Barnegat Bay—Year 1

Benthic Invertebrate Community Monitoring and Indicator Development for the Barnegat Bay-Little Egg Harbor Estuary

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Final Report

Project SR12-002: Benthic Invertebrate Community Monitoring and Indicator Development for Barnegat Bay-Little Egg Harbor Estuary

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Introduction

The Barnegat Bay ecosystem is potentially under stress from human impacts, which have increased over the past several decades. Benthic macroinvertebrates are commonly included in studies to monitor the effects of human and natural stresses on marine and estuarine ecosystems. There are several reasons for this. Macroinvertebrates (here defined as animals retained on a 0.5-mm mesh sieve) are abundant in most coastal and estuarine sediments, typically on the order of 10^3 to 10^4 per meter squared. Benthic communities are typically composed of many taxa from different phyla, and quantitative measures of community diversity (e.g., Rosenberg et al. 2004) and the relative abundance of animals with different feeding behaviors (e.g., Weisberg et al. 1997, Pelletier et al. 2010), can be used to evaluate ecosystem health. Because most benthic invertebrates are sedentary as adults, they function as integrators, over periods of months to years, of the properties of their environment.

The Barnegat Bay-Little Egg Harbor (BB-LEH) Estuary is heterogeneous with respect to environmental variables that are well known to affect benthic community composition. Salinity and sediment particle size vary throughout the system. Salinity varies locally along the main axis of the estuary in response to ocean water sources (notably at Barnegat Inlet, Beach Haven Inlet, and the Point Pleasant canal) and fresh-water sources (notably Toms River, Metedeconck River, and Cedar Creek). Long-term data collected by the New Jersey Department of Environmental Protection, Bureau of Marine Water Monitoring show that salinity tends to be lower in northern Barnegat Bay (range 0-20) than in central and southern Barnegat Bay and in Little Egg Harbor (range 20 to >28). Sediment particle size, and the inversely correlated sediment organic content, varies from east to west, with fine-grained sediments predominantly present in the western half and coarser sediments in the east. Sediment organic matter content is likely to also vary in response to variations in nutrient loadings throughout the system. Our objective is to develop quantitative measures to relate benthic community structure to variation in these and other environmental properties in BB-LEH Estuary.

Benthic invertebrates in the BB-LEH Estuary were last sampled comprehensively in 2001 as part of the EPA REMAP and NCA efforts, when 96 stations were sampled. The most recent quantitative data available come from NCA sampling in 2006 (data for samples collected in 2010 are not yet available). Only 13 stations were sampled in 2006, with none in northern Barnegat Bay and only one in the Barnegat Inlet section. We sampled 100 stations throughout the bay in order to obtain a data set comparable to the sampling density in 2001.

Methods

Field sampling

One hundred stations were sampled during July 2012. Surface and bottom water salinity, temperature, dissolved oxygen, and pH were measured at each station with a YSI hand-held meter (Yellow Springs Instruments, Yellow Springs OH). These data were hand-entered onto waterproof sheets, along with date and time of sampling, station coordinates, water depth, weather, sea conditions, sediment visual characteristics, presence of submerged aquatic vegetation, and general notes about station characteristics.

Three sediment samples were taken at each station, using a 0.044-m^2 Ted Young Modified Van Veen grab. Depth of sediment sampled was recorded. Two of the sediment samples were processed in their entirety for benthic invertebrate macrofauna. Sediment was sieved over a 0.5-mm-mesh screen, and material remaining on the screen was fixed in 3.7% formaldehyde solution in seawater buffered with Borax. Rose Bengal was added to stain organisms to facilitate sorting. Sieved samples were delivered to Cove Corporation (Lusby, MD) for sorting and identification of organisms to lowest possible taxonomic unit, usually species.

The third grab from each station was used for measurement of sediment properties. The top 2-cm layer of sediment was removed with a stainless steel spoon, transferred to a stainless steel bucket, and homogenized by stirring. Subsamples of the homogenized sediment were taken for total organic carbon, total nitrogen, and total phosphorus (~100 mL of sediment transferred to a glass 250 mL jar with a Teflon-lined cap), for grain size analysis (~250 mL of sediment transferred to a Whirl-Pak bag), organics (~250 mL of sediment transferred to a glass 500 mL jar with a Teflon-lined cap), and metals (~100 mL of sediment into a pre-cleaned plastic (HDPE) jar). All samples were stored on ice immediately after collection and during transport to the laboratory. The sediment samples for organics were transferred to a 4° refrigerator and those for metals were transferred to a -20° freezer for possible future analysis (US EPA 2001).

Laboratory analysis: sediment grain size

Sediment for grain size analysis was processed using methods described in detail in the EMAP-Estuaries Laboratory Methods Manual (US EPA 1995). Briefly, sediment was wet-sieved through a 63µm-mesh sieve in distilled water with dispersant to separate the silt and clay fraction from the sand-sized fraction. The sand fraction was dried and then sieved into the following size fractions: <4ϕ (<63 µm, silt), 4ϕ (63-125 µm, very fine sand), 3ϕ (125-250 µm, fine sand), 2ϕ (250-500 µm, medium sand), 1ϕ (500-1000 µm, coarse sand), and 0ϕ (1000-2000 µm, very coarse sand). Each fraction was weighed. The mass of the <4ϕ fraction was determined by drying a known volume of the water-particle mixture passing through the 63µm-mesh sieve.

An aliquot of the <4ϕ fraction was further analyzed using a Spectrex model PC-2000 laser particle counter (Spectrex Corporation, Redwood City CA). Counts of particles were obtained corresponding to these additional size categories: 5ϕ (31-63 µm, coarse silt), 6ϕ (16-31 µm, medium silt), 7ϕ (8-16 µm, fine silt), 8ϕ (4-8 µm, very fine silt), and 9ϕ (2-4 µm, clay). Particle counts were converted to mass by multiplying the fractional volume percent in each size category by the total mass of the <4ϕ fraction determined during wet sieving.

Grain size statistics were computed using the program GSSTAT, developed by the United States Geological Service (Poppe et al. 2004).

Laboratory analysis: sediment organic carbon, nitrogen, and phosphorus

Sediment was dried at 60°C and then gently disaggregated and homogenized using a ceramic mortar and pestle. Large shell fragments, pieces of vegetation, or visible organic debris were removed.

Total organic carbon (TOC) and total nitrogen (TN) were measured using standard methods (elemental analysis EPA Method 440.0 for total C and N (US EPA 1992)). Aliquots were weighed into silver foil sample cups. Two replicates per station were prepared. The silver foil cups with sediment were placed into a sealed chamber with concentrated hydrochloric acid fumes to remove inorganic carbonate. Samples were analyzed using a Carlo Erba NA1500 Elemental Analyzer. Internal standards of acetanilide or NIST Standard Reference Material 2702-Inorganics in Marine Sediment (National Institute of Standards and Technology, Gaithersburg MD) were run after every five unknowns to validate instrument performance. Data were accepted if the measured values for carbon of the standards differed by less than ±10% from the expected values.

Total phosphorus (TP) was measured using standard methods (colorimetric analysis of total phosphate (US EPA 2010, chapter 6). A laboratory reagent blank and an internal standard (NIST Standard Reference Material 2702-Inorganics in Marine Sediment) were run after every 10 unknowns. Data were accepted if the measured value for phosphorus of the standard differed by less than ±10% from the expected value.

Data analysis

Exploratory data analysis was conducted using Microsoft Excel 2007 or Statistix v9.0 (Analytical Software, Tallahassee FL). In most cases exploratory data analysis involved use of scatterplots to examine potential correlations among variables. Locally weighted scatterplot smoothing (LOWESS), a robust locally weighted regression algorithm, was used to visualize trends in data (Cleveland 1979). Multivariate analysis was conducted using Canoco v4.56 (Microcomputer Power, Ithaca NY).

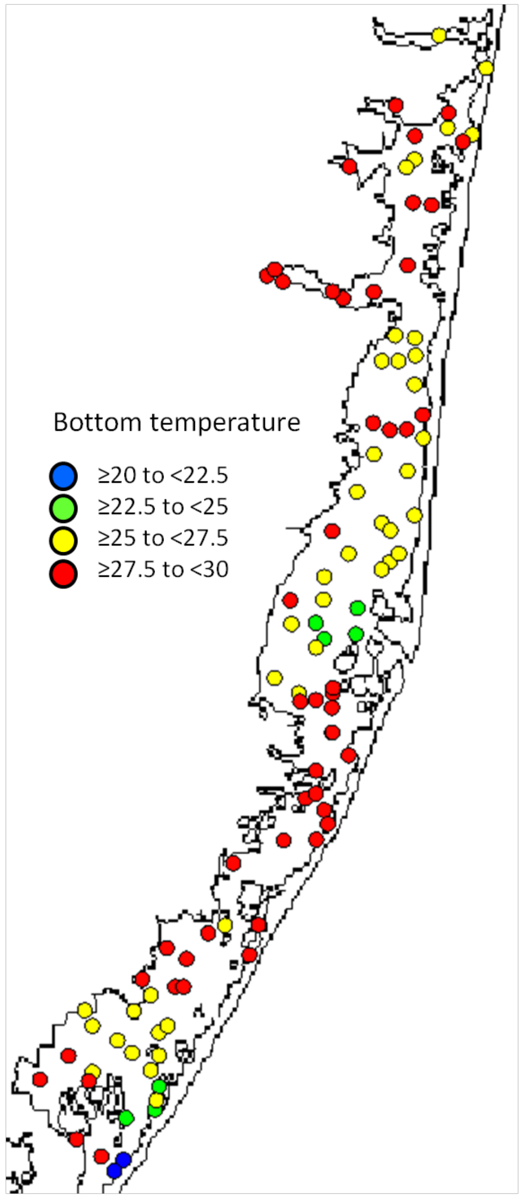
Results and Discussion

Water column properties

On the dates when sampling occurred, the water column was not stratified. On average, for all stations, the surface and bottom temperatures were the same, bottom salinity was 2% greater than surface salinity, and surface dissolved oxygen concentration was 6% greater than bottom dissolved oxygen. Maps of the breakdown of bottom temperature, salinity, and dissolved oxygen are presented here (all data on sampling locations and water column properties are in Appendix Table A1).

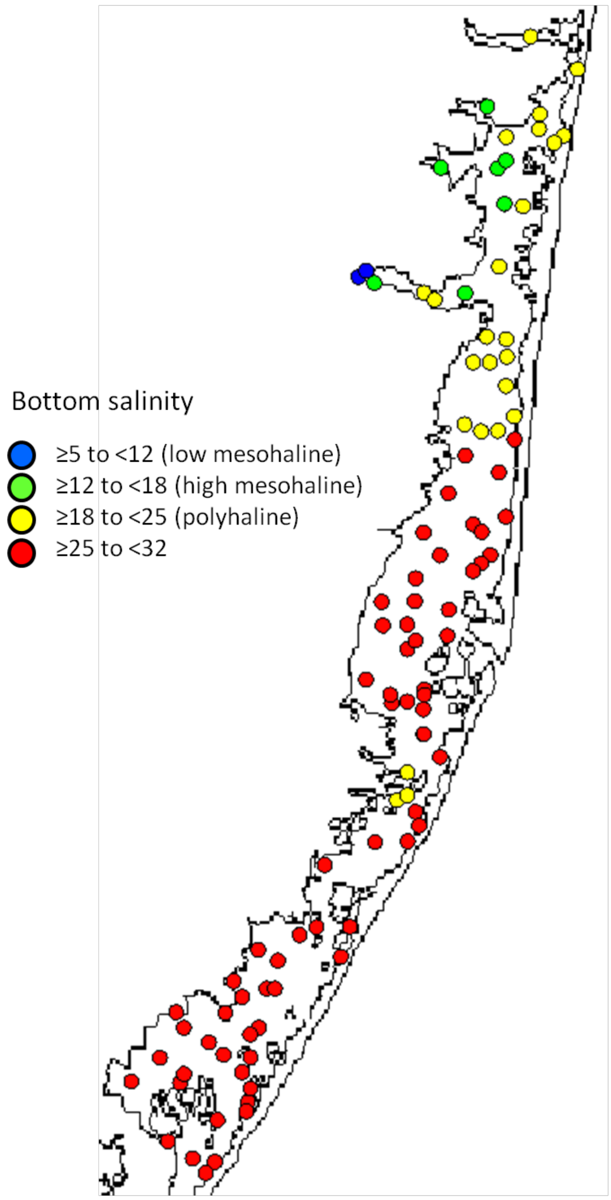
Temperatures ranged from 21 to nearly 30° with the coolest waters present in the central section of the bay near Barnegat Inlet and in southern Little Egg Harbor (Figure 1).

Figure 1. Bottom water temperatures during the period July 2 – July 11, 2012.



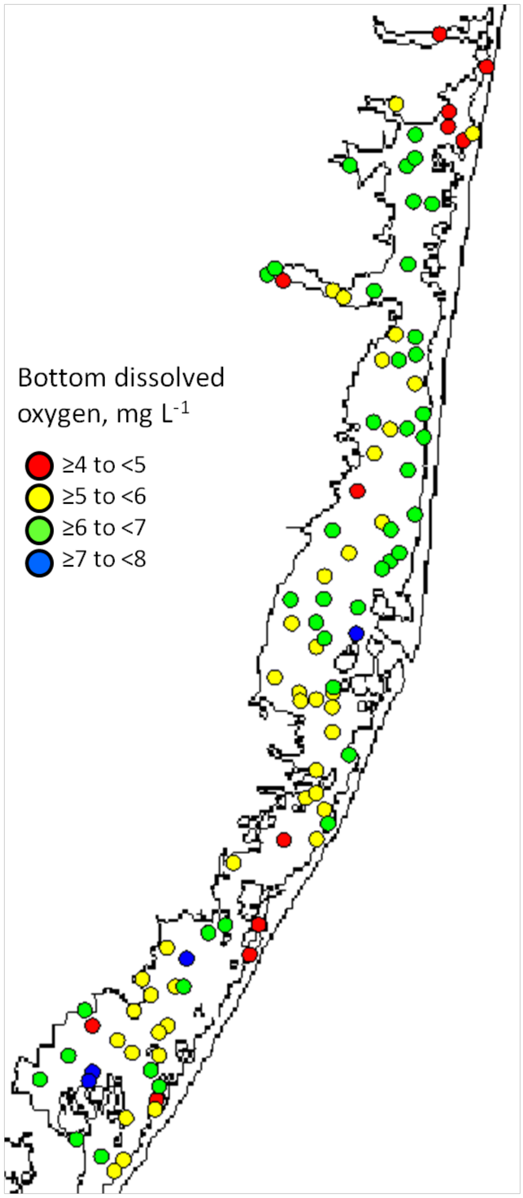
Salinity ranged from 11.3 to nearly 32 (Figure 2). Lowest values were in the northern section of the bay, particularly at the three stations at the western end of Toms River. Highest salinities occurred in the central section of the bay and in southern Little Egg Harbor.

Figure 2. Bottom water salinity during the period July 2 – July 11, 2012.



