50	5	1	
storm lens	faint		21		5	
E10	Comments	x	y	W	H	D
Crenulites	toppled; part of E11?	34	60	3	15; 90?	
receptaculitid		10	84	12	1	
receptaculitid		38	82	8	1	
bryozoan	branching	5	27			1
receptaculitid		47	10	18	1	
gastropod		62	15			4
horn coral	epitheca abraded; cardinal septum 30 degrees down from west	58	20			1
receptaculitid		67	19	10	1	

storm lens	faint		21		5	
E11	Comments	x	y	W	H	D
receptaculitid		28	82	21	2	
receptaculitid		28	72	20	2	
receptaculitid		20	52	27	1	
Protrochiscolithus		6	5	9	1	
horn coral	well preserved; cardinal septum 30 degrees down from east	79	20			4
receptaculitid		56	17	9	1	
receptaculitid	possibly same one as above	83	16	15	1	
gastropod	in storm lens	97	24			4
Manipora	fragment in storm lens	97	20			
storm lens			23		4	
E12	Comments	x	y	W	H	D
receptaculitid		7	70	48	2	
receptaculitid	encrusted by *Protrochiscolithus*	92	74	20	1	
Protrochiscolithus	encrusting receptaculitid	98	75	4	0.5	
horn coral	well preserved; apex pointing west	75	70			4
receptaculitid		72	37	20	1.5	
receptaculitid		58	30	12	1	
horn coral	slightly abraded; cardinal septum 50 degrees up from west	19	27			2
horn coral	epitheca abraded; cardinal septum 45 down from east	45	28			3
Protrochiscolithus		85	19	4	0.5	
storm lens	faint		23		4	
E13	Comments	x	y	W	H	D
storm lens	strong		89		9	
cephalopod	in storm lens					2.5
Catenipora	fragment in storm lens					
horn coral	in storm lens					2.5
gastropod	in storm lens					3
gastropod	in storm lens					2.5
gastropod	in storm lens					2.5
bryozoan	branching; 2 branches	62	80	4		1
algal stromatolite		70	48	10	0.5	
storm lens	highly burrowed		23		4	
E14	Comments	x	y	W	H	D
cephalopod	in storm lens; apex points 170 degrees; encrusted by *Saffordophyllum*	30	95			8
receptaculitid		85	76	15	1	
cephalopod		64	44			2
receptaculitid		1	42	11	1	
horn coral	highly abraded; cardinal septum 80 down from east	30	7			1
storm lens	faint		23		4	
cephalopod	*Endoceras* siphuncle; apex points 170 degrees	95	96			3
E15	Comments	x	y	W	H	D
cephalopod	apex pointing 170 degrees	46	91			3
cephalopod	apex pointing 170 degrees	42	92			2.5
Crenulites	on top of storm lens	76	51	9	1.5	
receptaculitid		72	55	9	1	
horn coral	highly abraded	79	14			2
horn coral	highly abraded	48	52			3
Protrochiscolithus		38	64	5	0.5	

storm lens			44		6	
E16	Comments	x	y	W	H	D
gastropod		16	93			3
Calapoecia	fragment in storm lens	27	71			
storm lens	faint		70		3	
cephalopod	fragment in storm lens	26	72			
receptaculitid	good shielding	87	55	10	1	
receptaculitid		82	30	11	1	
horn coral	highly abraded; in storm lens	32	10			2
horn coral	in growth position; highly abraded	38	5	4		2
horn coral	highly abraded	93	14			3
storm lens	weakly burrowed		11		2	
storm lens	strong		46		3	
storm lens	weak		70		2	
E17	Comments	x	y	W	H	D
receptaculitid		10	19	26	1.5	
receptaculitid		15	7	25	2	
horn coral	weakly abraded; cardinal septum 10 degrees down from west	26	5			3.5
storm lens	weak		29		2	
E18	Comments	x	y	W	H	D
receptaculitid	above storm lens; partial shielding	32	77	16	1	
storm lens	weak		68		8	
horn coral	moderately abraded; cardinal septum 50 degrees up from west	29	72			2
gastropod	*Maclurina*	78	75			9
horn coral	slightly abraded; cardinal septum 45 degrees up from east	60	54			3
Crenulites		76	52	28	3.5	
horn coral	highly abraded	63	25			1.5
cephalopod	fragment in storm lens	38	19			
storm lens	weak		16		4	
horn coral	epitheca gone	95	7			1.5
E19	Comments	x	y	W	H	D
stromatoporoid	domical; shielding; bored	20	57	20	5	
gastropod	*Trochonema*	25	56			3
cephalopod	*Endoceras*	37	25			5
cephalopod	*Endoceras*	47	25			8
horn coral	weakly abraded; cardinal septum 20 degrees down from west	53	23			3
Calapoecia	overturned; on top of storm lens	54	25	3	2	
Crenulites	overturned; on top of storm lens	60	29	10	3	
receptaculitid	good shielding	90	42	17	1	
storm lens	weak		20		2	
receptaculitid	good shielding	92	80	18	1	
horn coral	highly abraded; apex pointing east	97	44			2
E20	Comments	x	y	W	H	D
gastropod	in storm lens	14	30			4
storm lens	weak		24		4	
horn coral	weakly abraded; cardinal septum 75 degrees up from east	61	6			4.5
stromatoporoid	domical	75	5	16	3	
horn coral	highly abraded	97	24			1
Favistina	overturned; in storm lens	26	43	6	2	
horn coral	highly abraded	17	44			1

horn coral	highly abraded	28	42			2
storm lens	weak		42		3	
E21	Comments	x	y	W	H	D
receptaculitid	good shielding	26	83	9	1	
stromatoporoid		14	34	44	8	
E22						
Crenulites	above storm lens	60	86	50	12	
storm lens	heavily burrowed		79		4	
receptaculitid	good shielding	50	70	12	1	
Crenulites	overturned	10	54	26	5	
gastropod	*Maclurina*; encrusted by *Saffordophyllum*	19	28			10
storm lens	weak		24		4	
gastropod		6	38			3
gastropod		6	27			4
gastropod		3	28			3
horn coral	highly abraded	56	52			2.5
receptaculitid		90	8	20	1	
gastropod	above storm lens	96	84			4
E23	Comments	x	y	W	H	D
storm lens	strong		77		5	
receptaculitid		23	83	13	1.5	
horn coral	highly abraded; in storm lens	81	75			1
receptaculitid		54	17	18	1	
trilobite	fragment	40	20			
horn coral	highly abraded	33	21			3
horn coral	highly abraded	2	7			2.5
storm lens	weak		15		2	
E24	Comments	x	y	W	H	D
stromatoporoid	domical	56	88	29	7	
storm lens	patchy		78		6	
stromatoporoid	domical	56	68	51	12	
receptaculitid		20	58	19	1.5	
Calapoecia	fragment	19	56			
horn coral	apex points west	22	65			2
E25	Comments	x	y	W	H	D
Crenulites	growth higher to west	4	70	28	8	
gastropod	*Trochonema*	20	73			3.5
receptaculitid		42	72	7	1	
receptaculitid		70	76	9	1	
receptaculitid		66	80	8	1	
storm lens	weak		77		4	
horn coral	moderately abraded; apex points west	21	16	6		3
gastropod	*Trochonema*	24	23			4.5
Catenipora	tilted	4	28	7	3	
storm lens	patchy; weak		15		4	
Protrochiscolithus		78	47	4	0.5	
gastropod	*Hormotoma*; apex points east	54	17	5.5		2
gastropod		70	11			5
storm lens	weak		52		2	
E26	Comments	x	y	W	H	D

horn coral		42	78			1
storm lens	strong; lots of fragments		55		11	
Calapoecia		31	66	5	2	
Crenulites	domical	15	58	20	5	
horn coral	in storm lens	40	60			1
Favistina	more growth to west; dissolved	26	23	14	0.5	
stromatoporoid	domical	72	60	19	3	
receptaculitid	good shielding	80	45	14	1	
storm lens	weak		40		2	
cephalopod	fragment	77	17			
E27	Comments	x	y	W	H	D
horn coral	weakly abraded; cardinal septum 50 degrees down from west	52	66			3
horn coral	highly abraded	32	41			2
Calapoecia	overturned	35	48	4	2	
storm lens			48		3	
Crenulites	domical	23	18	28	5	
storm lens	weak		14		2	
horn coral	apex points east; tilted	40	15			3
E28	Comments	x	y	W	H	D
stromatoporoid	domical	2	70	38	5	
stromatoporoid	domical; growth higher to west; killed by storm on east	90	70	58	12	
storm lens			68		3	
gastropod	*Trochonema*	65	26			2
storm lens	weak		24		3	
gastropod	*Trochonema*	28	24			3.5
Crenulites		14	22	20	5	
brachiopod		38	15			4.5
storm lens	weak		40		3	
Favistina		3	44	4	1	
E29	Comments	x	y	W	H	D
receptaculitid		4	85	27	1.5	
cephalopod		28	77			3
cephalopod	apex points south	24	68			4
receptaculitid	good shielding	25	18	19	1	
horn coral	highly abraded	29	18			2.5
receptaculitid	good shielding	67	80	18	1.5	
Favistina		88	30	26	7	
storm lens			30		4	
E30	Comments	x	y	W	H	D
storm lens			90		5	
horn coral	slightly abraded; cardinal septum 30 degrees down from east	17	92			3
receptaculitid		44	81	12	0.5	
cephalopod	*Endoceras*	14	70			9
cephalopod	*Endoceras*	23	74			3.5
storm lens	strong		25		5	
receptaculitid		21	35	7	1	
receptaculitid	below storm lens	17	27	16	1	
Crenulites	killed by storm lens	70	25	43	10	
cephalopod	fragment	28	76			
E31	Comments	x	y	W	H	D

storm lens			89		6	
cephalopod	beaded	3	38	10		1.5
receptaculitid		94	70	13	2	
storm lens	weak; sharp base		27		3	
receptaculitid		23	9	18	1	
E32	Comments	x	y	W	H	D
Crenulites	recrystallized	50	89	11	4	
storm lens			89		8	
horn coral	weakly abraded; cardinal septum 45 degrees up from east	58	54			5
horn coral	highly abraded; in storm lens	66	20			2.5
E33	Comments	x	y	W	H	D
Crenulites	domical; dissolved in middle; killed at ends	10	90	69	14	
storm lens	weak		89		8	
E34	Comments	x	y	W	H	D
gastropod	*Maclurina*	20	82			4.5
storm lens	weak		87		6	
cephalopod		53	79	15		
stromatoporoid	tabular	88	50	32	5	
horn coral	highly abraded; cardinal septum straight down	68	26			2
E35	Comments	x	y	W	H	D
storm lens	strong; sharp base		74		4	
horn coral	highly abraded	82	50			3
Protrochiscolithus		50	20	13	1	
storm lens	faint		30		4	
gastropod		38	69			2
receptaculitid		93	30	13	1.5	
receptaculitid		90	18	17	1	
F1	Comments	x	y	W	H	D
receptaculitid		52	39	5		
horn coral	highly abraded	28	44			2
horn coral		7	26			1
gastropod	fragment in storm lens	47	29			1
storm lens		0	25		4	
trilobite	fragment	5	42			
F2	Comments	x	y	W	H	D
stromatoporoid	tapers laterally	53	24	40	8	
stromatoporoid		13	19	34	6	
storm lens			29		5	
Catenipora		30	41			2
F3	Comments	x	y	W	H	D
horn coral	highly abraded	38	33			3
brachiopod		58	23			
trilobite	fragment	52	31			
cephalopod	siphuncle	92	41			3
algal stromatolite		52	23	35	3	
cephalopod	siphuncle	90	2	8		
storm lens	lots of trash; pinches out west		28		4	
cephalopod	siphuncle	52	4	9	3	
F4	Comments	x	y	W	H	D
horn coral	mod abraded	59	36			3

gastropod		4	30			3
horn coral	highly abraded	31	42			2
horn coral		16	42			1
storm lens			41		4	
storm lens			27		4	
trilobite	fragment	52	33			
F5	Comments	x	y	W	H	D
gastropod	*Maclurina*	6	53			10
receptaculitid		46	20	38	1	
horn coral	highly abraded	44	45			
storm lens			19		3	
storm lens			25		4	
F6	Comments	x	y	W	H	D
storm lens			31		4	
F7	Comments	x	y	W	H	D
storm lens			30		5	
F8						
storm lens	highly bioturbated		31		4	
horn coral		22	10			1
F9	Comments	x	y	W	H	D
brachiopod	fragment	28	36			
horn coral	epitheca abraded	64	21			1
storm lens	blotchy		33		6	
algal stromatolite	just above storm lens; no burrows immed. below storm lens	75	45	47	2	
F10	Comments	x	y	W	H	D
receptaculitid	good shielding from burrowing	32	54	22	1	
horn coral	highly abraded	44	42			2
horn coral	tilted	93	39			
cephalopod	fragment	28	20			
gastropod	*Maclurina*	52	3			
storm lens	weak, burrowed		32		3	
F11	Comments	x	y	W	H	D
Catenipora	sideways	75	42	5		
storm lens	heavily burrowed		32		4	
F12	Comments	x	y	W	H	D
horn coral	sideways; epitheca abraded; bored	85	13			3
cephalopod		80	30	3		
storm lens	patchy; thins to west		32		5	
trilobite	fragment	15	33			
F13	Comments	x	y	W	H	D
horn coral	sideways	14	54			2
Protrochiscolithus	domed, encrusted on stromatoporoid	6	52			
stromatoporoid	encrusted by *Protrochiscolithus*	6	52	14	4	
horn coral	epitheca abraded	8	8			3
gastropod	*Maclurina*	18	8			6
gastropod		17	2			3
storm lens	burrowed; patchy		34		14	
F14						
receptaculitid		4	59	10	1	
storm lens	trashy		32		4	

F15	Comments	x	y	W	H	D
horn coral	sideways	73	48			1
receptaculitid		90	56	8	1	
receptaculitid		67	24	18	1	
horn coral	epitheca gone	65	23			1
storm lens	trashy; less burrowing		35		15	
storm lens			21		3	
gastropod	*Maclurina*	97	22			5
F16	Comments	x	y	W	H	D
storm lens			35		15	
storm lens			21		3	
storm lens	patchy		54		3	
receptaculitid		67	46	10	1	
receptaculitid	in storm bed	34	22	11	1	
receptaculitid	in storm bed	4	23	8	1	
gastropod		16	21			7
cephalopod	siphuncle	43	24			3
gastropod	fragment	86	17			5
F17	Comments	x	y	W	H	D
gastropod	*Maclurina*	10	48			7
receptaculitid	domical	35	40	19	1	
gastropod	*Maclurina*	10	48			4
cephalopod	fragment	44	35			
stromatoporoid	tapers laterally; domical; borings	72	15	19	4	
storm lens	trashy; echinoderm, ostracods, brachiopod		30		4	
storm lens	patchy		21		4	
F18	Comments	x	y	W	H	D
cephalopod	fragment	6	14			
storm lens	weakly burrowed		32		4	
storm lens	very patchy; fading out		20		4	
F19	Comments	x	y	W	H	D
trilobite	fragment	15	27		3	
trilobite	fragment	52	36		4	
stromatoporoid	flattened; in storm lens	72	24	17	3	
stromatoporoid	flattened; heavily burrowed	100	44	21	2	
storm lens	heavily burrowed		31		4	
F20	Comments	x	y	W	H	D
horn coral	apex pointing west	73	60		3	
Catenipora	domical; grew higher in middle	86	55	22	6	
gastropod	*Maclurina*	100	36			9
storm lens			30		4	
F21	Comments	x	y	W	H	D
Crenulites	partially burrowed	64	50	16	4	
cephalopod		93	51			
storm lens	weakly burrowed		31		4	
F22	Comments	x	y	W	H	D
gastropod		48	31			4
horn coral	cardinal septum 65 degrees down from east; epitheca abraded	50	28			1
horn coral		50	42			2
stromatoporoid	domical; directly above storm lens	66	44	37	7	

storm lens	weakly burrowed		31		4	
storm lens	very weak; patchy		44		3	
F23	Comments	x	y	W	H	D
stromatoporoid	highly burrowed; growth higher in the middle; sudden death on west side	30	53	73	6	
brachiopod	fragment	74	51			
horn coral		41	43			1
storm lens			30		4	
storm lens	weak; stromatoporoid directly above		43		4	
F24	Comments	x	y	W	H	D
storm lens	highly burrowed		31		4	
storm lens	weak, blotchy		46		4	
F25	Comments	x	y	W	H	D
trilobite	fragment; above storm lens	67	34			
horn coral	highly abraded	26	13			1
horn coral	cardinal septum 80 degrees down from east	4	33			1
storm lens			30		4	
storm lens	very faint		46		4	
F26	Comments	x	y	W	H	D
gastropod		4	61			1
receptaculitid	good shielding from burrowing	91	15	16	1	
storm lens	weakly burrowed		31		4	
F27	Comments	x	y	W	H	D
horn coral		73	29			3
Catenipora	fragment in storm lens	79	30			
storm lens			30		4	
F28	Comments	x	y	W	H	D
horn coral		58	34			4
storm lens	large fragments; highly burrowed		31		4	
F29	Comments	x	y	W	H	D
receptaculitid		7	48	7	1	
F30	Comments	x	y	W	H	D
receptaculitid		1	56	10	1	
stromatoporoid	domical; tapers at ends	54	19	30	7	
gastropod	*Maclurina*	66	19			6
receptaculitid		88	7	7	1	
storm lens	patchy		31		3	
F31	Comments	x	y	W	H	D
Protrochiscolithus	bored; overturned	93	47	13	2	
receptaculitid	heavily burrowed	26	59	7	2	
storm lens	weakly burrowed		31		3	
F32	Comments	x	y	W	H	D
horn coral		2	50			2
horn coral	cardinal septum 45 degrees up from west	12	43			3
Crenulites	domical	11	21	13	4	
gastropod	*Hormotoma*	61	23	4	5	
receptaculitid		76	20	29	2	
gastropod		86	41			3
cephalopod	fragment	73	12			
bryozoan	small mound	12	15			3
gastropod	*Maclurina*	8	48			6

storm lens	highly burrowed in middle of grid		31		3	
F33	Comments	x	y	W	H	D
gastropod	burrowed inside	95	19			3
storm lens	trashy		31		3	
F34	Comments	x	y	W	H	D
horn coral	epitheca abraded; cardinal septum 80 degrees down from east	13	61			1
horn coral	highly abraded	9	57			1
horn coral	highly abraded	18	55			2
horn coral	highly abraded; apex pointing west	34	58	3		
horn coral	highly abraded	42	58			2
horn coral	highly abraded; cardinal 50 degrees down from east	62	44			1
stromatoporoid	domical; burrowed	39	24	15	3	
horn coral	highly abraded	58	62			1
trilobite	fragment; in storm lens	66	61			
gastropod	*Maclurina*	62	43			8
cephalopod	siphuncle	91	58			2
storm lens	highly burrowed		32		4	
storm lens	thins out west; blotchy		53		8	
F35	Comments	x	y	W	H	D
Calapoecia	tilted on side; mound shaped; encrusted *Manipora*	3	62	5	3	
gastropod	*Maclurina*	35	63			15
cephalopod	beaded siphuncle; apex points west	23	64	5		
horn coral	well preserved	87	68			4
horn coral	highly abraded	18	45			2
storm lens	moderately burrowed		31		3	
F36	Comments	x	y	W	H	D
horn coral	well preserved; cardinal septum 45 degrees down from east	46	67			4
cephalopod		58	72			5
horn coral	moderately abraded	66	70			2
horn coral		86	67			1
horn coral	highly abraded	90	61			1
Favistina	mound shaped	40	10	8	3	
storm lens	moderately burrowed		30		4	

Appendix A-2: Original Fossil Data

Pit 1: North-South Wall

Note:
1. "Shielding" refers to the lack of mottling and/or bioturbation found underneath certain organisms
2. W = width at widest point in cm; H = height in cm; D = diameter in cm
3. x = horizontal distance from origin (0,0) in cm; y = vertical distance from base of section in cm

B1	Comments	x	y	W	H	D
storm lens			10		6	
algal stromatolite		55	9	19	3	
horn coral	highly abraded	4	13			3.5
B2	Comments	x	y	W	H	D
receptaculitid	good shielding; on top of storm lens	62	9	17	3	
storm lens			6		3	
horn coral	epitheca abraded; cardinal septum 20 degrees down from south	6	3			1
B3	Comments	x	y	W	H	D
storm lens	weak		18		3	
receptaculitid		98	7	10	1	
receptaculitid		38	37	10	1	
receptaculitid		80	42	8	1	
B4	Comments	x	y	W	H	D
receptaculitid		8	34	9	1	
receptaculitid	good shielding	25	30	15	1	
algal stromatolite		21	1	7	2	
horn coral	highly abraded	5	16			2.5
B5	Comments	x	y	W	H	D
cephalopod		9	40			4.5
receptaculitid		24	45	27	4	
Protrochiscolithus		32	43	8	2	
storm lens	strong		21		3	
receptaculitid		62	35	11	1	
receptaculitid		61	28	9	1	
receptaculitid		15	6	7	1	
B6	Comments	x	y	W	H	D
receptaculitid	good shielding	12	18	17	3	
receptaculitid	good shielding	73	41	18	2	
Favistina		70	35	10	5	
horn coral	cardinal septum straight down	86	5			2.5
storm lens			20		3	
B7	Comments	x	y	W	H	D
receptaculitid		73	12	24	2	
storm lens			19		3	
gastropod		55	26			3
B8	Comments	x	y	W	H	D
Protrochiscolithus		18	37	15	5	
horn coral	highly abraded; cardinal septum 30 degrees down from north	71	3			1.5
B9	Comments	x	y	W	H	D
storm lens	strong; sharp basal contact		18		4	

B10	Comments	x	y	W	H	D
Crenulites		43	38	9	2	
horn coral	highly abraded	11	15			4.5
receptaculitid		92	11	9	1	
receptaculitid		95	36	9	1	
B11	Comments	x	y	W	H	D
stromatoporoid		13	25	22	8	
receptaculitid		6	40	6	0.5	
Palaeophyllum	one branch	45	30			1.5
B12	Comments	x	y	W	H	D
receptaculitid		42	35	7	1	
brachiopod		9	22			3
receptaculitid		72	15	15	1	
B13	Comments	x	y	W	H	D
receptaculitid		35	3	9	1	
cephalopod		49	1			3.5
receptaculitid	good shielding	96	29	18	2	
receptaculitid		100	3	14	1	
B14	Comments	x	y	W	H	D
storm lens	strong		18		4	
Calapoecia	tilted on side; in storm lens	93	14	6	25	
B15	Comments	x	y	W	H	D
cephalopod		34	33			6.5
receptaculitid		26	25	12	1	
horn coral	highly abraded	43	9			1
storm lens			17		3	
B16	Comments	x	y	W	H	D
storm lens			19		4	
gastropod		47	21			3
horn coral	in growth position	50	26			3
receptaculitid		66	5	10	1	
B17	Comments	x	y	W	H	D
Crenulites		58	24	26	10	
storm lens			17		4	
receptaculitid		85	19	12	1.5	
horn coral	highly abraded; cardinal septum 30 degrees up from north	86	21			2.5
B18	Comments	x	y	W	H	D
receptaculitid		37	15	19	1	
receptaculitid		22	19	11	1	
receptaculitid		27	21	8	0.5	
storm lens			5		4	
receptaculitid		45	23	9	0.5	
B19	Comments	x	y	W	H	D
storm lens			17		3	
B20	Comments	x	y	W	H	D
receptaculitid	good shielding	29	17	13	1	
storm lens			19		4	
receptaculitid		27	28	8	1	
gastropod		97	29			3
B21	Comments	x	y	W	H	D

Crenulites	domical	33	32	26	9	
Crenulites	overturned	66	9	7.5	3	
Protrochiscolithus		98	27	10	5	
Saffordophyllum		65	34	2	1.5	
B22	Comments	x	y	W	H	D
gastropod	*Maclurina*	73	35			12.5
B23	Comments	x	y	W	H	D
storm lens	weak		19		23	
B24	Comments	x	y	W	H	D
Protrochiscolithus	overturned	18	10	39	12	
Crenulites		48	28	18	6	
stromatoporoid		58	12	28	5	
stromatoporoid		80	24	36	7	
B25	Comments	x	y	W	H	D
receptaculitid		24	58	18	1.5	
horn coral	highly abraded	21	50			3
horn coral	epitheca abraded; cardinal septum 30 degrees down from south	35	16			1
horn coral	highly abraded; cardinal septum straight down	64	14			1.5
horn coral	apex points south	82	17	4.5		2.5
Protrochiscolithus	overturned	93	12	7	3.5	
gastropod	*Maclurina*	38	42			10
B26	Comments	x	y	W	H	D
stromatoporoid	good shield	94	17	41	8	
B27	Comments	x	y	W	H	D
receptaculitid		37	59	18	1	
storm lens	strong		36		4	
horn coral	highly abraded	67	12			4.5
B28	Comments	x	y	W	H	D
receptaculitid		92	54	16	1	
storm lens	strong		30		4	
receptaculitid		90	7	25	1	
Protrochiscolithus		38	13	7	1.5	
horn coral	highly abraded	35	18			3
cephalopod		52	61			2
storm lens	weak		20		3	
receptaculitid		27	13	8	1	
B29	Comments	x	y	W	H	D
receptaculitid		5	13	15	1	
storm lens	moderate		18		4	
storm lens	moderate		42		4	
horn coral	highly abraded; cardinal septum 75 degrees down from south	57	16			4
receptaculitid		100	12	12	1	
receptaculitid		95	23	9	1	
gastropod		17	2			2.5
B30	Comments	x	y	W	H	D
storm lens	moderate		38		4	
gastropod		41	10			4
Protrochiscolithus		78	28	3	1	
receptaculitid		80	9	12	1	
receptaculitid		1	12	12	1.5	

B31	Comments	x	y	W	H	D
receptaculitid		10	52	10	3	
receptaculitid		33	48	13	1	
gastropod	*Hormotoma*	66	53	8		3
receptaculitid		85	17	18	1.5	
horn coral	highly abraded	5	20			1.5
receptaculitid		5	21	9	1	
B32	comments	x	y	W	H	D
receptaculitid		36	54	10	1	
receptaculitid		45	58	13	1	
storm lens	strong		43		4	
storm lens	weak		31		5	
Protrochiscolithus		36	15	16	2	
gastropod		12	11			2
B33	Comments	x	y	W	H	D
receptaculitid		32	46	16	1	
receptaculitid		70	10	9	1	
storm lens			34		5	
receptaculitid		82	34	11	1	
bryozoan	branching	93	18			2
receptaculitid		85	16	9	1	
B34	Comments	x	y	W	H	D
horn coral	highly abraded; highly recrystallized	36	18			3
horn coral	highly abraded	42	12			3.5
receptaculitid		70	30	27	1.5	
bryozoan	branching	71	28			1.5
horn coral	highly abraded	94	54			2.5
Crenulites	tabular	85	22	52	7	
Crenulites		100	13	13	2	
horn coral	cardinal septum 30 degrees down from north	85	19			1.5
stromatoporoid		90	1	15	2	
B35	Comments	x	y	W	H	D
storm lens	strong		10		4	
cephalopod	*Endoceras*	65	18			15
horn coral	apex points south	5	18	5		3
Protrochiscolithus	on top of storm lens	77	12	6	1	
horn coral	cardinal septum 45 degrees down from south	90	31			1.5
Favistina	domical	95	41	29	11	
gastropod	*Maclurina*	43	53			12
B36	Comments	x	y	W	H	D
horn coral	highly abraded; cardinal septum 20 degrees down from north	8	10			1.5
horn coral	epitheca abraded	7	8			2
storm lens	weak		19		5	
receptaculitid		36	7	11	1	
B37	Comments	x	y	W	H	D
receptaculitid	good shielding	12	40	20	1	
gastropod	*Maclurina*	25	34			13
receptaculitid	good shielding	13	25	12	1	
stromatoporoid		50	39	33	15	
storm lens			22		4	

receptaculitid		80	22	16	1	
C1	Comments	x	y	W	H	D
storm lens	strong		9		5	
gastropod	*Trochonema*	37	12			2.5
Favistina		16	29	6	2	
horn coral	epitheca abraded	92	37			3.5
horn coral	highly abraded	88	38			3
storm lens			32		3	
gastropod	*Maclurina*	19	11			4
C2	Comments	x	y	W	H	D
Protrochiscolithus		33	35	11.5	2	
horn coral	epitheca abraded; cardinal septum 45 degrees down from south	21	32			1
horn coral	highly abraded	30	34			2.5
storm lens	strong		32		4	
Favistina	domical; on top of storm lens	70	45	33	13	
Favistina	domical; below storm lens	68	30	25	6	
Catenipora		72	24	5	2	
horn coral	highly abraded; cardinal septum 70 degrees down from south	99	37			1
horn coral	highly abraded	60	38			3
horn coral		93	38	1.5		1
horn coral	epitheca abraded	39	47			2
C3	Comments	x	y	W	H	D
storm lens	strong		35		40	
receptaculitid		14	26	9	1	
Protrochiscolithus		29	45	8	1.5	
gastropod		20	36			2.5
horn coral	highly abraded	30	43			2
horn coral	highly abraded	37	42			1
gastropod		36	41			2
horn coral	epitheca abraded; cardinal septum 70 degrees down from north	40	40			2.5
receptaculitid		57	48	17	1	
Favistina		56	42	10	3	
receptaculitid		68	2	5	1	
C4	Comments	x	y	W	H	D
stromatoporoid		32	52	67	9	
receptaculitid		1	16	6	1	
receptaculitid		8	6	7	1	
receptaculitid		59	26	9	1	
horn coral	epitheca abraded; cardinal septum 70 degrees down from south	95	33			1
C5	Comments	x	y	W	H	D
storm lens	strong		33		5	
receptaculitid		44	23	17	1	
storm lens	strong		10		5	
C6	Comments	x	y	W	H	D
storm lens			32		6	
Favistina		62	2	21	3.5	
receptaculitid		83	44	16	1	
C7	Comments	x	y	W	H	D
storm lens	strong		31		6	
storm lens			7		2	

C8	Comments	x	y	W	H	D
storm lens	strong		7		3	
storm lens			31		6	
cephalopod		92	34	11		5
stromatoporoid		70	29	47	7	
horn coral	weakly abraded; cardinal septum 45 degrees up from north	51	31			1.5
storm lens	weak		11		3	
receptaculitid		6	12	10	1	
C9	Comments	x	y	W	H	D
storm lens	strong		33		5	
storm lens	weak		11		3	
receptaculitid		60	35	14	1	
receptaculitid		65	31	8	1	
Crenulites	encrusted by *Protrochiscolithus*	59	52	15	5	
Protrochiscolithus	encrusting *Crenulites*	54	54	5	0.5	
receptaculitid		86	6	12	1	
receptaculitid		78	13	9	1	
C10	Comments	x	y	W	H	D
storm lens	strong		8		7	
receptaculitid		96	38	15	1.5	
C11	Comments	x	y	W	H	D
storm lens	strong		4		7	
horn coral	highly abraded	88	41			1.5
C12	Comments	x	y	W	H	D
storm lens	strong		8		8	
storm lens	strong		39		4	
algal stromatolite		19	40	21	4	
horn coral	apex points south	42	41	7.5		3
receptaculitid		39	3	12	1	
receptaculitid		86	14	7	1.5	
cephalopod	*Endoceras*	80	20			7
C13	Comments	x	y	W	H	D
stromatoporoid		24	34	43	11	
storm lens	strong		9		4	
horn coral	apex points south	70	22	7		4
horn coral	highly abraded	47	14			1.5
C14	Comments	x	y	W	H	D
storm lens	strong		10		6	
horn coral	epitheca abraded; cardinal septum straight down	95	42			2
horn coral	highly abraded	94	18			2.5
horn coral	life position	48	16	1.5		1
C15	Comments	x	y	W	H	D
stromatoporoid	domical; good shielding	13	5	31	7	
Crenulites	overturned	27	2	7	3.5	
receptaculitid		52	34	9	1	
storm lens			10		4	
C16	Comments	x	y	W	H	D
Favistina	overturned	20	15	20	6	
receptaculitid		14	11	9	1	
stromatoporoid		14	6	21	4	

receptaculitid		24	27	9	1	
receptaculitid		45	26	6	1	
receptaculitid		70	25	10	1	
Favistina		65	14	24	5	
gastropod	*Hormotoma*	87	23	4		1.5
C17	Comments	x	y	W	H	D
storm lens	strong		21		6	
horn coral	highly abraded	70	26			4
receptaculitid		92	19	10	1	
receptaculitid	might be same	86	23	10	1	
receptaculitid	might be same	81	26	10	1	
cephalopod	encrusted by *Protrochiscolithus*	98	23			3
C18	Comments	x	y	W	H	D
receptaculitid		16	43	16	3	
stromatoporoid		100	34	16	4	
Protrochiscolithus		30	25	6	1.5	
C19	Comments	x	y	W	H	D
receptaculitid		39	18	15	1	
receptaculitid		60	18	16	1	
Favistina	domical	29	5	4.5	2	
Crenulites	overturned	96	3	24	5	
C20	Comments	x	y	W	H	D
cephalopod		2	19			5.5
receptaculitid		26	16	22	1.5	
Catenipora		62	30	7	3	
Favistina		60	5	24	5	
receptaculitid		82	22	9	1	
C21	Comments	x	y	W	H	D
receptaculitid		20	18	16.5	2	
storm lens	strong		21		4	
C22	Comments	x	y	W	H	D
receptaculitid		31	25	8	1	
receptaculitid		100	22	24	22	
C23	Comments	x	y	W	H	D
storm lens	strong		22		3	
Catenipora		5	27	10	5	
gastropod		42	25			2
receptaculitid		29	27	8	1.5	
bryozoan	branching; 2 branches	20	25	2.5		
receptaculitid		75	15	14	2	
horn coral	epitheca abraded; cardinal septum points straight down	95	7			1
gastropod	*Maclurina*	74	2			6
gastropod		11	6			3
horn coral	highly abraded; cardinal septum points south	15	7			2.5
C24	Comments	x	y	W	H	D
storm lens	strong		12		3	
Protrochiscolithus		23	10	4.5	1	
Crenulites	tilted; encrusted by bryozoan	43	13	21	5	
bryozoan	encrusted by bryozoan	33	10	4	1.5	
receptaculitid		64	10	20	2	

stromatoporoid		60	3	27	5	
receptaculitid		81	4	23	2	
gastropod		9	3			1.5
C25	Comments	x	y	W	H	D
storm lens	strong		13		4	
receptaculitid		46	35	14	1.5	
stromatoporoid		23	10	87	15	
horn coral	cardinal septum 20 degrees down from south	60	14			2
horn coral	weakly abraded	77	10			1.5
stromatoporoid		75	24	31	8	
horn coral	epitheca abraded	98	12			1.5
cephalopod		87	10			4
Favistina	tabular	85	30	20	6	
C26	Comments	x	y	W	H	D
algal stromatolite		11	29	28	4	
gastropod		3	12			3.5
Calapoecia		7	8	6	4	
storm lens	strong		11		8	
gastropod	*Hormotoma*	47	28	6		3.5
Crenulites	in storm lens	56	15	9	3	
horn coral	epitheca abraded; cardinal septum 10 degrees down from south	65	7			2.5
stromatoporoid	overturned	70	16	35	10	
horn coral	highly abraded	70	9			2.5
horn coral	apex points south	91	14	5	3.5	
horn coral	weakly abraded; encrusted by *Protrochiscolithus*	95	17			4
Protrochiscolithus	encrusting horn coral	96	16	4	1	
C27	Comments	x	y	W	H	D
receptaculitid		14	27	13	1	
gastropod		1	23			4
storm lens	strong		11		6	
receptaculitid		10	12	16	2	
stromatoporoid		47	28	43	8	
Protrochiscolithus		68	25	7	2	
receptaculitid		87	22	7	1	
C28	Comments	x	y	W	H	D
horn coral	epitheca abraded; cardinal septum points straight down	44	30			1
receptaculitid		76	32	21	2	
receptaculitid		88	22	14	1.5	
storm lens	strong		10		4	
Favistina		57	17	5	1.5	
C29	Comments	x	y	W	H	D
Catenipora		20	14	8	5	
horn coral	in storm lens	15	12	3.5		2.5
storm lens	strong		10		6	
C30	Comments	x	y	W	H	D
receptaculitid		2	27	11	1	
receptaculitid		34	31	15	1	
receptaculitid		56	30	9	1	
Protrochiscolithus		58	34	8	2.5	
algal stromatolite		36	27	15.5	3	

receptaculitid		70	9	12	1	
C31	Comments	x	y	W	H	D
Favistina	overturned	16	20	30	9	
receptaculitid		65	4	7	1	
horn coral	highly abraded	36	4			3.5
C32	Comments	x	y	W	H	D
stromatoporoid		9	24	27	8	
storm lens	weak		20		3	
C33	Comments	x	y	W	H	D
receptaculitid		28	30	8	1	
storm lens	strong		13		3	
cephalopod	*Endoceras*; top of bed; apex points 50 degrees			13		5.5
C34	Comments	x	y	W	H	D
storm lens	strong		13		3	
Protrochiscolithus		9	27	7	2	
gastropod		9	18			5.5
Protrochiscolithus		40	25	4.5	1.5	
C35	Comments	x	y	W	H	D
receptaculitid		26	23	16	1.5	
receptaculitid		24	18	16	0.5	
horn coral	highly abraded	25	3			3
storm lens	strong		8		3	
Catenipora		82	22	5	3	
Protrochiscolithus		75	22	3.5	1.5	
D1	Comments	x	y	W	H	D
Crenulites	domical	13	10	44	12	
storm lens	strong		27		8	
receptaculitid		9	11	15	1.5	
horn coral		45	30			4
receptaculitid		7	2	11	1	
gastropod		37	24			2.5
receptaculitid		94	27	6	1	
receptaculitid		28	51	13	2	
cephalopod	top of bed; apex points 40 degrees	93				4.6
D2	Comments	x	y	W	H	D
storm lens	strong		45		4	
Crenulites		46	45	24	9	
receptaculitid		25	41	12	1	
storm lens	strong		22		4	
receptaculitid		23	5	10	1	
stromatoporoid	encrusted by *Protrochiscolithus*	14	2	10	2.5	
Protrochiscolithus	encrusting stromatoporoid	14	2.5	4	1.5	
receptaculitid		69	45	8	1	
gastropod		6	31			2
horn coral	epitheca abraded; cardinal septum 50 degrees up from south	10	26			1
horn coral	moderately abraded	11	27			1
D3	Comments	x	y	W	H	D
receptaculitid		10	46	14	1	
receptaculitid		38	47	20	1.5	
receptaculitid	good shielding	59	41	17	1	

storm lens	strong		22		3	
horn coral	highly abraded	60	11			1.5
Protrochiscolithus		42	44	5	1	
bryozoan	branching	81	40	2.5		0.5
D4	Comments	x	y	W	H	D
stromatoporoid		34	12	45	13	
storm lens	strong		24		3	
receptaculitid		76	41	11	1	
receptaculitid		76	38	8	1	
gastropod		29	26			6
Manipora		23	30	6	1.5	
Catenipora		67	45	7	3	
D5	Comments	x	y	W	H	D
receptaculitid		35	18	11	1.5	
receptaculitid		62	22	8	1	
storm lens	strong		25		5	
storm lens	weak		9		5	
D6	Comments	x	y	W	H	D
receptaculitid		12	24	12.5	1.5	
receptaculitid		88	4	12	1	
D7	Comments	x	y	W	H	D
Protrochiscolithus	mound shaped	3	12	12	5	
receptaculitid		70	27	11	1	
storm lens	weak		19		3	
Favistina		24	2	9	2.5	
stromatoporoid		49	19	21	6.5	
D8	Comments	x	y	W	H	D
storm lens	strong		15		5	
receptaculitid		91	39	22	1	
receptaculitid		63	21	19.5	2	
horn coral	highly abraded	17	34			3
gastropod	*Hormotoma*; apex points north	26	34	9		4
cephalopod		5	44			5
gastropod	batwing	19	30			3
stromatoporoid	weak	18	45	25	7	
stromatoporoid		42	40	12	3	
Favistina		78	44	19	6	
Crenulites		90	42	6	2	
D9	Comments	x	y	W	H	D
storm lens	strong		20		4	
gastropod	encrusted by *Protrochiscolithus*	34	21			6
Protrochiscolithus	encrusting gastropod	38	22	4	2	
D10	Comments	x	y	W	H	D
storm lens			24		5	
receptaculitid		85	39	10	1.5	
receptaculitid		37	25	8	0.5	
receptaculitid		66	17	10	1	
receptaculitid		65	16	10	1	
Crenulites	encrusted by *Protrochiscolithus*	6	4	6	0.5	
Protrochiscolithus	encrusting *Crenulites*; borings	6	5	7	1	

storm lens	weak		7		4	
gastropod	*Trochonema*	91	10			2
D11	Comments	x	y	W	H	D
storm lens	strong; sharp basal contact		26		4	
receptaculitid		10	2	9	1	
receptaculitid		33	14	13	2.5	
Favistina		74	42	14	2	
horn coral	highly recrystallized	19	29			2
D12	Comments	x	y	W	H	D
gastropod		60	20			2
receptaculitid		7	26	7	1	
D13	Comments	x	y	W	H	D
receptaculitid		89	33	17	1	
Calapoecia	partially burrowed	6	31	15	5	
cephalopod	*Endoceras*; top of bed; apex points 350 degrees	21		26		6
gastropod		22	15			4.5
D14	Comments	x	y	W	H	D
Favistina		16	24	12	3.5	
gastropod		69	18	6	1.5	
D15	Comments	x	y	W	H	D
Protrochiscolithus		94	48	12.5	2	
receptaculitid		76	21	20	2	
receptaculitid		79	5	30	4	
storm lens	weak		10		3	
receptaculitid		38	10	12.5	1	
storm lens	weak		16		4	
D16	Comments	x	y	W	H	D
storm lens	strong		10		5	
storm lens	weak		23		3	
Palaeophyllum		19	40	6	8	1
horn coral	dissolved	12	21			2
receptaculitid		87	45	11.5	1	
receptaculitid		89	39	7	0.5	
receptaculitid		20	3	6	1	
cephalopod		35	22			1.5
cephalopod		62	25			3.5
cephalopod		78	48			5
cephalopod		86	11			1.5
stromatoporoid	encrusted by *Calapoecia*	45	48	17	4.5	
Calapoecia	encrusting stromatoporoid	48	51	5	2.5	
D17	Comments	x	y	W	H	D
Calapoecia		81	32	5	1	
Calapoecia		78	8	2.5	1.5	
gastropod	*Maclurina*	46	2			9.5
receptaculitid		57	21	7	1	
D18	Comments	x	y	W	H	D
storm lens	weak		15		3	
storm lens	weak		45		2	
receptaculitid		41	19	5	1	
receptaculitid		86	7	16	2	

receptaculitid		89	44	8	1	
D19	Comments	x	y	W	H	D
receptaculitid		93	38	10	1.5	
receptaculitid		59	38	24.5	2	
storm lens	weak		17		4	
Calapoecia		8	19	3.5	2	
Protrochiscolithus		82	10	5.5	1.5	
D20	Comments	x	y	W	H	D
horn coral	epitheca gone; cardinal septum 45 degrees down from south	27	43			1.5
horn coral	highly abraded	65	7			3
receptaculitid		49	48	18	1	
D21	Comments	x	y	W	H	D
D22	Comments	x	y	W	H	D
receptaculitid		74	41	11	1.5	
receptaculitid		24	17	8	1	
Favistina		61	40	7	2	
receptaculitid		9	23	13	1	
D23	Comments	x	y	W	H	D
receptaculitid		93	27	13	1	
D24	Comments	x	y	W	H	D
receptaculitid		7	17	13	2	
receptaculitid		100	26	16.5	2	
storm lens	weak		7		3	
D25	Comments	x	y	W	H	D
receptaculitid		3	20	10	1	
receptaculitid		30	21	15	1	
receptaculitid		77	14	22	2	
receptaculitid		76	5	11	1.5	
receptaculitid		77	3	8	1.5	
storm lens	moderate		10		3	
cephalopod	*Endoceras*	41	4			7
cephalopod		79	41			3.5
Protrochiscolithus		37	18	6.5	1	
cephalopod		89	2			3.5
horn coral	epitheca abraded	92	32			1
D26	Comments	x	y	W	H	D
storm lens	strong		9		3	
Favistina		30	29	10	2.5	
stromatoporoid	domical; burrowed	74	37	38	10	
stromatoporoid	domical	74	4	28	7	
gastropod		93	28			3
D27	Comments	x	y	W	H	D
storm lens	strong		19		7	
Crenulites	partially dissolved to south	2	28	19	6	
cephalopod		12	2	18		5
receptaculitid		100	45	23	2	
receptaculitid		39	12	11	1	
D28	Comments	x	y	W	H	D
storm lens	strong		19		6	

