GRAY'S REEF BENTHIC MACROINVERTEBRATE COMMUNITY ASSESSMENT, APRIL 2001

SUBMITTED TO:

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service
National Centers for Coastal Ocean Science
Center for Coastal Monitoring And Assessment
219 Fort Johnson Road
Charleston, South Carolina 29412

PREPARED BY:

Barry A. Vittor & Associates, Inc.
8060 Cottage Hill Road
Mobile, Alabama 36695
(251) 633-6100
www.bvaenviro.com

April 2002

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The Gray's Reef National Marine Sanctuary was sampled during April 2001 (Figure 1). 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).

The 2001 Gray's Reef sampling stations are indicated in Figure 1; location data for the stations are given in Table 1.

METHODS

Sample Collection and Handling

A Young dredge (area = 0.04 m^2) was used to collect bottom samples at 20 station locations (three replicate samples were taken at each station) along three transects (stations 21-25, 26-29, 30-34) from the coast to the vicinity of Gray's Reef and in Gray's Reef proper (stations 1, 10, 11,12, 14, 17) (Figure 1). 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.

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 the Shannon-Weaver Index (Pielou, 1966), according to the following formula:

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

where,

S = the total number of taxa identified in the sample (including LPILs),

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 the equitability in the fauna to the taxa diversity for a given area, Pielou's Index J' (Pielou, 1966) was calculated as J' = H'/lnS, where $lnS = H'_{max}$, or the maximum possible diversity, when all taxa are represented by the same number of individuals; thus, $J' = H' / H'_{max}$.

Cluster analysis of both stations (normal analysis) and taxa (inverse analysis) was performed by calculating the Bray-Curtis dissimilarity for all pairs (Bray and Cutis 1957). Clusters were formed using the average linkage method between dissimilarities (Rohlf, 1998). In this method, the distance between two clusters is the average distance between pairs of observations, one in each cluster. Taxa used in these analyses were selected according to their percent abundance in the assemblage.

HABITAT CHARACTERISTICS

Water quality data for the 20 stations are presented in Table 1. Sediment data for the 20 stations are given in Table 1 and Figures 2, 3 and 4. Sediment composition at 17 of the twenty stations was > 98% sand (Table 1); the nearshore stations 21, 26 and 30 were silty sand with a percent silt + clay fraction ranging between 20% and 30% (Figures 2 and 3). The percent total organic carbon (TOC) fraction of the sediment was uniformly low at all stations with values less than 1% (Table 1, Figure 4).

BENTHIC COMMUNITY CHARACTERIZATION

Faunal Composition, Abundance, and Community Structure

A total of 20,518 organisms, representing 474 taxa, were identified from the 20 stations (Table 2). Polychaetes were the most numerous organisms present representing 62.1% of the total assemblage, followed in abundance by malacostracans (11.2%), gastropods (7.3%), and bivalves (6.7%). Polychaetes represented 42.8% of the total number of taxa followed by malacostracans (25.1%), gastropods (14.8%), and bivalves (10.3%)(Table 2). The percentage abundance of the major taxa at the 20 stations is given in Table 3 and Figure 5. Annelids (polychaetes) were the dominant taxa at the Gray's Reef stations, while annelids (polychaetes), mollusks and arthropods variously dominated the assemblages at stations located along the three transects (Figure 5).

The dominant taxon collected from the 20 stations was the polychaete genus, *Mediomastus* (LPIL) representing 12.8% of the total individuals identified. Other abundant taxa were the polychaetes, *Polycirrus eximius* and *Spiophanes bombyx*, and the gastropod, *Caecum johnsoni* representing 5.9%, 5.0% and 4.4% of the individuals, respectively (Table 4). *Spiophanes bombyx* was the most widely distributed taxon being found at 100% of the stations. The distribution of taxa representing > 10% of the total assemblage at each station is given in Table 5.

Taxa richness (mean number of taxa per station) and density data are summarized for the 20 stations in Table 6 and Figures 7-10. Taxa richness ranged from 17.0 taxa per

replicate (SD = 4.6) at Station 28 to 89.0 taxa per replicate (SD = 23.3) at Station 12 (Table 6; Figures 7 and 8). There were no apparent trends in taxa richness, although stations in Gray's Reef proper generally had higher taxa richness. Mean station densities ranged from 1941.7 organisms·m^2 (SD = 357.4) at Station 22 to 28,591.7.3 organisms·m^2 (SD = 10702.8) at Station 26 (Table 6; Figures 9 and 10). There were no apparent trends in density among stations (Figure 10).

Taxa diversity and evenness for the Gray's Reef stations are given in Table 6 and Figure 11. Taxa diversity (H´) was uniformly high and ranged from 1.69 at Station 30 to 3.89 at Station 10 (Table 6, Figure 11). Diversity was greater than 3.00 at all stations located in Gray's Reef proper. Taxa evenness (J´) also exhibited variation and ranged from 0.42 at Station 30 to 0.88 at Station 11 (Table 6, Figure 11).

Cluster Analysis

Normal (station) and inverse (taxa) cluster analyses were performed on the Gray's Reef data set and displayed as dendrograms (Figures 12 and 13). Count data for the 25 taxa selected were included in a matrix of station and taxa (Table 7). There was no logical clustering of the various stations into either the sampled transects or the Gray's Reef sanctuary (Figure 12). Clustering of the 25 taxa in the 20 stations was not useful in separating ecologically meaningful taxa assemblages (Figure 13). There were several taxa which dominated the assemblage at specific stations in the Gray's Reef sanctuary that were rare elsewhere and included the malacostracans, *Erichthonius brasiliensis* at Station 12, the polychaete, *Fabricinuda trilobata* at Station 17, and the polychaete, *Protodorvillea kefersteini* at Station 12 (Table 7, Figure 13).

LITERATURE CITED

Bray, J.R. and J.T. Curtis. 1957. An ordination of upland forest communities of southern Wisconsin. Ecological Monographs 27: 325-349.

Pielou, E.C. 1966. The measurement of diversity in different types of biological collections. Journal of Theoretical Biology 13:131-144.

Rohlf, J. F. 1998. NTSYSpc Version 2.0 for the Windows. State University of New York. Stony Brook, NY.

Table 1. Station locations, water quality and sediment data for the Gray's Reef stations, April 2001.

Station	Latitude	Longitude	Depth (m)	Temp (˚C)	Salinity (ppt)	D.O. (mg/l)	pH	% Moisture	% TOC	% Gravel	% Sand	% Silt+Clay	USAE Description	Median phi	Sorting Coeff.
1	31° 25.163	80° 54.760	15.5	19.2	35.6	7.2	8.0	23.58	0.05	0.00	99.47	0.53	sand	0.587	–
10	31° 24.330	80° 49.920	18.0	19.2	36.0	7.2	8.0	21.13	0.08	0.00	98.93	1.07	sand	0.979	0.889
11	31° 23.476	80° 54.335	12.0	19.3	35.9	7.2	7.9	26.07	0.10	0.00	99.16	0.88	sand	1.546	0.805
12	31° 23.361	80° 53.780	15.7	19.3	35.9	7.2	7.9	25.10	0.17	0.00	99.74	0.26	sand	1.276	1.031
14	31° 22.990	80° 51.530	18.1	19.3	36.1	7.2	8.0	22.62	0.10	0.00	99.75	0.25	sand	1.047	0.786
17	31° 22.060	80° 53.840	17.0	19.3	35.9	7.2	7.9	18.19	0.17	0.00	99.72	0.28	sand	0.331	–
21	31° 31.897	81° 09.446	10.1	21.6	33.7	7.1	7.9	31.20	0.28	0.00	77.87	22.14	silty sand	0.957	–
22	31° 31.513	81° 04.587	7.0	20.4	34.5	7.3	7.9	2.35	0.20	0.00	99.57	0.43	sand	2.495	0.415
23	31° 30.969	81° 00.004	13.5	19.4	34.9	7.3	7.9	24.72	0.25	0.00	99.98	0.02	sand	1.672	0.681
24	31° 30.602	80° 55.305	15.0	19.1	35.1	7.2	7.9	25.58	0.16	0.00	99.19	0.81	sand	1.271	0.800
25	31° 30.213	80° 50.597	14.8	18.2	35.5	7.3	7.9	22.33	0.19	0.00	99.71	0.29	sand	1.118	0.787
26	31° 22.198	81° 15.732	10.1	21.5	33.2	6.9	7.9	38.10	0.57	0.00	71.06	28.94	silty sand	2.236	4.587
27	31° 22.526	81° 09.850	9.3	20.4	34.6	7.3	7.9	38.38	0.42	0.00	98.00	2.00	sand	2.483	0.449
28	31° 22.890	81° 03.790	12.2	19.8	34.6	7.3	7.8	25.45	0.31	0.00	97.50	2.50	sand	1.593	0.502
29	31° 23.200	80° 58.312	14.2	19.5	35.5	7.2	7.9	22.80	0.30	0.00	99.44	0.56	sand	0.940	0.859
30	31° 19.008	81° 15.916	4.1	22.4	22.8	7.9	7.9	36.71	0.54	0.00	78.49	21.52	silty sand	2.674	2.217
31	31° 18.429	81° 11.462	8.5	20.5	34.3	7.2	7.9	26.67	0.56	0.00	98.61	1.39	sand	1.752	1.214
32	31° 17.913	81° 06.170	10.4	20.2	34.8	7.3	7.9	21.58	0.39	0.00	99.61	0.39	sand	1.338	0.776
33	31° 17.406	81° 01.257	12.2	20.0	35.3	7.3	8.0	19.60	0.51	0.00	99.85	0.15	sand	0.510	–
34	31° 16.934	80° 56.386	15.3	19.6	35.8	7.3	8.0	19.14	0.51	0.00	99.58	0.42	sand	0.786	0.866

Table 2. Summary of overall abundance of major benthic macrofaunal taxonomic groups for the Gray's Reef stations, April 2001.

Taxa	Total No. Taxa	% Total	Total No. Individuals	% Total
Annelida				
Oligochaeta	2	0.4	827	4.0
Polychaeta	203	42.8	12,751	62.1
Mollusca				
Aplacophora	1	0.2	2	0.0
Bivalvia	49	10.3	1,376	6.7
Gastropoda	70	14.8	1,492	7.3
Polyplacophora	1	0.2	8	0.0
Scaphopoda	2	0.4	2	0.0
Arthropoda				
Malacostraca	119	25.1	2,295	11.2
Echinodermata				
Echinodermata (LPIL)	1	0.2	4	0.0
Asteroidea	2	0.4	79	0.4
Echinoidea	5	1.1	144	0.7
Holothuroidea	1	0.2	1	0.0
Ophiuroidea	1	0.2	65	0.3
Other Taxa	17	3.6	1,472	7.2
Total	474		20,518	

Table 3. Summary of abundance of major benthic macrofaunal taxonomic groups by station for the Gray's Reef project, April 2001.

Station	Phylum	No. of Taxa	% of Total	No. of Individuals (per 0.04 m^2)	% of Total
1	Annelida	32	41.6	158	42.6
	Mollusca	22	28.6	110	29.6
	Arthropoda	13	16.9	38	10.2
	Echinodermata	3	3.9	14	3.8
	Other Taxa	7	9.1	51	13.7
	Total	**77**		**371**	
10	Annelida	69	55.6	650	55.0
	Mollusca	25	20.2	200	16.9
	Arthropoda	20	16.1	82	6.9
	Echinodermata	3	2.4	22	1.9
	Other Taxa	7	5.6	227	19.2
	Total	**124**		**1,181**	
11	Annelida	33	41.8	181	48.3
	Mollusca	15	19.0	86	22.9
	Arthropoda	21	26.6	62	16.5
	Echinodermata	3	3.8	4	1.1
	Other Taxa	7	8.9	42	11.2
	Total	**79**		**375**	
12	Annelida	82	48.2	1106	54.6
	Mollusca	31	18.2	97	4.8
	Arthropoda	46	27.1	668	33.0
	Echinodermata	2	1.2	37	1.8
	Other Taxa	9	5.3	118	5.8
	Total	**170**		**2,026**	
14	Annelida	37	40.7	325	61.9
	Mollusca	24	26.4	104	19.8
	Arthropoda	20	22.0	42	8.0
	Echinodermata	4	4.4	11	2.1
	Other Taxa	6	6.6	43	8.2
	Total	**91**		**525**	
17	Annelida	67	54.9	1604	84.8
	Mollusca	24	19.7	167	8.8
	Arthropoda	20	16.4	38	2.0
	Echinodermata	3	2.5	17	0.9
	Other Taxa	8	6.6	65	3.4
	Total	**122**		**1,891**	

Table 3 continued:

Station	Phylum	No. of Taxa	% of Total	No. of Individuals (per 0.04 m^2)	% of Total
21	Annelida	36	50.7	831	76.7
	Mollusca	18	25.4	74	6.8
	Arthropoda	11	15.5	149	13.7
	Echinodermata	2	2.8	5	0.5
	Other Taxa	4	5.6	25	2.3
	Total	**71**		**1,084**	
22	Annelida	12	38.7	88	37.8
	Mollusca	7	22.6	39	16.7
	Arthropoda	8	25.8	97	41.6
	Echinodermata	0	0.0	0	0.0
	Other Taxa	4	12.9	9	3.9
	Total	**31**		**233**	
23	Annelida	34	42.0	77	21.0
	Mollusca	24	29.6	142	38.8
	Arthropoda	17	21.0	126	34.4
	Echinodermata	0	0.0	0	0.0
	Other Taxa	6	7.4	21	5.7
	Total	**81**		**366**	
24	Annelida	30	38.0	137	31.9
	Mollusca	23	29.1	113	26.3
	Arthropoda	18	22.8	116	27.0
	Echinodermata	2	2.5	44	10.2
	Other Taxa	6	7.6	20	4.7
	Total	**79**		**430**	
25	Annelida	27	41.5	104	28.6
	Mollusca	14	21.5	119	32.7
	Arthropoda	18	27.7	107	29.4
	Echinodermata	1	1.5	3	0.8
	Other Taxa	5	7.7	31	8.5
	Total	**65**		**364**	
26	Annelida	50	54.9	3122	91.0
	Mollusca	18	19.8	191	5.6
	Arthropoda	16	17.6	64	1.9
	Echinodermata	2	2.2	3	0.1
	Other Taxa	5	5.5	51	1.5
	Total	**91**		**3,431**	

Table 3 continued:

Station	Phylum	No. of Taxa	% of Total	No. of Individuals (per 0.04 m^2)	% of Total
27	Annelida	30	43.5	360	54.5
	Mollusca	12	17.4	93	14.1
	Arthropoda	19	27.5	165	25.0
	Echinodermata	0	0.0	0	0.0
	Other Taxa	8	11.6	42	6.4
	Total	**69**		**660**	
28	Annelida	8	20.5	25	10.3
	Mollusca	12	30.8	70	28.8
	Arthropoda	13	33.3	138	56.8
	Echinodermata	2	5.1	4	1.6
	Other Taxa	4	10.3	6	2.5
	Total	**39**		**243**	
29	Annelida	39	45.3	163	49.2
	Mollusca	23	26.7	55	16.6
	Arthropoda	17	19.8	57	17.2
	Echinodermata	0	0.0	0	0.0
	Other Taxa	7	8.1	56	16.9
	Total	**86**		**331**	
30	Annelida	29	52.7	1564	93.4
	Mollusca	9	16.4	20	1.2
	Arthropoda	13	23.6	60	3.6
	Echinodermata	0	0.0	0	0.0
	Other Taxa	4	7.3	30	1.8
	Total	**55**		**1,674**	
31	Annelida	44	47.8	1308	78.0
	Mollusca	16	17.4	72	4.3
	Arthropoda	22	23.9	157	9.4
	Echinodermata	2	2.2	40	2.4
	Other Taxa	8	8.7	100	6.0
	Total	**92**		**1,677**	
32	Annelida	53	49.5	254	44.8
	Mollusca	22	20.6	227	40.0
	Arthropoda	19	17.8	40	7.1
	Echinodermata	4	3.7	9	1.6
	Other Taxa	9	8.4	37	6.5
	Total	**107**		**567**	

Table 3 continued:

Station	Phylum	No. of Taxa	% of Total	No. of Individuals (per 0.04 m^2)	% of Total
33	Annelida	47	50.0	1015	48.4
	Mollusca	24	25.5	668	31.8
	Arthropoda	11	11.7	52	2.5
	Echinodermata	3	3.2	20	1.0
	Other Taxa	9	9.6	344	16.4
	Total	**94**		**2,099**	
34	Annelida	54	58.7	506	51.1
	Mollusca	30	32.6	233	23.5
	Arthropoda	18	19.6	37	3.7
	Echinodermata	4	4.3	26	2.6
	Other Taxa	12	13.0	188	19.0
	Total	**118**		**990**	

Table 4. Distribution and abundance of taxa for the Gray's Reef stations, April 2001.