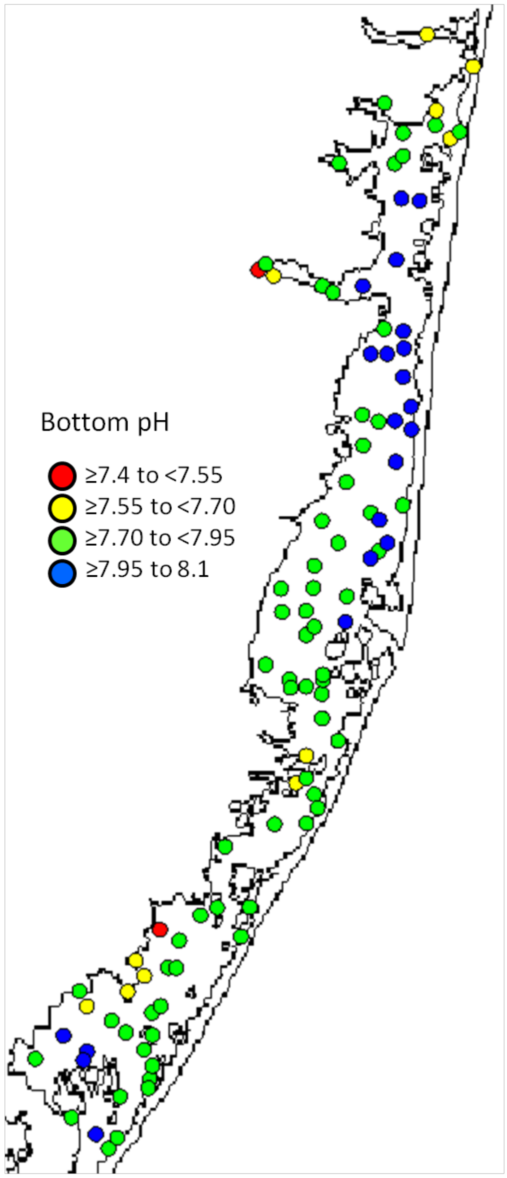
Dissolved oxygen concentrations ranged from 4 to 7.4 mg L^{-1} (Figure 3). The spatial pattern for oxygen was not as distinctive as those for temperature and salinity. Low values occurred in the extreme northern stations in the bay as well as at several locations in Little Egg Harbor. High values were found at locations interspersed throughout the bay and Little Egg Harbor.

Figure 3. Bottom water dissolved oxygen concentration during the period July 2 – July 11, 2012.



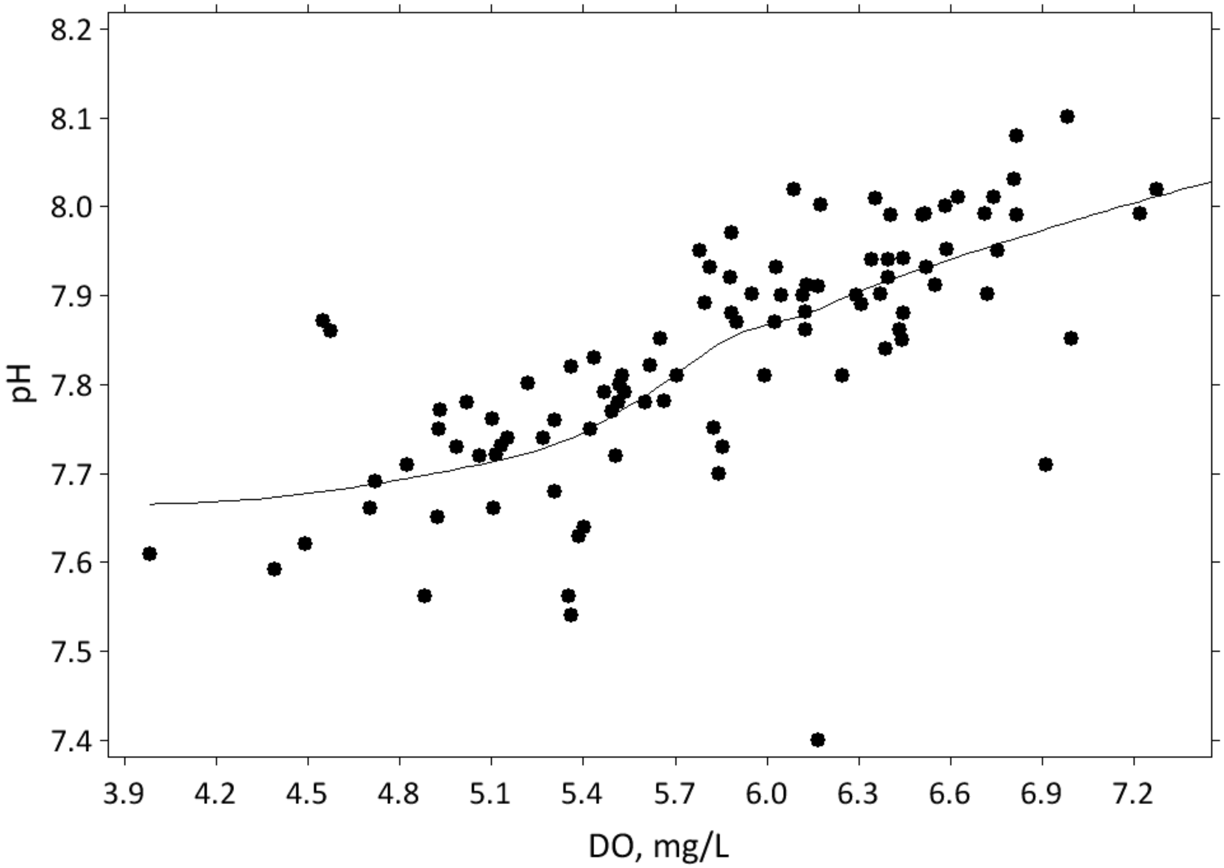
Bottom water pH varied from 7.4, measured at the head of Toms River, to 8.1, measured at station 001 slightly north of Toms River (Figure 4). At most stations pH was less than 8. Highest values were measured in the northern part of the bay and at four stations in the southern part of Little Egg Harbor.

Figure 4. Bottom water pH during the period July 2 – July 11, 2012.



Bottom water dissolved oxygen concentration and pH are positively correlated (Figure 5). Sites where heterotrophic respiration rates are high lead to decreased oxygen concentration and increased CO_2 concentration (lower pH).

Figure 5. Scatterplot of bottom water pH versus dissolved oxygen concentration during the period July 2 – July 11, 2012. Line is LOWESS fit, f=0.75.

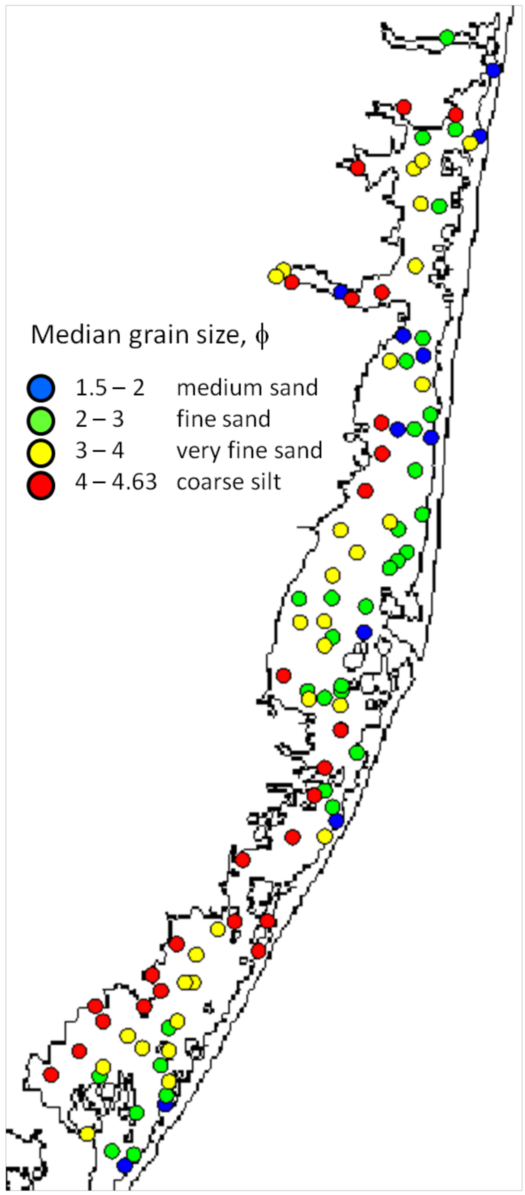


Sediment grain size

Complete sediment grain size data and statistics are given in Appendix Table A2.

Sediments ranged from medium sands to coarse silts (Figure 6). Although medium sands tended to occur along the eastern boundary of BB-LEH and finer-grained sediments tended to occur on the western side, there was considerable heterogeneity in the distribution of particle sizes. In several cases sediments at two closely spaced stations were at opposite ends of the particle size spectrum.

Figure 6. Median sediment size during the period July 2 – July 11, 2012.



Sediment organic carbon, nitrogen, and phosphorus

Complete sediment elemental data are given in Appendix Table A3.

Sediment organic carbon concentration ranged from 0.02 to 12.2% by weight (Figure 7). The distribution was highly skewed, however, by eight stations located in the northern section of the bay, especially three stations in the Toms River. Because sediment at most stations had less than 3% organic carbon, those 91 stations were replotted to examine any trends (Figure 8). For the majority of locations (60 sites), sediment organic carbon concentration was less than 1%; for 80 sites sediment TOC was less than 2%. A few locations along the western boundary of BB-LEH had concentrations as high as 3%.

Figure 7. Sediment total organic C concentration during the period July 2 – July 11, 2012.

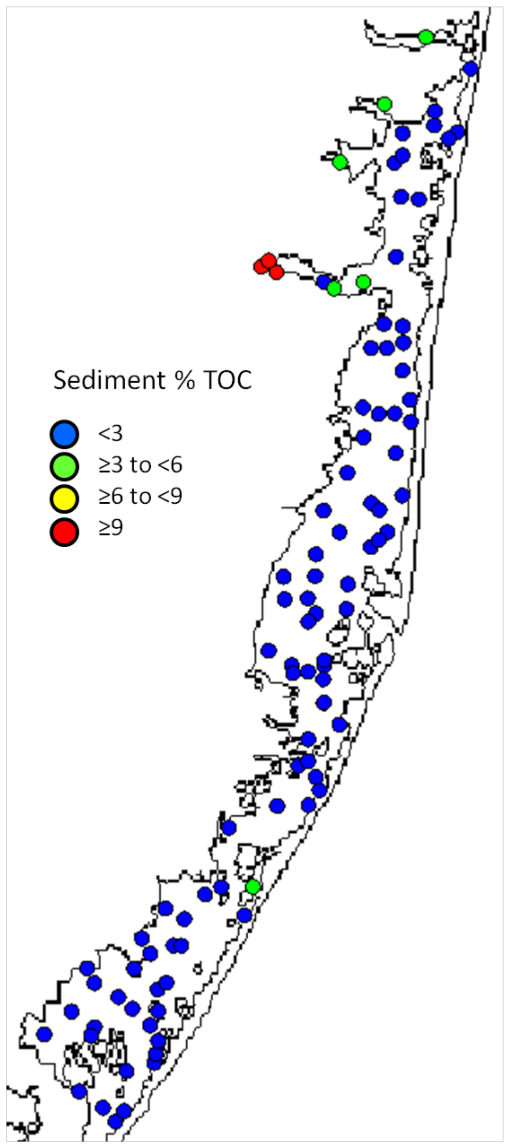
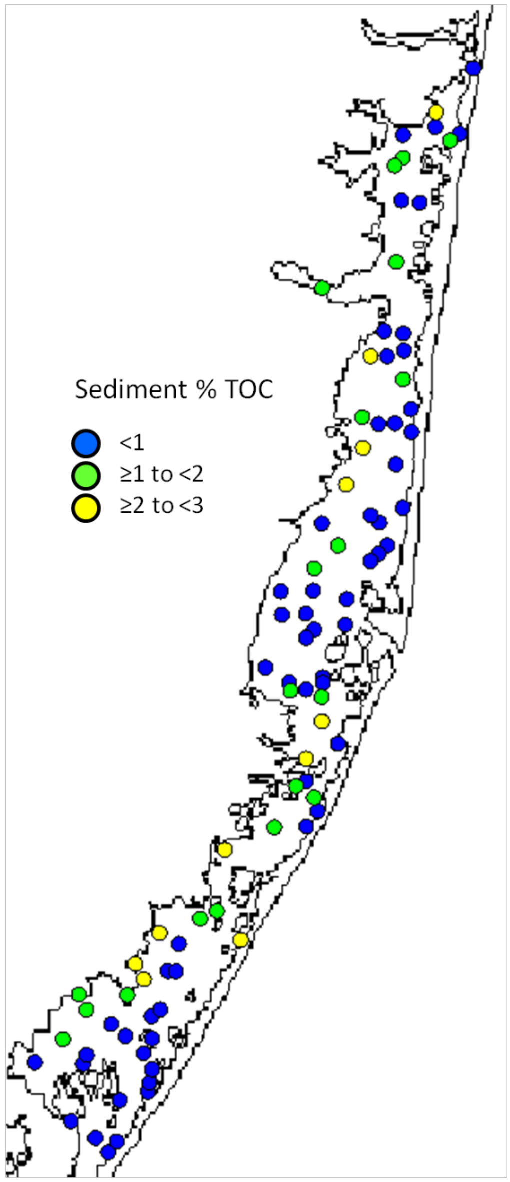
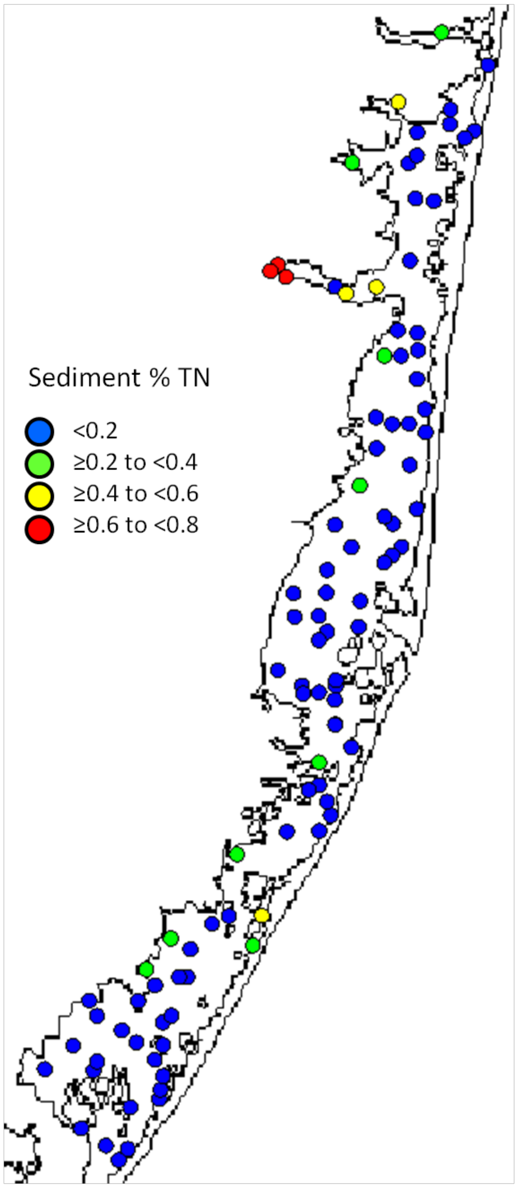


Figure 8. Sediment total organic C concentration at stations where TOC <3%, during the period July 2 – July 11, 2012.