Catenipora		10	52	12	4	
storm lens	weak		8		4	
stromatoporoid		60	8	39	13	
cephalopod		50	20			2
D29	Comments	x	y	W	H	D
storm lens	strong		19		5	
receptaculitid		24	11	25	2	
stromatoporoid		85	44	43	12	
horn coral	highly abraded	61	21			2
Protrochiscolithus	overturned	87	12	4	1	
D30	Comments	x	y	W	H	D
storm lens	moderate		16		5	
storm lens	moderate		33		5	
receptaculitid		6	44	13.5	1	
receptaculitid		33	44	16	2	
receptaculitid		40	20	8	1	
stromatoporoid		84	23	28	10	
D31	Comments	x	y	W	H	D
storm lens	strong		16		6	
receptaculitid	overturned	4	14	13	1	
horn coral	highly abraded	67	13			3.5
gastropod		27	13			4.5
D32	Comments	x	y	W	H	D
Crenulites		42	8	23	10	
Crenulites	domical	90	30	25	7	
horn coral	highly abraded	6	10			4
D33	Comments	x	y	W	H	D
cephalopod	*Lambeoceras*	18	2			12
bryozoan	mound	3	25	3.5	5	
receptaculitid		82	36	12	1	
horn coral	well preserved	60	16			3.5
D34	Comments	x	y	W	H	D
storm lens	weak		7		4	
storm lens	weak		23		5	
receptaculitid		75	43	12	1	
D35	Comments	x	y	W	H	D
receptaculitid		48	40	12	1.5	
receptaculitid		51	6	12	1	
receptaculitid	good shielding	65	31	15	1	
receptaculitid		93	41	20	1.5	
E1	Comments	x	y	W	H	D
storm lens	strong		52		5	
Crenulites		12	52	16	2.5	
horn coral	highly abraded	7	31			2.5
horn coral	highly abraded; cardinal septum 40 degrees down from north	71	29			2.5
horn coral	highly abraded	39	53			1
receptaculitid		59	64	17	2	
gastropod		85	80	5.5		4
E2	Comments	x	y	W	H	D
storm lens	strong		50		4	

gastropod		1	75			2
stromatoporoid		97	20	20	7	
Protrochiscolithus		93	58	11	4	
E3	Comments	x	y	W	H	D
storm lens	strong		86		4	
Crenulites		34	26	17	3.5	
receptaculitid		85	83	11	1	
receptaculitid		45	19	8	1	
receptaculitid		60	28	9.5	1	
receptaculitid		95	9	17	1.5	
E4	Comments	x	y	W	H	D
receptaculitid		17	83	13.5	2	
receptaculitid		67	75	9	1	
receptaculitid		47	35	9	1	
receptaculitid		1	9	16	1	
Protrochiscolithus	mound shaped; overturned	33	83	12	4	
gastropod		76	93			6.5
cephalopod		74	82			1.5
E5	Comments	x	y	W	H	D
horn coral	highly abraded	20	50			2
horn coral	highly abraded	18	6			1
receptaculitid		26	65	9	1	
receptaculitid		2	25	7	1	
receptaculitid		43	22	9.5	1	
receptaculitid		81	17	23	2	
Crenulites	overturned	93	57	4.5	2.5	
E6	Comments	x	y	W	H	D
storm lens	strong		60		7	
horn coral	highly abraded	34	68			2.5
horn coral	well preserved; cardinal septum 45 degrees down from south	70	14			3.5
receptaculitid		80	15	10.5	1.5	
receptaculitid		50	9	14	1	
receptaculitid		8	15	10.5	1	
receptaculitid		43	62	11	1.5	
Protrochiscolithus	overturned; encrusting cephalopod	3	57	9	1.5	
cephalopod	encrusting by *Protrochiscolithus*	5	59			4
gastropod	*Maclurina*	54	40			4.5
Calapoecia	tilted on side	10	65	2.5	2.5	
Crenulites		87	81	13	3	
E7	Comments	x	y	W	H	D
storm lens	weak		23		5	
Crenulites		54	17	13	3.5	
receptaculitid		86	15	7.5	1	
horn coral	highly abraded	39	28			1
E8	Comments	x	y	W	H	D
receptaculitid		28	77	20	2	
receptaculitid		95	86	15	2	
horn coral	weakly abraded; cardinal septum 40 degrees from south	28	14			2.5
storm lens	weak		35		6	
E9	Comments	x	y	W	H	D

storm lens	strong		36		5	
stromatoporoid		6	35	18	4.5	
horn coral	highly abraded	43	40			3.5
gastropod	*Maclurina*	68	17			6
bryozoan		41	5	2	0.5	
E10	Comments	x	y	W	H	D
storm lens	strong		35		5	
receptaculitid		90	68	22	1.5	
receptaculitid		1	20	7	0.5	
horn coral	weakly abraded	59	75			5.5
horn coral	highly abraded	62	79			2.5
horn coral	highly abraded; cardinal septum 75 degrees down from north	72	22			3
E11	Comments	x	y	W	H	D
storm lens	strong		34		6	
storm lens	strong		64		8	
receptaculitid		8	77	7	1.5	
receptaculitid		61	86	16	1.5	
receptaculitid		63	7	14.5	1	
receptaculitid		100	23	15	1	
Protrochiscolithus	fragment	54	63	6	1	
E12	Comments	x	y	W	H	D
storm lens	weak		64		5	
storm lens	strong		34		5	
receptaculitid		92	83	12	1	
receptaculitid		4	23	18	1	
receptaculitid		25	13	22	1	
horn coral	weakly abraded; filled with sediment; cardinal septum 30 degrees down from south	21	71			4.5
Crenulites		95	62	7	1.5	
stromatoporoid	overturned	20	30	24	5	
stromatoporoid	killed by storm lens	30	33	39	3	
gastropod		11	27			3
gastropod		6	68			1.5
gastropod		52	28			3
E13	Comments	x	y	W	H	D
storm lens	strong		33		5	
storm lens	moderate		74		5	
horn coral	highly abraded		74	10		4
horn coral		33	87			1.5
horn coral		24	80	1.5		1.5
stromatoporoid		80	34	41	9	
E14	Comments	x	y	W	H	D
storm lens	strong		35		5	
storm lens			80		3	
storm lens			85		4	
receptaculitid	good shielding	50	87	22	3	
receptaculitid		62	70	6	1	
receptaculitid		86	31	8.5	1	
receptaculitid		52	36	9	1	
receptaculitid		25	23	7	1	
stromatoporoid		45	65	27	5	

cephalopod		61	85			4
gastropod		70	86			5
gastropod		67	80			3
gastropod		91	82			3
horn coral	recrystallized	15	7			1
horn coral	highly abraded; cardinal septum points straight down	59	40			1
E15	Comments	x	y	W	H	D
storm lens	strong		66		5	
storm lens	strong		77		5	
horn coral	moderately abraded; cardinal septum straight down	4	84			1
horn coral	highly abraded	46	87			1.5
horn coral	highly abraded	59	79			3
horn coral	moderately abraded	82	82			2.5
horn coral		56	78			2
Crenulites		59	39	18	5	
receptaculitid		41	12	17	1.5	
receptaculitid		90	35	11.5	1	
receptaculitid	good shielding	43	35	12.5	1	
receptaculitid		17	36	12	1	
gastropod		11	79			4.5
cephalopod		15	79	5		2
gastropod		40	19			7
gastropod		75	51	3		2
E16	Comments	x	y	W	H	D
storm lens	strong		64		6	
receptaculitid		13	80	19	1	
receptaculitid		24	35	15	1	
receptaculitid		8	66	10	1	
receptaculitid	good shielding	9	64	10	1	
cephalopod	*Lambeoceras*	81	87			12
Crenulites		50	35	23	5	
Favistina	overturned; encrusted on bottom by *Protrochiscolithus*	68	83	8	1	
Protrochiscolithus		66	82	4.5	0.5	
E17	Comments	x	y	W	H	D
storm lens	strong		65		6	
storm lens	strong		35		3	
receptaculitid	good shielding	44	85	21	2	
receptaculitid		32	68	11.5	1.5	
receptaculitid		19	67	10.5	1	
receptaculitid	good shielding	30	32	11	1	
horn coral	highly abraded	80	32			2
horn coral	moderately abraded	52	48			1.5
bryozoan	branching	57	47	2		1
E18	Comments	x	y	W	H	D
receptaculitid		65	36	18	1.5	
gastropod		68	85			4
horn coral	highly abraded	0	8	1		1
horn coral		20	18			1
Protrochiscolithus		88	57	5.5	1	
E19	Comments	x	y	W	H	D

storm lens	weak		37		5	
receptaculitid		2	3	8	1.5	
horn coral	highly abraded	60	16			1.5
E20	Comments	x	y	W	H	D
receptaculitid		58	67	17	1	
receptaculitid		68	52	7	1	
Manipora		26	62	26	5	
cephalopod	apex points south	68	30	14		2.5
horn coral	highly abraded; cardinal septum 50 degrees down from north	60	28			2.5
horn coral	highly abraded	57	26			1
horn coral	highly abraded	34	23			1.5
horn coral	highly abraded	80	14			3
horn coral	highly recrystallized	21	26			1
E21	Comments	x	y	W	H	D
stromatoporoid	domical	36	5	44	9	
receptaculitid	good shielding	44	93	10	1.5	
receptaculitid		37	75	6	1.5	
cephalopod	*Armenoceras*	84	88			6
cephalopod	apex points south	92	60	6		3
gastropod		42	53			4.5
gastropod	*Maclurina*	83	25			4
Protrochiscolithus		72	53	7	1	
horn coral	highly abraded	45	47			2
horn coral	epitheca abraded	80	45			1.5
E22	Comments	x	y	W	H	D
receptaculitid	good shielding	24	90	14	2	
receptaculitid		56	70	12	1.5	
receptaculitid	good shielding	54	7	15	1	
storm lens	strong		28		5	
Protrochiscolithus		74	47	7	2	
Protrochiscolithus		95	59	2.5	1.5	
cephalopod	apex points north	40	39	7		2.5
gastropod	*Maclurina*	57	46			5.5
cephalopod		30	88			2
horn coral	highly abraded	95	87			2.5
E23	Comments	x	y	W	H	D
cephalopod		18	42	12.5		3
receptaculitid	good shielding	29	19	11	1	
horn coral	highly abraded	74	19			2
horn coral	moderately abraded; cardinal septum 45 degrees down from south	100	28			3
horn coral		24	21	1		1
horn coral		13	22	2		1.5
storm lens	strong		19		4	
storm lens	strong		44		5	
Calapoecia		16	21	3.5	2	
E24	Comments	x	y	W	H	D
storm lens	very strong		19		4	
storm lens	very strong		40		5	
receptaculitid		76	83	29	1.5	
receptaculitid	good shielding	90	58	18	1.5	

Protrochiscolithus		63	43	6	1	
Protrochiscolithus		46	43	9	2	
stromatoporoid		24	25	15	2	
horn coral	epitheca abraded; cardinal septum 45 degrees up from south	18	29			2.5
horn coral	moderately abraded; cardinal septum due south	21	28			1
cephalopod		90	11			3
horn coral	highly recrystallized	88	57			1
horn coral	highly recrystallized	94	18			1
horn coral	highly recrystallized	67	6			1
gastropod		42	15			2
E25	Comments	x	y	W	H	D
storm lens	strong		20		5	
receptaculitid	good shielding	55	64	20	2	
Protrochiscolithus		34	43	4.5	0.5	
gastropod		77	32			2
horn coral	epitheca gone; cardinal septum 70 degrees up from south	8	16			1.5
cephalopod	*Lambeoceras*	15	19			7
E26	Comments	x	y	W	H	D
storm lens	strong		19		4	
storm lens	moderate		30		8	
receptaculitid		29	20	9.5	1	
receptaculitid		80	36	11	1	
receptaculitid		80	28	20	1	
gastropod	*Maclurina*	9	53			7
cephalopod	*Lambeoceras*	92	66			5
horn coral	highly abraded	80	28			2.5
horn coral	cardinal septum straight down	92	12			2.5
horn coral	life position	100	5	2.5		1.5
horn coral	highly abraded	84	3			1.5
gastropod		77	32			2
Protrochiscolithus		68	32	3.5	1	
E27	Comments	x	y	W	H	D
storm lens	moderate		33		4	
storm lens	strong		68		5	
gastropod		25	43			1.5
horn coral	highly abraded	4	14			3
horn coral	highly abraded	7	12	1.5		1.5
horn coral	epitheca abraded	18	14			1
horn coral	moderately abraded; cardinal septum straight down	68	35			1.5
horn coral	highly abraded	75	28			1.5
horn coral	highly abraded	77	88			1.5
horn coral	highly abraded	82	84			1
horn coral	highly abraded	83	84			1
horn coral	highly abraded	84	85			1
horn coral	highly abraded	84	83			1
horn coral	epitheca abraded; cardinal septum 45 degrees up from north	82	70			1
receptaculitid		27	14	9	1	
E28	Comments	x	y	W	H	D
storm lens	strong		44		5	
receptaculitid		86	47	18	1.5	

gastropod	*Maclurina*	9	32			4.5
gastropod		41	85			4
gastropod		62	16			2
horn coral	cardinal septum 50 degrees down from south	41	25			1
horn coral	highly abraded; cardinal septum 50 degrees down from north	47	24			1
cephalopod	encrusted by *Protrochiscolithus*	31	41			4.5
Protrochiscolithus	encrusting cephalopod; domical	31	44	7.5	4	
E29	Comments	x	y	W	H	D
Crenulites		28	21	28	7	
stromatoporoid		59	51	29	4	
stromatoporoid		88	60	7	2	
receptaculitid		90	7	8	1	
horn coral	highly abraded	83	17			4.5
horn coral		41	3	6		4
Catenipora		86	51	7		2.5
E30	Comments	x	y	W	H	D
Saffordophyllum		15	60	36	5.5	
receptaculitid		43	27	18	1.5	
receptaculitid		57	68	14	1	
cephalopod		57	28			4
horn coral	highly abraded	62	71			1.5
E31	Comments	x	y	W	H	D
storm lens	strong		32		6	
receptaculitid		7	28	7	1	
receptaculitid		52	88	12	1.5	
receptaculitid		91	39	7	1	
Favistina	overturned	85	22	10	3.5	
gastropod		18	30			4
gastropod		25	27			1.5
E32	Comments	x	y	W	H	D
storm lens	strong		25		11	
receptaculitid		94	81	19.5	1.5	
receptaculitid		67	63	13	1.5	
cephalopod		72	19			3
horn coral	highly abraded	6	35			1.5
E33	Comments	x	y	W	H	D
storm lens	strong		19		3	
storm lens	strong		27		6	
stromatoporoid		97	78	14.5	7	
Favistina	tilted; growing towards south	97	30	24	3	
horn coral	epitheca abraded; cardinal septum 45 degrees down from south	4	23			1.5
horn coral	highly abraded	11	30			1.5
horn coral	cardinal septum due south	86	19			1.5
horn coral	apex points south	80	37	6		4
horn coral	highly abraded	59	52			2
E34	Comments	x	y	W	H	D
storm lens	strong		14		7	
storm lens	strong		39		4	
cephalopod	*Endoceras*	9	19			11
cephalopod		39	78	8		4

receptaculitid		53	82	12	2	
receptaculitid		59	60	10.5	1	
horn coral	highly abraded	31	19			1.5
horn coral	highly abraded; apex points north	31	17	2		1.5
bryozoan		35	16			1.5
bryozoan		62	6			1.5
E35	Comments	x	y	W	H	D
storm lens	strong		37		4	
storm lens	strong		46		5	
receptaculitid	good shielding	26	71	18	2	
receptaculitid	good shielding	94	82	21	2	
gastropod		5	18			3
Crenulites	tabular	34	21	50	6	
gastropod		99	25			3
gastropod		31	60			3.5
horn coral	highly abraded	27	11			2
cephalopod		72	21			8.5
E36	Comments	x	y	W	H	D
receptaculitid	good shielding	15	81	17	2	
receptaculitid		80	18	14.5	1	
storm lens	strong		30		5	
storm lens	strong		48		4	
gastropod		55	77			3.5
Protrochiscolithus		83	53	6.5	1	
Favistina		51	28	12	3	
horn coral	highly abraded	25	12			1.5
bryozoan		17	18			1
F1	Comments	x	y	W	H	D
receptaculitid		35	13	14	1	
receptaculitid		37	37	14	1	
F2	Comments	x	y	W	H	D
receptaculitid		35	33	12	1	
receptaculitid		10	12	9	1	
stromatoporoid	burrowed and bored	74	27	23	12	
Favistina	partially dissolved in centre; filled with sediment	91	21	16	3.5	
F3	Comments	x	y	W	H	D
storm lens	strong		23		4	
receptaculitid		8	27	5.5	0.5	
stromatoporoid		85	6	20	9.5	
F4	Comments	x	y	W	H	D
storm lens	strong		27		4	
horn coral	epitheca abraded	14	15			1
horn coral	apex points north	62	39	2		1.5
F5	Comments	x	y	W	H	D
Crenulites		15	24	38	5.5	
gastropod		60	27			4
horn coral	highly abraded	94	40			3
horn coral	epitheca abraded; cardinal septum 45 up from south	93	40			1.5
storm lens			27		5	
F6	Comments	x	y	W	H	D

storm lens	strong		27		7	
receptaculitid		56	17	7	1	
F7	Comments	x	y	W	H	D
horn coral	highly abraded	60	37			3
horn coral	highly abraded	65	36			1.5
horn coral	highly abraded; cardinal septum 45 degrees down from south	71	36			2
horn coral	highly abraded	86	36			1.5
horn coral	highly abraded	84	44			1
receptaculitid		83	13	11	1	
F8	Comments	x	y	W	H	D
receptaculitid		2	18	4.5	1	
receptaculitid		25	13	14	1	
storm lens	weak		28		3	
F9	Comments	x	y	W	H	D
storm lens	strong		27		4	
storm lens	weak		37		4	
horn coral	weakly abraded; cardinal septum 45 degrees up from north	77	59			2
horn coral	weakly abraded; cardinal septum 10 degrees down from south	26	35			2
gastropod	*Maclurina*	53	36			11
F10	Comments	x	y	W	H	D
storm lens	strong		30		5	
storm lens	strong		39		4	
cephalopod		74	40	6		3
receptaculitid		90	22	13	1	
trilobite	fragment	27	23	3		
receptaculitid		2	58	8.5	0.5	
horn coral	highly abraded	62	42			1
F11	Comments	x	y	W	H	D
storm lens	strong		31		6	
gastropod		95	23			3.5
Crenulites		90	27	5.5	2	
F12	Comments	x	y	W	H	D
storm lens	strong		33		5	
horn coral	moderately abraded; apex pointing north	2	24	6		3
horn coral	epitheca abraded	61	63			1
horn coral	highly abraded	63	63			2
gastropod	*Hormotoma*	77	46			4.5
F13	Comments	x	y	W	H	D
storm lens	strong		30		5	
horn coral	epitheca abraded; cardinal septum straight down	17	35			1.5
horn coral	epitheca abraded; cardinal septum 80 degrees down from south	55	36			1
horn coral	highly abraded; cardinal septum 45 degrees down from south	64	57			2.5
Favistina		48	30	7	3	
gastropod		27	33			2.5
Protrochiscolithus		13	23	4	1.5	
Protrochiscolithus		33	34	10	3.5	
brachiopod		19	34			3
F14	Comments	x	y	W	H	D
Protrochiscolithus		71	46	12	1.5	
horn coral	epitheca	51	25			1.5

horn coral	life position	18	55	4		3
F15	Comments	x	y	W	H	D
storm lens	strong		26		4	
horn coral	epitheca abraded; cardinal septum 30 degrees up from south	23	30			1
horn coral	highly abraded	86	27			3
F16	Comments	x	y	W	H	D
storm lens	strong; sharp base		22		5	
receptaculitid		39	49	9	1	
Protrochiscolithus	overturned	61	10	4.5	1.5	
F17	Comments	x	y	W	H	D
storm lens	strong		24		5	
Favistina		56	34	8.5	4.5	
gastropod		17	11		2.5	
stromatoporoid	tabular	95	30	8	1.5	
F18	Comments	x	y	W	H	D
storm lens	strong		27		6	
stromatoporoid		47	45	39	7.5	
stromatoporoid		83	40	37	10	
Favistina		7	45	9.5	2.5	
receptaculitid		12	29	7	1.5	
cephalopod	ventral siphuncle	30	31			8
F19	Comments	x	y	W	H	D
Protrochiscolithus		1	36	11	3	
receptaculitid	good shielding	18	36	16	1	
receptaculitid		67	35	8	1	
receptaculitid		92	42	8	1	
horn coral	epitheca abraded	30	30			1
horn coral	epitheca abraded	31	30			1.5
horn coral	cardinal septum 45 degrees down from south	49	30			2
horn coral	highly abraded; cardinal septum straight down	47	9			3
Crenulites		46	20	8	1.5	
horn coral	highly abraded	54	30			3.5
storm lens	strong		29		5	
gastropod	*Maclurina*	60	18			4
F20	Comments	x	y	W	H	D
cephalopod		63	15			7
receptaculitid		85	54	10	1	
horn coral	highly abraded	61	14			1
F21	Comments	x	y	W	H	D
receptaculitid		23	52	20	2	
receptaculitid		70	39	15	1	
horn coral	highly abraded	53	39			2
gastropod		10	38			3.5
gastropod		10	21			2.5
F22	Comments	x	y	W	H	D
storm lens	strong		26		4	
storm lens	very strong		42		6	
horn coral	moderately abraded	72	44			2
horn coral	highly abraded	83	45			2.5
horn coral	highly abraded	100	45			1.5

gastropod	encrusted by *Protrochiscolithus*; overturned	20	9			5
Protrochiscolithus	encrusting gastropod; encrusted by *Calapoecia*; overturned	20	8	6	1	
Calapoecia	encrusting *Protrochiscolithus*; encrusted by *Catenipora*; overturned	22	7	6	1.5	
Catenipora	encrusting *Calapoecia*; overturned	24	6	8	3.5	
Crenulites		78	22	16.5	2	
F23	Comments	x	y	W	H	D
storm lens	strong		48		6	
cephalopod	apex points south	31	24	12		3.5
gastropod		14	61			4
gastropod		100	48			3.5
storm lens	weak		30		4	
horn coral	highly abraded	99	40			1.5
stromatoporoid		68	48	47	12	
receptaculitid		74	41	9	1	
F24	Comments	x	y	W	H	D
storm lens	weak		46		5	
stromatoporoid		47	28	18	3	
F25	Comments	x	y	W	H	D
storm lens	strong		29		4	
receptaculitid		31	10	15	1	
horn coral	epitheca abraded	93	56			2
horn coral	highly abraded	54	10			1
horn coral	highly abraded	56	11			1
F26	Comments	x	y	W	H	D
receptaculitid		38	35	13	1	
horn coral	highly abraded	46	32			1
storm lens	weak		23		7	
horn coral	highly abraded	62	23			1
F27	Comments	x	y	W	H	D
storm lens	strong		28		4	
storm lens	strong		46		5	
gastropod		19	51			3.5
horn coral	moderately abraded	36	50			3.5
horn coral	highly abraded	71	32			1.5
horn coral	highly abraded	85	32			2.5
horn coral	highly abraded	68	10			1
F28	Comments	x	y	W	H	D
receptaculitid		11	57	7	1	
receptaculitid	good shielding	41	36	23	2	
receptaculitid	good shielding	34	12	22	1.5	
receptaculitid		66	42	18	1.5	
gastropod		52	11			2.5
F29	Comments	x	y	W	H	D
F30	Comments	x	y	W	H	D
storm lens	strong		32		4	
horn coral	highly abraded	48	45			3
horn coral	highly abraded	65	50			2.5
bryozoan		84	48			3
receptaculitid		100	55	7	1	
F31	Comments	x	y	W	H	D

receptaculitid		30	64	14	1	
receptaculitid		60	62	14	2	
storm lens	strong		33		4	
cephalopod		44	33			2.5
horn coral	highly abraded	6	50			1.5
horn coral	epitheca abraded; cardinal septum 45 degrees up from north	58	54			1
horn coral	highly abraded	60	54			1
storm lens	strong; lots of fragment		34		6	
horn coral	moderately abraded	66	34	2.5		2
horn coral	moderately abraded	49	36			1
storm lens	weak		20		5	
receptaculitid		97	5	17	1.5	
F33	Comments	x	y	W	H	D
storm lens	strong		29		6	
Favistina	tilted to south	7	29	12	2.5	
storm lens	weak		46		5	
F34	Comments	x	y	W	H	D
storm lens	strong		27		4	
cephalopod	encrusted by *Saffordophyllum*	14	37	20.5		
Saffordophyllum	wrapped around cephalopod shell; encrusted by *Protrochiscolithus*	14	40	18.5	5	
Protrochiscolithus	encrusting *Saffordophyllum*	9	42	5	1	
receptaculitid		60	50	11	1	
F35	Comments	x	y	W	H	D
storm lens	strong		24		6	
gastropod	*Hormotoma*	14	12	4		4
receptaculitid		47	46	45.5	1	
Crenulites	encrusted by *Protrochiscolithus*; dissolved in middle	46	18	27	8	
Protrochiscolithus	encrusting *Crenulites*	46	20	6	3	
stromatoporoid		77	25	27	16	
Crenulites		28	8	18	1.5	

Appendix A-3: Original Fossil Data

Pit 2: East-West Wall

Note:
1. "Shielding" refers to the lack of mottling and/or bioturbation found underneath certain organisms
2. W = width at widest point in cm; H = height in cm; D = diameter in cm
3. x = horizontal distance from origin (0,0) in cm; y = vertical distance from base of section in cm

B1	Comments	x	y	W	H	D
receptaculitid		4	42	9	1	
receptaculitid		74	28	12	1	
gastropod		58	1			4
horn coral	highly abraded	66	5			2.5
B2	Comments	x	y	W	H	D
receptaculitid		24	31	12	1	
receptaculitid		10	6	18	1	
horn coral	highly abraded	70	9			2
stromatoporoid		55	8	11	1.5	
gastropod	*Maclurina*	70	47			15.5
gastropod	*Maclurina*	61	10			10
B3	Comments	x	y	W	H	D
receptaculitid		32	28	8	1	
horn coral	weakly abraded	75	1			2
Protrochiscolithus		80	42	13	3	
B4	Comments	x	y	W	H	D
receptaculitid		27	51	15	1.5	
cephalopod		35	37			5
cephalopod		6	34			3
horn coral		50	6			3.5
gastropod	*Maclurina*	35	59			10
B5	Comments	x	y	W	H	D
storm lens	moderate		2		4	
receptaculitid		31	57	13	1	
gastropod		15	28			4.5
gastropod		24	23			3.5
horn coral	weakly abraded	72	14			2
horn coral	weakly abraded; cardinal septum 45 degrees down from east	75	15			2
horn coral	highly abraded	90	12			3
cephalopod		86	10			1.5
B6	Comments	x	y	W	H	D
storm lens	strong		2		5	
storm lens	strong		9		5	
receptaculitid		54	38	12	1	
receptaculitid		64	31	8	1	
stromatoporoid		51	34	9	5	
horn coral	highly abraded	6	12			3
horn coral	highly abraded	8	9			3.5
horn coral	highly abraded	22	11			3
horn coral	highly abraded	55	10			1.5

horn coral	highly abraded	59	11			4
B7	Comments	x	y	W	H	D
storm lens	strong		1		5	
stromatoporoid		36	18	12	4	
receptaculitid	encrusted by *Favistina*	64	26	20	1	
Favistina	encrusting on receptaculitid	65	27	3	1.5	
horn coral	moderately abraded	32	21			2
horn coral	highly abraded	35	20			1
Protrochiscolithus		86	14	8	1	
B8	Comments	x	y	W	H	D
stromatoporoid		50	9	28	9	
bryozoan		51	4	2	2	
Favistina	overturned; beneath stromatoporoid	57	5	9	3	
receptaculitid		47	25	25	2	
cephalopod		68	54			6
B9	Comments	x	y	W	H	D
storm lens	strong		11		4	
receptaculitid		5	41	10	1	
receptaculitid		74	31	15	2	
stromatoporoid		60	39	21	7	
horn coral	weakly abraded	39	27			4
stromatoporoid		43	19	14	3	
B10	Comments	x	y	W	H	D
receptaculitid		15	11	17	1.5	
receptaculitid		32	23	16	1.5	
receptaculitid		43	14	20	1.5	
receptaculitid		100	36	18	2	
horn coral	highly abraded	14	8			3
stromatoporoid		46	5	14	5	
B11	Comments	x	y	W	H	D
Protrochiscolithus		2	14	8	7	
receptaculitid		80	27	8	1	
receptaculitid		90	44	5.5	1	
B12	Comments	x	y	W	H	D
receptaculitid		10	37	18	1.5	
receptaculitid		37	9	8	1.5	
receptaculitid		50	2	18	1.5	
stromatoporoid		28	1	12	3	
stromatoporoid		64	39	7	3	
gastropod	*Maclurina*	50	47			18
cephalopod		55	53			7
horn coral	weakly abraded; cardinal septum 45 degrees up from east	60	44			1.5
receptaculitid		95	10	7	1.5	
B13	Comments	x	y	W	H	D
receptaculitid		38	52	13	1.5	
receptaculitid		95	52	17	1.5	
receptaculitid		88	31	19	1.5	
stromatoporoid		40	24	20	5	
Protrochiscolithus		49	12	9	4	
B14	Comments	x	y	W	H	D

stromatoporoid		5	29	33	9	
storm lens	moderate		22		5	
receptaculitid		43	33	20	1	
receptaculitid		50	37	12	1	
receptaculitid		30	24	21	1.5	
receptaculitid		75	39	12	1	
horn coral	highly abraded	75	47			2
horn coral	highly abraded	73	16			2.5
horn coral	highly abraded	88	15			2
B15	Comments	x	y	W	H	D
storm lens	moderate		6		9	
receptaculitid		19	52	9	1	
receptaculitid		20	39	18	1.5	
receptaculitid		42	23	15	1	
horn coral	highly abraded	18	50			4.5
B16	Comments	x	y	W	H	D
storm lens	weak		5		5	
receptaculitid		14	37	7	1	
receptaculitid		25	29	9	1.5	
receptaculitid		90	46	17	1.5	
B17	Comments	x	y	W	H	D
storm lens	weak		24		4	
receptaculitid		23	7	15	1	
receptaculitid		46	49	24	1.5	
gastropod		28	44			3
Protrochiscolithus		96	49	7	1	
B18	Comments	x	y	W	H	D
receptaculitid		56	11	13	1.5	
Protrochiscolithus		26	52	5	3	
horn coral	highly abraded	53	30			2
B19	Comments	x	y	W	H	D
receptaculitid		75	49	11	1.5	
receptaculitid		71	5	12	1.5	
B20	Comments	x	y	W	H	D
receptaculitid		66	39	25	1	
gastropod	*Maclurina*	80	37			11.5
gastropod		25	47			7
B21	Comments	x	y	W	H	D
receptaculitid		10	1	25	2	
stromatoporoid		61	39	22	5	
Protrochiscolithus		49	26	8.5	1	
gastropod		54	47			5
gastropod	*Maclurina*; horn coral inside	75	37			15
horn coral	inside gastropod; moderately abraded					1.5
B22	Comments	x	y	W	H	D
receptaculitid		0	6	14	1	
receptaculitid		77	39	30	1	
receptaculitid		89	54	18	1	
receptaculitid		80	30	12	1	
B23	Comments	x	y	W	H	D

receptaculitid		52	42	17	1	
gastropod		45	7			5
Protrochiscolithus		57	32	13	1	
stromatoporoid	tilted to west; encrusted by *Protrochiscolithus*	85	0	20	7	
Protrochiscolithus	encrusting stromatoporoid	90	3	4.5	1	
Crenulites		93	52	7	3	
B24	Comments	x	y	W	H	D
stromatoporoid		8	46	23	9	
cephalopod		29	24			2
B25	Comments	x	y	W	H	D
receptaculitid		27	59	8	2	
receptaculitid		90	50	11	1.5	
Favistina		82	39	8.5	1	
gastropod		5	46			4
B26	Comments	x	y	W	H	D
receptaculitid		23	46	14	2	
gastropod	*Maclurina*; horn coral inside	50	52			21
horn coral	inside gastropod; moderately abraded					1.5
receptaculitid		78	43	18	1	
gastropod		71	46			3
horn coral	highly abraded	42	19			2
horn coral	highly abraded	42	24			1
C1	Comments	x	y	W	H	D
storm lens	weak		5		3	
storm lens	moderate		15	40		
receptaculitid		4	33	14	1	
receptaculitid		82	36	8	1	
horn coral	weakly abraded	99	35			2
receptaculitid		7	1	10	1.5	
receptaculitid		23	15	20	2	
Crenulites	dissolved in middle	95	12	53	11	
gastropod		46	9			4
receptaculitid		40	8	9	1	3
C2	Comments	x	y	W	H	D
storm lens	strong		9		5	
storm lens	moderate		32		5	
receptaculitid		22	30	14	1	
horn coral	highly abraded	10	33			3
horn coral	highly abraded	91	49			2
Favistina		94	27	13	2	
receptaculitid		47	2	22	1.5	
Protrochiscolithus		12	4	7.5	1	
C3	Comments	x	y	W	H	D
brachiopod		9	4			3.5.
receptaculitid		47	31	14	1	
stromatoporoid	encrusted by *Protrochiscolithus*	26	42	11.5	3.5	
Protrochiscolithus	encrusting stromatoporoid	24	44	8	1	
Calapoecia	encrusted by *Protrochiscolithus*	37	47	3	1	
Protrochiscolithus	encrusting *Calapoecia*	27	48	4	1	
Favistina		54	44	15	4.5	

cephalopod		60	44			2.5
Manipora		93	44	19	9	
receptaculitid		20	37	11	1.5	
horn coral	highly abraded	34	5			1
C4	Comments	x	y	W	H	D
cephalopod		7	15			2.5
receptaculitid		23	37	10	1	
Crenulites		66	36	18	5	
gastropod		33	12			7.5
C5	Comments	x	y	W	H	D
receptaculitid		3	11	14	2	
storm lens	moderate		35		4	
gastropod		34	13			3
receptaculitid		30	22	13	1.5	
Favistina		47	24	18	4	
horn coral	highly abraded	10	12			1.5
brachiopod		5	10			3
C6	Comments	x	y	W	H	D
stromatoporoid		25	41	35	9	
C7	Comments	x	y	W	H	D
Crenulites		7	36	22	4.5	
receptaculitid		59	4	5.5	1	
C8	Comments	x	y	W	H	D
storm lens	strong		32		4	
cephalopod		62	24			5
cephalopod		70	24			3
cephalopod		65	23			3
receptaculitid		10	6	5.5	1.5	
C9	Comments	x	y	W	H	D
cephalopod		75	2			4
horn coral	moderately abraded	75	51			2
gastropod		79	1			4
C10	Comments	x	y	W	H	D
receptaculitid		53	12	7	1	
C11	Comments	x	y	W	H	D
receptaculitid		54	1	4.5	1.5	
receptaculitid		85	34	15	1.5	
stromatoporoid		85	30	7	3.5	
receptaculitid		82	5	10.5	1	
C12	Comments	x	y	W	H	D
stromatoporoid	tilted; encrusted by *Protrochiscolithus*	34	30	10	17	
Protrochiscolithus	encrusting stromatoporoid	45	30	9	1	
Catenipora		15	32	8	4	
horn coral	highly abraded	90	50			1.5
storm lens	strong		11		9	
C13	Comments	x	y	W	H	D
receptaculitid		56	1	9	1	
C14	Comments	x	y	W	H	D
receptaculitid		9	12	6	1	
cephalopod		14	33			7.5

bryozoan		34	32	2	2	
C15	Comments	x	y	W	H	D
receptaculitid		0	30	9	1	
Calapoecia		43	23	6	1	
C16	Comments	x	y	W	H	D
receptaculitid		10	24	9	1	
receptaculitid		80	29	12	1	
receptaculitid		100	31	15	1	
C17	Comments	x	y	W	H	D
Favistina		32	3	9	2	
receptaculitid		52	26	20	1.5	
Crenulites		12	33	11	5.5	
Crenulites		85	40	37	7	
C18	Comments	x	y	W	H	D
receptaculitid		35	10	21	2	
receptaculitid		0	31	20	1.5	
receptaculitid		13	34	6	1	
receptaculitid		45	32	9	1.5	
stromatoporoid		45	44	17	3	
stromatoporoid		37	38	44	4	
stromatoporoid		37	33	14	4	
cephalopod		21	32			2
cephalopod		95	36			3.5
horn coral	moderately abraded	39	45			1
receptaculitid		30	31	17	2	
receptaculitid		96	34	16	1	
horn coral	epitheca abraded; cardinal septum 45 degrees down from east	30	2			2
C19	Comments	x	y	W	H	D
storm lens	strong		6		8	
cephalopod		90	41			5
receptaculitid		85	16	11	1	
receptaculitid		37	16	13	1	
stromatoporoid	encrusted by *Favistina*	64	12	17	1	
Favistina	encrusting stromatoporoid	65	14	11	2.5	
C20	Comments	x	y	W	H	D
storm lens	strong		9		5	
horn coral	weakly abraded	5	12			2
Favistina		28	50	12	5.5	
cephalopod		95	35			8
receptaculitid		60	10	15.5	1	
Rhabdotetradium		84	9	8	3.5	
C21	Comments	x	y	W	H	D
receptaculitid		38	10	16	1	
receptaculitid		31	12	7	1	
stromatoporoid		10	23	13	5	
Favistina		51	22	9	2.5	
gastropod		90	35			3.5
Protrochiscolithus		61	2	8	1	
stromatoporoid		100	10	33	5	
C22	Comments	x	y	W	H	D

Protrochiscolithus		54	3	3.5	1	
Favistina		84	4	9	3.5	
gastropod		97	11			3
C23	Comments	x	y	W	H	D
storm lens	moderate		9		3	
C24	Comments	x	y	W	H	D
Protrochiscolithus		10	9	12	3.5	
horn coral	highly abraded	65	5			4
C25	Comments	x	y	W	H	D
horn coral	highly abraded	49	2			3
receptaculitid		40	30	19	1	
C26	Comments	x	y	W	H	D
receptaculitid		57	1	18	2	
storm lens	strong		6		14	
Crenulites	overturned; below storm lens	100	7	15	7	
horn coral	highly abraded	70	13			3
D1	Comments	x	y	W	H	D
storm lens	strong		41		5	
receptaculitid		13	32	11	1	
receptaculitid		75	20	6	1	
cephalopod		92	54			3
D2	Comments	x	y	W	H	D
storm lens	strong		42		3	
receptaculitid		97	24	8	1	
stromatoporoid		7	46	13.5	1.5	
Favistina	encrusted by *Favistina*	70	49	24	7	
Favistina	encrusting *Favistina*	62	47	4	2	
receptaculitid		86	66	9	1	
horn coral	highly abraded	7	67			3
Protrochiscolithus		12	74	7.5	1	
D3	Comments	x	y	W	H	D
receptaculitid		24	57	12.5	2	
receptaculitid		42	52	9	1	
receptaculitid		77	49	17	1.5	
storm lens	moderate		15		6	
brachiopod		9	74			3.5
horn coral	highly abraded	9	20			3
stromatoporoid		37	5	13.5	3	
stromatoporoid	good shielding	90	59	27	3.5	
Calapoecia		47	21	4	2.5	
gastropod	*Maclurina*	93	6			3.5
D4	Comments	x	y	W	H	D
horn coral	highly abraded	2	69			1.5
horn coral	highly abraded	4	20			1
brachiopod		48	44			2.5
Protrochiscolithus		61	31	11.5	1	
D5	Comments	x	y	W	H	D
receptaculitid		20	58	14	2	
receptaculitid		64	52	10	1	
receptaculitid		32	21	8	1	

brachiopod		2	38			3
D6	Comments	x	y	W	H	D
storm lens	weak		26		5	
receptaculitid		69	60	11.5	2	
receptaculitid		56	5	15	2	
D7	Comments	x	y	W	H	D
receptaculitid		65	54	16	1	
receptaculitid		57	18	11	1	
brachiopod		37	53			3
D8	Comments	x	y	W	H	D
receptaculitid		67	57	23	1.5	
receptaculitid		80	54	14	1.5	
receptaculitid		82	18	12.5	1	
receptaculitid		78	8	9.5	1	
horn coral	moderately abraded	44	17			1.5
stromatoporoid	good shielding	80	26	44	6	
D9	Comments	x	y	W	H	D
storm lens	moderate		5		5	
receptaculitid		65	20	11.5	1.5	
receptaculitid		38	18	10	1.5	
receptaculitid		75	63	7.5	2	
stromatoporoid	dissolved; encrusted by *Protrochiscolithus*	100	67	40	15	
Protrochiscolithus	encrusting stromatoporoid	83	72	6.5	1.5	
storm lens	strong		57		8	
D10	Comments	x	y	W	H	D
receptaculitid		26	69	13	1.5	
receptaculitid		76	60	11.5	2	
receptaculitid		29	62	9	1	
Calapoecia	overturned	20	63	5.5	4.5	
storm lens	strong		56		11	
cephalopod		28	25			3
storm lens	strong		4		4	
brachiopod		24	10			3.5
Protrochiscolithus	good shielding	51	10	7	3	
Protrochiscolithus		98	58	9	3	
Favistina		83	47	22	6	
D11	Comments	x	y	W	H	D
storm lens	strong		5		5	
receptaculitid		80	7	20	1.5	
horn coral	highly abraded	8	51			4
stromatoporoid		39	12	21	4	
Palaeophyllum	12 branches	35	24	9	6	
Favistina		70	42	9	4	
D12	Comments	x	y	W	H	D
Protrochiscolithus		1	49	11	2	
Favistina		5	12	19	6	
storm lens	strong		67		3	
Favistina		47	51	14	5	
gastropod		38	12			2.5
brachiopod		49	33			2.5

brachiopod		95	8			3
D13	Comments	x	y	W	H	D
Favistina		4	10	17	4	
storm lens	strong		10		4	
receptaculitid		24	3	14	1	
gastropod		31	34			5.5
gastropod	*Maclurina*	52	68			6
gastropod		56	59			4
cephalopod		61	2			4
horn coral	weakly abraded; cardinal septum 60 degrees up from east	80	69			3
Crenulites	overturned	92	60	26	9	
D14	Comments	x	y	W	H	D
storm lens	strong		49		11	
receptaculitid		14	61	11	1.5	
receptaculitid		26	60	14	1.5	
receptaculitid		29	68	10	1	
receptaculitid		38	63	20	1.5	
receptaculitid		54	60	11.5	1.5	
receptaculitid		92	70	15	1	
stromatoporoid		7	44	14	2	
stromatoporoid		54	57	35	5	
stromatoporoid		36	55	21	4.5	
storm lens	strong		8		4	
Protrochiscolithus		35	58	10	1.5	
Protrochiscolithus		51	10	5.5	1	
horn coral	weakly abraded; cardinal septum 20 down from east	11	56			2.5
horn coral	moderately abraded	33	70			3.5
horn coral	moderately abraded	39	70			2
horn coral	moderately abraded	47	70			2.5
horn coral	highly abraded	49	70			1.5
Crenulites		48	45	12	3	
D15	Comments	x	y	W	H	D
storm lens	moderate		60		4	
storm lens	moderate		8		3	
Protrochiscolithus		20	45	12	2	
receptaculitid		47	46	13	1	
receptaculitid		82	67	15.5	1	
Favistina		47	32	17	9	
D16	Comments	x	y	W	H	D
stromatoporoid		5	52	42	13	
cephalopod		25	43			2
Favistina		43	6	9	1.5	
receptaculitid		44	66	14	1	
cephalopod		68	35			2.5
receptaculitid		34	18	6.5	1	
horn coral	moderately abraded	73	9			4
brachiopod		85	25			4.5
cephalopod		90	11	6		3
D17	Comments	x	y	W	H	D
storm lens	strong		9		5	

receptaculitid		30	20	13	1	
receptaculitid		49	20	13	1	
horn coral	highly abraded	6	69			3
horn coral	moderately abraded	82	53			2
gastropod		84	20			6
gastropod		90	5			5
Protrochiscolithus		82	65	4	2	
D18	Comments	x	y	W	H	D
storm lens	strong		10		5	
storm lens	strong		26		32	
receptaculitid		95	58	10	1	
receptaculitid		68	62	16	1.5	
stromatoporoid		40	63	9	2.5	
Calapoecia		80	60	2.5	2.5	
D19	Comments	x	y	W	H	D
storm lens	strong		5		5	
storm lens	weak		26		5	
Protrochiscolithus		3	44	5	1.5	
gastropod	encrusted by *Protrochiscolithus*	97	40			7
Protrochiscolithus	encrusting gastropod	97	42	6	1	
Favistina		23	9	8.5	3	
receptaculitid		100	64	15	2	
stromatoporoid		87	53	26	7	
D20	Comments	x	y	W	H	D
storm lens	strong		9		6	
storm lens	strong		39		5	
horn coral	highly abraded	31	36			3
horn coral	highly abraded	3	15			4.5
horn coral	highly abraded	55	33			2
gastropod		25	13			3
gastropod		23	16			3.5
cephalopod		29	15			3
receptaculitid		52	58	11	1	
D21	Comments	x	y	W	H	D
storm lens	strong		23		8	
storm lens	moderate		54		3	
receptaculitid		18	55	14.5	1	
receptaculitid		100	5	16	1.5	
stromatoporoid		60	38	20	2	
cephalopod		96	33			3.5
horn coral	highly abraded	68	18			2
D22	Comments	x	y	W	H	D
storm lens	strong		27		5	
receptaculitid		8	66	13	1	
receptaculitid		88	9	12	1	
stromatoporoid	encrusted by *Protrochiscolithus*	8	34	22	7	
Protrochiscolithus		3	37	5.5	1	
horn coral	highly abraded	0	65			4
horn coral	highly abraded	6	65			2
horn coral	highly abraded	4	32			2

D23	Comments	x	y	W	H	D
receptaculitid	encrusted by *Protrochiscolithus*	10	17	6.5	1	
Protrochiscolithus	encrusting receptaculitid	11	17	6.5	1	
receptaculitid		25	40	13	1	
receptaculitid		49	64	16	1.5	
receptaculitid		83	10	13	1	
Favistina		78	38	19	4.5	
D24	Comments	x	y	W	H	D
Crenulites		43	69	9	3.5	
receptaculitid		50	57	6	1	
receptaculitid		96	24	13.5	2	
horn coral	highly abraded	65	75			4
horn coral	highly abraded	82	70			3.5
horn coral	highly abraded	97	57			3
D25	Comments	x	y	W	H	D
Calapoecia		30	63	6	4	
cephalopod		67	35	5		
cephalopod	siphuncle	85	52	50		3
D26	Comments	x	y	W	H	D
storm lens	strong		24		4	
stromatoporoid	encrusted by *Protrochiscolithus*	35	67	31	11	
Protrochiscolithus	encrusting stromatoporoid	34	70	14	1.5	
receptaculitid		82	40	18	1	
Favistina		18	54	13	4	
Crenulites		46	54	33	5	
gastropod		26	41	3.5		5
E1	Comments	x	y	W	H	D
storm lens			38		4	
receptaculitid		4	23	12	1	
horn coral	highly abraded	50	40			4
brachiopod		90	26			3
E2	Comments	x	y	W	H	D
storm lens	strong		46		4	
receptaculitid		46	31	17	1	
storm lens	moderate		32		4	
Protrochiscolithus		75	33	8	1	
Calapoecia		90	35	4.5	2.5	
Crenulites		56	36	9	2	
E3	Comments	x	y	W	H	D
storm lens	strong		46		6	
stromatoporoid		18	34	26	2	
receptaculitid		77	53	9	1	
receptaculitid		63	25	12	1	
gastropod		11	53			3
cephalopod		22	32			7.5
horn coral	epitheca abraded	47	52			1.5
horn coral	highly abraded	47	35			1
horn coral	highly abraded	100	55			5
E4	Comments	x	y	W	H	D
storm lens	strong		45		10	

Protrochiscolithus		11	59	8	1.5	
receptaculitid		98	60	9	1	
stromatoporoid		24	31	26	6	
stromatoporoid	encrusted by *Protrochiscolithus*	67	9	41	8	
Protrochiscolithus		45	11	12	1	
receptaculitid		33	31	8	1	
horn coral	highly abraded	40	52			3
horn coral	highly abraded	40	47			1
horn coral	well preserved; cardinal septum 45 degrees up from west	70	4			3
horn coral	highly abraded	10	27			2
brachiopod		6	72			3
brachiopod		14	28			3
cephalopod		46	57	16		6
E5	Comments	x	y	W	H	D
receptaculitid		65	57	20	1.5	
receptaculitid		67	52	10	1	
horn coral	moderately abraded	52	51			2
brachiopod		21	34			2
Calapoecia		26	34	2	1.5	
bryozoan		4	72	1	1	
Favistina		88	48	27	5.5	
E6	Comments	x	y	W	H	D
storm lens	strong		61		3	
Protrochiscolithus		44	52	10	1	
receptaculitid		90	30	15	1	
Favistina		46	11	7.5	2	
E7	Comments	x	y	W	H	D
storm lens	strong		64		4	
Favistina		86	74	3	0.5	
Protrochiscolithus		34	7	5.5	1	
horn coral	weakly abraded	88	75			1
horn coral	weakly abraded	90	23			1
horn coral	weakly abraded	95	23			1
E8	Comments	x	y	W	H	D
receptaculitid		10	66	16	1.5	
receptaculitid		82	28	15.5	1	
gastropod		70	26			3
Favistina		50	78	35	5	
Favistina		90	74	15	4	
E9	Comments	x	y	W	H	D
Favistina		66	56	22	7.5	
receptaculitid		59	80	14	1.5	
Protrochiscolithus	encrusted on east side by *Calapoecia*	28	57	12	5	
Calapoecia	encrusting *Protrochiscolithus*	19	57	3	2	
receptaculitid		55	47	12	1	
receptaculitid		54	41	11	1	
receptaculitid		85	3	13.5	1.5	
horn coral	moderately abraded	50	5			4.5
Crenulites	highly dissolved	25	44	10	3	
bryozoan		68	1	1	1	