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
Mediomastus (LPIL)	Ann	Poly	2632	12.83	12.83	7	35
Polycirrus eximius	Ann	Poly	1216	5.93	18.75	5	25
Spiophanes bombyx	Ann	Poly	1023	4.99	23.74	20	100
Caecum johnsoni	Mol	Gast	909	4.43	28.17	16	80
Tubificidae (LPIL)	Ann	Olig	764	3.72	31.89	18	90
Fabricinuda trilobata	Ann	Poly	739	3.60	35.50	3	15
Tharyx acutus	Ann	Poly	704	3.43	38.93	3	15
Protodorvillea kefersteini	Ann	Poly	611	2.98	41.90	12	60
Branchiostoma (LPIL)	Cho	Lept	565	2.75	44.66	14	70
Mediomastus ambiseta	Ann	Poly	395	1.93	46.58	4	20
Oxyurostylis smithi	Art	Mala	381	1.86	48.44	19	95
Crassinella dupliniana	Mol	Biva	373	1.82	50.26	12	60
Streblospio benedicti	Ann	Poly	340	1.66	51.92	3	15
Parapionosyllis longicirrata	Ann	Poly	313	1.53	53.44	14	70
Rhynchocoela (LPIL)	Rhy	–	305	1.49	54.93	19	95
Exogone rolani	Ann	Poly	301	1.47	56.39	12	60
Sphaerosyllis piriferopsis	Ann	Poly	300	1.46	57.86	7	35
Erichthonius brasiliensis	Art	Mala	282	1.37	59.23	12	60
Owenia fusiformis	Ann	Poly	273	1.33	60.56	11	55
Spio pettiboneae	Ann	Poly	260	1.27	61.83	14	70
Sipuncula (LPIL)	Sip	–	212	1.03	62.86	16	80
Goniadides carolinae	Ann	Poly	180	0.88	63.74	11	55
Onuphidae (LPIL)	Ann	Poly	177	0.86	64.60	15	75
Eumida sanguinea	Ann	Poly	169	0.82	65.43	6	30
Bhawania goodei	Ann	Poly	164	0.80	66.22	6	30
Rictaxis punctostriatus	Mol	Gast	163	0.79	67.02	17	85
Photis pugnator	Art	Mala	156	0.76	67.78	6	30
Filogranula sp. A	Ann	Poly	154	0.75	68.53	7	35
Mediomastus californiensis	Ann	Poly	150	0.73	69.26	11	55
Tellina (LPIL)	Mol	Biva	132	0.64	69.90	10	50
Echinoidea (LPIL)	Ech	Echi	129	0.63	70.53	11	55
Crassinella lunulata	Mol	Biva	128	0.62	71.16	12	60
Phoxocephalidae (LPIL)	Art	Mala	125	0.61	71.77	11	55
Semele nuculoides	Mol	Biva	107	0.52	72.29	14	70
Tanaissus psammophilus	Art	Mala	102	0.50	72.78	12	60
Armandia maculata	Ann	Poly	96	0.47	73.25	14	70
Metharpinia floridana	Art	Mala	96	0.47	73.72	13	65
Nucula aegeenis	Mol	Biva	96	0.47	74.19	3	15
Aspidosiphon (LPIL)	Sip	–	89	0.43	74.62	13	65
Bivalvia (LPIL)	Mol	Biva	88	0.43	75.05	16	80
Axiothella mucosa	Ann	Poly	85	0.41	75.47	8	40
Nephtys (LPIL)	Ann	Poly	85	0.41	75.88	14	70
Exogone lourei	Ann	Poly	84	0.41	76.29	5	25
Eudevenopus honduranus	Art	Mala	83	0.40	76.69	11	55
Pholoe minuta	Ann	Poly	80	0.39	77.08	6	30
Pionosyllis gesae	Ann	Poly	80	0.39	77.47	11	55
Bhawania heteroseta	Ann	Poly	79	0.39	77.86	5	25
Dentatisyllis carolinae	Ann	Poly	78	0.38	78.24	7	35
Asteroidea (LPIL)	Ech	Aste	78	0.38	78.62	7	35
Prionospio (LPIL)	Ann	Poly	76	0.37	78.99	13	65
Protohaustorius wigleyi	Art	Mala	76	0.37	79.36	8	40
Actiniaria (LPIL)	Cni	Anth	76	0.37	79.73	11	55
Ophiuroidea (LPIL)	Ech	Ophi	65	0.32	80.05	12	60
Enchytraeidae (LPIL)	Ann	Olig	63	0.31	80.35	10	50
Maldanidae (LPIL)	Ann	Poly	61	0.30	80.65	14	70
Caprella sp. C	Art	Mala	61	0.30	80.95	1	5
Cirratulidae (LPIL)	Ann	Poly	60	0.29	81.24	6	30
Tellinidae (LPIL)	Mol	Biva	60	0.29	81.53	4	20
Aspidosiphon muelleri	Sip	–	58	0.28	81.82	11	55
Grubeosyllis rugulosa	Ann	Poly	57	0.28	82.09	2	10
Tubulanus (LPIL)	Rhy	Anop	57	0.28	82.37	14	70
Nephtys picta	Ann	Poly	55	0.27	82.64	12	60
Rhepoxynius hudsoni	Art	Mala	55	0.27	82.91	5	25
Caecum pulchellum	Mol	Gast	53	0.26	83.17	10	50

Table 4 continued:

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
Tellina versicolor	Mol	Biva	52	0.25	83.42	7	35
Acanthohaustorius millsi	Art	Mala	51	0.25	83.67	8	40
Batea catharinensis	Art	Mala	51	0.25	83.92	2	10
Brania wellfleetensis	Ann	Poly	49	0.24	84.16	4	20
Diplodonta (LPIL)	Mol	Biva	49	0.24	84.39	13	65
Sphaerosyllis aciculata	Ann	Poly	48	0.23	84.63	10	50
Phyllodoce (LPIL)	Ann	Poly	45	0.22	84.85	11	55
Plakosyllis quadrioculata	Ann	Poly	45	0.22	85.07	6	30
Galathowenia oculata	Ann	Poly	44	0.21	85.28	8	40
Paraonis pygoenigmatica	Ann	Poly	42	0.20	85.49	6	30
Polycirrus (LPIL)	Ann	Poly	42	0.20	85.69	3	15
Spionidae (LPIL)	Ann	Poly	41	0.20	85.89	13	65
Tectonatica pusilla	Mol	Gast	39	0.19	86.08	12	60
Asabellides oculata	Ann	Poly	37	0.18	86.26	4	20
Unciola serrata	Art	Mala	37	0.18	86.44	3	15
Clymenella torquata	Ann	Poly	34	0.17	86.61	1	5
Lepidonotus sp. A	Ann	Poly	34	0.17	86.77	3	15
Glyceridae (LPIL)	Ann	Poly	33	0.16	86.93	10	50
Goniada littorea	Ann	Poly	33	0.16	87.09	5	25
Magelona sp. H	Ann	Poly	32	0.16	87.25	2	10
Paracaprella pusilla	Art	Mala	32	0.16	87.41	1	5
Podocerus kleidus	Art	Mala	32	0.16	87.56	1	5
Nereis succinea	Ann	Poly	31	0.15	87.71	3	15
Caulleriella cf. *alata*	Ann	Poly	30	0.15	87.86	4	20
Heteropodarke lyonsi	Ann	Poly	30	0.15	88.01	5	25
Glycera robusta	Ann	Poly	29	0.14	88.15	9	45
Phyllodocidae (LPIL)	Ann	Poly	29	0.14	88.29	7	35
Laevicardium laevigatum	Mol	Biva	29	0.14	88.43	2	10
Americhelidium americanum	Art	Mala	28	0.14	88.57	11	55
Apoprionospio dayi	Ann	Poly	27	0.13	88.70	4	20
Bathyporeia quoddyensis	Art	Mala	27	0.13	88.83	5	25
Serpulidae (LPIL)	Ann	Poly	26	0.13	88.96	5	25
Sphaerosyllis taylori	Ann	Poly	26	0.13	89.08	3	15
Nucula proxima	Mol	Biva	26	0.13	89.21	1	5
Glycera (LPIL)	Ann	Poly	25	0.12	89.33	8	40
Apocorophium simile	Art	Mala	25	0.12	89.45	2	10
Ensis minor	Mol	Biva	25	0.12	89.58	5	25
Caecum cooperi	Mol	Gast	25	0.12	89.70	8	40
Caecum floridanum	Mol	Gast	25	0.12	89.82	5	25
Pisione remota	Ann	Poly	24	0.12	89.94	3	15
Sabellaria vulgaris	Ann	Poly	24	0.12	90.05	4	20
Exogone verugera	Ann	Poly	23	0.11	90.16	4	20
Mitrella lunata	Mol	Gast	23	0.11	90.28	4	20
Ophelia denticulata	Ann	Poly	22	0.11	90.38	7	35
Diplodonta punctata	Mol	Biva	22	0.11	90.49	7	35
Syllis cornuta	Ann	Poly	21	0.10	90.59	6	30
Haustoriidae (LPIL)	Art	Mala	21	0.10	90.70	6	30
Paracerceis caudata	Art	Mala	21	0.10	90.80	1	5
Lucina (LPIL)	Mol	Biva	21	0.10	90.90	6	30
Chone (LPIL)	Ann	Poly	20	0.10	91.00	4	20
Cyclaspis sp. O	Art	Mala	20	0.10	91.10	7	35
Strigilla mirabilis	Mol	Biva	20	0.10	91.19	2	10
Paraonis fulgens	Ann	Poly	19	0.09	91.29	5	25
Syllidae (LPIL)	Ann	Poly	19	0.09	91.38	6	30
Bathyporeia parkeri	Art	Mala	19	0.09	91.47	6	30
Leptochelia (LPIL)	Art	Mala	19	0.09	91.56	1	5
Pagurus (LPIL)	Art	Mala	19	0.09	91.66	8	40
Diopatra cuprea	Ann	Poly	18	0.09	91.74	4	20
Grubeosyllis clavata	Ann	Poly	18	0.09	91.83	4	20
Phyllodoce arenae	Ann	Poly	18	0.09	91.92	7	35
Acanthohaustorius shoemakeri	Art	Mala	18	0.09	92.01	6	30
Ampelisca abdita	Art	Mala	18	0.09	92.09	4	20
Brachiopoda (LPIL)	Bra	–	18	0.09	92.18	5	25
Calyptraea centralis	Mol	Gast	18	0.09	92.27	5	25
Phoronis (LPIL)	Pho	–	18	0.09	92.36	2	10
Gastropoda (LPIL)	Mol	Gast	17	0.08	92.44	9	45

Table 4 continued:

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
Cirrophorus ilvana	Ann	Poly	16	0.08	92.52	5	25
Heteropodarke formalis	Ann	Poly	16	0.08	92.60	6	30
Spio (LPIL)	Ann	Poly	16	0.08	92.67	6	30
Acanthohaustorius intermedius	Art	Mala	16	0.08	92.75	4	20
Ampelisca (LPIL)	Art	Mala	16	0.08	92.83	6	30
Edotea triloba	Art	Mala	16	0.08	92.91	3	15
Elasmopus levis	Art	Mala	16	0.08	92.99	2	10
Pleuromeris tridentata	Mol	Biva	16	0.08	93.06	4	20
Acteocina recta	Mol	Gast	16	0.08	93.14	5	25
Lineidae (LPIL)	Rhy	Anop	16	0.08	93.22	9	45
Glycera americana	Ann	Poly	15	0.07	93.29	7	35
Phyllodoce longipes	Ann	Poly	15	0.07	93.37	4	20
Synelmis ewingi	Ann	Poly	15	0.07	93.44	8	40
Lucinidae (LPIL)	Mol	Biva	15	0.07	93.51	6	30
Syllis corallicola	Ann	Poly	14	0.07	93.58	1	5
Campylaspis heardi	Art	Mala	14	0.07	93.65	5	25
Cyclaspis pustulata	Art	Mala	14	0.07	93.72	6	30
Photis (LPIL)	Art	Mala	14	0.07	93.79	6	30
Sphaerosyllis (LPIL)	Ann	Poly	13	0.06	93.85	4	20
Trypanosyllis coeliaca	Ann	Poly	13	0.06	93.91	1	5
Melita nitida	Art	Mala	13	0.06	93.98	1	5
Lyonsia hyalina	Mol	Biva	13	0.06	94.04	6	30
Acteocina (LPIL)	Mol	Gast	13	0.06	94.10	4	20
Hesionura elongata	Ann	Poly	12	0.06	94.16	7	35
Nephtys simoni	Ann	Poly	12	0.06	94.22	8	40
Syllis hyalina	Ann	Poly	12	0.06	94.28	2	10
Ampelisca bicarinata	Art	Mala	12	0.06	94.34	2	10
Apseudes olympiae	Art	Mala	12	0.06	94.40	3	15
Stenothoe minuta	Art	Mala	12	0.06	94.45	3	15
Bryozoa (LPIL)	Bry	–	12	0.06	94.51	3	15
Encope aberrans	Ech	Echi	12	0.06	94.57	5	25
Aspidosiphon albus	Sip	–	12	0.06	94.63	6	30
Phascolion strombi	Sip	–	12	0.06	94.69	1	5
Caulleriella (LPIL)	Ann	Poly	11	0.05	94.74	4	20
Ophelina acuminata	Ann	Poly	11	0.05	94.79	2	10
Ischyroceridae (LPIL)	Art	Mala	11	0.05	94.85	3	15
Montacutidae (LPIL)	Mol	Biva	11	0.05	94.90	3	15
Arene tricarinata	Mol	Gast	11	0.05	94.96	3	15
Naticidae (LPIL)	Mol	Gast	11	0.05	95.01	6	30
Cirrophorus branchiatus	Ann	Poly	10	0.05	95.06	2	10
Aoridae (LPIL)	Art	Mala	10	0.05	95.11	4	20
Synidotea sp. F	Art	Mala	10	0.05	95.16	1	5
Polygordius (LPIL)	Ann	Poly	9	0.04	95.20	5	25
Streptosyllis arenae	Ann	Poly	9	0.04	95.24	5	25
Corophium (LPIL)	Art	Mala	9	0.04	95.29	2	10
Eobrolgus spinosus	Art	Mala	9	0.04	95.33	2	10
Gammaropsis (LPIL)	Art	Mala	9	0.04	95.37	4	20
Gorgonacea (LPIL)	Cni	Anth	9	0.04	95.42	1	5
Mytilidae (LPIL)	Mol	Biva	9	0.04	95.46	1	5
Pythinella cuneata	Mol	Biva	9	0.04	95.51	1	5
Semele (LPIL)	Mol	Biva	9	0.04	95.55	5	25
Nassariidae (LPIL)	Mol	Gast	9	0.04	95.59	1	5
Rissoina sp. C	Mol	Gast	9	0.04	95.64	2	10
Ampharetidae (LPIL)	Ann	Poly	8	0.04	95.68	3	15
Arabella multidentata	Ann	Poly	8	0.04	95.72	4	20
Magelona (LPIL)	Ann	Poly	8	0.04	95.75	3	15
Poecilochaetus (LPIL)	Ann	Poly	8	0.04	95.79	3	15
Potamethus (LPIL)	Ann	Poly	8	0.04	95.83	1	5
Syllis (LPIL)	Ann	Poly	8	0.04	95.87	2	10
Syllis gracilis	Ann	Poly	8	0.04	95.91	1	5
Amakusanthura magnifica	Art	Mala	8	0.04	95.95	3	15
Leucothoe spinicarpa	Art	Mala	8	0.04	95.99	1	5
Metatiron tropakis	Art	Mala	8	0.04	96.03	4	20
Ascidiacea (LPIL)	Cho	Asci	8	0.04	96.07	3	15
Caecum (LPIL)	Mol	Gast	8	0.04	96.11	3	15
Doridella obscura	Mol	Gast	8	0.04	96.14	2	10

Table 4 continued:

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
Eulimidae (LPIL)	Mol	Gast	8	0.04	96.18	3	15
Polyplacophora (LPIL)	Mol	Polyp	8	0.04	96.22	5	25
Capitellidae (LPIL)	Ann	Poly	7	0.03	96.26	6	30
Drilonereis longa	Ann	Poly	7	0.03	96.29	2	10
Hemipodus roseus	Ann	Poly	7	0.03	96.33	2	10
Hypereteone fauchaldi	Ann	Poly	7	0.03	96.36	3	15
Leitoscoloplos (LPIL)	Ann	Poly	7	0.03	96.39	2	10
Monticellina dorsobranchialis	Ann	Poly	7	0.03	96.43	1	5
Nephtys squamosa	Ann	Poly	7	0.03	96.46	3	15
Nereididae (LPIL)	Ann	Poly	7	0.03	96.50	3	15
Pectinaria gouldii	Ann	Poly	7	0.03	96.53	4	20
Spiochaetopterus oculatus	Ann	Poly	7	0.03	96.56	2	10
Spiophanes missionensis	Ann	Poly	7	0.03	96.60	3	15
Ampithoe rubricata	Art	Mala	7	0.03	96.63	1	5
Acteocina candei	Mol	Gast	7	0.03	96.67	2	10
Calyptraeidae (LPIL)	Mol	Gast	7	0.03	96.70	3	15
Columbellidae (LPIL)	Mol	Gast	7	0.03	96.73	3	15
Okenia (LPIL)	Mol	Gast	7	0.03	96.77	1	5
Apoprionospio (LPIL)	Ann	Poly	6	0.03	96.80	3	15
Autolytus (LPIL)	Ann	Poly	6	0.03	96.83	1	5
Litocorsa antennata	Ann	Poly	6	0.03	96.86	5	25
Onuphis eremita	Ann	Poly	6	0.03	96.89	4	20
Prionospio cristata	Ann	Poly	6	0.03	96.91	1	5
Prionospio lighti	Ann	Poly	6	0.03	96.94	1	5
Syllis danieli	Ann	Poly	6	0.03	96.97	2	10
Terebellidae (LPIL)	Ann	Poly	6	0.03	97.00	3	15
Vermiliopsis annulata	Ann	Poly	6	0.03	97.03	3	15
Acanthohaustorius (LPIL)	Art	Mala	6	0.03	97.06	2	10
Ampeliscidae (LPIL)	Art	Mala	6	0.03	97.09	4	20
Leucon americanus	Art	Mala	6	0.03	97.12	2	10
Liljeborgia sp. A	Art	Mala	6	0.03	97.15	3	15
Listriella barnardi	Art	Mala	6	0.03	97.18	2	10
Paracaprella tenuis	Art	Mala	6	0.03	97.21	1	5
Phtisica marina	Art	Mala	6	0.03	97.24	5	25
Shoemakerella cubensis	Art	Mala	6	0.03	97.27	2	10
Thraciidae (LPIL)	Mol	Biva	6	0.03	97.30	4	20
Nassarius acutus	Mol	Gast	6	0.03	97.32	3	15
Odostomia sp. Q	Mol	Gast	6	0.03	97.35	1	5
Caulleriella sp. J	Ann	Poly	5	0.02	97.38	3	15
Cirrophorus (LPIL)	Ann	Poly	5	0.02	97.40	4	20
Dipolydora socialis	Ann	Poly	5	0.02	97.43	3	15
Dipolydora sp. B	Ann	Poly	5	0.02	97.45	3	15
Exogone (LPIL)	Ann	Poly	5	0.02	97.48	5	25
Leitoscoloplos robustus	Ann	Poly	5	0.02	97.50	2	10
Magelona papillicornis	Ann	Poly	5	0.02	97.52	4	20
Nephtyidae (LPIL)	Ann	Poly	5	0.02	97.55	2	10
Nereiphylla fragilis	Ann	Poly	5	0.02	97.57	3	15
Nereis falsa	Ann	Poly	5	0.02	97.60	3	15
Scolelepis texana	Ann	Poly	5	0.02	97.62	3	15
Syllis beneliahui	Ann	Poly	5	0.02	97.65	2	10
Synelmis (LPIL)	Ann	Poly	5	0.02	97.67	5	25
Bowmaniella portoricensis	Art	Mala	5	0.02	97.69	3	15
Cyclaspis (LPIL)	Art	Mala	5	0.02	97.72	4	20
Pinnotheridae (LPIL)	Art	Mala	5	0.02	97.74	4	20
Stenopleustes inermis	Art	Mala	5	0.02	97.77	1	5
Crenella divaricata	Mol	Biva	5	0.02	97.79	4	20
Melanella intermedia	Mol	Gast	5	0.02	97.82	4	20
Vitrinellidae (LPIL)	Mol	Gast	5	0.02	97.84	1	5
Apoprionospio pygmaea	Ann	Poly	4	0.02	97.86	1	5
Aricidea suecica	Ann	Poly	4	0.02	97.88	4	20
Eunice unifrons	Ann	Poly	4	0.02	97.90	2	10
Hesionidae (LPIL)	Ann	Poly	4	0.02	97.92	2	10
Lumbrineris latreilli	Ann	Poly	4	0.02	97.94	3	15
Odontosyllis enopla	Ann	Poly	4	0.02	97.96	1	5
Paraonis (LPIL)	Ann	Poly	4	0.02	97.98	2	10
Podarkeopsis levifuscina	Ann	Poly	4	0.02	98.00	3	15

Table 4 continued:

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
Sabellidae (LPIL)	Ann	Poly	4	0.02	98.02	2	10
Sigalion arenicola	Ann	Poly	4	0.02	98.04	2	10
Syllis maryae	Ann	Poly	4	0.02	98.06	1	5
Ampelisca vadorum	Art	Mala	4	0.02	98.07	1	5
Bathyporeia (LPIL)	Art	Mala	4	0.02	98.09	1	5
Chiridotea caeca	Art	Mala	4	0.02	98.11	2	10
Colomastix halichondriae	Art	Mala	4	0.02	98.13	1	5
Eurydice littoralis	Art	Mala	4	0.02	98.15	4	20
Parametopella cypris	Art	Mala	4	0.02	98.17	3	15
Synopiidae (LPIL)	Art	Mala	4	0.02	98.19	4	20
Xanthidae (LPIL)	Art	Mala	4	0.02	98.21	4	20
Hydrozoa (LPIL)	Cni	Hydr	4	0.02	98.23	4	20
Echinodermata (LPIL)	Ech	–	4	0.02	98.25	2	10
Asthenothaerus hemphilli	Mol	Biva	4	0.02	98.27	4	20
Crassinella (LPIL)	Mol	Biva	4	0.02	98.29	3	15
Crassostrea virginica	Mol	Biva	4	0.02	98.31	1	5
Ervilia concentrica	Mol	Biva	4	0.02	98.33	4	20
Orobitella sp. A	Mol	Biva	4	0.02	98.35	2	10
Caecum carolinianum	Mol	Gast	4	0.02	98.37	4	20
Cerithiidae (LPIL)	Mol	Gast	4	0.02	98.39	3	15
Sigatica carolinensis	Mol	Gast	4	0.02	98.41	3	15
Terebra concava	Mol	Gast	4	0.02	98.43	4	20
Aglaophamus verrilli	Ann	Poly	3	0.01	98.44	2	10
Boguea enigmatica	Ann	Poly	3	0.01	98.46	1	5
Eunice (LPIL)	Ann	Poly	3	0.01	98.47	2	10
Magelona pettiboneae	Ann	Poly	3	0.01	98.48	3	15
Megalomma (LPIL)	Ann	Poly	3	0.01	98.50	2	10
Mooreonuphis pallidula	Ann	Poly	3	0.01	98.51	1	5
Nereis pelagica	Ann	Poly	3	0.01	98.53	3	15
Notomastus latericeus	Ann	Poly	3	0.01	98.54	2	10
Opisthodonta sp. B	Ann	Poly	3	0.01	98.56	1	5
Petaloproctus (LPIL)	Ann	Poly	3	0.01	98.57	1	5
Podarke obscura	Ann	Poly	3	0.01	98.59	1	5
Rhodine (LPIL)	Ann	Poly	3	0.01	98.60	1	5
Scoloplos rubra	Ann	Poly	3	0.01	98.62	2	10
Ampelisca agassizi	Art	Mala	3	0.01	98.63	1	5
Argissa hamatipes	Art	Mala	3	0.01	98.65	2	10
Caprellidae (LPIL)	Art	Mala	3	0.01	98.66	2	10
Cerapus tubularis	Art	Mala	3	0.01	98.67	1	5
Cumacea (LPIL)	Art	Mala	3	0.01	98.69	3	15
Cyclaspis unicornis	Art	Mala	3	0.01	98.70	3	15
Deutella incerta	Art	Mala	3	0.01	98.72	2	10
Metatiron triocellatus	Art	Mala	3	0.01	98.73	2	10
Microcharon sp. A	Art	Mala	3	0.01	98.75	1	5
Microprotopus raneyi	Art	Mala	3	0.01	98.76	1	5
Monoculodes (LPIL)	Art	Mala	3	0.01	98.78	1	5
Ogyrides alphaerostris	Art	Mala	3	0.01	98.79	2	10
Pinnixa (LPIL)	Art	Mala	3	0.01	98.81	3	15
Spilocuma sp. A	Art	Mala	3	0.01	98.82	2	10
Corbula contracta	Mol	Biva	3	0.01	98.84	2	10
Lucina radians	Mol	Biva	3	0.01	98.85	1	5
Macoma tenta	Mol	Biva	3	0.01	98.86	2	10
Modiolus americanus	Mol	Biva	3	0.01	98.88	1	5
Semele bellastriata	Mol	Biva	3	0.01	98.89	3	15
Acteocina lepta	Mol	Gast	3	0.01	98.91	3	15
Marginella apicina	Mol	Gast	3	0.01	98.92	2	10
Marginellidae (LPIL)	Mol	Gast	3	0.01	98.94	2	10
Moelleria sp. A	Mol	Gast	3	0.01	98.95	2	10
Odostomia (LPIL)	Mol	Gast	3	0.01	98.97	1	5
Pyramidellidae (LPIL)	Mol	Gast	3	0.01	98.98	2	10
Stiliger vanellus	Mol	Gast	3	0.01	99.00	1	5
Strombiformis bilineatus	Mol	Gast	3	0.01	99.01	1	5
Ancistrosyllis jonesi	Ann	Poly	2	0.01	99.02	2	10
Aricidea (LPIL)	Ann	Poly	2	0.01	99.03	2	10
Aricidea sp. H	Ann	Poly	2	0.01	99.04	2	10
Armandia agilis	Ann	Poly	2	0.01	99.05	2	10

Table 4 continued:

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
Branchiosyllis exilis	Ann	Poly	2	0.01	99.06	1	5
Branchiosyllis oculata	Ann	Poly	2	0.01	99.07	1	5
Eunicidae (LPIL)	Ann	Poly	2	0.01	99.08	2	10
Fimbriosthenelais (LPIL)	Ann	Poly	2	0.01	99.09	2	10
Glycera dibranchiata	Ann	Poly	2	0.01	99.10	2	10
Hydroides dianthus	Ann	Poly	2	0.01	99.11	1	5
Laonice cirrata	Ann	Poly	2	0.01	99.12	2	10
Leitoscoloplos fragilis	Ann	Poly	2	0.01	99.13	1	5
Lumbrineridae (LPIL)	Ann	Poly	2	0.01	99.14	2	10
Macrochaeta sp. A	Ann	Poly	2	0.01	99.15	2	10
Microphthalmus hartmanae	Ann	Poly	2	0.01	99.16	2	10
Microspio pigmentata	Ann	Poly	2	0.01	99.17	1	5
Nematonereis hebes	Ann	Poly	2	0.01	99.18	2	10
Nereis acuminata	Ann	Poly	2	0.01	99.19	2	10
Nereis micromma	Ann	Poly	2	0.01	99.20	2	10
Paraonidae (LPIL)	Ann	Poly	2	0.01	99.21	2	10
Paraprionospio pinnata	Ann	Poly	2	0.01	99.22	1	5
Pherusa inflata	Ann	Poly	2	0.01	99.23	1	5
Polydora cornuta	Ann	Poly	2	0.01	99.23	2	10
Scolelepis (LPIL)	Ann	Poly	2	0.01	99.24	2	10
Scoletoma ernesti	Ann	Poly	2	0.01	99.25	1	5
Travisia parva	Ann	Poly	2	0.01	99.26	2	10
Amphilochus casahoya	Art	Mala	2	0.01	99.27	2	10
Carpias bermudensis	Art	Mala	2	0.01	99.28	1	5
Erichsonella filiformis	Art	Mala	2	0.01	99.29	1	5
Eurypanopeus depressus	Art	Mala	2	0.01	99.30	1	5
Hippolytidae (LPIL)	Art	Mala	2	0.01	99.31	2	10
Iphimedia zora	Art	Mala	2	0.01	99.32	1	5
Isaeidae (LPIL)	Art	Mala	2	0.01	99.33	2	10
Kalliapseudes sp. C	Art	Mala	2	0.01	99.34	2	10
Liljeborgiidae (LPIL)	Art	Mala	2	0.01	99.35	1	5
Majidae (LPIL)	Art	Mala	2	0.01	99.36	1	5
Metoporhaphis calcarata	Art	Mala	2	0.01	99.37	1	5
Oedicerotidae (LPIL)	Art	Mala	2	0.01	99.38	2	10
Pinnixa cristata	Art	Mala	2	0.01	99.39	1	5
Processa (LPIL)	Art	Mala	2	0.01	99.40	2	10
Ptilanthura tenuis	Art	Mala	2	0.01	99.41	2	10
Unciola (LPIL)	Art	Mala	2	0.01	99.42	1	5
Aplacophora (LPIL)	Mol	Apla	2	0.01	99.43	2	10
Anodontia alba	Mol	Biva	2	0.01	99.44	1	5
Brachidontes exustus	Mol	Biva	2	0.01	99.45	1	5
Carditidae (LPIL)	Mol	Biva	2	0.01	99.46	2	10
Chione intapurpurea	Mol	Biva	2	0.01	99.47	2	10
Verticordia ornata	Mol	Biva	2	0.01	99.48	2	10
Acteocina canaliculata	Mol	Gast	2	0.01	99.49	1	5
Epitonium (LPIL)	Mol	Gast	2	0.01	99.50	2	10
Olivella (LPIL)	Mol	Gast	2	0.01	99.51	2	10
Olivella mutica	Mol	Gast	2	0.01	99.52	1	5
Scaphandridae (LPIL)	Mol	Gast	2	0.01	99.53	1	5
Ancistrosyllis (LPIL)	Ann	Poly	1	0.00	99.53	1	5
Ancistrosyllis hartmanae	Ann	Poly	1	0.00	99.54	1	5
Aricidea taylori	Ann	Poly	1	0.00	99.54	1	5
Ceratonereis (LPIL)	Ann	Poly	1	0.00	99.55	1	5
Cirrophorus lyra	Ann	Poly	1	0.00	99.55	1	5
Dipolydora (LPIL)	Ann	Poly	1	0.00	99.56	1	5
Dispio uncinata	Ann	Poly	1	0.00	99.56	1	5
Eulepethidae (LPIL)	Ann	Poly	1	0.00	99.57	1	5
Glycera sphyrabrancha	Ann	Poly	1	0.00	99.57	1	5
Glycinde solitaria	Ann	Poly	1	0.00	99.58	1	5
Haplosyllis spongicola	Ann	Poly	1	0.00	99.58	1	5
Loimia medusa	Ann	Poly	1	0.00	99.59	1	5
Lumbrineriopsis gardineri	Ann	Poly	1	0.00	99.59	1	5
Lumbrineris (LPIL)	Ann	Poly	1	0.00	99.60	1	5
Lysidice notata	Ann	Poly	1	0.00	99.60	1	5
Magelona sp. B	Ann	Poly	1	0.00	99.61	1	5
Marphysa sanguinea	Ann	Poly	1	0.00	99.61	1	5

Table 4 continued:

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
Melinna maculata	Ann	Poly	1	0.00	99.61	1	5
Mooreonuphis nebulosa	Ann	Poly	1	0.00	99.62	1	5
Nereis (LPIL)	Ann	Poly	1	0.00	99.62	1	5
Opheliidae (LPIL)	Ann	Poly	1	0.00	99.63	1	5
Paramphinome sp. B	Ann	Poly	1	0.00	99.63	1	5
Pionosyllis (LPIL)	Ann	Poly	1	0.00	99.64	1	5
Saccocirridae (LPIL)	Ann	Poly	1	0.00	99.64	1	5
Schistomeringos pectinata	Ann	Poly	1	0.00	99.65	1	5
Sigalionidae (LPIL)	Ann	Poly	1	0.00	99.65	1	5
Sigambra bassi	Ann	Poly	1	0.00	99.66	1	5
Sigambra tentaculata	Ann	Poly	1	0.00	99.66	1	5
Sphaerodoropsis vittori	Ann	Poly	1	0.00	99.67	1	5
Syllides bansei	Ann	Poly	1	0.00	99.67	1	5
Albunea paretii	Art	Mala	1	0.00	99.68	1	5
Amphipoda (LPIL)	Art	Mala	1	0.00	99.68	1	5
Anthuridae (LPIL)	Art	Mala	1	0.00	99.69	1	5
Bateidae (LPIL)	Art	Mala	1	0.00	99.69	1	5
Campylaspis sp. E	Art	Mala	1	0.00	99.70	1	5
Campylaspis sp. M	Art	Mala	1	0.00	99.70	1	5
Campylaspis sp. O	Art	Mala	1	0.00	99.71	1	5
Cerapus (LPIL)	Art	Mala	1	0.00	99.71	1	5
Cyclaspis varians	Art	Mala	1	0.00	99.72	1	5
Cymadusa compta	Art	Mala	1	0.00	99.72	1	5
Euceramus praelongus	Art	Mala	1	0.00	99.73	1	5
Horoloanthura irpex	Art	Mala	1	0.00	99.73	1	5
Lembos (LPIL)	Art	Mala	1	0.00	99.74	1	5
Listriella carinata	Art	Mala	1	0.00	99.74	1	5
Macrocoeloma camptocerum	Art	Mala	1	0.00	99.75	1	5
Maera caroliniana	Art	Mala	1	0.00	99.75	1	5
Mysidae (LPIL)	Art	Mala	1	0.00	99.76	1	5
Pinnixa chaetopterana	Art	Mala	1	0.00	99.76	1	5
Pleustidae (LPIL)	Art	Mala	1	0.00	99.77	1	5
Polyceria antarctica	Art	Mala	1	0.00	99.77	1	5
Rimakoroga floridana	Art	Mala	1	0.00	99.78	1	5
Serolis mgrayi	Art	Mala	1	0.00	99.78	1	5
Gorgonia (LPIL)	Cni	Anth	1	0.00	99.79	1	5
Astropecten articulatus	Ech	Aste	1	0.00	99.79	1	5
Encope (LPIL)	Ech	Echi	1	0.00	99.80	1	5
Leodia sexiesperforata	Ech	Echi	1	0.00	99.80	1	5
Schizasteridae Genus A	Ech	Echi	1	0.00	99.81	1	5
Thyonella pervicax	Ech	Holo	1	0.00	99.81	1	5
Corbula (LPIL)	Mol	Biva	1	0.00	99.81	1	5
Ensis (LPIL)	Mol	Biva	1	0.00	99.82	1	5
Gastrochaenidae (LPIL)	Mol	Biva	1	0.00	99.82	1	5
Gouldia cerina	Mol	Biva	1	0.00	99.83	1	5
Hiatella arctica	Mol	Biva	1	0.00	99.83	1	5
Mactridae (LPIL)	Mol	Biva	1	0.00	99.84	1	5
Pteromeris perplana	Mol	Biva	1	0.00	99.84	1	5
Semelidae (LPIL)	Mol	Biva	1	0.00	99.85	1	5
Solenidae (LPIL)	Mol	Biva	1	0.00	99.85	1	5
Tellina listeri	Mol	Biva	1	0.00	99.86	1	5
Buccinidae (LPIL)	Mol	Gast	1	0.00	99.86	1	5
Caecidae (LPIL)	Mol	Gast	1	0.00	99.87	1	5
Calliostoma pulchrum	Mol	Gast	1	0.00	99.87	1	5
Dentimargo aureocincta	Mol	Gast	1	0.00	99.88	1	5
Diodora cayenensis	Mol	Gast	1	0.00	99.88	1	5
Epitonium multistriatum	Mol	Gast	1	0.00	99.89	1	5
Hindsiclava alesidota	Mol	Gast	1	0.00	99.89	1	5
Kurtziella limonitella	Mol	Gast	1	0.00	99.90	1	5
Lucapinella limatula	Mol	Gast	1	0.00	99.90	1	5
Mitrella (LPIL)	Mol	Gast	1	0.00	99.91	1	5
Niso aeglees	Mol	Gast	1	0.00	99.91	1	5
Nudibranchia (LPIL)	Mol	Gast	1	0.00	99.92	1	5
Odostomia gibbosa	Mol	Gast	1	0.00	99.92	1	5
Oliva sayana	Mol	Gast	1	0.00	99.93	1	5
Olividae (LPIL)	Mol	Gast	1	0.00	99.93	1	5

Table 4 continued:

Taxon Name	Phylum	Class	No. of Individuals	% Total	Cumulative %	Station Occurrence	Station % Occurrence
Pleuroploca gigantea	Mol	Gast	1	0.00	99.94	1	5
Rissoidae (LPIL)	Mol	Gast	1	0.00	99.94	1	5
Simnia uniplicata	Mol	Gast	1	0.00	99.95	1	5
Sinum perspectivum	Mol	Gast	1	0.00	99.95	1	5
Strombiformis (LPIL)	Mol	Gast	1	0.00	99.96	1	5
Strombiformis auricinctus	Mol	Gast	1	0.00	99.96	1	5
Strombiformis hemphilli	Mol	Gast	1	0.00	99.97	1	5
Trochidae (LPIL)	Mol	Gast	1	0.00	99.97	1	5
Turbonilla (LPIL)	Mol	Gast	1	0.00	99.98	1	5
Turbonilla conradi	Mol	Gast	1	0.00	99.98	1	5
Turbonilla interrupta	Mol	Gast	1	0.00	99.99	1	5
Turridae (LPIL)	Mol	Gast	1	0.00	99.99	1	5
Graptacme calamus	Mol	Scap	1	0.00	100.00	1	5
Scaphopoda (LPIL)	Mol	Scap	1	0.00	100.00	1	5

Taxa Key

Ann = Annelida
- Olig = Oligochaeta
- Poly = Polychaeta

Art = Arthropoda
- Mala = Malacostraca

Bra = Brachiopoda

Bry = Bryozoa

Cho = Chordata
- Asci = Ascidiacea
- Lept = Leptocardia

Cni = Cnidaria
- Anth = Anthozoa
- Hydr = Hydrozoa

Ech = Echinodermata
- Aste = Asteroidea
- Echi = Echinoidea
- Holo = Holothuroidea
- Ophi = Ophiuroidea

Mol = Mollusca
- Apla = Aplacophora
- Biva = Bivalvia
- Gast = Gastropoda
- Poly = Polyplacophora
- Scap = Scaphopoda

Pho = Phoronida

Rhy = Rhynchocoela
- Anop = Anopla

Sip = Sipuncula

Table 5. Percent abundance of dominant taxa (> 10% of the total assemblage) for the Gray's Reef stations, April 2001.

Taxon Name	1	10	11	12	14	17	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Annelida																				
Polychaeta																				
Eumida sanguinea							11.1													
Fabricinuda trilobata						36.5														
Mediomastus (LPIL)												26.1	21.4			60.4	34.6			
Mediomastus ambiseta																10.4				
Owenia fusiformis																	13.5			
Polycirrus eximius							39.2					22.4								
Protodorvillea kefersteini				14.2																
Spio pettiboneae					12.4															
Spiophanes bombyx	11.6		10.9					25.3							10.3		10.6			
Tharyx acutus												17.3								
Arthropoda																				
Malacostraca																				
Erichthonius brasiliensis				12.3																
Eudevenopus honduranus														10.7						
Oxyurostylis smithi								18.5					16.8							
Phoxocephalidae (LPIL)														14.4						
Protohaustorius wigleyi														19.8						
Chordata																				
Leptocardia																				
Branchiostoma (LPIL)		11.1													10.9				12.5	
Echinodermata																				
Echinoidea																				
Echinoidea (LPIL)										10.0										
Mollusca																				
Bivalvia																				
Crassinella dupliniana											22.8							17.5		
Crassinella lunulata	12.9																			
Tellina (LPIL)								10.7												
Gastropoda																				
Caecum johnsoni																			26.2	

Table 6. Summary of benthic macrofaunal data for the Gray's Reef stations, April 2001.

Station	Rep	No. of Taxa	No. of Indvs	Density (no/m^2)	Mean No. Taxa	Taxa (SD)	Mean Density	Density (SD)	Total No. Taxa	Total No, Individuals	H' Diversity	J' Evenness
1	1	41	130	3250	41.3	4.5	3091.7	137.7	77	371	3.61	0.83
	2	46	120	3000								
	3	37	121	3025								
10	1	81	412	10300	71.3	8.4	9841.7	1782.3	125	1181	3.89	0.81
	2	66	454	11350								
	3	67	315	7875								
11	1	39	135	3375	42.0	2.6	3125.0	238.5	79	375	3.83	0.88
	2	43	116	2900								
	3	44	124	3100								
12	1	114	1037	25925	89.0	23.3	16883.3	7865.0	170	2026	3.85	0.75
	2	85	465	11625								
	3	68	524	13100								
14	1	53	176	4400	51.7	4.2	4375.0	213.6	91	525	3.73	0.83
	2	47	166	4150								
	3	55	183	4575								
17	1	75	819	20475	70.3	13.6	15758.3	6283.8	122	1891	3.04	0.63
	2	81	727	18175								
	3	55	345	8625								
21	1	59	536	13400	38.7	18.2	9033.3	4050.1	71	1084	2.71	0.64
	2	33	332	8300								
	3	24	216	5400								
22	1	21	81	2025	17.7	3.5	1941.7	357.4	31	233	2.49	0.72
	2	18	62	1550								
	3	14	90	2250								
23	1	29	89	2225	35.0	15.9	3050.0	1672.8	81	366	3.68	0.84
	2	53	199	4975								
	3	23	78	1950								
24	1	42	195	4875	37.7	4.5	3583.3	1230.4	79	430	3.61	0.83
	2	38	138	3450								
	3	33	97	2425								
25	1	35	110	2750	37.0	2.6	3033.3	387.6	65	364	3.37	0.81
	2	36	115	2875								
	3	40	139	3475								
26	1	62	1484	37100	54.7	11.8	28591.7	10702.8	91	3431	2.43	0.54
	2	61	1284	32100								
	3	41	663	16575								
27	1	30	153	3825	34.3	4.0	5500.0	1662.6	69	660	2.92	0.69
	2	38	221	5525								
	3	35	286	7150								
28	1	16	70	1750	17.0	4.6	2025.0	263.4	39	243	2.87	0.78
	2	22	91	2275								
	3	13	82	2050								
29	1	51	157	3925	43.0	11.4	2758.3	1320.4	86	331	3.81	0.86
	2	48	121	3025								
	3	30	53	1325								
30	1	26	440	11000	29.7	4.7	13950.0	2833.3	56	1674	1.69	0.42
	2	35	568	14200								
	3	28	666	16650								
31	1	55	459	11475	56.3	4.9	13975.0	5494.5	93	1677	2.71	0.60
	2	53	407	10175								
	3	62	811	20275								
32	1	61	211	5275	56.3	3.5	4725.0	507.4	107	567	3.74	0.80
	2	56	171	4275								
	3	53	185	4625								
33	1	55	717	17925	57.0	6.2	17491.7	1522.0	94	2099	2.95	0.65
	2	52	632	15800								
	3	64	750	18750								
34	1	67	318	7950	67.0	14.0	8250.0	1547.0	118	990	3.74	0.78
	2	53	275	6875								
	3	81	397	9925								

Table 7. Two-way matrix of stations and the 25 most abundant taxa for the Gray's Reef stations, April 2001.