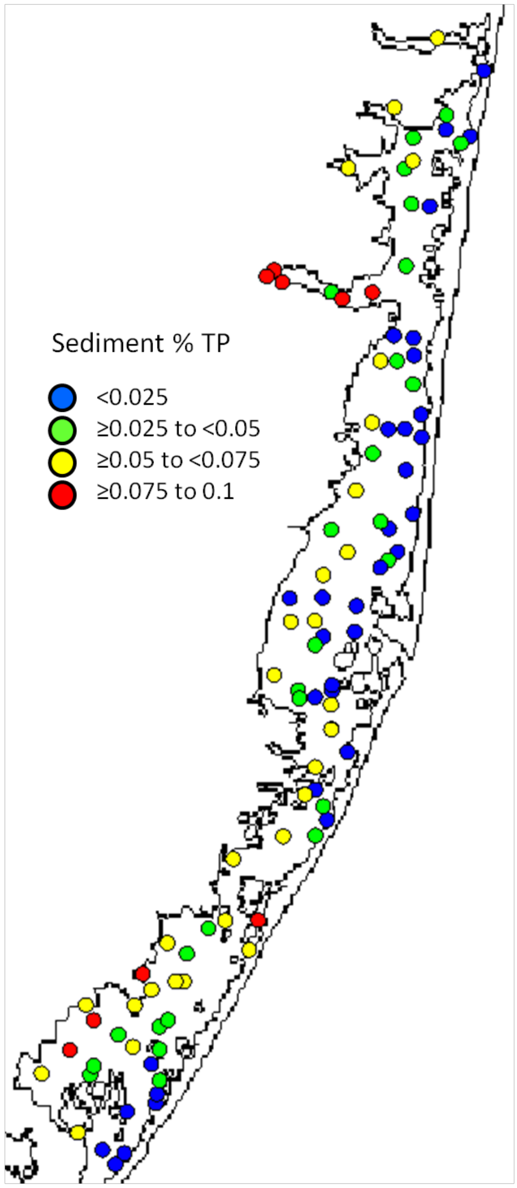
Total nitrogen concentration of sediments ranged from 0.003 to 0.8% (Figure 9). Most stations (84) had nitrogen concentrations below 0.2%.

Figure 9. Sediment total N concentration during the period July 2 – July 11, 2012.



Sediment total phosphorus concentrations ranged from 0.002 to 0.11% (Figure 10). Higher values tended to occur on the western boundary of BB-LEH and lower values on the eastern boundary.

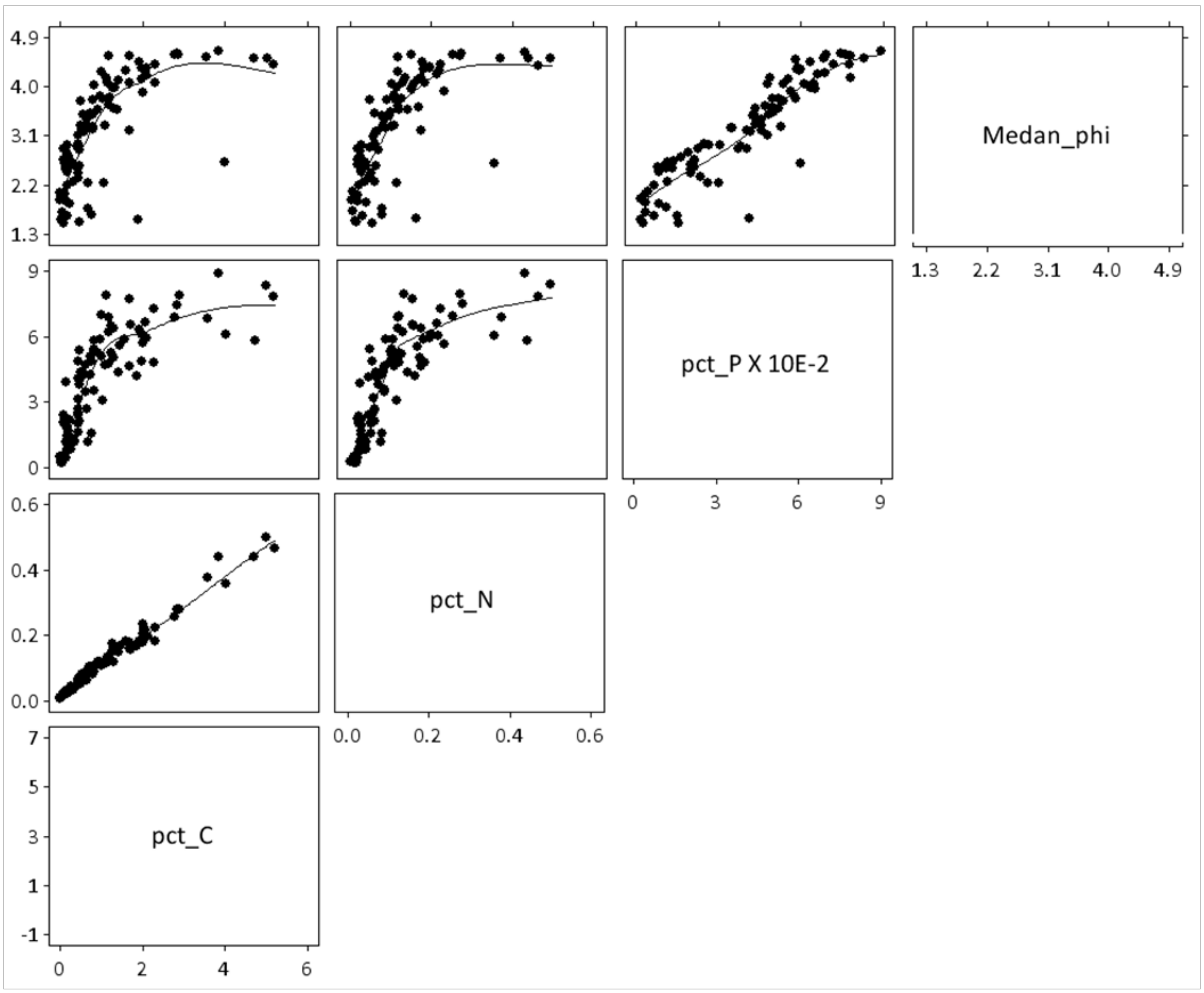
Figure 10. Sediment total P concentration during the period July 2 – July 11, 2012.



Relationships among sediment grain size, carbon, nitrogen, and phosphorus concentrations

Carbon and nitrogen concentrations were tightly and linearly correlated (Figure 11). The correlations between carbon and phosphorus and between nitrogen and phosphorus were less tight, and non-linear, with phosphorus concentrations leveling out at higher carbon and nitrogen concentrations. Similarly, both TOC and TN increased linearly as median sediment grain size decreased, until about 4ϕ, the boundary between sand and silt sizes. Further increases in TOC and TN were not associated with decreasing grain size. Total P showed a strong and consistent increase as grain size decreased, unlike TOC and TN.

Figure 11. Scatterplot matrix of sediment properties during the period July 2 – July 11, 2012. Three stations in Toms River with anomalously high TOC, TN, and TP concentrations were omitted. Lines are LOWESS fits, with f=0.25.



Benthic macroinvertebrate community composition

A total of 244 taxa were found (all data in appendix Table A4). A subset of 211 of these taxa was used for further analyses. Taxa were not included in analyses if they were epifaunal (for example, encrusting on *Zostera* or *Ruppia* blades), since such taxa are not indicative of conditions in sediments. We consulted the list of taxa omitted in calculations of the Chesapeake Bay Benthic Index of Biotic Integrity (see below and Table 1 in Llansó 2002) when making these decisions since the species lists in BB-LEH and the Chesapeake Bay are similar. We also omitted highly motile species since they are unlikely to be sampled quantitatively by a Van Veen grab. Finally, we omitted all taxonomic designations at the generic, familial, and higher taxonomic levels if there were two or more valid lower-level designations for that group (Gallagher & Grassle 1997). This usually occurred with unidentified specimens that were likely to belong to an already identified species. Explanations for each case where a taxon was omitted are given in Table A4. For consistency when comparing the values for the various indices (see below), omitted taxa were not used in calculations of any index. Most of the omitted taxa were rare or only occurred at a few stations, therefore we do not believe that our conclusions were materially affected by these omissions.

As is common in estuarine environments, the benthic community in BB-LEH is dominated by relatively few species. Ten species accounted for 61% of all individuals collected, and 45 species accounted for 90% of all individuals (Figure 12). The most abundant species, *Mediomastus ambiseta*, was the only species present at all 97 stations selected for further analyses and by itself accounted for over 34% of all individuals (Table 1). At the other end of the spectrum, 74 species had 10 or fewer individuals.

Figure 12. Species rank (1 = most abundant) vs. cumulative abundance of all macroinvertebrates at all stations. Some taxa were tied in abundance.

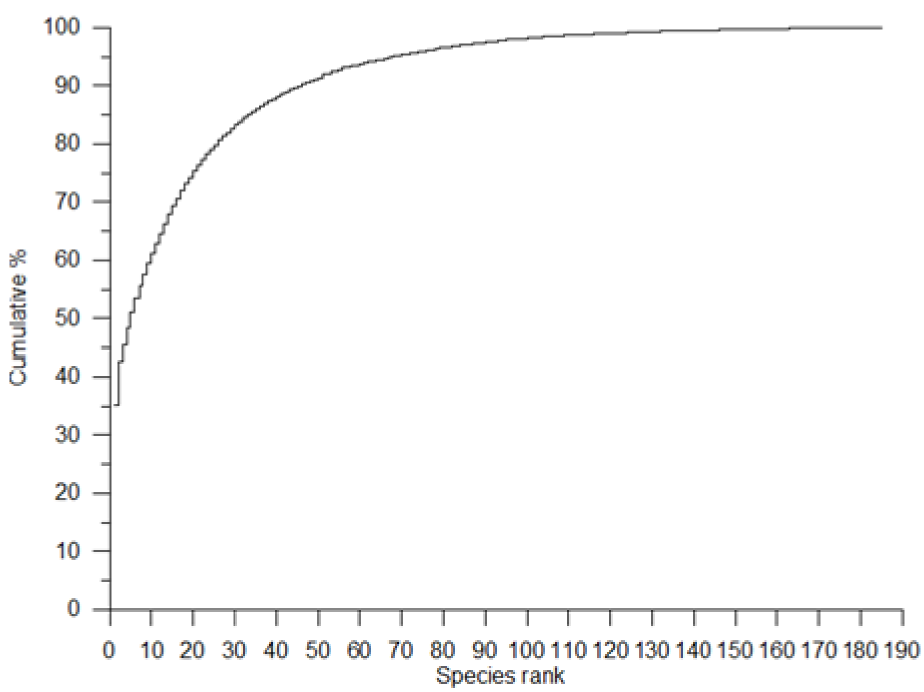
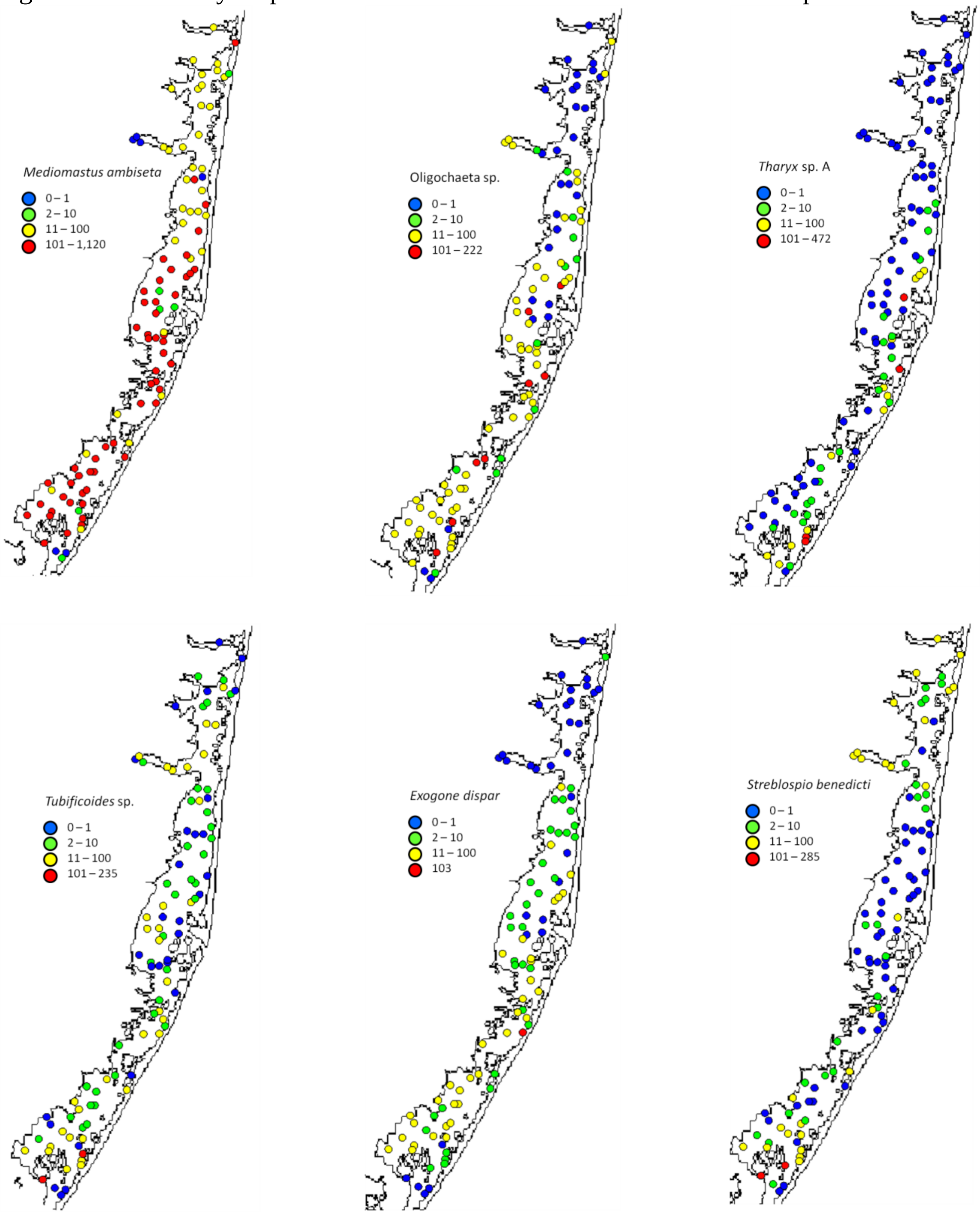


Table 1. Most abundant 45 species that make up 90% of all individuals collected.

Taxon	RANK	TOTAL	cumulative %
Mediomastus ambiseta	1	18224	35.41
Oligochaeta sp.	2	3680	42.56
Tharyx sp. A (MWRA)	3	1471	45.42
Tubificoides sp.	4	1442	48.22
Exogone (Exogone) dispar	5	1317	50.78
Streblospio benedicti	6	1267	53.25
Aricidea (Acmira) catherinae	7	1130	55.44
Notomastus sp. A Ewing	8	970	57.33
Ampelisca abdita	9	922	59.12
Elasmopus levis	10	920	60.91
Clymenella zonalis	11	901	62.66
Clymenella torquata	12	874	64.35
Glycinde multidens	13	871	66.05
Angulus agilis	14	834	67.67
Sabaco elongatus	15	800	69.22
Spiochaetopterus costarum oculatus	16	656	70.50
Polydora cornuta	17	654	71.77
Scoletoma tenuis	18	616	72.96
Leitoscoloplos robustus	19	597	74.12
Acteocina canaliculata	20	570	75.23
Microdeutopus gryllotalpa	21	519	76.24
Ampelisca verrilli	22	486	77.19
Listriella barnardi	23	448	78.06
Polycirrus eximius	24	444	78.92
Tagelus divisus	25	411	79.72
Lysianopsis alba	26	393	80.48
Podarkeopsis levifuscina	27	374	81.21
Rhepoxynius hudsoni	28	364	81.91
Heteromastus filiformis	29	344	82.58
Gemma gemma	30	328	83.22
Nucula proxima	31	310	83.82
Glycera americana	32	300	84.41
Melinna maculata	33	288	84.97
Turbonilla interrupta	34	269	85.49
Prionospio heterobranchia	35	263	86.00
Solemya velum	36	238	86.46
Leptosynapta tenuis	37	229	86.91
Amphiporus bioculatus	38	213	87.32
Salvatoria clavata	39	199	87.71
Paraprionospio pinnata	39	199	88.09
Ampelisca vadorum	41	195	88.47
Alitta succinea	42	191	88.84
Cyathura burbancki	43	180	89.19
Eumida sanguinea	44	177	89.54
Batea catharinensis	45	176	89.88

The six most-abundant species, comprising over half of all individuals, showed no consistent spatial pattern (Figure 13). *Mediomastus ambiseta* was most abundant in the central and southern regions of the bay and throughout Little Egg Harbor. Oligochaeta sp. and *Exogone dispar* were rare in the northern section of the bay. *Tharyx* sp. A was rare in the north and along most of the western boundary. *Streblospio benedicti* was rare in the central section. Little pattern was apparent for *Tubificoides* sp.