E10	Comments	x	y	W	H	D
receptaculitid		21	33	8	1	
receptaculitid		74	15	14	1	
receptaculitid		64	14	8	1	
Calapoecia		29	9	2.5	2.5	
horn coral	highly abraded	98	26			2
E11	Comments	x	y	W	H	D
storm lens	moderate		45		5	
storm lens	moderate		61		4	
receptaculitid		95	64	13	1	
receptaculitid	encrusted by *Catenipora*	20	25	12	1	
Catenipora		23	29	16	6	
gastropod		13	50			4
gastropod		54	51			4.5
cephalopod		42	67			3
E12	Comments	x	y	W	H	D
storm lens	strong		28		9	
receptaculitid		12	64	14	1.5	
receptaculitid		73	61	11	1	
storm lens	moderate		61		3	
stromatoporoid	pinches out laterally	32	54	50	10	
stromatoporoid	mound; encrusting *Calapoecia* and *Protrochiscolithus*	32	64	12	6	
Calapoecia	encrusting stromatoporoid	28	59	3	1	
Protrochiscolithus	encrusting stromatoporoid	37	58	4	1	
Crenulites		41	40	13	3.5	
stromatoporoid		80	30	40	9	
horn coral	weakly abraded	62	31			1.5
E13	Comments	x	y	W	H	D
Favistina		41	58	55	6	
Crenulites		5	6	14	4.5	
Crenulites		86	36	12	4.5	
E14	Comments	x	y	W	H	D
storm lens	strong		44		6	
receptaculitid		52	18	7.5	1	
gastropod		60	48			2
E15	Comments	x	y	W	H	D
stromatoporoid		2	52	25	6	
receptaculitid		21	48	18	1	
cephalopod		72	42			7
E16	Comments	x	y	W	H	D
Crenulites		1	74	16	4	
receptaculitid		37	63	19	1	
receptaculitid		74	39	10.5	1	
horn coral	weakly abraded; cardinal septum 45 degrees down from east	27	48			2
horn coral	highly abraded	0	4			3
horn coral	highly abraded	5	2			2.5
horn coral	epitheca abraded; cardinal septum 75 degrees down from east	16	4			4
horn coral	highly abraded	60	1			3
Crenulites		94	5	51	6.5	
Crenulites		87	54	4	1.5	

stromatoporoid		98	18	21	8	
E17	Comments	x	y	W	H	D
stromatoporoid	good shielding	25	43	51	8	
Crenulites		14	18	9.5	5	
Protrochiscolithus	overturned	88	52	11	2	
storm lens	moderate		40		4	
E18	Comments	x	y	W	H	D
storm lens	moderate		38		5	
cephalopod		5	73			4.5
cephalopod	apex points west	90	32	21		5.5
receptaculitid		75	59	8	1	
receptaculitid		15	69	12	1	
horn coral	moderately abraded	5	19			1.5
E19	Comments	x	y	W	H	D
storm lens	strong		34		5	
stromatoporoid	tilted	30	25	16	5	
horn coral	highly abraded	82	49			3
horn coral	highly abraded	83	47			4
receptaculitid		97	39	13	2	
receptaculitid		99	14	15	1	
E20	Comments	x	y	W	H	D
storm lens	strong		18		7	
storm lens	strong		30		7	
horn coral	highly abraded	15	22			3
horn coral	highly abraded	13	22			2
horn coral	weakly abraded; cardinal septum 50 degrees down from west	34	18			2.5
receptaculitid		65	72	17	1.5	
E21	Comments	x	y	W	H	D
cephalopod		100	68			6
Protrochiscolithus		5	37	6	1	
E22	Comments	x	y	W	H	D
storm lens	moderate		30		5	
receptaculitid		53	28	13	1	
horn coral	moderately abraded	22	60			2
receptaculitid		40	35	10	1	
stromatoporoid		11	22	10	2	
E23	Comments	x	y	W	H	D
storm lens	moderate		30		3	
storm lens	moderate		50		5	
receptaculitid		52	19	13	1	
cephalopod	apex points east	94	52	13		4
E24	Comments	x	y	W	H	D
receptaculitid		4	23	14	1	
Crenulites		35	42	11	1.5	
stromatoporoid	good shielding	50	31	32	6	
E25	Comments	x	y	W	H	D
Favistina	overturned	37	50	15	3.5	
stromatoporoid	encrusted by *Calapoecia*	57	50	11	6	
Calapoecia	growing on stromatoporoid; in middle of storm	57	5	4	2	
E26	Comments	x	y	W	H	D

receptaculitid		8	57	14	1	
receptaculitid		47	69	16	2	
receptaculitid		80	61	19	1	
horn coral	epitheca abraded; cardinal septum 45 degrees up from west	33	26			1.5
Crenulites		65	57	57	8	
receptaculitid		90	40	20	1	
gastropod	*Hormotoma*	98	37	4.5		2.5
F1	Comments	x	y	W	H	D
Crenulites		0	21	25.5	4	
receptaculitid		45	21	11	1	
cephalopod		56	18			4
storm lens	moderate		30		6	
F2	Comments	x	y	W	H	D
storm lens	strong		27		6	
gastropod	encrusted by *Protrochiscolithus*	28	41			4
Protrochiscolithus	encrusting gastropod; encrusted by *Calapoecia*	31	41	4.5	2	
Calapoecia	encrusting *Protrochiscolithus*	32	41	5	2	
cephalopod		95	18			6
F3	Comments	x	y	W	H	D
storm lens	strong		30		8	
receptaculitid		42	46	21	1	
receptaculitid		76	49	19.5	1	
stromatoporoid		16	23	33	9	
Calapoecia		73	15	5	2.5	
cephalopod		84	16	15		2.5
F4	Comments	x	y	W	H	D
storm lens	strong		32		8	
receptaculitid		77	54	7	1	
F5	Comments	x	y	W	H	D
storm lens	strong		32		6	
F6	Comments	x	y	W	H	D
F7	Comments	x	y	W	H	D
storm lens	strong		30		6	
receptaculitid		16	13	10	1	
F8	Comments	x	y	W	H	D
receptaculitid		19	60	9	1	
receptaculitid		78	20	10	1	
stromatoporoid		28	19	41	3	
Calapoecia		100	30	6.5	3	
F9	Comments	x	y	W	H	D
storm lens	strong		26		5	
receptaculitid		20	47	8	1	
receptaculitid	same as above?	22	51	7	1	
F10	Comments	x	y	W	H	D
storm lens	strong		28		4	
F11	Comments	x	y	W	H	D
Crenulites		45	42	19	4.5	
storm lens	strong		30		6	
stromatoporoid	overturned	84	38	25	10	
gastropod		79	44			4

gastropod		88	46			4
F12	Comments	x	y	W	H	D
gastropod		66	50			2.5
gastropod		70	21			3.5
horn coral	highly abraded	59	49			3.5
F13	Comments	x	y	W	H	D
receptaculitid		34	12	16	1	
Crenulites		98	27	23	6	
receptaculitid		55	33	11.5	1	
gastropod		63	33			1.5
F14	Comments	x	y	W	H	D
Crenulites		20	50	22	5.5	
Crenulites		67	49	18	3	
horn coral	highly abraded	81	26			3.5
storm lens	mild		30		5	
receptaculitid		85	22	8	1	
gastropod	encrusted by *Protrochiscolithus*; tilted on side	95	14			4
Protrochiscolithus	encrusting gastropod	98	15	5	4.5	
F15	Comments	x	y	W	H	D
Protrochiscolithus		5	53	16	4	
cephalopod		40	1			5
F16	Comments	x	y	W	H	D
storm lens	strong		32		3	
receptaculitid		70	25	13	1	
F17	Comments	x	y	W	H	D
cephalopod		17	34			4
stromatoporoid		95	41	36	5	
F18	Comments	x	y	W	H	D
stromatoporoid		95	40	22	3.5	
gastropod		86	45			4
F19	Comments	x	y	W	H	D
horn coral	epitheca abraded	16	48			2.5
cephalopod		5	38			2
receptaculitid		12	58	9.5	1	
F20	Comments	x	y	W	H	D
horn coral	highly abraded	9	44			1.5
F21	Comments	x	y	W	H	D
storm lens	moderate		32		5	
stromatoporoid		23	43	15	5	
receptaculitid		60	42	11	1	
receptaculitid	same as above?	90	44	12.5	1	
F22	Comments	x	y	W	H	D
receptaculitid		67	53	15	1	
receptaculitid		53	45	12	1	
Protrochiscolithus		96	50	5.5	1	
receptaculitid		55	63	16	1.5	
receptaculitid		5	55	10.5	1	
F23	Comments	x	y	W	H	D
storm lens	strong		33		4	
storm lens	moderate		47		3	

gastropod		100	26			3.5
Protrochiscolithus		68	35	5	1.5	
F24	Comments	x	y	W	H	D
horn coral	highly abraded	5	20			3.5
receptaculitid		90	54	15	1.5	
F25	Comments	x	y	W	H	D
receptaculitid		9	52	11	1	
horn coral	highly abraded	42	6			4.5
gastropod		50	6			4.5
F26	Comments	x	y	W	H	D
receptaculitid		5	38	14	1	
Favistina		7	5	8	4	
Favistina		80	40	25.5	5.5	
gastropod		44	24			3.5
G1	Comments	x	y	W	H	D
receptaculitid		7	5	10	1	
receptaculitid		52	5	11	1.5	
receptaculitid		94	14	10	1	
storm lens	weak		29		5	
horn coral	highly abraded; apex points east	97	33	3.5		3
stylolite			12			
G2	Comments	x	y	W	H	D
gastropod		98	10			2
gastropod	*Maclurina*	100	44			9
G3	Comments	x	y	W	H	D
receptaculitid		26	14	9	1	
receptaculitid		41	31	12.5	1.5	
cephalopod	coiled; entire top surface encrusted by *Protrochiscolithus*; top of bed	22				6
Protrochiscolithus	encrusting cephalopod	22		6	1	
G4	Comments	x	y	W	H	D
receptaculitid		46	51	20	1.5	
storm lens	moderate		12		5	
G5	Comments	x	y	W	H	D
receptaculitid		41	46	18	1.5	
receptaculitid		71	46	9	1	
storm lens	moderate		12		6	
gastropod		30	15			2
horn coral	highly abraded	45	58			2
horn coral	highly abraded	50	57	3.5		2.5
horn coral	highly abraded	54	58	3		2.5
storm lens	moderate		55		6	
cephalopod	top of bed; apex points 225 degrees	47		7		3.5
G6	Comments	x	y	W	H	D
cephalopod		38	17			6.5
cephalopod		34	29			4.5
receptaculitid		86	35	8.5	1	
storm lens	weak		34		5	
gastropod	*Hormotoma*; lying on side; encrusted on bottom by *Calapoecia*	90	16	7		5
Calapoecia	encrusting *Hormotoma*	93	15	4	1	
gastropod		94	15			1.5

G7	Comments	x	y	W	H	D
storm lens	moderate		31		6	
receptaculitid		40	60	10.5	1.5	
gastropod		37	7			2
receptaculitid		99	24	11	0.5	
unknown		30	34			
G8	Comments	x	y	W	H	D
receptaculitid		7	5	9	1	
receptaculitid		15	14	17	1.5	
storm lens	moderate		33		6	
gastropod		57	5			2
cephalopod		8	46	3.5		1.5
horn coral	highly abraded	5	52	1		1
G9	Comments	x	y	W	H	D
storm lens	moderate		31		6	
stromatoporoid	encrusted by *Protrochiscolithus*	60	58	37	7	
Protrochiscolithus	encrusting	41	61	9	2	
gastropod	*Maclurina*	88	59			14
receptaculitid		50	3	9	1	
G10	Comments	x	y	W	H	D
receptaculitid		52	22	18	1	
receptaculitid		69	44	17.5	1.5	
receptaculitid		0	25	14.5	1	
Calapoecia		16	56	4	3	
gastropod		36	33			1.5
horn coral	epitheca abraded; cardinal 45 degrees down from west	44	24			1.5
storm lens	moderate		30		4	
gastropod		43	22			6
G11	Comments	x	y	W	H	D
receptaculitid		9	26	19	1.5	
receptaculitid		54	30	16.5	1	
receptaculitid		66	24	8	1	
cephalopod		83	32			4.5
G12	Comments	x	y	W	H	D
cephalopod		77	17			4
cephalopod		100	2			3
Protrochiscolithus		99	12	16	4	
G13	Comments	x	y	W	H	D
cephalopod		3	17			4.5
cephalopod		18	22			3
gastropod		97	10			3
horn coral	highly abraded	62	21			2.5
cephalopod		8	8			2
G14	Comments	x	y	W	H	D
storm lens	strong		26		6	
cephalopod		57	27			1.5
cephalopod	apex points east	70	28	13		3
G15	Comments	x	y	W	H	D
storm lens	strong		26		5	
storm lens	strong		34		5	

horn coral	highly abraded	74	38			3.5
Calapoecia		60	35	3	2	
G16	Comments	x	y	W	H	D
stromatoporoid		30	38	27	8	
storm lens	strong		27		7	
receptaculitid		67	30	12	1	
gastropod		46	55			3
G17	Comments	x	y	W	H	D
receptaculitid		20	39	17	1	
receptaculitid		221	12	15	1	
Protrochiscolithus		18	9	9.5	1.5	
G18	Comments	x	y	W	H	D
cephalopod		8	58			3
gastropod		2	20			3.5
Favistina		58	10	56	7	
receptaculitid		100	4	11	1.5	
G19	Comments	x	y	W	H	D
receptaculitid		91	32	17	2	
stromatoporoid		72	60	30	6	
horn coral	highly abraded	62	3			3.5
horn coral	highly abraded	66	3			3
horn coral	highly abraded	76	5			3
cephalopod	apex points east	72	54	18		4.5
stromatoporoid		86	10	25	8	
cephalopod		85	4			2.5
G20	Comments	x	y	W	H	D
receptaculitid	on top of storm lens	54	35	20.5	1.5	
horn coral	highly abraded	39	21			3
cephalopod		82	12			2.5
storm lens	strong		0		7	
G21	Comments	x	y	W	H	D
receptaculitid		65	7	12.5	1	
receptaculitid		65	12	12.5	1	
storm lens	strong		0		7	
horn coral	highly abraded	66	35			2
G22	Comments	x	y	W	H	D
storm lens	strong		0		7	
G23	Comments	x	y	W	H	D
receptaculitid		18	15	14	1.5	
Manipora		60	3	11	5	
G24	Comments	x	y	W	H	D
cephalopod		50	7			12
cephalopod		70	6			9
storm lens	strong		25		4	
gastropod	*Hormotoma*	74	44	4		2.5
G25	Comments	x	y	W	H	D
storm lens	strong		30		5	
Rhabdotetradium		30	61	12	3	
cephalopod		41	6			2.5
G26	Comments	x	y	W	H	D

storm lens	strong		32		5	
receptaculitid		55	6	18	1	
receptaculitid		46	17	11	1	
horn coral	highly abraded	51	37	2.5		1.5
H1	Comments	x	y	W	H	D
stromatoporoid		41	33	21	3	
Catenipora		78	2	6	5	
gastropod		79	38			2
horn coral	moderately abraded	29	26			1.5
H2	Comments	x	y	W	H	D
algal stromatolite	encrusted by *Protrochiscolithus*; tilted on side	15	5	4	4	
Protrochiscolithus	encrusting algal stromatolite	19	4	4	3.5	
H3	Comments	x	y	W	H	D
brachiopod		76	52			2
receptaculitid		50	43	10.5	1.5	
horn coral		58	9			1
storm lens	strong		64		2	
H4	Comments	x	y	W	H	D
storm lens	strong		56		4	
horn coral	highly abraded	14	60			3.5
horn coral	highly abraded	39	58			3
horn coral	highly abraded	44	59			3
horn coral	highly abraded	64	60			1.5
horn coral	highly abraded	65	56			1.5
horn coral	highly abraded	85	63			3
horn coral	highly abraded	85	47			2
storm lens	weak		40		5	
receptaculitid		28	11	14	1	
H5	Comments	x	y	W	H	D
storm lens	strong		58		10	
storm lens	strong		42		6	
gastropod		10	42			3.5
stromatoporoid		50	41	65	8	
Favistina		65	44	43	5	
horn coral	highly abraded	93	62			2
receptaculitid		93	64	7	1.5	
cephalopod	in storm lens	8	66			4
H6	Comments	x	y	W	H	D
storm lens	strong		35		8	
receptaculitid		14	60	17	3	
cephalopod		52	56	13		4
gastropod		25	37			2.5
Protrochiscolithus	in storm lens; encrusting *Catenipora*	35	42	9	6	
stromatoporoid	tabular	80	30	63	10	
H7	Comments	x	y	W	H	D
receptaculitid		24	35	12	1	
receptaculitid		27	8	16	1	
brachiopod		8	42			3
horn coral	epitheca abraded; cardinal septum 45 degrees up from east	90	7			1
H8	Comments	x	y	W	H	D

storm lens	strong		52		13	
receptaculitid		3	57	11	1.5	
Calapoecia		5	44	7	3	
gastropod	encrusted by *Favistina*	51	55			3.5
Favistina		51	56	3	0.5	
gastropod		59	56			2
cephalopod		71	56			6
horn coral	epitheca abraded	68	54			1
H9	Comments	x	y	W	H	D
receptaculitid		43	44	16	1.5	
receptaculitid		100	36	15	1	
horn coral	highly abraded; apex points west	46	38	5		4
H10	Comments	x	y	W	H	D
cephalopod	apex points east	68	46	5		2
gastropod		90	25			2.5
H11	Comments	x	y	W	H	D
horn coral	weakly abraded; cardinal septum 30 degrees down from west	11	46			4.5
gastropod		10	42			5
gastropod		0	42			1.5
storm lens	strong		28		3	
stromatoporoid	domical	31	48	25	12	
horn coral		66	8	2		1.5
horn coral		51	44	2.5		2
H12	Comments	x	y	W	H	D
horn coral	highly	15	5			1
horn coral	moderately abraded; cardinal septum 30 degrees up from east	62	23			4
stromatoporoid	tabular	90	29	31	4	
receptaculitid		80	27	11	1	
H13	Comments	x	y	W	H	D
horn coral	epitheca abraded; cardinal septum 45 degrees down from east	24	25			2
cephalopod		34	14			4
receptaculitid		45	14	10	1	
stromatoporoid	bulbous; tilted on sided	47	26	8	19	
gastropod		60	25			2
Protrochiscolithus	encrusted by *Calapoecia* (twice)	98	53	20	1	
Calapoecia	encrusting *Protrochiscolithus*	97	53	3.5	1.5	
H14	Comments	x	y	W	H	D
Calapoecia	encrusting *Protrochiscolithus* (from H13)	5	52	6	1.5	
Favistina	overturned	77	38	20.5	3	
gastropod		50	25			3
gastropod		48	47			2
H15	Comments	x	y	W	H	D
storm lens	strong		42		6	
horn coral	apex points west	33	44	8		3
horn coral	moderately abraded; cardinal septum 50 degrees down from east	53	47			2.5
horn coral	moderately abraded; cardinal septum 5 degrees up from west	56	44			3
H16	Comments	x	y	W	H	D
receptaculitid		88	48	10.5	1	
receptaculitid		89	28	8	1	
storm lens	weak		11		3	

gastropod		98	9		1.5	
H17	Comments	x	y	W	H	D
cephalopod	*Endoceras*; apex points east	9	15	30		9
horn coral	highly abraded	10	10			4
Calapoecia		12	8	5.5	1.5	
horn coral	epitheca abraded	29	8			1.5
stromatoporoid	tabular	36	16	23	3.5	
horn coral	moderately abraded; cardinal septum points east	46	46			1.5
horn coral	cardinal septum 50 degrees down from east	48	9			1.5
Palaeophyllum		55	12	9	5	
receptaculitid		15	46	5	1	
horn coral	highly abraded	74	15			1
H18	Comments	x	y	W	H	D
horn coral	moderately abraded; cardinal septum points straight down	17	38			2
gastropod	*Trochonema*	18	38			1.5
storm lens	weak		6		4	
gastropod	*Maclurina*	91	16			4
H19	Comments	x	y	W	H	D
stromatoporoid	burrowed	60	3	38	7	
H20	Comments	x	y	W	H	D
receptaculitid		38	51	18	3	
receptaculitid		13	34	20	1.5	
receptaculitid		17	12	9.5	1.5	
receptaculitid		87	14	12	1	
horn coral	highly abraded	43	60			2.5
storm lens	moderate		57		3	
H21	Comments	x	y	W	H	D
receptaculitid		42	63	13	2	
gastropod		32	6			2
H22	Comments	x	y	W	H	D
Saffordophyllum		94	5	14	3.5	
brachiopod		61	4			3
brachiopod		50	3			2
H23	Comments	x	y	W	H	D
receptaculitid		18	29	13	1	
cephalopod		10	7			6
brachiopod	encrusted by *Favistina*	8	20			4
Favistina	encrusting brachiopod	5	22	6	3	
horn coral	epitheca abraded; cardinal septum 60 degrees down from east	92	19			1
horn coral	highly abraded	81	3			2
H24	Comments	x	y	W	H	D
stromatoporoid	tabular; slightly burrowed	8	9	53	13	
cephalopod	encrusted by *Favistina*	53	14			3
Favistina	encrusting *Favistina*	57	14	3	1	
H25	Comments	x	y	W	H	D
brachiopod		8	43			2.5
Catenipora		90	30	10	4	
cephalopod	encrusted by *Protrochiscolithus*	85	8			16
Protrochiscolithus	encrusting cephalopod	82	6	13	1	
horn coral	highly abraded; inside cephalopod	81	9			2

brachiopod		73	6			4
Calapoecia		85	2	4	1.5	
horn coral		74	3	4		3.5
brachiopod		100	1			4
H26	Comments	x	y	W	H	D
storm lens	strong		30		4	
gastropod		1	29			2
gastropod		10	18			2
gastropod		22	6			3
horn coral	highly abraded	25	6			3.5
horn coral	epitheca abraded	42	7			3
gastropod		42	7			3.5
horn coral	moderately abraded	2	16			4
cephalopod		63	50			3
I1	Comments	x	y	W	H	D
storm lens	weak		37		3	
cephalopod		22	39			6
horn coral	epitheca abraded	15	39			1.5
I2	Comments	x	y	W	H	D
horn coral	epitheca abraded	8	41			2.5
storm lens	moderate		23		5	
Protrochiscolithus		51	11	5	1	
I3	Comments	x	y	W	H	D
receptaculitid		65	37	11	1	
horn coral	life position	60	25	3		3
storm lens	weak		23		6	
gastropod	encrusted by *Calapoecia*	77	43			4.5
Calapoecia		79	44	2.5	1.5	
I4	Comments	x	y	W	H	D
storm lens	strong		21		4	
receptaculitid		93	18	16	1	
I5	Comments	x	y	W	H	D
horn coral	highly abraded	15	23			4
storm lens	strong		21		7	
I6	Comments	x	y	W	H	D
receptaculitid		23	39	14	1	
cephalopod		80	38			5.5
horn coral	highly abraded	76	34			1
gastropod		85	14			3.5
horn coral	highly abraded	65	35			2
horn coral	highly abraded	63	32			1
horn coral	highly abraded	61	31			1
I7	Comments	x	y	W	H	D
horn coral	epitheca abraded; cardinal septum 75 degrees down from west	58	47			1.5
Crenulites		100	5	27	3.5	
I8	Comments	x	y	W	H	D
receptaculitid		63	5	21	1	
horn coral	highly abraded	2	40			1.5
horn coral	highly abraded	16	3			3.5
horn coral	moderately abraded	58	3			1

cephalopod		80	27	13		3.5
I9	Comments	x	y	W	H	D
storm lens	strong		14		4	
horn coral	highly abraded	2	43			3
horn coral	highly abraded	76	36			2
Calapoecia		86	44	6.5	4	
storm lens	weak		16		3	
horn coral	highly abraded	10	22			1
I10	Comments	x	y	W	H	D
receptaculitid		95	37	10	1	
I11	Comments	x	y	W	H	D
horn coral	highly abraded	16	31			1
horn coral	highly abraded	11	13			1
horn coral	highly abraded	10	15	1		1
horn coral	epitheca abraded	60	26			2
gastropod		58	25			3
cephalopod		66	27	10		4
storm lens	weak		22		6	
I12	Comments	x	y	W	H	D
receptaculitid		81	6	17	1	
receptaculitid		100	3	16	1	
horn coral	epitheca abraded; cardinal septum 10 degrees up from west	32	38	5		3.5
horn coral	moderately abraded	38	38	5		3.5
cephalopod	encrusted by *Protrochiscolithus*	87	43			13
Protrochiscolithus	encrusting cephalopod; overturned	82	39	8	1	
I13	Comments	x	y	W	H	D
receptaculitid		89	32	9	1	
receptaculitid		35	7	16	1	
receptaculitid		55	8	16	1	
I14	Comments	x	y	W	H	D
receptaculitid		20	50	16	1.5	
receptaculitid	good shielding	97	36	15	1.5	
horn coral	highly abraded	97	29			3.5
I15	Comments	x	y	W	H	D
storm lens	weak		25		3	
horn coral	highly abraded	95	38			3.5
I16	Comments	x	y	W	H	D
gastropod		52	51			2
horn coral	moderately abraded	76	51	3.5		2
horn coral	highly abraded	74	48	2.5		2.5
I17	Comments	x	y	W	H	D
stromatoporoid	on top of storm lens	19	6	12	2	
storm lens	weak		1		4	
horn coral	highly abraded	42	4			5
horn coral	highly abraded	85	17			3
horn coral	highly abraded	84	46			1
gastropod	*Maclurina*	81	52			4
I18	Comments	x	y	W	H	D
receptaculitid		19	51	20	1	
cephalopod		44	50	12		3

brachiopod		33	47			3
I19	Comments	x	y	W	H	D
cephalopod		16	35			5.5
I20	Comments	x	y	W	H	D
I21	Comments	x	y	W	H	D
storm lens	weak		11		4	
horn coral	epitheca abraded	78	44			2.5
Protrochiscolithus		1	3	3	0.5	
I22	Comments	x	y	W	H	D
horn coral	highly abraded	51	46			3
horn coral	highly abraded	66	24			1.5
Catenipora		60	23	8	2	
I23	Comments	x	y	W	H	D
horn coral	weakly abraded; cardinal septum 15 degrees down from west	43	39			2
I24	Comments	x	y	W	H	D
receptaculitid		20	21	12	1	
storm lens	weak		20		4	
Favistina		75	23	5	1	
I25	Comments	x	y	W	H	D
horn coral	highly abraded	15	48			4
brachiopod		6	46			5
horn coral	highly abraded	60	45			3
horn coral	highly abraded	52	7			2.5
gastropod	*Hormotoma*	49	7	2		1.5
I26	Comments	x	y	W	H	D
horn coral	moderately abraded	23	26			3.5
horn coral	highly abraded	74	35			1.5
receptaculitid		83	35	13	1	
Crenulites	overturned	22	18	7	2.5	
brachiopod		90	3			3

Appendix A-4: Original Fossil Data

Pit 2: North-South Wall

Note:
1. "Shielding" refers to the lack of mottling and/or bioturbation found underneath certain organisms
2. W = width at widest point in cm; H = height in cm; D = diameter in cm
3. x = horizontal distance from origin (0,0) in cm; y = vertical distance from base of section in cm

B1	Comments	x	y	W	H	D
receptaculitid		74	34	11	1.5	
cephalopod		88	19			12.5
receptaculitid	overlies *Crenulites*	43	13	16	1.5	
Crenulites	underlies receptaculitid	35	14	140	10	
B2	Comments	x	y	W	H	D
storm lens	strong		3		10	
receptaculitid		19	25	16	1	
storm lens	weak		26		3	
gastropod		15	10			3.5
horn coral	weakly abraded	0	10			2
horn coral	highly abraded	0	7			2
horn coral	moderately abraded	1	12			1
horn coral	weakly abraded	4	4	3.5		3
horn coral	highly abraded	6	12			2.5
horn coral	epitheca abraded	7	8			2
horn coral	weakly abraded	12	13			2.5
horn coral	weakly abraded	18	12			1.5
B3	Comments	x	y	W	H	D
receptaculitid		9	49	11	1.5	
receptaculitid		68	26	15	1	
storm lens	strong		3		8	
storm lens	weak		26		3	
Saffordophyllum		73	5	6	1.5	
B4	Comments	x	y	W	H	D
storm lens	weak		26		3	
receptaculitid		27	20	20	1	
receptaculitid		15	5	7	1	
horn coral	highly abraded	95	47			2
gastropod		73	39			3.5
B5	Comments	x	y	W	H	D
storm lens	strong		22		6	
B6	Comments	x	y	W	H	D
storm lens	strong		23		5	
receptaculitid		6	42	16	1	
receptaculitid		60	5	11	1	
receptaculitid		70	14	20	1	
B7	Comments	x	y	W	H	D
storm lens	strong		21		5	
receptaculitid		43	19	10	1	
B8	Comments	x	y	W	H	D

storm lens	strong		22		5	
stromatoporoid		72	4	18	4	
B9	Comments	x	y	W	H	D
storm lens	moderate		23		6	
receptaculitid		15	23	13	1	
cephalopod	partially destroyed	29	21	37		
receptaculitid		60	5	27	1.5	
cephalopod		44	33			3.5
B10	Comments	x	y	W	H	D
receptaculitid		72	45	15	1.5	
B11	Comments	x	y	W	H	D
storm lens	strong		21		5	
receptaculitid		96	5	9	1	
horn coral	highly abraded	1	23			3
B12	Comments	x	y	W	H	D
storm lens	strong		22		6	
receptaculitid		95	45	10	1	
receptaculitid		85	15	11	1	
receptaculitid		16	24	11	1	
B13	Comments	x	y	W	H	D
storm lens	moderate		54		5	
horn coral	epitheca abraded; covered by cephalopod shell	55	60			1
cephalopod	covering horn coral	55	61	8		
B14	Comments	x	y	W	H	D
storm lens	moderate		25		4	
receptaculitid		7	28-Jan	11.5	1	
receptaculitid		8	19	9	1.5	
receptaculitid		29	24	11	1	
receptaculitid		34	17	8	1	
gastropod	*Maclurina*; encrusted by *Protrochiscolithus*	4	40			21
Protrochiscolithus	encrusting gastropod	4	45	9.5	1.5	
horn coral	highly abraded	12	49			4
B15	Comments	x	y	W	H	D
cephalopod		81	37			2
receptaculitid		11	22	12	1	
receptaculitid	overturned; encrusted by *Protrochiscolithus*	36	32	9	1	
Protrochiscolithus	encrusting receptaculitid	38	30	1.5	2	
gastropod	*Maclurina*	35	41			16
receptaculitid		12	54	15	1	
B16	Comments	x	y	W	H	D
storm lens	weak		24		5	
cephalopod		9	16	7.5		3
horn coral	highly abraded	4	17			2.5
horn coral	highly abraded	25	15			2
horn coral	highly abraded	39	14			2.5
horn coral	highly abraded	40	14			2.5
horn coral	highly abraded	78	14			2
horn coral	moderately abraded; cardinal septum 45 degrees down from south	82	18			3
Crenulites	overturned; encrusted by *Protrochiscolithus*	18	13	9	3	

Protrochiscolithus	encrusting *Crenulites*	17	11	4.5	1	
B17	Comments	x	y	W	H	D
receptaculitid		82	33	17	1	
receptaculitid		17	9	7	1	
receptaculitid	tilted	44	17	9	1	
storm lens	moderate		5		15	
stromatoporoid		70	24	32	8	
stromatoporoid		85	14	12	2	
Protrochiscolithus		65	8	10	2	
horn coral	well preserved; cardinal septum 50 degrees down from south	4	13			4.5
horn coral	highly abraded	6	7			2
horn coral	highly abraded	3	20			1.5
horn coral	highly abraded	40	5			2
horn coral	highly abraded	44	8			2.5
bryozoan		0	7	1.5	1	
B18	Comments	x	y	W	H	D
storm lens	moderate		10		10	
receptaculitid		32	15	12	1.5	
horn coral	highly abraded	30	12			3
horn coral	moderately abraded; cardinal septum 60 degrees down from north	7	7			1.5
bryozoan		19	1	1.5	1	
Manipora		26	41	12	5	
B19	Comments	x	y	W	H	D
receptaculitid		90	19	11	1	
storm lens	weak		20		4	
cephalopod		74	10			6
receptaculitid		23	32	21	2	
receptaculitid		46	3	11	1	
Crenulites	partially dissolved near top	32	12	20	5.5	
B20	Comments	x	y	W	H	D
storm lens	strong		13		7	
stromatoporoid	on top of storm lens	12	22	19	5	
cephalopod	in storm lens	14	19			3
gastropod		33	25			1.5
horn coral	highly abraded	12	31			2.5
cephalopod		1	0			2
B21	Comments	x	y	W	H	D
receptaculitid		90	26	8	1	
cephalopod	coiled	11	27			15
gastropod	*Maclurina*	0	34			15
Protrochiscolithus		57	17	11.5	1	
B22	Comments	x	y	W	H	D
storm lens	moderate		21		5	
stromatoporoid		91	3	25	6	
receptaculitid		77	15	21	1	
gastropod		70	24			5
cephalopod		73	1			3
B23	Comments	x	y	W	H	D
storm lens	moderate		19		6	
receptaculitid		90	37	22	1.5	

gastropod		96	24			3
B24	Comments	x	y	W	H	D
storm lens	strong		23		3	
receptaculitid		90	37	22	1.5	
gastropod		96	24			3
C1	Comments	x	y	W	H	D
Protrochiscolithus		96	35	18	3	
Protrochiscolithus	good shielding	30	37	24	1	
receptaculitid		60	35	18	1	
horn coral	moderately abraded	14	11			1
receptaculitid		52	2	10	1.5	
receptaculitid		58	7	8	1	
C2	Comments	x	y	W	H	D
storm lens	strong		5		5	
receptaculitid		27	18	9	1	
receptaculitid		54	43	13	1.5	
gastropod		35	44			7
receptaculitid		45	7	11	1	
stromatoporoid		0	2	6.5	3	
horn coral	moderately abraded	37	9			1.5
C3	Comments	x	y	W	H	D
storm lens	strong; many fragments		2		6	
receptaculitid		38	27	12	1	
horn coral	highly abraded	75	43			3
Favistina		55	20	5	2	
C4	Comments	x	y	W	H	D
storm lens	strong		0		5	
receptaculitid		15	29	13	1.5	
receptaculitid		85	38	12	0.5	
horn coral	epitheca abraded	68	35			3
horn coral	moderately abraded	77	48			3.5
receptaculitid		39	15	10	1	
gastropod		13	19			1.5
C5	Comments	x	y	W	H	D
Favistina		60	12	34	8	
stromatoporoid		18	24	27	4	
Manipora		10	32	7	2.5	
horn coral	highly abraded	30	10			2
horn coral	epitheca abraded; cardinal septum 45 degrees down from south	78	12			3
horn coral	highly abraded	7	14			1
C6	Comments	x	y	W	H	D
receptaculitid		47	33	17	1	
stromatoporoid		21	35	24	5.5	
Favistina	overturned	34	38	9	5	
horn coral	epitheca abraded; cardinal septum 45 degrees up from north	28	38			1.5
horn coral	highly abraded	7	40			1.5
horn coral	highly abraded	7	30			1.5
cephalopod		50	29			6
Protrochiscolithus		6	35	5	2	
horn coral	highly abraded	7	14			1

C7	Comments	x	y	W	H	D
storm lens	strong		11		6	
gastropod		94	37			6
stromatoporoid	raised in centre; dissolved	73	38	53	28	
stromatoporoid	tilted	35	36	23	8	
Favistina	raised in centre	42	47	20	6	
horn coral	highly abraded	28	5			1.5
C8	Comments	x	y	W	H	D
storm lens	strong		11		5	
receptaculitid		20	7	12	1.5	
storm lens	weak		32		3	
Protrochiscolithus		94	31	5	2	
horn coral	highly abraded	83	38			2
bryozoan		82	35	3	2	
horn coral	highly abraded	35	39			3.5
horn coral	highly abraded	21	28			1
bryozoan		37	36	1	1	
stromatoporoid		5	29	42	5	
receptaculitid		19	0	15	1	
C9	Comments	x	y	W	H	D
stromatoporoid		17	12	24	6	
receptaculitid		37	27	11	1	
receptaculitid		9	24	6.5	1	
Saffordophyllum		69	28	19	7	
gastropod	encrusted by *Saffordophyllum*; overturned	58	33			6
Saffordophyllum		58	33	5	2	
cephalopod	*Cyrtogomphoceras*	68	43			6
Catenipora		75	29	6	4	
stromatoporoid	killed on north half; continued growth on south half	30	45	52	27	
cephalopod	encrusted by *Saffordophyllum*	57	32			4
storm lens	moderate		8		4	
C10	Comments	x	y	W	H	D
receptaculitid		93	33	14	1	
Calapoecia		97	29	3	4	
Favistina	partially dissolved in middle	65	34	23	6	
horn coral	highly abraded	37	39			4
storm lens	strong		8		12	
C11	Comments	x	y	W	H	D
storm lens	strong		7		13	
bryozoan		90	38	2.5	2.5	
C12	Comments	x	y	W	H	D
storm lens	strong		6		14	
receptaculitid		80	30	7	1	
horn coral	highly abraded	9	39			2
C13	Comments	x	y	W	H	D
storm lens	strong		6		14	
C14	Comments	x	y	W	H	D
storm lens	highly abraded		7		13	
C15	Comments	x	y	W	H	D

storm lens	strong		6		9	
stromatoporoid		19	42	17	6.5	
C16	Comments	x	y	W	H	D
storm lens	strong		7		8	
gastropod		69	6			4
stromatoporoid		59	42	33	5	
C17	Comments	x	y	W	H	D
storm lens	strong		6		7	
receptaculitid		44	10	23	1.5	
receptaculitid		52	27	21	1	
stromatoporoid		85	26	21	7	
receptaculitid		100	32	9	1	
horn coral	moderately abraded	80	5			5.5
horn coral	highly abraded	98	5			1.5
Protrochiscolithus		28	4	5.5	1	
C18	Comments	x	y	W	H	D
storm lens	strong		7		5	
stromatoporoid		0	50	63	12	
C19	Comments	x	y	W	H	D
storm lens	moderate		0		4	
receptaculitid		48	30	17	1	
receptaculitid		38	26			
horn coral	moderately abraded	61	37			2
C20	Comments	x	y	W	H	D
receptaculitid		75	2	18	1.5	
horn coral	epitheca abraded; cardinal septum 80 degrees down from north	30	41			1.5
Protrochiscolithus		9	42	8.8	4	
C21	Comments	x	y	W	H	D
Catenipora		20	5	17	5.5	
stromatoporoid	raised in middle; thins out laterally	64	48	51	18	
stromatoporoid		36	16	8	4	
C22	Comments	x	y	W	H	D
receptaculitid		67	3	13	1	
horn coral	highly abraded	5	48			2
Crenulites	overturned	82	4	7.5	2.5	
C23	Comments	x	y	W	H	D
stromatoporoid	good shielding	25	46	33	15	
C24	Comments	x	y	W	H	D
gastropod		23	8			2.5
Crenulites		5	26	7	1	
Protrochiscolithus		37	7	5	0.5	
receptaculitid		12	4	18	0.5	
D1	Comments	x	y	W	H	D
storm lens	weak		32		6	
receptaculitid		88	47	10	1	
receptaculitid		88	30	11	1	
stromatoporoid		65	40	14.5	2	
Favistina		53	66	25	5	
gastropod		95	60			6
D2	Comments	x	y	W	H	D

receptaculitid		49	35	8.5	1	
cephalopod		3	55			1.5
brachiopod		11	41			1.5
D3	Comments	x	y	W	H	D
receptaculitid		11	45	12	1	
receptaculitid		68	64	18	1	
cephalopod		37	8			7
cephalopod		69	33			2
D4	Comments	x	y	W	H	D
receptaculitid		90	41	21	1.5	
Crenulites		44	60	15	4.5	
Crenulites		90	23	6.5	2.5	
cephalopod		16	36			11.5
cephalopod	apex points north	42	26	14		3
cephalopod	apex points south	57	42	15		4
gastropod		5	45			3
Protrochiscolithus	overturned	7	30	5	1.5	
D5	Comments	x	y	W	H	D
stromatoporoid		45	34	54	13.5	
stromatoporoid		90	3	28	6	
Favistina		66	56	10	4	
Catenipora		4	51	15	5	
storm lens	moderate		62		3	
cephalopod		6	30			6.5
cephalopod		71	30			4
horn coral	highly abraded	83	64			2.5
cephalopod		3	26			2
gastropod		90	48			3
gastropod		91	30			1.5
gastropod		80	26			6
D6	Comments	x	y	W	H	D
receptaculitid		46	57	18.5	1.5	
receptaculitid		0	16	6	1	
storm lens	weak		30		5	
stromatoporoid		30	38	18	6	
horn coral	epitheca abraded; cardinal septum straight up	1	13			1.5
cephalopod	encrusted by *Protrochiscolithus*; overturned	62	35			2
Protrochiscolithus	encrusting cephalopod	62	33	3.5	1	
receptaculitid		54	67	11	1	
D7	Comments	x	y	W	H	D
receptaculitid		60	67	13	1	
receptaculitid		44	42	14	2	
receptaculitid		71	28	9	1	
receptaculitid		4	43	14	1	
horn coral	highly abraded	17	32			2.5
cephalopod		87	65			3.5
brachiopod		72	2			2
D8	Comments	x	y	W	H	D
receptaculitid		75	58	18	1	
receptaculitid		3	30	17	1.5	

stromatoporoid		81	33	9	1	
gastropod		28	34			5.5
Protrochiscolithus		47	15	7.5	11	
storm lens	moderate		5		10	
D9	Comments	x	y	W	H	D
receptaculitid		57	67	19	2	
receptaculitid		83	42	13	1	
Protrochiscolithus		14	61	9.5	2	
storm lens	moderate		24		6	
D10	Comments	x	y	W	H	D
Favistina		17	54	14.5	5.5	
Favistina		30	62	13.5	5.5	
storm lens	moderate		23		7	
horn coral	highly abraded	82	52			3
horn coral	highly abraded	90	47			2.5
horn coral	highly abraded	0	44			3
receptaculitid		90	27	21	1.5	
receptaculitid		62	41	11.5	1	
Crenulites		11	16	3.5	1.5	
horn coral	highly abraded	90	15			1.5
D11	Comments	x	y	W	H	D
storm lens	moderate		21		9	
storm lens	moderate		38		5	
receptaculitid		0	23	10	1	
receptaculitid		11	15	15.5	2	
receptaculitid		43	43	9.5	1	
horn coral	moderately abraded	6	41			5
horn coral	highly abraded	82	17			3
horn coral	highly abraded	21	43			2.5
bryozoan		30	42	2.5	3	
bryozoan		44	40	1.5	1.5	
gastropod	*Maclurina*	90	66			8
gastropod		87	20			3.5
D12	Comments	x	y	W	H	D
storm lens	moderate		21		5	
receptaculitid		20	66	15	1.5	
receptaculitid		19	19	11	1.5	
receptaculitid		90	23	10	1	
receptaculitid		45	40	8.5	1	
stromatoporoid	arched	55	25	21	5.5	
cephalopod		8	19	12.5		3.5
horn coral	highly abraded	30	26			1.5
horn coral	highly abraded	70	17			2
D13	Comments	x	y	W	H	D
storm lens	moderate		25		4	
stromatoporoid	encrusted by *Calapoecia*	9	20	14.5	5	
Calapoecia	encrusting stromatoporoid	10	23	1	1	
receptaculitid		35	27	14	1	
gastropod		90	17			2
gastropod		75	17			3

gastropod	encrusted by *Protrochiscolithus*; overturned	3	52			2.5
Protrochiscolithus	encrusting gastropod	2	21	3	1.5	
D14	Comments	x	y	W	H	D
storm lens	strong		24		4	
stromatoporoid		27	68	25	5	
receptaculitid		4	13	31	1	
Favistina		53	42	18	5	
gastropod		10	11			2.5
gastropod		27	20			3
gastropod		50	34			3.5
gastropod		50	20			3
horn coral	highly abraded	54	88			4
horn coral	highly abraded	43	18			3
cephalopod		72	42			3
D15	Comments	x	y	W	H	D
receptaculitid		8	55	10	1.5	
receptaculitid		56	64	6.5	1	
receptaculitid		60	27	9	1	
gastropod		44	18			2
Protrochiscolithus	encrusted by *Palaeophyllum*	13	20	6	1	
Palaeophyllum	encrusting *Protrochiscolithus*	13	21	7	2	
horn coral	highly abraded	5	17			1
D16	Comments	x	y	W	H	D
horn coral	epitheca abraded; cardinal septum 45 degrees down from north	47	73			3.5
horn coral	highly abraded	63	15			3
gastropod		9	46			3
brachiopod	good shielding	90	25			5
cephalopod		70	23			8
D17	Comments	x	y	W	H	D
storm lens	weak		24		6	
Catenipora		90	56	8	4	
stromatoporoid		8	27	28	9.5	
cephalopod		60	64			2.5
gastropod		64	16			5
gastropod		66	22			3
D18	Comments	x	y	W	H	D
storm lens	strong		67		5	
receptaculitid		34	26	11.5	1.5	
storm lens	moderate		24		6	
receptaculitid		74	45	10	1.5	
Favistina		75	22	14	7	
Favistina		62	65	9	2	
D19	Comments	x	y	W	H	D
receptaculitid		2	37	17.5	1.5	
receptaculitid		30	16	16.5	1.5	
receptaculitid		54	37	21	1.5	
receptaculitid		85	15	7	1.5	
receptaculitid		94	17	10	1.5	
stromatoporoid		42	25	14	3.5	
storm lens	weak		4		4	

storm lens	moderate		51		5	
Protrochiscolithus	encrusted by *Saffordophyllum*	32	47	9	1	
Saffordophyllum	encrusting *Protrochiscolithus*; broken in middle	31	50	12.5	4	
Protrochiscolithus	good shielding	63	40	9.5	1	
Protrochiscolithus		79	48	8	1.5	
cephalopod		66	55			4.5
cephalopod		73	7			3.5
cephalopod		6	23			10
D20	Comments	x	y	W	H	D
receptaculitid		23	25	16	1.5	
receptaculitid		16	19	13	1	
receptaculitid		32	16	12	1	
receptaculitid		90	48	7	1.5	
Crenulites	partially dissolved inside	71	50	27	4	
Protrochiscolithus		64	53	4.5	1.5	
D21	Comments	x	y	W	H	D
storm lens	strong		30		7	
receptaculitid		60	35	7	1.5	
horn coral	highly abraded	90	10			3
gastropod		30	13			4.5
gastropod		16	13			4
stromatoporoid		16	10	6	2	
brachiopod		20	55			5
horn coral	epitheca abraded; cardinal septum 60 degrees down from south	30	12			1
horn coral	highly abraded	55	14			2
Crenulites		0	18	21	3.5	
D22	Comments	x	y	W	H	D
storm lens	strong; many fragments		64		5	
horn coral	moderately abraded	60	7			2
receptaculitid		55	63	56	2	
Protrochiscolithus	overturned	72	48	6.5	2	
Crenulites		18	53	24	6	
D23	Comments	x	y	W	H	D
Crenulites	encrusted by *Protrochiscolithus*	37	53	5	1.5	
Protrochiscolithus	encrusting *Crenulites*	37	54	6.5	1.5	
storm lens	moderate		34		4	
E1	Comments	x	y	W	H	D
storm lens	strong; sharp base		36		5	
storm lens	strong		63		4	
stromatoporoid	on top of storm lens	100	42	10	6	
stromatoporoid		8	30	38	9	
receptaculitid		6	10	20	1.5	
receptaculitid		69	53	12	1	
horn coral	highly abraded	65	67		3	
E2	Comments	x	y	W	H	D
stromatoporoid		30	54	71	12	
storm lens	strong		24		4	
storm lens	strong		38		4	
receptaculitid		36	74	11	1.5	
Favistina		83	24	30	7	

brachiopod		65	20			5
horn coral	moderate	83	66			1
E3	Comments	x	y	W	H	D
storm lens	strong		21		6	
storm lens	strong		36		6	
stromatoporoid		16	72	18	8.5	
receptaculitid		6	18	15	1	
receptaculitid		44	17	13	1	
horn coral	highly abraded	80	18			1
horn coral	weakly abraded; cardinal septum 45 degrees down from north	43	72			3.5
gastropod		13	56			3.5
algal stromatolite	good shielding	15	28	24	4	
E4	Comments	x	y	W	H	D
storm lens	strong		24		4	
cephalopod	encrusted by *Protrochiscolithus*	98	56			5.5
Protrochiscolithus	encrusting cephalopod	96	58	4	0.5	
horn coral	weakly abraded; cardinal septum 45 degrees down from south	30	18			2.5
brachiopod		81	21			5
receptaculitid		20	37	8	1	
E5	Comments	x	y	W	H	D
storm lens	strong		26		3	
storm lens	moderate		37		4	
Protrochiscolithus		95	69	2.5	2	
E6	Comments	x	y	W	H	D
storm lens	strong		38		7	
receptaculitid		44	56	18	1	
Crenulites	in storm lens	62	42	12	3	
Crenulites		43	24	11	2	
cephalopod		0	22	8.5		2
E7	Comments	x	y	W	H	D
storm lens	strong		40		6	
receptaculitid		23	55	11.5	1	
receptaculitid		90	7	18	1	
horn coral	moderately abraded	43	60			2
horn coral	epitheca abraded; cardinal septum 45 degrees down from north	9	21			1.5
receptaculitid		6	37	17.5	1	
E8	Comments	x	y	W	H	D
storm lens	strong		30		8	
receptaculitid		7	63	10	1	
receptaculitid		33	56	14	1	
receptaculitid		76	60	15	1	
receptaculitid		44	27	11.5	1	
Favistina		14	25	23.5	5	
stromatoporoid		30	47	27	6	
storm lens	strong		48		7	
stromatoporoid		30	16	24	2.5	
horn coral	moderately abraded	23	53			3.5
horn coral		90	54	2		1.5
cephalopod		54	30			4
E9	Comments	x	y	W	H	D

storm lens	strong		30		7	
storm lens	strong		14		5	
horn coral	moderately abraded; apex points south	35	60			5
receptaculitid		95	25	13	1	
cephalopod	in storm lens; trash	90	13	9		3.5
gastropod	*Hormotoma*	99	55	4		3
horn coral	highly abraded; in storm lens	92	20			2
horn coral	highly abraded; in storm lens	97	15			1.5
horn coral	highly abraded; in storm lens	2	19			3.5
horn coral	highly abraded; in storm lens	19	17			1.5
horn coral	highly abraded; in storm lens	28	18			1.5
E10	Comments	x	y	W	H	D
storm lens	strong		37		8	
Calapoecia		27	65	3.5	2.5	
receptaculitid		95	51	15	1	
Favistina		43	16	11	3	
horn coral	epitheca abraded	38	23			1.5
brachiopod		75	30			3.5
storm lens	moderate		12		6	
E11	Comments	x	y	W	H	D
storm lens	strong		32		11	
receptaculitid		48	73	21	1	
receptaculitid		34	35	18	1	
receptaculitid		86	57	10	1	
horn coral	moderately abraded	15	20			3
cephalopod		37	26			4
gastropod		23	30			4
stromatoporoid		87	41	12	3.5	
E12	Comments	x	y	W	H	D
receptaculitid		30	62	12	1	
receptaculitid		30	14	14.5	1	
receptaculitid		90	30	10	0.5	
Crenulites	overturned	82	28	13	3	
storm lens	moderate		70		6	
E13	Comments	x	y	W	H	D
receptaculitid		69	17	13	1	
receptaculitid		86	13	10	1	
horn coral	highly abraded	30	13			2.5
Calapoecia		41	69	4	2	
E14	Comments	x	y	W	H	D
receptaculitid		60	10	21	1	
cephalopod		63	7			2.5
E15	Comments	x	y	W	H	D
Favistina		43	48	18	3	
gastropod	encrusted by *Protrochiscolithus*	84	75			2
Protrochiscolithus	encrusting gastropod	84	74	4	1	
cephalopod		82	10			4.5
receptaculitid		8	8	6	1	
E16	Comments	x	y	W	H	D
stromatoporoid		3	51	16.5	6	

stromatoporoid	encrusted by *Protrochiscolithus*	42	34	26	5	
Protrochiscolithus	encrusting stromatoporoid	43	36	20	1	
Crenulites		38	48	24	3.5	
Favistina		46	20	15.5	5	
cephalopod	encrusted by *Protrochiscolithus*	66	51			14
Protrochiscolithus	encrusting cephalopod	66	52	15	1.5	
horn coral	highly abraded	6	35			4
gastropod		14	45			3.5
E17	Comments	x	y	W	H	D
receptaculitid		97	38	18	2	
horn coral	highly abraded	64	39			3
horn coral	highly abraded	20	44			2
horn coral	epitheca abraded	15	17			1
horn coral	highly abraded	27	21			2
receptaculitid		42	30	16	1	
receptaculitid		6	54	18	1	
stromatoporoid	good shielding	18	36	70	4.5	
stromatoporoid		2	21	14	3	
gastropod		22	45			2.5
gastropod		12	20			3.5
E18	Comments	x	y	W	H	D
stromatoporoid		0	74	58	7	
receptaculitid		30	46	11	1	
stromatoporoid		60	75	52	7	
horn coral	highly abraded	7	48			3.5
Protrochiscolithus	tilted on side	11	20	4	3	
E19	Comments	x	y	W	H	D
Crenulites		9	75	13	2.5	
gastropod		62	37			2.5
E20	Comments	x	y	W	H	D
storm lens	strong; lots of fragments		65		11	
stromatoporoid		92	49	12	2.5	
gastropod	encrusted by *Calapoecia*	72	26			4.5
Calapoecia	encrusting gastropod	67	26	3.5	2	
E21	Comments	x	y	W	H	D
storm lens	strong		69		7	
receptaculitid		73	68	16	1.5	
stromatoporoid		44	53	12	4.5	
gastropod		12	71			3.5
E22	Comments	x	y	W	H	D
receptaculitid		42	50	19	1	
receptaculitid		38	23	13.5	1	
horn coral	highly abraded	45	65			3.5
horn coral	highly abraded	55	65			3
gastropod		42	15			6.5
receptaculitid		34	5	15	1	
storm lens	strong		46		5	
horn coral	moderately abraded	0	39			2.5
E23	Comments	x	y	W	H	D
storm lens	strong		41		5	