	1	**10**	**11**	**12**	**14**	**17**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**
Bhawania goodei	0	37	0	52	10	55	0	0	0	0	0	0	0	0	0	0	0	0	1	9
Branchiostoma (LPIL)	18	131	10	1	12	5	0	0	0	6	11	0	0	1	36	1	0	4	263	66
Caecum johnsoni	16	71	4	14	24	70	4	0	8	7	3	0	2	1	9	0	0	36	550	90
Crassinella dupliniana	0	26	14	2	20	5	0	0	21	7	83	0	0	0	4	0	0	99	51	41
Erichthonius brasiliensis	0	0	6	249	1	0	5	0	0	1	12	1	0	1	2	0	2	1	1	0
Eumida sanguinea	0	0	0	0	0	0	120	0	0	0	0	15	0	0	0	0	29	1	1	3
Exogone rolani	2	50	0	42	4	51	24	0	1	0	0	115	1	0	1	0	0	1	9	0
Fabricinuda trilobata	0	8	0	41	0	690	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goniadides carolinae	2	3	2	52	4	44	0	0	0	1	0	0	0	0	1	0	0	1	47	23
Mediomastus ambiseta	0	0	0	0	0	0	0	0	0	0	0	77	47	0	0	174	97	0	0	0
Onuphidae (LPIL)	3	43	1	6	7	62	0	0	0	3	3	2	4	1	1	0	2	0	14	25
Owenia fusiformis	0	3	1	2	0	3	0	0	0	1	2	0	30	0	1	0	226	3	0	1
Oxyurostylis smithi	6	4	8	9	3	0	13	43	4	17	24	22	111	1	5	1	100	1	2	7
Parapionosyllis longicirrata	9	17	6	7	11	4	3	0	0	4	16	5	0	0	10	0	0	24	159	38
Polycirrus eximius	0	0	0	0	0	0	425	0	0	0	0	770	0	0	1	0	4	0	16	0
Protodorvillea kefersteini	19	10	20	288	29	84	0	0	0	1	6	0	0	0	14	0	0	5	41	94
Rhynchocoela (LPIL)	7	23	4	34	10	25	11	6	1	6	0	19	2	3	8	15	35	10	32	54
Rictaxis punctostriatus	0	35	6	3	17	23	0	6	1	8	3	1	14	2	4	0	2	11	4	23
Sipuncula (LPIL)	3	35	3	51	14	23	3	1	3	2	0	1	2	0	0	0	18	1	23	0
Sphaerosyllis piriferopsis	0	42	0	4	38	31	0	0	0	0	0	0	0	0	0	0	0	8	141	36
Spio pettiboneae	5	24	16	3	65	15	0	0	0	10	6	1	0	0	10	0	1	1	29	74
Spiophanes bombyx	43	40	41	49	44	73	14	59	20	37	25	132	52	9	34	73	177	19	47	35
Streblospio benedicti	0	0	0	0	0	0	3	0	0	0	0	227	0	0	0	110	0	0	0	0
Tharyx acutus	0	0	0	0	0	0	0	0	0	0	0	595	0	0	0	83	26	0	0	0
Tubificidae (LPIL)	8	45	14	103	10	120	18	0	3	11	7	101	0	1	12	56	1	33	192	29

Figure 1. Locations of the Gray's Reef stations, April 2001.

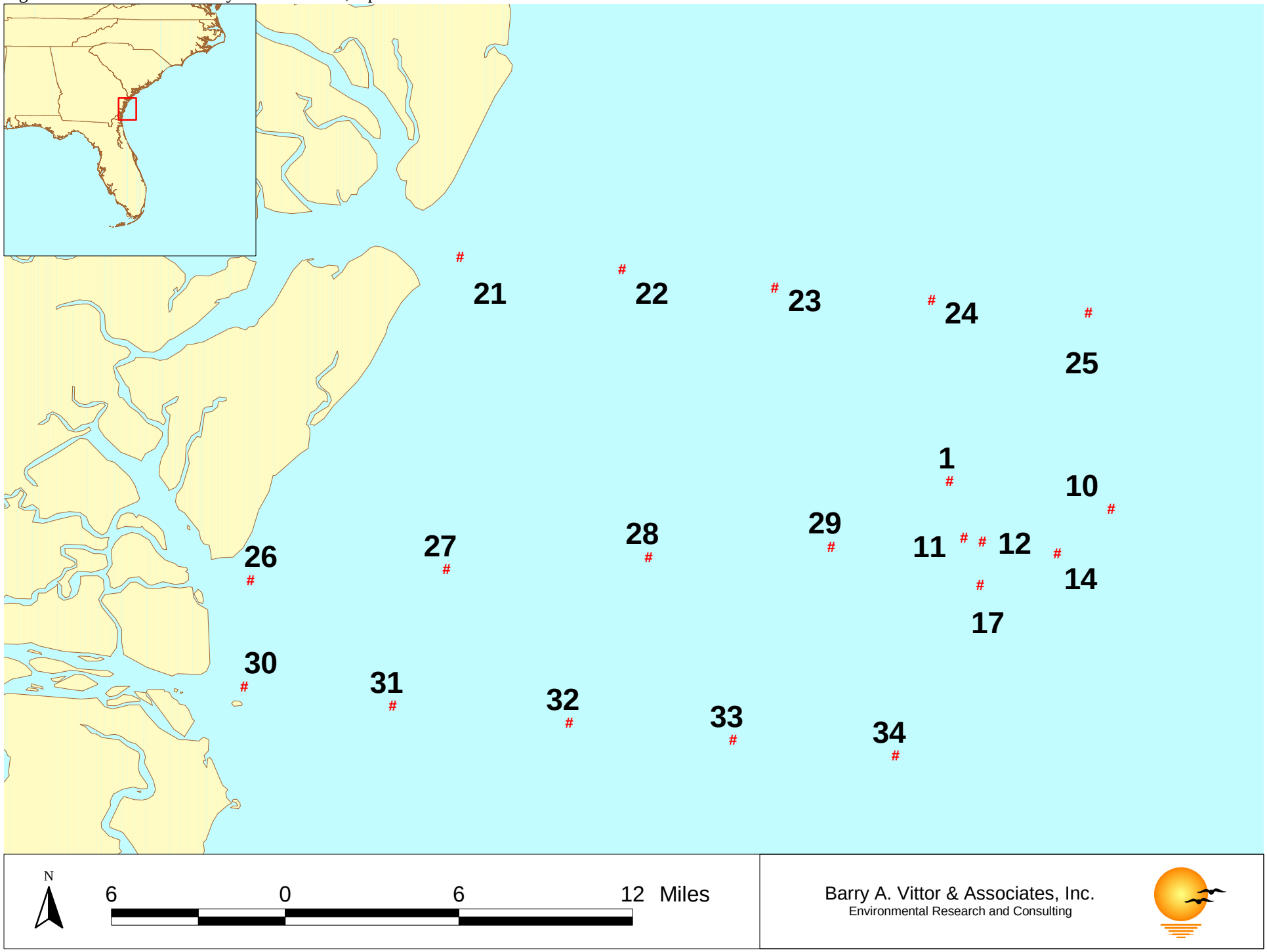


Figure 2. Sediment composition for the the Gray's Reef stations, April 2001.

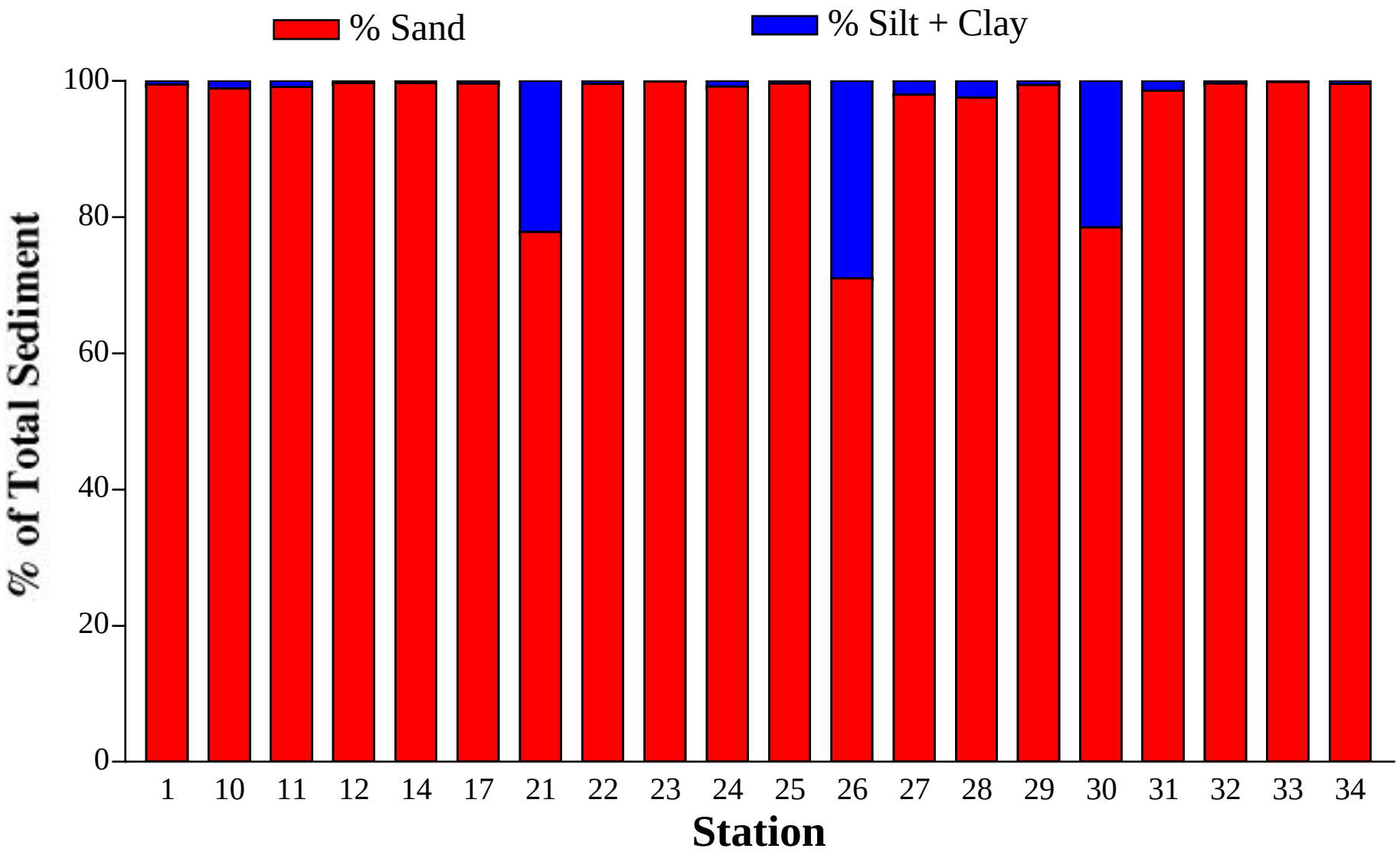


Figure 3. Spatial distribution of sediments for the Gray's Reef stations, April 2001.

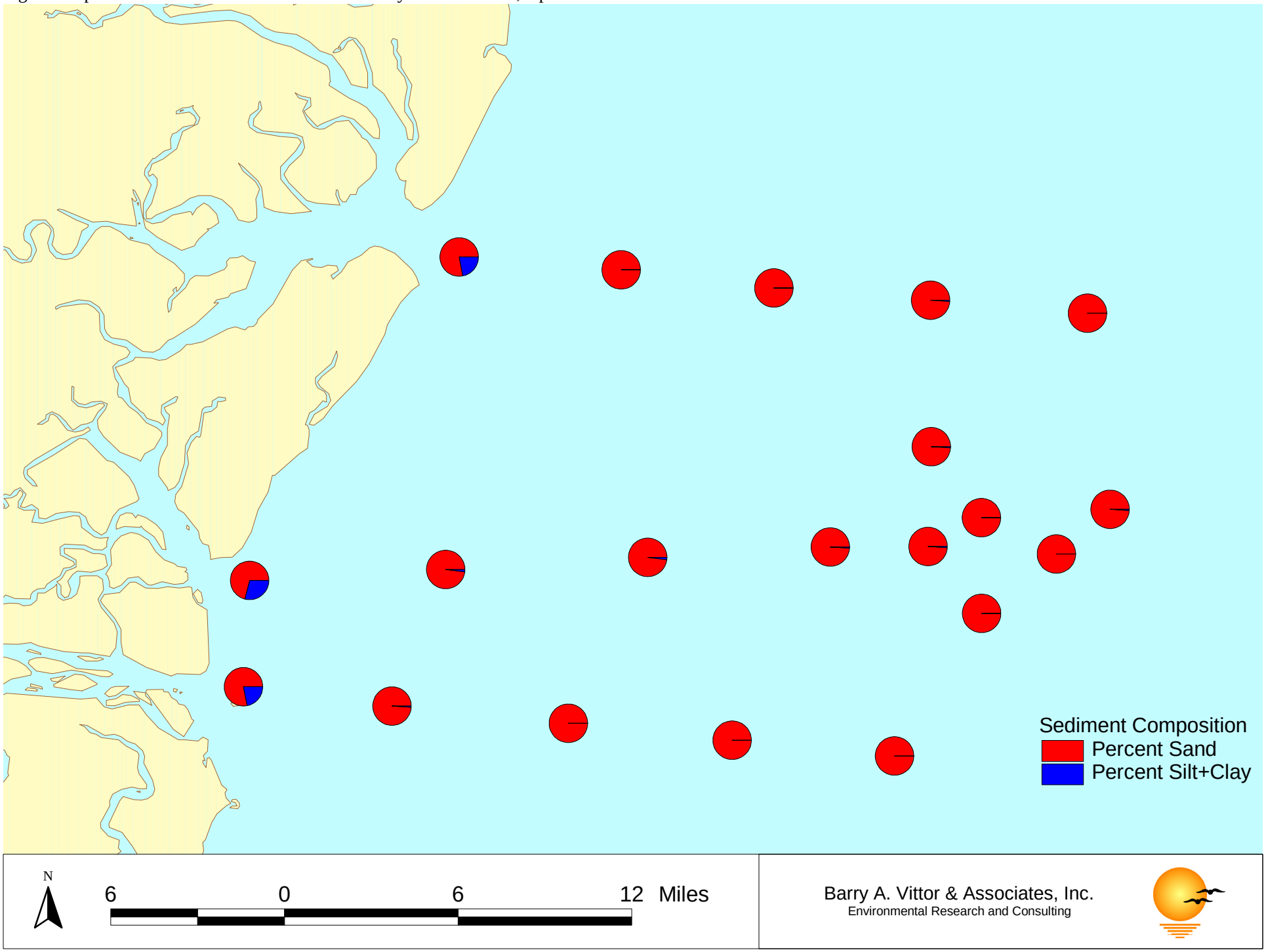


Figure 4. Sediment percent total organic carbon (TOC) for the the Gray's Reef stations, April 2001.