Figure 13. Summary maps of the distributions of the six most abundant species.



Univariate analysis of community structure

The most straightforward approach to relating community structure to environmental variables is to look for correlations of single variables with abundances of various taxa; a univariate approach. This must be tempered with the realization that correlation does not necessarily imply causation, that multiple environmental variables can be at work, and that relationships may not be linear. In fact, classic ecological theory posits that species responses to environmental factors are unimodal. Initially, therefore, we examined simple scatterplots of species abundances against environmental properties measured in this study.

An example is given for abundance of the numerical dominant, *Mediomastus ambiseta*, plotted against seven environmental properties (Figure 14). LOWESS smoothing of the data suggests a unimodal response of the abundance of this species to sediment TOC, TN, and TP, median sediment phi size, and salinity. The effects of dissolved oxygen and temperature are less clear, but this is expected given that these properties can change on short time scales.

Given that nitrogen and phosphorus loadings to Barnegat Bay are of particular interest, we conducted similar univariate analyses for the top 10 most abundant species. An ideal 'indicator' species would show a monotonic increase with nitrogen or phosphorus, or both. In most cases, LOWESS analysis indicated a unimodal model was appropriate. Normal curves were fit to the abundance data. Species abundances dropped off sharply with increased sediment nitrogen (Figure 15) and sediment phosphorus (Figure 16).

Figure 14. Scatterplots of abundance of *Mediomastus ambiseta* (Med_ambi) vs. sediment %TOC, %TN, %TP, bottom water DO, salinity, and temperature, and median particle size.

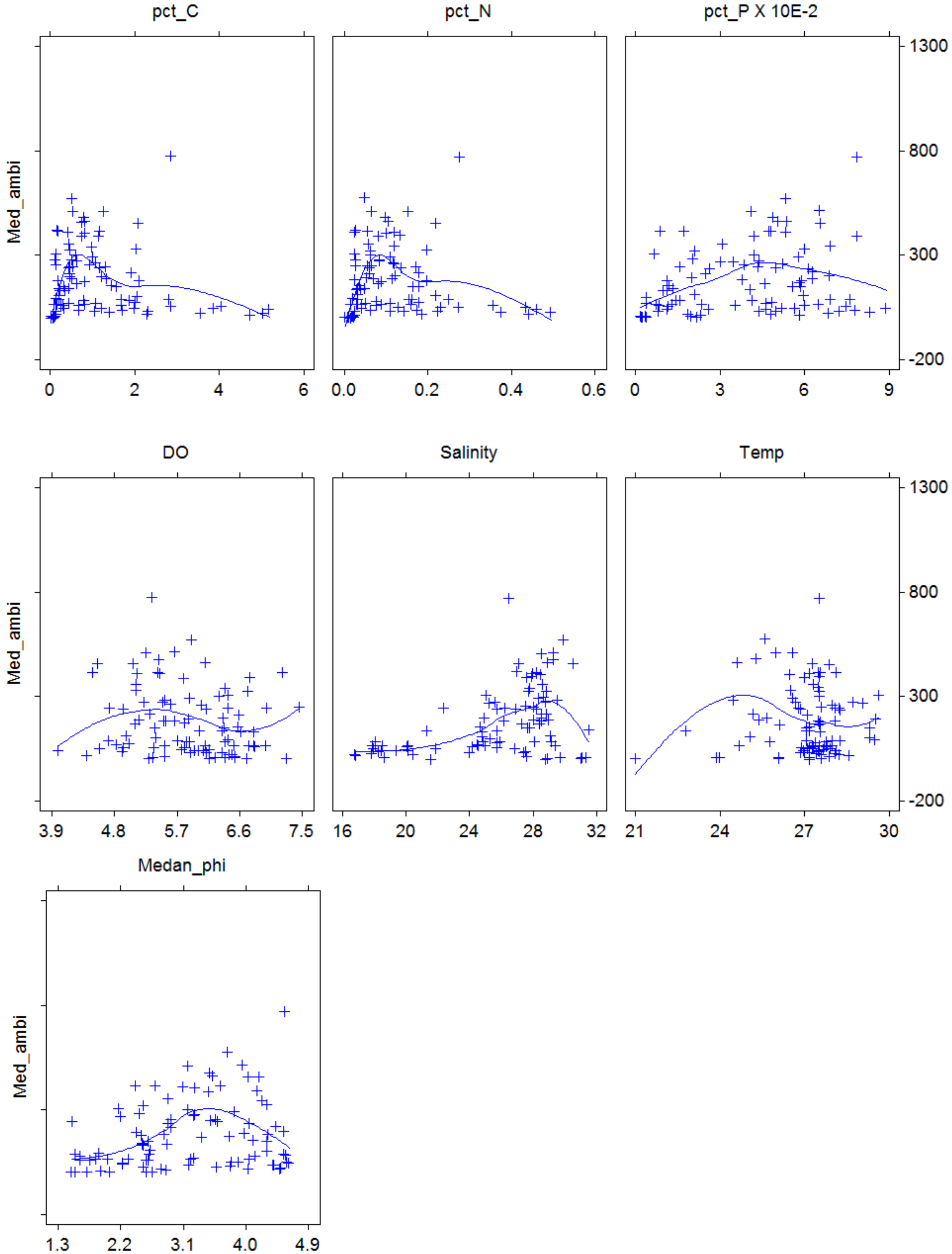


Figure 15. Unimodal curve fits to abundances of 10 most abundant taxa as a function of sediment %TN. Numbers next to curves correspond to species rank order in Table 1.

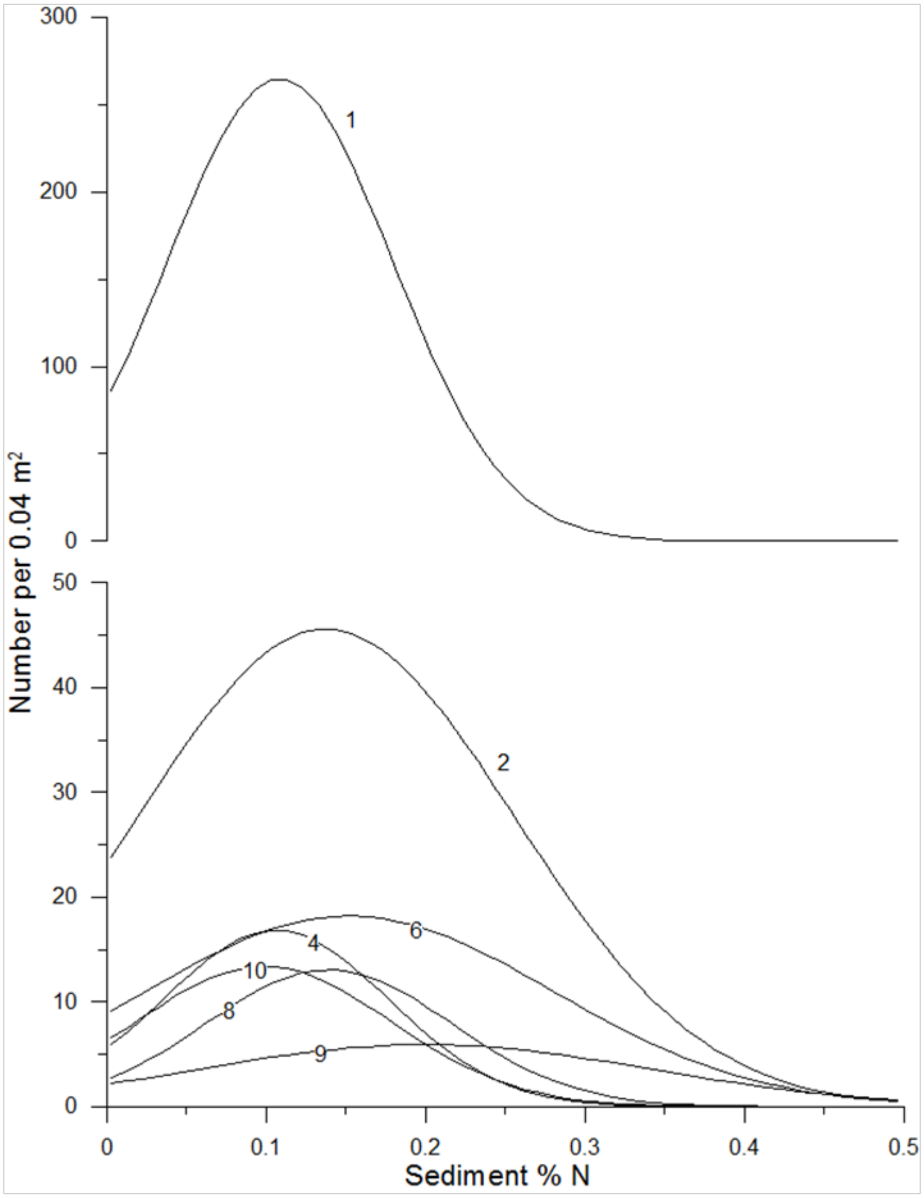
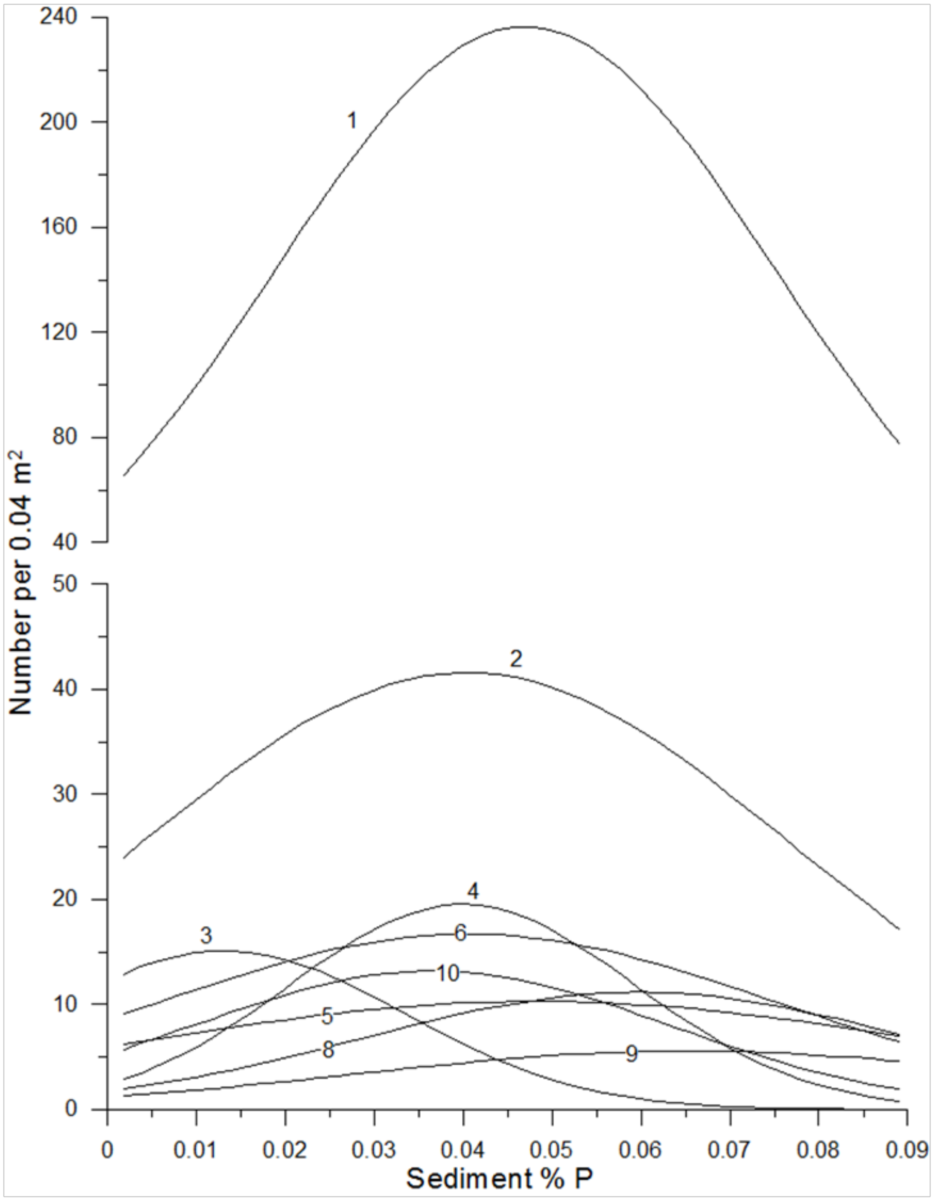
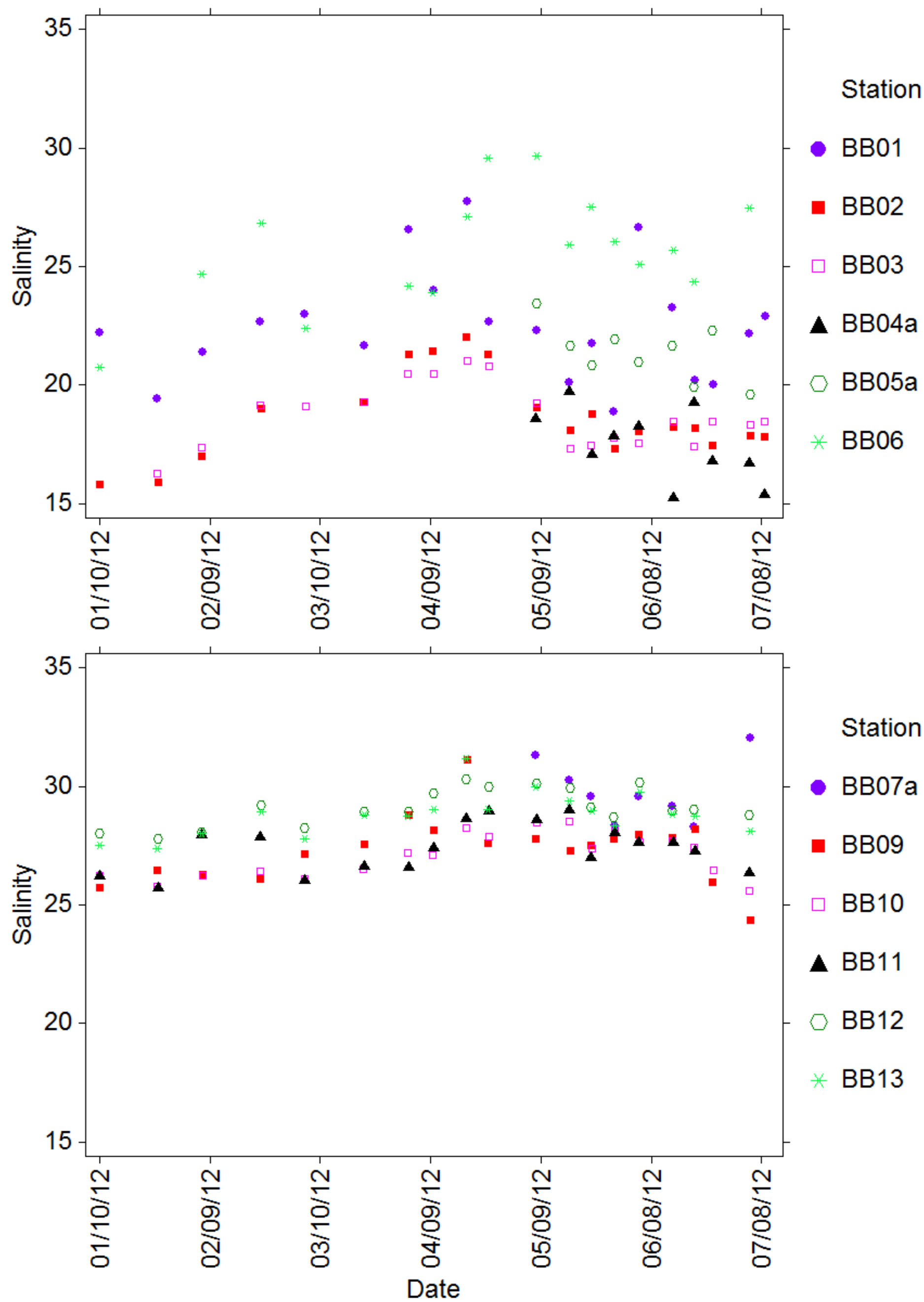


Figure 16. Unimodal curve fits to abundances of 10 most abundant taxa as a function of sediment %TP. Numbers next to curves correspond to species rank order in Table 1.