horn coral	epitheca abraded; cardinal septum 45 degrees down from north	55	69			2
receptaculitid		73	6	24	1.5	
E25	Comments	x	y	W	H	D
storm lens	strong		29		9	
Protrochiscolithus		26	90	8	1	
receptaculitid		90	43	14	1	
horn coral	highly abraded	90	9			2
F1	Comments	x	y	W	H	D
receptaculitid		75	54	16	1	
receptaculitid		74	10	9	1	
receptaculitid		20	18	16	1	
storm lens	strong		28		6	
F2	Comments	x	y	W	H	D
receptaculitid		75	52	16	1	
storm lens	moderate		30		6	
cephalopod	encrusted by *Calapoecia*	4	12			3
Calapoecia		4	13	3	1	
horn coral	highly abraded	30	14			3
horn coral	moderately abraded	38	14			2
receptaculitid		3	54	10	1	
F3	Comments	x	y	W	H	D
storm lens	strong		30		6	
Rhabdotetradium		53	21	11	4.5	
F4	Comments	x	y	W	H	D
storm lens	strong		30		8	
storm lens	strong		58		7	
stromatoporoid		90	16	45	8	
stromatoporoid		18	48	37	4	
receptaculitid		48	43	10.5	1	
gastropod		38	46			2
gastropod		42	43			1
horn coral	highly abraded	3	45	2		2
cephalopod	encrusted by *Protrochiscolithus*	27	16			6.5
Protrochiscolithus	encrusting cephalopod	28	18	4.5	0.5	
F5	Comments	x	y	W	H	D
storm lens	strong		29		7	
receptaculitid		92	41	12	1	
receptaculitid		62	55	17.5	1.5	
stromatoporoid		69	16	12	3	
horn coral	moderately abraded	23	45			3
Crenulites		0	23	7.5	2.5	
F6	Comments	x	y	W	H	D
storm lens	strong		30		6	
receptaculitid		37	22	10.5	1	
F7	Comments	x	y	W	H	D
storm lens	strong		30		7	
receptaculitid		83	51	9.5	1	
gastropod		2	36			3.5
F8	Comments	x	y	W	H	D
storm lens	strong		29		7	

receptaculitid		94	25	18	1	
receptaculitid		63	49	9.5	1	
F9	Comments	x	y	W	H	D
storm lens	strong		30		7	
horn coral	highly abraded	98	52			2.5
storm lens	weak		50		3	
horn coral	highly abraded	30	23			3
F10	Comments	x	y	W	H	D
cephalopod		41	11			5.5
F11	Comments	x	y	W	H	D
storm lens	strong		30		4	
stromatoporoid		90	44	9.5	2	
receptaculitid		68	43	17	1	
receptaculitid		30	12	16	1	
F12	Comments	x	y	W	H	D
storm lens	strong		30		6	
stromatoporoid		10	45	31	4	
Crenulites		1	27	24	5	
F13	Comments	x	y	W	H	D
storm lens	strong		30		6	
receptaculitid		75	10	21.5	1	
gastropod		60	20			4.5
horn coral	highly abraded; cardinal septum 30 degrees down from south	68	19			2.5
F14	Comments	x	y	W	H	D
storm lens	strong		30		5	
gastropod	*Maclurina*	72	51			11
Protrochiscolithus		50	52	5	1.5	
cephalopod		4	51	5.5		2
F15	Comments	x	y	W	H	D
storm lens	strong		30		5	
horn coral	weakly abraded; cardinal septum 50 degrees down from north	63	60			2
horn coral	highly abraded	49	59			2
cephalopod		54	60			2
F16	Comments	x	y	W	H	D
storm lens	strong		30		5	
horn coral	epitheca abraded	67	50			2
horn coral	highly abraded	74	42			2
horn coral	highly abraded	37	42			1
stromatoporoid		55	15	44	8	
F17	Comments	x	y	W	H	D
storm lens	strong		30		5	
cephalopod		67	33			3.5
receptaculitid		35	60	10	1	
receptaculitid		42	22	11	1	
F18	Comments	x	y	W	H	D
receptaculitid		19	58	15	1	
receptaculitid		48	38	10	1	
receptaculitid		77	51	17	1.5	
storm lens	strong		30		6	
horn coral	highly abraded	10	32			3

gastropod		64	40			3.5
Calapoecia		28	40	3.5	2	
F19	Comments	x	y	W	H	D
horn coral	highly abraded	93	31			2
storm lens	moderate		30		6	
gastropod		24	56			3
horn coral	moderately abraded	42	43			1
F20	Comments	x	y	W	H	D
stromatoporoid		93	52	33	3	
stromatoporoid		38	55	26	3	
storm lens	weak		30		6	
Saffordophyllum		56	62	3	2	
horn coral	highly abraded	25	44			1
F21	Comments	x	y	W	H	D
storm lens	moderate		32		6	
algal stromatolite		90	42	14	2	
Crenulites	directly below algal stromatolite	90	39	13	2	
horn coral	highly abraded	18	49			4
stromatoporoid		60	17	60	8	
receptaculitid		2	40	13	2	
cephalopod		17	41			2
F22	Comments	x	y	W	H	D
storm lens	moderate		30		6	
algal stromatolite		5	5	6	4	
receptaculitid		13	50	12	1	
F23	Comments	x	y	W	H	D
storm lens	moderate		30		6	
receptaculitid		30	21	12.5	1.5	
cephalopod		91	25	6		2
horn coral	highly abraded	56	36			1
stromatoporoid		5	28	15	3	
Favistina		11	51	12	4	
Favistina		22	38	5	1.5	
F24	Comments	x	y	W	H	D
storm lens	moderate		30		6	
storm lens	moderate		42		4	
gastropod		74	41			2.5
gastropod		5	16			4
G1	Comments	x	y	W	H	D
receptaculitid		24	12	16	1	
receptaculitid		96	5	6	1	
algal stromatolite		36	59	21	2	
gastropod		5	51			3.5
unknown		8	24			2
G2	Comments	x	y	W	H	D
receptaculitid		77	5	9	1	
G3	Comments	x	y	W	H	D
receptaculitid	good shielding	95	23	10	0.5	
storm lens	weak		18		6	
G4	Comments	x	y	W	H	D

cephalopod		68	26			3.5
G5	Comments	x	y	W	H	D
storm lens	moderate		37		5	
receptaculitid		36	55	23	1.5	
Manipora		98	40	4	3	
receptaculitid		99	12	10	1	
Calapoecia		90	12	3	3	
horn coral	highly abraded	54	41	1.5		1.5
algal stromatolite	bored	23	12	7	2	
Favistina		20	6	30	2	
G6	Comments	x	y	W	H	D
receptaculitid		90	11	8	1	
receptaculitid		90	3	22	1	
receptaculitid		63	5	10	1	
horn coral	highly abraded	10	38			2.5
G7	Comments	x	y	W	H	D
storm lens	moderate		37		3	
receptaculitid		38	8	11	1	
G8	Comments	x	y	W	H	D
storm lens	moderate		33		4	
receptaculitid		38	8	11	1	
G9	Comments	x	y	W	H	D
storm lens	moderate		35		3	
receptaculitid		68	13	10	1	
receptaculitid		43	13	10	1	
receptaculitid		35	7	10	1	
G10	Comments	x	y	W	H	D
receptaculitid		42	10	10	1	
receptaculitid		71	13	18	1.5	
receptaculitid		90	12	8	1	
cephalopod	encrusted by *Rhabdotetradium*	57	35			9.5
Rhabdotetradium	encrusting cephalopod	76	36	10	1	
G11	Comments	x	y	W	H	D
receptaculitid		95	21	11	1	
receptaculitid		86	21	13	1	
receptaculitid		71	5	11.5	1	
receptaculitid		33	9	17	1.5	
algal stromatolite		98	53	6.5	1.5	
G12	Comments	x	y	W	H	D
storm lens	moderate		30		6	
receptaculitid		70	11	14	1	
receptaculitid		11	5	18	1.5	
G13	Comments	x	y	W	H	D
storm lens	moderate		30		7	
G14	Comments	x	y	W	H	D
storm lens	moderate		34		4	
receptaculitid		35	2	5	1	
G15	Comments	x	y	W	H	D
storm lens	moderate		33		5	
horn coral	weakly abraded; cardinal septum 50 degrees down from north	30	18			3.5

G16	Comments	x	y	W	H	D
cephalopod		38	20			3.5
Favistina		38	39	4	2.5	
G17	Comments	x	y	W	H	D
receptaculitid		85	8	14	1	
storm lens	weak		36		4	
G18	Comments	x	y	W	H	D
receptaculitid		82	35	14	1	
receptaculitid		73	10	12.5	1	
Saffordophyllum		26	11	64	9	
cephalopod		2	9			3
G19	Comments	x	y	W	H	D
receptaculitid		21	7	19	1	
receptaculitid		5	6	17	1	
Crenulites		35	30	44	4.5	
cephalopod	apex points north	68	28	7		2.5
G20	Comments	x	y	W	H	D
G21	Comments	x	y	W	H	D
receptaculitid		48	47	14	1.5	
receptaculitid		48	41	20	1	
G22	Comments	x	y	W	H	D
Protrochiscolithus		4	30	7	2	
Crenulites		57	20	10.5	3	
receptaculitid		60	13	9	1	
G23	Comments	x	y	W	H	D
storm lens	moderate		33		5	
Protrochiscolithus		83	43	9	1.5	
receptaculitid		32	9	11	1.5	
G24	Comments	x	y	W	H	D
cephalopod		60	6			2.5
G25	Comments	x	y	W	H	D
horn coral	epitheca abraded	80	14			1
horn coral	moderately abraded; cardinal septum straight up	63	13			1
horn coral	highly abraded	36	9			3
H1	Comments	x	y	W	H	D
horn coral	moderately abraded	46	33			1.5
gastropod		51	33			3
receptaculitid		74	33	6	1.5	
H2	Comments	x	y	W	H	D
horn coral	epitheca abraded; cardinal septum 45 degrees down from south	3	50			2
horn coral	highly abraded	41	11			1.5
storm lens	moderate		8		4	
receptaculitid	bent; arched	30	57	19	5	
receptaculitid		3	13	12	1	
Favistina	killed in middle; growth continued to the south	23	30	31	3.5	
H3	Comments	x	y	W	H	D
receptaculitid		98	13	8	1	
receptaculitid		87	6	9	1	
receptaculitid		47	3	18	2	
gastropod		12	64			3

gastropod		0	21			3
horn coral	epitheca abraded; cardinal septum 15 degrees up from south	77	53			2.5
H4	Comments	x	y	W	H	D
horn coral	epitheca abraded; cardinal septum 5 degrees down from south	0	27			2.5
horn coral	highly abraded	22	40			2
brachiopod		83	37			4
storm lens	moderate		26		4	
horn coral	moderately abraded	18	29			1
H5	Comments	x	y	W	H	D
storm lens	moderate		24		5	
receptaculitid		55	4	16	2	
storm lens	weak		9		4	
stromatoporoid		8	30	16.5	4.5	
horn coral	epitheca abraded; cardinal septum 80+B14 degrees down from south	84	39			2
cephalopod		79	30			2.5
cephalopod	encrusted by *Catenipora*	90	41	4.5		1.5
H6	Comments	x	y	W	H	D
Crenulites	good shielding	25	52	26	3	
storm lens	moderate		62		4	
Favistina		68	57	10.5	1.5	
gastropod		34	34			1.5
horn coral	highly abraded	8	24			3.5
horn coral		60	22			2
H7	Comments	x	y	W	H	D
storm lens	moderate; lots of fragments		18		5	
gastropod		6	34			3.5
gastropod		56	52			2.5
receptaculitid		85	8	8	1	
Protrochiscolithus	encrusting some trash	53	13	7	2.5	
H8	Comments	x	y	W	H	D
cephalopod	encrusted by *Calapoecia*	49	64			3
Calapoecia	encrusting cephalopod	47	65	3	2	
storm lens	moderate		20		5	
horn coral	highly abraded	87	24			2.5
horn coral	highly abraded	65	26			2.5
receptaculitid		24	17	9	1	
H9	Comments	x	y	W	H	D
receptaculitid		6	23	8	1	
receptaculitid		60	53	19	2	
stromatoporoid		77	58	25	6.5	
horn coral	moderately abraded	93	56			2.5
cephalopod		46	52			3
horn coral	highly abraded	41	52			2.5
gastropod	*Hormotoma*	5	32	3.5		2
brachiopod		2	7			3
H10	Comments	x	y	W	H	D
H11	Comments	x	y	W	H	D
receptaculitid		53	6	16	1	
receptaculitid		90	8	21	1	
gastropod		66	57			2.5

gastropod		52	22			3
cephalopod	apex points south	30	60	22		7
H12	Comments	x	y	W	H	D
receptaculitid		34	15	24	1	
cephalopod	apex points south	52	10	10.5		3.5
H13	Comments	x	y	W	H	D
receptaculitid		42	66	16	2	
horn coral	highly abraded	36	57			2.5
horn coral	highly abraded	26	51			3
horn coral	highly abraded	14	52			1.5
Calapoecia		30	52	2	2	
H14	Comments	x	y	W	H	D
gastropod	*Maclurina*	88	19			6
cephalopod	apex points south	27	20	7.5		2.5
horn coral	moderately abraded	93	63			1.5
H15	Comments	x	y	W	H	D
storm lens	strong		14		6	
gastropod		5	18			4.5
gastropod		99	25			3
horn coral	highly abraded; in storm lens	65	17			1
H16	Comments	x	y	W	H	D
receptaculitid		9	58	18.5	3	
storm lens	moderate		23		7	
horn coral	highly abraded	38	30			2
H17	Comments	x	y	W	H	D
storm lens	strong		60		6	
storm lens	moderate		23		7	
stromatoporoid		35	13	48	3.5	
horn coral	highly abraded	22	65			2
gastropod		9	63			2.5
gastropod		10	26			2
gastropod		20	32			3
cephalopod		90	63			11.5
H18	Comments	x	y	W	H	D
stromatoporoid		14	58	21	6	
storm lens	moderate		26		5	
storm lens	moderate		36		7	
gastropod		14	53			4
horn coral	highly abraded	64	42			2
horn coral	highly abraded	67	40			2
horn coral	highly abraded	71	17			1
gastropod		60	42			2.5
H19	Comments	x	y	W	H	D
receptaculitid		8	41	13.5	1	
receptaculitid		5	26	21	1.5	
receptaculitid		47	5	11	1.5	
horn coral	moderately abraded	65	13			3.5
gastropod	*Hormotoma*	75	4	3.5		2
horn coral	highly abraded	90	64			4
gastropod		57	3			2

cephalopod		64	17			3
H20	Comments	x	y	W	H	D
cephalopod		24	53			3
Favistina		81	35	24.5	5	
storm lens	moderate		39		4	
horn coral	highly abraded	15	62			2.5
H21	Comments	x	y	W	H	D
receptaculitid		4	15	10	1	
horn coral	highly abraded	72	48			3.5
H22	Comments	x	y	W	H	D
horn coral	highly abraded	72	6			2
horn coral	epitheca abraded; cardinal septum 45 degrees down from south	77	4			2.5
horn coral	moderately abraded	34	17			1
horn coral	highly abraded	3	35			2.5
H23	Comments	x	y	W	H	D
receptaculitid		12	54	11	1.5	
receptaculitid		15	43	14	1	
H24	Comments	x	y	W	H	D
receptaculitid		4	13	9.5	1	
gastropod		28	55			1
gastropod		43	27			2.5
horn coral	highly abraded; apex points south	51	60	5		2.5
H25	Comments	x	y	W	H	D
receptaculitid		78	32	20	1	
cephalopod	apex points north	30	18	10		3.5
storm lens	moderate		16		5	
gastropod		78	43			2.5
H26	Comments	x	y	W	H	D
Crenulites		16	5	32	2.5	
stromatoporoid		12	34	102	6	
H27	Comments	x	y	W	H	D
cephalopod	apex points south	21	45	7		2.5
Protrochiscolithus		40	3	9	1	
cephalopod		8	47			2
I1	Comments	x	y	W	H	D
cephalopod	encrusting by *Protrochiscolithus*	15	46			7
brachiopod		20	48			4.5
I2	Comments	x	y	W	H	D
Crenulites		70	47	26.5	3.5	
horn coral	moderately abraded	2	49			3
storm lens	moderate		40		4	
horn coral	moderately abraded	1	44	1.5		1
horn coral	highly abraded	19	30			1.5
horn coral	moderately abraded; cardinal septum 45 degrees up from south	98	46			3
cephalopod		13	27	12		4
horn coral	highly abraded	41	44			1.5
I3	Comments	x	y	W	H	D
horn coral	moderately abraded	56	46			4
horn coral	highly abraded	79	46			4.5
horn coral	moderately; cardinal septum straight down	89	43			3

horn coral	highly abraded	99	42			1
receptaculitid		40	38	7.5	1	
I4	Comments	x	y	W	H	D
Catenipora		16	39	12	3.5	
gastropod		22	34			3.5
cephalopod		16	35			1.5
I5	Comments	x	y	W	H	D
storm lens	strong		48		4	
horn coral	highly abraded	73	51			1.5
horn coral	highly abraded	79	51			2.5
horn coral	highly abraded	86	51			1
horn coral	highly abraded	91	51			2.5
cephalopod		64	50			2
cephalopod		58	51			3
gastropod	encrusted by *Calapoecia*	64	25			2
Calapoecia	encrusting gastropod	63	26	1.5	1.5	
I6	Comments	x	y	W	H	D
storm lens	moderate		23		2	
horn coral	highly abraded	90	24			1.5
I7	Comments	x	y	W	H	D
I8	Comments	x	y	W	H	D
horn coral	highly abraded	45	34			1
brachiopod		66	30			3
I9	Comments	x	y	W	H	D
Calapoecia		7	24	2.5	2.5	
storm lens	moderate		23		5	
horn coral	highly abraded	51	24			1
I10	Comments	x	y	W	H	D
receptaculitid		63	17	16	1	
storm lens	moderate		23		5	
horn coral	epitheca abraded	10	1			1.5
cephalopod		8	1			3
I11	Comments	x	y	W	H	D
horn coral	moderately abraded	46	28			2
storm lens	moderate		23		5	
brachiopod		93	37			2
Saffordophyllum	tilted on side; encrusted by *Calapoecia*	92	3	6	5	
Calapoecia	encrusting *Saffordophyllum*	98	2	4	2	
horn coral	well preserved; cardinal septum 50 degrees down from south	3	9			1.5
I12	Comments	x	y	W	H	D
storm lens	moderate		8		5	
I13	Comments	x	y	W	H	D
horn coral	highly abraded	4	49			2.5
horn coral	highly abraded	34	26			2.5
cephalopod	apex points south	27	25	11		2
receptaculitid		0	29	12.5	1	
horn coral	highly abraded	1	25			1.5
I14	Comments	x	y	W	H	D
Crenulites		3	5	39	5	
storm lens	moderate		3		3	

gastropod		62	37			2.5
horn coral	highly abraded	58	36			1
horn coral	moderately abraded	46	52	3		3
cephalopod	apex points north	17	2	6.5		2
horn coral	highly abraded	88	2			2
I15	Comments	x	y	W	H	D
receptaculitid		54	7	23.5	1.5	
storm lens	strong; lots of fragments		5		6	
Favistina		32	50	26	3.5	
gastropod		60	12			4
I16	Comments	x	y	W	H	D
cephalopod	on top of storm lens	83	11	20		9
storm lens	moderate		5		4	
horn coral	life position	57	39	2		2
I17	Comments	x	y	W	H	D
I18	Comments	x	y	W	H	D
horn coral	epitheca abraded	50	41			1.5
cephalopod		22	15			3.5
horn coral	highly abraded	4	42			1.5
I19	Comments	x	y	W	H	D
gastropod		76	37			2
I20	Comments	x	y	W	H	D
I21	Comments	x	y	W	H	D
cephalopod		1	30	10	1	
I22	Comments	x	y	W	H	D
I23	Comments	x	y	W	H	D
cephalopod		96	28	5		2
cephalopod		42	47			2.5
storm lens	weak		2		4	
horn coral	highly abraded	51	2			2
gastropod		58	10			3
I24	Comments	x	y	W	H	D
receptaculitid		82	43	13	1	
receptaculitid		0	43	10	1	

Appendix B-1: Revised Fossil Data

EW Wall

Note:
1. "Shielding" refers to the lack of mottling and/or bioturbation found underneath certain organisms
2. W = width at widest point in cm; H = height in cm; D = diameter in cm
3. x = horizontal distance from origin (0,0) in cm; y = vertical distance from base of section in cm

EW Wall	Comments	x	y	W	H	D
algal stromatolite		139	491	12	2.5	
algal stromatolite		252	203	35	3	
algal stromatolite		875	225	47	2	
algal stromatolite		878	437	10	1	
algal stromatolite		924	438			
algal stromatolite		1270	294	10	0.5	
algal stromatolite		1554	514	11	2	
algal stromatolite		1613	503	10	1	
algal stromatolite		1814	426	21	2	
algal stromatolite		2523	513	10	2	
algal stromatolite		2529	420	18	2	
algal stromatolite	encrusted by *Protrochiscolithus*; tilted on side	3815	63	4	4	
Brachiopod		258	203			
Brachiopod	fragment	828	216			
Brachiopod	fragment	2274	231			
Brachiopod		2738	261			4.5
Brachiopod		3790	281			3
Brachiopod		3909	409			3.5
Brachiopod		3909	409			3.5.
Brachiopod		3976	110			2
Brachiopod		4006	327			3
Brachiopod		4014	283			3
Brachiopod		4048	379			2.5
Brachiopod		4102	373			3
Brachiopod		4105	415			3
Brachiopod		4121	289			2
Brachiopod		4308	100			3
Brachiopod		4337	388			3
Brachiopod		4624	345			3.5
Brachiopod		4849	368			2.5
Brachiopod		4895	343			3
Brachiopod		5285	360			4.5
Brachiopod		5433	47			3
Brachiopod		5850	61			2
Brachiopod		5861	62			3
Brachiopod	encrusted by *Favistina*	5908	78			4
Brachiopod		6106	46			5
Brachiopod		6108	101			2.5
Brachiopod		6173	64			4
Brachiopod		6200	59			4

EW Wall	Comments	x	y	W	H	D
Brachiopod		6290	3			3
Bryozoan	fragmented in storm lens	349	425	1.5	1	
Bryozoan	branching	905	273			1
Bryozoan	branching; 2 branches	1262	326	4		1
Bryozoan	domical; encrusted by *Protrochiscolithus*	2625	429	3	1.5	
Bryozoan	branching	3087	438			1.5
Bryozoan	small mound	3112	195			3
Bryozoan		4104	327	1	1	
Bryozoan		4451	461	2	2	
Bryozoan		4568	256	1	1	
Bryozoan		5034	437	2	2	
Calapoecia		34	356	2	3	
Calapoecia		351	272	4	2	
Calapoecia	in storm lens	441	429	3.5	2.5	
Calapoecia	fragment in storm lens	1527	317			
Calapoecia	domical; killed by storm lens; good shielding	1675	428	17	3	
Calapoecia	overturned; on top of storm lens	1854	271	3	2	
Calapoecia	tilted on side	1932	496	4	4	
Calapoecia		1962	403	5	3	
Calapoecia	domical	2166	443	6	2.5	
Calapoecia	on side	2270	381	2	1.5	
Calapoecia		2285	375	4.5	2.5	
Calapoecia	fragment	2319	302			
Calapoecia		2531	312	5	2	
Calapoecia	overturned	2635	294	4	2	
Calapoecia	overturned	2734	387	5	3	
Calapoecia	tilted on side; mound shaped; encrusted by *Manipora*	3403	242	5	3	
Calapoecia	encrusting *Protrochiscolithus*	3832	230	5	2	
Calapoecia		3890	290	4.5	2.5	
Calapoecia	encrusted by *Protrochiscolithus*	3937	452	3	1	
Calapoecia		3947	356	4	2.5	
Calapoecia		3973	204	5	2.5	
Calapoecia		3979	44	2.5	1.5	
Calapoecia		4126	289	2	1.5	
Calapoecia	encrusting *Hormotoma*	4293	141	4	1	
Calapoecia		4405	102	7	3	
Calapoecia		4500	219	6.5	3	
Calapoecia	encrusting *Protrochiscolithus*	4519	312	3	2	
Calapoecia		4586	44	6.5	4	
Calapoecia		4616	182	4	3	
Calapoecia	overturned	4620	398	5.5	4.5	
Calapoecia		4629	264	2.5	2.5	
Calapoecia	encrusting stromatoporoid	4828	314	3	1	
Calapoecia	encrusting *Protrochiscolithus*	4997	111	3.5	1.5	
Calapoecia	encrusting *Protrochiscolithus*	5005	110	6	1.5	
Calapoecia		5143	428	6	1	
Calapoecia		5160	161	3	2	
Calapoecia		5312	66	5.5	1.5	
Calapoecia		5480	395	2.5	2.5	

EW Wall	Comments	x	y	W	H	D
Calapoecia		6130	398	6	4	
Calapoecia	encrusting stromatoporoid; in middle of storm lens	6157	260	4	2	
Calapoecia		6185	60	4	1.5	
Catenipora	overturned; scoured extensively	115	484	40	7	
Catenipora	fragment; tilted on side	121	436	4	2	
Catenipora		130	221			2
Catenipora	fragment directly on top of receptaculitid	432	250			
Catenipora	domical	553	300	8	3	
Catenipora	fragment in storm lens	598	271			
Catenipora	sideways	1075	222	5		
Catenipora	overturned	1335	437	4	2	
Catenipora	fallen on side	1770	398	11	5	
Catenipora	domical; grew higher in middle	1986	235	22	6	
Catenipora	on side	2008	389	6	3	
Catenipora	domical	2233	514	23	9	
Catenipora	tilted	2404	274	7	3	
Catenipora	fragment in storm lens	2679	210			
Catenipora		2748	387	13	5	
Catenipora	tilted on side; domical	3000	446	38	13	
Catenipora	domical	3062	507	12	6	
Catenipora		3778	60	6	5	
Catenipora		4723	284	16	6	
Catenipora		4815	437	8	4	
Catenipora		6190	88	10	4	
Catenipora		2476	23	8	2	
Catenipora	fragment in storm lens		246			
cephalopod	ventral siphuncle	43	286			3
cephalopod		64	300			8
cephalopod		164	323			2
cephalopod	apex pointing east; encrusted by *Protrochiscolithus* on bottom	184	307			7
cephalopod	fragment	218	298			
cephalopod		220	308			5
cephalopod	fragment	227	324			
cephalopod	siphuncle	233	261			1
cephalopod	siphuncle	252	184	9	3	
cephalopod	siphuncle	290	182	8		
cephalopod	siphuncle	292	221			3
cephalopod		310	268			5
cephalopod	fragment	317	329			
cephalopod		391	499			2.5
cephalopod	fragment	647	455			
cephalopod		651	497	6		3
cephalopod	*Cyrtogomphoceras*; encrusted by *Protrochiscolithus*	703	446			7
cephalopod		722	290			
cephalopod		725	291			
cephalopod	*Endoceras*?; apex points east	736	324	5	?	
cephalopod	apex up	750	268			9
cephalopod		816	498			3
cephalopod		822	498			2.5

EW Wall	Comments	x	y	W	H	D
cephalopod		868	437	5		1.5
cephalopod	fragment	928	200			
cephalopod	fragment	1174	423			
cephalopod		1180	210	3		
cephalopod	shell; good shielding; encrusted by *Protrochiscolithus*	1303	459			
cephalopod	in storm lens; apex points 170 degrees (longitudinal section); encrusted by *Saffordophyllum*	1330	341			8
cephalopod		1364	290			2
cephalopod	*Endoceras*? Siphuncle; apex points 170 degrees (longitudinal section)	1395	342			3
cephalopod	*Orthoceras*?	1404	516			5
cephalopod	apex pointing 170 degrees	1442	338			2.5
cephalopod	apex pointing 170 degrees	1446	337			3
cephalopod	fragment in storm lens	1526	318			
cephalopod	siphuncle	1543	204			3
cephalopod	in storm lens	1609	435	6		2.5
cephalopod	fragment	1644	215			
cephalopod	fragment	1706	194			
cephalopod	fragment in storm lens	1738	265			
cephalopod	*Endoceras*?	1837	271			5
cephalopod		1844	442	18		5
cephalopod	*Endoceras*?	1847	271			8
cephalopod	*Armenoceras*?	2340	455			8
cephalopod	*Armenoceras*?	2348	455			5
cephalopod		2360	424	12		3.5
cephalopod	*Endoceras*?	2430	439			10
cephalopod		2499	505			1.5
cephalopod		2569	427	8		3.5
cephalopod	fragment	2577	263			
cephalopod		2603	503	9		4
cephalopod	apex points east	2713	462	8		3.5
cephalopod	*Endoceras*?	2722	434			12.5
cephalopod	*Armenoceras*?	2796	425			3.5
cephalopod		2808	474	3		1.5
cephalopod	apex points south	2824	314			4
cephalopod		2828	323			3
cephalopod	*Endoceras*?	2914	316			9
cephalopod	*Endoceras*?	2923	320			3.5
cephalopod	fragment	2928	322			
cephalopod		2990	517	1.5		
cephalopod	Beaded siphuncle	3003	284	10		1.5
cephalopod	fragment	3173	192			
cephalopod		3353	325	15		
cephalopod	siphuncle	3391	238			2
cephalopod	beaded siphuncle; apex points west	3423	244	5		
cephalopod		3558	252			5
cephalopod		3722	39			6
cephalopod		3756	207			4
cephalopod		3792	389			3
cephalopod		3895	207			6

EW Wall	Comments	x	y	W	H	D
cephalopod	coiled; entire top surface encrusted by *Protrochiscolithus*; top of bed	3922	126			6
cephalopod		3922	287			7.5
cephalopod		3960	449			2.5
cephalopod		3984	205	15		2.5
cephalopod		4006	491			3
cephalopod		4007	420			2.5
cephalopod		4035	494			5
cephalopod		4046	312	16		6
cephalopod	in storm lens	4108	124			4
cephalopod	top of bed; apex points 225 degrees	4147	126	7		3.5
cephalopod		4186	467			1.5
cephalopod		4234	155			4.5
cephalopod		4238	143			6.5
cephalopod		4252	114	13		4
cephalopod		4280	38			5.5
cephalopod		4462	429			5
cephalopod		4465	428			3
cephalopod		4468	511			6
cephalopod		4470	429			3
cephalopod		4471	114			6
cephalopod		4480	27	13		3.5
cephalopod		4546	172	3.5		1.5
cephalopod		4575	407			4
cephalopod		4628	360			3
cephalopod	apex points east	4668	104	5		2
cephalopod		4742	322			3
cephalopod		4766	27	10		4
cephalopod		4783	158			4.5
cephalopod		4855	510			7
cephalopod		4877	143			4
cephalopod	encrusted by *Protrochiscolithus*	4887	43			13
cephalopod		4900	128			3
cephalopod		4903	143			4.5
cephalopod		4908	134			2
cephalopod		4918	148			3
cephalopod		4934	72			4
cephalopod		4961	337			4
cephalopod		5014	438			7.5
cephalopod		5057	153			1.5
cephalopod	apex points east	5070	154	13		3
cephalopod		5140	190			5
cephalopod		5172	297			7
cephalopod		5225	378			2
cephalopod		5268	370			2.5
cephalopod		5290	346	6		3
cephalopod	*Endoceras*?; apex points east	5309	73	30		9
cephalopod		5317	223			4
cephalopod		5405	328			4.5
cephalopod		5408	184			3

EW Wall	Comments	x	y	W	H	D
cephalopod		5421	437			2
cephalopod		5444	50	12		3
cephalopod	apex points west	5490	287	21		5.5
cephalopod		5495	441			3.5
cephalopod		5505	227			2
cephalopod		5516	35			5.5
cephalopod	apex points east	5572	180	18		4.5
cephalopod		5585	130			2.5
cephalopod		5590	446			5
cephalopod		5629	350			3
cephalopod		5682	138			2.5
cephalopod		5695	440			8
cephalopod		5796	368			3.5
cephalopod		5800	323			6
cephalopod		5910	65			6
cephalopod	apex points east	5994	307	13		4
cephalopod		6029	481			2
cephalopod		6050	133			12
cephalopod	encrusted by *Favistina*	6053	72			3
cephalopod		6070	132			9
cephalopod		6141	132			2.5
cephalopod		6167	370	5		
cephalopod	encrusted by *Protrochiscolithus*	6185	66			16
cephalopod	siphuncle	6185	387	50		3
cephalopod		6263	108			3
cephalopod	in storm lens		246			2.5
cephalopod	coiled; top of bed; *Cyrtogomphoceras*	13	349			
cephalopod	apex points west	280	377	7		4
cephalopod	*Endoceras*?	353	395			9.5
cephalopod	Shell fragment	537	382			
cephalopod		1161	402			3
cephalopod	shell; encrusted by *Protrochiscolithus*	1421	380			
cephalopod		1757	406			2.5
cephalopod		1793	389			4
cephalopod		2093	231			
cephalopod	*Endoceras*?; encrusted by *Protrochiscolithus*	2273	378			5.5
Crenulites		54	258	12	2	
Crenulites	maybe same one as above	63	269	5	1	
Crenulites	tabular	277	391	25	4.5	
Crenulites	thins to east; dissolved and filled with sediment	330	271	30	9	
Crenulites	overturned	400	256	7	3	
Crenulites	encrusted by *Favistina*	423	424	3	1	
Crenulites		506	459	4	2	
Crenulites		511	454	13	4	
Crenulites	tabular	512	489	81	7	
Crenulites		770	280	5	2	
Crenulites	heavily burrowed beneath	853	286	29	4	
Crenulites	shielding on top; whole rock overturned?	860	296	5	1	
Crenulites	growing on top of stromatoporoid	870	400	16	10	

EW Wall	Comments	x	y	W	H	D
Crenulites	toppled	934	306	3	15; 90?	
Crenulites	dissolved in middle	1094	368	25	6	
Crenulites	overturned	1317	441	14	2	
Crenulites	on top of storm lens	1476	297	9	1.5	
Crenulites		1520	429	22	4	
Crenulites		1776	298	28	3.5	
Crenulites	overturned; on top of storm lens	1860	275	10	3	
Crenulites	domical; directly above storm lens	1975	379	30	8	
Crenulites	partially burrowed	2064	230	16	4	
Crenulites		2067	431	61	11	
Crenulites	overturned	2110	300	26	5	
Crenulites	above storm lens	2160	332	50	12	
Crenulites	growth higher to west	2404	316	28	8	
Crenulites	tabular; overturned	2443	427	16	4	
Crenulites	domical	2515	304	20	5	
Crenulites		2603	425	15.5	8	
Crenulites	domical	2623	264	28	5	
Crenulites		2670	496	8	2.5	
Crenulites		2714	268	20	5	
Crenulites		2715	510	20	4	
Crenulites		2738	424	8	4	
Crenulites	killed by storm lens	2970	271	43	10	
Crenulites	domical	3111	201	13	4	
Crenulites	recrystallized	3150	335	11	4	
Crenulites	domical; dissolved in middle; killed at ends	3210	336	69	14	
Crenulites		3700	210	25.5	4	
Crenulites	dissolved in middle	3795	417	53	11	
Crenulites		3856	291	9	2	
Crenulites		4066	441	18	5	
Crenulites		4307	441	22	4.5	
Crenulites		4400	5	27	3.5	
Crenulites	highly dissolved	4525	299	10	3	
Crenulites		4745	231	19	4.5	
Crenulites		4841	295	13	3.5	
Crenulites		4905	261	14	4.5	
Crenulites		4986	291	12	4.5	
Crenulites	overturned	4992	395	26	9	
Crenulites		4998	216	23	6	
Crenulites		5020	239	22	5.5	
Crenulites		5048	380	12	3	
Crenulites		5067	238	18	3	
Crenulites		5201	329	16	4	
Crenulites		5287	309	4	1.5	
Crenulites		5294	260	51	6.5	
Crenulites		5312	438	11	5.5	
Crenulites		5314	273	9.5	5	
Crenulites		5385	445	37	7	
Crenulites		5993	509	7	3	
Crenulites		6035	297	11	1.5	

EW Wall	Comments	x	y	W	H	D
Crenulites		6043	404	9	3.5	
Crenulites	overturned	6222	18	7	2.5	
Crenulites		6246	389	33	5	
Crenulites		6265	312	57	8	
Crenulites	overturned; below storm lens	6300	412	15	7	
Favistina		195	442	7	2.5	
Favistina	domical	376	392	16	7	
Favistina	domical	424	389	24	7	
Favistina		468	300	3	1	
Favistina		1126	379	14	5	
Favistina	domical; on top of storm lens	1194	503	25	6	
Favistina	tabular; overturned	1502	435	4	1	
Favistina		1920	378	5	2	
Favistina	overturned; in storm lens	1926	289	6	2	
Favistina	tabular	2127	389	22	4	
Favistina		2407	396	23	4	
Favistina	more growth to west; dissolved	2526	269	14	0.5	
Favistina		2703	290	4	1	
Favistina		2888	276	26	7	
Favistina		2892	372	11	2	
Favistina	mound shaped	3540	190	8	3	
Favistina	encrusting *Favistina*	3862	382	4	2	
Favistina	encrusted by *Favistina*	3870	384	24	7	
Favistina		3894	432	13	2	
Favistina		3954	449	15	4.5	
Favistina		4147	429	18	4	
Favistina		4165	102	43	5	
Favistina		4188	303	27	5.5	
Favistina		4246	266	7.5	2	
Favistina	encrusting on receptaculitid	4365	484	3	1.5	
Favistina		4386	329	3	0.5	
Favistina		4450	333	35	5	
Favistina		4451	114	3	0.5	
Favistina	overturned; beneath stromatoporoid	4457	462	9	3	
Favistina		4490	329	15	4	
Favistina		4566	311	22	7.5	
Favistina		4683	382	22	6	
Favistina		4770	377	9	4	
Favistina		4805	347	19	6	
Favistina		4847	386	14	5	
Favistina		4904	345	17	4	
Favistina		4941	313	55	6	
Favistina	overturned	5077	96	20.5	3	
Favistina		5147	367	17	9	
Favistina		5243	341	9	1.5	
Favistina		5332	408	9	2	
Favistina		5458	136	56	7	
Favistina		5523	344	8.5	3	
Favistina	encrusting stromatoporoid	5565	419	11	2.5	

EW Wall	Comments	x	y	W	H	D
Favistina		5628	455	12	5.5	
Favistina		5751	427	9	2.5	
Favistina		5884	409	9	3.5	
Favistina	encrusting brachiopod	5905	80	6	3	
Favistina		5978	373	19	4.5	
Favistina	encrusting *Favistina*	6057	72	3	1	
Favistina		6075	23	5	1	
Favistina	overturned	6137	305	15	3.5	
Favistina		6182	496	8.5	1	
Favistina		6207	194	8	4	
Favistina		6218	389	13	4	
Favistina		6280	229	25.5	5.5	
gastropod		7	329			3
gastropod		9	318			2
gastropod	*Maclurina*	16	330			8
gastropod	*Trochonema*	17	290			3
gastropod	*Maclurina*	60	379			5
gastropod		67	269			2
gastropod	*Maclurina*	91	433			4
gastropod		95	281			3
gastropod	*Maclurina*	283	436	5	3	
gastropod		305	210			3
gastropod	directly on top of receptaculitid	329	361	4		1
gastropod		367	519			1.5
gastropod	*Maclurina*; encrusted by *Protrochiscolithus*	370	281			4
gastropod	*Maclurina*	370	426			4
gastropod	*Maclurina*	370	364			4.5
gastropod	*Maclurina*	406	233			10
gastropod	*Maclurina*	437	527			7.5
gastropod	*Maclurina*	574	357			3
gastropod	*Maclurina*	595	276			5
gastropod	*Maclurina*	599	277			3
gastropod	*Maclurina*	704	357			3
gastropod	*Maclurina*; encrusted by *Protrochiscolithus*	709	518			7
gastropod	*Maclurina*	749	429			4
gastropod	*Maclurina*	766	502			3
gastropod	*Maclurina*	821	274			5
gastropod	*Maclurina*	821	291			9
gastropod		822	274			2
gastropod	*Maclurina*	849	446			3
gastropod	*Maclurina*	952	183			
gastropod	*Maclurina*	962	261			4
gastropod	*Maclurina*; in storm lens	1097	270			4
gastropod	*Maclurina*	1217	182			3
gastropod	*Maclurina*	1218	188			6
gastropod	*Maclurina*	1240	520			11.5
gastropod	coiled	1405	399			2.5
gastropod		1432	374			2
gastropod	*Maclurina*	1497	202			5

EW Wall	Comments	x	y	W	H	D
gastropod	*Maclurina*	1507	361			4.5
gastropod	*Maclurina*	1516	339			3
gastropod	*Maclurina*	1516	201			7
gastropod	*Maclurina*	1530	379			3.5
gastropod	*Maclurina*	1570	435			7.5
gastropod	*Hormotoma*	1585	426	7		3.5
gastropod	fragment	1586	197			5
gastropod	*Maclurina*	1610	228			4
gastropod	*Maclurina*	1610	228			7
gastropod	in storm lens	1614	430			3
gastropod	*Maclurina*	1723	404			5.5
gastropod	*Maclurina*	1735	494			3.5
gastropod	*Maclurina*	1778	321			9
gastropod	*Maclurina*	1796	499			3.5
gastropod	*Trochonema*	1825	302			3
gastropod	*Maclurina*	1854	492			7
gastropod	*Maclurina*	1913	493			2.5
gastropod	*Maclurina*; in storm lens	1914	276			4
gastropod	*Maclurina*	1933	493			5
gastropod	*Maclurina*	2000	216			9
gastropod	*Maclurina*	2047	378			3.5
gastropod	*Maclurina*	2103	274			3
gastropod	*Maclurina*	2106	284			3
gastropod	*Maclurina*	2106	273			4
gastropod	*Maclurina*; encrusted by *Saffordophyllum*	2119	274			10
gastropod	*Maclurina*	2132	506			3.5
gastropod	*Maclurina*	2148	211			4
gastropod	*Maclurina*; above storm lens	2196	330			4
gastropod	*Maclurina*	2349	483			5
gastropod	*Trochonema*	2420	319			3.5
gastropod	*Trochonema*	2424	269			4.5
gastropod		2446	436			2.5
gastropod	*Hormotoma*; apex points east	2454	263	5.5		2
gastropod	*Maclurina*	2470	257			5
gastropod	*Maclurina*	2494	506			8
gastropod		2504	241			1
gastropod	*Hormotoma*	2587	506			1.5
gastropod	*Maclurina*	2614	503			7
gastropod	*Maclurina*	2627	505			3
gastropod	*Maclurina*	2680	507			4.5
gastropod	*Maclurina*	2721	425			7.5
gastropod	*Trochonema*	2728	270			3.5
gastropod	*Trochonema*	2765	272			2
gastropod		2786	428			2.5
gastropod		2791	423			3
gastropod	*Maclurina*	2803	508			12
gastropod	*Maclurina*	2868	421			4
gastropod	*Maclurina*	2908	421			5
gastropod	*Hormotoma*	2962	448	11		3.5

EW Wall	Comments	x	y	W	H	D
gastropod	*Maclurina*	2962	445			8
gastropod	*Maclurina*	2966	199			6
gastropod	*Maclurina*	3059	446			7
gastropod	*Maclurina*; encrusted by *Protrochiscolithus*	3066	498			5
gastropod	*Maclurina*	3108	228			6
gastropod	*Maclurina*	3127	429			5
gastropod	*Hormotoma*	3161	203	4	5	
gastropod		3186	221			3
gastropod	*Maclurina*	3239	493			3.5
gastropod	burrowed inside	3295	199			3
gastropod	*Maclurina*	3320	328			4.5
gastropod	*Maclurina*	3362	223			8
gastropod	*Maclurina*	3435	243			15
gastropod		3438	315			2
gastropod	*Maclurina*	3746	414			4
gastropod	*Maclurina*	3758	458			4
gastropod		3779	96			2
gastropod	*Maclurina*; encrusted by *Protrochiscolithus*	3828	230			4
gastropod	*Maclurina*	3861	467			10
gastropod	*Maclurina*	3870	504			15.5
gastropod		3898	136			2
gastropod	*Maclurina*	3900	170			9
gastropod	*Maclurina*	3911	308			3
gastropod	*Maclurina*; encrusted by *Calapoecia*	3977	43			4.5
gastropod	*Maclurina*	3993	341			3.5
gastropod	*Maclurina*	4033	417			7.5
gastropod	*Maclurina*	4035	516			10
gastropod	*Maclurina*	4110	100			3.5
gastropod	*Maclurina*	4115	485			4.5
gastropod	*Maclurina*	4124	480			3.5
gastropod		4130	141			2
gastropod	*Maclurina*	4134	418			3
gastropod		4225	95			2.5
gastropod	*Maclurina*	4285	14			3.5
gastropod	*Hormotoma*; lying on side; encrusted on bottom by *Calapoecia*	4290	142	7		5
gastropod		4294	141			1.5
gastropod		4337	133			2
gastropod	*Maclurina*; encrusted by *Favistina*	4451	113			3.5
gastropod		4459	114			2
gastropod	*Maclurina*	4470	281			3
gastropod		4557	131			2
gastropod	*Maclurina*	4579	406			4
gastropod	*Maclurina*	4588	185			14
gastropod		4636	159			1.5
gastropod	*Maclurina*	4643	148			6
gastropod		4690	83			2.5
gastropod		4700	100			1.5
gastropod	*Maclurina*	4710	100			5
gastropod	*Maclurina*	4713	305			4

EW Wall	Comments	x	y	W	H	D
gastropod	*Maclurina*	4754	306			4.5
gastropod		4758	25			3
gastropod	*Maclurina*	4779	233			4
gastropod	*Maclurina*	4788	235			4
gastropod		4838	347			2.5
gastropod		4866	239			2.5
gastropod	*Maclurina*	4870	210			3.5
gastropod	*Maclurina*	4931	369			5.5
gastropod	*Maclurina*	4952	403			6
gastropod	*Maclurina*	4956	394			4
gastropod		4960	83			2
gastropod		4963	222			1.5
gastropod		4997	136			3
gastropod		5048	105			2
gastropod		5050	83			3
gastropod		5060	303			2
gastropod	*Maclurina*; encrusted by *Protrochiscolithus*	5095	203			4
gastropod		5246	181			3
gastropod		5252	51			2
gastropod		5298	67		1.5	
gastropod		5328	501			3
gastropod	*Maclurina*	5381	52			4
gastropod	*Maclurina*	5384	355			6
gastropod	*Maclurina*	5390	340			5
gastropod	*Maclurina*	5402	146			3.5
gastropod	*Trochonema*	5418	96			1.5
gastropod	*Maclurina*	5486	234			4
gastropod	*Maclurina*	5491	74			4
gastropod	*Maclurina*; encrusted by *Protrochiscolithus*	5597	375			7
gastropod	*Maclurina*	5623	351			3.5
gastropod	*Maclurina*	5625	348			3
gastropod	*Maclurina*	5625	504			7
gastropod	*Maclurina*	5680	494			11.5
gastropod		5732	64			2
gastropod	*Maclurina*	5754	504			5
gastropod	*Maclurina*	4850	504			18
gastropod	in storm lens		246			2.5
gastropod	in storm lens		246			2.5
gastropod	in storm lens		246			3
gastropod	fragment in storm lens	47	209			1
gastropod	*Maclurina*; horn coral inside	5775	494			15
gastropod	*Maclurina*	5790	440			3.5
gastropod	*Maclurina*	5897	416			3
gastropod	*Maclurina*	5945	464			5
gastropod	*Maclurina*	6000	215			3.5
gastropod	*Hormotoma*	6074	170	4		2.5
gastropod	*Maclurina*	6105	503			4
gastropod	*Hormotoma*	6149	7	2		1.5
gastropod	*Maclurina*	6150	195			4.5

EW Wall	Comments	x	y	W	H	D
gastropod		6201	87			2
gastropod		6210	76			2
gastropod	*Maclurina*	6222	64			3
gastropod	*Maclurina*	6226	376	3.5		5
gastropod	*Maclurina*	6242	65			3.5
gastropod	*Maclurina*	6244	213			3.5
gastropod	*Maclurina*; horn coral inside	6250	509			21
gastropod		6271	503			3
gastropod	*Hormotoma*	6298	292	4.5		2.5
horn coral	epitheca gone; cardinal septum 45 degrees up from west	47	358			1
horn coral	epitheca abraded	97	254			3
horn coral	highly abraded; cardinal septum pointing west	100	434			2
horn coral	highly abraded; cardinal septum straight down	115	378			3
horn coral	epitheca abraded; cardinal septum due west	158	269			2
horn coral	epitheca abraded	159	267			1
horn coral	epitheca gone; cardinal septum 30 degrees down from west	167	434			1
horn coral	epitheca abraded; cardinal septum 40 degrees down from east	170	449			1.5
horn coral	highly abraded	177	324			3
horn coral	moderately abraded	191	296			2
horn coral	highly abraded	217	433			2.5
horn coral	highly abraded	238	213			3
horn coral	apex pointing west	238	263	4		3
horn coral	highly abraded; on top of storm lens	312	429			2.5
horn coral		316	222			1
horn coral	highly abraded	331	222			2
horn coral	highly abraded	339	424			1
horn coral	highly abraded	347	428			2.5
horn coral	moderately abraded	359	216			3
horn coral	fragment	364	487			
horn coral		366	328			4
horn coral		412	499	1.5		1.5
horn coral	moderately abraded	442	436			2
horn coral	highly abraded	444	225			
horn coral	epitheca abraded	531	483			1
horn coral	apex points east	556	485	4		2.5
horn coral	highly abraded	559	386			3
horn coral	highly abraded	589	491			2.5
horn coral	burrowed into; Bryozoan inside	604	270			4
horn coral	highly abraded	639	486			2.5
horn coral	epitheca abraded; cardinal septum 30 degrees down from east	668	457			1
horn coral	apex pointing west	669	270			4
horn coral	highly abraded	711	435			2
horn coral	highly abraded	715	435			2.5
horn coral		722	190			1
horn coral	highly abraded	740	386			5
horn coral	well preserved; cardinal septum 30 degrees down from west	748	261			4
horn coral	epitheca abraded	759	288			2
horn coral	highly abraded	777	446			4
horn coral	epitheca abraded; cardinal septum 60 degrees down from west	812	264			2