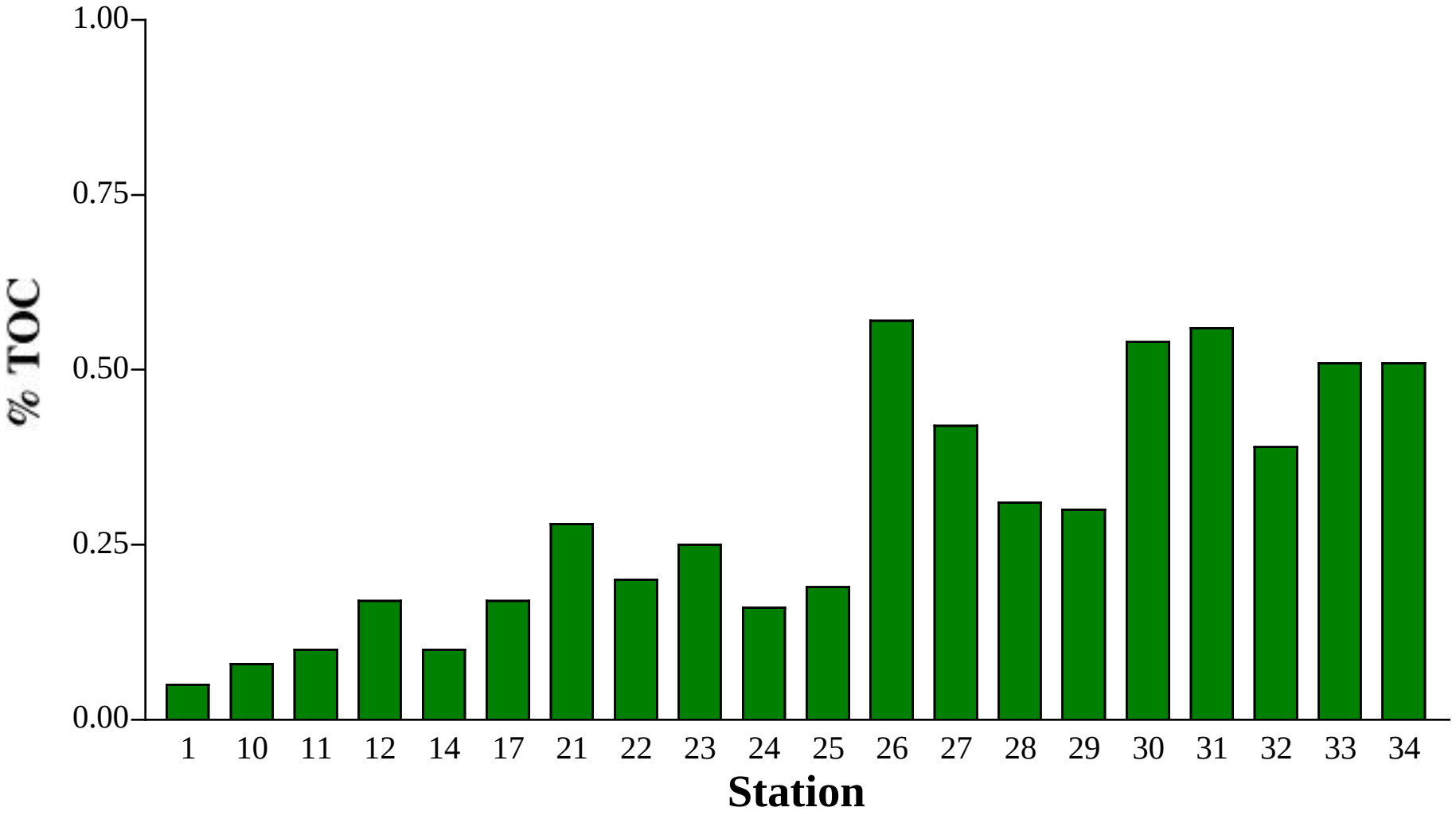


Figure 5. Percent abundance of major taxonomic groups for the Gray's Reef stations, April 2001.

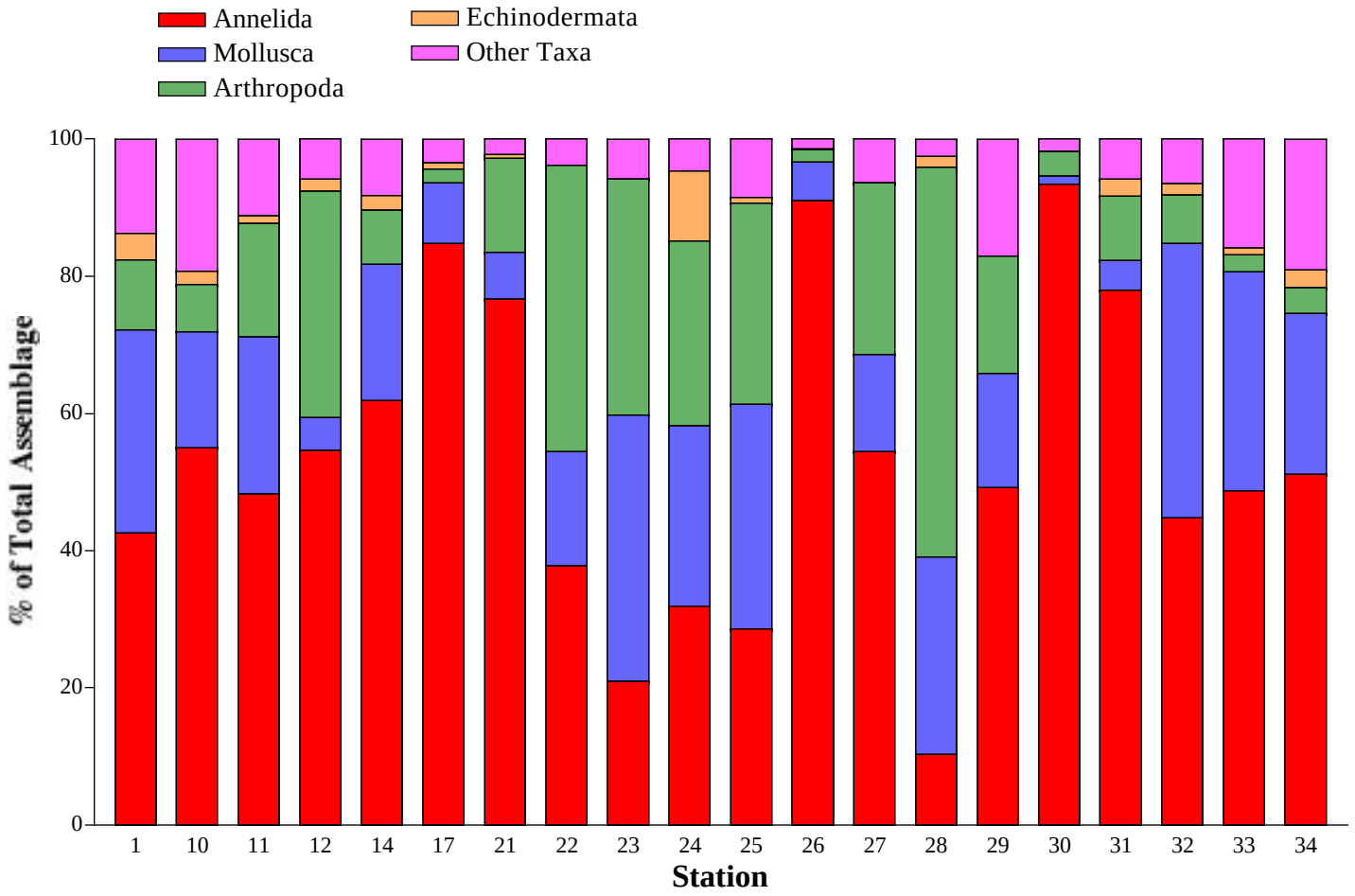


Figure 6. Spatial distribution of of major taxonomic groups for the Gray's Reef stations, April 2001.

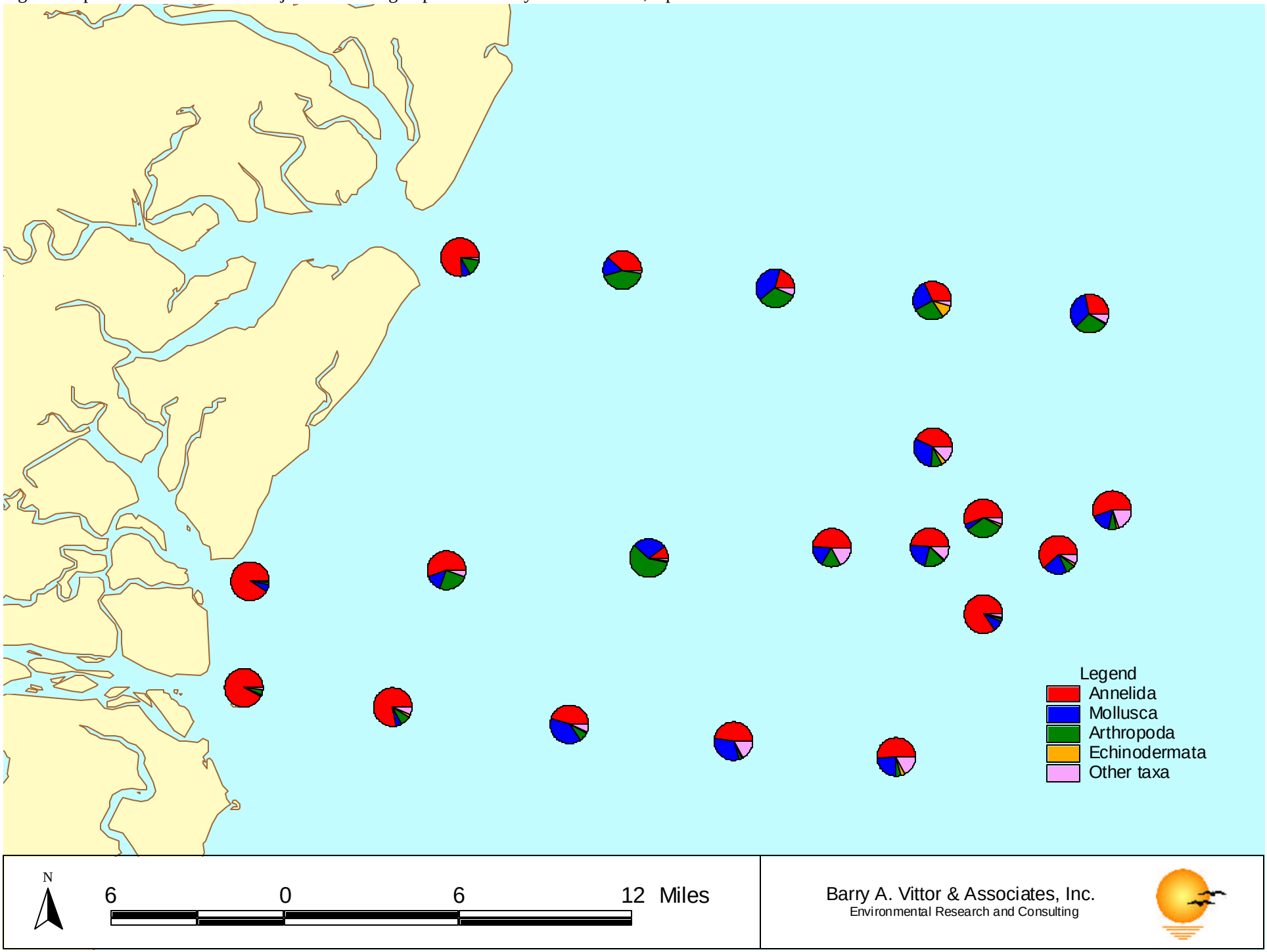


Figure 7. Taxa richness data for the the Gray's Reef stations, April 2001.

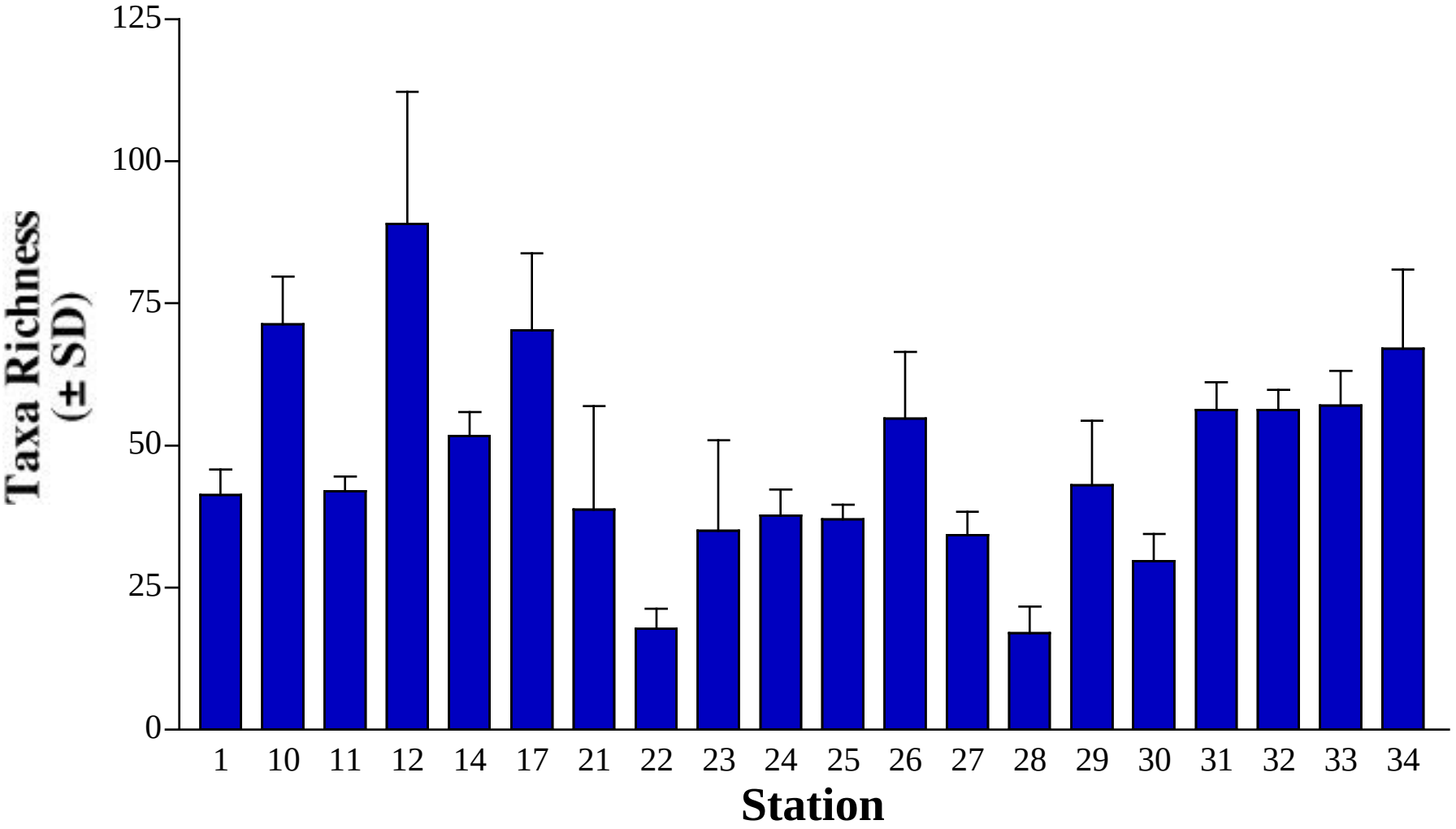


Figure 8. Spatial distribution of taxa richness for the Gray's Reef stations, April 2001.