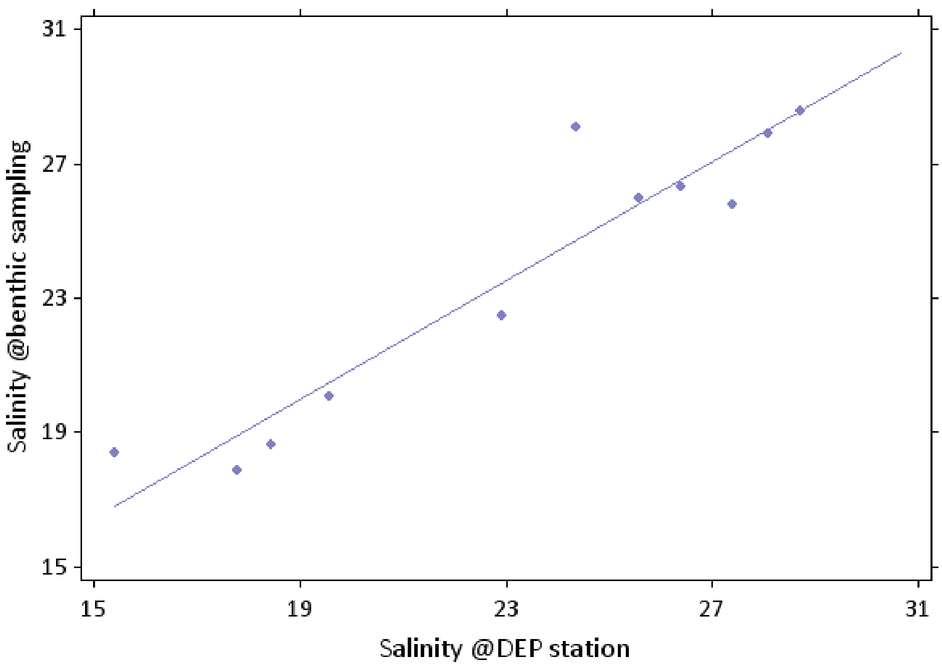
Since abundances of these dominant species are usually low at both low and high sediment N and P concentrations, a simple univariate approach will not suffice, at least if applied to the entire data set of stations throughout BB-LEH. An alternative approach is to subdivide BB-LEH into regions where the environmental gradients are not as 'long,' in order to determine if linear, rather than unimodal, patterns can be used. Estuarine habitats are commonly classified on the basis of salinity and sediment size (e.g., Weisberg et al. 1997), (Pelletier et al. 2012). Given that the salinity data collected in our study are one-time measurements at each station at the time of sampling, we needed to determine whether there were any patterns in salinity over longer time scales. For this, we used time series data from the in-bay water quality monitoring sites (http://www.nj.gov/dep/barnegatbay/bbmapviewer.htm). These sites are distributed along the north-south axis of BB-LEH; BB01 is the northernmost at Mantoloking and BB13 is the southernmost near Tuckerton Creek (Figure 17). (We did not use the data from BB08 at Barnegat Inlet or from BB14 at Little Egg Harbor Inlet because these locations are dominated by ocean water.)

Figure 17. Salinity measurements from beginning of 2012 until time of benthic sampling for 12 stations in BB-LEH.



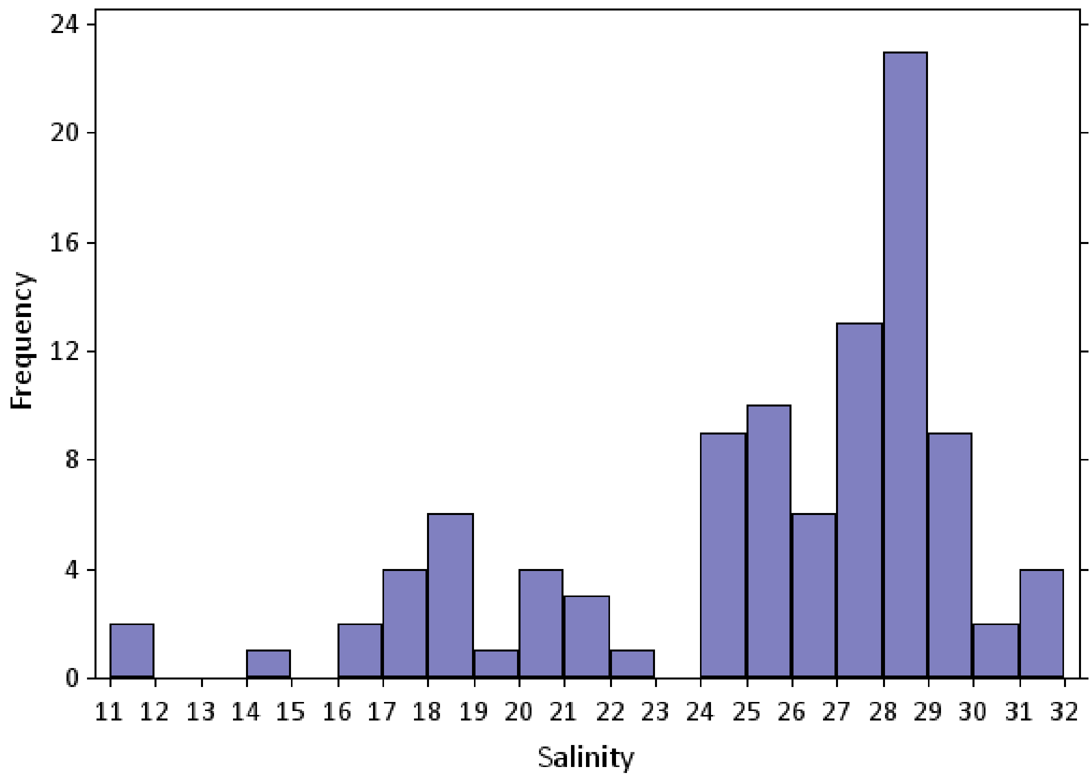
Salinity was more variable for stations in the northern part of the bay (BB01 through BB06) (Figure 17). Salinity in the northern part of the bay varied from 15 to as high as 30, but on average was below 25. In the central and southern part of the bay salinity was less variable and nearly always greater than 25. Measurements of bottom water salinity made at the time of benthic sampling correlate well with measurements made within ±3 days at the adjacent monitoring station (Figure 18).

Figure 18. Comparison of bottom water salinity measured at time of benthic sampling with the measurements from the NJDEP monitoring station at same location, within plus or minus 3 days.



Bottom water salinities at all 100 benthic sampling stations showed a bimodal distribution, with a break at 23-24 (Figure 19). Based on this, we investigated subdividing the stations into two groups, in order to 'shorten' the salinity gradient, prior to further univariate analysis of the macroinvertebrate community.

Figure 19. Histogram of bottom water salinities during the period July 2 – July 11, 2012.



Binning bottom water salinities into two groups, ≤23 or ≥24, showed a clear pattern (Figure 20). Stations with salinity ≤23, hereafter referred to as 'low salinity stations' were all present in the northern section of the bay. Stations with salinity ≥24, hereafter referred to as 'high salinity stations' were, with one exception in the central and southern parts of the bay. Radar plots (Benyi et al. 2009) of the 12 most abundant taxa showed that 11 of them were more abundant than average at the high salinity stations; only *Streblospio benedicti* was more abundant than average at low salinity stations (Figure 21).

Figure 20. Distribution of stations with bottom water salinities ≤23 or ≥24 during the period July 2 – July 11, 2012.

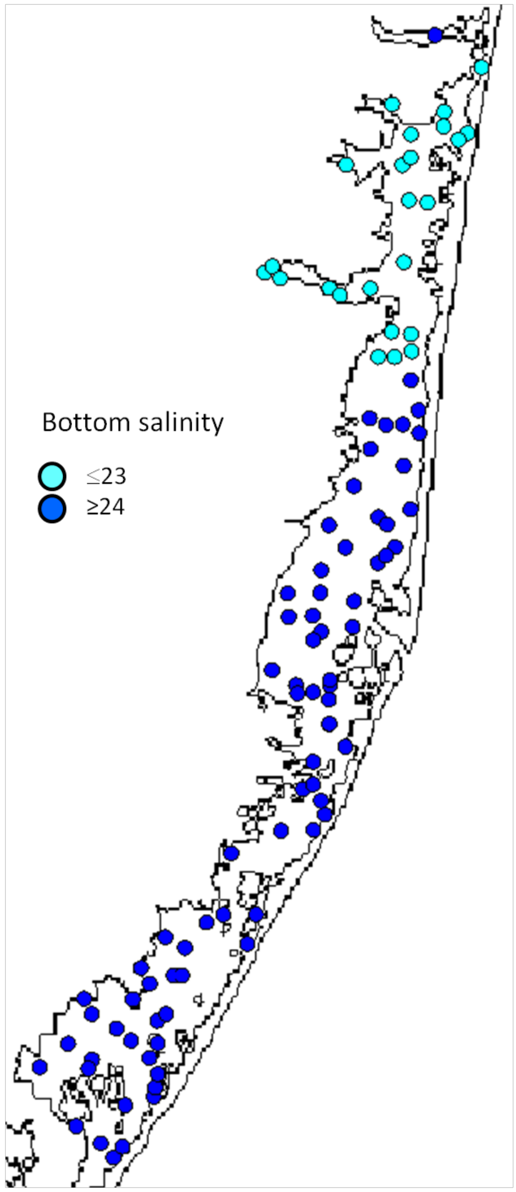
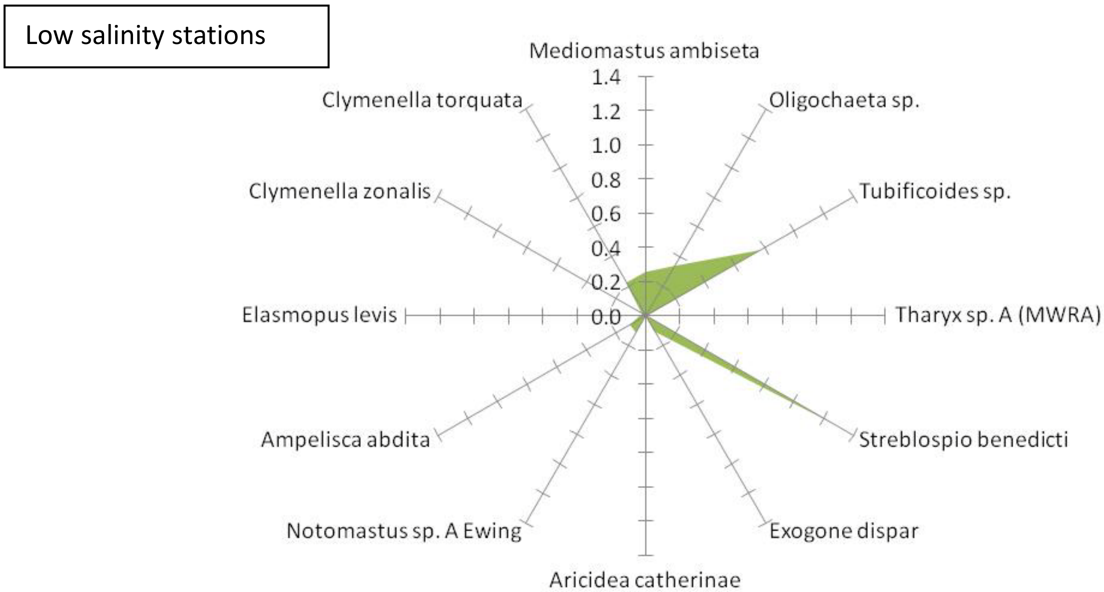
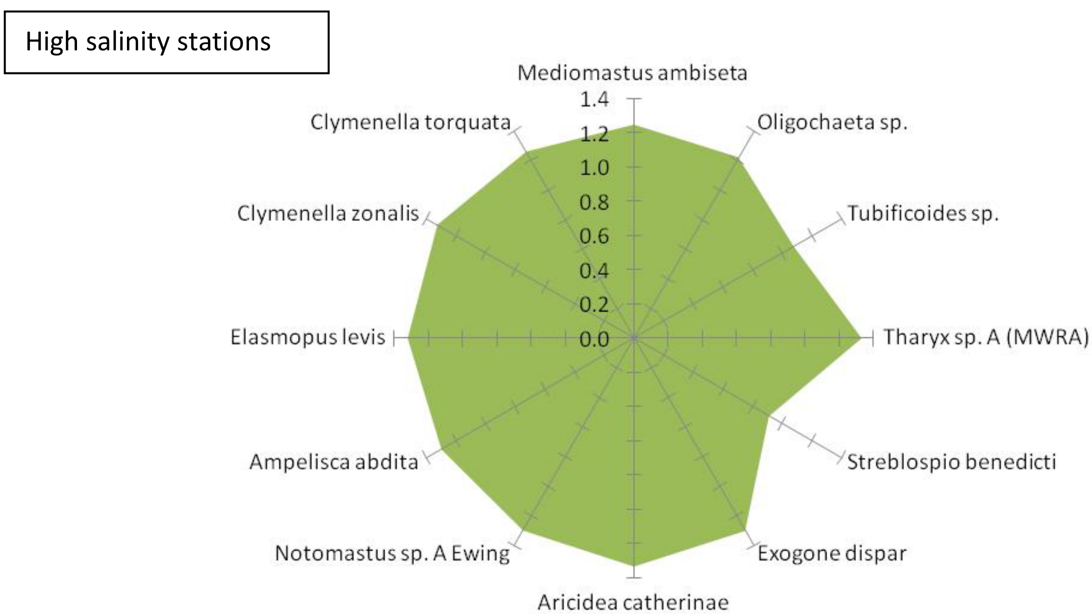


Figure 21. Radar plots showing average abundance of taxa at low salinity and high stations, expressed as proportion of the average of each taxon for all stations.