EW Wall	Comments	x	y	W	H	D
horn coral	highly abraded	841	438			3
horn coral	epitheca abraded	864	201			1
horn coral	epitheca abraded; cardinal septum 60 degrees up from west	867	285			2
horn coral	highly abraded	892	483			4
horn coral	highly abraded	944	222			2
horn coral	cardinal septum 45 degrees down from west	945	447			3.5
horn coral	epitheca abraded; cardinal septum 30 degrees down from west	958	266			1
horn coral	tilted	993	219			
horn coral	well preserved; cardinal septum 30 degrees down from east	1079	266			4
horn coral	slightly abraded; cardinal septum 50 degrees up from west	1119	273			2
horn coral	epitheca abraded	1137	439			3
horn coral	epitheca abraded; cardinal septum 45 down from east	1145	274			3
horn coral	well preserved; apex pointing west	1175	316			4
horn coral	sideways; epitheca abraded; scoured	1185	193			3
horn coral	highly abraded	1198	486			2.5
horn coral	epitheca abraded	1208	188			3
horn coral	sideways	1214	234			2
horn coral	epitheca abraded; cardinal septum 30 degrees down from west	1304	460			3
horn coral	highly abraded; cardinal septum 80 down from east	1330	253			1
horn coral	moderately abraded	1378	388			3
horn coral	highly abraded	1388	401			1.5
horn coral	apex points west	1392	433	3.5		2
horn coral	highly abraded	1419	399			2
horn coral	highly abraded	1424	401			3
horn coral	highly abraded	1448	298			3
horn coral	epitheca gone	1465	203			1
horn coral	sideways	1473	228			1
horn coral	highly abraded	1479	260			2
horn coral	cardinal septum 30 degrees down from west	1490	498			1
horn coral	highly abraded; in storm lens	1532	256			2
horn coral	in growth position; highly abraded	1538	251	4		2
horn coral	highly abraded	1591	493			3
horn coral	highly abraded	1593	260			3
horn coral	epitheca abraded	1594	464			1.5
horn coral	weakly abraded; cardinal septum 10 degrees down from west	1626	251			3.5
horn coral	epitheca abraded; cardinal septum 50 degrees down from west	1672	449			2.5
horn coral	moderately abraded; cardinal septum 50 degrees up from west	1729	318			2
horn coral	cardinal septum 45 degrees up from west	1757	401			1
horn coral	slightly abraded; cardinal septum 45 degrees up from east	1760	300			3
horn coral	highly abraded	1763	271			1.5
horn coral	epitheca gone	1795	253			1.5
horn coral	epitheca abraded	1827	488			3
horn coral	weakly abraded; cardinal septum 20 degrees down from west	1853	269			3
horn coral	highly abraded; apex pointing east	1897	290			2
horn coral	highly abraded	1917	290			1
horn coral	epitheca abraded	1918	468			2.5
horn coral	highly abraded	1928	288			2
horn coral	weakly abraded; cardinal septum 75 degrees up from east	1961	252			4.5
horn coral	apex pointing west	1973	240		3	

EW Wall	Comments	x	y	W	H	D
horn coral	epitheca abraded; cardinal septum 50 degrees down from west	1982	507			1.5
horn coral	epitheca abraded	1985	464			1.5
horn coral	well preserved; cardinal septum 30 degrees down from east	1991	464			4
horn coral	highly abraded	1997	270			1
horn coral	cardinal septum 50 degrees down from west	2092	485			2.5
horn coral	cardinal septum 65 degrees down from east; epitheca abraded	2150	208			1
horn coral		2150	222			2
horn coral	highly abraded	2156	298			2.5
horn coral	highly abraded	2202	253			2.5
horn coral	highly abraded	2233	267			3
horn coral		2241	223			1
horn coral	highly abraded; in storm lens	2281	321			1
horn coral	apex points west	2322	311			2
horn coral		2343	399			3.5
horn coral		2353	370			3
horn coral	highly abraded	2361	486			1.5
horn coral	epitheca gone	2366	424			1
horn coral	highly abraded	2387	492			1
horn coral	cardinal septum 80 degrees down from east	2404	213			1
horn coral	moderately abraded; apex points west	2421	262	6		3
horn coral	highly abraded	2426	193			1
horn coral	highly abraded; cardinal septum 30 degrees down from west	2510	506			3.5
horn coral	in storm lens	2540	306			1
horn coral		2542	324			1
horn coral	highly abraded	2632	287			2
horn coral	apex points east; tilted	2640	261			3
horn coral	weakly abraded; cardinal septum 50 degrees down from west	2652	312			3
horn coral		2673	209			3
horn coral	well preserved; cardinal septum 20 degrees down from west	2700	509			2.5
horn coral		2758	214			4
horn coral	encrusted by *Saffordophyllum*	2758	392			2.5
horn coral	highly abraded	2770	423			1
horn coral	highly recrystallized	2770	427			4.5
horn coral	weakly abraded	2773	421			4
horn coral	weakly abraded; cardinal septum 30 degrees down from west	2775	426			1
horn coral	cardinal septum straight down	2784	423			3.5
horn coral	in storm lens	2804	427	5.5		4
horn coral	highly abraded	2829	264			2.5
horn coral	highly abraded	2888	421			1.5
horn coral	epitheca abraded; cardinal septum due east	2907	363			4
horn coral	slightly abraded; cardinal septum 30 degrees down from east	2917	338			3
horn coral	highly abraded; cardinal septum 30 degrees down from west	3082	454			2
horn coral		3102	230			2
horn coral	cardinal septum 45 degrees up from west	3112	223			3
horn coral	moderately abraded	3130	429			1
horn coral	weakly abraded; cardinal septum 45 degrees up from east	3158	300			5
horn coral	highly abraded; in storm lens	3166	266			2.5
horn coral		3210	480			2
horn coral	highly abraded	3309	237			1

EW Wall	Comments	x	y	W	H	D
horn coral	epitheca abraded; cardinal septum 80 degrees down from east	3313	241			1
horn coral	highly abraded	3318	235			2
horn coral	highly abraded; apex pointing west	3334	238	3		
horn coral	highly abraded	3342	238			2
horn coral	highly abraded	3358	242			1
horn coral	highly abraded; cardinal septum 50 degrees down from east	3362	224			1
horn coral	highly abraded; cardinal septum straight down	3368	272			2
horn coral	highly abraded	3418	225			2
horn coral	highly abraded	3482	296			3
horn coral	well preserved	3487	248			4
horn coral	well preserved; cardinal septum 45 degrees down from east	3546	247			4
horn coral	moderately abraded	3566	250			2
horn coral		3586	247			1
horn coral	highly abraded	3590	241			1
horn coral	epitheca abraded	3715	39			1.5
horn coral	moderately abraded	3729	84			1.5
horn coral	highly abraded	3750	295			4
horn coral	highly abraded	3766	462			2.5
horn coral	highly abraded; apex points east	3797	159	3.5		3
horn coral	weakly abraded	3799	440			2
horn coral	highly abraded	3807	402			3
horn coral	epitheca abraded	3808	41			2.5
horn coral	highly abraded	3810	438			3
horn coral	highly abraded	3870	466			2
horn coral	highly abraded	3891	454			2
horn coral	highly abraded	3909	355			3
horn coral	highly abraded	3934	410			1
horn coral	highly abraded	3947	290			1
horn coral	epitheca abraded	3947	307			1.5
horn coral		3958	67			1
horn coral	life position	3960	25	3		3
horn coral	weakly abraded	3975	458			2
horn coral	highly abraded	4000	310			5
horn coral	highly abraded	4002	404			1.5
horn coral	highly abraded	4004	355			1
horn coral	highly abraded	4010	282			2
horn coral	highly abraded	4014	118			3.5
horn coral	highly abraded	4039	116			3
horn coral	highly abraded	4040	302			1
horn coral	highly abraded	4040	307			3
horn coral	highly abraded	4044	117			3
horn coral		4050	463			3.5
horn coral	highly abraded	4064	118			1.5
horn coral	highly abraded	4065	114			1.5
horn coral	well preserved; cardinal septum 45 degrees up from west	4070	259			3
horn coral	highly abraded	4085	105			2
horn coral	highly abraded	4085	121			3
horn coral	highly abraded	4110	417			1.5
horn coral	highly abraded	4115	23			4

EW Wall	Comments	x	y	W	H	D
horn coral	highly abraded	4145	184			2
horn coral	highly abraded	4150	183	3.5		2.5
horn coral	moderately abraded	4152	306			2
horn coral	highly abraded	4154	184	3		2.5
horn coral	weakly abraded	4172	471			2
horn coral	weakly abraded; cardinal septum 45 degrees down from east	4175	472			2
horn coral	highly abraded	4190	469			3
horn coral	highly abraded	4193	120			2
horn coral	highly abraded	4206	469			3
horn coral	highly abraded	4208	466			3.5
horn coral	highly abraded	4222	468			3
horn coral	highly abraded	4255	467			1.5
horn coral	highly abraded	4259	468			4
horn coral	highly abraded	4261	31			1
horn coral	highly abraded	4263	32			1
horn coral	highly abraded	4265	35			2
horn coral	highly abraded	4276	34			1
horn coral	moderately abraded	4332	478			2
horn coral	highly abraded	4335	477			1
horn coral	epitheca abraded; cardinal septum 75 degrees down from west	4358	47			1.5
horn coral	weakly abraded	4388	330			1
horn coral	epitheca abraded; cardinal septum 45 degrees up from east	4390	65			1
horn coral	weakly abraded	4390	278			1
horn coral	weakly abraded	4395	278			1
horn coral	highly abraded	4402	40			1.5
horn coral	highly abraded	4416	3			3.5
horn coral	moderately abraded	4444	352			1.5
horn coral	moderately abraded	4458	3			1
horn coral	epitheca abraded	4468	112			1
horn coral	highly abraded	4502	43			3
horn coral	highly abraded	4505	178	1		1
horn coral	highly abraded	4510	22			1
horn coral	weakly abraded	4539	484			4
horn coral	highly abraded; apex points west	4546	96	5		4
horn coral	moderately abraded	4550	260			4.5
horn coral	highly abraded	4576	36			2
horn coral	highly abraded	4614	465			3
horn coral	epitheca abraded; cardinal septum 45 degrees down from west	4644	150			1.5
horn coral	highly abraded	4698	281			2
horn coral	highly abraded	4710	15	1		1
horn coral	highly abraded	4711	13			1
horn coral	weakly abraded; cardinal septum 30 degrees down from west	4711	104			4.5
horn coral		4751	102	2.5		2
horn coral	epitheca abraded	4760	26			2
horn coral		4766	66	2		1.5
horn coral	highly	4815	63			1
horn coral	epitheca abraded; cardinal septum 10 degrees up from west	4832	38	5		3.5
horn coral	moderately abraded	4838	38	5		3.5
horn coral	highly abraded	4859	238			3.5

EW Wall	Comments	x	y	W	H	D
horn coral	weakly abraded; cardinal septum 45 degrees up from east	4860	501			1.5
horn coral	moderately abraded; cardinal septum 30 degrees up from east	4862	81			4
horn coral	weakly abraded	4862	286			1.5
horn coral	highly abraded	4890	455			1.5
horn coral	epitheca abraded; cardinal septum 45 degrees down from east	4924	83			2
horn coral	highly abraded	4962	147			2.5
horn coral	weakly abraded; cardinal septum 60 degrees up from east	4980	404			3
horn coral	moderately abraded	5033	405			3.5
horn coral	moderately abraded	5039	405			2
horn coral	moderately abraded	5047	405			2.5
horn coral	highly abraded	5049	405			1.5
horn coral	highly abraded	5073	473			2.5
horn coral	highly abraded	5075	504			2
horn coral	highly abraded	5081	215			3.5
horn coral	highly abraded	5088	472			2
horn coral	highly abraded	5097	29			3.5
horn coral	highly abraded	5118	507			4.5
horn coral	apex points west	5133	102	8		3
horn coral	moderately abraded; cardinal septum 50 degrees down from east	5153	105			2.5
horn coral	moderately abraded; cardinal septum 5 degrees up from west	5156	102			3
horn coral	highly abraded	5174	164			3.5
horn coral	highly abraded	5195	38			3.5
horn coral	highly abraded	5200	259			3
horn coral	highly abraded	5205	257			2.5
horn coral	epitheca abraded; cardinal septum 75 degrees down from east	5216	259			4
horn coral	weakly abraded; cardinal septum 45 degrees down from east	5227	303			2
horn coral	highly abraded	5260	256			3
horn coral	moderately abraded	5273	344			4
horn coral	highly abraded	5274	48	2.5		2.5
horn coral	moderately abraded	5276	51	3.5		2
horn coral	highly abraded	5306	404			3
horn coral	highly abraded	5310	68			4
horn coral	epitheca abraded	5329	66			1.5
horn coral	highly abraded	5342	4			5
horn coral	moderately abraded; cardinal septum points east	5346	104			1.5
horn coral	cardinal septum 50 degrees down from east	5348	67			1.5
horn coral	highly abraded	5374	73			1
horn coral	moderately abraded	5382	388			2
horn coral	highly abraded	5384	46			1
horn coral	highly abraded	5385	17			3
horn coral	moderately abraded	5405	274			1.5
horn coral	moderately abraded; cardinal septum points straight down	5417	96			2
horn coral	epitheca abraded; cardinal septum 45 degrees down from east	5430	407			2
horn coral	moderately abraded	5439	450			1
horn coral	highly abraded	5453	487			2
horn coral	epitheca abraded	5516	237			2.5
horn coral	highly abraded	5562	129			3.5
horn coral	highly abraded	5566	129			3
horn coral	highly abraded	5576	131			3

EW Wall	Comments	x	y	W	H	D
horn coral	highly abraded	5582	304			3
horn coral	highly abraded	5583	302			4
horn coral	highly abraded	5603	350			4.5
horn coral	weakly abraded	5605	417			2
horn coral	highly abraded	5609	233			1.5
horn coral	highly abraded	5613	277			2
horn coral	highly abraded	5615	277			3
horn coral	highly abraded	5631	371			3
horn coral	weakly abraded; cardinal septum 50 degrees down from west	5634	273			2.5
horn coral	highly abraded	5639	147			3
horn coral	highly abraded	5643	118			2.5
horn coral	highly abraded	5655	368			2
horn coral	inside gastropod; moderately abraded	5700	457			1.5
horn coral	highly abraded	5766	161			2
horn coral	highly abraded	5768	353			2
horn coral	epitheca abraded	5778	44			2.5
horn coral	highly abraded	5800	400			4
horn coral	highly abraded	5804	367			2
horn coral	highly abraded	5805	46			3
horn coral	highly abraded	5806	24			1.5
horn coral	highly abraded	5806	400			2
horn coral	moderately abraded	5822	315			2
horn coral	weakly abraded; cardinal septum 15 degrees down from west	5943	39			2
horn coral	highly abraded	5981	61			2
horn coral	epitheca abraded; cardinal septum 60 degrees down from east	5992	77			1
horn coral	highly abraded	6005	209			3.5
horn coral	highly abraded	6065	410			4
horn coral	highly abraded	6065	410			4
horn coral	highly abraded	6082	405			3.5
horn coral	highly abraded	6097	392			3
horn coral	highly abraded	6115	48			4
horn coral	highly abraded	6142	195			4.5
horn coral	highly abraded	6149	407			3
horn coral	highly abraded	6152	7			2.5
horn coral	highly abraded	6160	45			3
horn coral		6174	61	4		3.5
horn coral	highly abraded; inside cephalopod	6181	67			2
horn coral	inside gastropod; moderately abraded	6200	457			1.5
horn coral	moderately abraded	6202	74			4
horn coral	moderately abraded	6223	26			3.5
horn coral	highly abraded	6225	64			3.5
horn coral	epitheca abraded; cardinal septum 45 degrees up from west	6233	281			1.5
horn coral	epitheca abraded	6242	65			3
horn coral	highly abraded	6242	476			2
horn coral	highly abraded	6242	481			1
horn coral	highly abraded	6251	163	2.5		1.5
horn coral	highly abraded	6270	418			3
horn coral	highly abraded	6274	35			1.5
horn coral	highly abraded	28	224			2

EW Wall	Comments	x	y	W	H	D
horn coral		7	206			1
horn coral	in storm lens		246			2.5
horn coral	highly abraded	322	482			1.5
horn coral	epitheca abraded	540	484			1
horn coral	highly abraded; cardinal septum 50 degrees up from west	779	258			2
horn coral	epitheca abraded; cardinal septum 30 degrees up from east	1065	490			1
horn coral	moderately abraded	4575	456			2
horn coral	highly abraded	4708	386			4
horn coral	highly abraded	4716	31			1
horn coral	weakly abraded; cardinal septum 20 down from east	5011	391			2.5
Manipora	fragment in storm lens	1097	266			
Manipora		3993	449	19	9	
Manipora		5960	129	11	5	
Palaeophyllum	12 corallites	4735	359	9	6	
Palaeophyllum		5355	70	9	5	
Protrochiscolithus		4899	138	16	4	
Protrochiscolithus		5318	135	9.5	1.5	
Protrochiscolithus		6	496	9.5	2.5	
Protrochiscolithus		11	532	14	5	
Protrochiscolithus	overturned	124	532	4.5	2.5	
Protrochiscolithus	encrusting cephalopod	186	304	7	1	
Protrochiscolithus	encrusting stromatoporoid above	292	279	10	1	
Protrochiscolithus	encrusting gastropod	370	281			4.5
Protrochiscolithus	domical	462	401	7	6	
Protrochiscolithus	encrusting cephalopod	704	448	10	0.5	
Protrochiscolithus	encrusting gastropod	707	519	5	0.5	
Protrochiscolithus	encrusting a receptaculitid	826	395	15	12	
Protrochiscolithus		964	462	7	1	
Protrochiscolithus		1006	251	9	1	
Protrochiscolithus		1185	265	4	0.5	
Protrochiscolithus	encrusting receptaculitid	1198	321	4	0.5	
Protrochiscolithus	domed, encrusted on stromatoporoid	1206	232			
Protrochiscolithus	partially bored	1282	469	9	5	
Protrochiscolithus	encrusting cephalopod	1303	460	8	0.5	
Protrochiscolithus		1438	310	5	0.5	
Protrochiscolithus	encrusting cephalopod	1446	378	6	0.5	
Protrochiscolithus		1523	437	5	2.5	
Protrochiscolithus		1532	424	9	5	
Protrochiscolithus	borings	1699	404	4	3	
Protrochiscolithus	encrusting receptaculitid	1797	402	5	0.5	
Protrochiscolithus	encrusting stromatoporoid	1808	405	5	3.5	
Protrochiscolithus		1850	411	4	3	
Protrochiscolithus	domical	1850	469	13	6	
Protrochiscolithus	overturned	1878	400	10	8	
Protrochiscolithus		2059	402	3	1	
Protrochiscolithus		2230	463	9	2.5	
Protrochiscolithus	encrusting *Endoceras*?	2269	382	4	0.5	
Protrochiscolithus	encrusting stromatoporoid	2451	447			
Protrochiscolithus		2478	293	4	0.5	

EW Wall	Comments	x	y	W	H	D
Protrochiscolithus		2484	361	5	0.5	
Protrochiscolithus		2545	429	10	3	
Protrochiscolithus	encrusting bryozoan	2621	429	8.5	0.5	
Protrochiscolithus	overturned; encrusting *Saffordophyllum*	2756	388	13	1.5	
Protrochiscolithus	domical	2764	519	15	5	
Protrochiscolithus	encrusting gastropod; bored	3066	501	5	1	
Protrochiscolithus	bored; overturned	3093	227	13	2	
Protrochiscolithus		3450	266	13	1	
Protrochiscolithus		3812	409	7.5	1	
Protrochiscolithus		3812	409	7.5	1	
Protrochiscolithus	encrusting algal stromatolite	3819	62	4	3.5	
Protrochiscolithus	encrusting gastropod; encrusted by *Calapoecia*	3831	230	4.5	2	
Protrochiscolithus		3851	11	5	1	
Protrochiscolithus		3875	288	8	1	
Protrochiscolithus	encrusting cephalopod	3922	126	6	1	
Protrochiscolithus	encrusting stromatoporoid	3924	449	8	1	
Protrochiscolithus	encrusting *Calapoecia*	3927	453	4	1	
Protrochiscolithus		3980	499	13	3	
Protrochiscolithus		4011	314	8	1.5	
Protrochiscolithus		4045	266	12	1	
Protrochiscolithus		4061	366	11.5	1	
Protrochiscolithus	in storm lens; encrusting *Catenipora*	4235	100	9	6	
Protrochiscolithus		4244	307	10	1	
Protrochiscolithus		4334	262	5.5	1	
Protrochiscolithus		4386	471	8	1	
Protrochiscolithus	encrusted on east side by *Calapoecia*	4528	312	12	5	
Protrochiscolithus	encrusting	4541	187	9	2	
Protrochiscolithus	encrusting stromatoporoid	4583	407	6.5	1.5	
Protrochiscolithus	good shielding	4651	345	7	3	
Protrochiscolithus		4698	393	9	3	
Protrochiscolithus		4702	471	8	7	
Protrochiscolithus		4801	384	11	2	
Protrochiscolithus	encrusting stromatoporoid	4837	313	4	1	
Protrochiscolithus	encrusting stromatoporoid	4845	435	9	1	
Protrochiscolithus	encrusting cephalopod; overturned	4882	39	8	1	
Protrochiscolithus		4949	469	9	4	
Protrochiscolithus	encrusted by *Calapoecia* (twice)	4998	111	20	1	
Protrochiscolithus		5035	393	10	1.5	
Protrochiscolithus		5051	345	5.5	1	
Protrochiscolithus	encrusting gastropod	5098	204	5	4.5	
Protrochiscolithus		5105	242	16	4	
Protrochiscolithus		5120	380	12	2	
Protrochiscolithus		5382	400	4	2	
Protrochiscolithus	overturned	5388	307	11	2	
Protrochiscolithus		5396	506	7	1	
Protrochiscolithus		5426	509	5	3	
Protrochiscolithus		5503	379	5	1.5	
Protrochiscolithus	encrusting gastropod	5597	377	6	1	
Protrochiscolithus		5701	3	3	0.5	

EW Wall	Comments	x	y	W	H	D
Protrochiscolithus		5705	292	6	1	
Protrochiscolithus		5749	483	8.5	1	
Protrochiscolithus		5761	407	8	1	
Protrochiscolithus		5803	372	5.5	1	
Protrochiscolithus		5854	408	3.5	1	
Protrochiscolithus		5896	239	5.5	1	
Protrochiscolithus	encrusting receptaculitid	5911	352	6.5	1	
Protrochiscolithus		5957	489	13	1	
Protrochiscolithus		5968	224	5	1.5	
Protrochiscolithus	encrusting stromatoporoid	5990	460	4.5	1	
Protrochiscolithus		6010	414	12	3.5	
Protrochiscolithus	encrusting cephalopod	6182	64	13	1	
Protrochiscolithus	encrusting stromatoporoid	6234	405	14	1.5	
receptaculitid	good shielding	1	454	17	1	
receptaculitid		6	502	17	1	
receptaculitid		10	359	6	1.5	
receptaculitid		20	516	10	1	
receptaculitid		46	490	13	1.5	
receptaculitid		52	219	5		
receptaculitid	on top of storm lens	63	363	12	1	
receptaculitid	overturned	70	277	15	1	
receptaculitid		86	372	19	1	
receptaculitid		93	422	11	1	
receptaculitid		142	328	6	1	
receptaculitid	encrusting stromatoporoid above	160	279	10	1	
receptaculitid		170	396	14	1	
receptaculitid		177	449	17	1	
receptaculitid		182	446	12	1	
receptaculitid		235	385	11	1.5	
receptaculitid		266	259	10	1	
receptaculitid		280	357	12	1	
receptaculitid	good shielding	312	506	12	1	
receptaculitid		319	389	9	1	
receptaculitid		327	461	14	1	
receptaculitid	good shielding	329	511	10	1	
receptaculitid	gastropod directly on top	333	360	27	1	
receptaculitid	good shielding	351	506	10.5	1	
receptaculitid		362	459	12	1	
receptaculitid		377	459	19	1	
receptaculitid	on top of storm lens	380	431	19	1	
receptaculitid		410	369	11	1	
receptaculitid		422	356	1		
receptaculitid		440	250	19	1	
receptaculitid		446	200	38	1	
receptaculitid		473	516	13	1.5	
receptaculitid		477	366	8	1	
receptaculitid		477	393	11	1	
receptaculitid	good shielding	478	460	23	1	
receptaculitid		529	451	16	1	

EW Wall	Comments	x	y	W	H	D
receptaculitid		537	506	17	1	
receptaculitid		550	330	12	1	
receptaculitid		550	497	18	1	
receptaculitid		552	382	10	1	
receptaculitid		558	318	12	1	
receptaculitid		562	512	11	1	
receptaculitid	directly on top of unburrowed sediment; great shielding	580	383	31	2.5	
receptaculitid		597	357	15	1	
receptaculitid	good shielding	602	501	11	1	
receptaculitid		603	388	10	1	
receptaculitid		605	383	12	1	
receptaculitid		623	367	9	1	
receptaculitid		624	389	13	1.5	
receptaculitid		642	498	8	1	
receptaculitid		654	359	13	1.5	
receptaculitid		662	497	9	1	
receptaculitid		688	354	8	1.5	
receptaculitid	good shielding	693	425	18	1	
receptaculitid		704	376	13	1	
receptaculitid		723	462	9.5	1	
receptaculitid	good shielding	736	295	10	1	
receptaculitid	good shielding	748	251	10	1	
receptaculitid		769	499	21	1.5	
receptaculitid		813	256	20	1	
receptaculitid		818	262	7	1	
receptaculitid	encrusted by *Protrochiscolithus*; on top of storm lens	826	390	23	1	
receptaculitid		840	420	14	1	
receptaculitid		849	263	2	1	
receptaculitid	directly on top of storm lens	853	363	14	1	
receptaculitid	good shielding	856	279	10	1	
receptaculitid	on top of storm lens	888	437	10	0.5.	
receptaculitid		910	330	12	1	
receptaculitid		916	489	15	1	
receptaculitid	good shielding from burrowing	932	234	22	1	
receptaculitid		932	389	20	1	
receptaculitid		938	328	8	1	
receptaculitid		947	256	18	1	
receptaculitid		955	436	16	1	
receptaculitid		966	493	13	1	
receptaculitid		967	265	10	1	
receptaculitid	good shielding	981	507	15	1	
receptaculitid		982	495	17	1	
receptaculitid		1020	298	27	1	
receptaculitid		1028	318	20	2	
receptaculitid		1028	328	21	2	
receptaculitid	good shielding	1050	407	19	1	
receptaculitid		1056	263	9	1	
receptaculitid		1076	448	11	1	
receptaculitid		1083	262	15	1	

EW Wall	Comments	x	y	W	H	D
receptaculitid		1087	492	16	1	
receptaculitid		1097	494	8	1	
receptaculitid		1107	316	48	2	
receptaculitid	good shielding	1144	373	10	1	
receptaculitid	good shielding	1145	492	16	1	
receptaculitid	moderate shielding	1153	392	14	1	
receptaculitid		1155	507	9	1	
receptaculitid		1158	276	12	1	
receptaculitid		1168	441	6.5	1	
receptaculitid		1172	283	20	1.5	
receptaculitid	encrusted by *Protrochiscolithus*	1192	320	20	1	
receptaculitid		1200	457	8	1	
receptaculitid		1234	371	23	1	
receptaculitid	below storm lens	1243	394	19	1	
receptaculitid	good shielding	1270	495	13	1	
receptaculitid		1280	391	17	1	
receptaculitid		1297	395	6	1	
receptaculitid		1301	288	11	1	
receptaculitid		1304	239	10	1	
receptaculitid		1372	492	28	2	
receptaculitid		1382	424	24	1	
receptaculitid		1385	322	15	1	
receptaculitid	good shielding	1420	449	15	1	
receptaculitid		1422	362	15	2	
receptaculitid		1429	500	10	1	
receptaculitid		1445	377	23	1	
receptaculitid		1455	437	11	1	
receptaculitid		1467	204	18	1	
receptaculitid		1472	301	9	1	
receptaculitid		1490	236	8	1	
receptaculitid	good shielding	1493	400	16	1	
receptaculitid		1500	462	12	1	
receptaculitid	in storm lens	1504	203	8	1	
receptaculitid		1508	495	8	1	
receptaculitid	good shielding	1508	523	16	1.5	
receptaculitid		1520	481	16	1	
receptaculitid		1522	485	14	1	
receptaculitid		1523	500	23	1.5	
receptaculitid	in storm lens	1534	202	11	1	
receptaculitid	possibly same as above	1540	364	10	1.5	
receptaculitid		1545	385	19	1	
receptaculitid		1557	364	10	1.5	
receptaculitid		1560	519	15	1	
receptaculitid		1567	226	10	1	
receptaculitid		1582	276	11	1	
receptaculitid	good shielding	1587	301	10	1	
receptaculitid		1606	381	9	1.5	
receptaculitid		1610	265	26	1.5	
receptaculitid	fragment in storm lens	1610	430	3	1	

EW Wall	Comments	x	y	W	H	D
receptaculitid		1615	253	25	2	
receptaculitid	fragment in storm lens	1620	431	5	1	
receptaculitid		1629	433	10	0.5	
receptaculitid	domical	1635	220	19	1	
receptaculitid	in storm lens	1635	493	11	1	
receptaculitid		1640	400	22	1	
receptaculitid		1642	382	19	0.5	
receptaculitid	good shielding	1675	440	18	1.5	
receptaculitid		1677	387	11	1	
receptaculitid		1720	462	7	1	
receptaculitid	on top of storm lens	1727	496	9	1	
receptaculitid	above storm lens; partial shielding	1732	323	16	1	
receptaculitid	on top of storm lens; good shielding	1738	435	9	1	
receptaculitid		1743	494	7	1	
receptaculitid		1763	492	10	1	
receptaculitid	good shielding	1773	516	14	1	
receptaculitid	encrusted by *Protrochiscolithus*	1799	401	17	1.5	
receptaculitid		1820	383	19	1	
receptaculitid		1827	441	14	1	
receptaculitid		1853	427	9	1	
receptaculitid		1865	426	12	1	
receptaculitid	on top of storm lens; encrusted by *Protrochiscolithus*	1878	400	41	1.5	
receptaculitid	good shielding	1890	288	17	1	
receptaculitid	good shielding	1892	326	18	1	
receptaculitid		1915	512	15	1.5	
receptaculitid		1940	371	8	1	
receptaculitid		1953	425	14	1	
receptaculitid		1954	459	14	1	
receptaculitid	good shielding	1986	433	16	1	
receptaculitid		2002	422	12	1	
receptaculitid		2009	393	9	1	
receptaculitid		2015	505	18	1	
receptaculitid	good shielding	2026	329	9	1	
receptaculitid		2035	435	13	1	
receptaculitid	good shielding	2049	503	21	2	
receptaculitid	good shielding	2052	464	10	1	
receptaculitid		2053	444	11	1	
receptaculitid		2118	504	9	1	
receptaculitid		2134	467	10	1	
receptaculitid	good shielding	2150	316	12	1	
receptaculitid	good shielding	2184	497	15	1	
receptaculitid		2190	254	20	1	
receptaculitid		2223	329	13	1.5	
receptaculitid		2254	263	18	1	
receptaculitid		2257	503	13	1	
receptaculitid		2264	506	9	1	
receptaculitid		2267	446	10	1	
receptaculitid		2272	496	13	1	
receptaculitid		2283	482	9	0.5	

EW Wall	Comments	x	y	W	H	D
receptaculitid	good shielding	2304	494	15	1	
receptaculitid		2320	304	19	1.5	
receptaculitid		2344	371	10	1	
receptaculitid	good shielding	2344	517	8	1	
receptaculitid	top of bed	2358	419			
receptaculitid		2403	517	15	1	
receptaculitid		2428	385	18	1	
receptaculitid		2439	442	5	1	
receptaculitid		2442	318	7	1	
receptaculitid		2466	326	8	1	
receptaculitid		2470	322	9	1	
receptaculitid		2515	423	9	1	
receptaculitid		2517	427	13	1	
receptaculitid		2545	482	11	1	
receptaculitid	good shielding	2580	291	14	1	
receptaculitid		2589	427	9	1	
receptaculitid	good shielding from burrowing	2591	195	16	1	
receptaculitid		2614	449	8	1	
receptaculitid		2652	391	17	1.5	
receptaculitid		2690	392	11	1	
receptaculitid		2693	460	8	1	
receptaculitid		2695	512	8	1	
receptaculitid		2703	482	10	1	
receptaculitid	good shielding	2721	379	11	1	
receptaculitid		2753	423	10	1	
receptaculitid		2760	381	11	1	
receptaculitid		2760	422	12	1	
receptaculitid		2784	421	12	1	
receptaculitid		2804	331	27	1.5	
receptaculitid		2807	228	7	1	
receptaculitid	good shielding	2813	500	15	1	
receptaculitid	good shielding	2825	264	19	1	
receptaculitid		2866	493	9	2	
receptaculitid	good shielding	2867	326	18	1.5	
receptaculitid		2901	236	10	1	
receptaculitid		2903	389	8	1	
receptaculitid		2903	426	7	1	
receptaculitid		2904	424	9	1	
receptaculitid		2905	422	11	1	
receptaculitid	below storm lens	2917	273	16	1	
receptaculitid		2921	281	7	1	
receptaculitid		2930	371	12.5	1	
receptaculitid		2940	389	18	2.5	
receptaculitid		2944	327	12	0.5	
receptaculitid		2955	450	12	1	
receptaculitid		2988	187	7	1	
receptaculitid		3023	255	18	1	
receptaculitid	extensively scoured	3026	239	7	2	
receptaculitid		3030	441	14	1	

EW Wall	Comments	x	y	W	H	D
receptaculitid		3049	451	5	1	
receptaculitid		3094	316	13	2	
receptaculitid		3125	445	7	1	
receptaculitid		3175	443	11	1	
receptaculitid		3176	200	29	2	
receptaculitid		3177	443	11	1	
receptaculitid		3192	480	14	1	
receptaculitid	good shielding	3226	497	10	1	
receptaculitid		3490	264	17	1	
receptaculitid		3493	276	13	1.5	
receptaculitid		3704	278	12	1	
receptaculitid		3704	438	14	1	
receptaculitid		3704	499	9	1	
receptaculitid		3707	131	10	1	
receptaculitid		3707	406	10	1.5	
receptaculitid		3713	367	11	1	
receptaculitid		3723	420	20	2	
receptaculitid		3740	413	9	1	3
receptaculitid		3745	210	11	1	
receptaculitid		3752	131	11	1.5	
receptaculitid		3774	485	12	1	
receptaculitid		3775	355	6	1	
receptaculitid		3782	441	8	1	
receptaculitid		3794	140	10	1	
receptaculitid		3810	463	18	1	
receptaculitid		3822	435	14	1	
receptaculitid		3824	488	12	1	
receptaculitid		3846	286	17	1	
receptaculitid		3847	407	22	1.5	
receptaculitid		3886	401	9	1	
receptaculitid		3897	359	8	1	
receptaculitid		3920	442	11	1.5	
receptaculitid		3924	392	12.5	2	
receptaculitid		3926	140	9	1	
receptaculitid		3932	485	8	1	
receptaculitid		3941	157	12.5	1.5	
receptaculitid		3942	235	21	1	
receptaculitid		3942	387	9	1	
receptaculitid		3947	436	14	1	
receptaculitid		3950	101	10.5	1.5	
receptaculitid		3963	280	12	1	
receptaculitid		3965	37	11	1	
receptaculitid		3976	238	19.5	1	
receptaculitid		3977	308	9	1	
receptaculitid		3977	384	17	1.5	
receptaculitid		4023	442	10	1	
receptaculitid		4027	508	15	1.5	
receptaculitid		4028	69	14	1	
receptaculitid		4033	286	8	1	

EW Wall	Comments	x	y	W	H	D
receptaculitid		4046	177	20	1.5	
receptaculitid		4077	243	7	1	
receptaculitid		4093	18	16	1	
receptaculitid		4098	315	9	1	
receptaculitid		4103	416	14	2	
receptaculitid		4120	393	14	2	
receptaculitid		4130	427	13	1.5	
receptaculitid		4131	514	13	1	
receptaculitid		4132	356	8	1	
receptaculitid		4141	172	18	1.5	
receptaculitid		4164	387	10	1	
receptaculitid		4165	312	20	1.5	
receptaculitid		4167	307	10	1	
receptaculitid		4171	172	9	1	
receptaculitid		4193	122	7	1.5	
receptaculitid		4214	118	17	3	
receptaculitid		4223	39	14	1	
receptaculitid		4254	495	12	1	
receptaculitid		4256	340	15	2	
receptaculitid		4264	488	8	1	
receptaculitid		4269	395	11.5	2	
receptaculitid		4286	161	8.5	1	
receptaculitid		4290	285	15	1	
receptaculitid		4316	202	10	1	
receptaculitid		4324	93	12	1	
receptaculitid		4327	66	16	1	
receptaculitid		4340	186	10.5	1.5	
receptaculitid		4357	353	11	1	
receptaculitid		4359	409	5.5	1	
receptaculitid	encrusted by *Favistina*	4364	483	20	1	
receptaculitid		4365	389	16	1	
receptaculitid		4399	150	11	0.5	
receptaculitid		4403	115	11	1.5	
receptaculitid		4407	131	9	1	
receptaculitid		4410	321	16	1.5	
receptaculitid		4410	411	5.5	1.5	
receptaculitid		4415	140	17	1.5	
receptaculitid		4419	249	9	1	
receptaculitid		4447	482	25	2	
receptaculitid		4463	5	21	1	
receptaculitid		4467	392	23	1.5	
receptaculitid		4478	209	10	1	
receptaculitid		4478	343	9.5	1	
receptaculitid		4480	389	14	1.5	
receptaculitid		4482	283	15.5	1	
receptaculitid		4482	353	12.5	1	
receptaculitid		4505	498	10	1	
receptaculitid		4520	236	8	1	
receptaculitid		4522	240	7	1	

EW Wall	Comments	x	y	W	H	D
receptaculitid		4538	353	10	1.5	
receptaculitid		4543	102	16	1.5	
receptaculitid		4550	129	9	1	
receptaculitid		4554	296	11	1	
receptaculitid		4555	302	12	1	
receptaculitid		4559	335	14	1.5	
receptaculitid		4565	355	11.5	1.5	
receptaculitid		4574	488	15	2	
receptaculitid		4575	398	7.5	2	
receptaculitid		4585	258	13.5	1.5	
receptaculitid		4600	94	15	1	
receptaculitid		4600	151	14.5	1	
receptaculitid		4615	468	17	1.5	
receptaculitid		4621	288	8	1	
receptaculitid		4626	404	13	1.5	
receptaculitid		4629	397	9	1	
receptaculitid		4632	480	16	1.5	
receptaculitid		4643	471	20	1.5	
receptaculitid		4652	148	18	1	
receptaculitid		4653	417	7	1	
receptaculitid		4664	269	8	1	
receptaculitid		4669	170	17.5	1.5	
receptaculitid		4674	270	14	1	
receptaculitid		4676	395	11.5	2	
receptaculitid		4695	37	10	1	
receptaculitid		4700	493	18	2	
receptaculitid		4709	152	19	1.5	
receptaculitid	encrusted by *Catenipora*	4720	280	12	1	
receptaculitid		4754	156	16.5	1	
receptaculitid		4754	406	4.5	1.5	
receptaculitid		4766	150	8	1	
receptaculitid		4780	342	20	1.5	
receptaculitid		4780	484	8	1	
receptaculitid		4782	410	10.5	1	
receptaculitid		4785	439	15	1.5	
receptaculitid		4790	501	5.5	1	
receptaculitid		4795	319	13	1	
receptaculitid		4810	494	18	1.5	
receptaculitid		4812	319	14	1.5	
receptaculitid		4837	466	8	1.5	
receptaculitid		4850	459	18	1.5	
receptaculitid		4873	316	11	1	
receptaculitid		4880	85	11	1	
receptaculitid		4881	6	17	1	
receptaculitid		4895	467	7	1.5	
receptaculitid		4900	3	16	1	
receptaculitid		4924	338	14	1	
receptaculitid		4934	201	16	1	
receptaculitid		4935	7	16	1	

EW Wall	Comments	x	y	W	H	D
receptaculitid		4938	509	13	1.5	
receptaculitid		4945	72	10	1	
receptaculitid		4955	8	16	1	
receptaculitid		4955	222	11.5	1	
receptaculitid		4956	406	9	1	
receptaculitid		4988	488	19	1.5	
receptaculitid		4989	32	9	1	
receptaculitid		4995	509	17	1.5	
receptaculitid		5009	417	6	1	
receptaculitid		5014	396	11	1.5	
receptaculitid		5020	50	16	1.5	
receptaculitid		5026	395	14	1.5	
receptaculitid		5029	403	10	1	
receptaculitid		5030	481	21	1.5	
receptaculitid		5038	398	20	1.5	
receptaculitid		5043	490	20	1	
receptaculitid		5050	494	12	1	
receptaculitid		5052	273	7.5	1	
receptaculitid		5054	395	11.5	1.5	
receptaculitid		5075	496	12	1	
receptaculitid		5085	211	8	1	
receptaculitid		5092	405	15	1	
receptaculitid	good shielding	5097	36	15	1.5	
receptaculitid		5100	435	9	1	
receptaculitid		5119	509	9	1	
receptaculitid		5120	496	18	1.5	
receptaculitid		5121	303	18	1	
receptaculitid		5142	480	15	1	
receptaculitid		5147	381	13	1	
receptaculitid		5182	402	15.5	1	
receptaculitid		5210	429	9	1	
receptaculitid		5214	494	7	1	
receptaculitid		5225	486	9	1.5	
receptaculitid		5234	353	6.5	1	
receptaculitid		5237	318	19	1	
receptaculitid		5244	401	14	1	
receptaculitid		5267	156	12	1	
receptaculitid		5270	214	13	1	
receptaculitid		5274	294	10.5	1	
receptaculitid		5280	434	12	1	
receptaculitid		5288	106	10.5	1	
receptaculitid		5289	86	8	1	
receptaculitid		5290	503	17	1.5	
receptaculitid		5300	436	15	1	
receptaculitid		5315	104	5	1	
receptaculitid		5320	165	17	1	
receptaculitid		5321	138	15	1	
receptaculitid		5323	464	15	1	
receptaculitid		5330	355	13	1	

EW Wall	Comments	x	y	W	H	D
receptaculitid		5346	506	24	1.5	
receptaculitid		5349	355	13	1	
receptaculitid		5352	431	20	1.5	
receptaculitid		5400	436	20	1.5	
receptaculitid		5413	439	6	1	
receptaculitid		5415	324	12	1	
receptaculitid		5419	51	20	1	
receptaculitid		5430	436	17	2	
receptaculitid		5435	415	21	2	
receptaculitid		5445	437	9	1.5	
receptaculitid		5456	468	13	1.5	
receptaculitid		5468	397	16	1.5	
receptaculitid		5475	314	8	1	
receptaculitid		5495	393	10	1	
receptaculitid		5496	439	16	1	
receptaculitid		5500	130	11	1.5	
receptaculitid		5512	247	9.5	1	
receptaculitid		5537	421	13	1	
receptaculitid		5571	462	12	1.5	
receptaculitid		5575	506	11	1.5	
receptaculitid		5585	421	11	1	
receptaculitid		5591	158	17	2	
receptaculitid		5597	294	13	2	
receptaculitid		5599	269	15	1	
receptaculitid		5600	399	15	2	
receptaculitid		5613	92	20	1.5	
receptaculitid		5617	70	9.5	1.5	
receptaculitid		5638	109	18	3	
receptaculitid		5652	393	11	1	
receptaculitid	on top of storm lens	5654	161	20.5	1.5	
receptaculitid		5660	415	15.5	1	
receptaculitid		5665	327	17	1.5	
receptaculitid		5666	496	25	1	
receptaculitid		5687	72	12	1	
receptaculitid		5710	458	25	2	
receptaculitid		5718	390	14.5	1	
receptaculitid		5731	417	7	1	
receptaculitid		5738	415	16	1	
receptaculitid		5742	121	13	2	
receptaculitid		5760	231	11	1	
receptaculitid		5765	133	12.5	1	
receptaculitid		5765	138	12.5	1	
receptaculitid		5790	233	12.5	1	
receptaculitid		5800	340	16	1.5	
receptaculitid		5800	463	14	1	
receptaculitid		5805	244	10.5	1	
receptaculitid		5808	401	13	1	
receptaculitid		5840	290	10	1	
receptaculitid		5853	234	12	1	

EW Wall	Comments	x	y	W	H	D
receptaculitid		5853	283	13	1	
receptaculitid		5855	252	16	1.5	
receptaculitid		5867	242	15	1	
receptaculitid		5877	496	30	1	
receptaculitid		5880	487	12	1	
receptaculitid		5888	344	12	1	
receptaculitid		5889	511	18	1	
receptaculitid	encrusted by *Protrochiscolithus*	5910	352	6.5	1	
receptaculitid		5918	87	13	1	
receptaculitid		5918	141	14	1.5	
receptaculitid		5925	375	13	1	
receptaculitid		5949	399	16	1.5	
receptaculitid		5952	274	13	1	
receptaculitid		5952	499	17	1	
receptaculitid		5983	345	13	1	
receptaculitid		6004	278	14	1	
receptaculitid		6020	21	12	1	
receptaculitid		6050	392	6	1	
receptaculitid		6090	243	15	1.5	
receptaculitid		6096	359	13.5	2	
receptaculitid		6109	241	11	1	
receptaculitid		6127	516	8	2	
receptaculitid		6140	435	19	1	
receptaculitid		6190	507	11	1.5	
receptaculitid		6205	227	14	1	
receptaculitid		6208	312	14	1	
receptaculitid		6223	503	14	2	
receptaculitid		6246	143	11	1	
receptaculitid		6247	324	16	2	
receptaculitid		6255	132	18	1	
receptaculitid		6257	406	18	2	
receptaculitid		6278	500	18	1	
receptaculitid		6280	316	19	1	
receptaculitid		6282	375	18	1	
receptaculitid		6283	35	13	1	
receptaculitid		6290	295	20	1	
Saffordophyllum		569	253	4	1	
Saffordophyllum	good shielding	646	278	14	2	
Saffordophyllum	domical; on top of storm lens; good shielding	1643	437	16	4	
Saffordophyllum	overturned; growing on horn coral	2757	389	8	3	
Saffordophyllum		5894	63	14	3.5	
stromatoporoid		2	293	19	5	
stromatoporoid	tapers laterally	15	204	40	8	
stromatoporoid		50	303	26	10	
stromatoporoid		113	199	34	6	
stromatoporoid		138	534	5.5	2.5	
stromatoporoid	encrusted by receptaculitid	156	276	74	7	
stromatoporoid	encrusted by *Protrochiscolithus*	295	274	17	4	
stromatoporoid	good shielding	395	284	13	3	

EW Wall	Comments	x	y	W	H	D
stromatoporoid	domical	404	460	31	6	
stromatoporoid	domical; good shielding	624	359	47	5	
stromatoporoid		670	353	12	3	
stromatoporoid	domical	706	439	8	3	
stromatoporoid		710	386	114	13	
stromatoporoid	good shielding	775	525	14	4	
stromatoporoid		778	351	29	4	
stromatoporoid	tabular	795	446	14	3	
stromatoporoid	domical; on top of storm lens	826	445	18	8	
stromatoporoid	domical; extensively scoured	880	505	54	20	
stromatoporoid		885	394	38	8	
stromatoporoid		885	394	38	8	
stromatoporoid		997	383	30	1.5	
stromatoporoid		1050	394	21	4	
stromatoporoid	encrusted by *Protrochiscolithus*	1206	232	14	4	
stromatoporoid	killed by storm lens; higher growth in middle	1207	394	20	5	
stromatoporoid	domical	1380	468	39	7	
stromatoporoid		1418	453	37	9	
stromatoporoid		1450	369	57	10	
stromatoporoid	tilted	1472	367	15	5	
stromatoporoid	domical	1552	438	32	12	
stromatoporoid	tapers laterally; domical; borings	1672	195	19	4	
stromatoporoid	on top of storm lens	1736	407	23	9	
stromatoporoid	domical	1756	517	10	3	
stromatoporoid	domical	1782	445	14	4	
stromatoporoid	domical	1783	455	21	8	
stromatoporoid	encrusting receptaculitid; encrusted by *Protrochiscolithus*	1808	403	8	3	
stromatoporoid	domical; shielding; scoured	1820	303	20	5	
stromatoporoid	in storm lens	1872	204	17	3	
stromatoporoid	extensively scoured	1900	224	21	2	
stromatoporoid	tabular	1912	491	23	4	
stromatoporoid		1968	447	11	4	
stromatoporoid	domical	1975	251	16	3	
stromatoporoid		2014	280	44	8	
stromatoporoid		2073	451	12	5	
stromatoporoid	domical	2120	401	12	6	
stromatoporoid	domical; directly above storm lens	2166	224	37	7	
stromatoporoid		2191	451	19	6	
stromatoporoid	extensively scoured; growth higher in the middle; sudden death on west side	2230	233	73	6	
stromatoporoid	domical; burrowed; storm lens in middle	2312	433	46	16	
stromatoporoid		2324	373	20	6	
stromatoporoid	domical	2356	314	51	12	
stromatoporoid	Domical	2356	334	29	7	
stromatoporoid	tabular	2432	430	22	6	
stromatoporoid		2446	483	19	7	
stromatoporoid	overturned in storm lens	2447	440	12	6	
stromatoporoid	entire top encrusted by *Protrochiscolithus*	2451	447	14	3	
stromatoporoid	domical	2549	449	27	5	
stromatoporoid	domical	2572	306	19	3	

