Gray's Reef Benthic Macroinvertebrate Community Assessment, 2002

SUBMITTED TO:

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INTRODUCTION

The Gray's Reef National Marine Sanctuary was sampled during 2002. One aspect of this study was benthic community characterization, which was accomplished via sample collection by National Oceanic and Atmospheric Administration (NOAA) personnel and laboratory and data analysis by Barry A. Vittor & Associates, Inc. (BVA). Location data for the Gray's Reef stations are given in Figure 1 and Table 1.

METHODS

Sample Collection and Handling

A Young dredge (area = 0.04 m^2) was used to collect bottom samples at each of 20 station locations (three replicate samples were taken at each station)(Table1). Samples were prescreened through 0.5 mm mesh sieves, by NOAA in the field and fixed in 10% formalin. The preserved sample fractions were transported to BVA's laboratory in Mobile, Alabama.

Sediment Analysis

Sediment texture was determined at half-phi intervals using the hydrometer technique for fractions smaller than 44 μm and nested sieves for larger particle fractions. Texture parameters that were computed included percent gravel, sand, and silt /clay. Total organic carbon (TOC) content was measured as ash-free dry weight expressed as a percentage.

Macroinfaunal Sample Analysis

In the laboratory of BVA, benthic samples were inventoried, rinsed gently through a 0.5 mm mesh sieve to remove preservatives and sediment, stained with Rose Bengal, and stored in 70% isopropanol solution until processing. Sample material (sediment, detritus, organisms) was placed in white enamel trays for sorting under Wild M-5A dissecting microscopes. All macroinvertebrates were carefully removed with

forceps and placed in labeled glass vials containing 70% isopropanol. Each vial represented a major taxonomic group (*e.g.* Polychaeta, Mollusca, Arthropoda). All sorted macroinvertebrates were identified to the lowest practical identification level (LPIL), which in most cases was to species level unless the specimen was a juvenile, damaged, or otherwise unidentifiable. The number of individuals of each taxon, excluding fragments, was recorded. A voucher collection was prepared, composed of representative individuals of each species not previously encountered in samples from the region.

DATA ANALYSIS

All data generated as a result of laboratory analysis of macroinfauna samples were first coded on data sheets. Enumeration data were entered for each species according to station and replicate. These data were reduced to a data summary report for each station, which included a taxonomic species list and benthic community parameters information. Archive data files of species identification and enumeration were prepared. The Quality Assurance/Quality Control (QA/QC) reports for the Gray's Reef samples are given in the Appendix.

Assemblage Structure

Several numerical indices were chosen for analysis and interpretation of the macroinfaunal data. Selection was based primarily on the ability of the index to provide a meaningful summary of data, as well as the applicability of the index to the characterization of the benthic community. Infaunal abundance is reported as the total number of individuals per station and the total number of individuals per square meter (= density). Taxa richness is reported as the total number of taxa represented in a given station collection.

Taxa diversity, which is often related to the ecological stability and environmental "quality" of the benthos, was estimated by Shannon's Index (Pielou, 1966), according to the following formula:

$$H' = -\sum_{i=1}^{s} p_i(ln\ p_i)$$

where, S = the number of taxa in the sample,

i = the i'th taxa in the sample, and

p_i = the number of individuals of the i'th taxa divided by the total number of individuals in the sample.

Taxa diversity was calculated using ln; however, diversity may also be calculated using log_2. Both methods of calculating diversity are common in the scientific literature. The taxa diversity calculated in this report using ln, can be converted to log_2 diversity by multiplying the ln taxa diversity by 1.4427.

Taxa diversity within a given community is dependent upon the number of taxa present (taxa richness) and the distribution of all individuals among those taxa (equitability or evenness). In order to quantify and compare faunal equitability to taxa diversity for a given area, Pielou's Index J' (Pielou, 1966) was calculated as J' = H'/ln S, where ln S = H' max , or the maximum possible diversity, when all taxa are represented by the same number of individuals; thus, J' = H' /H' max .

Cluster and MDS Analysis

Cluster analysis of the Gray's Reef data was performed by calculating the Bray-Curtis similarity coefficient for all pairs of stations, having square-root transformed the original taxa abundances (PRIMER 2003). The most abundant eighty taxa representing 80.1% of all individuals encountered were included in the analysis. Clusters were formed using the group-average linkage method between similarities (PRIMER 2003). A non-

metric multi-dimensional scaling (MDS) was performed on the similarity matrix

generated by the cluster analysis. MDS represents stations in 2-dimensional space such

that the relative distances apart of all points are in the same rank order as the relative

dissimilarities of the samples as calculated by the Bray-Curtis coefficients. Points close

together in an MDS plot represent stations that are very similar in taxa composition and

points that are far apart represent very different assemblages (PRIMER 2003). The

relative distribution and abundance of selected taxa (or taxa groups) can be overlain on

the MDS plots.

HABITAT CHARACTERISTICS

Water quality data for the 20 stations are given in Table 1 and Figure 2. Depth

ranged from 7.9 m at Station 22 to 43.5 m at Station 5 (Figure 2). Salinities were greater

than 34 ppt at all stations (Table 1).

Sediment data for the 20 stations are given in Table 1 and Figure 3. Sediment

texture at the 20 stations was uniform throughout the study area (Figure 3). Sand

comprised at least of 97% of the total sediment at all stations except Station 22, which

had an 8% silt+clay fraction (Figure 3). The percent total organic carbon (TOC) fraction

of the sediment was very low with all values less than 0.5% (Table 1, Figure 3).

BENTHIC COMMUNITY CHARACTERIZATION

Faunal Composition, Abundance, and Community Structure

Microsoft ™Excel spreadsheets are being provided separately to NOAA which

include: raw data on taxa abundance and density, a complete taxonomic listing with

station abundance and occurrence, a major taxa table with overall taxa abundance, and an

assemblage parameter table including data on number of taxa, density, taxa diversity and

taxa evenness by station.

A total of 9252 organisms, representing 482 taxa, were identified from the 20

stations (Table 2). Polychaetes were the most numerous organisms present representing 42.2% of the total assemblage, followed in abundance by malacostracans (24.5%) and bivalves (14.0%). Polychaetes represented 44.0% of the total number of taxa followed by malacostracans (23.7%), bivalves (13.1%) and gastropods (10.4%)(Table 3). The percentage abundance of the major taxa at the 20 stations is given in Table 3 and Figures 4 and 5. A diverse, mixed assemblage of annelids, mollusks and arthropods was found at each of the 20 stations (Figures 4 and 5).

The dominant taxa collected from the 20 stations were the malacostracan, *Erichthonius brasiliensis*, the polychaete, *Spiophanes bombyx*, the malacostracan, *Bathyporeia parkeri*, the polychaete genera, *Mediomastus* (LPIL), and the echinoderm order, Echinoidea (LPIL) representing 5.2%, 4.1%, 3.3%, 3.2% and 3.0%, respectively (Table 4). The most widely distributed taxon was the polychaete, *S. bombyx* being found at 100% of the stations. The distribution of taxa representing > 5% of the total assemblage at each station is given in Table 5.

Station taxa richness and abundance data are summarized for the 20 stations in Table 6 and Figures 6-9. The mean number of taxa per station ranged from 15.0 (SD = 3.6) at Station 26 to 65.7 (SD = 14.4) at Station 37 (Table 6; Figures 6 and 7). Mean density per station ranged from 1550.0 organisms·m^2 (SD = 499.4) at Station 39 to 9975.0 organisms·m^2 (SD = 4664.6) at Station 27 (Table 6; Figures 8 and 9).

Taxa diversity and evenness for the Gray's Reef stations are given in Table 6 and Figure 10. Taxa diversity (H´) was uniformly high and ranged from 2.68 at Station 35 to >4.0 at Stations 36. 37 and 38 (Table 6; Figure 10). Taxa evenness (J´) ranged from 0.60 at Station 12 to 0.93 at Station 39 (Table 6; Figure 10).

Cluster and MDS Analysis

The cluster analysis of the 20 Gray's Reef station is given in Figure 11. The 20 stations formed several distinct clusters: the easternmost Station 39; the nearshore stations 21 and 26; Station 27; Stations 22, 23, 24, 28, 29, and 35; and Stations 1, 10, 11,

12, 14, 17, 25, 36, 37, and 38 (Figure 11). Non-metric multidimensional scaling using the Bray-Curtis similarity matrix was performed. The 2-dimensional MDS plots were then overlain with the transformed abundances of major taxa groups (Figures 12-15). Points close together on the MDS plot represent stations that are very similar in taxa composition and points that are far apart represent very different assemblages; circles represent the relative abundance of a taxa group. Station 27 is isolated in the MDS plots indicating a macroinvertebrate assemblage different than the remaining stations and dominated by annelids and mollusks (Figures 12 and 14). The assemblages at Stations 21, 26 and 39 were dominated by mollusks and annelids; the assemblages at Stations 22, 23, and 28 was dominated by arthropods and mollusks (Figures 12-15).

LITERATURE CITED

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Clarke, K.R. and R.N. Gorley. 2003. PRIMER 5 (Plymouth Routines in Multivariate Ecological Research). Plymouth Marine Laboratory, Plymouth, United Kingdom.

Table 1. Summary of water quality and sediment data for the Gray's Reef stations, 2002.

Station	Latitude	Longitude	Depth (m)	Temp. (C)	Sal. (ppt)	D.O. (mg/l)	Conductivity (umhos)	pH	% T.O.C.	% Gravel	% Sand	% Silt + Clay	USACE Description	Median Particle Size (phi)	Sorting Coefficient	% Moisture
1	31° 25.16'	80° 54.70'	15.2	26.73	37.28	6.27	56.06	7.69	0.03	2.92	96.97	0.11	Sand	1.110	0.853	15.26
10	31° 24.34'	80° 49.92'	18.9	26.67	37.40	6.26	56.19	7.68	0.09	3.92	95.78	0.30	Sand	0.877	1.000	16.60
11	31° 23.47'	80° 54.35'	17.9	27.07	37.15	6.10	55.85	7.69	0.12	1.21	98.66	0.13	Sand	1.473	0.910	17.38
12	31° 23.36'	80° 53.77'	17.7	18.40	36.10	nd	nd	nd	0.30	2.10	97.61	0.29	Sand	1.214	1.033	19.31
14	31° 22.98'	80° 51.60'	18.7	26.96	37.30	6.00	55.96	7.60	0.20	0.87	99.03	0.10	Sand	1.514	0.995	17.80
17	31° 22.06'	80° 53.87'	18.5	27.03	37.26	6.00	55.97	7.67	0.07	6.17	93.66	0.17	+	0.068	0.901	19.52
21	31° 31.88'	81° 09.50'	*	*	*	*	*	*	0.42	21.63	70.09	8.28	+	0.397	1.697	20.81
22	31° 31.50'	81° 04.60'	7.9	19.20	34.90	nd	nd	nd	0.19	0.26	97.41	2.33	Sand	2.728	0.700	21.27
23	31° 30.94'	80° 59.97'	15.0	18.80	35.50	nd	nd	nd	0.12	0.51	99.25	0.24	Sand	2.323	0.653	18.99
24	31° 30.586'	80° 55.264'	16.4	18.60	36.10	nd	nd	nd	0.06	0.65	99.08	0.27	Sand	1.687	0.936	16.92
25	31° 30.204'	80° 50.564'	17.0	18.60	36.50	nd	nd	nd	0.06	1.36	98.27	0.37	Sand	1.309	0.963	16.24
26	31° 22.20'	81° 15.71'	*	*	*	*	*	*	0.19	6.47	93.05	0.49	+	1.246	0.806	18.67
27	31° 22.533'	81° 09.803'	10.2	19.50	34.60	nd	nd	nd	0.24	0.00	98.92	1.08	Sand	2.769	0.688	22.85
28	31° 22.815'	81° 03.861'	13.9	18.90	35.30	nd	nd	nd	0.03	0.00	99.73	0.27	Sand	2.463	0.537	22.06
29	31° 23.218'	80° 58.267'	14.6	18.60	35.70	nd	nd	nd	0.15	1.36	98.52	0.11	Sand	1.807	0.744	17.69
35	31° 31.19'	80° 35.37'	23.2	18.90	36.50	nd	nd	nd	0.07	2.29	97.71	0.00	Sand	1.670	0.881	16.98
36	31° 32.275'	80° 20.365'	30.1	19.50	36.40	nd	nd	nd	0.07	2.20	97.60	0.21	Sand	1.166	0.875	17.87
37	31° 33.156'	80° 05.415'	34.1	20.10	36.40	nd	nd	nd	0.15	2.81	96.98	0.22	Sand	0.758	0.819	15.91
38	31° 33.98'	79° 50.333'	43.5	20.70	36.40	nd	nd	nd	0.03	0.46	99.39	0.15	Sand	1.086	0.789	15.88
39	31° 34.878'	79° 37.225'	105.0	20.10	36.30	nd	nd	nd	0.41	0.42	97.89	1.70	Sand	1.430	0.670	21.99

nd-No data
* No bottom reading available due to swift current.
+ Too much Gravel for remaining textural descriptions.
- Unable to calculate due to amount of sample in sieve.

Table 2. Summary of overall abundance of major benthic macroinfaunal taxonomic groups for the Gray's Reef stations, 2002.

Taxa	Total No. Taxa	% of Total	Total No. Individuals	% of Total
Annelida				
Oligochaeta	3	0.6	309	3.3
Polychaeta	212	44.0	3,906	42.2
Mollusca				
Bivalvia	63	13.1	1,299	14.0
Gastropoda	50	10.4	428	4.6
Polyplacophora	1	0.2	3	0.0
Scaphopoda	4	0.8	18	0.2
Arthropoda				
Malacostraca	114	23.7	2,263	24.5
Pycnogonida	1	0.2	2	0.0
Echinodermata				
Asteroidea	2	0.4	6	0.1
Echinoidea	5	1.0	300	3.2
Holothuroidea	2	0.4	2	0.0
Ophiuroidea	5	1.0	30	0.3
Other Taxa	20	4.1	686	7.4
Total	**482**		**9,252**	

Table 3. Summary of abundance of major benthic macroinfaunal taxonomic groups
by station for the Gray's Reef stations, 2002.