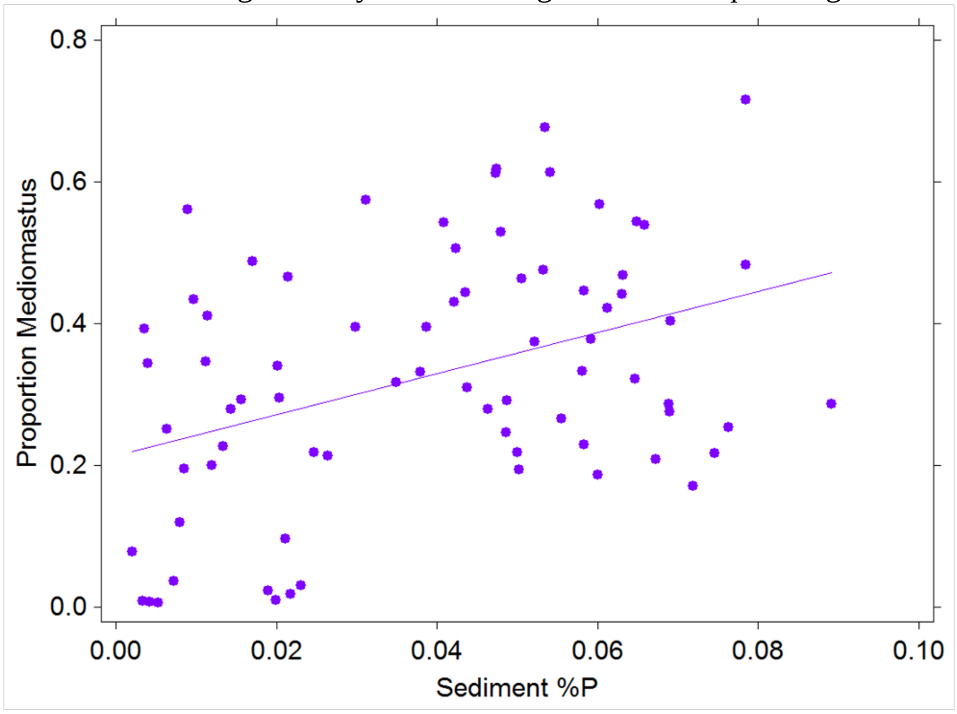
The statistics in this next section are for the species in the high salinity stations where their scaled average abundance is ≥1, that is, they are on average more abundant at the high-salinity sites than the low. Stepwise linear regressions were performed to see if there were any correlations of abundance with measured environmental variables. As an example, the results for the top-ranked species, *Mediomastus ambiseta*, are given (Table 2).

Table 2. Stepwise linear regression of abundance of *Mediomastus ambiseta* (as proportion of total individuals in the sample) against environmental variables.

```
Stepwise Linear Regression of prop_m_a
Unforced Variables: DO Temp Salinity Medan_phi pct_P
  P to Enter 0.0500
  P to Exit  0.0500

Step   Variable   Coefficient          T          P       R Sq         MSE
   1   Constant      -0.91357      -0.95                0.2108     0.02604
       DO            -0.03453      -1.16     0.2519
       Temp           0.03616       1.84     0.0697
       Salinity       0.01683       0.98     0.3309
       Medan_phi     -0.04308      -0.62     0.5377
       pct_P          3.69157       1.48     0.1423

   2   Constant      -1.03429      -1.11                0.2064     0.02581
       DO            -0.03178      -1.08     0.2837
       Temp           0.03626       1.86     0.0677
       Salinity       0.01751       1.03     0.3088
       pct_P          2.24884       2.59     0.0117

   3   Constant      -0.14204      -0.42                0.1945     0.02583
       DO            -0.02857      -0.98     0.3323
       Temp           0.02030       1.72     0.0901
       pct_P          2.33262       2.70     0.0088

   4   Constant      -0.27730      -0.89                0.1837     0.02581
       Temp           0.01863       1.59     0.1153
       pct_P          2.65380       3.32     0.0014

   5   Constant       0.21398       5.87                0.1549     0.02636
       pct_P          2.90098       3.66     0.0005

Resulting Stepwise Model
Variable    Coefficient   Std Error         T         P      VIF
Constant        0.21398     0.03647      5.87    0.0000
pct_P           2.90098     0.79314      3.66    0.0005      1.0

Cases Included   75       R Squared       0.1549       MSE   0.02636
Missing Cases     0       Adjusted R Sq   0.1433       SD    0.16235

Variables Not in the Model
              Correlations
Variable    Multiple    Partial         T          P
DO            0.3600    -0.0851     -0.72     0.4711
Temp          0.1938     0.1846      1.59     0.1153
Salinity      0.1204    -0.0823     -0.70     0.4857
Medan_phi     0.9480    -0.0522     -0.44     0.6587
```

In this case, the only variable in the model is sediment %P concentration. All other variables drop out. Although the resulting linear regression is significant, sediment P concentration explains only 14-15% of the variation in *Mediomastus* abundance. The considerable scatter in the data (Figure 22) indicates that factors not included in the regression analysis are important. Nonetheless, *Mediomastus* may be a candidate indicator species whose abundance is correlated with sediment P concentration at high salinity stations. Further sampling in 2013 will allow us to test this possibility.

Figure 22. Scatter plot of *Mediomastus ambiseta* proportional abundance vs. sediment total P concentration at high salinity stations. Regression line equation given in Table 2.



A similar approach was used to evaluate other taxa that were abundant at high salinity sites (Table 3). In addition to *Mediomastus*, *Glycera americana* and *Turbonilla interrupta* also correlated only with sediment P. A stepwise regression was performed to evaluate the potential of these three taxa to predict sediment P concentrations. Only *Mediomastus* and *Turbonilla* were retained in the model, together accounting for 33% of the variation in sediment P (Table 4). Additional sampling in 2013 will allow us to continue to evaluate the responses of these species.

Table 3. Results of stepwise linear regressions of abundances of highly ranked species at high salinity sites.

Taxon	Variables in model	Conclusion
Oligochaetes	Constant only	Abundance unaffected by any measured variable
Tubificoides sp.	Median ϕ, %P	Variables autocorrelated (Fig. 11), therefore not predictive of nutrient loading
Tharyx sp. A	Median ϕ	More abundant in coarser sediments
Exogone dispar	Temperature	Abundance positively correlated with temperature
Aricidea catherinae	DO, temp, P, N	Multiple variables important
Notomastus sp. A	DO	Negative correlation, more abundant at low DO, potentially useful indicator species
Ampelisca abdita	DO, median ϕ	Multiple variables important
Elasmopus levis	Constant only	Abundance unaffected by any measured variable
Clymenella zonalis	Constant only	Abundance unaffected by any measured variable
Clymenella torquata	Constant only	Abundance unaffected by any measured variable
Angulus agilis	Salinity	Sensitive to salinity even with the shorter salinity gradient at these stations
Sabaco elongatus	N	Correlation is weak, non-significant
Spiochaetopterus costarum oculatus	N	Correlation is weak, non-significant
Polydora cornuta	Constant only	Abundance unaffected by any measured variable
Scoletoma tenuis	Median ϕ	More abundant in finer sediments
Microdeutopus gryllotalpa	Constant only	Abundance unaffected by any measured variable
Ampelisca verrilli	DO, N	Multiple variables important
Listriella barnardi	Constant only	Abundance unaffected by any measured variable
Polycirrus eximius	Constant only	Abundance unaffected by any measured variable
Tagelus divisus	Temp, salinity, P	Multiple variables important
Lysianopsis alba	Median ϕ	More abundant in coarser sediments
Podarkeopsis levifuscina	DO, salinity	Multiple variables important
Rhepoxynius hudsoni	Salinity, P	Multiple variables important
Gemma gemma	Median ϕ	More abundant in coarser sediments
Nucula proxima	Constant only	Abundance unaffected by any measured variable
Glycera americana	P	Positive correlation, potentially useful indicator species
Melinna maculata	DO, salinity	Multiple variables important
Turbonilla interrupta	P	Positive correlation, potentially useful indicator species
Prionospio heterobranchia	Constant only	Abundance unaffected by any measured variable
Solemya velum	Constant only	Abundance unaffected by any measured variable

Table 4. Results of stepwise linear regression of sediment P concentration against the proportional abundances of *Mediomastus ambiseta*, *Glycera americana*, and *Turbonilla interrupta*.

```
Stepwise Linear Regression of pct_P
Unforced Variables: prop_m_a prop_g_a prop_t_i
  P to Enter 0.0500
  P to Exit  0.0500

Step   Variable   Coefficient        T        P      R Sq        MSE
   1   Constant       0.01851     3.54             0.3356  3.921E-04
       prop_m_a       0.04494     3.39   0.0012
       prop_g_a       0.19475     0.73   0.4686
       prop_t_i       0.81625     4.10   0.0001

   2   Constant       0.01984     4.06             0.3306  3.895E-04
       prop_m_a       0.04527     3.43   0.0010
       prop_t_i       0.84517     4.35   0.0000


Resulting Stepwise Model
Variable    Coefficient   Std Error        T        P      VIF
Constant        0.01984     0.00489     4.06   0.0001
prop_m_a        0.04527     0.01321     3.43   0.0010      1.0
prop_t_i        0.84517     0.19440     4.35   0.0000      1.0

Cases Included   75       R Squared      0.3306       MSE 3.895E-04
Missing Cases     0       Adjusted R Sq  0.3120       SD    0.01974

Variables Not in the Model
              Correlations
Variable   Multiple   Partial        T        P
prop_g_a     0.2085    0.0861     0.73   0.4686
```

When these analyses were repeated for the species that are on average more abundant in the low-salinity sites, two potential indicators of sediment TN emerged, the polychaete *Glycinde multidens* and the gastropod *Acteocina canaliculata* (Table 5). Both taxa were more abundant at low-salinity sites with low sediment TN concentrations. Since low-salinity sites may be those more heavily influenced by anthropogenic activities, relatively high abundances of these taxa may be indicators of ‘good’ conditions. Again, additional sampling in 2013 will allow us to continue to evaluate the responses of these species.

Table 5. Results of stepwise linear regressions of abundances of highly ranked species at low salinity sites.

Taxon	Variables in model	Conclusion
Streblospio benedicti	DO, %P	Multiple variables important
Glycinde multidens	%N	Negative correlation, more abundant at low %N, potentially useful indicator species
Acteocina canaliculata	%N	Negative correlation, more abundant at low %N, potentially useful indicator species
Heteromastus filiformis	Constant only	Abundance unaffected by any measured variable

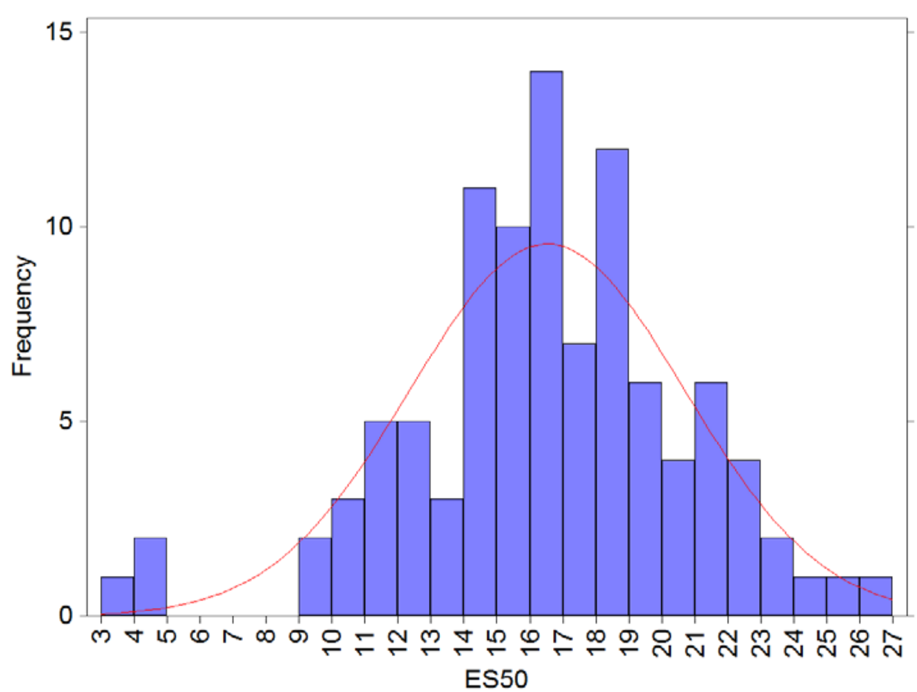
Multivariate and multimetric analyses of community structure and relation to habitat quality

We have evaluated several multimetric and multivariate indices of benthic community condition as a preliminary assessment of their applicability to BB-LEH. There are many indices which have been developed by researchers all over the world. For example, Diaz et al. (Diaz et al. 2004) list 17 indices that try to relate estuarine or marine macrobenthos communities to some measure of environmental quality. A 'universal' index is unlikely to exist. Even indices developed for smaller regions may have limited utility to correctly classify habitats outside of the specific region for which they were calibrated (Pelletier et al. 2012). Therefore, our approach was to apply several of the most widely used indices to the 2012 data set from BB-LEH to determine if there was a general agreement among different indices.

Species diversity

The next step beyond examining the abundance of a single taxon to environmental properties is to look at higher-level groupings. One way of doing this is to combine species at higher levels of taxonomy, for example at the genus, family, order, etc, level. We have elected to use a metric of the diversity of all individuals collected at a given site. Hurlbert's expected number of species was used as a measure of species diversity (Hurlbert 1971). A sample size of 50 individuals was chosen, common practice in studies attempting to relate benthic community structure to environmental stressors (Rosenberg et al. 2004, Leonardsson et al. 2009). For a random sample of 50 individuals from each site, the expected number of different species in the sample ranged from 3.8 to 26.9; a frequency distribution of values was well fit by a normal distribution with a mean of 16.5 (Figure 23).

Figure 23. Frequency distribution $E(S_{50})$ values. Red line is normal curve fit to the data.



The sites with lowest diversity were at the mouth of the Toms River, while most of the highest diversity sites were in the eastern part of the central section of the bay (Figure 24). As is typical in estuaries, species diversity was lowest at the lowest salinity sites, but also declined at the highest salinity sites (Figure 25).

Figure 24. Distribution map of species diversity during the period July 2 – July 11, 2012.

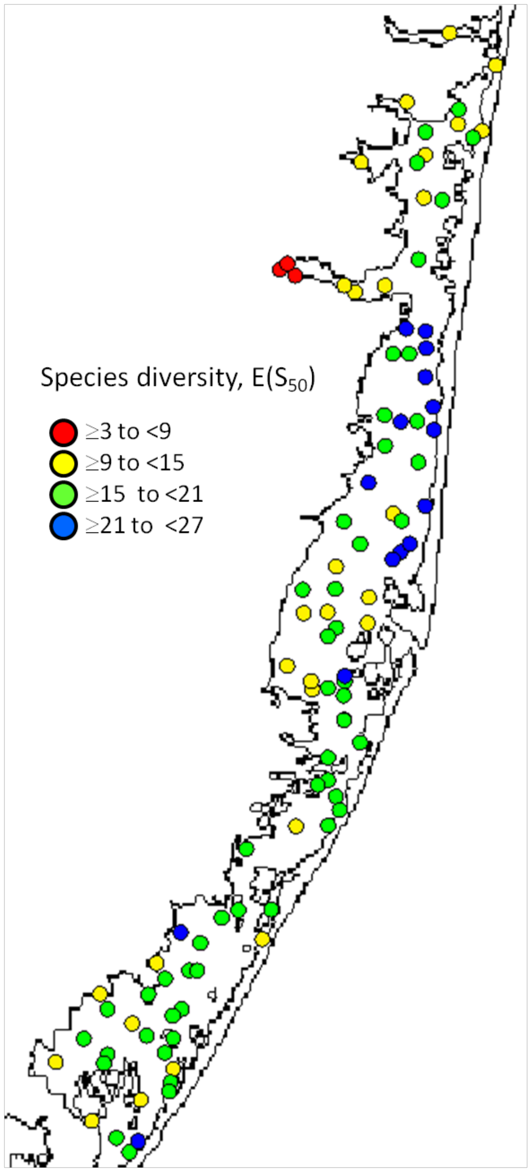
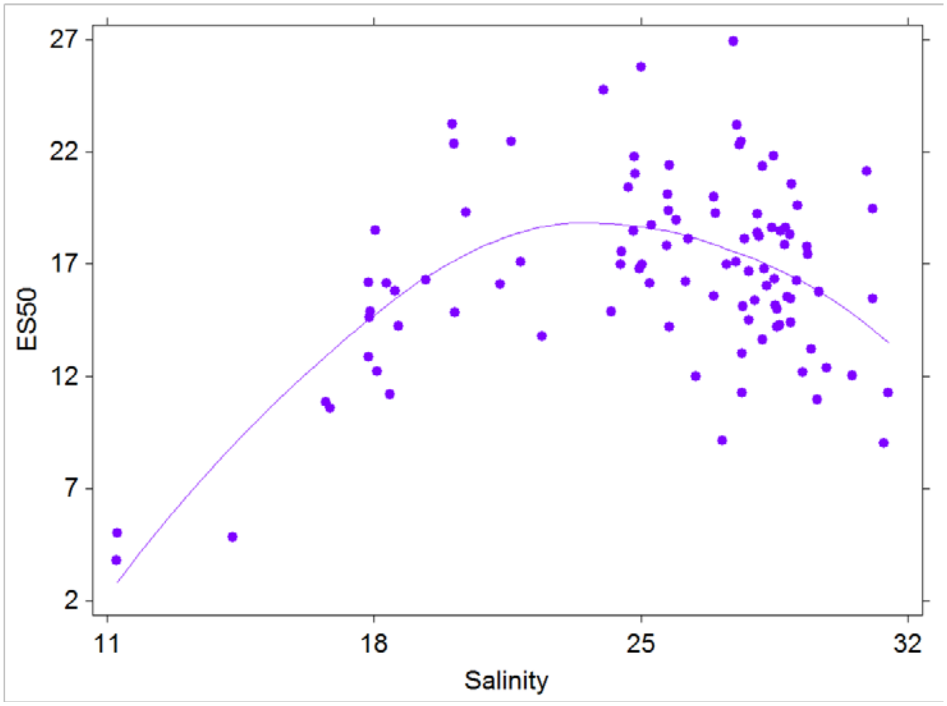


Figure 25. Scatterplot of species diversity vs. bottom water salinity during the period July 2 – July 11, 2012. Line is LOWESS fit, f=0.75.