EW Wall	Comments	x	y	W	H	D
stromatoporoid	domical	2702	316	38	5	
stromatoporoid	domical; growth higher to west; killed by storm lens on east	2790	316	58	12	
stromatoporoid		2826	427	33	11	
stromatoporoid		2860	423	19	4	
stromatoporoid	domical; tapers at ends	2924	199	30	7	
stromatoporoid	domical; scoured	3339	204	15	3	
stromatoporoid	tabular	3388	296	32	5	
stromatoporoid		3741	91	21	3	
stromatoporoid		3807	381	13.5	1.5	
stromatoporoid		3855	465	11	1.5	
stromatoporoid		3916	212	33	9	
stromatoporoid		3918	289	26	2	
stromatoporoid	encrusted by *Protrochiscolithus*	3926	447	11.5	3.5	
stromatoporoid		3937	340	13.5	3	
stromatoporoid	good shielding	3990	394	27	3.5	
stromatoporoid		4024	286	26	6	
stromatoporoid	encrusted by *Protrochiscolithus*	4067	264	41	8	
stromatoporoid		4150	99	65	8	
stromatoporoid		4225	446	35	9	
stromatoporoid		4251	491	9	5	
stromatoporoid	tabular	4280	88	63	10	
stromatoporoid		4336	475	12	4	
stromatoporoid		4428	208	41	3	
stromatoporoid		4450	466	28	9	
stromatoporoid	good shielding	4480	361	44	6	
stromatoporoid		4543	476	14	3	
stromatoporoid	encrusted by *Protrochiscolithus*	4560	184	37	7	
stromatoporoid		4560	496	21	7	
stromatoporoid	dissolved; encrusted by *Protrochiscolithus*	4600	402	40	15	
stromatoporoid		4646	462	14	5	
stromatoporoid	domical	4731	106	25	12	
stromatoporoid		4739	347	21	4	
stromatoporoid	overturned	4784	227	25	10	
stromatoporoid		4785	435	7	3.5	
stromatoporoid		4828	458	12	3	
stromatoporoid	pinches out laterally	4832	309	50	10	
stromatoporoid	mound; encrusting *Calapoecia* and *Protrochiscolithus*	4832	319	12	6	
stromatoporoid	tilted; encrusted by *Protrochiscolithus*	4834	435	10	17	
stromatoporoid		4864	496	7	3	
stromatoporoid		4880	285	40	9	
stromatoporoid	tabular	4890	87	31	4	
stromatoporoid		4940	481	20	5	
stromatoporoid	bulbous; tilted on side	4947	84	8	19	
stromatoporoid		5005	486	33	9	
stromatoporoid		5007	379	14	2	
stromatoporoid		5036	390	21	4.5	
stromatoporoid		5054	392	35	5	
stromatoporoid		5102	307	25	6	
stromatoporoid		5205	387	42	13	

EW Wall	Comments	x	y	W	H	D
stromatoporoid		5230	164	27	8	
stromatoporoid		5298	273	21	8	
stromatoporoid	on top of storm lens	5319	6	12	2	
stromatoporoid	good shielding	5325	298	51	8	
stromatoporoid	tabular	5336	74	23	3.5	
stromatoporoid		5395	230	36	5	
stromatoporoid		5437	438	14	4	
stromatoporoid		5437	443	44	4	
stromatoporoid		5440	398	9	2.5	
stromatoporoid		5445	449	17	3	
stromatoporoid		5495	229	22	3.5	
stromatoporoid	tilted	5530	280	16	5	
stromatoporoid	scoured	5560	61	38	7	
stromatoporoid	encrusted by *Favistina*	5564	417	17	1	
stromatoporoid		5572	186	30	6	
stromatoporoid		5586	136	25	8	
stromatoporoid		5587	388	26	7	
stromatoporoid		5710	428	13	5	
stromatoporoid		5723	232	15	5	
stromatoporoid		5760	373	20	2	
stromatoporoid		5761	496	22	5	
stromatoporoid		5800	415	33	5	
stromatoporoid	encrusted by *Protrochiscolithus*	5808	369	22	7	
stromatoporoid		5811	277	10	2	
stromatoporoid	tilted to west; encrusted by *Protrochiscolithus*	5985	457	20	7	
stromatoporoid	tabular; slightly burrowed	6008	67	53	13	
stromatoporoid		6008	503	23	9	
stromatoporoid	good shielding	6050	286	32	6	
stromatoporoid	encrusted by *Calapoecia*	6157	305	11	6	
stromatoporoid	encrusted by *Protrochiscolithus*	6235	402	31	11	
Rhabdotetradium		1365	451	6	4	
Rhabdotetradium	domical	2459	481	12	3.5	
Rhabdotetradium		5684	414	8	3.5	
Rhabdotetradium		6130	187	12	3	

Appendix B-2: Revised Fossil Data

NS Wall

Note:
1. "Shielding" refers to the lack of mottling and/or bioturbation found underneath certain organisms
2. W = width at widest point in cm; H = height in cm; D = diameter in cm
3. x = horizontal distance from origin (0,0) in cm; y = vertical distance from base of section in cm

NS Wall	Comments	x	y	W	H	D
algal stromatolite		55	469	19	3	
algal stromatolite		321	461	7	2	
algal stromatolite		1119	440	21	4	
algal stromatolite		2511	429	28	4	
algal stromatolite		2936	427	16	3	
algal stromatolite		3836	177	21	2	
algal stromatolite		4015	273	24	4	
algal stromatolite		4223	130	7	2	
algal stromatolite		4898	171	6.5	1.5	
algal stromatolite		5890	222	14	2	
algal stromatolite		5905	185	6	4	
brachiopod		1109	482			3
brachiopod		1219	214			3
brachiopod		3820	48			4.5
brachiopod		3911	362			1.5
brachiopod		3965	265			5
brachiopod		4181	266			5
brachiopod		4472	323			2
brachiopod		4566	30			3
brachiopod		4602	59			3
brachiopod		4775	275			3.5
brachiopod		4893	37			2
brachiopod	good shielding	5390	346			5
brachiopod		5820	376			5
bryozoan	branching	281	385	2.5		0.5
bryozoan		841	253	2	0.5	
bryozoan	branching	1657	295	2		1
bryozoan	branching; 2 branches	2220	425	2.5		
bryozoan	encrusted by bryozoan	2333	410	4	1.5	
bryozoan		2984	228			3
bryozoan	mound	3203	370	3.5	5	
bryozoan	branching	3293	478			2
bryozoan		3335	264			1.5
bryozoan		3362	254			1.5
bryozoan	branching	3371	488			1.5
bryozoan		3517	266			1
bryozoan		4537	427	1	1	

NS Wall	Comments	x	y	W	H	D
bryozoan		4582	426	3	2	
bryozoan		4830	363	2.5	3	
bryozoan		4844	361	1.5	1.5	
bryozoan		4890	429	2.5	2.5	
bryozoan		5400	450	1.5	1	
bryozoan		5519	444	1.5	1	
Calapoecia		510	313	2.5	2.5	
Calapoecia	partially scoured	1206	376	15	5	
Calapoecia	tilted on side; in storm lens	1393	474	6	2.5	
Calapoecia	encrusting stromatoporoid	1548	396	5	2.5	
Calapoecia		1678	353	2.5	1.5	
Calapoecia		1681	377	5	1	
Calapoecia		1808	364	3.5	2	
Calapoecia	encrusting *Protrochiscolithus*; encrusted by *Catenipora*; overturned	2122	187	6	1.5	
Calapoecia		2216	269	3.5	2	
Calapoecia		2507	408	6	4	
Calapoecia		3904	193	3	1	
Calapoecia	encrusting gastropod	4263	26	1.5	1.5	
Calapoecia		4290	130	3	3	
Calapoecia	encrusting cephalopod	4547	117	3	2	
Calapoecia		4607	24	2.5	2.5	
Calapoecia		4727	310	3.5	2.5	
Calapoecia		4797	420	3	4	
Calapoecia	encrusting *Saffordophyllum*	4898	2	4	2	
Calapoecia	encrusting stromatoporoid	5010	344	1	1	
Calapoecia		5030	104	2	2	
Calapoecia		5041	314	4	2	
Calapoecia		5528	220	3.5	2	
Calapoecia	encrusting gastropod	5767	271	3.5	2	
Catenipora		172	424	5	2	
Catenipora		367	390	7	3	
Catenipora		1962	430	7	3	
Catenipora	encrusting *Calapoecia*; overturned	2124	186	8	3.5	
Catenipora		2205	427	10	5	
Catenipora		2710	397	12	4	
Catenipora		2820	414	8	5	
Catenipora		2886	299	7		2.5
Catenipora		3482	422	5	3	
Catenipora		4116	39	12	3.5	
Catenipora		4204	372	15	5	
Catenipora		4675	420	6	4	
Catenipora		5490	377	8	4	
Catenipora		5820	396	17	5.5	
cephalopod	top of bed; apex points 40 degrees	93	345			4.6
cephalopod		374	330			1.5
cephalopod		409	500			4.5

NS Wall	Comments	x	y	W	H	D
cephalopod	encrusted by *Protrochiscolithus*	505	307			4
cephalopod		705	389			5
cephalopod		792	434	11		5
cephalopod		974	220	6		3
cephalopod	*Endoceras*?	1180	420			7
cephalopod	*Endoceras*?; top of bed; apex pointing north	1221	345	26		6
cephalopod		1249	461			3.5
cephalopod		1361	333			4
cephalopod		1415	327	5		2
cephalopod		1434	493			6.5
cephalopod		1535	367			1.5
cephalopod		1562	370			3.5
cephalopod		1578	393			5
cephalopod	*Lambeoceras*?	1581	335			12
cephalopod		1586	356			1.5
cephalopod	encrusted by *Protrochiscolithus*	1698	423			3
cephalopod	ventral siphuncle	1730	211			8
cephalopod		1902	419			5.5
cephalopod		1963	195			7
cephalopod	apex points south	1968	278	14		2.5
cephalopod	*Armenoceras*?	2084	336			6
cephalopod	apex points south	2092	308	6		3
cephalopod		2130	336			2
cephalopod	apex points north	2140	287	7		2.5
cephalopod		2218	290	13		3
cephalopod	apex points south	2231	204	12		3.5
cephalopod		2390	259			3
cephalopod	*Lambeoceras*?	2415	267			7
cephalopod	*Endoceras*?	2441	349			7
cephalopod		2479	386			3.5
cephalopod		2487	410			4
cephalopod		2489	347			3.5
cephalopod	*Lambeoceras*?	2592	314			5
cephalopod		2612	347	18		5
cephalopod	encrusted by *Protrochiscolithus*	2731	289			4.5
cephalopod		2750	365			2
cephalopod		2752	521			2
cephalopod		2957	276			4
cephalopod		3044	213			2.5
cephalopod		3172	267			3
cephalopod	*Endoceras*?; top of bed; apex points 50 degrees	3200	400	13		5.5
cephalopod	*Lambeoceras*?	3218	347			12
cephalopod	*Endoceras*?	3309	267			11
cephalopod	encrusted by *Saffordophyllum*	3314	217	21		
cephalopod		3339	326	8		4
cephalopod	*Endoceras*?	3465	478			15

NS Wall	Comments	x	y	W	H	D
cephalopod		3472	269			8.5
cephalopod	encrusting by *Protrochiscolithus*	3815	46			7
cephalopod		3888	462			13
cephalopod		3903	376			1.5
cephalopod	encrusted by *Calapoecia*	3904	192			3
cephalopod		3913	27	12		4
cephalopod		4037	329			7
cephalopod		4069	354			2
cephalopod		4116	35			1.5
cephalopod		4116	357			12
cephalopod	encrusted by *Protrochiscolithus*	4127	196			6.5
cephalopod	apex points north	4142	347	14		3
cephalopod	apex points south	4157	363	15		4
cephalopod		4168	144			3.5
cephalopod	encrusted by *Protrochiscolithus*	4198	301			5.5
cephalopod		4203	347			2
cephalopod		4206	351			6.5
cephalopod		4258	51			3
cephalopod		4264	50			2
cephalopod		4271	351			4
cephalopod		4279	82			2.5
cephalopod	encrusted by *Catenipora*	4290	93	4.5		1.5
cephalopod		4300	267	8.5		2
cephalopod		4350	420			6
cephalopod	encrusted by *Protrochiscolithus*; overturned	4362	356			2
cephalopod		4487	386			3.5
cephalopod	encrusted by *Calapoecia*	4549	116			3
cephalopod		4554	275			4
cephalopod	partially destroyed	4629	464	37		
cephalopod		4644	476			3.5
cephalopod		4646	104			3
cephalopod	encrusted by *Saffordophyllum*	4657	423			4
cephalopod	*Cyrtogomphoceras*	4668	434			6
cephalopod	in storm lens; trash	4690	258	9		3.5
cephalopod		4708	1			3
cephalopod		4741	191			5.5
cephalopod	encrusted by *Rhabdotetradium*	4757	153			9.5
cephalopod	apex points south	4830	112	22		7
cephalopod		4837	271			4
cephalopod		4908	340	13		3.5
cephalopod	apex points south	4952	62	11		3.5
cephalopod	apex points south	5027	25	11		2
cephalopod	covering horn coral	5055	504	8		
cephalopod		5104	231	5.5		2
cephalopod	apex points north	5117	2	6.5		2
cephalopod	apex points south	5127	72	7.5		2.5

NS Wall	Comments	x	y	W	H	D
cephalopod		5163	252			2.5
cephalopod		5172	363			3
cephalopod		5254	240			2
cephalopod		5281	480			2
cephalopod		5282	255			4.5
cephalopod		5309	459	7.5		3
cephalopod		5338	138			3.5
cephalopod	encrusted by *Protrochiscolithus*	5366	296			14
cephalopod		5370	344			8
cephalopod	on top of storm lens	5383	11	20		9
cephalopod		5460	385			2.5
cephalopod		5467	213			3.5
cephalopod		5490	115			12
cephalopod		5502	127			3
cephalopod		5522	15			3.5
cephalopod		5606	344			10
cephalopod		5664	69			3
cephalopod		5666	376			4.5
cephalopod	apex points north	5668	146	7		2.5
cephalopod		5673	328			3.5
cephalopod		5674	453			6
cephalopod		5701	443			2
cephalopod	in storm lens	5714	462			3
cephalopod		5724	105			3
cephalopod		5801	30	10	1	
cephalopod	coiled	5811	470			15
cephalopod		5817	221			2
cephalopod		5973	444			3
cephalopod		6042	47			2.5
cephalopod		6091	205	6		2
cephalopod		6096	28	5		2
cephalopod		6160	124			2.5
cephalopod	apex points north	6230	70	10		3.5
cephalopod		6408	99			2
cephalopod	apex points south	6421	97	7		2.5
Crenulites		12	300	16	2.5	
Crenulites	domical	13	355	44	12	
Crenulites		146	390	24	9	
Crenulites		234	274	17	3.5	
Crenulites		415	204	38	5.5	
Crenulites	overturned	493	305	4.5	2.5	
Crenulites		587	329	13	3	
Crenulites		654	265	13	3.5	
Crenulites		790	387	6	2	
Crenulites	encrusted by *Protrochiscolithus*	859	452	15	5	
Crenulites	encrusted by *Protrochiscolithus*	906	349	6	0.5	

NS Wall	Comments	x	y	W	H	D
Crenulites		943	498	9	2	
Crenulites		1090	207	5.5	2	
Crenulites		1195	310	7	1.5	
Crenulites	overturned	1427	402	7	3.5	
Crenulites		1459	287	18	5	
Crenulites		1550	283	23	5	
Crenulites		1658	484	26	10	
Crenulites		1846	200	8	1.5	
Crenulites	overturned	1896	403	24	5	
Crenulites	domical	2033	492	26	9	
Crenulites	overturned	2066	469	7.5	3	
Crenulites		2178	202	17	2	
Crenulites	tilted; encrusted by bryozoan	2343	413	21	5	
Crenulites		2348	488	18	6	
Crenulites	in storm lens	2556	415	9	3	
Crenulites	partially dissolved to south	2602	373	19	6	
Crenulites		2828	269	28	7	
Crenulites		3142	353	23	10	
Crenulites	domical	3190	375	25	7	
Crenulites	tabular	3385	482	52	7	
Crenulites		3400	473	13	2	
Crenulites		3428	188	18	1.5	
Crenulites	tabular	3434	269	50	6	
Crenulites	encrusted by *Protrochiscolithus*; dissolved in middle	3446	198	27	8	
Crenulites	underlies receptaculitid	3835	457	140	10	
Crenulites		3970	47	27	3.5	
Crenulites		4144	381	15	4.5	
Crenulites		4190	344	6.5	2.5	
Crenulites		4200	203	7.5	2.5	
Crenulites	good shielding	4325	104	26	3	
Crenulites		4343	269	11	2	
Crenulites	in storm lens	4362	287	12	3	
Crenulites		4711	337	3.5	1.5	
Crenulites		4901	207	24	5	
Crenulites	overturned	4982	273	13	3	
Crenulites		5103	5	39	5	
Crenulites	overturned; encrusted by *Protrochiscolithus*	5318	456	9	3	
Crenulites		5338	293	24	3.5	
Crenulites		5609	320	13	2.5	
Crenulites	partially dissolved near top	5632	455	20	5.5	
Crenulites		5635	148	44	4.5	
Crenulites	partially dissolved inside	5771	371	27	4	
Crenulites		5800	339	21	3.5	
Crenulites	directly below algal stromatolite	5890	219	13	2	
Crenulites		5918	374	24	6	
Crenulites		5957	138	11	3	

NS Wall	Comments	x	y	W	H	D
Crenulites	overturned	5982	395	7.5	2.5	
Crenulites	encrusted by *Protrochiscolithus*	6037	374	5	1.5	
Crenulites		6105	417	7	1	
Crenulites		6316	57	32	2.5	
Favistina		16	429	6	2	
Favistina	domical; below storm lens	168	430	25	6	
Favistina	domical; on top of storm lens	170	445	33	13	
Favistina	partially dissolved in centre; filled with sediment	191	201	16	3.5	
Favistina		256	442	10	3	
Favistina		562	402	21	3.5	
Favistina		570	495	10	5	
Favistina		624	347	9	2.5	
Favistina		778	389	19	6	
Favistina		1074	387	14	2	
Favistina		1248	210	7	3	
Favistina		1316	369	12	3.5	
Favistina	overturned	1520	415	20	6	
Favistina		1565	414	24	5	
Favistina	overturned; encrusted on bottom by *Protrochiscolithus*	1568	331	8	1	
Favistina		1656	214	8.5	4.5	
Favistina		1707	225	9.5	2.5	
Favistina	domical	1829	405	4.5	2	
Favistina		1960	405	24	5	
Favistina		2161	385	7	2	
Favistina	tabular	2485	430	20	6	
Favistina		2530	374	10	2.5	
Favistina		2757	417	5	1.5	
Favistina	overturned	3016	420	30	9	
Favistina	overturned	3085	270	10	3.5	
Favistina	tilted to south	3207	209	12	2.5	
Favistina	tilted; growing towards south	3297	278	24	3	
Favistina	domical	3495	501	29	11	
Favistina		3551	276	12	3	
Favistina		3853	387	25	5	
Favistina	killed in middle; growth continued to the south	3923	82	31	3.5	
Favistina		3983	269	30	7	
Favistina		4055	411	5	2	
Favistina		4220	124	30	2	
Favistina		4260	403	34	8	
Favistina		4266	377	10	4	
Favistina	overturned	4334	429	9	5	
Favistina		4368	109	11	1.5	
Favistina	raised in centre	4442	438	20	6	
Favistina		4514	270	24	5	
Favistina		4717	375	15	5.5	
Favistina		4730	383	14	5.5	

NS Wall	Comments	x	y	W	H	D
Favistina		4743	261	11	3	
Favistina	partially dissolved in middle	4765	425	23	6	
Favistina		5153	363	18	5	
Favistina		5232	50	26	3.5	
Favistina		5243	293	18	3	
Favistina		5338	157	4	2.5	
Favistina		5346	265	16	5	
Favistina		5562	386	9	2	
Favistina		5575	343	14	7	
Favistina		5781	87	25	5	
Favistina		6011	231	12	4	
Favistina		6022	218	5	1.5	
gastropod	*Maclurina*	19	411			4
gastropod		37	369			2.5
gastropod	*Trochonema*	37	412			2.5
gastropod	*Maclurina*	85	328	5.5		4
gastropod		101	323			2
gastropod	*Trochonema*	106	376			2
gastropod	*Trochonema*	220	436			2.5
gastropod		236	441			2
gastropod	*Maclurina*	329	371			6
gastropod	*Maclurina*	376	341			6.5
gastropod	*Maclurina*	460	207			4
gastropod	*Maclurina*	554	288			4.5
gastropod		655	486			3
gastropod		719	375			3
gastropod	*Hormotoma*; apex points north	726	379	9		4
gastropod	encrusted by *Protrochiscolithus*	834	366			6
gastropod	*Maclurina*	853	216			11
gastropod	*Maclurina*	868	265			6
gastropod	*Trochonema*	991	355			2
gastropod	*Maclurina*	1095	203			3.5
gastropod		1106	316			1.5
gastropod		1111	275			3
gastropod		1152	276			3
gastropod		1160	365			2
gastropod	*Hormotoma*	1177	226			4.5
gastropod	*Maclurina*	1222	360			4.5
gastropod		1227	213			2.5
gastropod		1367	328			3
gastropod		1369	363	6	1.5	
gastropod	*Maclurina*	1370	334			5
gastropod		1391	330			3
gastropod	*Maclurina*	1411	327			4.5
gastropod	*Maclurina*	1440	267			7
gastropod	*Trochonema*	1475	299	3		2

NS Wall	Comments	x	y	W	H	D
gastropod		1547	481			3
gastropod	*Hormotoma*	1587	423	4		1.5
gastropod		1617	191		2.5	
gastropod	*Maclurina*	1646	347			9.5
gastropod	*Maclurina*	1768	333			4
gastropod	*Maclurina*	1860	198			4
gastropod		1997	489			3
gastropod		2010	201			2.5
gastropod	*Maclurina*	2010	218			3.5
gastropod	*Maclurina*	2042	301			4.5
gastropod	*Maclurina*	2083	273			4
gastropod	*Maclurina*; encrusted by *Protrochiscolithus*; overturned	2120	189			5
gastropod	*Maclurina*	2157	294			5.5
gastropod	*Maclurina*	2173	495			13
gastropod		2211	406			3
gastropod	*Maclurina*	2214	241			4
gastropod		2242	425			2
gastropod	*Maclurina*	2274	402			6
gastropod	*Maclurina*	2300	228			3.5
gastropod		2309	403			1.5
gastropod		2342	263			2
gastropod	*Maclurina*	2438	502			10
gastropod		2477	280			2
gastropod	*Maclurina*	2503	412			3.5
gastropod	*Maclurina*	2509	301			7
gastropod	*Hormotoma*	2547	428	6		3.5
gastropod		2577	280			2
gastropod	*Maclurina*	2593	373			3
gastropod	*Maclurina*	2601	423			4
gastropod	*Maclurina*	2619	231			3.5
gastropod		2625	291			1.5
gastropod	*Maclurina*	2709	280			4.5
gastropod	*Maclurina*	2741	333			4
gastropod		2752	191			2.5
gastropod		2762	264			2
gastropod		2817	462			2.5
gastropod	*Maclurina*	2941	470			4
gastropod	*Maclurina*	3018	278			4
gastropod		3025	275			1.5
gastropod	*Maclurina*	3027	358			4.5
gastropod	*Hormotoma*	3066	513	8		3
gastropod		3112	471			2
gastropod	*Maclurina*	3309	418			5.5
gastropod	*Maclurina*	3405	266			3
gastropod	*Hormotoma*	3414	192	4		4
gastropod	*Maclurina*	3431	308			3.5

NS Wall	Comments	x	y	W	H	D
gastropod	*Maclurina*	3443	513			12
gastropod	*Maclurina*	3499	273			3
gastropod	*Maclurina*	3555	325			3.5
gastropod	*Maclurina*	3625	494			13
gastropod	*Maclurina*	3805	169			3.5
gastropod	*Maclurina*	3851	85			3
gastropod	*Maclurina*	3895	381			6
gastropod	*Maclurina*	3915	453			3.5
gastropod	*Maclurina*	3935	435			7
gastropod	*Maclurina*	4000	73			3
gastropod	*Maclurina*	4012	116			3
gastropod	*Maclurina*	4013	301			3.5
gastropod	*Maclurina*	4105	366			3
gastropod		4113	410			1.5
gastropod	*Maclurina*	4122	34			3.5
gastropod		4138	226			2
gastropod		4142	223			1
gastropod	*Maclurina*	4173	482			3.5
gastropod	encrusted by *Calapoecia*	4264	25			2
gastropod	*Maclurina*	4280	347			6
gastropod	*Maclurina*	4290	369			3
gastropod		4291	351			1.5
gastropod		4334	86			1.5
gastropod	*Maclurina*	4402	216			3.5
gastropod	*Maclurina*	4406	86			3.5
gastropod		4456	104			2.5
gastropod	*Maclurina*	4494	428			6
gastropod	*Maclurina*	4528	355			5.5
gastropod	*Hormotoma*	4605	84	3.5		2
gastropod	*Maclurina*; encrusted by *Saffordophyllum*; overturned	4658	424			6
gastropod	*Hormotoma*	4699	300	4		3
gastropod	*Maclurina*	4823	275			4
gastropod	*Maclurina*	4852	74			3
gastropod		4866	109			2.5
gastropod	*Maclurina*	4887	341			3.5
gastropod	*Maclurina*	4890	387			8
gastropod	encrusted by *Protrochiscolithus*; overturned	5003	373			2.5
gastropod	*Maclurina*	5060	200			4.5
gastropod	*Maclurina*	5075	338			3
gastropod		5090	338			2
gastropod	*Maclurina*; encrusted by *Protrochiscolithus*	5104	483			21
gastropod		5110	332			2.5
gastropod	*Maclurina*	5127	341			3
gastropod	*Maclurina*	5150	341			3
gastropod	*Maclurina*	5150	355			3.5
gastropod		5162	37			2.5

NS Wall	Comments	x	y	W	H	D
gastropod	*Maclurina*	5172	231			11
gastropod	*Maclurina*	5188	71			6
gastropod	*Maclurina*	5205	70			4.5
gastropod	*Maclurina*	5235	484			16
gastropod		5244	339			2
gastropod	*Maclurina*	5260	12			4
gastropod	encrusted by *Protrochiscolithus*	5284	320			2
gastropod	*Maclurina*	5299	77			3
gastropod	*Maclurina*	5309	367			3
gastropod	*Maclurina*	5314	290			3.5
gastropod	*Maclurina*	5369	397			4
gastropod		5409	115			2.5
gastropod		5410	78			2
gastropod	*Maclurina*	5412	265			3.5
gastropod	*Maclurina*	5420	84			3
gastropod		5422	290			2.5
gastropod	*Maclurina*	5464	337			5
gastropod	*Maclurina*	5466	343			3
gastropod	*Maclurina*	5514	105			4
gastropod		5560	94			2.5
gastropod	*Maclurina*	5564	220			3.5
gastropod	*Maclurina*	5624	236			3
gastropod		5657	55			2
gastropod		5662	282			2.5
gastropod	*Hormotoma*	5675	56	3.5		2
gastropod		5676	37			2
gastropod		5733	468			1.5
gastropod	*Maclurina*; encrusted by *Calapoecia*	5772	271			4.5
gastropod	*Maclurina*	5800	477			15
gastropod	*Maclurina*	5812	316			3.5
gastropod	*Maclurina*	5816	334			4
gastropod	*Maclurina*	5830	334			4.5
gastropod	*Maclurina*	5942	260			6.5
gastropod	*Maclurina*	5970	467			5
gastropod	*Maclurina*	6058	10			3
gastropod	*Maclurina*	6096	467			3
gastropod	*Maclurina*	6105	196			4
gastropod		6123	399			2.5
gastropod		6128	107			1
gastropod		6143	79			2.5
gastropod		6174	221			2.5
gastropod	*Maclurina*	6196	467			3
gastropod		6278	95			2.5
horn coral	highly abraded	4	473			3.5
horn coral	highly abraded	7	279			2.5
horn coral	epitheca abraded	14	195			1

NS Wall	Comments	x	y	W	H	D
horn coral	highly abraded	39	301			1
horn coral		45	375			4
horn coral	apex points north	62	219	2		1.5
horn coral	highly abraded; cardinal septum 40 degrees down from north	71	277			2.5
horn coral	highly abraded	88	438			3
horn coral	epitheca abraded	92	437			3.5
horn coral	epitheca abraded; cardinal septum 20 degrees down from south	106	463			1
horn coral	epitheca abraded; cardinal septum 50 degrees up from south	110	371			1
horn coral	moderately abraded	111	372			1
horn coral	epitheca abraded; cardinal septum 45 degrees down from south	121	432			1
horn coral	highly abraded	130	434			2.5
horn coral	epitheca abraded	139	447			2
horn coral	highly abraded	160	438			3
horn coral		193	438	1.5		1
horn coral	highly abraded; cardinal septum 70 degrees down from south	199	437			1
horn coral	highly abraded	230	443			2
horn coral	highly abraded	237	442			1
horn coral	epitheca abraded; cardinal septum 70 degrees down from north	240	440			2.5
horn coral	highly abraded	260	356			1.5
horn coral	highly abraded	305	476			2.5
horn coral	epitheca abraded; cardinal septum 70 degrees down from south	395	433			1
horn coral	highly abraded	418	254			1
horn coral	highly abraded	420	298			2
horn coral	epitheca abraded; cardinal septum 45 up from south	493	220			1.5
horn coral	highly abraded	494	220			3
horn coral	highly abraded	534	316			2.5
horn coral	well preserved; cardinal septum 45 degrees down from south	570	262			3.5
horn coral	cardinal septum straight down	586	465			2.5
horn coral	highly abraded	639	276			1
horn coral	highly abraded	660	217			3
horn coral	highly abraded	665	216			1.5
horn coral	highly abraded; cardinal septum 45 degrees down from south	671	216			2
horn coral	highly abraded	684	224			1
horn coral	highly abraded	686	216			1.5
horn coral	highly abraded	717	379			3
horn coral	weakly abraded; cardinal septum 40 degrees from south	728	262			2.5
horn coral	weakly abraded; cardinal septum 45 degrees up from north	751	431			1.5
horn coral	highly abraded; cardinal septum 30 degrees down from north	771	463			1.5
horn coral	weakly abraded; cardinal septum 10 degrees down from south	826	215			2
horn coral	highly abraded	843	288			3.5
horn coral	weakly abraded; cardinal septum 45 degrees up from north	877	239			2
horn coral	highly abraded	911	475			4.5
horn coral	weakly abraded	959	323			5.5
horn coral	highly abraded	962	222			1
horn coral	highly abraded	962	327			2.5
horn coral	highly abraded; cardinal septum 75 degrees down from north	972	270			3

NS Wall	Comments	x	y	W	H	D
horn coral	highly recrystallized	1019	374			2
horn coral	highly abraded	1088	441			1.5
horn coral	moderately abraded; apex pointing north	1102	204	6		3
horn coral	weakly abraded; filled with sediment; cardinal septum 30 degrees down from south	1121	319			4.5
horn coral	apex points south	1142	441	7.5		3
horn coral	epitheca abraded	1161	243			1
horn coral	highly abraded	1163	243			2
horn coral	highly abraded	1200	322	10		4
horn coral	epitheca abraded; cardinal septum straight down	1217	215			1.5
horn coral		1224	328	1.5		1.5
horn coral		1233	335			1.5
horn coral	highly abraded	1247	414			1.5
horn coral	epitheca abraded; cardinal septum 80 degrees down from south	1255	216			1
horn coral	highly abraded; cardinal septum 45 degrees down from south	1264	237			2.5
horn coral	apex points south	1270	422	7		4
horn coral	recrystallized	1315	255			1
horn coral	life position	1318	235	4		3
horn coral	life position	1348	416	1.5		1
horn coral	epitheca	1351	205			1.5
horn coral	highly abraded; cardinal septum points straight down	1359	288			1
horn coral	highly abraded	1394	418			2.5
horn coral	epitheca abraded; cardinal septum straight down	1395	442			2
horn coral	moderately abraded; cardinal septum straight down	1404	332			1
horn coral	epitheca abraded; cardinal septum 30 degrees up from south	1423	210			1
horn coral	highly abraded	1443	469			1
horn coral	highly abraded	1446	335			1.5
horn coral		1456	326			2
horn coral	highly abraded	1459	327			3
horn coral	moderately abraded	1482	330			2.5
horn coral	highly abraded	1486	207			3
horn coral	dissolved	1512	366			2
horn coral	in growth position	1550	486			3
horn coral	moderately abraded	1652	296			1.5
horn coral	highly abraded	1670	426			4
horn coral	highly abraded	1680	280			2
horn coral	highly abraded; cardinal septum 30 degrees up from north	1686	481			2.5
horn coral	highly abraded	1700	256	1		1
horn coral		1720	266			1
horn coral	epitheca abraded	1830	210			1
horn coral	epitheca abraded	1831	210			1.5
horn coral	highly abraded; cardinal septum straight down	1847	189			3
horn coral	cardinal septum 45 degrees down from south	1849	210			2
horn coral	highly abraded	1854	210			3.5
horn coral	highly abraded	1860	264			1.5
horn coral	highly recrystallized	1921	274			1
horn coral	epitheca gone; cardinal septum 45 degrees down from south	1927	388			1.5

NS Wall	Comments	x	y	W	H	D
horn coral	highly abraded	1934	271			1.5
horn coral	highly abraded	1957	274			1
horn coral	highly abraded; cardinal septum 50 degrees down from north	1960	276			2.5
horn coral	highly abraded	1961	194			1
horn coral	highly abraded	1965	352			3
horn coral	highly abraded	1980	262			3
horn coral	highly abraded	2045	295			2
horn coral	highly abraded	2053	219			2
horn coral	epitheca abraded	2080	293			1.5
horn coral	moderately abraded	2172	224			2
horn coral	highly abraded	2183	225			2.5
horn coral	highly abraded	2195	335			2.5
horn coral	highly abraded	2200	225			1.5
horn coral		2213	270	2		1.5
horn coral	highly abraded; cardinal septum points south	2215	407			2.5
horn coral		2224	269	1		1
horn coral	highly abraded	2274	267			2
horn coral	epitheca abraded; cardinal septum points straight down	2295	407			1
horn coral	highly abraded	2299	220			1.5
horn coral	moderately abraded; cardinal septum 45 degrees down from south	2300	276			3
horn coral	epitheca abraded; cardinal septum 45 degrees up from south	2318	277			2.5
horn coral	moderately abraded; cardinal septum due south	2321	276			1
horn coral	highly recrystallized	2367	254			1
horn coral	highly recrystallized	2388	305			1
horn coral	highly recrystallized	2394	266			1
horn coral	epitheca gone; cardinal septum 70 degrees up from south	2408	264			1.5
horn coral	highly abraded	2421	510			3
horn coral	epitheca abraded; cardinal septum 30 degrees down from south	2435	476			1
horn coral	highly abraded	2454	190			1
horn coral	highly abraded	2456	191			1
horn coral	cardinal septum 20 degrees down from south	2460	414			2
horn coral	highly abraded; cardinal septum straight down	2464	474			1.5
horn coral	weakly abraded	2477	410			1.5
horn coral	apex points south	2482	477	4.5		2.5
horn coral	epitheca abraded	2492	377			1
horn coral	epitheca abraded	2493	236			2
horn coral	epitheca abraded	2498	412			1.5
horn coral	highly abraded	2546	212			1
horn coral	highly abraded	2562	203			1
horn coral	epitheca abraded; cardinal septum 10 degrees down from south	2565	407			2.5
horn coral	highly abraded	2570	409			2.5
horn coral	highly abraded	2580	276			2.5
horn coral	highly abraded	2584	251			1.5
horn coral	apex points south	2591	414	5	3.5	
horn coral	cardinal septum straight down	2592	260			2.5
horn coral	weakly abraded; encrusted by *Protrochiscolithus*	2595	417			4

NS Wall	Comments	x	y	W	H	D
horn coral	life position	2600	253	2.5		1.5
horn coral	highly abraded	2604	262			3
horn coral	highly abraded	2607	260	1.5		1.5
horn coral	epitheca abraded	2618	262			1
horn coral	moderately abraded	2636	230			3.5
horn coral	highly abraded	2667	472			4.5
horn coral	highly abraded	2668	190			1
horn coral	moderately abraded; cardinal septum straight down	2668	283			1.5
horn coral	highly abraded	2671	212			1.5
horn coral	highly abraded	2675	276			1.5
horn coral	highly abraded	2677	336			1.5
horn coral	epitheca abraded; cardinal septum 45 degrees up from north	2682	318			1
horn coral	highly abraded	2682	332			1
horn coral	highly abraded	2683	332			1
horn coral	highly abraded	2684	331			1
horn coral	highly abraded	2684	333			1
horn coral	highly abraded	2685	212			2.5
horn coral	highly abraded	2735	478			3
horn coral	cardinal septum 50 degrees down from south	2741	273			1
horn coral	epitheca abraded; cardinal septum points straight down	2744	430			1
horn coral	highly abraded; cardinal septum 50 degrees down from north	2747	272			1
horn coral	in storm lens	2815	412	3.5		2.5
horn coral		2841	251	6		4
horn coral	highly abraded; cardinal septum 75 degrees down from south	2857	476			4
horn coral	highly abraded	2861	366			2
horn coral	highly abraded	2883	265			4.5
horn coral	highly abraded	2948	225			3
horn coral	highly abraded	2962	319			1.5
horn coral	highly abraded	2965	230			2.5
horn coral	highly abraded	3005	480			1.5
horn coral	highly abraded	3006	230			1.5
horn coral	highly abraded	3036	404			3.5
horn coral	epitheca abraded; cardinal septum 45 degrees up from north	3058	234			1
horn coral	highly abraded	3060	234			1
horn coral	highly abraded	3067	358			3.5
horn coral	highly abraded	3106	283			1.5
horn coral	highly abraded	3106	355			4
horn coral	moderately abraded	3149	216			1
horn coral	moderately abraded	3166	214	2.5		2
horn coral	epitheca abraded; cardinal septum 45 degrees down from south	3204	271			1.5
horn coral	highly abraded	3211	278			1.5
horn coral	highly abraded	3259	300			2
horn coral	well preserved	3260	361			3.5
horn coral	apex points south	3280	285	6		4
horn coral	cardinal septum due south	3286	267			1.5
horn coral	highly abraded; apex points north	3331	265	2		1.5

NS Wall	Comments	x	y	W	H	D
horn coral	highly abraded	3331	267			1.5
horn coral	highly abraded; highly recrystallized	3336	478			3
horn coral	highly abraded	3342	472			3.5
horn coral	cardinal septum 30 degrees down from north	3385	479			1.5
horn coral	highly abraded	3394	514			2.5
horn coral	apex points south	3405	478	5		3
horn coral	highly abraded	3425	403			3
horn coral	highly abraded	3427	259			2
horn coral	cardinal septum 45 degrees down from south	3490	491			1.5
horn coral	epitheca abraded	3507	468			2
horn coral	highly abraded; cardinal septum 20 degrees down from north	3508	470			1.5
horn coral	highly abraded	3525	260			1.5
horn coral	moderately abraded	3814	402			1
horn coral	moderately abraded	3846	85			1.5
horn coral	highly abraded	3865	312		3	
horn coral	highly abraded	3900	450			2
horn coral	weakly abraded	3900	453			2
horn coral	moderately abraded	3901	44	1.5		1
horn coral	moderately abraded	3901	455			1
horn coral	moderately abraded	3902	49			3
horn coral	epitheca abraded; cardinal septum 45 degrees down from south	3903	102			2
horn coral	weakly abraded	3904	447	3.5		3
horn coral	highly abraded	3906	455			2.5
horn coral	epitheca abraded	3907	451			2
horn coral	weakly abraded	3912	456			2.5
horn coral	weakly abraded	3918	455			1.5
horn coral	highly abraded	3919	30			1.5
horn coral	highly abraded	3930	194			3
horn coral	moderately abraded	3937	400			1.5
horn coral	moderately abraded	3938	194			2
horn coral	highly abraded	3941	44			1.5
horn coral	highly abraded	3941	63			1.5
horn coral	moderate	3983	311			1
horn coral	moderately abraded; cardinal septum 45 degrees up from south	3998	46			3
horn coral	weakly abraded; cardinal septum 45 degrees down from north	4043	317			3.5
horn coral	moderately abraded	4056	46			4
horn coral	highly abraded	4075	434			3
horn coral	epitheca abraded; cardinal septum 15 degrees up from south	4077	105			2.5
horn coral	highly abraded	4079	46			4.5
horn coral	highly abraded	4080	263			1
horn coral	moderately; cardinal septum straight down	4089	43			3
horn coral	highly abraded	4099	42			1
horn coral	epitheca abraded; cardinal septum 5 degrees down from south	4100	79			2.5
horn coral	highly abraded	4103	225	2		2
horn coral	moderately abraded	4118	81			1
horn coral	highly abraded	4122	92			2

NS Wall	Comments	x	y	W	H	D
horn coral	weakly abraded; cardinal septum 45 degrees down from south	4130	263			2.5
horn coral	epitheca abraded	4168	426			3
horn coral	moderately abraded	4177	439			3.5
horn coral	highly abraded	4195	490			2
horn coral	highly abraded	4207	405			1
horn coral	moderately abraded	4223	225			3
horn coral	highly abraded	4230	401			2
horn coral	highly abraded	4254	159	1.5		1.5
horn coral	highly abraded	4273	51			1.5
horn coral	epitheca abraded; cardinal septum 45 degrees down from south	4278	403			3
horn coral	highly abraded	4279	51			2.5
horn coral	highly abraded	4283	385			2.5
horn coral	epitheca abraded	4284	91			2
horn coral	highly abraded	4286	51			1
horn coral	highly abraded	4291	51			2.5
horn coral	epitheca abraded; cardinal septum straight up	4301	334			1.5
horn coral	highly abraded	4307	405			1
horn coral	highly abraded	4307	421			1.5
horn coral	highly abraded	4307	431			1.5
horn coral	highly abraded	4308	76			3.5
horn coral	highly abraded	4310	156			2.5
horn coral	epitheca abraded; cardinal septum 45 degrees up from north	4328	429			1.5
horn coral		4360	74			2
horn coral	highly abraded	4390	24			1.5
horn coral	epitheca abraded; cardinal septum 45 degrees down from north	4409	266			1.5
horn coral	highly abraded	4417	353			2.5
horn coral	highly abraded	4428	396			1.5
horn coral	moderately abraded	4443	305			2
horn coral	highly abraded	4521	419			1
horn coral	moderately abraded	4523	298			3.5
horn coral	highly abraded	4535	430			3.5
horn coral	highly abraded	4545	34			1
horn coral	highly abraded	4565	78			2.5
horn coral	highly abraded	4583	429			2
horn coral	highly abraded	4587	76			2.5
horn coral		4590	299	2		1.5
horn coral	highly abraded; in storm lens	4602	264			3.5
horn coral	highly abraded; in storm lens	4619	262			1.5
horn coral	highly abraded; in storm lens	4628	263			1.5
horn coral	highly abraded	4630	203			3
horn coral	moderately abraded; apex points south	4635	305			5
horn coral	highly abraded	4641	104			2.5
horn coral	highly abraded	4651	24			1
horn coral	highly abraded; in storm lens	4692	265			2
horn coral	moderately abraded	4693	108			2.5
horn coral	highly abraded; in storm lens	4697	260			1.5

NS Wall	Comments	x	y	W	H	D
horn coral	highly abraded	4698	232			2.5
horn coral	highly abraded	4700	365			3
horn coral	epitheca abraded	4710	1			1.5
horn coral	highly abraded	4737	430			4
horn coral	epitheca abraded	4738	268			1.5
horn coral	highly abraded	4782	373			3
horn coral	highly abraded	4790	336			1.5
horn coral	highly abraded	4790	368			2.5
horn coral	highly abraded	4801	466			3
horn coral	well preserved; cardinal septum 50 degrees down from south	4803	9			1.5
horn coral	moderately abraded	4806	362			5
horn coral	moderately abraded	4815	265			3
horn coral	highly abraded	4821	364			2.5
horn coral	moderately abraded	4846	28			2
horn coral	highly abraded	4882	338			3
horn coral	highly abraded	4909	430			2
horn coral	highly abraded	4930	347			1.5
horn coral	highly abraded	4970	338			2
horn coral	highly abraded	5001	25			1.5
horn coral	highly abraded	5004	49			2.5
horn coral	highly abraded	5014	104			1.5
horn coral	highly abraded	5026	103			3
horn coral	highly abraded	5030	258			2.5
horn coral	highly abraded	5034	26			2.5
horn coral	highly abraded	5036	109			2.5
horn coral	epitheca abraded; covered by cephalopod shell	5055	503			1
horn coral	highly abraded; cardinal septum 30 degrees down from south	5068	199			2.5
horn coral	highly abraded	5112	492			4
horn coral	highly abraded	5143	339			3
horn coral	moderately abraded	5146	52	3		3
horn coral	highly abraded	5154	409			4
horn coral	highly abraded	5158	36			1
horn coral	highly abraded	5188	2			2
horn coral	moderately abraded	5193	115			1.5
horn coral	highly abraded	5205	338			1
horn coral	weakly abraded; cardinal septum 50 degrees down from north	5230	136			3.5
horn coral	highly abraded	5249	239			2
horn coral	weakly abraded; cardinal septum 50 degrees down from north	5263	240			2
horn coral	highly abraded; in storm lens	5265	69			1
horn coral	highly abraded	5304	460			2.5
horn coral	highly abraded	5306	280			4
horn coral	highly abraded	5325	458			2
horn coral	highly abraded	5337	222			1
horn coral	highly abraded	5338	82			2
horn coral	highly abraded	5339	457			2.5
horn coral	highly abraded	5340	457			2.5

NS Wall	Comments	x	y	W	H	D
horn coral	epitheca abraded; cardinal septum 45 degrees down from north	5347	394			3.5
horn coral	life position	5357	39	2		2
horn coral	highly abraded	5363	336			3
horn coral	epitheca abraded	5367	230			2
horn coral	highly abraded	5374	222			2
horn coral	highly abraded	5378	457			2
horn coral	moderately abraded; cardinal septum 45 degrees down from south	5382	461			3
horn coral	highly abraded	5403	463			1.5
horn coral	well preserved; cardinal septum 50 degrees down from south	5404	456			4.5
horn coral	highly abraded	5406	450			2
horn coral	epitheca abraded	5415	262			1
horn coral	highly abraded	5420	289			2
horn coral	highly abraded	5422	117			2
horn coral	highly abraded	5427	266			2
horn coral	highly abraded	5440	448			2
horn coral	highly abraded	5444	451			2.5
horn coral	highly abraded	5464	284			3
horn coral	moderately abraded	5480	396			5.5
horn coral	highly abraded	5498	396			1.5
horn coral	highly abraded	5504	42			1.5
horn coral	highly abraded	5507	293			3.5
horn coral	moderately abraded; cardinal septum 60 degrees down from north	5507	450			1.5
horn coral	highly abraded	5510	212			3
horn coral	highly abraded	5530	455			3
horn coral	epitheca abraded	5550	41			1.5
horn coral	highly abraded	5564	94			2
horn coral	highly abraded	5567	92			2
horn coral	highly abraded	5571	69			1
horn coral	moderately abraded	5642	223			1
horn coral	moderately abraded	5661	428			2
horn coral	moderately abraded	5665	65			3.5
horn coral	highly abraded	5690	116			4
horn coral	highly abraded	5693	211			2
horn coral	highly abraded	5712	474			2.5
horn coral	highly abraded	5715	114			2.5
horn coral	highly abraded	5725	224			1
horn coral	epitheca abraded; cardinal septum 80 degrees down from north	5730	432			1.5
horn coral	highly abraded	5818	229			4
horn coral	epitheca abraded; cardinal septum 60 degrees down from south	5830	333			1
horn coral	highly abraded	5855	335			2
horn coral	highly abraded	5872	100			3.5
horn coral	highly abraded	5890	331			3
horn coral	moderately abraded	5900	284			2.5
horn coral	highly abraded	5903	87			2.5
horn coral	highly abraded	5905	439			2
horn coral	moderately abraded	5934	69			1