Station	Taxa	Total No. Taxa	% of Total	Total No. Individuals	% of Total
1	Annelida	40	46.5	112	30.7
	Mollusca	18	20.9	116	31.8
	Arthropoda	20	23.3	74	20.3
	Echinodermata	2	2.3	3	0.8
	Other Taxa	6	7.0	60	16.4
	Total	86		365	
10	Annelida	54	55.7	455	68.4
	Mollusca	21	21.6	63	9.5
	Arthropoda	13	13.4	36	5.4
	Echinodermata	1	1.0	1	0.2
	Other Taxa	8	8.2	110	16.5
	Total	97		665	
11	Annelida	33	42.9	111	38.5
	Mollusca	15	19.5	104	36.1
	Arthropoda	20	26.0	43	14.9
	Echinodermata				
	Other Taxa	9	11.7	30	10.4
	Total	77		288	
12	Annelida	50	36.2	171	16.3
	Mollusca	30	21.7	168	16.0
	Arthropoda	46	33.3	638	60.8
	Echinodermata	5	3.6	52	5.0
	Other Taxa	7	5.1	21	2.0
	Total	138		1,050	
14	Annelida	29	37.7	59	29.5
	Mollusca	15	19.5	27	13.5
	Arthropoda	26	33.8	57	28.5
	Echinodermata	2	2.6	3	1.5
	Other Taxa	5	6.5	54	27.0
	Total	77		200	
17	Annelida	54	61.4	349	59.5
	Mollusca	11	12.5	127	21.6
	Arthropoda	16	18.2	79	13.5
	Echinodermata	2	2.3	2	0.3
	Other Taxa	5	5.7	30	5.1
	Total	88		587	

Table 3 continued:

Station	Taxa	Total No. Taxa	% of Total	Total No. Individuals	% of Total
21	Annelida	50	61.0	288	53.3
	Mollusca	14	17.1	159	29.4
	Arthropoda	12	14.6	61	11.3
	Echinodermata	3	3.7	3	0.6
	Other Taxa	3	3.7	29	5.4
	Total	**82**		**540**	
22	Annelida	14	37.8	101	34.9
	Mollusca	10	27.0	46	15.9
	Arthropoda	10	27.0	136	47.1
	Echinodermata	0	0	0	0
	Other Taxa	3	8.1	6	2.1
	Total	**37**		**289**	
23	Annelida	14	30.4	51	24.2
	Mollusca	14	30.4	55	26.1
	Arthropoda	11	23.9	89	42.2
	Echinodermata	2	4.3	5	2.4
	Other Taxa	5	10.9	11	5.2
	Total	**46**		**211**	
24	Annelida	21	31.3	58	27.4
	Mollusca	17	25.4	65	30.7
	Arthropoda	20	29.9	47	22.2
	Echinodermata	2	3.0	18	8.5
	Other Taxa	7	10.4	24	11.3
	Total	**67**		**212**	
25	Annelida	35	36.1	250	36.1
	Mollusca	23	23.7	170	24.6
	Arthropoda	26	26.8	90	13.0
	Echinodermata	5	5.2	127	18.4
	Other Taxa	8	8.2	55	7.9
	Total	**97**		**692**	
26	Annelida	17	51.5	222	70.0
	Mollusca	7	21.2	57	18.0
	Arthropoda	6	18.2	16	5.0
	Echinodermata	1	3.0	1	0.3
	Other Taxa	2	6.1	21	6.6
	Total	**33**		**317**	

Table 3 continued:

Station	Taxa	Total No. Taxa	% of Total	Total No. Individuals	% of Total
27	Annelida	28	38.4	904	75.5
	Mollusca	21	28.8	133	11.1
	Arthropoda	17	23.3	91	7.6
	Echinodermata	1	1.4	4	0.3
	Other Taxa	6	8.2	65	5.4
	Total	**73**		**1,197**	
28	Annelida	15	35.7	31	12.4
	Mollusca	12	28.6	45	18.0
	Arthropoda	12	28.6	163	65.2
	Echinodermata	0	0	0	0
	Other Taxa	3	7.1	11	4.4
	Total	**42**		**250**	
29	Annelida	18	32.1	44	18.1
	Mollusca	11	19.6	62	25.5
	Arthropoda	20	35.7	94	38.7
	Echinodermata	3	5.4	26	10.7
	Other Taxa	4	7.1	17	7.0
	Total	**56**		**243**	
35	Annelida	26	34.7	76	13.5
	Mollusca	20	26.7	62	11.1
	Arthropoda	21	28.0	341	60.8
	Echinodermata	2	2.7	60	10.7
	Other Taxa	6	8.0	22	3.9
	Total	**75**		**561**	
36	Annelida	54	54.0	257	58.9
	Mollusca	19	19.0	78	17.9
	Arthropoda	13	13.0	48	11.0
	Echinodermata	3	3.0	12	2.8
	Other Taxa	11	11.0	41	9.4
	Total	**100**		**436**	
37	Annelida	68	53.5	361	56.8
	Mollusca	24	18.9	133	20.9
	Arthropoda	24	18.9	93	14.6
	Echinodermata	3	2.4	13	2.0
	Other Taxa	8	6.3	36	5.7
	Total	**127**		**636**	

Table 3 continued:

Station	Taxa	Total No. Taxa	% of Total	Total No. Individuals	% of Total
38	Annelida	63	61.2	206	63.0
	Mollusca	14	13.6	39	11.9
	Arthropoda	12	11.7	47	14.4
	Echinodermata	3	2.9	4	1.2
	Other Taxa	11	10.7	31	9.5
	Total	**103**		**327**	
39	Annelida	40	54.1	109	58.6
	Mollusca	19	25.7	39	21.0
	Arthropoda	9	12.2	22	11.8
	Echinodermata	1	1.4	2	1.1
	Other Taxa	5	6.8	14	7.5
	Total	**74**		**186**	

Table 4. Distribution and abundance and of benthic macroinfaunal taxa for the Gray's Reef stations, 2002.

Taxa	Phylum	Class	No. of Individuals	% of Total	Cumulative %	Station Occurrence	% Station Occurrence
Erichthonius brasiliensis	Art	Mala	485	5.24	5.24	5	25
Spiophanes bombyx	Ann	Poly	382	4.13	9.37	20	100
Bathyporeia parkeri	Art	Mala	309	3.34	12.71	9	45
Mediomastus (LPIL)	Ann	Poly	297	3.21	15.92	7	35
Echinoidea (LPIL)	Ech	Echin	278	3.00	18.93	10	50
Tubificidae (LPIL)	Ann	Olig	266	2.88	21.80	17	85
Ervilia concentrica	Mol	Biva	252	2.72	24.52	14	70
Owenia fusiformis	Ann	Poly	205	2.22	26.74	8	40
Sabellaria vulgaris	Ann	Poly	187	2.02	28.76	3	15
Semele nuculoides	Mol	Biva	187	2.02	30.78	16	80
Caecum johnsoni	Mol	Gast	179	1.93	32.72	10	50
Filogranula sp. A	Ann	Poly	169	1.83	34.54	7	35
Protodorvillea kefersteini	Ann	Poly	160	1.73	36.27	10	50
Rhynchocoela (LPIL)	Rhy	-	155	1.68	37.95	19	95
Rhepoxynius epistomus	Art	Mala	148	1.60	39.55	10	50
Protohaustorius wigleyi	Art	Mala	136	1.47	41.02	8	40
Tellina (LPIL)	Mol	Biva	134	1.45	42.47	12	60
Fabricinuda trilobata	Ann	Poly	129	1.39	43.86	6	30
Eudevenopus honduranus	Art	Mala	123	1.33	45.19	10	50
Bhawania goodei	Ann	Poly	116	1.25	46.44	12	60
Crassinella lunulata	Mol	Biva	114	1.23	47.68	16	80
Branchiostoma (LPIL)	Cho	Lept	108	1.17	48.84	13	65
Oxyurostylis smithi	Art	Mala	106	1.15	49.99	9	45
Bivalvia (LPIL)	Mol	Biva	103	1.11	51.10	19	95
Apseudes olympiae	Art	Mala	100	1.08	52.18	6	30
Sipuncula (LPIL)	Sip	-	96	1.04	53.22	11	55
Spionidae (LPIL)	Ann	Poly	94	1.02	54.24	17	85
Sphaerosyllis piriferopsis	Ann	Poly	93	1.01	55.24	7	35
Aspidosiphon muelleri	Sip	-	91	0.98	56.23	11	55
Pionosyllis gesae	Ann	Poly	86	0.93	57.16	9	45
Ostrea equestris	Mol	Biva	85	0.92	58.07	2	10
Cnidaria (LPIL)	Cni	-	79	0.85	58.93	9	45
Cirratulidae (LPIL)	Ann	Poly	78	0.84	59.77	6	30
Exogone rolani	Ann	Poly	75	0.81	60.58	9	45
Maldanidae (LPIL)	Ann	Poly	75	0.81	61.39	14	70
Parapionosyllis longicirrata	Ann	Poly	75	0.81	62.20	13	65
Prionospio (LPIL)	Ann	Poly	65	0.70	62.91	11	55
Exogone lourei	Ann	Poly	59	0.64	63.54	5	25
Diplodonta (LPIL)	Mol	Biva	58	0.63	64.17	13	65
Acteocina lepta	Mol	Gast	53	0.57	64.74	8	40
Goniadides carolinae	Ann	Poly	51	0.55	65.29	12	60
Leptochelia (LPIL)	Art	Mala	49	0.53	65.82	8	40
Spio pettiboneae	Ann	Poly	49	0.53	66.35	9	45
Syllidae (LPIL)	Ann	Poly	49	0.53	66.88	12	60
Armandia maculata	Ann	Poly	46	0.50	67.38	10	50
Armandia agilis	Ann	Poly	45	0.49	67.87	4	20
Apoprionospio pygmaea	Ann	Poly	43	0.46	68.33	4	20
Cyclaspis pustulata	Art	Mala	42	0.45	68.79	6	30
Metharpinia floridana	Art	Mala	41	0.44	69.23	7	35
Lumbriculidae (LPIL)	Ann	Olig	40	0.43	69.66	13	65
Ampelisca (LPIL)	Art	Mala	39	0.42	70.08	13	65
Microphthalmus hartmanae	Ann	Poly	38	0.41	70.49	1	5
Tectonatica pusilla	Mol	Gast	38	0.41	70.90	10	50
Nephtys simoni	Ann	Poly	37	0.40	71.30	8	40

Table 4 continued:

Taxa	Phylum	Class	No. of Individuals	% of Total	Cumulative %	Station Occurrence	% Station Occurrence
Pisione remota	Ann	Poly	36	0.39	71.69	3	15
Actiniaria (LPIL)	Cni	Anth	35	0.38	72.07	8	40
Campylaspis heardi	Art	Mala	34	0.37	72.44	8	40
Monticellina dorsobranchialis	Ann	Poly	34	0.37	72.81	2	10
Cirrophorus ilvana	Ann	Poly	33	0.36	73.16	4	20
Tanaissus psammophilus	Art	Mala	33	0.36	73.52	10	50
Goniadella sp. A	Ann	Poly	32	0.35	73.87	3	15
Sphaerosyllis aciculata	Ann	Poly	32	0.35	74.21	6	30
Taylorpholoe hirsuta	Ann	Poly	31	0.34	74.55	5	25
Synelmis ewingi	Ann	Poly	30	0.32	74.87	9	45
Americhelidium americanum	Art	Mala	29	0.31	75.18	12	60
Acanthohaustorius millsi	Art	Mala	28	0.30	75.49	9	45
Glycera robusta	Ann	Poly	28	0.30	75.79	11	55
Bhawania heteroseta	Ann	Poly	27	0.29	76.08	4	20
Lucinidae (LPIL)	Mol	Biva	27	0.29	76.37	10	50
Onuphidae (LPIL)	Ann	Poly	26	0.28	76.65	13	65
Pagurus (LPIL)	Art	Mala	26	0.28	76.93	9	45
Crassinella dupliniana	Mol	Biva	25	0.27	77.20	4	20
Cupuladria (LPIL)	Ect	Gymn	25	0.27	77.48	7	35
Cyclaspis varians	Art	Mala	25	0.27	77.75	7	35
Heteropodarke formalis	Ann	Poly	25	0.27	78.02	5	25
Tellina agilis	Mol	Biva	25	0.27	78.29	2	10
Dulichiella appendiculata	Art	Mala	24	0.26	78.55	1	5
Mya arenaria	Mol	Biva	23	0.25	78.79	1	5
Chone (LPIL)	Ann	Poly	21	0.23	79.02	7	35
Nucula proxima	Mol	Biva	21	0.23	79.25	2	10
Ophiuroidea (LPIL)	Ech	Ophi	21	0.23	79.47	11	55
Photis sp. N	Art	Mala	21	0.23	79.70	1	5
Phoxocephalidae (LPIL)	Art	Mala	21	0.23	79.93	8	40
Rictaxis punctostriatus	Mol	Gast	21	0.23	80.16	6	30
Capitellidae (LPIL)	Ann	Poly	20	0.22	80.37	7	35
Glycera (LPIL)	Ann	Poly	20	0.22	80.59	8	40
Phoronis (LPIL)	Pho	-	20	0.22	80.80	3	15
Phtisica marina	Art	Mala	20	0.22	81.02	1	5
Cirrophorus (LPIL)	Ann	Poly	19	0.21	81.23	4	20
Dentatisyllis carolinae	Ann	Poly	19	0.21	81.43	3	15
Glyceridae (LPIL)	Ann	Poly	19	0.21	81.64	6	30
Tellina listeri	Mol	Biva	19	0.21	81.84	5	25
Tellina versicolor	Mol	Biva	19	0.21	82.05	1	5
Tharyx acutus	Ann	Poly	19	0.21	82.25	1	5
Hesionura elongata	Ann	Poly	18	0.19	82.45	6	30
Nephtys picta	Ann	Poly	18	0.19	82.64	5	25
Tubulanus (LPIL)	Rhy	Anop	18	0.19	82.84	7	35
Phyllodocidae (LPIL)	Ann	Poly	17	0.18	83.02	6	30
Podarke obscura	Ann	Poly	17	0.18	83.20	8	40
Aspidosiphon (LPIL)	Sip	-	16	0.17	83.38	7	35
Eumida sanguinea	Ann	Poly	16	0.17	83.55	5	25
Ophelia denticulata	Ann	Poly	16	0.17	83.72	3	15
Laevicardium (LPIL)	Mol	Biva	15	0.16	83.88	6	30
Serpulidae (LPIL)	Ann	Poly	15	0.16	84.05	5	25
Diplodonta punctata	Mol	Biva	14	0.15	84.20	2	10
Galathowenia oculata	Ann	Poly	14	0.15	84.35	6	30
Gibberosus myersi	Art	Mala	14	0.15	84.50	9	45
Goniada littorea	Ann	Poly	14	0.15	84.65	4	20
Lucina radians	Mol	Biva	14	0.15	84.80	2	10
Mitrella lunata	Mol	Gast	14	0.15	84.95	5	25

Table 4 continued:

Taxa	Phylum	Class	No. of Individuals	% of Total	Cumulative %	Station Occurrence	% Station Occurrence
Nephtys (LPIL)	Ann	Poly	14	0.15	85.11	9	45
Podocerus kleidus	Art	Mala	14	0.15	85.26	1	5
Acanthohaustorius shoemakeri	Art	Mala	13	0.14	85.40	7	35
Arabella multidentata	Ann	Poly	13	0.14	85.54	1	5
Carpias bermudensis	Art	Mala	13	0.14	85.68	1	5
Encope aberrans	Ech	Echin	13	0.14	85.82	7	35
Gastropoda (LPIL)	Mol	Gast	13	0.14	85.96	6	30
Grubeosyllis clavata	Ann	Poly	13	0.14	86.10	3	15
Maera caroliniana	Art	Mala	13	0.14	86.24	1	5
Microphthalmus (LPIL)	Ann	Poly	13	0.14	86.38	6	30
Polycirrus eximius	Ann	Poly	13	0.14	86.52	3	15
Shoemakerella cubensis	Art	Mala	13	0.14	86.66	2	10
Apoprionospio dayi	Ann	Poly	12	0.13	86.79	3	15
Eurydice littoralis	Art	Mala	12	0.13	86.92	5	25
Glycera americana	Ann	Poly	12	0.13	87.05	3	15
Ptilanthura tenuis	Art	Mala	12	0.13	87.18	5	25
Ampeliscidae (LPIL)	Art	Mala	11	0.12	87.30	2	10
Asthenothaerus hemphilli	Mol	Biva	11	0.12	87.42	6	30
Cirrophorus lyra	Ann	Poly	11	0.12	87.54	3	15
Crassinella (LPIL)	Mol	Biva	11	0.12	87.66	4	20
Haustoriidae (LPIL)	Art	Mala	11	0.12	87.78	5	25
Magelona pettiboneae	Ann	Poly	11	0.12	87.89	6	30
Photis (LPIL)	Art	Mala	11	0.12	88.01	5	25
Acuminodeutopus naglei	Art	Mala	10	0.11	88.12	5	25
Ampelisca agassizi	Art	Mala	10	0.11	88.23	4	20
Ascidiacea (LPIL)	Cho	Asci	10	0.11	88.34	6	30
Batea catharinensis	Art	Mala	10	0.11	88.45	3	15
Caecum floridanum	Mol	Gast	10	0.11	88.55	5	25
Eurydice personata	Art	Mala	10	0.11	88.66	6	30
Leitoscoloplos (LPIL)	Ann	Poly	10	0.11	88.77	4	20
Liljeborgia sp. A	Art	Mala	10	0.11	88.88	2	10
Polycirrus (LPIL)	Ann	Poly	10	0.11	88.99	3	15
Polygordius (LPIL)	Ann	Poly	10	0.11	89.09	2	10
Strigilla mirabilis	Mol	Biva	10	0.11	89.20	3	15
Syllis cornuta	Ann	Poly	10	0.11	89.31	5	25
Syllis gracilis	Ann	Poly	10	0.11	89.42	2	10
Caecum pulchellum	Mol	Gast	9	0.10	89.52	5	25
Cirrophorus branchiatus	Ann	Poly	9	0.10	89.61	3	15
Deutella incerta	Art	Mala	9	0.10	89.71	2	10
Exogone (LPIL)	Ann	Poly	9	0.10	89.81	5	25
Gammaropsis (LPIL)	Art	Mala	9	0.10	89.90	4	20
Laevicardium laevigatum	Mol	Biva	9	0.10	90.00	3	15
Lembos (LPIL)	Art	Mala	9	0.10	90.10	2	10
Opisthodonta sp. B	Ann	Poly	9	0.10	90.20	4	20
Photis pugnator	Art	Mala	9	0.10	90.29	2	10
Rhodine sp. A	Ann	Poly	9	0.10	90.39	4	20
Acteocina bidentata	Mol	Gast	8	0.09	90.48	1	5
Aspidosiphon albus	Sip	-	8	0.09	90.56	4	20
Cadulus quadridentatus	Mol	Scap	8	0.09	90.65	2	10
Cyclaspis sp. O	Art	Mala	8	0.09	90.74	5	25
Lucina (LPIL)	Mol	Biva	8	0.09	90.82	5	25
Pholadidae (LPIL)	Mol	Biva	8	0.09	90.91	1	5
Phyllodoce (LPIL)	Ann	Poly	8	0.09	91.00	6	30
Schistomeringos pectinata	Ann	Poly	8	0.09	91.08	3	15
Turbellaria (LPIL)	Pla	Turb	8	0.09	91.17	5	25
Turbonilla (LPIL)	Mol	Gast	8	0.09	91.26	3	15
Unciola serrata	Art	Mala	8	0.09	91.34	2	10