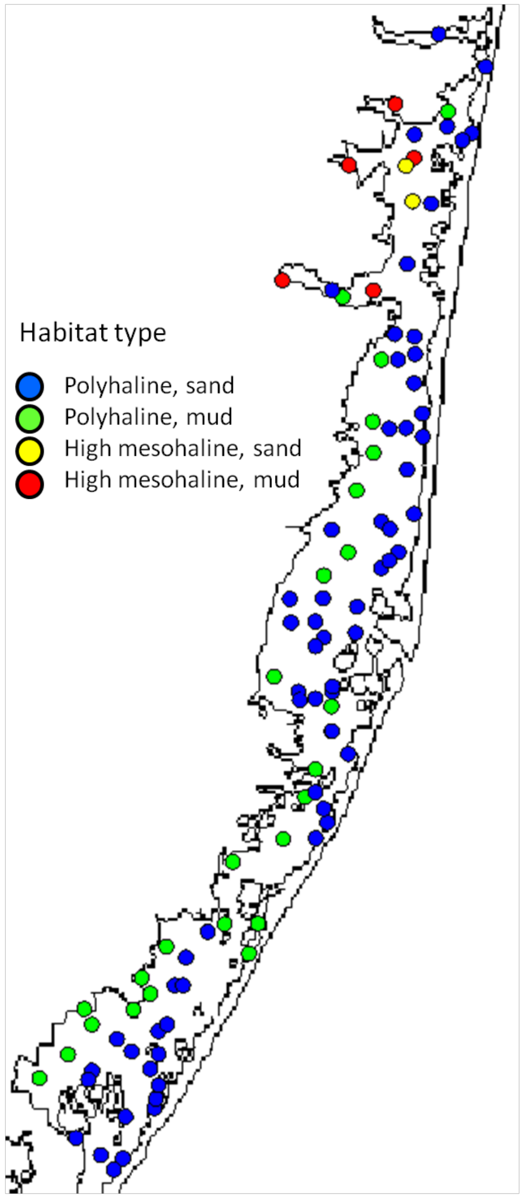


Benthic Index of Biotic Integrity (B-IBI)

Weisberg et al. (1997) developed a multimetric benthic index of biotic integrity using data collected in Chesapeake Bay during sampling programs between 1972 and 1991. The B-IBI has been periodically updated since then as additional data becomes available (Llansó 2002). Depending on the salinity and percent sand of the site, the B-IBI uses different metrics, and different values for metrics, to score sites from a value of 1 to 5. Because the index was developed to track restoration efforts in Chesapeake Bay, a site score of ≤2 is considered "severely degraded," a score from 2.1 to 2.6 considered "degraded," from 2.7 to 2.9 considered "marginal," and ≥3 as "meets restoration goals," equivalent to "non-degraded." Metrics included in the calculation of the index include the Shannon index of species diversity, total abundance of individuals, abundance of pollution-indicative taxa, abundance of pollution-sensitive taxa, abundance of carnivorous and omnivorous taxa, and the abundance of deep deposit-feeding taxa. One of the pitfalls of using metrics based on sensitivity or tolerance to stressors such as pollution, or based on behavior, is that the classification of a given species is often based on expert opinion, and there may be no consensus among different experts. For example, the dominant species in BB-LEH in 2012 was *Mediomastus ambiseta*, which is classified in the B-IBI as pollution-sensitive (Weisberg et al. 1997). Other workers, however, classify *Mediomastus* as pollution-tolerant (Pelletier et al. 2010).

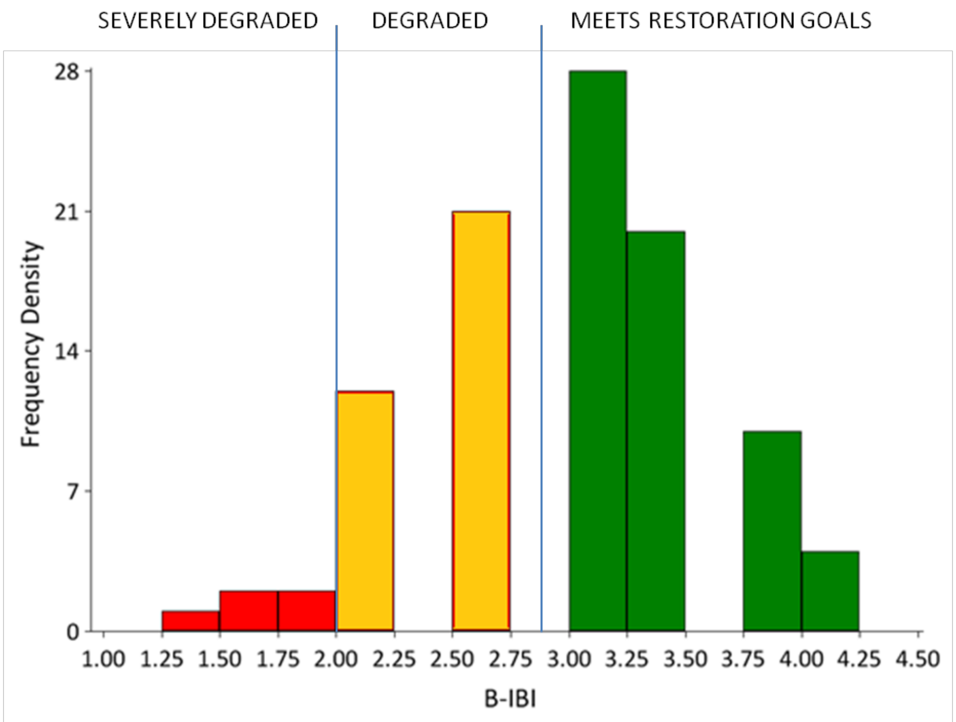
When the stations in BB-LEH were categorized on the basis of salinity and percent sand or percent mud, most stations fell into the polyhaline, sand category (salinity ≥18, sand >40% by weight) (Figure 26).

Figure 26. Distribution map of habitat types based on salinity and percent sand or mud of sediment.



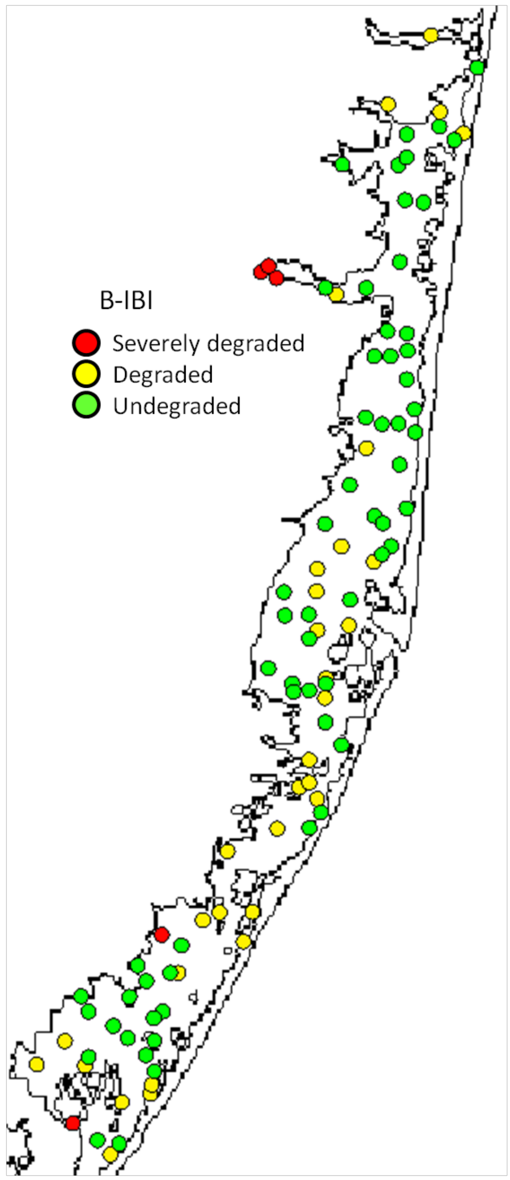
Most stations (61) were classified as meets restoration goals/undegraded by the B-IBI (Figure 27).

Figure 27. Histogram of frequency distribution of stations as classified by B-IBI.



Three of the sites classified as severely degraded were at the head of Toms River, while two more were in the Little Egg Harbor section (Figure 28). Degraded and undegraded stations were often close together, with no consistent pattern in their distributions.

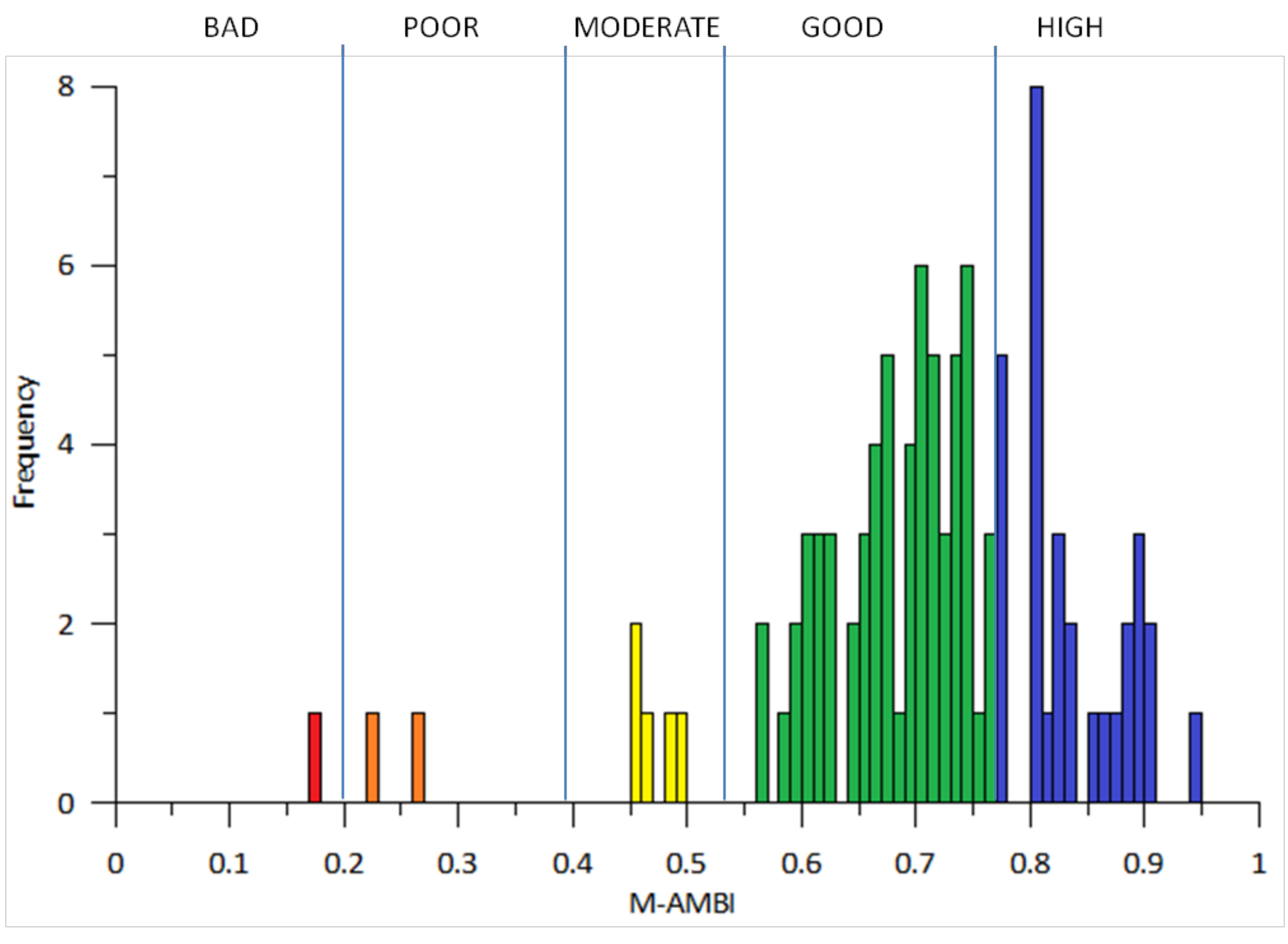
Figure 28. Distribution map for stations as classified by Benthic Index of Biotic Integrity.



AZTI's Marine Biotic Index (AMBI) and the Multivariate AMBI (M-AMBI)

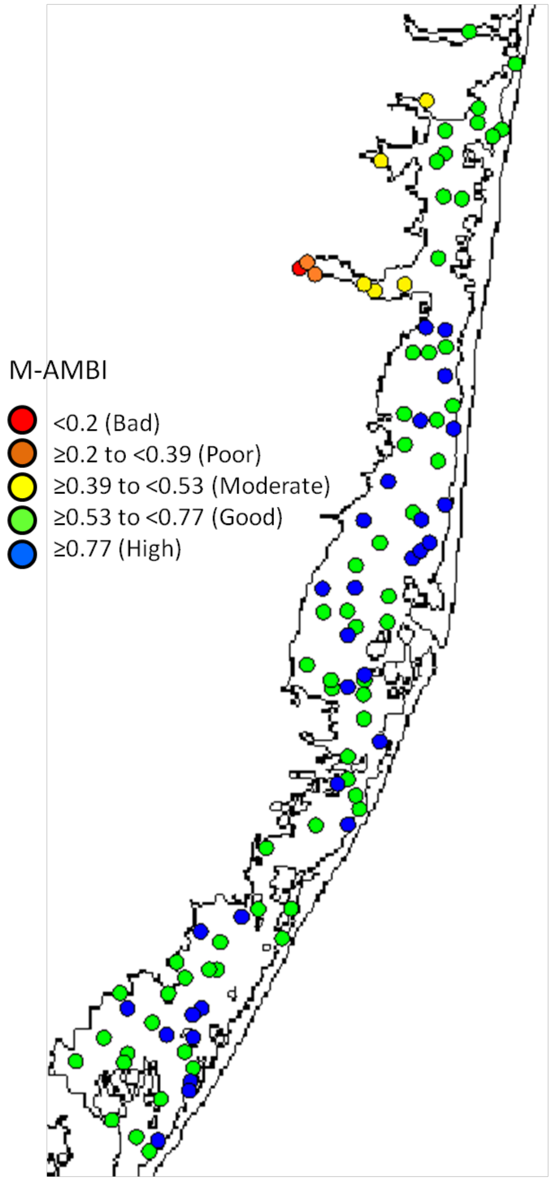
Borja et al. (2000) developed AMBI as an index of the habitat quality of European coastal zones. AMBI is based on the relative proportions of benthic macroinvertebrate that fall into each of five groups, based on their tolerance or response to organic enrichment: very sensitive, indifferent, tolerant, second-order opportunists, and first-order opportunists. As was the case for the B-IBI, there can be varying degrees of subjectivity in how species are assigned to the groups. AMBI values are used to place a site into one of five categories set by the European Union Water Framework Directive: bad, poor, moderate, good, or high. While originally developed for European waters, taxa from Chesapeake Bay have since been added to the database (Borja et al. 2008). A multivariate version, M-AMBI, added species richness and species diversity (Shannon index) to the index (Muxika et al. 2007, Borja et al. 2012), and that is the version we used here. The M-AMBI classifies 92 of the stations in BB-LEH as good or high (Figure 29).