NS Wall	Comments	x	y	W	H	D
horn coral	highly abraded	5945	310			3.5
horn coral	highly abraded	5955	310			3
horn coral	moderately abraded	5960	328			2
horn coral	highly abraded	5972	58			2
horn coral	epitheca abraded; cardinal septum 45 degrees down from south	5977	56			2.5
horn coral	highly abraded	6051	2			2
horn coral	epitheca abraded; cardinal septum 45 degrees down from north	6055	314			2
horn coral	highly abraded	6056	216			1
horn coral	highly abraded; apex points south	6151	112	5		2.5
horn coral	highly abraded	6236	127			3
horn coral	moderately abraded; cardinal septum straight up	6263	131			1
horn coral	epitheca abraded	6280	132			1
horn coral	highly abraded	6290	254			2
Manipora		323	375	6	1.5	
Manipora		1926	310	26	5	
Manipora		4210	423	7	2.5	
Manipora		4298	158	4	3	
Manipora		5526	484	12	5	
Palaeophyllum	one corallite	1045	490			1.5
Palaeophyllum		1519	385	6	8	1
Palaeophyllum	encrusting *Protrochiscolithus*	5213	342	7	2	
Protrochiscolithus	encrusting stromatoporoid	114	348	4	1.5	
Protrochiscolithus		133	435	12	2	
Protrochiscolithus		193	306	11	4	
Protrochiscolithus		229	445	8	1.5	
Protrochiscolithus		242	389	5	1	
Protrochiscolithus	mound shaped; overturned	333	331	12	4	
Protrochiscolithus		432	503	8	2	
Protrochiscolithus	overturned; encrusting cephalopod	503	305	9	1.5	
Protrochiscolithus	mound shaped	603	357	12	5	
Protrochiscolithus		718	497	15	5	
Protrochiscolithus	encrusting gastropod	838	367	4	2	
Protrochiscolithus	encrusting *Crenulites*	854	454	5	0.5	
Protrochiscolithus	encrusting *Crenulites*; borings	906	350	7	1	
Protrochiscolithus	fragment	1054	311	6	1	
Protrochiscolithus		1213	203	4	1.5	
Protrochiscolithus		1233	214	10	3.5	
Protrochiscolithus		1371	226	12	1.5	
Protrochiscolithus		1494	393	13	2	
Protrochiscolithus	overturned	1561	190	4.5	1.5	
Protrochiscolithus		1566	330	4.5	0.5	
Protrochiscolithus		1730	425	6	1.5	
Protrochiscolithus		1788	305	5.5	1	
Protrochiscolithus		1801	216	11	3	
Protrochiscolithus		1882	355	5.5	1.5	
Protrochiscolithus		2072	301	7	1	

NS Wall	Comments	x	y	W	H	D
Protrochiscolithus		2098	487	10	5	
Protrochiscolithus	encrusting gastropod; encrusted by *Calapoecia*; overturned	2120	188	6	1	
Protrochiscolithus		2174	295	7	2	
Protrochiscolithus		2195	307	2.5	1.5	
Protrochiscolithus	Overturned	2318	470	39	12	
Protrochiscolithus		2323	410	4.5	1	
Protrochiscolithus		2346	291	9	2	
Protrochiscolithus		2363	291	6	1	
Protrochiscolithus		2434	291	4.5	0.5	
Protrochiscolithus		2437	363	6.5	1	
Protrochiscolithus	overturned	2493	472	7	3.5	
Protrochiscolithus		2568	280	3.5	1	
Protrochiscolithus	encrusting horn coral	2596	416	4	1	
Protrochiscolithus		2668	425	7	2	
Protrochiscolithus	encrusting cephalopod; domical	2731	292	7.5	4	
Protrochiscolithus		2738	473	7	1.5	
Protrochiscolithus	overturned	2887	357	4	1	
Protrochiscolithus		2958	434	8	2.5	
Protrochiscolithus		2978	488	3	1	
Protrochiscolithus		3136	475	16	2	
Protrochiscolithus	encrusting *Saffordophyllum*	3309	222	5	1	
Protrochiscolithus		3309	427	7	2	
Protrochiscolithus		3340	425	4.5	1.5	
Protrochiscolithus	encrusting *Crenulites*	3446	200	6	3	
Protrochiscolithus		3475	422	3.5	1.5	
Protrochiscolithus	on top of storm lens	3477	472	6	1	
Protrochiscolithus		3583	301	6.5	1	
Protrochiscolithus	good shielding	3830	428	24	1	
Protrochiscolithus		3896	426	18	3	
Protrochiscolithus	overturned	4107	351	5	1.5	
Protrochiscolithus	encrusting cephalopod	4128	198	4.5	0.5	
Protrochiscolithus	encrusting cephalopod	4196	303	4	0.5	
Protrochiscolithus		4200	314	2.5	2	
Protrochiscolithus		4306	426	5	2	
Protrochiscolithus	encrusting cephalopod	4362	354	3.5	1	
Protrochiscolithus	encrusting some trash	4453	65	7	2.5	
Protrochiscolithus		4547	336	7.5	11	
Protrochiscolithus		4594	422	5	2	
Protrochiscolithus		4614	382	9.5	2	
Protrochiscolithus	encrusting gastropod	5002	342	3	1.5	
Protrochiscolithus	encrusting gastropod	5104	488	9.5	1.5	
Protrochiscolithus		5150	232	5	1.5	
Protrochiscolithus	encrusted by *Palaeophyllum*	5213	341	6	1	
Protrochiscolithus	encrusting receptaculitid	5238	473	1.5	2	
Protrochiscolithus	encrusting gastropod	5284	319	4	1	
Protrochiscolithus	encrusting *Crenulites*	5317	454	4.5	1	

NS Wall	Comments	x	y	W	H	D
Protrochiscolithus	encrusting stromatoporoid	5343	281	20	1	
Protrochiscolithus	encrusting cephalopod	5366	297	15	1.5	
Protrochiscolithus		5428	395	5.5	1	
Protrochiscolithus		5465	451	10	2	
Protrochiscolithus	tilted on side	5511	265	4	3	
Protrochiscolithus	encrusted by *Saffordophyllum*	5632	368	9	1	
Protrochiscolithus	good shielding	5663	361	9.5	1	
Protrochiscolithus		5679	369	8	1.5	
Protrochiscolithus		5709	433	8.8	4	
Protrochiscolithus		5764	374	4.5	1.5	
Protrochiscolithus		5857	460	12	1	
Protrochiscolithus		5904	148	7	2	
Protrochiscolithus	overturned	5972	369	6.5	2	
Protrochiscolithus	encrusting *Crenulites*	6037	375	6.5	1.5	
Protrochiscolithus		6083	161	9	1.5	
Protrochiscolithus		6137	398	5	0.5	
Protrochiscolithus		6226	335	8	1	
Protrochiscolithus		6440	55	9	1	
receptaculitid		7	347	11	1	
receptaculitid		8	207	5.5	0.5	
receptaculitid		9	356	15	1.5	
receptaculitid		28	396	13	2	
receptaculitid		35	193	14	1	
receptaculitid		37	217	14	1	
receptaculitid		59	312	17	2	
receptaculitid		94	372	6	1	
receptaculitid		110	192	9	1	
receptaculitid		123	350	10	1	
receptaculitid		125	386	12	1	
receptaculitid		135	213	12	1	
receptaculitid	good shielding; on top of storm lens	162	469	17	3	
receptaculitid		169	390	8	1	
receptaculitid		210	391	14	1	
receptaculitid		214	426	9	1	
receptaculitid		238	392	20	1.5	
receptaculitid		238	497	10	1	
receptaculitid		245	267	8	1	
receptaculitid		257	448	17	1	
receptaculitid	good shielding	259	386	17	1	
receptaculitid		260	276	9.5	1	
receptaculitid		268	402	5	1	
receptaculitid		280	502	8	1	
receptaculitid		285	331	11	1	
receptaculitid		295	257	17	1.5	
receptaculitid		298	467	10	1	
receptaculitid		301	257	16	1	

NS Wall	Comments	x	y	W	H	D
receptaculitid		301	416	6	1	
receptaculitid		308	406	7	1	
receptaculitid		308	494	9	1	
receptaculitid		317	331	14	2	
receptaculitid	good shielding	325	490	15	1	
receptaculitid		347	283	9	1	
receptaculitid		359	426	9	1	
receptaculitid		367	323	9	1	
receptaculitid		376	383	8	1	
receptaculitid		376	386	11	1	
receptaculitid		402	273	7	1	
receptaculitid		415	466	7	1	
receptaculitid		424	505	27	4	
receptaculitid		426	313	9	1	
receptaculitid		435	363	11	1.5	
receptaculitid		443	270	9.5	1	
receptaculitid		444	423	17	1	
receptaculitid		461	488	9	1	
receptaculitid		462	367	8	1	
receptaculitid		462	495	11	1	
receptaculitid		481	265	23	2	
receptaculitid		508	263	11	1	
receptaculitid		512	369	13	1.5	
receptaculitid	good shielding	512	478	17	3	
receptaculitid		543	310	11	1.5	
receptaculitid		550	257	14	1	
receptaculitid		556	197	7	1	
receptaculitid	good shielding	573	501	18	2	
receptaculitid		580	263	11	1.5	
receptaculitid		583	444	16	1	
receptaculitid		588	349	12	1	
receptaculitid		670	372	11	1	
receptaculitid		673	472	24	2	
receptaculitid		683	193	11	1	
receptaculitid		686	263	7.5	1	
receptaculitid		702	198	4.5	1	
receptaculitid		706	412	10	1	
receptaculitid		725	193	14	1	
receptaculitid		728	325	20	2	
receptaculitid		763	366	20	2	
receptaculitid		791	384	22	1	
receptaculitid		795	334	15	2	
receptaculitid		860	435	14	1	
receptaculitid		865	431	8	1	
receptaculitid		878	413	9	1	
receptaculitid		886	406	12	1	

NS Wall	Comments	x	y	W	H	D
receptaculitid		901	268	7	0.5	
receptaculitid		902	238	8.5	0.5	
receptaculitid		937	370	8	0.5	
receptaculitid		965	361	10	1	
receptaculitid		966	362	10	1	
receptaculitid		985	384	10	1.5	
receptaculitid		990	202	13	1	
receptaculitid		990	316	22	1.5	
receptaculitid		992	471	9	1	
receptaculitid		995	496	9	1	
receptaculitid		996	438	15	1.5	
receptaculitid		1006	500	6	0.5	
receptaculitid		1008	325	7	1.5	
receptaculitid		1010	347	9	1	
receptaculitid		1033	359	13	2.5	
receptaculitid		1061	334	16	1.5	
receptaculitid		1063	255	15	1	
receptaculitid		1100	271	15	1	
receptaculitid		1104	271	18	1	
receptaculitid		1107	371	7	1	
receptaculitid		1125	261	22	1	
receptaculitid		1139	403	12	1	
receptaculitid		1142	495	7	1	
receptaculitid		1172	475	15	1	
receptaculitid		1186	414	7	1.5	
receptaculitid		1192	331	12	1	
receptaculitid		1235	463	9	1	
receptaculitid		1289	378	17	1	
receptaculitid	good shielding	1296	489	18	2	
receptaculitid		1300	463	14	1	
receptaculitid		1325	271	7	1	
receptaculitid	good shielding	1350	335	22	3	
receptaculitid		1352	284	9	1	
receptaculitid		1362	318	6	1	
receptaculitid		1386	279	8.5	1	
receptaculitid		1417	284	12	1	
receptaculitid		1426	485	12	1	
receptaculitid		1438	355	13	1	
receptaculitid		1441	260	17	1.5	
receptaculitid	good shielding	1443	283	13	1	
receptaculitid		1452	434	9	1	
receptaculitid		1476	366	20	2	
receptaculitid		1479	350	30	4	
receptaculitid		1490	283	12	1	
receptaculitid		1508	314	10	1	
receptaculitid	good shielding	1509	312	10	1	

NS Wall	Comments	x	y	W	H	D
receptaculitid		1513	328	19	1	
receptaculitid		1514	411	9	1	
receptaculitid		1520	348	6	1	
receptaculitid		1524	283	15	1	
receptaculitid		1524	427	9	1	
receptaculitid		1539	229	9	1	
receptaculitid		1545	426	6	1	
receptaculitid		1566	465	10	1	
receptaculitid		1570	425	10	1	
receptaculitid		1587	390	12	1	
receptaculitid		1589	384	7	0.5	
receptaculitid		1619	315	11	1	
receptaculitid	good shielding	1630	280	11	1	
receptaculitid		1632	316	12	1.5	
receptaculitid	good shielding	1644	333	21	2	
receptaculitid		1657	366	7	1	
receptaculitid		1681	426	10	1	
receptaculitid		1685	479	12	1.5	
receptaculitid		1686	423	10	1	
receptaculitid		1692	419	10	1	
receptaculitid		1712	209	7	1.5	
receptaculitid		1716	443	16	3	
receptaculitid		1722	479	11	1	
receptaculitid		1727	481	8	0.5	
receptaculitid		1737	475	19	1	
receptaculitid		1741	364	5	1	
receptaculitid		1745	483	9	0.5	
receptaculitid		1765	284	18	1.5	
receptaculitid		1786	352	16	2	
receptaculitid		1789	389	8	1	
receptaculitid		1802	251	8	1.5	
receptaculitid	good shielding	1818	216	16	1	
receptaculitid		1839	418	15	1	
receptaculitid		1859	383	25	2	
receptaculitid		1860	418	16	1	
receptaculitid		1867	215	8	1	
receptaculitid		1892	222	8	1	
receptaculitid		1893	383	10	1.5	
receptaculitid		1926	416	22	1.5	
receptaculitid		1927	488	8	1	
receptaculitid	good shielding	1929	477	13	1	
receptaculitid		1949	393	18	1	
receptaculitid		1958	315	17	1	
receptaculitid		1968	300	7	1	
receptaculitid		1982	422	9	1	
receptaculitid		1985	234	10	1	

NS Wall	Comments	x	y	W	H	D
receptaculitid		2020	418	17	2	
receptaculitid		2023	232	20	2	
receptaculitid		2037	323	6	1.5	
receptaculitid	good shielding	2044	341	10	1.5	
receptaculitid		2070	219	15	1	
receptaculitid		2109	368	13	1	
receptaculitid	good shielding	2124	338	14	2	
receptaculitid		2124	362	8	1	
receptaculitid		2131	425	8	1	
receptaculitid	good shielding	2154	255	15	1	
receptaculitid		2156	318	12	1.5	
receptaculitid		2174	386	11	1.5	
receptaculitid		2200	422	24	22	
receptaculitid	good shielding	2229	267	11	1	
receptaculitid		2229	427	8	1.5	
receptaculitid		2274	221	9	1	
receptaculitid		2275	415	14	2	
receptaculitid		2293	372	13	3	
receptaculitid		2307	362	13	2	
receptaculitid		2364	410	20	2	
receptaculitid		2376	331	29	1.5	
receptaculitid		2381	404	23	2	
receptaculitid	good shielding	2390	306	18	1.5	
receptaculitid		2400	371	17	2	
receptaculitid		2403	365	10	1	
receptaculitid		2424	518	18	1.5	
receptaculitid		2430	366	15	1	
receptaculitid		2431	190	15	1	
receptaculitid		2446	435	14	1.5	
receptaculitid	good shielding	2455	312	20	2	
receptaculitid		2476	350	11	1.5	
receptaculitid		2477	348	8	1.5	
receptaculitid		2477	359	22	2	
receptaculitid		2529	268	9.5	1	
receptaculitid		2538	215	13	1	
receptaculitid		2580	276	20	1	
receptaculitid		2580	284	11	1	
receptaculitid		2610	412	16	2	
receptaculitid		2614	427	13	1	
receptaculitid		2627	262	9	1	
receptaculitid		2637	519	18	1	
receptaculitid		2639	357	11	1	
receptaculitid		2687	422	7	1	
receptaculitid		2700	390	23	2	
receptaculitid		2711	237	7	1	
receptaculitid		2727	473	8	1	

NS Wall	Comments	x	y	W	H	D
receptaculitid	good shielding	2734	192	22	1.5	
receptaculitid	good shielding	2741	216	23	2	
receptaculitid		2766	222	18	1.5	
receptaculitid		2776	432	21	2	
receptaculitid		2786	295	18	1.5	
receptaculitid		2788	422	14	1.5	
receptaculitid		2790	467	25	1	
receptaculitid		2792	514	16	1	
receptaculitid		2805	473	15	1	
receptaculitid		2824	356	25	2	
receptaculitid		2890	255	8	1	
receptaculitid		2895	483	9	1	
receptaculitid		2900	472	12	1	
receptaculitid		2901	472	12	1.5	
receptaculitid		2902	427	11	1	
receptaculitid		2906	389	14	1	
receptaculitid		2933	389	16	2	
receptaculitid		2934	431	15	1	
receptaculitid		2940	365	8	1	
receptaculitid		2943	275	18	1.5	
receptaculitid		2956	430	9	1	
receptaculitid		2957	316	14	1	
receptaculitid		2970	409	12	1	
receptaculitid		2980	469	12	1	
receptaculitid		3000	235	7	1	
receptaculitid	overturned	3004	359	13	1	
receptaculitid		3005	481	9	1	
receptaculitid		3007	276	7	1	
receptaculitid		3010	512	10	3	
receptaculitid		3030	244	14	1	
receptaculitid		3033	508	13	1	
receptaculitid		3052	336	12	1.5	
receptaculitid		3060	242	14	2	
receptaculitid		3065	404	7	1	
receptaculitid		3085	477	18	1.5	
receptaculitid		3091	287	7	1	
receptaculitid		3136	514	10	1	
receptaculitid		3145	518	13	1	
receptaculitid		3167	311	13	1.5	
receptaculitid		3194	329	20	1.5	
receptaculitid		3197	185	17	1.5	
receptaculitid		3228	430	8	1	
receptaculitid		3232	506	16	1	
receptaculitid		3270	470	9	1	
receptaculitid		3282	381	12	1	
receptaculitid		3282	494	11	1	

NS Wall	Comments	x	y	W	H	D
receptaculitid		3285	476	9	1	
receptaculitid		3353	330	12	2	
receptaculitid		3359	308	11	1	
receptaculitid		3360	230	11	1	
receptaculitid		3370	490	27	1.5	
receptaculitid		3375	388	12	1	
receptaculitid		3424	418	16	0.5	
receptaculitid	good shielding	3426	319	18	2	
receptaculitid		3426	423	16	1.5	
receptaculitid		3447	226	46	1	
receptaculitid		3448	385	12	1.5	
receptaculitid		3451	351	12	1	
receptaculitid	good shielding	3465	376	15	1	
receptaculitid		3493	386	20	1.5	
receptaculitid	good shielding	3494	330	21	2	
receptaculitid	good shielding	3515	329	17	2	
receptaculitid		3536	467	11	1	
receptaculitid		3580	266	15	1	
receptaculitid	good shielding	3612	500	20	1	
receptaculitid	good shielding	3613	485	12	1	
receptaculitid		3680	482	16	1	
receptaculitid		3806	255	20	1.5	
receptaculitid		3820	198	16	1	
receptaculitid		3824	130	16	1	
receptaculitid	overlies *Crenulites*	3843	456	16	1.5	
receptaculitid		3852	393	10	1.5	
receptaculitid		3858	398	8	1	
receptaculitid		3860	426	18	1	
receptaculitid		3869	298	12	1	
receptaculitid		3874	85	6	1.5	
receptaculitid		3874	190	9	1	
receptaculitid		3874	477	11	1.5	
receptaculitid		3875	234	16	1	
receptaculitid		3888	351	11	1	
receptaculitid		3888	368	10	1	
receptaculitid		3896	123	6	1	
receptaculitid		3903	65	12	1	
receptaculitid		3903	234	10	1	
receptaculitid		3919	468	16	1	
receptaculitid		3927	409	9	1	
receptaculitid	bent; arched	3930	109	19	5	
receptaculitid		3936	319	11	1.5	
receptaculitid		3945	398	11	1	
receptaculitid		3949	356	8.5	1	
receptaculitid		3954	434	13	1.5	
receptaculitid		3975	232	16	1	

NS Wall	Comments	x	y	W	H	D
receptaculitid		3977	123	9	1	
receptaculitid		4006	263	15	1	
receptaculitid		4009	492	11	1.5	
receptaculitid		4011	366	12	1	
receptaculitid		4038	418	12	1	
receptaculitid		4040	38	7.5	1	
receptaculitid		4044	262	13	1	
receptaculitid		4047	55	18	2	
receptaculitid		4068	385	18	1	
receptaculitid		4068	469	15	1	
receptaculitid		4087	58	9	1	
receptaculitid	good shielding	4095	141	10	0.5	
receptaculitid		4098	65	8	1	
receptaculitid		4115	420	13	1.5	
receptaculitid		4115	448	7	1	
receptaculitid		4120	282	8	1	
receptaculitid		4127	463	20	1	
receptaculitid		4139	406	10	1	
receptaculitid		4148	223	11	1	
receptaculitid		4185	429	12	0.5	
receptaculitid		4190	362	21	1.5	
receptaculitid		4236	173	23	1.5	
receptaculitid		4255	56	16	2	
receptaculitid		4262	235	18	1.5	
receptaculitid		4292	221	12	1	
receptaculitid		4299	130	10	1	
receptaculitid		4300	337	6	1	
receptaculitid		4306	485	16	1	
receptaculitid		4337	202	11	1	
receptaculitid		4344	301	18	1	
receptaculitid		4346	378	19	1.5	
receptaculitid		4347	424	17	1	
receptaculitid		4354	388	11	1	
receptaculitid		4360	448	11	1	
receptaculitid		4363	123	10	1	
receptaculitid		4370	457	20	1	
receptaculitid		4390	121	22	1	
receptaculitid		4390	129	8	1	
receptaculitid		4404	364	14	1	
receptaculitid		4406	282	18	1	
receptaculitid		4423	300	12	1	
receptaculitid		4438	126	11	1	
receptaculitid		4443	462	10	1	
receptaculitid		4444	363	14	2	
receptaculitid		4460	388	13	1	
receptaculitid		4471	349	9	1	

NS Wall	Comments	x	y	W	H	D
receptaculitid		4483	231	9.5	1	
receptaculitid		4485	60	8	1	
receptaculitid		4490	252	18	1	
receptaculitid		4503	351	17	1.5	
receptaculitid		4507	308	10	1	
receptaculitid		4519	391	15	1	
receptaculitid		4520	398	12	1.5	
receptaculitid		4524	69	9	1	
receptaculitid		4533	301	14	1	
receptaculitid		4538	126	11	1	
receptaculitid		4544	272	12	1	
receptaculitid		4563	229	9.5	1	
receptaculitid		4575	379	18	1	
receptaculitid		4576	305	15	1	
receptaculitid		4594	205	18	1	
receptaculitid		4606	75	8	1	
receptaculitid		4609	415	6.5	1	
receptaculitid		4615	466	13	1	
receptaculitid		4635	125	10	1	
receptaculitid		4637	418	11	1	
receptaculitid		4643	131	10	1	
receptaculitid		4657	388	19	2	
receptaculitid		4660	105	19	2	
receptaculitid		4660	448	27	1.5	
receptaculitid		4668	131	10	1	
receptaculitid		4683	363	13	1	
receptaculitid		4695	270	13	1	
receptaculitid		4742	128	10	1	
receptaculitid		4762	362	12	1	
receptaculitid		4763	17	16	1	
receptaculitid		4771	131	18	1.5	
receptaculitid		4772	488	15	1.5	
receptaculitid		4790	130	8	1	
receptaculitid		4790	348	21	1.5	
receptaculitid		4793	424	14	1	
receptaculitid		4795	296	15	1	
receptaculitid		4800	344	10	1	
receptaculitid		4811	336	16	2	
receptaculitid		4830	192	16	1	
receptaculitid		4833	127	17	1.5	
receptaculitid		4834	280	18	1	
receptaculitid		4843	364	9.5	1	
receptaculitid		4848	318	21	1	
receptaculitid		4853	58	16	1	
receptaculitid		4868	223	17	1	
receptaculitid		4871	123	12	1	

NS Wall	Comments	x	y	W	H	D
receptaculitid		4886	139	13	1	
receptaculitid		4886	302	10	1	
receptaculitid		4890	60	21	1	
receptaculitid		4895	139	11	1	
receptaculitid		4896	448	9	1	
receptaculitid		4911	123	18	1.5	
receptaculitid		4916	467	11	1	
receptaculitid		4919	340	11	1.5	
receptaculitid		4920	387	15	1.5	
receptaculitid		4930	259	15	1	
receptaculitid		4930	307	12	1	
receptaculitid		4934	67	24	1	
receptaculitid		4945	361	8.5	1	
receptaculitid		4970	129	14	1	
receptaculitid		4980	421	7	1	
receptaculitid		4985	458	11	1	
receptaculitid		4990	275	10	0.5	
receptaculitid		4990	344	10	1	
receptaculitid		4995	488	10	1	
receptaculitid		5000	29	13	1	
receptaculitid		5035	348	14	1	
receptaculitid		5042	118	16	2	
receptaculitid		5069	262	13	1	
receptaculitid		5075	190	22	1	
receptaculitid		5086	258	10	1	
receptaculitid		5104	334	31	1	
receptaculitid		5107	471	12	1	
receptaculitid		5108	462	9	1.5	
receptaculitid		5129	467	11	1	
receptaculitid		5134	460	8	1	
receptaculitid		5135	120	5	1	
receptaculitid		5160	255	21	1	
receptaculitid		5208	253	6	1	
receptaculitid		5208	376	10	1.5	
receptaculitid		5211	465	12	1	
receptaculitid		5212	497	15	1	
receptaculitid	overturned; encrusted by *Protrochiscolithus*	5236	475	9	1	
receptaculitid		5254	7	24	1.5	
receptaculitid		5256	385	6.5	1	
receptaculitid		5260	348	9	1	
receptaculitid		5309	110	19	3	
receptaculitid		5406	299	18	1	
receptaculitid		5417	452	7	1	
receptaculitid		5435	240	10	1	
receptaculitid		5442	202	11	1	
receptaculitid		5442	275	16	1	

NS Wall	Comments	x	y	W	H	D
receptaculitid		5444	401	23	1.5	
receptaculitid	tilted	5444	460	9	1	
receptaculitid		5452	418	21	1	
receptaculitid		5482	476	17	1	
receptaculitid		5485	126	14	1	
receptaculitid		5497	283	18	2	
receptaculitid		5500	423	9	1	
receptaculitid		5519	238	15	1	
receptaculitid		5530	291	11	1	
receptaculitid		5532	458	12	1.5	
receptaculitid		5534	347	12	1.5	
receptaculitid		5548	218	10	1	
receptaculitid		5573	128	13	1	
receptaculitid		5574	366	10	1.5	
receptaculitid		5577	231	17	1.5	
receptaculitid		5582	153	14	1	
receptaculitid		5602	358	18	1.5	
receptaculitid		5605	78	21	1.5	
receptaculitid		5605	124	17	1	
receptaculitid		5608	93	14	1	
receptaculitid		5621	125	19	1	
receptaculitid		5623	475	21	2	
receptaculitid		5630	337	17	1.5	
receptaculitid		5638	417			
receptaculitid		5646	446	11	1	
receptaculitid		5647	57	11	1.5	
receptaculitid		5648	421	17	1	
receptaculitid		5654	358	21	1.5	
receptaculitid		5685	336	7	1.5	
receptaculitid		5690	462	11	1	
receptaculitid		5694	338	10	1.5	
receptaculitid		5716	340	13	1	
receptaculitid		5723	346	16	1.5	
receptaculitid		5732	337	12	1	
receptaculitid		5775	393	18	1.5	
receptaculitid		5790	369	7	1.5	
receptaculitid		5802	220	13	2	
receptaculitid		5804	67	10	1	
receptaculitid		5848	159	20	1	
receptaculitid		5848	165	14	1.5	
receptaculitid		5860	356	7	1.5	
receptaculitid		5873	313	16	1.5	
receptaculitid		5890	469	8	1	
receptaculitid		5913	230	12	1	
receptaculitid		5934	250	15	1	
receptaculitid		5938	268	14	1	

NS Wall	Comments	x	y	W	H	D
receptaculitid		5942	295	19	1	
receptaculitid		5955	384	56	2	
receptaculitid		5960	131	9	1	
receptaculitid		5967	394	13	1	
receptaculitid		5977	458	21	1	
receptaculitid		6012	106	11	1.5	
receptaculitid		6015	95	14	1	
receptaculitid		6030	201	13	1.5	
receptaculitid		6032	127	11	1.5	
receptaculitid		6073	251	24	1.5	
receptaculitid		6090	480	22	1.5	
receptaculitid		6100	43	10	1	
receptaculitid		6104	65	9.5	1	
receptaculitid		6112	395	18	0.5	
receptaculitid		6182	43	13	1	
receptaculitid		6190	480	22	1.5	
receptaculitid		6278	84	20	1	
receptaculitid		6290	288	14	1	
Saffordophyllum		5756	242	3	2	
Saffordophyllum		2065	494	2	1.5	
Saffordophyllum		2915	308	36	5.5	
Saffordophyllum	wrapped around cephalopod shell; encrusted by *Protrochiscolithus*	3314	220	19	5	
Saffordophyllum		4073	448	6	1.5	
Saffordophyllum		4658	424	5	2	
Saffordophyllum		4669	419	19	7	
Saffordophyllum	tilted on side; encrusted by *Calapoecia*	4892	3	6	5	
Saffordophyllum		5526	129	64	9	
Saffordophyllum	encrusting *Protrochiscolithus*; broken in middle	5631	371	13	4	
stromatoporoid		85	186	20	9.5	
stromatoporoid	encrusted by *Protrochiscolithus*	114	347	10	2.5	
stromatoporoid	scoured and bored	174	207	23	12	
stromatoporoid		197	268	20	7	
stromatoporoid		332	452	67	9	
stromatoporoid		334	357	45	13	
stromatoporoid		649	364	21	6.5	
stromatoporoid	weak shielding	718	390	25	7	
stromatoporoid		742	385	12	3	
stromatoporoid		770	429	47	7	
stromatoporoid		806	283	18	4.5	
stromatoporoid		1013	485	22	8	
stromatoporoid	overturned	1120	278	24	5	
stromatoporoid	killed by storm lens	1130	281	39	3	
stromatoporoid		1224	434	43	11	
stromatoporoid		1280	282	41	9	
stromatoporoid		1345	313	27	5	
stromatoporoid	domical; good shielding	1413	405	31	7	

NS Wall	Comments	x	y	W	H	D
stromatoporoid		1514	406	21	4	
stromatoporoid	encrusted by *Calapoecia*	1545	393	17	4.5	
stromatoporoid	tabular	1695	210	8	1.5	
stromatoporoid		1747	225	39	7.5	
stromatoporoid		1783	220	37	10	
stromatoporoid		1800	434	16	4	
stromatoporoid	domical	2036	253	44	9	
stromatoporoid		2268	228	47	12	
stromatoporoid		2324	273	15	2	
stromatoporoid		2347	208	18	3	
stromatoporoid		2358	472	28	5	
stromatoporoid		2360	403	27	5	
stromatoporoid		2380	484	36	7	
stromatoporoid		2423	410	87	15	
stromatoporoid		2475	424	31	8	
stromatoporoid	overturned	2570	416	35	10	
stromatoporoid	domical	2574	349	28	7	
stromatoporoid	domical; scoured	2574	382	38	10	
stromatoporoid	good shielding	2594	477	41	8	
stromatoporoid		2647	428	43	8	
stromatoporoid		2760	353	39	13	
stromatoporoid		2859	299	29	4	
stromatoporoid		2885	389	43	12	
stromatoporoid		2888	308	7	2	
stromatoporoid		2984	368	28	10	
stromatoporoid		3109	424	27	8	
stromatoporoid		3297	326	15	7	
stromatoporoid		3390	461	15	2	
stromatoporoid		3477	205	27	16	
stromatoporoid		3650	499	33	15	
stromatoporoid		3808	275	38	9	
stromatoporoid		3865	361	15	2	
stromatoporoid	on top of storm lens	3900	287	10	6	
stromatoporoid		3900	393	6.5	3	
stromatoporoid		3930	299	71	12	
stromatoporoid		4016	317	18	8.5	
stromatoporoid		4118	228	37	4	
stromatoporoid		4190	196	45	8	
stromatoporoid		4208	82	17	4.5	
stromatoporoid		4218	415	27	4	
stromatoporoid		4245	355	54	14	
stromatoporoid		4269	196	12	3	
stromatoporoid		4290	324	28	6	
stromatoporoid		4321	426	24	5.5	
stromatoporoid		4330	359	18	6	
stromatoporoid	tilted	4435	427	23	8	

NS Wall	Comments	x	y	W	H	D
stromatoporoid	raised in centre; dissolved	4473	429	53	28	
stromatoporoid		4505	420	42	5	
stromatoporoid		4530	261	24	2.5	
stromatoporoid		4530	292	27	6	
stromatoporoid		4572	447	18	4	
stromatoporoid		4581	354	9	1	
stromatoporoid		4617	403	24	6	
stromatoporoid	killed on north half; continued growth on south half	4630	436	52	27	
stromatoporoid		4677	110	25	6.5	
stromatoporoid		4887	286	12	3.5	
stromatoporoid		4890	224	9.5	2	
stromatoporoid		4910	225	31	4	
stromatoporoid	arched	4955	346	21	5.5	
stromatoporoid	encrusted by *Calapoecia*	5009	341	15	5	
stromatoporoid		5127	389	25	5	
stromatoporoid		5219	433	17	6.5	
stromatoporoid		5303	296	17	6	
stromatoporoid	encrusted by *Protrochiscolithus*	5342	279	26	5	
stromatoporoid		5355	195	44	8	
stromatoporoid		5359	433	33	5	
stromatoporoid		5402	266	14	3	
stromatoporoid		5408	348	28	9.5	
stromatoporoid	good shielding	5418	281	70	4.5	
stromatoporoid		5435	65	48	3.5	
stromatoporoid		5470	467	32	8	
stromatoporoid		5485	417	21	7	
stromatoporoid		5485	457	12	2	
stromatoporoid		5500	319	58	7	
stromatoporoid		5500	441	63	12	
stromatoporoid		5514	110	21	6	
stromatoporoid		5560	320	52	7	
stromatoporoid		5642	346	14	3.5	
stromatoporoid	on top of storm lens	5712	465	19	5	
stromatoporoid		5738	235	26	3	
stromatoporoid		5792	294	12	2.5	
stromatoporoid		5793	232	33	3	
stromatoporoid		5816	331	6	2	
stromatoporoid		5836	407	8	4	
stromatoporoid		5844	298	12	4.5	
stromatoporoid		5860	197	60	8	
stromatoporoid	raised in middle; thins out laterally	5864	439	51	18	
stromatoporoid		5991	446	25	6	
stromatoporoid		6005	208	15	3	
stromatoporoid	good shielding	6025	437	33	15	
stromatoporoid		6312	86	102	6	
Rhabdotetradium		4053	201	11	4.5	

NS Wall	Comments	x	y	W	H	D
Rhabdotetradium	encrusting cephalopod	4776	154	10	1	

Appendix C: Instrumental Analysis Data

Table C-1: Transmitted light microscopy observations

Matrix				
Bed	**Calcite**	**Dolomite**	**Porosity**	**Grains**
B	~95%	3-5%	<1%	Bioclastic (dominantly echinoderm) fragments, micrite
C	~95%	3-5%	<1%	Bioclastic (dominantly echinoderm) fragments, micrite
D	~95%	3-5%	<1%	Bioclastic (dominantly echinoderm) fragments, micrite
E	~95%	3-5%	<1%	Bioclastic (dominantly echinoderm) fragments, micrite
F	~90%	3-5%	<1%	Bioclastic (dominantly echinoderm) fragments, micrite
G	~90%	3-5%	<1%	Bioclastic (dominantly echinoderm) fragments, micrite
H	~90%	3-5%	<1%	Bioclastic (dominantly echinoderm) fragments, micrite
Mottles				
Bed	**Calcite**	**Dolomite**	**Porosity**	**Grains**
B	<5%	>90%	~5%	Euhedral dolomite rhombs (~0.1-0.15 mm)
C	<5%	>90%	~5%	Euhedral dolomite rhombs (~0.1-0.15 mm)
D	<5%	>90%	~5%	Euhedral dolomite rhombs (~0.1-0.15 mm)
E	<5%	>90%	~5%	Euhedral dolomite rhombs (~0.1-0.15 mm)
F	<5%	>90%	~5%	Euhedral dolomite rhombs (~0.1-0.15 mm)
G	<5%	>90%	~5%	Euhedral dolomite rhombs (~0.075-0.12 mm)
H	<5%	>90%	~5%	Euhedral dolomite rhombs (~0.075-0.12 mm)

Table C-2: EMPA - element weight percent from matrix and burrows

Bed B			
Matrix		Burrow	
Element	Weight %	Element	Weight %
C	12.00	C	12.00
O	48.75	O	49.79
Mg	0.04	Mg	12.49
Ca	41.95	Ca	23.96
Mn	0.00	Mn	0.02
Fe	0.03	Fe	0.12

Bed E			
Matrix		Burrow	
Element	Weight %	Element	Weight %
C	12.00	C	12.00
O	47.72	O	49.76
Mg	0.05	Mg	12.70
Ca	39.31	Ca	23.51
Mn	0.02	Mn	0.06
Fe	0.07	Fe	0.12

Bed H			
Matrix		Burrow	
Element	Weight %	Element	Weight %
C	12.00	C	12.00
O	48.79	O	49.97
Mg	0.08	Mg	12.77
Ca	42.00	Ca	23.98
Mn	0.00	Mn	0.00
Fe	0.00	Fe	0.00

Table C-3: EMPA - transect data across mottle-matrix contact

Bed B: transect across contact (mottle-to-matrix)								
Element	Weight % pt 1	Weight % pt 2	Weight % pt 3	Weight % pt 4	Weight % pt 5	Weight % pt 6	Weight % pt 7	Weight % pt 8
C	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
O	49.62	49.65	49.66	49.99	49.98	48.46	48.64	46.88
Mg	12.38	12.17	12.22	12.58	12.55	0.73	0.21	0.10
Ca	23.83	23.92	23.93	24.34	24.33	40.04	41.35	37.17
Mn	0.00	0.00	0.05	0.00	0.03	0.00	0.02	0.00
Fe	0.06	0.06	0.31	0.09	0.08	0.08	0.06	0.00

Bed E: transect across contact (mottle-to-matrix)								
Element	Weight % pt 1	Weight % pt 2	Weight % pt 3	Weight % pt 4	Weight % pt 5	Weight % pt 6	Weight % pt 7	Weight % pt 8
C	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
O	49.53	49.79	48.79	46.88	47.87	48.35	48.54	45.10
Mg	12.23	12.52	0.56	0.47	0.32	0.22	0.26	0.12
Ca	23.73	23.93	41.18	36.52	39.23	40.65	41.06	32.55
Mn	0.03	0.03	0.00	0.04	0.04	0.00	0.00	0.03
Fe	0.10	0.09	0.04	0.04	0.08	0.03	0.04	0.16

Bed H: transect across contact (mottle-to-matrix)								
Element	Weight % pt 1	Weight % pt 2	Weight % pt 3	Weight % pt 4	Weight % pt 5	Weight % pt 6	Weight % pt 7	Weight % pt 8
C	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
O	49.89	47.45	48.73	47.31	46.95	48.75	48.29	48.74
Mg	12.65	4.73	0.16	0.12	0.10	0.07	0.10	0.17
Ca	23.96	30.73	41.71	38.21	37.36	41.89	40.66	41.67
Mn	0.01	0.02	0.01	0.00	0.00	0.04	0.06	0.03
Fe	0.10	0.31	0.00	0.00	0.00	0.02	0.00	0.09

Appendix D: Correlation and Linear Regression Data

Table D-1: Correlation data of fossil group density up-section

Fossil Groups		Correlation Coefficient
Receptaculitids	*Protrochiscolithus*	0.9017
Stromatoporoids	Bryozoans	0.8789
Stromatoporoids	*Protrochiscolithus*	0.8216
Cephalopods	*Calapoecia*	0.8067
Stromatoporoids	*Favistina*	0.7891
Protrochiscolithus	*Favistina*	0.7618
Crenulites	Bryozoans	0.7564
Protrochiscolithus	Bryozoans	0.7532
Receptaculitids	*Favistina*	0.7328
Stromatoporoids	Receptaculitid	0.6804
Saffordophyllum	Horn Corals	0.6688
Favistina	Bryozoans	0.6672
Favistina	*Catenipora*	0.6589
Saffordophyllum	*Catenipora*	0.6538
Stromatoporoids	*Crenulites*	0.6536
Catenipora	Bryozoans	0.6391
Stromatoporoids	*Catenipora*	0.6312
Horn Corals	Brachiopods	0.6238
Protrochiscolithus	*Crenulites*	0.6221
Saffordophyllum	*Favistina*	0.6161
Receptaculitids	Bryozoans	0.6116
Receptaculitids	*Manipora*	0.5396
Receptaculitids	*Crenulites*	0.5232
Saffordophyllum	Bryozoans	0.5137
Rhabdotetradium	Algal Stromatolite	0.5117
Manipora	Cephalopods	0.5067
Saffordophyllum	Brachiopods	0.5018
Stromatoporoids	*Saffordophyllum*	0.4853
Calapoecia	Brachiopods	0.4789
Palaeophyllum	Gastropod	0.4770
Manipora	*Calapoecia*	0.4693
Favistina	*Crenulites*	0.4677
Protrochiscolithus	*Catenipora*	0.4670
Manipora	Bryozoans	0.4645
Cephalopods	Brachiopods	0.4591
Saffordophyllum	*Calapoecia*	0.4284
Protrochiscolithus	*Manipora*	0.4201
Manipora	*Favistina*	0.4190
Palaeophyllum	*Favistina*	0.4140
Horn Corals	*Crenulites*	0.4084
Saffordophyllum	Cephalopods	0.3765
Saffordophyllum	*Crenulites*	0.3726
Saffordophyllum	*Protrochiscolithus*	0.3722
Palaeophyllum	Brachiopods	0.3713
Crenulites	*Catenipora*	0.3656

Fossil Groups		Correlation Coefficient
Bryozoans	Algal Stromatolite	0.3635
Favistina	*Calapoecia*	0.3634
Gastropod	*Favistina*	0.3596
Stromatoporoids	*Manipora*	0.3383
Saffordophyllum	Receptaculitid	0.3364
Rhabdotetradium	*Manipora*	0.3154
Gastropod	Brachiopods	0.3096
Manipora	Algal Stromatolite	0.3034
Horn Corals	Cephalopods	0.3020
Receptaculitids	*Catenipora*	0.3007
Receptaculitids	*Palaeophyllum*	0.2864
Horn Corals	*Calapoecia*	0.2685
Stromatoporoids	*Palaeophyllum*	0.2547
Saffordophyllum	Gastropod	0.2518
Horn Corals	Bryozoans	0.2419
Gastropod	Cephalopods	0.2369
Protrochiscolithus	*Palaeophyllum*	0.2318
Favistina	Cephalopods	0.2282
Stromatoporoids	Gastropod	0.2206
Receptaculitids	*Calapoecia*	0.2202
Saffordophyllum	*Manipora*	0.2196
Catenipora	Algal Stromatolite	0.2124
Horn Corals	*Catenipora*	0.2059
Manipora	*Crenulites*	0.2012
Crenulites	*Calapoecia*	0.1955
Catenipora	Brachiopods	0.1886
Receptaculitids	Cephalopods	0.1305
Stromatoporoids	Algal Stromatolite	0.1257
Palaeophyllum	*Catenipora*	0.1241
Stromatoporoids	Horn Corals	0.1236
Rhabdotetradium	Stromatoporoid	0.1190
Rhabdotetradium	Bryozoans	0.0976
Favistina	Brachiopods	0.0934
Protrochiscolithus	Algal Stromatolite	0.0797
Protrochiscolithus	*Calapoecia*	0.0544
Horn Corals	Gastropod	0.0534
Gastropod	*Catenipora*	0.0465
Saffordophyllum	*Palaeophyllum*	0.0395
Crenulites	Cephalopods	0.0362
Catenipora	*Calapoecia*	0.0353
Saffordophyllum	Algal Stromatolite	0.0351
Receptaculitids	Gastropod	0.0309
Calapoecia	Bryozoans	0.0306
Palaeophyllum	Cephalopods	0.0216
Horn Corals	*Favistina*	-0.0050
Palaeophyllum	*Calapoecia*	-0.0114
Protrochiscolithus	Cephalopods	-0.0254
Rhabdotetradium	*Protrochiscolithus*	-0.0442
Receptaculitids	Algal Stromatolite	-0.0448

Fossil Groups		Correlation Coefficient
Gastropod	Bryozoans	-0.0465
Crenulites	Brachiopods	-0.0483
Protrochiscolithus	Gastropod	-0.0526
Gastropod	*Crenulites*	-0.0607
Gastropod	*Calapoecia*	-0.0668
Protrochiscolithus	Horn Corals	-0.0767
Manipora	Horn Corals	-0.0797
Manipora	Gastropod	-0.0878
Manipora	*Catenipora*	-0.0878
Stromatoporoids	*Calapoecia*	-0.0899
Palaeophyllum	*Crenulites*	-0.0965
Crenulites	Algal Stromatolite	-0.1031
Palaeophyllum	Bryozoans	-0.1139
Cephalopods	Bryozoans	-0.1171
Receptaculitids	Horn Corals	-0.1208
Palaeophyllum	Horn Corals	-0.1216
Horn Corals	Algal Stromatolite	-0.1262
Rhabdotetradium	Receptaculitid	-0.1322
Favistina	Algal Stromatolite	-0.1366
Stromatoporoids	Cephalopods	-0.1732
Rhabdotetradium	*Crenulites*	-0.1987
Rhabdotetradium	*Catenipora*	-0.2012
Rhabdotetradium	Horn Corals	-0.2068
Stromatoporoids	Brachiopods	-0.2195
Palaeophyllum	*Manipora*	-0.2302
Rhabdotetradium	*Palaeophyllum*	-0.2309
Bryozoans	Brachiopods	-0.2376
Receptaculitids	Brachiopods	-0.2689
Rhabdotetradium	*Favistina*	-0.2709
Cephalopods	*Catenipora*	-0.3016
Protrochiscolithus	Brachiopods	-0.3158
Rhabdotetradium	*Calapoecia*	-0.3310
Manipora	Brachiopods	-0.3427
Rhabdotetradium	Cephalopods	-0.3555
Rhabdotetradium	*Saffordophyllum*	-0.3598
Calapoecia	Algal Stromatolite	-0.3608
Cephalopods	Algal Stromatolite	-0.3825
Gastropod	Algal Stromatolite	-0.4019
Rhabdotetradium	Gastropod	-0.4087
Rhabdotetradium	Brachiopods	-0.5920
Brachiopods	Algal Stromatolite	-0.5934
Palaeophyllum	Algal Stromatolite	-0.7008

Table D-2: Correlation data of average fossil size up-section

Fossil Groups		Correlation Coefficient
Trochonema	Cephalopods	0.8632
Saffordophyllum	*Favistina*	0.8620
Maclurina	*Catenipora*	0.8172
Rhabdotetradium	Algal Stromatolite	0.6947
Rhabdotetradium	*Maclurina*	0.6926
Protrochiscolithus	*Favistina*	0.6769
Trochonema	*Maclurina*	0.6455
Stromatoporoid	*Palaeophyllum*	0.5809
Hormotoma	*Calapoecia*	0.5637
Saffordophyllum	*Protrochiscolithus*	0.5448
Receptaculitid	Cephalopods	0.5146
Protrochiscolithus	*Hormotoma*	0.5060
Horn Corals	*Hormotoma*	0.4919
Manipora	*Trochonema*	0.4907
Hormotoma	*Catenipora*	0.4796
Saffordophyllum	*Manipora*	0.4725
Horn Corals	*Favistina*	0.4495
Maclurina	Algal Stromatolite	0.4476
Manipora	Horn Corals	0.4409
Manipora	Cephalopods	0.4399
Rhabdotetradium	*Catenipora*	0.4386
Saffordophyllum	*Trochonema*	0.4218
Saffordophyllum	Horn Corals	0.4207
Trochonema	Algal Stromatolite	0.4196
Maclurina	*Hormotoma*	0.4115
Hormotoma	*Favistina*	0.3906
Protrochiscolithus	*Crenulites*	0.3839
Stromatoporoid	*Favistina*	0.3602
Receptaculitid	*Trochonema*	0.3505
Stromatoporoid	*Calapoecia*	0.3490
Palaeophyllum	Horn Corals	0.3440
Palaeophyllum	Brachiopods	0.3238
Manipora	*Favistina*	0.3081
Manipora	*Maclurina*	0.2815
Palaeophyllum	*Favistina*	0.2773
Protrochiscolithus	Horn Corals	0.2769
Maclurina	Cephalopods	0.2721
Calapoecia	Algal Stromatolite	0.2691
Crenulites	*Catenipora*	0.2637
Horn Corals	Cephalopods	0.2635
Palaeophyllum	*Crenulites*	0.2541
Catenipora	Algal Stromatolite	0.2427
Rhabdotetradium	*Calapoecia*	0.2423
Protrochiscolithus	*Maclurina*	0.2375
Stromatoporoid	*Protrochiscolithus*	0.2323
Stromatoporoid	*Hormotoma*	0.2294
Hormotoma	Algal Stromatolite	0.2199
Cephalopods	*Catenipora*	0.2135