Table 4 continued:

Taxa	Phylum	Class	No. of Individuals	% of Total	Cumulative %	Station Occurrence	% Station Occurrence
Amakusanthura magnifica	Art	Mala	7	0.08	91.42	4	20
Ampharetidae (LPIL)	Ann	Poly	7	0.08	91.49	6	30
Autolytus (LPIL)	Ann	Poly	7	0.08	91.57	2	10
Brania wellfleetensis	Ann	Poly	7	0.08	91.65	3	15
Caprella equilibra	Art	Mala	7	0.08	91.72	1	5
Crenella divaricata	Mol	Biva	7	0.08	91.80	3	15
Spionidae Genus F	Ann	Poly	7	0.08	91.87	1	5
Lineidae (LPIL)	Rhy	Anop	7	0.08	91.95	2	10
Lumbrinerides dayi	Ann	Poly	7	0.08	92.02	3	15
Martesia cuneiformis	Mol	Biva	7	0.08	92.10	1	5
Metatiron tropakis	Art	Mala	7	0.08	92.17	5	25
Nereididae (LPIL)	Ann	Poly	7	0.08	92.25	4	20
Sphaerosyllis (LPIL)	Ann	Poly	7	0.08	92.33	3	15
Acteocina candei	Mol	Gast	6	0.06	92.39	4	20
Aglaophamus verrilli	Ann	Poly	6	0.06	92.46	2	10
Ancinus depressus	Art	Mala	6	0.06	92.52	1	5
Antalis (LPIL)	Mol	Scap	6	0.06	92.59	3	15
Apoprionospio (LPIL)	Ann	Poly	6	0.06	92.65	1	5
Corbula contracta	Mol	Biva	6	0.06	92.72	2	10
Cyclaspis unicornis	Art	Mala	6	0.06	92.78	5	25
Dentimargo aureocincta	Mol	Gast	6	0.06	92.84	3	15
Dispio uncinata	Ann	Poly	6	0.06	92.91	4	20
Hesionidae (LPIL)	Ann	Poly	6	0.06	92.97	1	5
Heteropodarke lyonsi	Ann	Poly	6	0.06	93.04	3	15
Lepidonotus sp. A	Ann	Poly	6	0.06	93.10	2	10
Mellitidae (LPIL)	Ech	Echin	6	0.06	93.17	2	10
Montacutidae (LPIL)	Mol	Biva	6	0.06	93.23	5	25
Mooreonuphis pallidula	Ann	Poly	6	0.06	93.30	2	10
Myidae (LPIL)	Mol	Biva	6	0.06	93.36	1	5
Mysidae (LPIL)	Art	Mala	6	0.06	93.43	4	20
Pinnixa (LPIL)	Art	Mala	6	0.06	93.49	6	30
Solenidae (LPIL)	Mol	Biva	6	0.06	93.56	1	5
Streptosyllis arenae	Ann	Poly	6	0.06	93.62	4	20
Xanthidae (LPIL)	Art	Mala	6	0.06	93.69	3	15
Xenanthura brevitelson	Art	Mala	6	0.06	93.75	1	5
Aoridae (LPIL)	Art	Mala	5	0.05	93.81	5	25
Aricidea cerrutii	Ann	Poly	5	0.05	93.86	4	20
Asteroidea (LPIL)	Ech	Aste	5	0.05	93.91	2	10
Axiothella mucosa	Ann	Poly	5	0.05	93.97	4	20
Cerapus tubularis	Art	Mala	5	0.05	94.02	2	10
Exogone verugera	Ann	Poly	5	0.05	94.08	1	5
Goniadidae (LPIL)	Ann	Poly	5	0.05	94.13	4	20
Mediomastus ambiseta	Ann	Poly	5	0.05	94.19	2	10
Metatiron triocellatus	Art	Mala	5	0.05	94.24	3	15
Nephtyidae (LPIL)	Ann	Poly	5	0.05	94.29	4	20
Nereis (LPIL)	Ann	Poly	5	0.05	94.35	4	20
Nereis micromma	Ann	Poly	5	0.05	94.40	3	15
Notomastus (LPIL)	Ann	Poly	5	0.05	94.46	3	15
Oedicerotidae (LPIL)	Art	Mala	5	0.05	94.51	3	15
Opheliidae (LPIL)	Ann	Poly	5	0.05	94.56	2	10
Paraonis (LPIL)	Ann	Poly	5	0.05	94.62	3	15
Semele purpurascens	Mol	Biva	5	0.05	94.67	1	5
Tellinidae (LPIL)	Mol	Biva	5	0.05	94.73	3	15
Acanthohaustorius (LPIL)	Art	Mala	4	0.04	94.77	3	15
Bowmaniella (LPIL)	Art	Mala	4	0.04	94.81	3	15
Caecum (LPIL)	Mol	Gast	4	0.04	94.86	4	20
Ceratocephale oculata	Ann	Poly	4	0.04	94.90	3	15
Chiridotea caeca	Art	Mala	4	0.04	94.94	1	5

Table 4 continued:

Taxa	Phylum	Class	No. of Individuals	% of Total	Cumulative %	Station Occurrence	% Station Occurrence
Cymadusa compta	Art	Mala	4	0.04	94.98	1	5
Diopatra cuprea	Ann	Poly	4	0.04	95.03	4	20
Doridella obscura	Mol	Gast	4	0.04	95.07	1	5
Ensis (LPIL)	Mol	Biva	4	0.04	95.11	2	10
Epitonium multistriatum	Mol	Gast	4	0.04	95.16	1	5
Eurysyllis tuberculata	Ann	Poly	4	0.04	95.20	2	10
Kalliapseudes sp. C	Art	Mala	4	0.04	95.24	2	10
Leucothoe spinicarpa	Art	Mala	4	0.04	95.29	1	5
Lima pellucida	Mol	Biva	4	0.04	95.33	2	10
Litocorsa antennata	Ann	Poly	4	0.04	95.37	3	15
Lumbrineridae (LPIL)	Ann	Poly	4	0.04	95.42	3	15
Magelona sp. C	Ann	Poly	4	0.04	95.46	2	10
Microprotopus raneyi	Art	Mala	4	0.04	95.50	1	5
Nereis succinea	Ann	Poly	4	0.04	95.55	1	5
Paraonis pygoenigmatica	Ann	Poly	4	0.04	95.59	2	10
Semele bellastriata	Mol	Biva	4	0.04	95.63	3	15
Sigalion arenicola	Ann	Poly	4	0.04	95.68	1	5
Streblospio benedicti	Ann	Poly	4	0.04	95.72	2	10
Terebellidae (LPIL)	Ann	Poly	4	0.04	95.76	3	15
Typosyllis amica	Ann	Poly	4	0.04	95.81	2	10
Abra aequalis	Mol	Biva	3	0.03	95.84	2	10
Ampelisca schellenbergi	Art	Mala	3	0.03	95.87	2	10
Amphilochus casahoya	Art	Mala	3	0.03	95.90	1	5
Amphiuridae (LPIL)	Ech	Ophi	3	0.03	95.94	2	10
Anachis lafresnayi	Mol	Gast	3	0.03	95.97	1	5
Caulleriella sp. J	Ann	Poly	3	0.03	96.00	1	5
Chione (LPIL)	Mol	Biva	3	0.03	96.03	3	15
Corophiidae (LPIL)	Art	Mala	3	0.03	96.07	1	5
Cumella garrityi	Art	Mala	3	0.03	96.10	1	5
Dipolydora socialis	Ann	Poly	3	0.03	96.13	1	5
Dissodactylus mellitae	Art	Mala	3	0.03	96.16	1	5
Dorvilleidae (LPIL)	Ann	Poly	3	0.03	96.20	2	10
Enchytraeidae (LPIL)	Ann	Olig	3	0.03	96.23	2	10
Eobrolgus spinosus	Art	Mala	3	0.03	96.26	2	10
Eurydice (LPIL)	Art	Mala	3	0.03	96.29	3	15
Eurypanopeus depressus	Art	Mala	3	0.03	96.33	1	5
Haplosyllis spongicola	Ann	Poly	3	0.03	96.36	2	10
Lumbrinerides acuta	Ann	Poly	3	0.03	96.39	1	5
Macrocoeloma (LPIL)	Art	Mala	3	0.03	96.42	1	5
Musculus lateralis	Mol	Biva	3	0.03	96.45	2	10
Nephtys squamosa	Ann	Poly	3	0.03	96.49	3	15
Nereis falsa	Ann	Poly	3	0.03	96.52	3	15
Onuphis eremita	Ann	Poly	3	0.03	96.55	3	15
Ophiothrix (LPIL)	Ech	Ophi	3	0.03	96.58	1	5
Paramphinome sp. B	Ann	Poly	3	0.03	96.62	2	10
Paraprionospio pinnata	Ann	Poly	3	0.03	96.65	1	5
Phyllodoce longipes	Ann	Poly	3	0.03	96.68	2	10
Podarkeopsis levifuscina	Ann	Poly	3	0.03	96.71	3	15
Poecilochaetus (LPIL)	Ann	Poly	3	0.03	96.75	1	5
Polyplacophora (LPIL)	Mol	Polyp	3	0.03	96.78	1	5
Prionospio cristata	Ann	Poly	3	0.03	96.81	2	10
Sabellidae (LPIL)	Ann	Poly	3	0.03	96.84	3	15
Schistomeringos rudolphi	Ann	Poly	3	0.03	96.88	3	15
Scolelepis texana	Ann	Poly	3	0.03	96.91	2	10
Scoloplos (LPIL)	Ann	Poly	3	0.03	96.94	1	5
Semelidae (LPIL)	Mol	Biva	3	0.03	96.97	2	10
Sigatica carolinensis	Mol	Gast	3	0.03	97.01	3	15
Spiophanes (LPIL)	Ann	Poly	3	0.03	97.04	1	5
Syllis (LPIL)	Ann	Poly	3	0.03	97.07	3	15

Table 4 continued:

Taxa	Phylum	Class	No. of Individuals	% of Total	Cumulative %	Station Occurrence	% Station Occurrence
Syllis beneliahui	Ann	Poly	3	0.03	97.10	2	10
Syllis sardai	Ann	Poly	3	0.03	97.14	1	5
Tellina iris	Mol	Biva	3	0.03	97.17	1	5
Terebra (LPIL)	Mol	Gast	3	0.03	97.20	2	10
Thraciidae (LPIL)	Mol	Biva	3	0.03	97.23	1	5
Typosyllis sp. B	Ann	Poly	3	0.03	97.27	2	10
Aeginellidae (LPIL)	Art	Mala	2	0.02	97.29	1	5
Albunea paretii	Art	Mala	2	0.02	97.31	1	5
Ancistrosyllis hartmanae	Ann	Poly	2	0.02	97.33	1	5
Anthozoa (LPIL)	Cni	Anth	2	0.02	97.35	1	5
Aricidea (LPIL)	Ann	Poly	2	0.02	97.37	2	10
Armandia (LPIL)	Ann	Poly	2	0.02	97.40	2	10
Brania gallagheri	Ann	Poly	2	0.02	97.42	1	5
Bryozoa (LPIL)	Bry	-	2	0.02	97.44	1	5
Bunakenia sp. B	Art	Mala	2	0.02	97.46	1	5
Caecidae (LPIL)	Mol	Gast	2	0.02	97.48	1	5
Caulleriella cf. *alata*	Ann	Poly	2	0.02	97.50	1	5
Cerithiidae (LPIL)	Mol	Gast	2	0.02	97.52	1	5
Chloeia viridis	Ann	Poly	2	0.02	97.55	2	10
Columbellidae (LPIL)	Mol	Gast	2	0.02	97.57	2	10
Cumella (LPIL)	Art	Mala	2	0.02	97.59	2	10
Drilonereis longa	Ann	Poly	2	0.02	97.61	2	10
Elasmopus levis	Art	Mala	2	0.02	97.63	2	10
Ellisellidae (LPIL)	Cni	Anth	2	0.02	97.65	2	10
Euceramus praelongus	Art	Mala	2	0.02	97.68	2	10
Eunice (LPIL)	Ann	Poly	2	0.02	97.70	2	10
Eunicidae (LPIL)	Ann	Poly	2	0.02	97.72	2	10
Fimbriosthenelais sp. A	Ann	Poly	2	0.02	97.74	1	5
Ampharetidae Genus B	Ann	Poly	2	0.02	97.76	1	5
Graptacme calamus	Mol	Scap	2	0.02	97.78	1	5
Hydrozoa (LPIL)	Cni	Hydr	2	0.02	97.81	2	10
Leptochela bermudensis	Art	Mala	2	0.02	97.83	2	10
Lumbrinerides (LPIL)	Ann	Poly	2	0.02	97.85	2	10
Lumbrineriopsis gardineri	Ann	Poly	2	0.02	97.87	2	10
Lyonsia hyalina	Mol	Biva	2	0.02	97.89	2	10
Lysidice notata	Ann	Poly	2	0.02	97.91	2	10
Marginellidae (LPIL)	Mol	Gast	2	0.02	97.94	2	10
Marphysa sanguinea	Ann	Poly	2	0.02	97.96	1	5
Mesochaetopterus (LPIL)	Ann	Poly	2	0.02	97.98	2	10
Nassarius acutus	Mol	Gast	2	0.02	98.00	1	5
Ophelina cylindricaudata	Ann	Poly	2	0.02	98.02	1	5
Ophiuridae (LPIL)	Ech	Ophi	2	0.02	98.04	1	5
Parametopella cypris	Art	Mala	2	0.02	98.07	2	10
Paraonis fulgens	Ann	Poly	2	0.02	98.09	1	5
Pectinaria gouldii	Ann	Poly	2	0.02	98.11	1	5
Philine sagra	Mol	Gast	2	0.02	98.13	1	5
Pitho lherminieri	Art	Mala	2	0.02	98.15	1	5
Podochela (LPIL)	Art	Mala	2	0.02	98.17	1	5
Pomatoceros americanus	Ann	Poly	2	0.02	98.19	1	5
Pycnogonida (LPIL)	Art	Pycn	2	0.02	98.22	2	10
Scaphandridae (LPIL)	Mol	Gast	2	0.02	98.24	2	10
Scaphopoda (LPIL)	Mol	Scap	2	0.02	98.26	2	10
Schizasteridae Genus A	Ech	Echin	2	0.02	98.28	2	10
Scoletoma (LPIL)	Ann	Poly	2	0.02	98.30	1	5
Semele (LPIL)	Mol	Biva	2	0.02	98.32	2	10
Sigalionidae (LPIL)	Ann	Poly	2	0.02	98.35	2	10
Solemya velum	Mol	Biva	2	0.02	98.37	1	5
Sphaeromatidae (LPIL)	Art	Mala	2	0.02	98.39	1	5
Spiochaetopterus oculatus	Ann	Poly	2	0.02	98.41	2	10
Syllis danieli	Ann	Poly	2	0.02	98.43	2	10
Tellina aequistriata	Mol	Biva	2	0.02	98.45	1	5

Table 4 continued:

Taxa	Phylum	Class	No. of Individuals	% of Total	Cumulative %	Station Occurrence	% Station Occurrence
Terebra concava	Mol	Gast	2	0.02	98.48	1	5
Tharyx (LPIL)	Ann	Poly	2	0.02	98.50	1	5
Trochidae (LPIL)	Mol	Gast	2	0.02	98.52	2	10
Turridae (LPIL)	Mol	Gast	2	0.02	98.54	2	10
Veneridae (LPIL)	Mol	Biva	2	0.02	98.56	2	10
Verticordia ornata	Mol	Biva	2	0.02	98.58	2	10
Acanthohaustorius intermedius	Art	Mala	1	0.01	98.59	1	5
Acteocina (LPIL)	Mol	Gast	1	0.01	98.61	1	5
Ampelisca bicarinata	Art	Mala	1	0.01	98.62	1	5
Amphinomidae (LPIL)	Ann	Poly	1	0.01	98.63	1	5
Amphiodia planispina	Ech	Ophi	1	0.01	98.64	1	5
Anachis (LPIL)	Mol	Gast	1	0.01	98.65	1	5
Ancistrosyllis jonesi	Ann	Poly	1	0.01	98.66	1	5
Apseudidae (LPIL)	Art	Mala	1	0.01	98.67	1	5
Arabella iricolor	Ann	Poly	1	0.01	98.68	1	5
Arene tricarinata	Mol	Gast	1	0.01	98.69	1	5
Argissa hamatipes	Art	Mala	1	0.01	98.70	1	5
Aricidea sp. H	Ann	Poly	1	0.01	98.71	1	5
Astropecten articulatus	Ech	Aste	1	0.01	98.72	1	5
Atys sandersoni	Mol	Gast	1	0.01	98.74	1	5
Boguea sp. A	Ann	Poly	1	0.01	98.75	1	5
Bowmaniella portoricensis	Art	Mala	1	0.01	98.76	1	5
Branchiosyllis oculata	Ann	Poly	1	0.01	98.77	1	5
Calliostoma pulchrum	Mol	Gast	1	0.01	98.78	1	5
Calyptraea centralis	Mol	Gast	1	0.01	98.79	1	5
Calyptraeidae (LPIL)	Mol	Gast	1	0.01	98.80	1	5
Caprella (LPIL)	Art	Mala	1	0.01	98.81	1	5
Carditidae (LPIL)	Mol	Biva	1	0.01	98.82	1	5
Caulleriella (LPIL)	Ann	Poly	1	0.01	98.83	1	5
Cerapus (LPIL)	Art	Mala	1	0.01	98.84	1	5
Cirratulus (LPIL)	Ann	Poly	1	0.01	98.85	1	5
Cooperella atlantica	Mol	Biva	1	0.01	98.87	1	5
Corbulidae (LPIL)	Mol	Biva	1	0.01	98.88	1	5
Crenella (LPIL)	Mol	Biva	1	0.01	98.89	1	5
Crepidula plana	Mol	Gast	1	0.01	98.90	1	5
Cyclaspis (LPIL)	Art	Mala	1	0.01	98.91	1	5
Cyclostremiscus (LPIL)	Mol	Gast	1	0.01	98.92	1	5
Cymatoica orientalis	Mol	Biva	1	0.01	98.93	1	5
Decapoda (LPIL)	Art	Mala	1	0.01	98.94	1	5
Divaricella quadrisulcata	Mol	Biva	1	0.01	98.95	1	5
Echiura (LPIL)	Echi	-	1	0.01	98.96	1	5
Erato maugeriae	Mol	Gast	1	0.01	98.97	1	5
Eulimidae (LPIL)	Mol	Gast	1	0.01	98.98	1	5
Fimbriosthenelais (LPIL)	Ann	Poly	1	0.01	98.99	1	5
Garosyrrhoe bigarra	Art	Mala	1	0.01	99.01	1	5
Glycera sp. A	Ann	Poly	1	0.01	99.02	1	5
Glycinde solitaria	Ann	Poly	1	0.01	99.03	1	5
Goniada maculata	Ann	Poly	1	0.01	99.04	1	5
Hippidae (LPIL)	Art	Mala	1	0.01	99.05	1	5
Holothuroidea (LPIL)	Ech	Holo	1	0.01	99.06	1	5
Hypsicomus phaeotaenia	Ann	Poly	1	0.01	99.07	1	5
Kupellonura sp. A	Art	Mala	1	0.01	99.08	1	5
Kurtziella limonitella	Mol	Gast	1	0.01	99.09	1	5
Kurtziella rubella	Mol	Gast	1	0.01	99.10	1	5
Laeonereis culveri	Ann	Poly	1	0.01	99.11	1	5
Laonice cirrata	Ann	Poly	1	0.01	99.12	1	5
Leptochela (LPIL)	Art	Mala	1	0.01	99.14	1	5
Leptochela papulata	Art	Mala	1	0.01	99.15	1	5
Leptosynapta (LPIL)	Ech	Holo	1	0.01	99.16	1	5
Leucon americanus	Art	Mala	1	0.01	99.17	1	5
Levinsenia gracilis	Ann	Poly	1	0.01	99.18	1	5
Lima (LPIL)	Mol	Biva	1	0.01	99.19	1	5

Table 4 continued:

Taxa	Phylum	Class	No. of Individuals	% of Total	Cumulative %	Station Occurrence	% Station Occurrence
Listriella carinata	Art	Mala	1	0.01	99.20	1	5
Loimia (LPIL)	Ann	Poly	1	0.01	99.21	1	5
Loimia medusa	Ann	Poly	1	0.01	99.22	1	5
Lucina pensylvanica	Mol	Biva	1	0.01	99.23	1	5
Lumbrineris (LPIL)	Ann	Poly	1	0.01	99.24	1	5
Lumbrineris latreilli	Ann	Poly	1	0.01	99.25	1	5
Lumbrineris sp. D	Ann	Poly	1	0.01	99.27	1	5
Lysianassidae (LPIL)	Art	Mala	1	0.01	99.28	1	5
Macoma (LPIL)	Mol	Biva	1	0.01	99.29	1	5
Magelona (LPIL)	Ann	Poly	1	0.01	99.30	1	5
Magelona filiformis	Ann	Poly	1	0.01	99.31	1	5
Magelona sp. H	Ann	Poly	1	0.01	99.32	1	5
Majidae (LPIL)	Art	Mala	1	0.01	99.33	1	5
Malacoceros vanderhorsti	Ann	Poly	1	0.01	99.34	1	5
Marphysa (LPIL)	Ann	Poly	1	0.01	99.35	1	5
Mediomastus californiensis	Ann	Poly	1	0.01	99.36	1	5
Mellita isometra	Ech	Echin	1	0.01	99.37	1	5
Melphidippidae (LPIL)	Art	Mala	1	0.01	99.38	1	5
Microprotopus (LPIL)	Art	Mala	1	0.01	99.39	1	5
Microspio (LPIL)	Ann	Poly	1	0.01	99.41	1	5
Mooreonuphis (LPIL)	Ann	Poly	1	0.01	99.42	1	5
Mytilidae (LPIL)	Mol	Biva	1	0.01	99.43	1	5
Naticidae (LPIL)	Mol	Gast	1	0.01	99.44	1	5
Nereiphylla fragilis	Ann	Poly	1	0.01	99.45	1	5
Nereis pelagica	Ann	Poly	1	0.01	99.46	1	5
Notomastus sp. A	Ann	Poly	1	0.01	99.47	1	5
Nucula (LPIL)	Mol	Biva	1	0.01	99.48	1	5
Odostomia (LPIL)	Mol	Gast	1	0.01	99.49	1	5
Okenia sapelona	Mol	Gast	1	0.01	99.50	1	5
Olivella mutica	Mol	Gast	1	0.01	99.51	1	5
Ovalipes stephensoni	Art	Mala	1	0.01	99.52	1	5
Oweniidae (LPIL)	Ann	Poly	1	0.01	99.54	1	5
Oxyurostylis (LPIL)	Art	Mala	1	0.01	99.55	1	5
Paguridae (LPIL)	Art	Mala	1	0.01	99.56	1	5
Pandoridae (LPIL)	Mol	Biva	1	0.01	99.57	1	5
Paranaitis speciosa	Ann	Poly	1	0.01	99.58	1	5
Periploma margaritaceum	Mol	Biva	1	0.01	99.59	1	5
Pettiboneia duofurca	Ann	Poly	1	0.01	99.60	1	5
Pherusa inflata	Ann	Poly	1	0.01	99.61	1	5
Pholoidae (LPIL)	Ann	Poly	1	0.01	99.62	1	5
Pilumnus sayi	Art	Mala	1	0.01	99.63	1	5
Pionosyllis (LPIL)	Ann	Poly	1	0.01	99.64	1	5
Pista palmata	Ann	Poly	1	0.01	99.65	1	5
Pleuromeris tridentata	Mol	Biva	1	0.01	99.66	1	5
Pleustidae (LPIL)	Art	Mala	1	0.01	99.68	1	5
Polydora cornuta	Ann	Poly	1	0.01	99.69	1	5
Polynoidae (LPIL)	Ann	Poly	1	0.01	99.70	1	5
Protoaricia sp. A	Ann	Poly	1	0.01	99.71	1	5
Pyramidella crenulata	Mol	Gast	1	0.01	99.72	1	5
Ranilia constricta	Art	Mala	1	0.01	99.73	1	5
Renilla reniformis	Cni	Anth	1	0.01	99.74	1	5
Rhodine (LPIL)	Ann	Poly	1	0.01	99.75	1	5
Saccocirrus cirratus	Ann	Poly	1	0.01	99.76	1	5
Serolis mgrayi	Art	Mala	1	0.01	99.77	1	5
Sicyonia (LPIL)	Art	Mala	1	0.01	99.78	1	5
Sicyonia parri	Art	Mala	1	0.01	99.79	1	5
Sigambra pettiboneae	Ann	Poly	1	0.01	99.81	1	5
Sigambra tentaculata	Ann	Poly	1	0.01	99.82	1	5
Solen viridis	Mol	Biva	1	0.01	99.83	1	5
Sphaerosyllis glandulata	Ann	Poly	1	0.01	99.84	1	5
Spio (LPIL)	Ann	Poly	1	0.01	99.85	1	5
Spiophanes missionensis	Ann	Poly	1	0.01	99.86	1	5
Stenothoe minuta	Art	Mala	1	0.01	99.87	1	5
Strombiformis bilineatus	Mol	Gast	1	0.01	99.88	1	5

Table 4 continued:

Taxa	Phylum	Class	No. of Individuals	% of Total	Cumulative %	Station Occurrence	% Station Occurrence
Syllides floridanus	Ann	Poly	1	0.01	99.89	1	5
Synelmis (LPIL)	Ann	Poly	1	0.01	99.90	1	5
Tellina sybaritica	Mol	Biva	1	0.01	99.91	1	5
Terebra dislocata	Mol	Gast	1	0.01	99.92	1	5
Tharyx sp. A	Ann	Poly	1	0.01	99.94	1	5
Thyasiridae (LPIL)	Mol	Biva	1	0.01	99.95	1	5
Trichobranchidae (LPIL)	Ann	Poly	1	0.01	99.96	1	5
Trichobranchus glacialis	Ann	Poly	1	0.01	99.97	1	5
Turbonilla conradi	Mol	Gast	1	0.01	99.98	1	5
Vitrinellidae (LPIL)	Mol	Gast	1	0.01	99.99	1	5
Westwoodilla sp. A	Art	Mala	1	0.01	100.00	1	5

Taxa Key

Ann = Annelida
  Olig = Oligochaeta
  Poly = Polychaeta
Art = Arthropoda
  Mala = Malacostraca
  Pycn = Pycnogonida
Bry = Bryozoa
Cho = Chordata
  Asci = Ascidiacea
  Lept = Leptocardia
Cni = Cnidaria
  Anth = Anthozoa
  Hydr = Hydrozoa

Ech = Echinodermata
  Aste = Asteroidea
  Echin = Echinoidea
  Holo = Holothuroidea
  Ophi = Ophiuroidea
Echi = Echiura
Ect = Ectoprocta
  Gymn = Gymnolaemata
Mol = Mollusca
  Biva = Bivalvia
  Gast = Gastropoda
  Polyp = Polyplacophora
  Scap = Scaphopoda

Pho = Phoronida
Pla = Platyhelminthes
  Turb = Turbellaria
Rhy = Rhynchocoela
  Anop = Anopla
Sip = Sipuncula

Table 5. Percentage abundance of dominant benthic macroinfaunal taxa (> 5% of the total) for the Gray's Reef stations, 2002.

										Station										
Taxa	1	10	11	12	14	17	21	22	23	24	25	26	27	28	29	35	36	37	38	39
Annelida																				
Oligochaeta																				
Tubificidae (LPIL)							6.3					11.0						12.7	10.1	
Polychaeta																				
Apoprionospio pygmaea								8.0												
Armandia agilis								9.0												
Bhawania goodei						7.3														
Cirratulidae (LPIL)												20.2								
Cirrophorus ilvana																5.0				
Fabricinuda trilobata						17.4														
Filogranula sp. A		14.0									5.1									
Goniadella sp. A																			8.0	
Maldanidae (LPIL)							5.7													
Mediomastus (LPIL)												9.5	20.1							
Microphthalmus hartmanae												12.0								
Monticellina dorsobranchialis							5.6													
Owenia fusiformis													16.1							
Pisione remota						5.5														
Protodorvillea kefersteini											6.2							6.3		
Sabellaria vulgaris							5.7						12.9							
Sphaerosyllis piriferopsis		9.0																		
Spiophanes bombyx								6.2	9.5	8.0				15.7	6.2					
Tharyx acutus												6.0								
Arthropoda																				
Malacostraca																				
Apseudes olympiae																	5.3		9.2	
Bathyporeia parkeri								9.5						10.4		42.2				
Erichthonius brasiliensis				42.3							5.7									
Eudevenopus honduranus								12.1	14.2					10.4						
Metharpinia floridana	6.8																			
Oxyurostylis smithi														5.6	16.9					
Protohaustorius wigleyi									5.7					21.2		6.8				
Rhepoxynius epistomus								20.4						12.0						
Chordata																				
Leptocardia																				
Branchiostoma (LPIL)	5.5																			

Table 5 continued:

Taxa	Station																			
	1	10	11	12	14	17	21	22	23	24	25	26	27	28	29	35	36	37	38	39
Cnidaria																				
Cnidaria (LPIL)				19.0																
Echinodermata																				
Echinoidea																				
Echinoidea (LPIL)										8.0	16.8				9.9	10.5				
Mollusca																				
Bivalvia																				
Crassinella lunulata	6.3										6.8									
Ervilia concentrica	7.9		7.3	9.9														6.3		
Lucina radians									6.2											
Ostrea equestris							15.6													
Semele nuculoides			10.8							12.7					12.3					
Tellina (LPIL)	6.3		7.3					8.7												
Tellina agilis												7.3								
Tellina versicolor												6.0								
Gastropoda																				
Caecum johnsoni						18.7														
Sipuncula																				
Aspidosiphon muelleri	6.3																			
Sipuncula (LPIL)		7.8																		

Table 6. Summary of the benthic macroinfaunal data for the Gray's Reef stations, 2002.