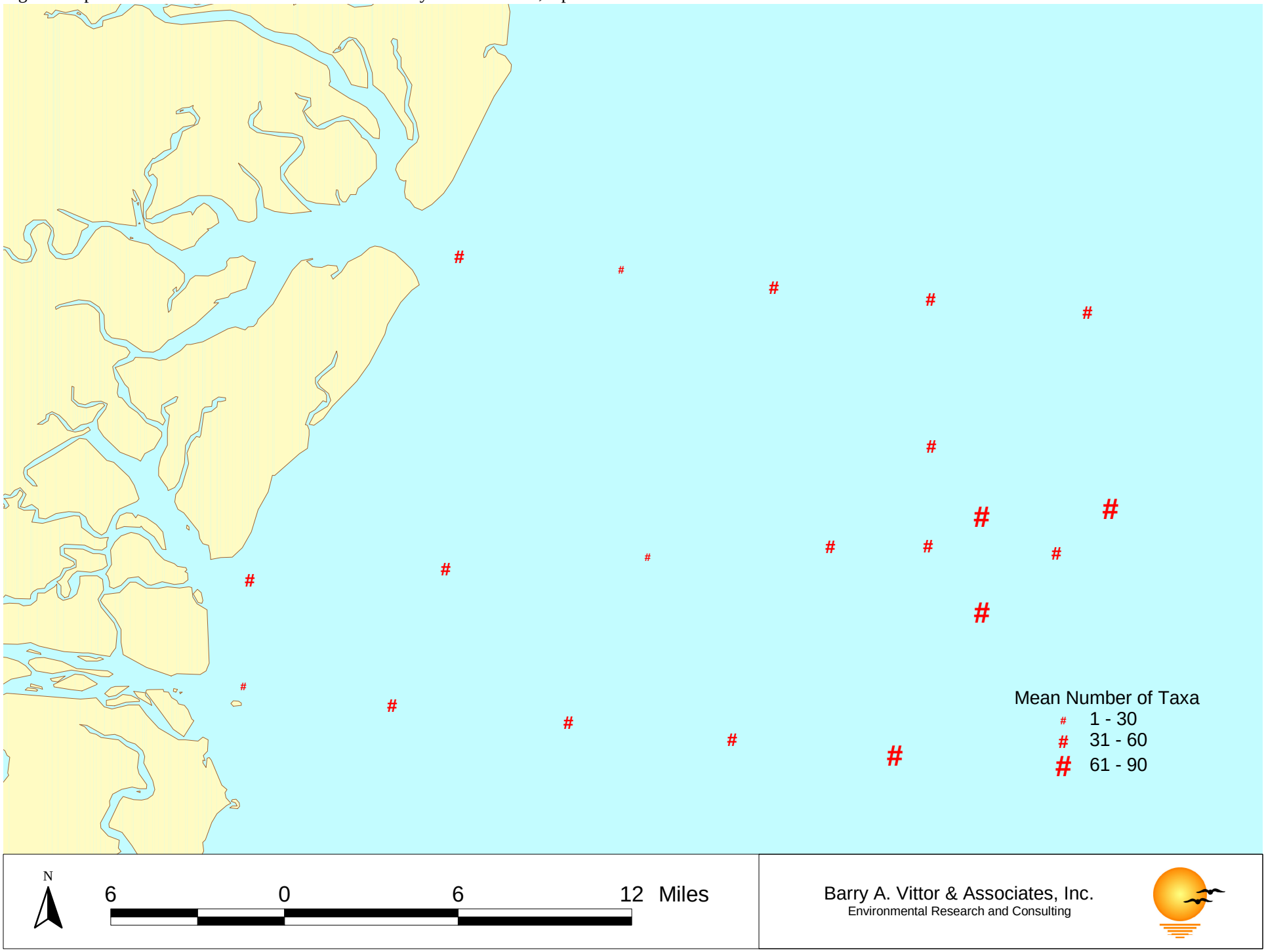


Figure 9. Mean macroinvertebrate density data for the the Gray's Reef stations, April 2001.

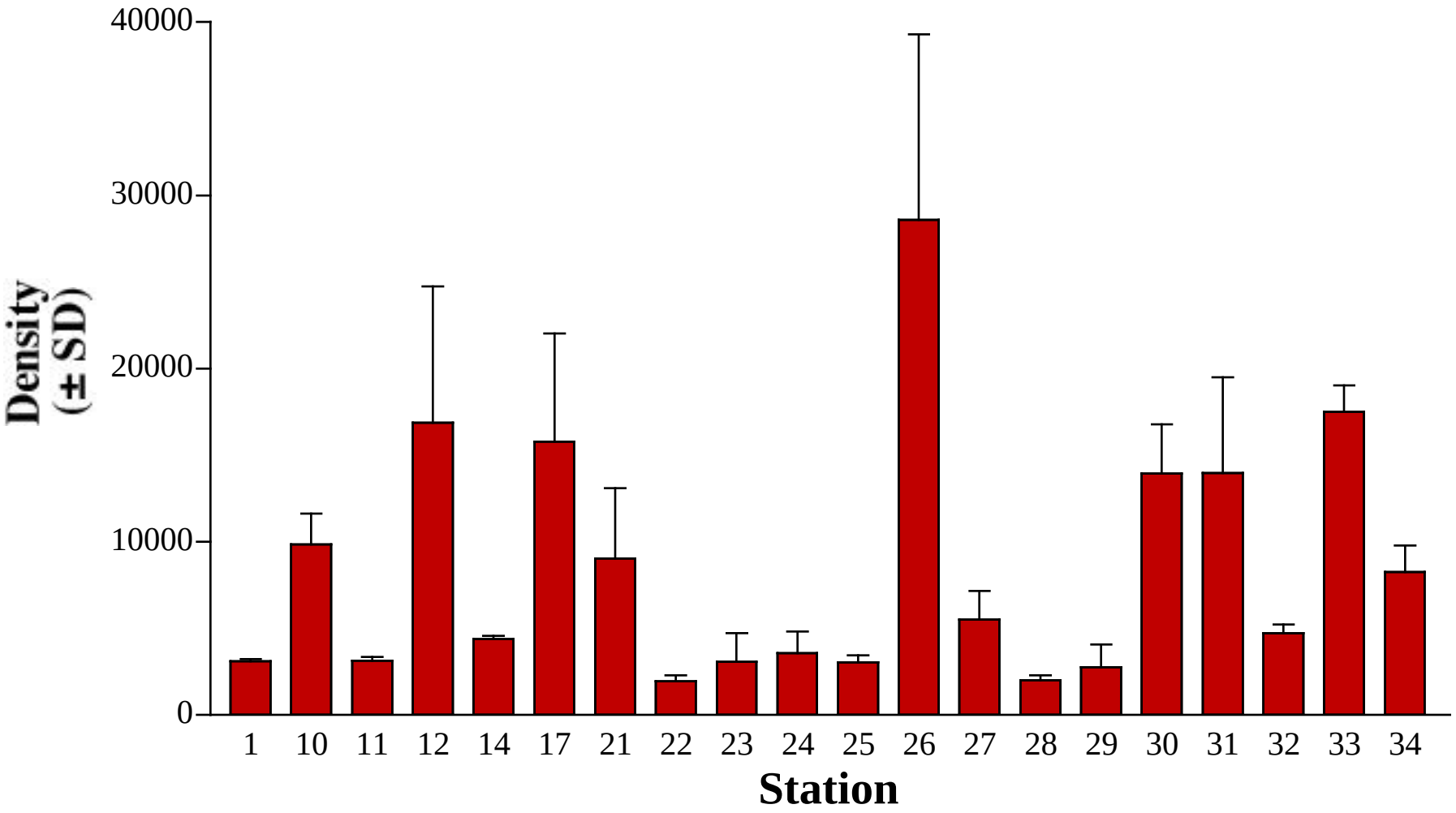


Figure 10. Spatial distribution of macroinvertebrate densities for the Gray's Reef stations, April 2001.

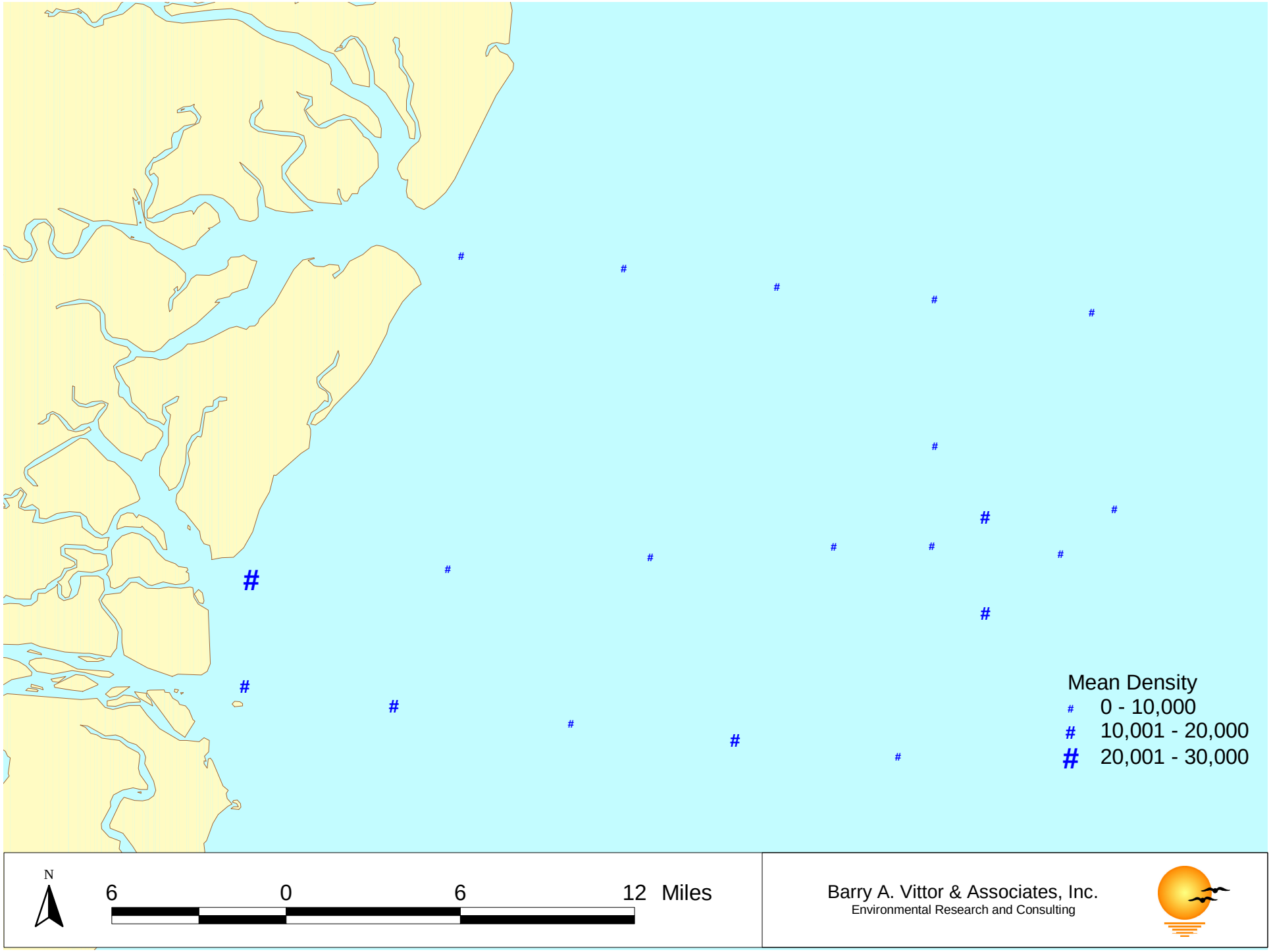
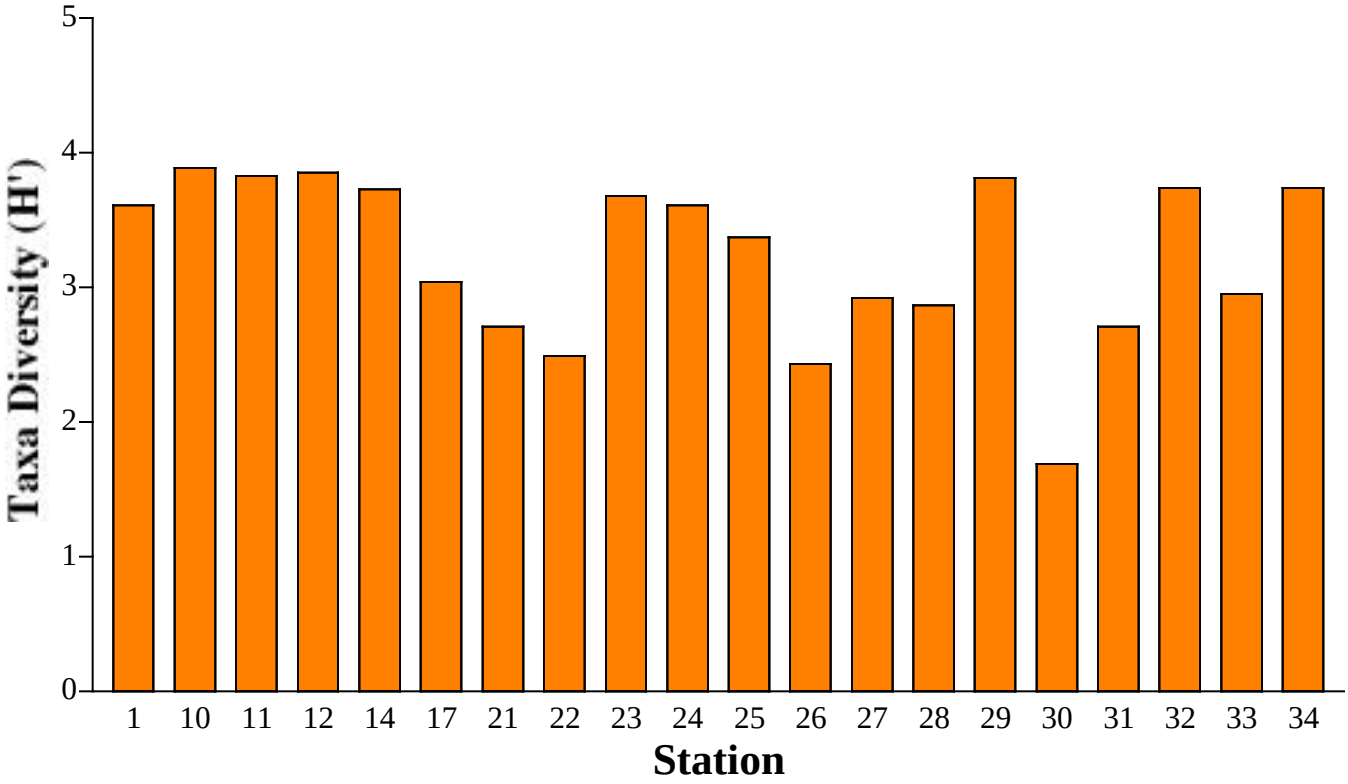


Figure 11. Taxa diversity (H') and evenness (J') data for the Gray's Reef stations, April 2001.