Fossil Groups		Correlation Coefficient
Favistina	Brachiopods	0.2127
Stromatoporoid	*Crenulites*	0.2077
Trochonema	Brachiopods	0.1995
Palaeophyllum	*Manipora*	0.1990
Crenulites	Cephalopods	0.1974
Favistina	*Calapoecia*	0.1865
Receptaculitid	*Palaeophyllum*	0.1818
Rhabdotetradium	*Hormotoma*	0.1736
Horn Corals	*Crenulites*	0.1686
Protrochiscolithus	Algal Stromatolite	0.1675
Horn Corals	*Calapoecia*	0.1518
Horn Corals	Brachiopods	0.1480
Catenipora	Brachiopods	0.1457
Protrochiscolithus	*Catenipora*	0.1404
Saffordophyllum	Brachiopods	0.1284
Palaeophyllum	*Hormotoma*	0.1268
Manipora	*Hormotoma*	0.1185
Receptaculitid	*Crenulites*	0.1175
Favistina	*Crenulites*	0.1089
Saffordophyllum	*Palaeophyllum*	0.1060
Saffordophyllum	*Crenulites*	0.0955
Protrochiscolithus	*Manipora*	0.0917
Protrochiscolithus	*Calapoecia*	0.0889
Protrochiscolithus	Brachiopods	0.0808
Manipora	*Catenipora*	0.0747
Receptaculitid	*Catenipora*	0.0546
Crenulites	Brachiopods	0.0542
Saffordophyllum	Cephalopods	0.0284
Maclurina	*Crenulites*	0.0190
Palaeophyllum	*Calapoecia*	0.0165
Receptaculitid	*Maclurina*	0.0123
Rhabdotetradium	*Trochonema*	0.0000
Hormotoma	Brachiopods	-0.0013
Receptaculitid	*Manipora*	-0.0037
Rhabdotetradium	Stromatoporoid	-0.0049
Cephalopods	Brachiopods	-0.0127
Trochonema	*Catenipora*	-0.0151
Rhabdotetradium	*Protrochiscolithus*	-0.0200
Protrochiscolithus	Cephalopods	-0.0230
Manipora	Brachiopods	-0.0272
Saffordophyllum	*Hormotoma*	-0.0390
Crenulites	*Calapoecia*	-0.0418
Stromatoporoid	*Saffordophyllum*	-0.0495
Receptaculitid	Horn Corals	-0.0571
Rhabdotetradium	*Manipora*	-0.0638
Maclurina	*Calapoecia*	-0.0675
Favistina	Cephalopods	-0.0702
Horn Corals	*Maclurina*	-0.0718
Stromatoporoid	Brachiopods	-0.0825

Fossil Groups		Correlation Coefficient
Stromatoporoid	*Maclurina*	-0.0862
Stromatoporoid	Horn Corals	-0.0865
Horn Corals	*Catenipora*	-0.1022
Stromatoporoid	Algal Stromatolite	-0.1080
Manipora	*Calapoecia*	-0.1104
Manipora	*Crenulites*	-0.1119
Cephalopods	Algal Stromatolite	-0.1227
Saffordophyllum	*Calapoecia*	-0.1261
Stromatoporoid	*Manipora*	-0.1299
Palaeophyllum	Cephalopods	-0.1304
Stromatoporoid	Receptaculitid	-0.1410
Horn Corals	*Trochonema*	-0.1468
Protrochiscolithus	*Palaeophyllum*	-0.1472
Stromatoporoid	*Catenipora*	-0.1501
Rhabdotetradium	Receptaculitid	-0.1706
Catenipora	*Calapoecia*	-0.1709
Trochonema	*Hormotoma*	-0.1778
Palaeophyllum	*Catenipora*	-0.1834
Receptaculitid	Brachiopods	-0.1895
Favistina	Algal Stromatolite	-0.1904
Rhabdotetradium	*Crenulites*	-0.1972
Brachiopods	Algal Stromatolite	-0.2183
Stromatoporoid	Cephalopods	-0.2218
Manipora	Algal Stromatolite	-0.2228
Rhabdotetradium	Cephalopods	-0.2339
Calapoecia	Brachiopods	-0.2448
Saffordophyllum	Algal Stromatolite	-0.2871
Cephalopods	*Calapoecia*	-0.2879
Trochonema	*Favistina*	-0.3060
Maclurina	Brachiopods	-0.3279
Saffordophyllum	*Maclurina*	-0.3622
Maclurina	*Favistina*	-0.3775
Palaeophyllum	*Maclurina*	-0.3779
Saffordophyllum	Receptaculitid	-0.3872
Protrochiscolithus	*Trochonema*	-0.4392
Hormotoma	Cephalopods	-0.4407
Hormotoma	*Crenulites*	-0.4454
Receptaculitid	Algal Stromatolite	-0.4501
Rhabdotetradium	*Saffordophyllum*	-0.4589
Crenulites	Algal Stromatolite	-0.4738
Rhabdotetradium	*Favistina*	-0.4773
Favistina	*Catenipora*	-0.5019
Saffordophyllum	*Catenipora*	-0.5086
Rhabdotetradium	*Palaeophyllum*	-0.5224
Horn Corals	Algal Stromatolite	-0.5265
Receptaculitid	*Calapoecia*	-0.5326
Trochonema	*Calapoecia*	-0.5448
Rhabdotetradium	Horn Corals	-0.5512
Palaeophyllum	*Trochonema*	-0.5590

Fossil Groups		Correlation Coefficient
Receptaculitid	*Favistina*	-0.5714
Rhabdotetradium	Brachiopods	-0.6152
Receptaculitid	*Hormotoma*	-0.6321
Receptaculitid	*Protrochiscolithus*	-0.6322
Palaeophyllum	Algal Stromatolite	-0.7759
Stromatoporoid	*Trochonema*	-0.7764
Trochonema	*Crenulites*	-0.8329

Table D-3: Linear regression of storm lens data

	Slope of regression line	R^2 value
Density	0.0469	0.4502
Thickness	0.6330	0.4649

Table D-4: Linear regression of fossil density data

Group	Slope of regression line	R^2 value
Receptaculitid	0.2113	0.6476
Stromatoporoid	0.0649	0.6261
Protrochiscolithus	0.0548	0.8128
Crenulites	0.0287	0.3743
Favistina	0.0219	0.2313
Maclurina	0.0182	0.2655
Bryozoans	0.0125	0.4687
Catenipora	0.0043	0.0566
Algal Stromatolite	0.0027	0.0457
Manipora	0.0015	0.1141
Trochonema	0.0015	0.0263
Rhabdotetradium	0.0014	0.0484
Palaeophyllum	0.0006	0.0148
Saffordophyllum	0.0001	0.0002
Hormotoma	-0.0029	0.1528
Calapoecia	-0.0079	0.1098
Brachiopods	-0.0179	0.4595
Cephalopods	-0.0256	0.1419
Horn Corals	-0.0522	0.0810

Table D-5: Linear regression of average fossil size data

Group	Slope of regression line	R^2 value
Catenipora	1.7669	0.2815
Algal Stromatolite	1.2282	0.4133
Hormotoma	0.6374	0.6589
Manipora	0.6180	0.0498
Maclurina	0.2320	0.5149
Trochonema	0.1284	0.2028
Stromatoporoid	0.0892	0.0013
Protrochiscolithus	0.0891	0.0265
Calapoecia	0.0814	0.0521
Cephalopods	0.0401	0.0393
Horn Corals	0.0251	0.0972
Brachiopods	-0.0455	0.0913
Receptaculitid	-0.0497	0.0539
Favistina	-0.1227	0.0030
Palaeophyllum	-0.2984	0.8493
Rhabdotetradium	-0.4615	0.8205
Crenulites	-0.4847	0.0907
Saffordophyllum	-1.6906	0.0740

Table D-6: Linear regression of horn coral abrasion data

Degree of abrasion	Slope of regression line	R^2 value
Well preserved	0.1449	0.1126
Weakly abraded	0.8483	0.2340
Moderately abraded	-0.5282	0.0806
Highly abraded	-0.4651	0.0355

Table D-7: Linear regression of encrusting relationship data

Encrusting relationships	Slope of regression line	R^2 value
Encrusters per fossil	-0.0020	0.1368

Appendix E: Vertical Trends of Fossil Groups

Table E-1: Area of Tyndall Stone intervals

	Interval										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Area (m^2)	25	26.38	25.94	35.85	60	61.41	61.18	59.5	59.82	61	476.1

Table E-2: Fossil count by interval

Fossil Count	**Interval**										
Group	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Algal Stromatolites	1	0	1	3	3	2	0	0	7	3	20
Brachiopods	6	6	3	0	4	7	5	7	3	1	42
Bryozoans	0	0	0	1	1	7	2	4	10	3	28
Calapoecia	5	2	7	4	5	9	9	13	7	2	63
Catenipora	2	2	0	1	5	5	1	8	10	1	35
Cephalopods	17	16	28	17	24	34	50	32	34	25	277
Crenulites	4	1	3	2	14	31	19	17	20	15	126
Favistina	1	6	5	3	8	13	15	26	26	5	108
Gastropods	10	31	21	19	46	48	49	39	43	32	338
Hormotoma	1	2	1	2	2	2	1	3	4	0	18
Maclurina	6	13	8	14	33	31	35	26	31	26	223
Trochonema	0	1	0	0	0	5	3	2	1	0	12
Genus unknown	3	15	12	3	11	10	10	8	7	6	85
Horn Corals	60	46	38	25	98	135	66	47	106	98	719
Manipora	0	0	1	1	0	1	1	1	2	1	8
Palaeophyllum	0	1	0	0	0	0	1	2	0	1	5
Protrochiscolithus	3	4	6	5	14	19	27	33	38	28	177
Receptaculitids	19	32	58	35	78	119	120	184	165	156	966
Saffordophyllum	1	1	1	0	2	2	1	2	4	1	15
Stromatoporoid	1	11	4	11	26	36	27	38	55	31	240
Rhabdotetradium	0	0	0	2	1	0	0	0	1	2	6
Total	130	159	176	129	329	468	393	453	531	405	3173

Table E-3: Population density by interval

Density (specimens per m^2)	Interval										
Group	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Algal Stromatolites	0.04	0	0.039	0.084	0.05	0.033	0	0	0.117	0.049	0.042
Brachiopods	0.24	0.227	0.116	0	0.067	0.114	0.082	0.118	0.05	0.016	0.088
Bryozoans	0	0	0	0.028	0.017	0.114	0.033	0.067	0.167	0.049	0.059
Calapoecia	0.2	0.076	0.27	0.112	0.083	0.147	0.147	0.218	0.117	0.033	0.132
Catenipora	0.08	0.076	0	0.028	0.083	0.081	0.016	0.134	0.167	0.016	0.074
Cephalopods	0.68	0.607	1.079	0.474	0.4	0.554	0.817	0.538	0.568	0.41	0.582
Crenulites	0.16	0.038	0.116	0.056	0.233	0.505	0.311	0.286	0.334	0.246	0.265
Favistina	0.04	0.227	0.193	0.084	0.133	0.212	0.245	0.437	0.435	0.082	0.227
Gastropods	0.4	1.175	0.81	0.53	0.767	0.782	0.801	0.655	0.719	0.525	0.71
Hormotoma	0.04	0.076	0.039	0.056	0.033	0.033	0.016	0.05	0.067	0	0.038
Maclurina	0.24	0.493	0.308	0.391	0.55	0.505	0.572	0.437	0.518	0.426	0.468
Trochonema	0	0.038	0	0	0	0.081	0.049	0.034	0.017	0	0.025
genus unknown	0.12	0.569	0.463	0.084	0.183	0.163	0.163	0.134	0.117	0.098	0.179
Horn Corals	2.4	1.744	1.465	0.697	1.633	2.198	1.079	0.79	1.772	1.607	1.51
Manipora	0	0	0.039	0.028	0	0.016	0.016	0.017	0.033	0.016	0.017
Palaeophyllum	0	0.038	0	0	0	0	0.016	0.034	0	0.016	0.011
Protrochiscolithus	0.12	0.152	0.231	0.139	0.233	0.309	0.441	0.555	0.635	0.459	0.372
Receptaculitids	0.76	1.213	2.236	0.976	1.3	1.938	1.961	3.092	2.758	2.557	2.029
Saffordophyllum	0.04	0.038	0.039	0	0.033	0.033	0.016	0.034	0.067	0.016	0.032
Stromatoporoid	0.04	0.417	0.154	0.307	0.433	0.586	0.441	0.639	0.919	0.508	0.504
Rhabdotetradium	0	0	0	0.056	0.017	0	0	0	0.017	0.033	0.013

Table E-4: Group percentages by interval

Percent of Fossils	Interval										
Group	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Algal Stromatolites	0.77	0.00	0.57	2.33	0.91	0.43	0.00	0.00	1.32	0.74	0.63
Brachiopods	4.62	3.77	1.70	0.00	1.22	1.50	1.27	1.55	0.56	0.25	1.32
Bryozoans	0.00	0.00	0.00	0.78	0.30	1.50	0.51	0.88	1.88	0.74	0.88
Calapoecia	3.85	1.26	3.98	3.10	1.52	1.92	2.29	2.87	1.32	0.49	1.99
Catenipora	1.54	1.26	0.00	0.78	1.52	1.07	0.25	1.77	1.88	0.25	1.10
Cephalopods	13.08	10.06	15.91	13.18	7.29	7.26	12.72	7.06	6.40	6.17	8.73
Crenulites	3.08	0.63	1.70	1.55	4.26	6.62	4.83	3.75	3.77	3.70	3.97
Favistina	0.77	3.77	2.84	2.33	2.43	2.78	3.82	5.74	4.90	1.23	3.40
Gastropods	7.69	19.50	11.93	14.73	13.98	10.26	12.47	8.61	8.10	7.90	10.65
Horn Corals	46.15	28.93	21.59	19.38	29.79	28.85	16.79	10.38	19.96	24.20	22.66
Manipora	0.00	0.00	0.57	0.78	0.00	0.21	0.25	0.22	0.38	0.25	0.25
Palaeophyllum	0.00	0.63	0.00	0.00	0.00	0.00	0.25	0.44	0.00	0.25	0.16
Protrochiscolithus	2.31	2.52	3.41	3.88	4.26	4.06	6.87	7.28	7.16	6.91	5.58
Receptaculitids	14.62	20.13	32.95	27.13	23.71	25.43	30.53	40.62	31.07	38.52	30.44
Saffordophyllum	0.77	0.63	0.57	0.00	0.61	0.43	0.25	0.44	0.75	0.25	0.47
Stromatoporoid	0.77	6.92	2.27	8.53	7.90	7.69	6.87	8.39	10.36	7.65	7.56
Rhabdotetradium	0.00	0.00	0.00	1.55	0.30	0.00	0.00	0.00	0.19	0.49	0.19
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.0

Table E-5: Population count and percent; combined data

Group	Count	Percent
Receptaculitids	966	30.44
Horn Corals	719	22.66
Gastropods	338	10.65
Maclurina	223	7.03
Hormotoma	18	0.57
Trochonema	12	0.38
genus unknown	85	2.68
Cephalopods	277	8.73
Stromatoporoid	240	7.56
Protrochiscolithus	177	5.58
Crenulites	126	3.97
Favistina	108	3.40
Calapoecia	63	1.99
Brachiopods	42	1.32
Catenipora	35	1.10
Bryozoans	28	0.88
Algal Stromatolites	20	0.63
Saffordophyllum	15	0.47
Manipora	8	0.25
Rhabdotetradium	6	0.19
Palaeophyllum	5	0.16
Total	3173	100

Table E-6: Average size of fossil specimens by interval

Average Size (cm)	Interval									
Group	1	2	3	4	5	6	7	8	9	10
Algal Stromatolites (width)	4	N/A	7	11.2	20.3	17	N/A	N/A	18.9	12.7
Brachiopods (diameter)	3.42	3.33	2.5	N/A	3	3.71	3.3	3.14	2.17	3
Calapoecia (width)	3.4	4.75	4.07	4	4.1	3.44	2.75	4.81	6.64	3.5
Catenipora (width)	10	8	N/A	8	13.5	10	8	11.1	9.5	40
Cephalopods (diameter)	4.63	4.19	4.38	4.54	3.03	4.93	4.94	3.79	4.59	5.02
Crenulites (width)	24.9	32	26.8	22.5	17.8	18.4	19.7	21.8	19.4	29.4
Favistina (width)	5	18.5	28.5	6.67	11.9	15.5	17.3	15	15.7	8.5
Gastropods										
Hormotoma (length)	2	3.5		4	6	5	4	9	7	
Maclurina (diameter)	3.58	3.58	4.06	5.38	4.71	4.5	4.48	4.41	4.88	6.95
Trochonema (diameter)	N/A	1.5	N/A	N/A	N/A	3.25	3.25	2	2.5	
Horn Corals (diameter)	2.18	2.13	2.51	2.06	1.8	2.17	2.33	2.69	2.3	2.28
Manipora (width)	N/A	N/A	11	4	N/A	N/A	26	6	13	12
Palaeophyllum (width)	N/A	9	N/A	N/A	N/A	N/A	7	7.5	N/A	N/A
Protrochiscolithus (width)	5.33	8.25	11.3	6.6	7.85	8.22	6.54	7.53	7.51	9.59
Receptaculitids (width)	14.1	13.5	12.6	14.3	12.5	13.6	14	13.3	12.7	13.4
Saffordophyllum (width)	6	14	64	N/A	10.8	9	36	10.3	11.5	2
Stromatoporoid (width)	12	42.6	24	29.5	26.9	28.9	25.9	29.2	27.4	23.5
Rhabdotetradium (width)	N/A	N/A	N/A	11	11	N/A	N/A	N/A	8	9

Table E-7: Encrusting relationships by interval

	Interval									
	1	2	3	4	5	6	7	8	9	10
Encrusting relationships (number)	8	10	11	12	12	17	25	27	29	17
Density of relationships (per m^2)	0.32	0.38	0.42	0.33	0.2	0.28	0.41	0.45	0.48	0.28

	Interval									
	1	2	3	4	5	6	7	8	9	10
Encrusters (number)	3	5	6	6	6	7	13	14	12	8
Density of encrusters (per m^2)	0.12	0.19	0.23	0.17	0.1	0.11	0.21	0.24	0.2	0.13

	Interval									
	1	2	3	4	5	6	7	8	9	10
Density of all fossils (per m^2)	5.20	6.03	6.78	3.60	5.48	7.62	6.42	7.61	8.88	6.64
Number of encrusters per fossil	0.06	0.06	0.06	0.09	0.04	0.04	0.06	0.06	0.05	0.04

Table E-8: Colonial coral and stromatoporoid growth form by interval

	Interval										
Growth Form	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Tabular	10	20	19	21	52	88	67	103	96	59	535
Domical-bulbous	7	6	8	8	18	23	29	34	64	26	223
Columnar	0	1	0	0	0	0	2	1	2	1	7
Total	17	27	27	29	70	111	98	138	162	86	765

	Interval										
Percent	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Tabular	58.82	74.07	70.37	72.41	74.29	79.28	68.37	74.64	59.26	68.60	69.93
Domical-bulbous	41.18	22.22	29.63	27.59	25.71	20.72	29.59	24.64	39.51	30.23	29.15
Columnar	0.00	3.70	0.00	0.00	0.00	0.00	2.04	0.72	1.23	1.16	0.92
Total	100	100	100	100	100	100	100	100	100	100	100

Table E-9: Horn coral abrasion by interval

	Interval										
Count	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Well preserved	1	0	0	0	2	4	1	1	0	2	11
Weakly abraded	9	8	7	3	17	27	14	5	27	20	137
Moderately abraded	9	10	6	1	9	14	10	8	11	8	86
Highly abraded	39	23	24	19	51	72	33	27	55	55	398
Total	58	41	37	23	79	117	58	41	93	85	632

	Interval										
Percent	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Well preserved	1.72	0.00	0.00	0.00	2.53	3.42	1.72	2.44	0.00	2.35	1.74
Weakly abraded	15.52	19.51	18.92	13.04	21.52	23.08	24.14	12.20	29.03	23.53	21.68
Moderately abraded	15.52	24.39	16.22	4.35	11.39	11.97	17.24	19.51	11.83	9.41	13.61
Highly abraded	67.24	56.10	64.86	82.61	64.56	61.54	56.90	65.85	59.14	64.71	62.97

	Interval										
Density (per m^2)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Well preserved	0.04	0.00	0.00	0.00	0.03	0.07	0.02	0.02	0.00	0.03	0.02
Weakly abraded	0.36	0.30	0.27	0.08	0.28	0.44	0.23	0.08	0.45	0.33	0.29
Moderately abraded	0.36	0.38	0.23	0.03	0.15	0.23	0.16	0.13	0.18	0.13	0.18
Highly abraded	1.56	0.87	0.93	0.53	0.85	1.17	0.54	0.45	0.92	0.90	0.84

Appendix F: Paleocurrent and Storm Lens Data

Table F-1: cephalopod orientation data from horizontal beds

Note: Trend 1 is the original measured direction (in degrees). Because original measurement is non-directional, it may represent one of two possible directions. Thus Trend 2 adds 180^0 to Trend 1.

Fossil	Trend 1	Trend 2
Cephalopod	2	182
Cephalopod	3	183
Cephalopod	4	184
Cephalopod	4	184
Cephalopod	7	187
Cephalopod	8	188
Cephalopod	8	188
Cephalopod	9	189
Cephalopod	13	193
Cephalopod	15	195
Cephalopod	15	195
Cephalopod	15	195
Cephalopod	16	196
Cephalopod	22	202
Cephalopod	23	203
Cephalopod	25	205
Cephalopod	26	206
Cephalopod	27	207
Cephalopod	29	209
Cephalopod	30	210
Cephalopod	31	211
Cephalopod	32	212
Cephalopod	32	212
Cephalopod	32	212
Cephalopod	33	213
Cephalopod	34	214
Cephalopod	36	216
Cephalopod	39	219
Cephalopod	42	222
Cephalopod	43	223
Cephalopod	44	224
Cephalopod	47	227
Cephalopod	53	233

Fossil	Trend 1	Trend 2
Cephalopod	57	237
Cephalopod	60	240
Cephalopod	62	242
Cephalopod	63	243
Cephalopod	64	244
Cephalopod	64	244
Cephalopod	65	245
Cephalopod	66	246
Cephalopod	66	246
Cephalopod	67	247
Cephalopod	70	250
Cephalopod	72	252
Cephalopod	72	252
Cephalopod	78	258
Cephalopod	78	258
Cephalopod	79	259
Cephalopod	80	260
Cephalopod	82	262
Cephalopod	83	263
Cephalopod	83	263
Cephalopod	84	264
Cephalopod	85	265
Cephalopod	88	268
Cephalopod	92	272
Cephalopod	94	274
Cephalopod	95	275
Cephalopod	97	277
Cephalopod	98	278
Cephalopod	100	280
Cephalopod	104	284
Cephalopod	104	284
Cephalopod	106	286
Cephalopod	109	289

Fossil	Trend 1	Trend 2
Cephalopod	112	292
Cephalopod	114	294
Cephalopod	117	297
Cephalopod	118	298
Cephalopod	118	298
Cephalopod	120	300
Cephalopod	122	302
Cephalopod	122	302
Cephalopod	122	302
Cephalopod	124	304
Cephalopod	128	308
Cephalopod	128	308
Cephalopod	129	309
Cephalopod	132	312
Cephalopod	138	318
Cephalopod	140	320
Cephalopod	143	323
Cephalopod	145	325
Cephalopod	146	326
Cephalopod	147	327
Cephalopod	150	330
Cephalopod	151	331
Cephalopod	153	333
Cephalopod	154	334
Cephalopod	163	343
Cephalopod	167	347
Cephalopod	169	349
Cephalopod	174	354
Cephalopod	178	358
Cephalopod	179	359

Table F-2: Distribution of cephalopod trend data

Direction	0-29^0	30-59^0	60-89^0	90-119^0	120-149^0	150-179^0	180-209^0	210-239^0	240-269^0	270-299^0	300-329^0	330-359^0	Total
Count	19	15	22	15	15	10	19	15	22	15	15	10	192
Percent	10	8	11	8	8	5	10	8	11	8	8	5	100

Table F-3: Attitudes of cardinal septa from horn corals

Note: "0" denotes that cardinal septum is directed straight up, while "180" indicates straight down.

Fossil	Attitude (degrees)	Fossil	Attitude (degrees)	Fossil	Attitude (degrees)	Fossil	Attitude (degrees)
horn coral	0	horn coral	90	horn coral	135	horn coral	140
horn coral	0	horn coral	90	horn coral	135	horn coral	150
horn coral	15	horn coral	90	horn coral	135	horn coral	150
horn coral	20	horn coral	95	horn coral	135	horn coral	150
horn coral	30	horn coral	100	horn coral	135	horn coral	150
horn coral	40	horn coral	100	horn coral	135	horn coral	150
horn coral	40	horn coral	100	horn coral	135	horn coral	155
horn coral	40	horn coral	105	horn coral	135	horn coral	160
horn coral	40	horn coral	110	horn coral	135	horn coral	160
horn coral	45	horn coral	110	horn coral	135	horn coral	160
horn coral	45	horn coral	110	horn coral	135	horn coral	165
horn coral	45	horn coral	110	horn coral	135	horn coral	165
horn coral	45	horn coral	110	horn coral	135	horn coral	165
horn coral	45	horn coral	120	horn coral	135	horn coral	165
horn coral	45	horn coral	120	horn coral	135	horn coral	170
horn coral	45	horn coral	120	horn coral	135	horn coral	170
horn coral	45	horn coral	120	horn coral	135	horn coral	170
horn coral	45	horn coral	120	horn coral	135	horn coral	170
horn coral	45	horn coral	120	horn coral	135	horn coral	170
horn coral	45	horn coral	120	horn coral	135	horn coral	170
horn coral	45	horn coral	120	horn coral	135	horn coral	180
horn coral	45	horn coral	120	horn coral	135	horn coral	180
horn coral	45	horn coral	120	horn coral	135	horn coral	180
horn coral	45	horn coral	120	horn coral	140	horn coral	180
horn coral	45	horn coral	120	horn coral	140	horn coral	180
horn coral	60	horn coral	120	horn coral	140	horn coral	180
horn coral	60	horn coral	120	horn coral	140	horn coral	180
horn coral	60	horn coral	120	horn coral	140	horn coral	180
horn coral	60	horn coral	120	horn coral	140	horn coral	180
horn coral	75	horn coral	120	horn coral	140	horn coral	180
horn coral	80	horn coral	130	horn coral	140	horn coral	180
horn coral	85	horn coral	130	horn coral	140	horn coral	180
horn coral	90	horn coral	130	horn coral	140	horn coral	180
horn coral	90	horn coral	135	horn coral	140	horn coral	180
horn coral	90	horn coral	135	horn coral	140	horn coral	180
horn coral	90	horn coral	135	horn coral	140		

Table F-4: Distribution of cardinal septa attitudes

Note: Top row indicates position of cardinal septum in relation to horizontal plane

	Beyond 45°	Beyond 45°	Within 45°	Within 45°	Within 45°	Within 45°	Beyond 45°	Beyond 45°	Total
Angle	0-22.5°	23-45°	45.5-67.5°	68-90°	90.5-112.5°	113-135°	135.5-157.5°	158-180°	
Number	4	5	20	10	10	46	20	28	143
Percent	2.80	3.50	13.99	6.99	6.99	32.17	13.99	19.58	100

Table F-5:Directions of cardinal septa from horn corals (for corals with cardinal septum within 45° of horizontal.

Fossil	Direction of cardinal septum	Wall
horn coral	5 degrees up from west	east-west
horn coral	10 degrees down from west	east-west
horn coral	10 degrees up from west	east-west
horn coral	15 degrees down from west	east-west
horn coral	20 degrees down from east	east-west
horn coral	20 degrees down from west	east-west
horn coral	30 degrees down from east	east-west
horn coral	30 degrees down from east	east-west
horn coral	30 degrees down from east	east-west
horn coral	30 degrees down from east	east-west
horn coral	30 degrees down from west	east-west
horn coral	30 degrees down from west	east-west
horn coral	30 degrees down from west	east-west
horn coral	30 degrees down from west	east-west
horn coral	30 degrees down from west	east-west
horn coral	30 degrees down from west	east-west
horn coral	30 degrees down from west	east-west
horn coral	30 degrees down from west	east-west
horn coral	30 degrees up from east	east-west
horn coral	30 degrees up from east	east-west
horn coral	40 degrees down from east	east-west
horn coral	45 degrees down from east	east-west
horn coral	45 degrees down from east	east-west
horn coral	45 degrees down from east	east-west
horn coral	45 degrees down from east	east-west
horn coral	45 degrees down from east	east-west
horn coral	45 degrees down from east	east-west
horn coral	45 degrees down from west	east-west
horn coral	45 degrees down from west	east-west
horn coral	45 degrees up from east	east-west
horn coral	45 degrees up from east	east-west
horn coral	45 degrees up from east	east-west
horn coral	45 degrees up from west	east-west
horn coral	45 degrees up from west	east-west
horn coral	45 degrees up from west	east-west
horn coral	45 degrees up from west	east-west

Fossil	Direction of cardinal septum	Wall
horn coral	45 degrees up from west	east-west
horn coral	Due east	east-west
horn coral	Due east	east-west
horn coral	Due west	east-west
horn coral	Due west	east-west
horn coral	5 degrees down from south	north-south
horn coral	10 degrees down from south	north-south
horn coral	10 degrees down from south	north-south
horn coral	15 degrees up from south	north-south
horn coral	20 degrees down from north	north-south
horn coral	20 degrees down from south	north-south
horn coral	20 degrees down from south	north-south
horn coral	30 degrees down from north	north-south
horn coral	30 degrees down from north	north-south
horn coral	30 degrees down from south	north-south
horn coral	30 degrees down from south	north-south
horn coral	30 degrees down from south	north-south
horn coral	30 degrees up from north	north-south
horn coral	30 degrees up from south	north-south
horn coral	40 degrees down from north	north-south
horn coral	40 degrees down from south	north-south
horn coral	45 degrees down from north	north-south
horn coral	45 degrees down from north	north-south
horn coral	45 degrees down from north	north-south
horn coral	45 degrees down from north	north-south
horn coral	45 degrees down from south	north-south
horn coral	45 degrees down from south	north-south
horn coral	45 degrees down from south	north-south
horn coral	45 degrees down from south	north-south
horn coral	45 degrees down from south	north-south
horn coral	45 degrees down from south	north-south
horn coral	45 degrees down from south	north-south
horn coral	45 degrees down from south	north-south
horn coral	45 degrees down from south	north-south
horn coral	45 degrees down from south	north-south
horn coral	45 degrees down from south	north-south

Fossil	Direction of cardinal septum	Wall
horn coral	45 degrees down from south	north-south
horn coral	45 degrees down from south	north-south
horn coral	45 degrees down from south	north-south
horn coral	45 degrees up from north	north-south
horn coral	45 degrees up from north	north-south
horn coral	45 degrees up from north	north-south
horn coral	45 degrees up from north	north-south

Fossil	Direction of cardinal septum	Wall
horn coral	45 degrees up from north	north-south
horn coral	45 degrees up from south	north-south
horn coral	45 degrees up from south	north-south
horn coral	45 up from south	north-south
horn coral	Due south	north-south
horn coral	Due south	north-south
horn coral	Due south	north-south

Table F-6: Distribution of horn coral directional data

	N	E	S	W	Total
Direction	0^0	90^0	180^0	270^0	
Count	14	19	31	22	86
Percent	16.28	22.09	36.05	25.58	100

Table F-7: Storm lens data EW Wall

Note: x = horizontal distance from origin (0,0) to middle of lens, in cm; y = vertical distance from base of section to base of lens in cm

EW Wall	x	y	Thickness (cm)
storm lens	0	205	4
storm lens	0	362	3
storm lens	0	432	3
storm lens	0	502	6
storm lens	100	209	5
storm lens	100	264	6
storm lens	100	362	3
storm lens	100	370	4
storm lens	100	427	4
storm lens	100	505	8
storm lens	200	208	4
storm lens	200	264	6
storm lens	200	375	9
storm lens	200	429	5
storm lens	200	510	3
storm lens	300	207	4
storm lens	300	221	4
storm lens	300	264	6
storm lens	300	329	3
storm lens	300	375	5
storm lens	300	425	6
storm lens	300	488	4
storm lens	300	493	7
storm lens	400	199	3
storm lens	400	205	4
storm lens	400	353	4
storm lens	400	376	5
storm lens	400	427	5
storm lens	400	491	8
storm lens	500	211	4
storm lens	500	329	3
storm lens	500	352	4
storm lens	500	381	4
storm lens	500	431	3
storm lens	500	455	3
storm lens	600	210	5
storm lens	600	267	5
storm lens	600	375	7
storm lens	600	430	3
storm lens	600	495	4
storm lens	700	211	4
storm lens	700	374	5
storm lens	700	429	4
storm lens	700	495	4

EW Wall	x	y	Thickness (cm)
storm lens	800	213	6
storm lens	800	267	5
storm lens	800	361	2
storm lens	800	380	9
storm lens	800	429	6
storm lens	800	437	3
storm lens	800	498	4
storm lens	900	212	3
storm lens	900	267	5
storm lens	900	376	4
storm lens	900	420	4
storm lens	1000	212	4
storm lens	1000	269	4
storm lens	1000	353	3
storm lens	1000	377	4
storm lens	1000	487	5
storm lens	1100	212	5
storm lens	1100	269	4
storm lens	1100	390	3
storm lens	1100	400	4
storm lens	1100	497	4
storm lens	1200	214	14
storm lens	1200	269	4
storm lens	1200	335	9
storm lens	1200	376	2
storm lens	1200	497	3
storm lens	1300	212	4
storm lens	1300	269	4
storm lens	1300	392	4
storm lens	1300	433	3
storm lens	1300	486	4
storm lens	1400	201	3
storm lens	1400	290	6
storm lens	1400	377	4
storm lens	1400	397	5
storm lens	1400	430	4
storm lens	1400	495	4
storm lens	1500	201	3
storm lens	1500	215	15
storm lens	1500	234	3
storm lens	1500	257	2
storm lens	1500	292	3
storm lens	1500	316	3
storm lens	1500	316	2

EW Wall	x	y	Thickness (cm)
storm lens	1500	361	3
storm lens	1500	377	5
storm lens	1500	432	3
storm lens	1600	201	4
storm lens	1600	210	4
storm lens	1600	275	2
storm lens	1600	363	3
storm lens	1600	394	3
storm lens	1600	430	5
storm lens	1600	491	4
storm lens	1700	200	4
storm lens	1700	212	4
storm lens	1700	262	4
storm lens	1700	314	8
storm lens	1700	385	4
storm lens	1700	404	4
storm lens	1700	431	3
storm lens	1700	492	4
storm lens	1800	211	4
storm lens	1800	266	2
storm lens	1800	367	2
storm lens	1800	397	2
storm lens	1800	494	3
storm lens	1900	210	4
storm lens	1900	270	4
storm lens	1900	288	3
storm lens	1900	373	5
storm lens	1900	430	3
storm lens	1900	491	4
storm lens	2000	211	4
storm lens	2000	376	3
storm lens	2000	494	3
storm lens	2100	211	4
storm lens	2100	224	3
storm lens	2100	270	4
storm lens	2100	325	4
storm lens	2100	380	3
storm lens	2200	210	4
storm lens	2200	223	4
storm lens	2200	261	2
storm lens	2200	323	5
storm lens	2200	373	4
storm lens	2200	448	4
storm lens	2200	496	3
storm lens	2300	211	4
storm lens	2300	226	4
storm lens	2300	324	6
storm lens	2300	374	4
storm lens	2300	495	4

EW Wall	x	y	Thickness (cm)
storm lens	2400	210	4
storm lens	2400	226	4
storm lens	2400	261	4
storm lens	2400	298	2
storm lens	2400	323	4
storm lens	2400	363	3
storm lens	2400	376	4
storm lens	2400	434	8
storm lens	2400	493	3
storm lens	2500	211	4
storm lens	2500	286	2
storm lens	2500	301	11
storm lens	2500	425	3
storm lens	2500	501	3
storm lens	2600	210	4
storm lens	2600	260	2
storm lens	2600	294	3
storm lens	2600	390	3
storm lens	2600	447	3
storm lens	2600	502	4
storm lens	2700	211	4
storm lens	2700	270	3
storm lens	2700	286	3
storm lens	2700	314	3
storm lens	2700	369	3
storm lens	2700	387	4
storm lens	2700	419	4
storm lens	2800	276	4
storm lens	2800	369	4
storm lens	2800	387	4
storm lens	2800	419	9
storm lens	2900	211	3
storm lens	2900	271	5
storm lens	2900	336	5
storm lens	2900	441	6
storm lens	2900	497	2
storm lens	3000	211	3
storm lens	3000	273	3
storm lens	3000	335	6
storm lens	3100	211	3
storm lens	3100	335	8
storm lens	3100	428	3
storm lens	3100	435	3
storm lens	3100	490	3
storm lens	3200	211	3
storm lens	3200	335	8
storm lens	3200	487	3
storm lens	3300	212	4
storm lens	3300	233	8

EW Wall	x	y	Thickness (cm)
storm lens	3300	333	6
storm lens	3400	211	3
storm lens	3400	276	4
storm lens	3400	320	4
storm lens	3500	210	4
storm lens	3700	37	3
storm lens	3700	155	5
storm lens	3700	219	6
storm lens	3700	293	4
storm lens	3700	376	5
storm lens	3700	410	3
storm lens	3700	420	4
storm lens	3800	23	5
storm lens	3800	216	6
storm lens	3800	287	4
storm lens	3800	301	4
storm lens	3800	377	3
storm lens	3800	414	5
storm lens	3800	437	5
storm lens	3900	23	6
storm lens	3900	122	2
storm lens	3900	219	8
storm lens	3900	301	6
storm lens	3900	350	6
storm lens	4000	21	4
storm lens	4000	98	5
storm lens	4000	114	4
storm lens	4000	138	5
storm lens	4000	221	8
storm lens	4000	300	10
storm lens	4100	21	7
storm lens	4100	100	6
storm lens	4100	116	10
storm lens	4100	138	6
storm lens	4100	181	6
storm lens	4100	221	6
storm lens	4100	440	4
storm lens	4100	459	4
storm lens	4200	93	8
storm lens	4200	160	5
storm lens	4200	316	3
storm lens	4200	361	5
storm lens	4200	459	5
storm lens	4200	466	5
storm lens	4300	157	6
storm lens	4300	219	6
storm lens	4300	319	4
storm lens	4300	458	5
storm lens	4400	110	13

EW Wall	x	y	Thickness (cm)
storm lens	4400	159	6
storm lens	4400	437	4
storm lens	4500	14	4
storm lens	4500	16	3
storm lens	4500	157	6
storm lens	4500	215	5
storm lens	4500	340	5
storm lens	4500	392	8
storm lens	4500	468	4
storm lens	4600	156	4
storm lens	4600	217	4
storm lens	4600	339	4
storm lens	4600	391	11
storm lens	4700	22	6
storm lens	4700	86	3
storm lens	4700	219	6
storm lens	4700	300	5
storm lens	4700	316	4
storm lens	4700	340	5
storm lens	4800	283	9
storm lens	4800	316	3
storm lens	4800	402	3
storm lens	4800	416	9
storm lens	4900	345	4
storm lens	5000	152	6
storm lens	5000	219	5
storm lens	5000	299	6
storm lens	5000	343	4
storm lens	5000	384	11
storm lens	5000	479	5
storm lens	5100	25	3
storm lens	5100	100	6
storm lens	5100	152	5
storm lens	5100	160	5
storm lens	5100	343	3
storm lens	5100	395	4
storm lens	5100	463	9
storm lens	5200	69	3
storm lens	5200	153	7
storm lens	5200	221	3
storm lens	5200	462	5
storm lens	5300	1	4
storm lens	5300	295	4
storm lens	5300	344	5
storm lens	5300	481	4
storm lens	5400	64	4
storm lens	5400	293	5
storm lens	5400	345	5
storm lens	5400	361	32

EW Wall	x	y	Thickness (cm)
storm lens	5500	289	5
storm lens	5500	340	5
storm lens	5500	361	5
storm lens	5500	411	8
storm lens	5600	115	3
storm lens	5600	126	7
storm lens	5600	273	7
storm lens	5600	285	7
storm lens	5600	344	6
storm lens	5600	374	5
storm lens	5600	414	5
storm lens	5700	11	4
storm lens	5700	126	7
storm lens	5700	221	5
storm lens	5700	358	8
storm lens	5700	389	3
storm lens	5800	126	7
storm lens	5800	285	5
storm lens	5800	362	5
storm lens	5900	222	4
storm lens	5900	236	3
storm lens	5900	285	3
storm lens	5900	305	5
storm lens	5900	414	3
storm lens	6000	20	4
storm lens	6000	151	4
storm lens	6100	156	5
storm lens	6200	88	4
storm lens	6200	158	5
storm lens	6200	359	4
storm lens	6200	411	14

Table F-8: Storm lens data NS Wall

Note: x = horizontal distance from origin (0,0) to middle of lens, in cm; y = vertical distance from base of section to base of lens in cm

NS Wall	x	y	Thickness (cm)
storm lens	0	300	5
storm lens	0	372	8
storm lens	0	409	5
storm lens	0	432	3
storm lens	0	470	6
storm lens	100	298	4
storm lens	100	367	4
storm lens	100	390	4
storm lens	100	432	4
storm lens	100	466	3
storm lens	200	203	4
storm lens	200	334	4
storm lens	200	367	3
storm lens	200	435	40
storm lens	200	478	3
storm lens	300	207	4
storm lens	300	369	3
storm lens	400	207	5
storm lens	400	354	5
storm lens	400	370	5
storm lens	400	410	5
storm lens	400	433	5
storm lens	400	481	3
storm lens	500	207	7
storm lens	500	308	7
storm lens	500	432	6
storm lens	500	480	3
storm lens	600	271	5
storm lens	600	364	3
storm lens	600	407	2
storm lens	600	431	6
storm lens	600	479	3
storm lens	700	208	3
storm lens	700	283	6
storm lens	700	360	5
storm lens	700	407	3
storm lens	700	411	3
storm lens	700	431	6
storm lens	800	207	4
storm lens	800	217	4
storm lens	800	284	5
storm lens	800	365	4
storm lens	800	411	3
storm lens	800	433	5

NS Wall	x	y	Thickness (cm)
storm lens	800	478	4
storm lens	900	210	5
storm lens	900	219	4
storm lens	900	283	5
storm lens	900	352	4
storm lens	900	369	5
storm lens	900	408	7
storm lens	1000	211	6
storm lens	1000	282	6
storm lens	1000	312	8
storm lens	1000	404	7
storm lens	1100	213	5
storm lens	1100	282	5
storm lens	1100	312	5
storm lens	1100	408	8
storm lens	1100	439	4
storm lens	1200	210	5
storm lens	1200	281	5
storm lens	1200	322	5
storm lens	1200	409	4
storm lens	1300	283	5
storm lens	1300	328	3
storm lens	1300	333	4
storm lens	1300	410	6
storm lens	1300	478	4
storm lens	1400	206	4
storm lens	1400	314	5
storm lens	1400	325	5
storm lens	1400	355	3
storm lens	1400	361	4
storm lens	1400	410	4
storm lens	1400	477	3
storm lens	1500	312	6
storm lens	1500	355	5
storm lens	1500	368	3
storm lens	1500	479	4
storm lens	1600	204	5
storm lens	1600	283	3
storm lens	1600	313	6
storm lens	1600	421	6
storm lens	1600	477	4
storm lens	1700	207	6
storm lens	1700	360	3
storm lens	1700	390	2

NS Wall	x	y	Thickness (cm)
storm lens	1700	465	4
storm lens	1800	209	5
storm lens	1800	285	5
storm lens	1800	362	4
storm lens	1800	477	3
storm lens	1900	479	4
storm lens	2000	421	4
storm lens	2100	206	4
storm lens	2100	222	6
storm lens	2100	276	5
storm lens	2200	210	4
storm lens	2200	228	6
storm lens	2200	267	4
storm lens	2200	292	5
storm lens	2200	422	3
storm lens	2200	479	23
storm lens	2300	226	5
storm lens	2300	267	4
storm lens	2300	288	5
storm lens	2300	352	3
storm lens	2300	412	3
storm lens	2400	209	4
storm lens	2400	268	5
storm lens	2400	355	3
storm lens	2400	413	4
storm lens	2500	203	7
storm lens	2500	267	4
storm lens	2500	278	8
storm lens	2500	354	3
storm lens	2500	411	8
storm lens	2600	208	4
storm lens	2600	226	5
storm lens	2600	281	4
storm lens	2600	316	5
storm lens	2600	364	7
storm lens	2600	411	6
storm lens	2600	496	4
storm lens	2700	292	5
storm lens	2700	353	4
storm lens	2700	364	6
storm lens	2700	410	4
storm lens	2700	480	3
storm lens	2700	490	4
storm lens	2800	364	5
storm lens	2800	410	6
storm lens	2800	478	4
storm lens	2800	502	4
storm lens	2900	212	4
storm lens	2900	361	5

NS Wall	x	y	Thickness (cm)
storm lens	2900	378	5
storm lens	2900	498	4
storm lens	3000	200	5
storm lens	3000	213	4
storm lens	3000	280	6
storm lens	3000	361	6
storm lens	3100	214	6
storm lens	3100	273	11
storm lens	3100	420	3
storm lens	3100	491	5
storm lens	3100	503	4
storm lens	3200	209	6
storm lens	3200	226	5
storm lens	3200	267	3
storm lens	3200	275	6
storm lens	3200	413	3
storm lens	3200	494	5
storm lens	3300	207	4
storm lens	3300	262	7
storm lens	3300	287	4
storm lens	3300	352	4
storm lens	3300	368	5
storm lens	3300	413	3
storm lens	3400	204	6
storm lens	3400	285	4
storm lens	3400	294	5
storm lens	3400	408	3
storm lens	3400	470	4
storm lens	3500	278	5
storm lens	3500	296	4
storm lens	3500	479	5
storm lens	3600	482	4
storm lens	3800	208	6
storm lens	3800	281	5
storm lens	3800	308	4
storm lens	3800	353	6
storm lens	3900	40	4
storm lens	3900	60	4
storm lens	3900	210	6
storm lens	3900	269	4
storm lens	3900	283	4
storm lens	3900	396	5
storm lens	3900	446	10
storm lens	3900	469	3
storm lens	4000	136	6
storm lens	4000	210	6
storm lens	4000	266	6
storm lens	4000	281	6
storm lens	4000	393	6

NS Wall	x	y	Thickness (cm)
storm lens	4000	446	8
storm lens	4000	469	3
storm lens	4100	78	4
storm lens	4100	210	8
storm lens	4100	238	7
storm lens	4100	269	4
storm lens	4100	391	5
storm lens	4100	469	3
storm lens	4200	48	4
storm lens	4200	61	4
storm lens	4200	76	5
storm lens	4200	155	5
storm lens	4200	209	7
storm lens	4200	271	3
storm lens	4200	282	4
storm lens	4200	383	3
storm lens	4200	465	6
storm lens	4300	23	2
storm lens	4300	114	4
storm lens	4300	210	6
storm lens	4300	283	7
storm lens	4300	351	5
storm lens	4300	466	5
storm lens	4400	70	5
storm lens	4400	155	3
storm lens	4400	210	7
storm lens	4400	285	6
storm lens	4400	391	
storm lens	4400	402	6
storm lens	4400	464	5
storm lens	4500	151	4
storm lens	4500	209	7
storm lens	4500	275	8
storm lens	4500	293	7
storm lens	4500	326	10
storm lens	4500	402	5
storm lens	4500	423	3
storm lens	4500	465	5
storm lens	4600	23	5
storm lens	4600	153	3
storm lens	4600	210	7
storm lens	4600	230	3
storm lens	4600	259	5
storm lens	4600	275	7
storm lens	4600	345	6
storm lens	4600	399	4
storm lens	4600	466	6
storm lens	4700	23	5
storm lens	4700	72	5

NS Wall	x	y	Thickness (cm)
storm lens	4700	257	6
storm lens	4700	282	8
storm lens	4700	344	7
storm lens	4700	399	12
storm lens	4800	23	5
storm lens	4800	210	4
storm lens	4800	277	11
storm lens	4800	342	9
storm lens	4800	359	5
storm lens	4800	398	13
storm lens	4800	464	5
storm lens	4900	8	5
storm lens	4900	148	6
storm lens	4900	210	6
storm lens	4900	315	6
storm lens	4900	342	5
storm lens	4900	397	14
storm lens	4900	465	6
storm lens	5000	148	7
storm lens	5000	210	6
storm lens	5000	346	4
storm lens	5000	397	14
storm lens	5000	497	5
storm lens	5100	3	3
storm lens	5100	152	4
storm lens	5100	210	5
storm lens	5100	345	4
storm lens	5100	398	13
storm lens	5100	468	4
storm lens	5200	5	6
storm lens	5200	66	6
storm lens	5200	151	5
storm lens	5200	210	5
storm lens	5200	397	9
storm lens	5300	5	4
storm lens	5300	75	7
storm lens	5300	210	5
storm lens	5300	398	8
storm lens	5300	467	5
storm lens	5400	75	7
storm lens	5400	112	6
storm lens	5400	154	4
storm lens	5400	210	5
storm lens	5400	345	6
storm lens	5400	397	7
storm lens	5400	448	15
storm lens	5500	78	5
storm lens	5500	88	7
storm lens	5500	210	6

NS Wall	x	y	Thickness (cm)
storm lens	5500	345	6
storm lens	5500	388	5
storm lens	5500	398	5
storm lens	5500	453	10
storm lens	5600	210	6
storm lens	5600	325	4
storm lens	5600	372	5
storm lens	5600	391	4
storm lens	5600	463	4
storm lens	5700	91	4
storm lens	5700	210	6
storm lens	5700	310	11
storm lens	5700	456	7
storm lens	5800	212	6
storm lens	5800	314	7
storm lens	5800	351	7
storm lens	5900	210	6

NS Wall	x	y	Thickness (cm)
storm lens	5900	291	5
storm lens	5900	385	5
storm lens	5900	464	5
storm lens	6000	2	4
storm lens	6000	151	5
storm lens	6000	210	6
storm lens	6000	286	5
storm lens	6000	355	4
storm lens	6000	462	6
storm lens	6100	210	6
storm lens	6100	222	4
storm lens	6100	466	3
storm lens	6200	68	5
storm lens	6200	274	9