Station ID	Rep	No. of Taxa	No. of Individuals	Density (no/m²)	Mean No. Taxa	Taxa (SD)	Mean Density	Density (SD)	Total No. Taxa	Total No. Individuals	H' Diversity	J' Evenness
1	A	50	162	4050	43.7	11.8	3041.7	1227.4	86	365	3.81	0.86
	B	30	67	1675								
	C	51	136	3400								
10	A	59	295	7375	52.7	6.5	5541.7	1745.4	97	665	3.68	0.80
	B	53	156	3900								
	C	46	214	5350								
11	A	42	111	2775	39.0	2.6	2400.0	330.7	77	288	3.81	0.88
	B	38	91	2275								
	C	37	86	2150								
12	A	44	181	4525	59.0	26.9	8750.0	5636.5	138	1050	2.95	0.60
	B	43	606	15150								
	C	90	263	6575								
14	A	39	75	1875	32.3	7.6	1666.7	200.5	77	200	3.82	0.88
	B	24	59	1475								
	C	34	66	1650								
17	A	33	192	4800	43.3	9.0	4891.7	226.8	88	587	3.26	0.73
	B	48	206	5150								
	C	49	189	4725								
21	A	63	381	9525	40.3	21.6	4500.0	4485.6	82	540	3.63	0.82
	B	38	123	3075								
	C	20	36	900								
22	A	21	115	2875	21.0	1.0	2408.3	450.9	37	289	2.86	0.79
	B	20	79	1975								
	C	22	95	2375								
23	A	25	67	1675	25.0	3.0	1758.3	332.9	46	211	3.30	0.86
	B	22	59	1475								
	C	28	85	2125								
24	A	28	67	1675	33.0	4.6	1766.7	274.2	67	212	3.61	0.86
	B	34	83	2075								
	C	37	62	1550								
25	A	62	267	6675	52.0	11.8	5766.7	1383.0	97	692	3.68	0.80
	B	55	258	6450								
	C	39	167	4175								
26	A	16	144	3600	15.0	3.6	2641.7	1531.8	33	317	2.75	0.79
	B	11	35	875								
	C	18	138	3450								
27	A	33	228	5700	41.7	10.3	9975.0	4664.6	73	1197	2.81	0.66
	B	39	371	9275								
	C	53	598	14950								
28	A	26	86	2150	22.0	4.6	2083.3	354.7	42	250	2.94	0.79
	B	17	68	1700								
	C	23	96	2400								
29	A	28	111	2775	26.7	4.2	2025.0	696.0	56	243	3.28	0.82
	B	30	76	1900								
	C	22	56	1400								

Table 6 continued:

Station ID	Rep	No. of Taxa	No. of Individuals	Density (no/m²)		Mean No. Taxa	Taxa (SD)	Mean Density	Density (SD)	Total No. Taxa	Total No. Individuals	H' Diversity	J' Evenness
35	A	34	293	7325		36.0	3.5	4675.0	2483.8	75	561	2.68	0.62
	B	34	96	2400									
	C	40	172	4300									
36	A	69	178	4450		53.3	15.5	3633.3	960.6	100	436	4.07	0.88
	B	38	103	2575									
	C	53	155	3875									
37	A	60	186	4650		65.7	14.4	5300.0	1169.4	127	636	4.03	0.83
	B	82	266	6650									
	C	55	184	4600									
38	A	46	86	2150		52.3	5.5	2725.0	516.6	103	327	4.01	0.87
	B	56	115	2875									
	C	55	126	3150									
39	A	38	49	1225		36.7	2.3	1550.0	499.4	74	186	3.99	0.93
	B	34	52	1300									
	C	38	85	2125									

Figure 1. Location of the Gray's Reef sampling stations, 2002.
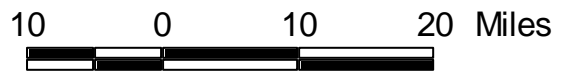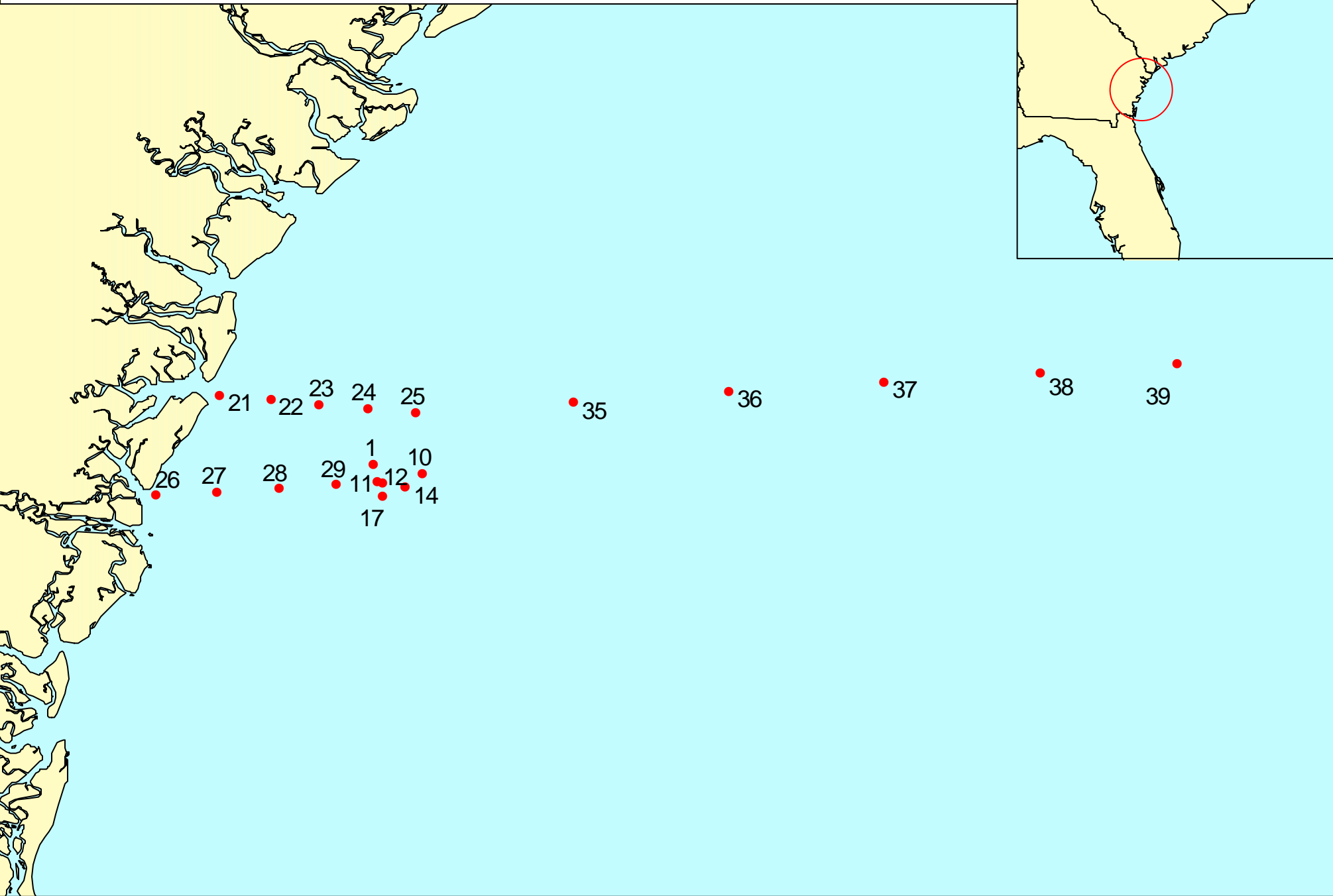
Figure 2. Water depth for the Gray's Reef stations, 2002.
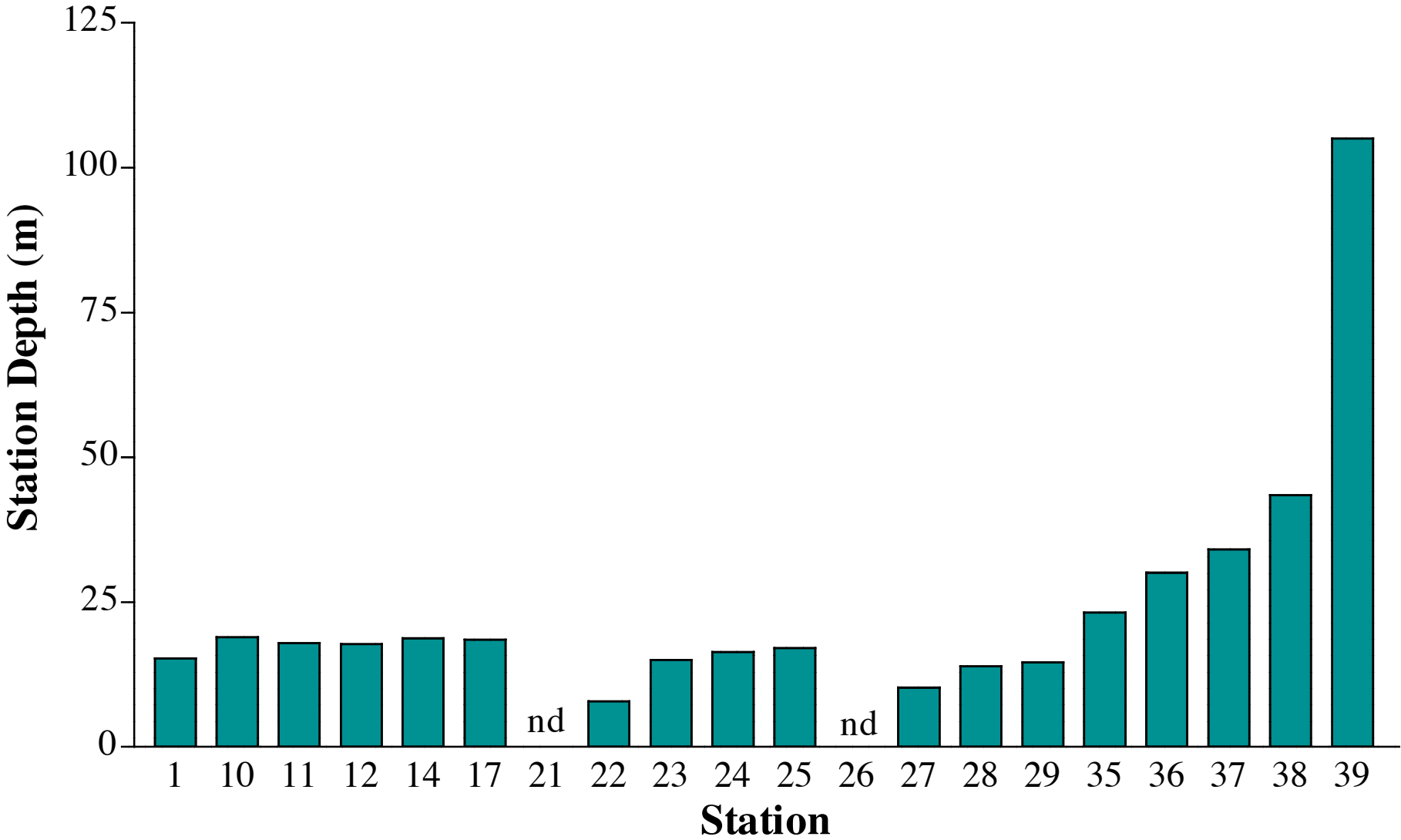
Figure 3. Sediment texture and Total Organic Carbon (TOC) data for the Gray's Reef stations, 2002.
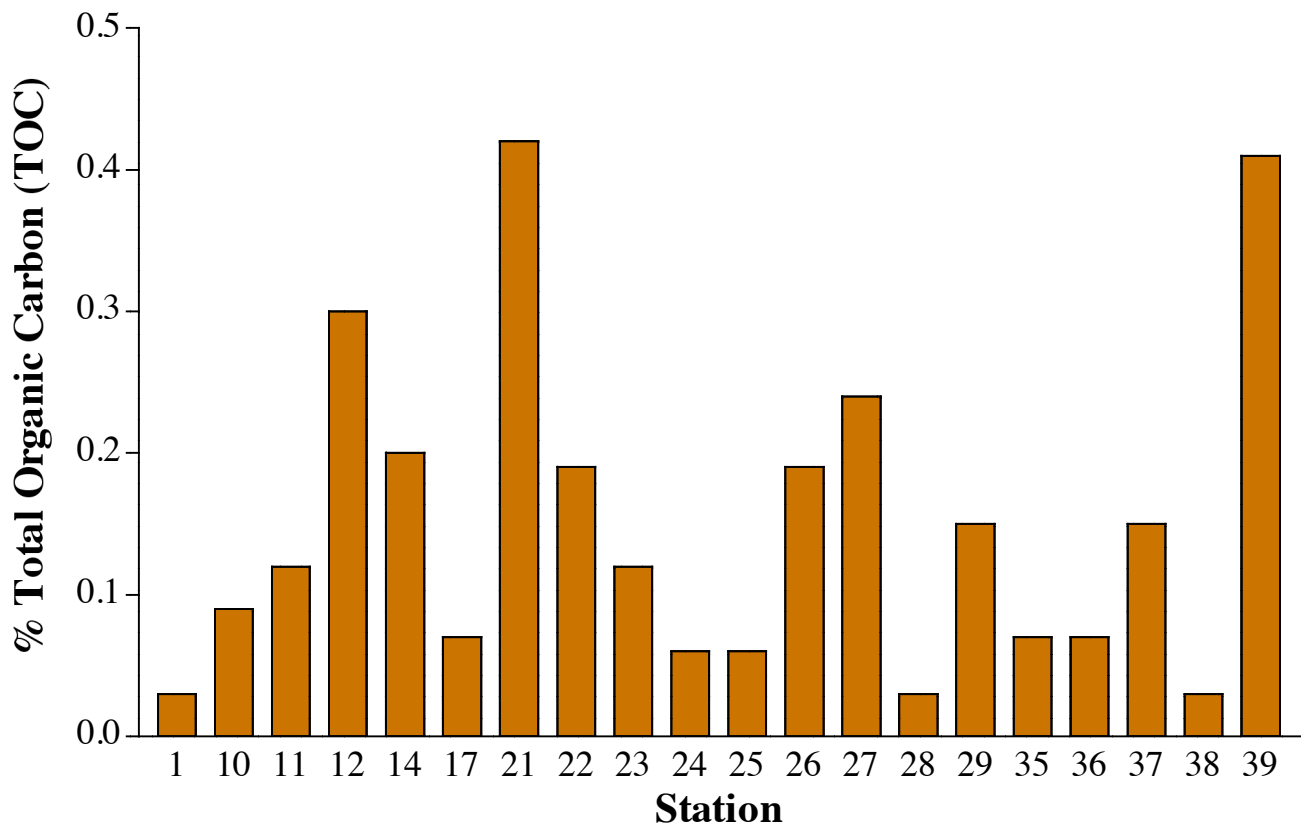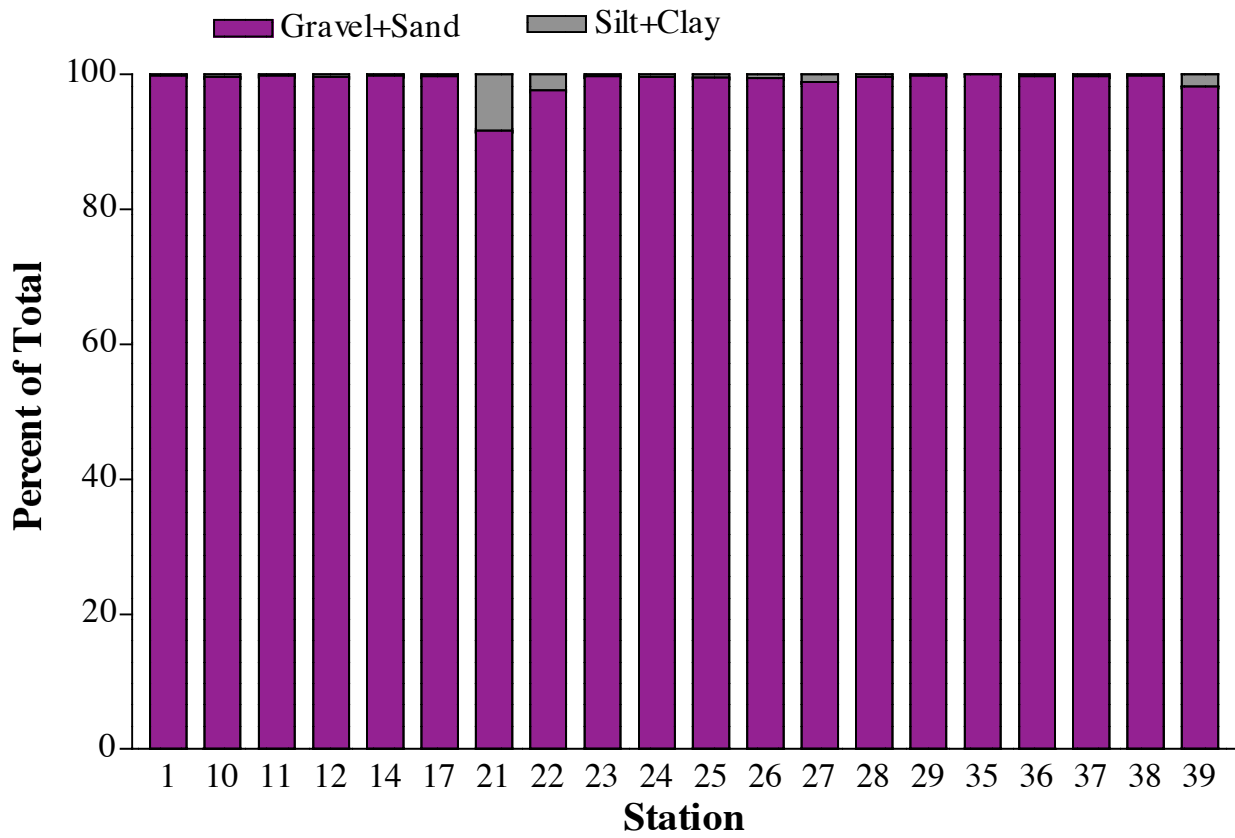
Figure 4. Percent abundance of major taxonomic groups for the Gray's Reef stations, 2002.
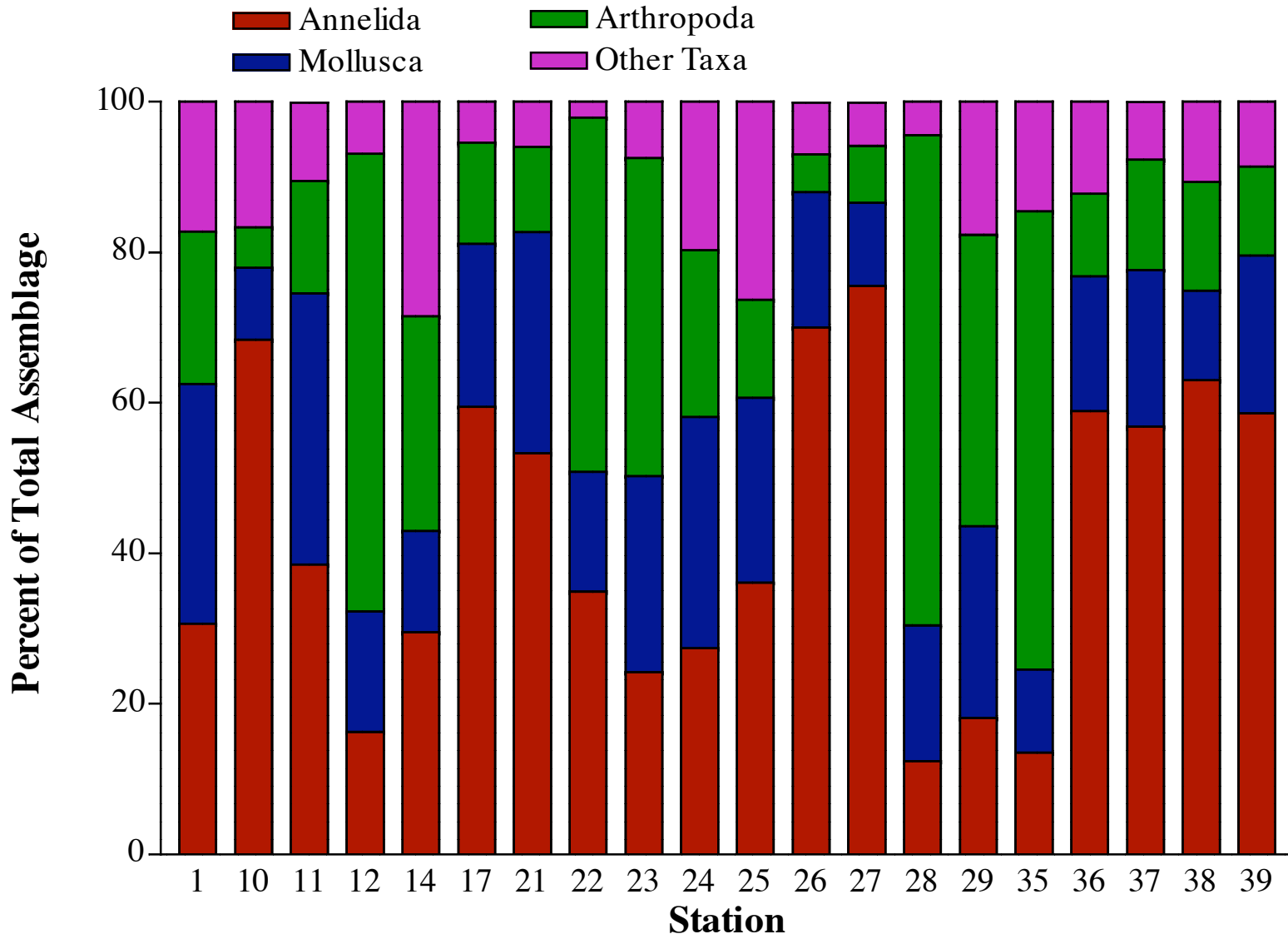
Figure 5. Spatial distribution of major taxonomic groups for the Gray's Reef stations, 2002.
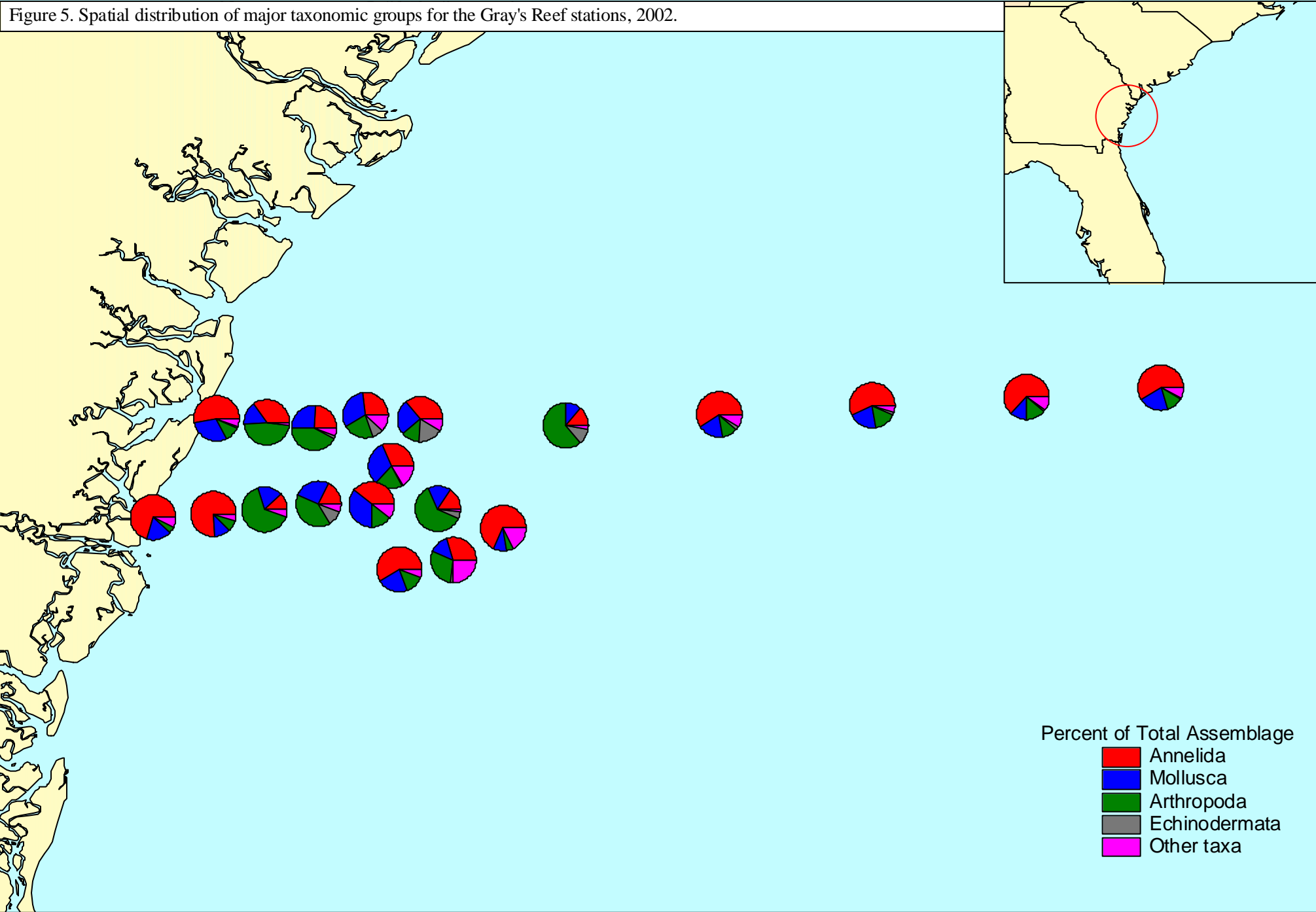
Percent of Total Assemblage
- Annelida
- Mollusca
- Arthropoda
- Echinodermata
- Other taxa