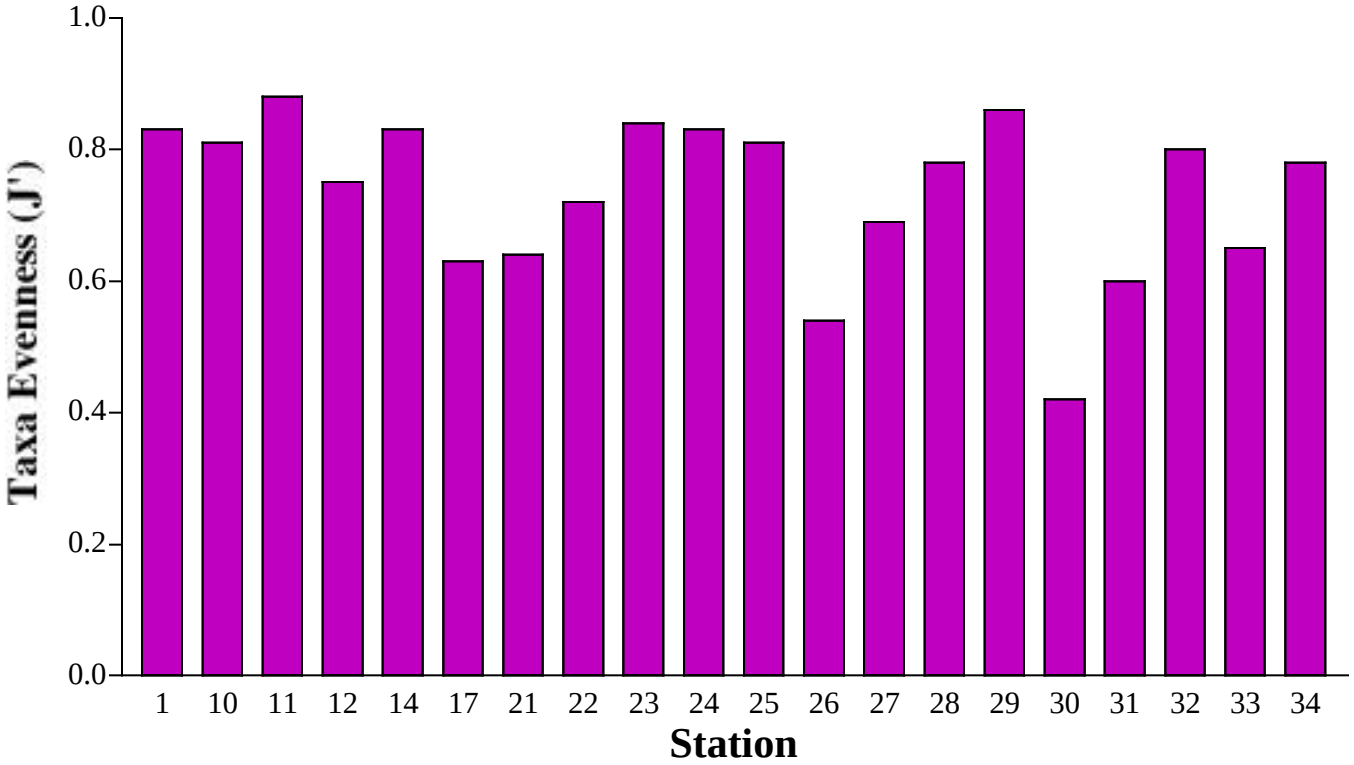


Figure 12. Station dendrogram from the cluster analysis for the Gray's Reef stations, April 2001.

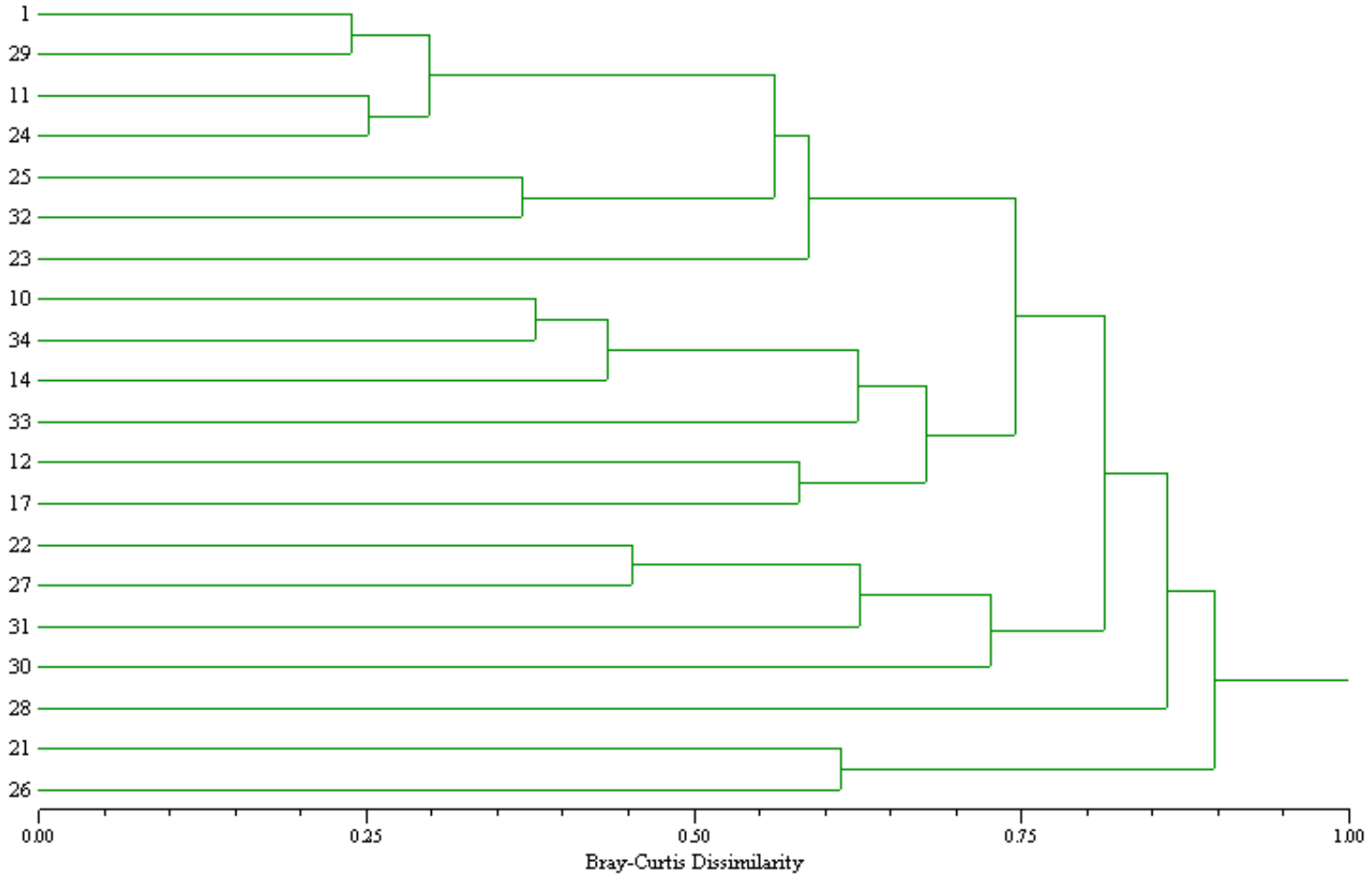
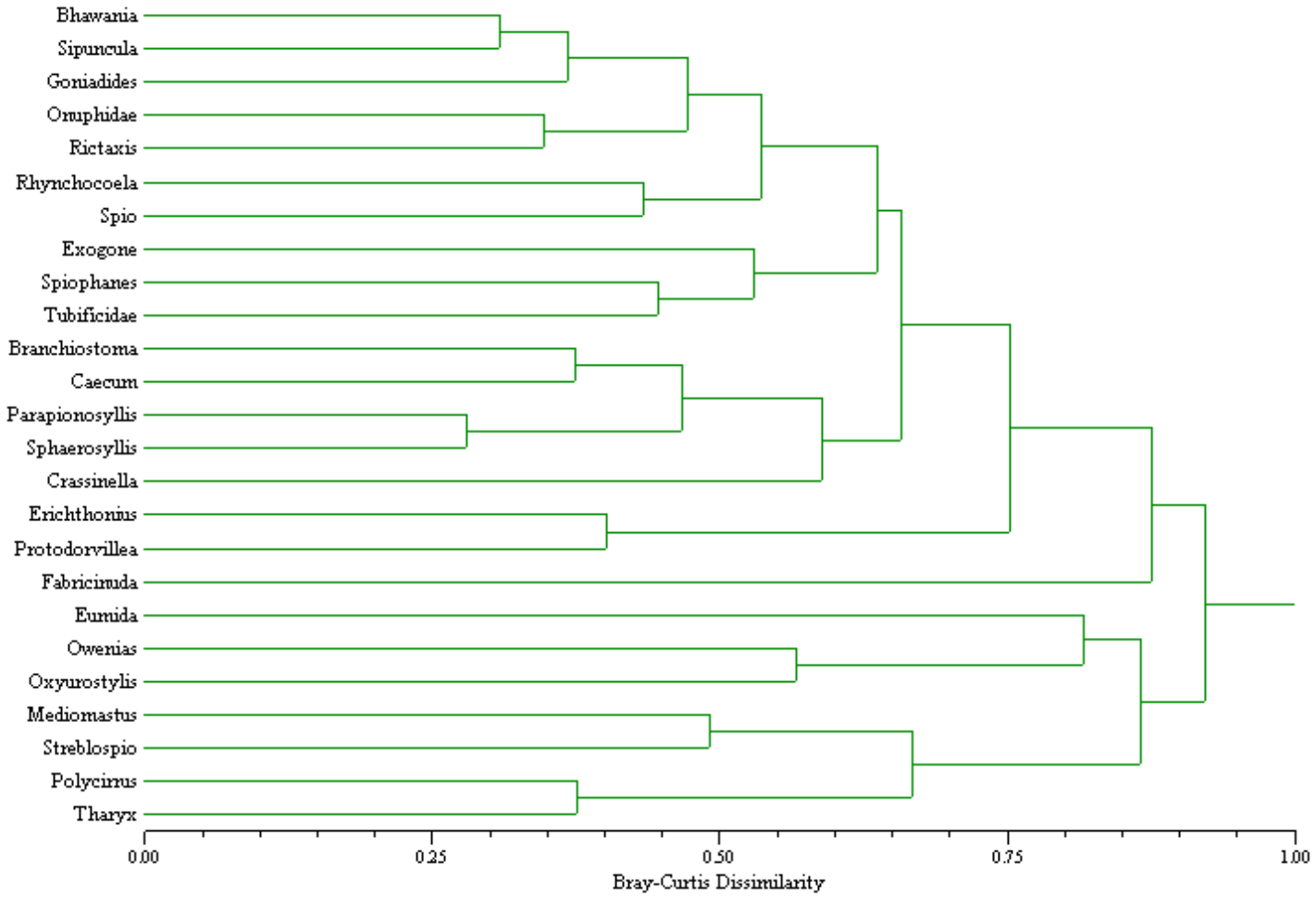


Figure 13. Taxa dendrogram from the cluster analysis for the Gray's Reef stations, April 2001.



APPENDICES

QUALITY ASSURANCE STATEMENT

Client/Project: NOAA

Work Assignment Title: Grays Reef 2001

Work Assignment Number Task Number: Opt 1-3

Description of Data Set or Deliverable: 60 Benthic macroinvertebrate samples collected May, 2001; Young Dredge grabs.

Description of audit and review activities: Judged accuracy rates were well above standard levels for sorting and taxonomy. Laboratory QC reports were completed. Copies of QC results follow (see attachment.) All taxonomic data were entered into computer and printed. This list was checked for accuracy against original taxonomic data sheets.

Description of outstanding issues or deficiencies which may affect data quality: None

_____

Signature of QA Officer or Reviewer Date

_____

Signature of Project Manager Date

QUALITY CONTROL REWORKS

Client/Project: NOAA-Gray's Reef 2001 **Task Number:** DO: Opt 1-3

Sorting Results:	**Sample #**	**% Accuracy**
	GR01022-1	100%
	GR01028-2	100%
	GR01022-3	100%
	GR01030-2	99%
	GR01028-1	100%
	GR01031-1	100%

Taxonomy Results:	**Sample #**	**Taxa**	**% Accuracy**
	GR01028-3	Crust./Moll.	97%
	GR01012-2	Crust./Moll.	96%
	GR01030-2	Crust./Moll.	98%
	GR01033-1	Crust./Moll.	100%
	GR01021-1	Crust./Moll.	99%
	GR01032-2	Crust./Moll.	99%
	GR01014-1	Poly./Misc.	99%
	GR01027-3	Poly./Misc.	98%
	GR01017-3	Poly./Misc.	97%
	GR01012-2	Poly./Misc.	98%
	GR01030-2	Poly./Misc.	100%
	GR01012-3	Poly./Misc.	100%

Description of outstanding issues or deficiencies which may affect data quality: None

Signature of QA Officer or Reviewer Date