10   0   10   20 Miles

N

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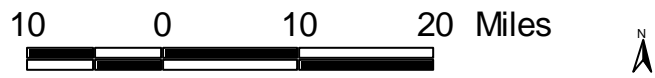
Figure 6. Taxa richness data for the Gray's Reef stations, 2002.
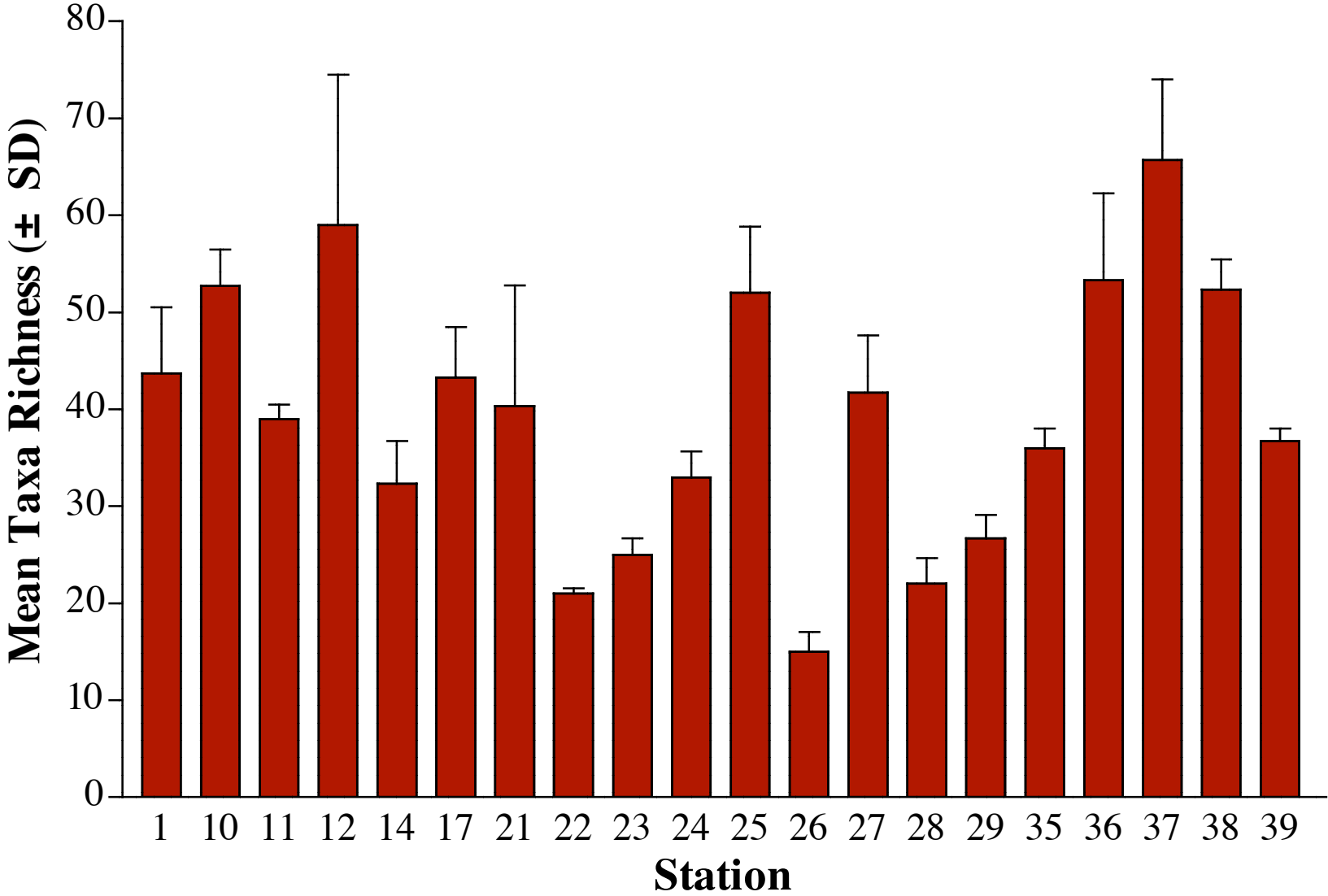
Figure 7. Spatial distribution of taxa richness for the Gray's Reef stations, 2002.
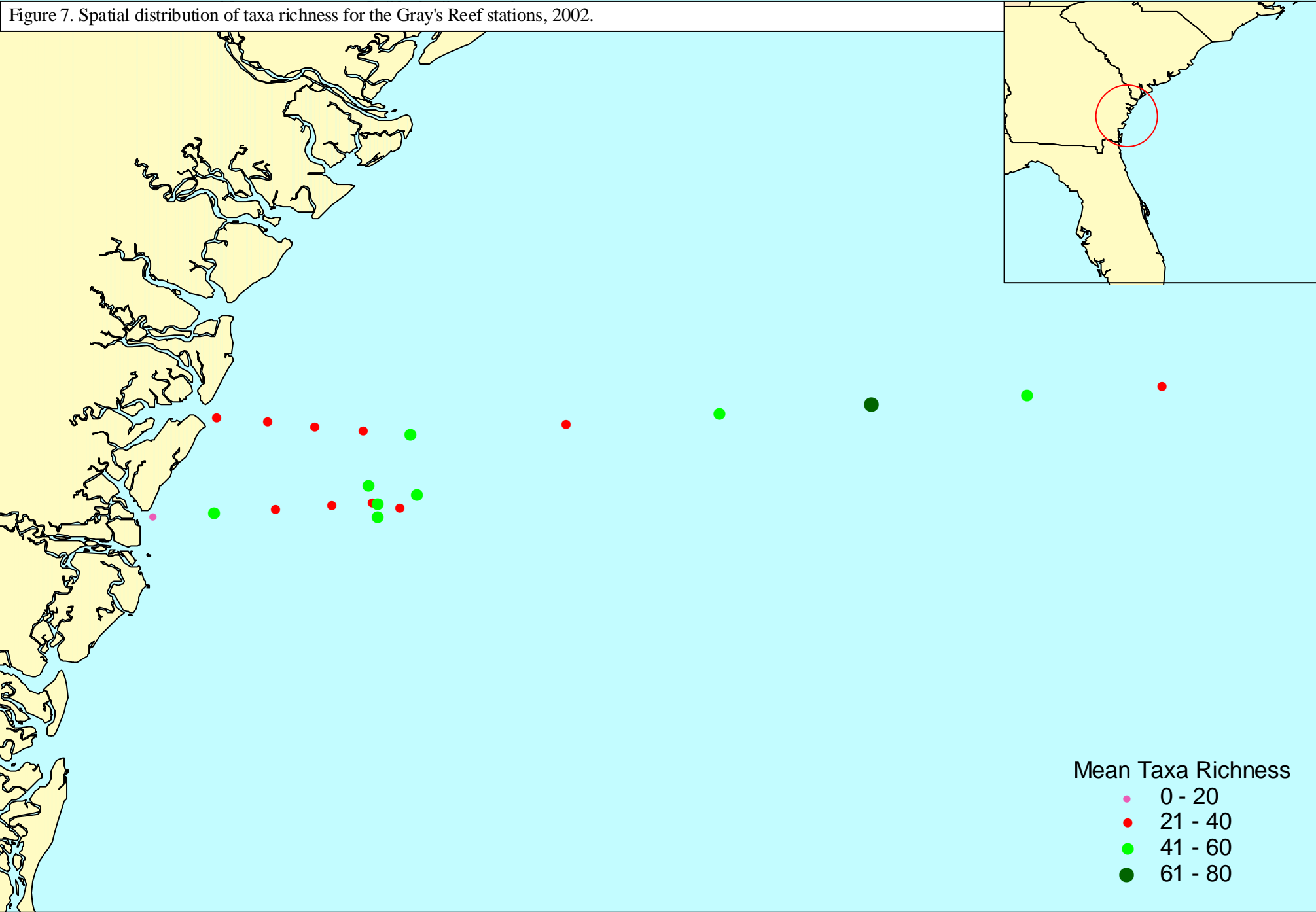
Mean Taxa Richness
- 0 - 20
- 21 - 40
- 41 - 60
- 61 - 80

10   0   10   20 Miles

N

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Figure 8. Mean macroinvertebrate densities for the Gray's Reef stations, 2002.
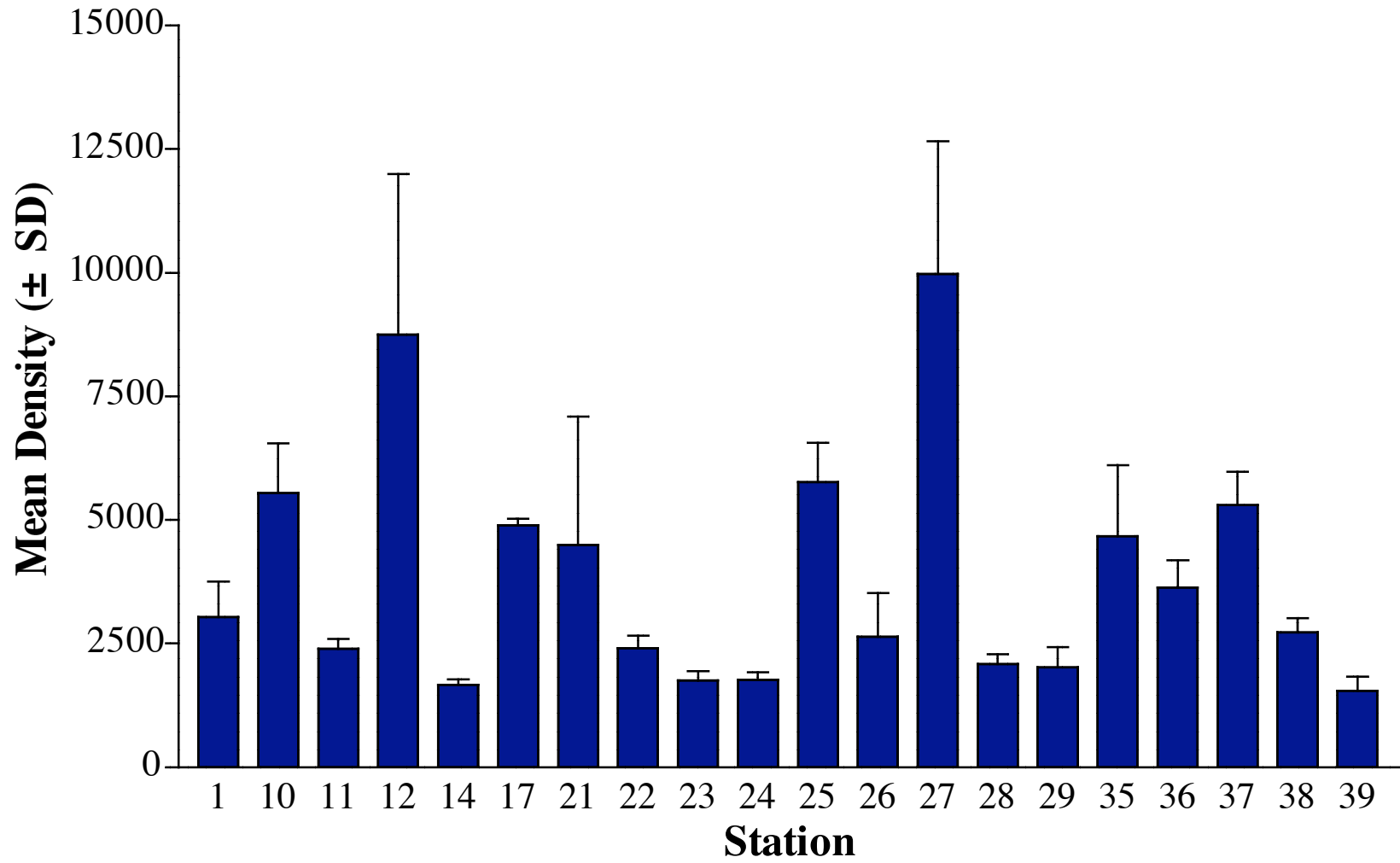
Figure 9. Spatial distribution of macroinvertebrate density for the Gray's Reef stations, 2002.

Mean density (nos/ sq. m)
- 0 - 2500
- 2501 - 5000
- 5001 - 7500
- 7501 - 10000

10   0   10   20 Miles

N

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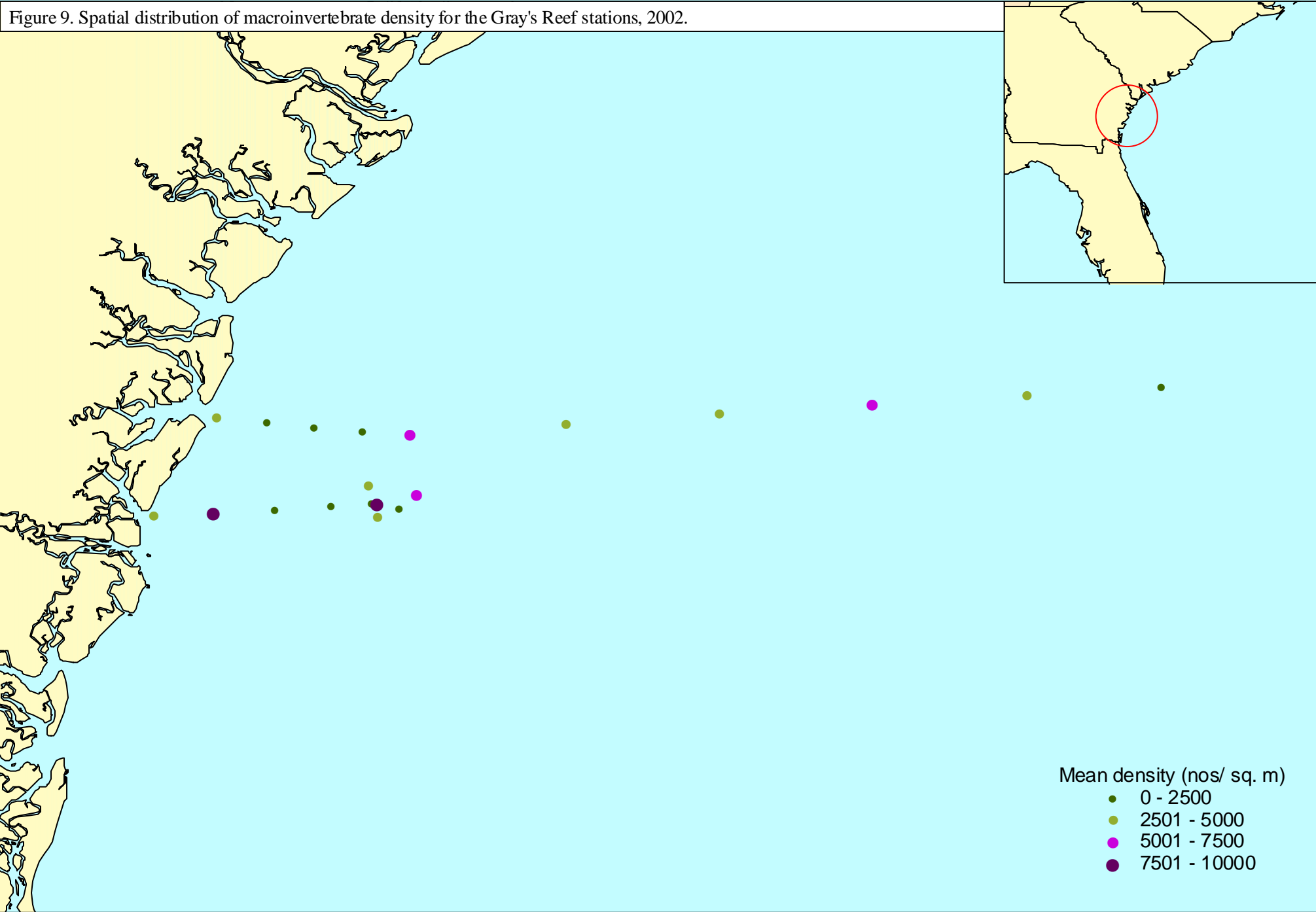
Figure 10. Taxa diversity (H´) and evenness (J') for the Gray's Reef stations, 2002.
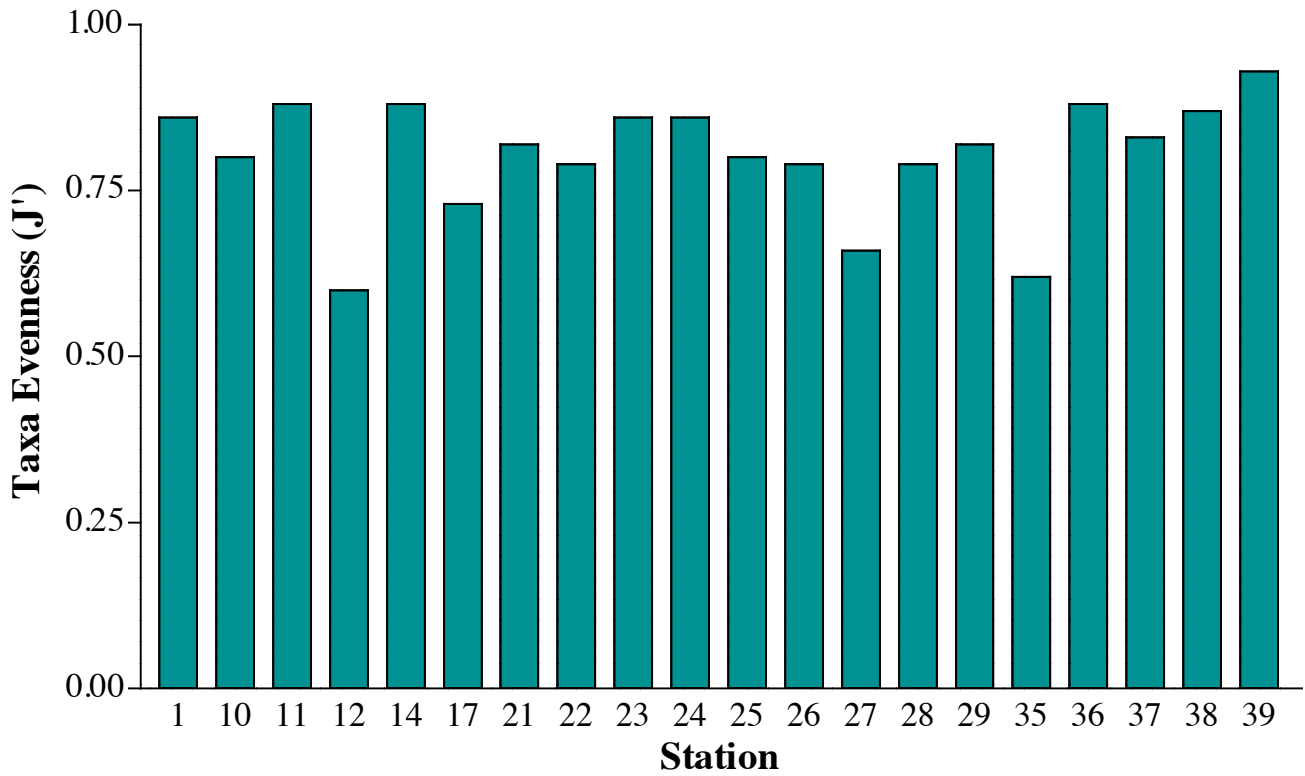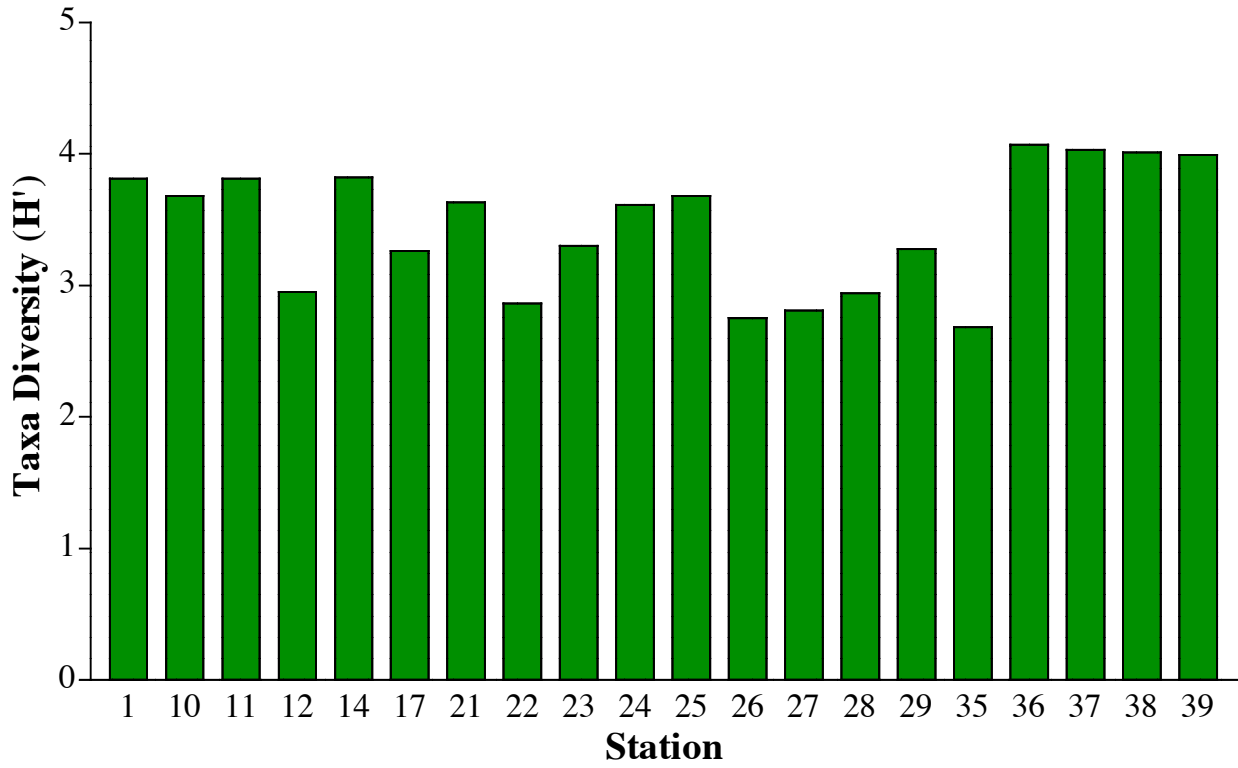
Figure 11. Cluster analysis of the Gray's Reef stations, 2002.
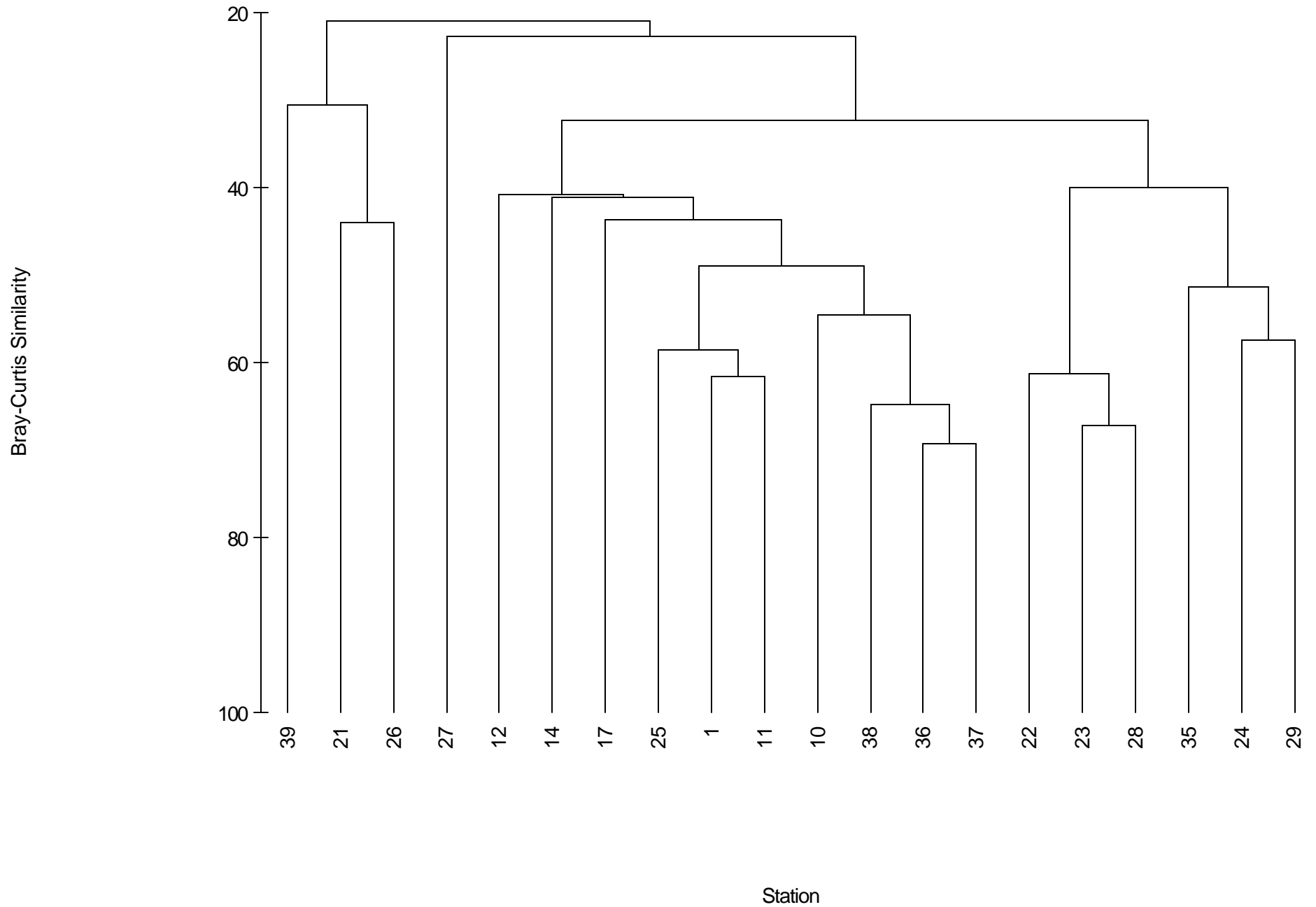
Figure 12. MDS plot and Annelida abundance for the Gray's Reef stations, 2002.

Stress: 0.11
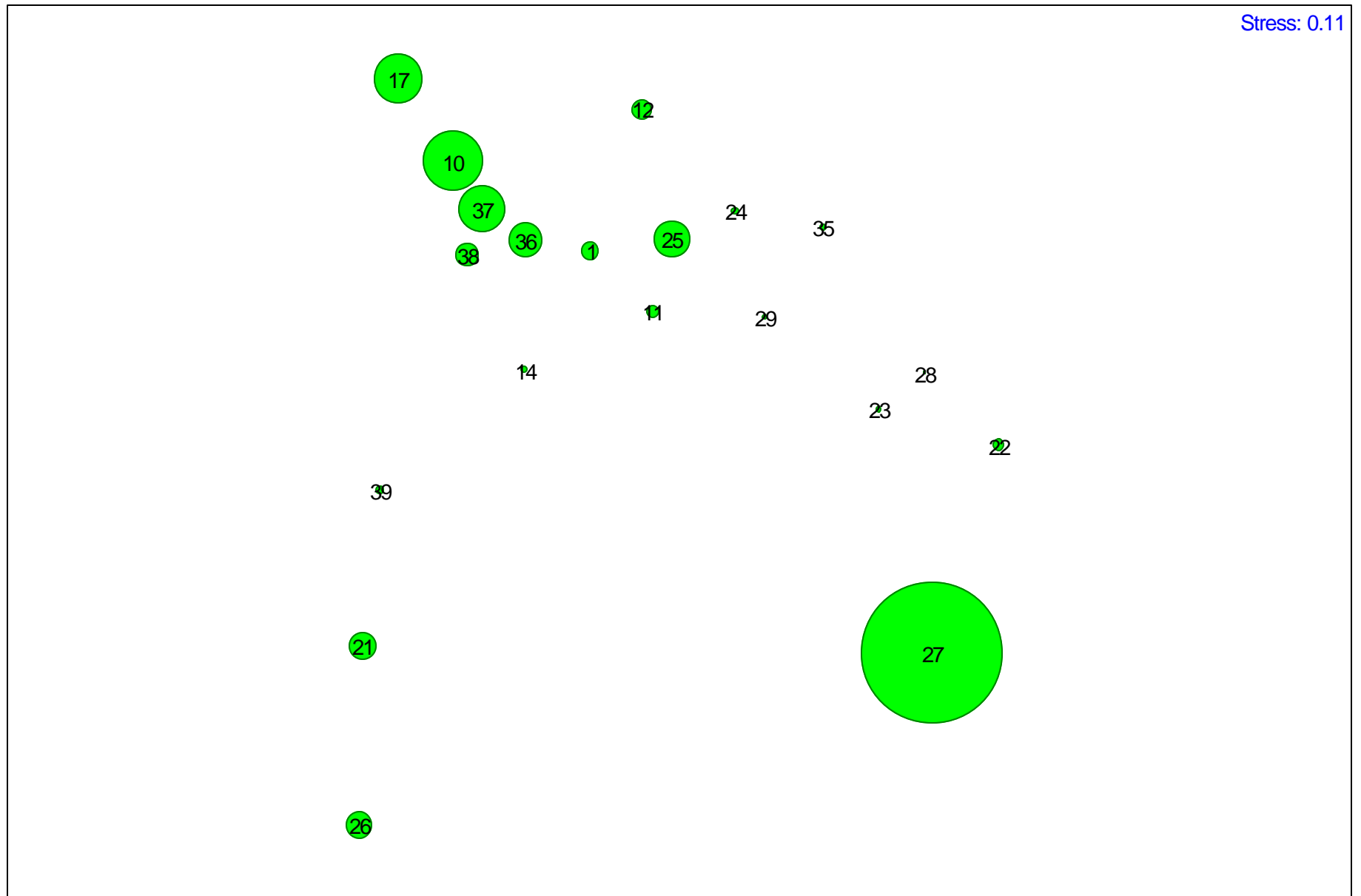
Figure 13. MDS plot and Arthropoda abundance for the Gray's Reef stations, 2002.

Stress: 0.11
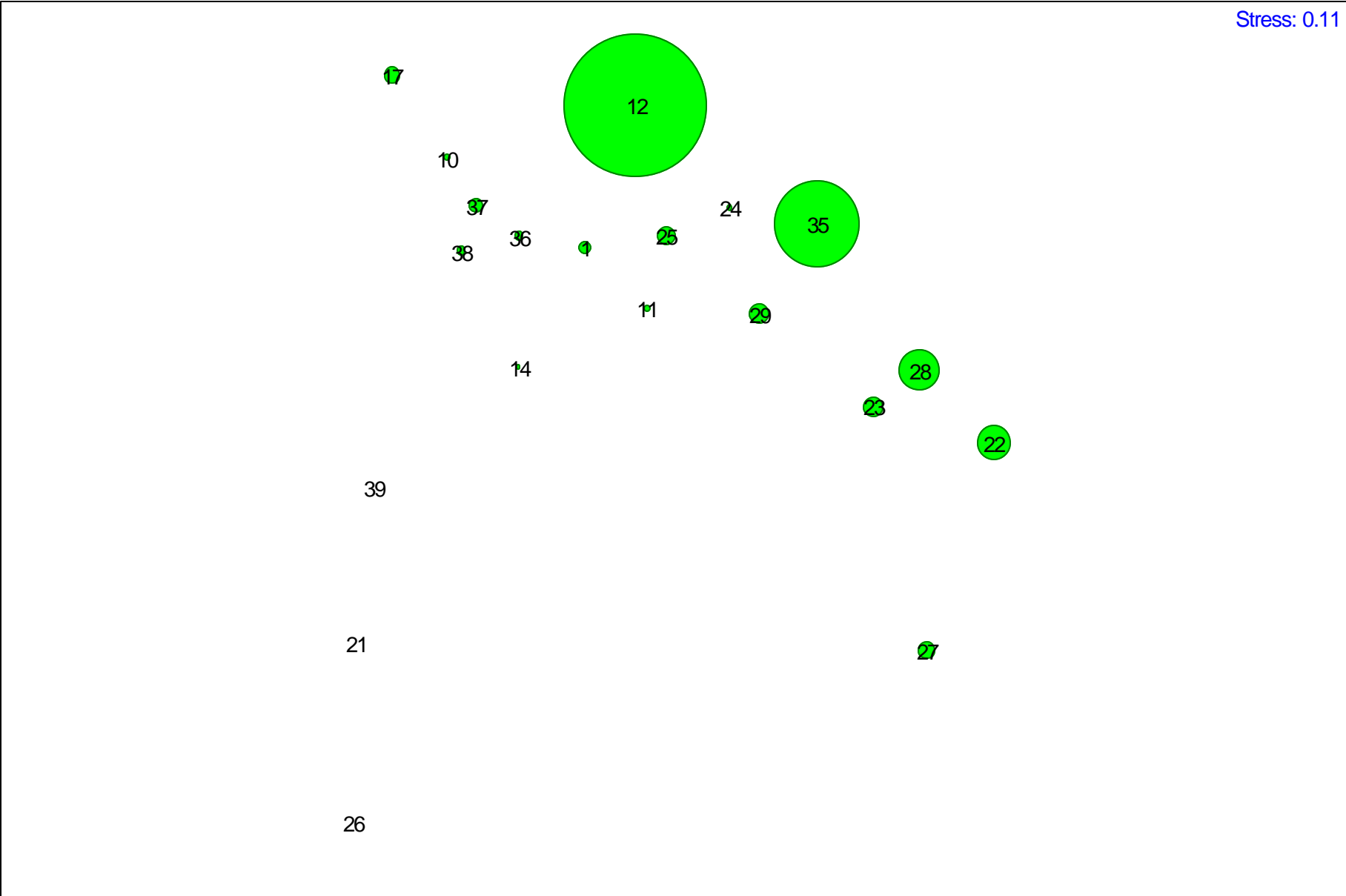
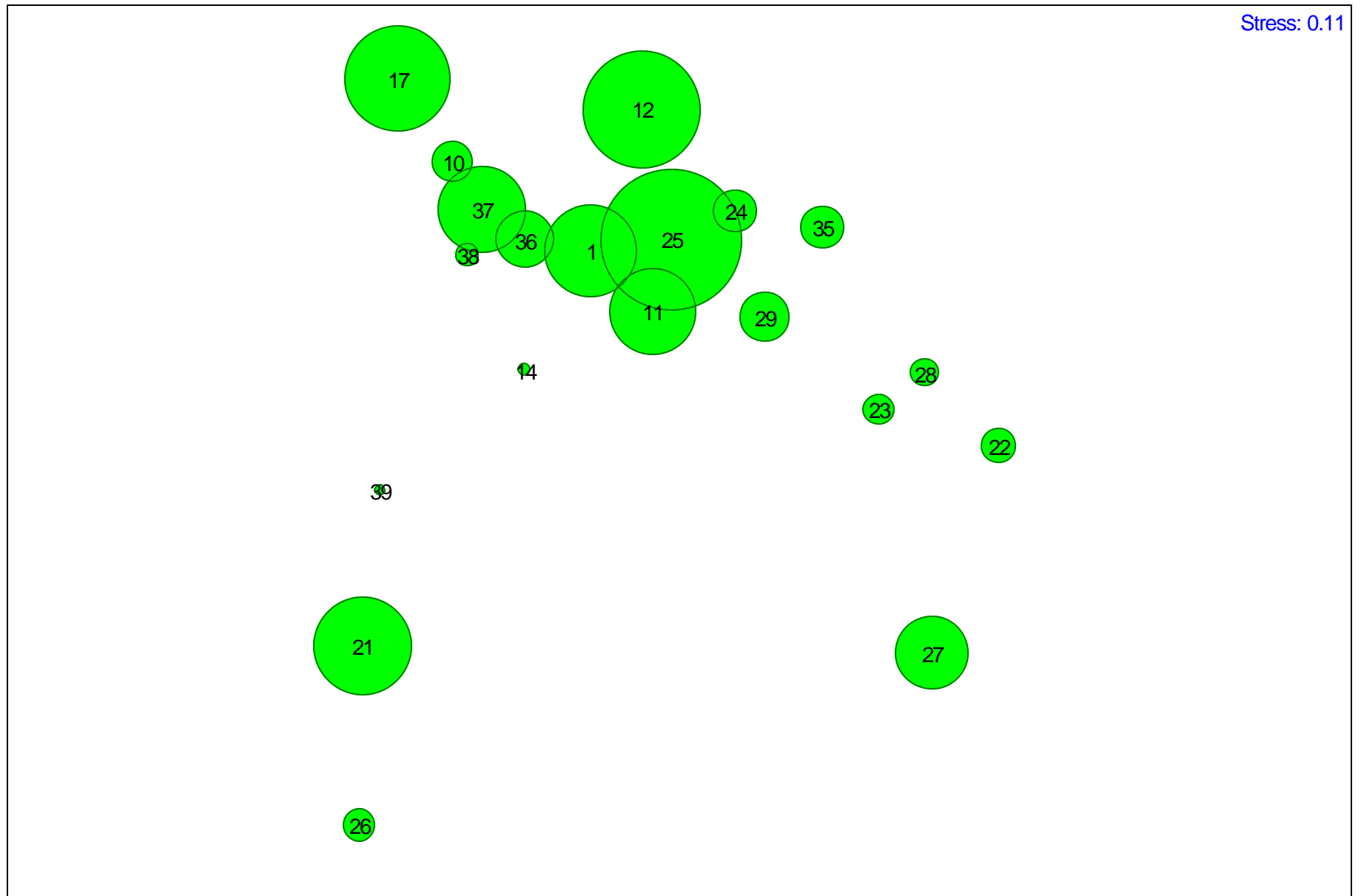Figure 14. MDS plot and Mollusca abundance for the Gray's Reef stations, 2002.
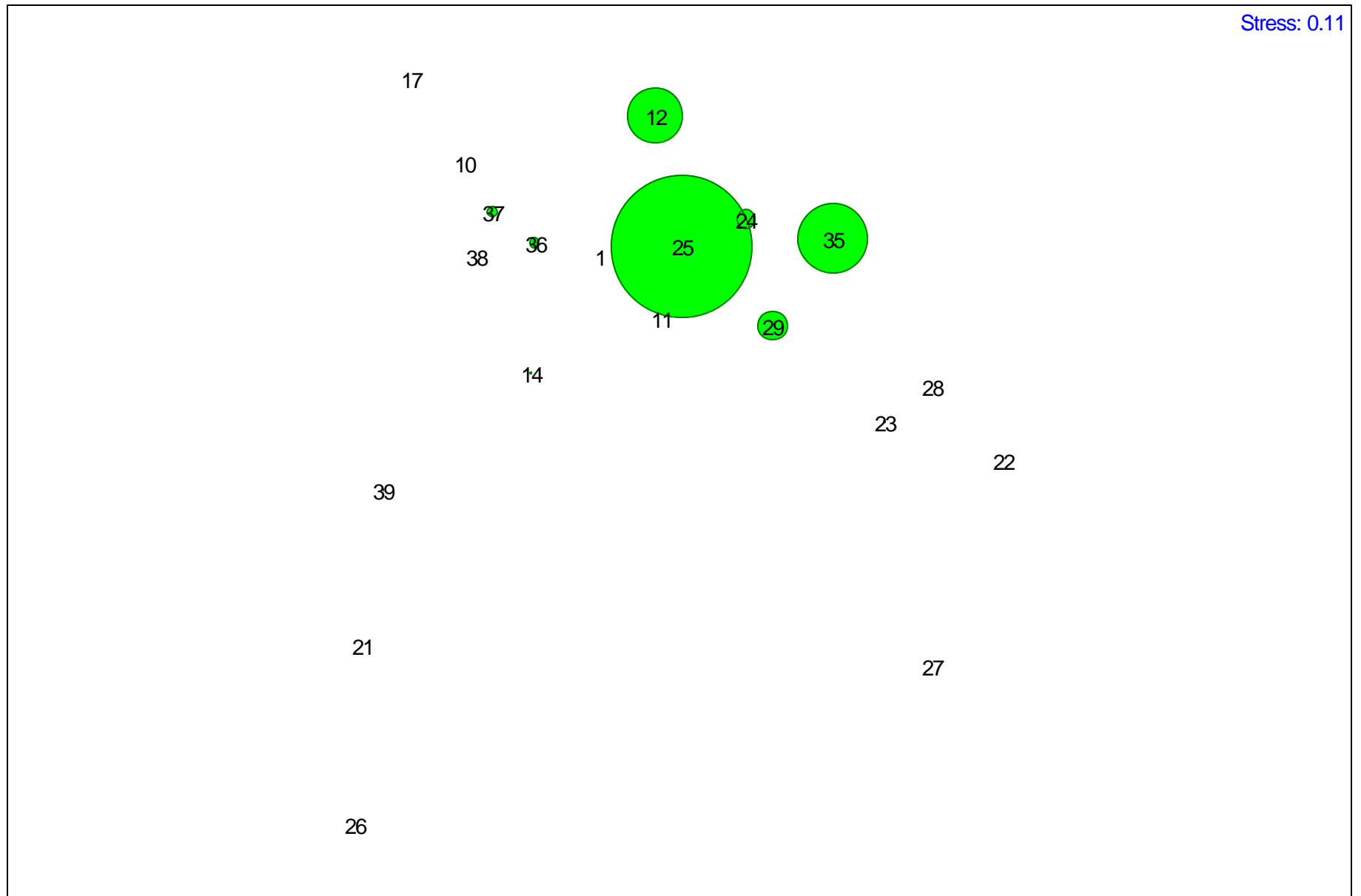
Stress: 0.11

Figure 15. MDS plot and Echinodermata abundance for the Gray's Reef stations, 2002.

APPENDICES