Figure 29. Histogram of frequency distribution of stations as classified by M-AMBI.



The eight stations classified as bad, poor, or moderate by M-AMBI were all associated with locations where fresh water enters the northern section of BB-LEH (Figure 30). All other sites in the northern section were classified as good. All sites in the central and southern sections were classified as good or high.

Figure 30. Distribution map for stations as classified by M-AMBI.



Virginian Province Index (VPI)

Paul et al. (2001) developed a benthic index of estuarine condition for the Virginian Biogeographic Province, which extends from Cape Cod to the mouth of Chesapeake Bay. There are four components in this index: Gleason's D (a metric of species diversity), the abundance of tubificid oligochaetes, the abundance of polychaetes in the family Spionidae, and a constant to center the index on a value of 0. Gleason's D and the abundance of tubificids are adjusted for effects of low salinity, although for the 2012 data from BB-LEH the salinity adjustment is not needed. Gleason's D, while one of the earlier metrics of species diversity, is rarely used by benthic ecologists. Tubificids are a group often associated with organic pollution. Gallagher and Grassle (1997) critiqued the inclusion of all taxa in the family Spionidae, on the basis that it is species-rich family with many different feeding behaviors and a wide range of sensitivity to disturbance. Paul et al. (2001) define degraded sites as those with an index of ≤0 and reference sites as those with an index >0.

Eleven stations in BB-LEH were classified as degraded by the VPI (Figure 31). Eight of these degraded sites were associated with locations where fresh water enters the northern section of BB-LEH, one was at Barnegat Inlet, and three were in the southern section of the bay, near Little Egg Harbor Inlet (Figure 32).

Figure 31. Histogram of frequency distribution of stations as classified by the VPI.

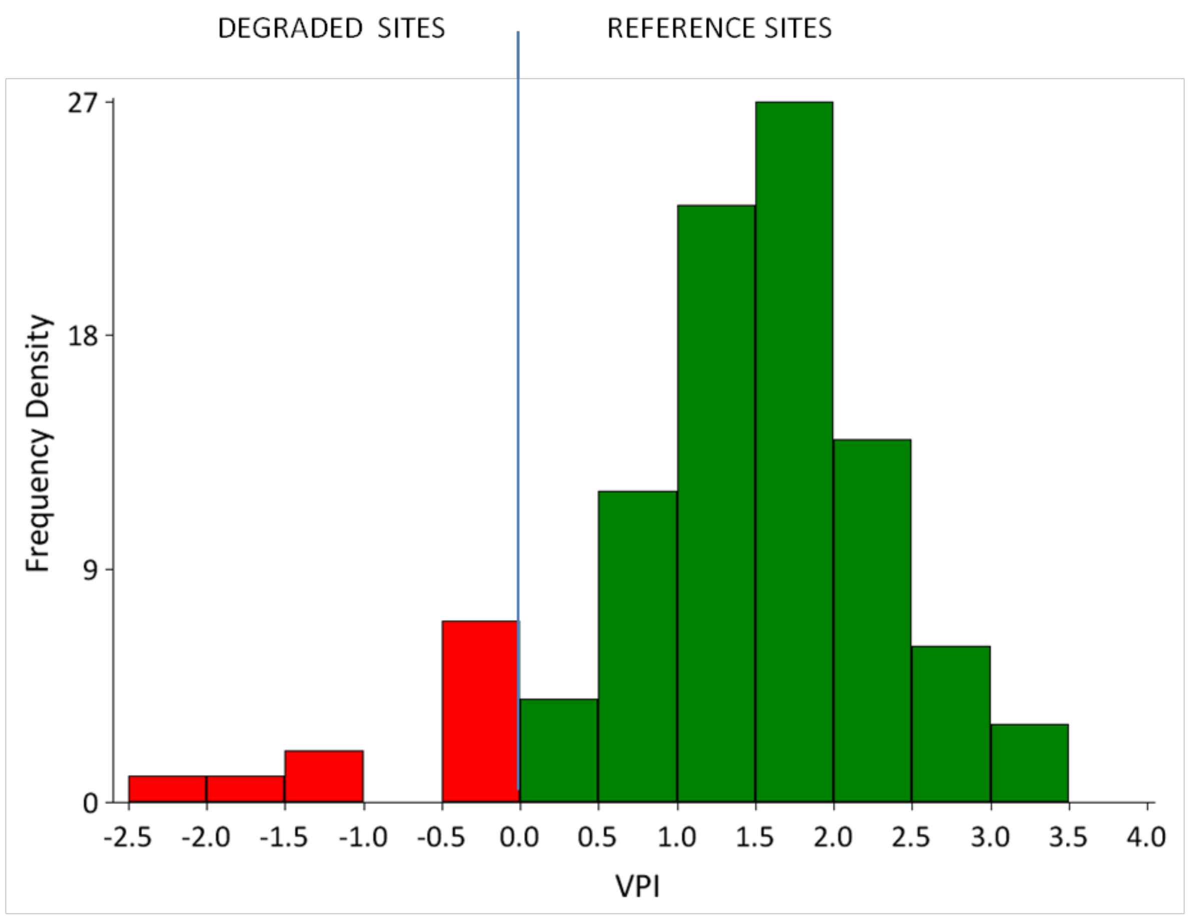
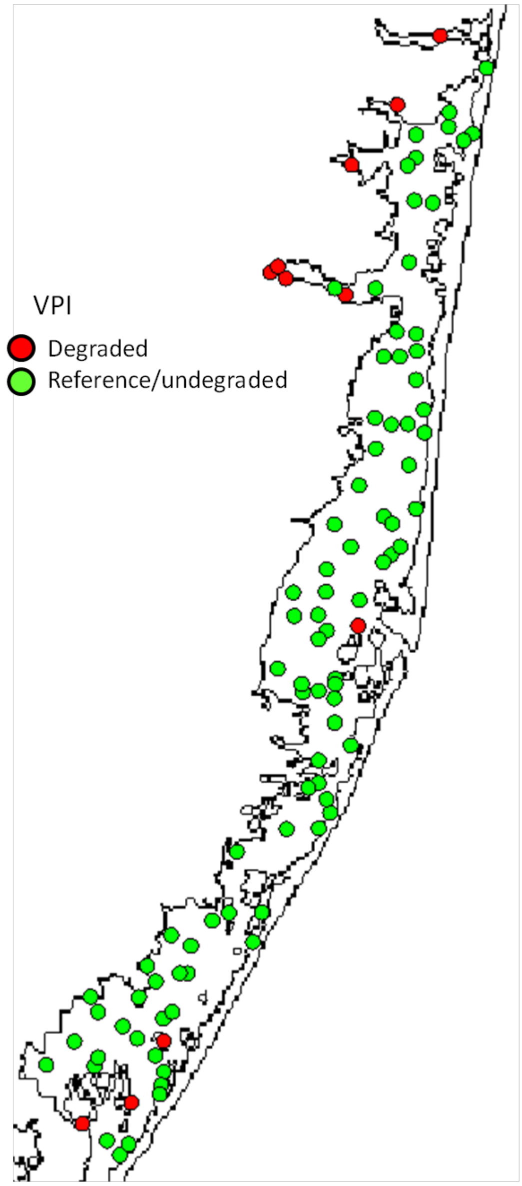


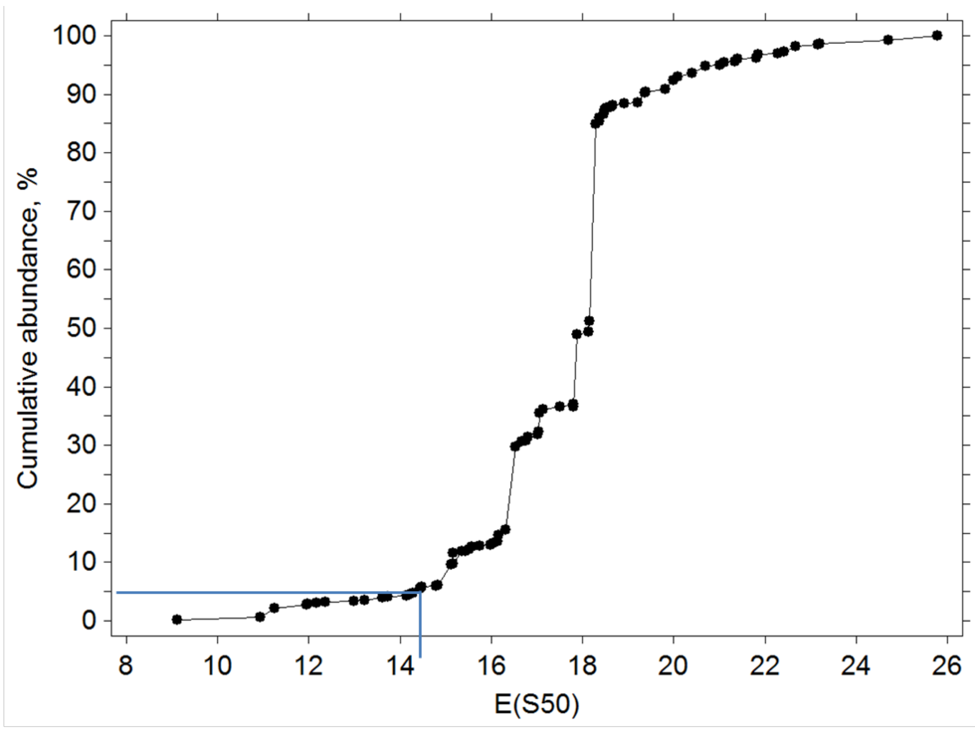
Figure 32. Distribution map for stations as classified by VPI.



Benthic Quality Index (BQI)

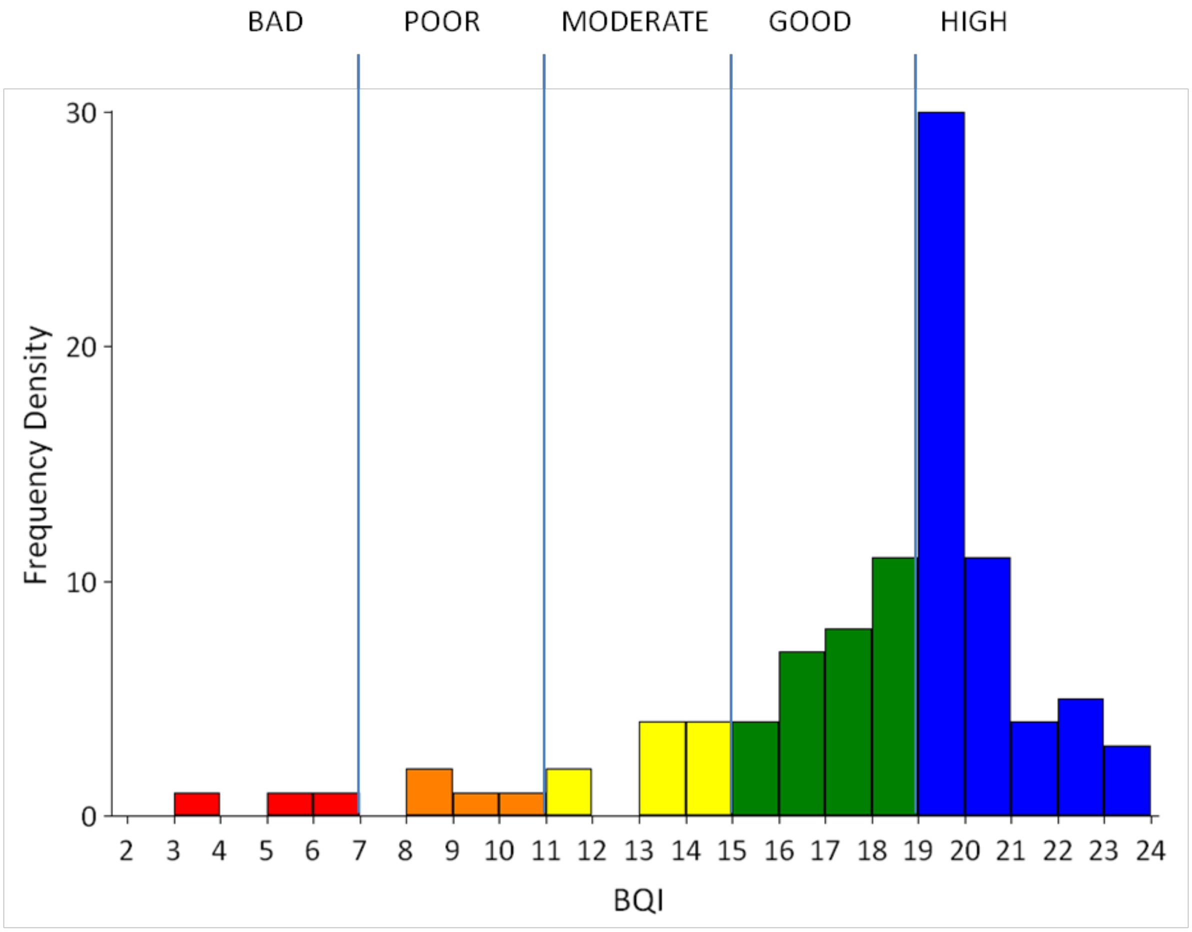
Rosenberg et al. (2004) developed a benthic quality index (BQI) to classify habitat quality according to the European Union Water Framework. The BQI differs from other indices in that it does not include a metric based on classifying taxa into groups based on their (assumed) tolerance or sensitivity to pollution. While it is thus more objective than some indices, it is not without assumptions. At the heart of the BQI is calculating a tolerance value for each taxon in the area under study. Tolerance values are determined by plotting the cumulative abundance of each taxon against Hurlbert's species diversity index, $E(S_{50})$. The assumption is made that species diversity will be low in polluted environments, and hence a species that reaches high abundance in habitats with low diversity is tolerant to pollution or eutrophication. Rosenberg et al. (2004) chose the value of $E(S_{50})$ where a species reaches 5% of its cumulative abundance, designated $E(S_{50})_{0.05}$, as the tolerance value for that species. An example of the method is given here, using data from the 76 stations where the amphipod *Ampelisca abdita* was present (Figure 33). The tolerance value for *Ampelisca abdita* is 14.3. By the assumptions of the BQI, a species more sensitive to pollution or eutrophication would its curve shifted to the right, with a higher tolerance value, while the reverse would hold for a species more tolerant to pollution or eutrophication. Tolerance values for taxa with a total abundance at all stations >20 are given in the Appendix (Table A5).

Figure 33. Plot of cumulative abundance of *Ampelisca abdita* against the rank-ordered species diversity of the stations where the species was present. The value of the abscissa at which the curve reaches 5% of the cumulative abundance is defined as the tolerance value.



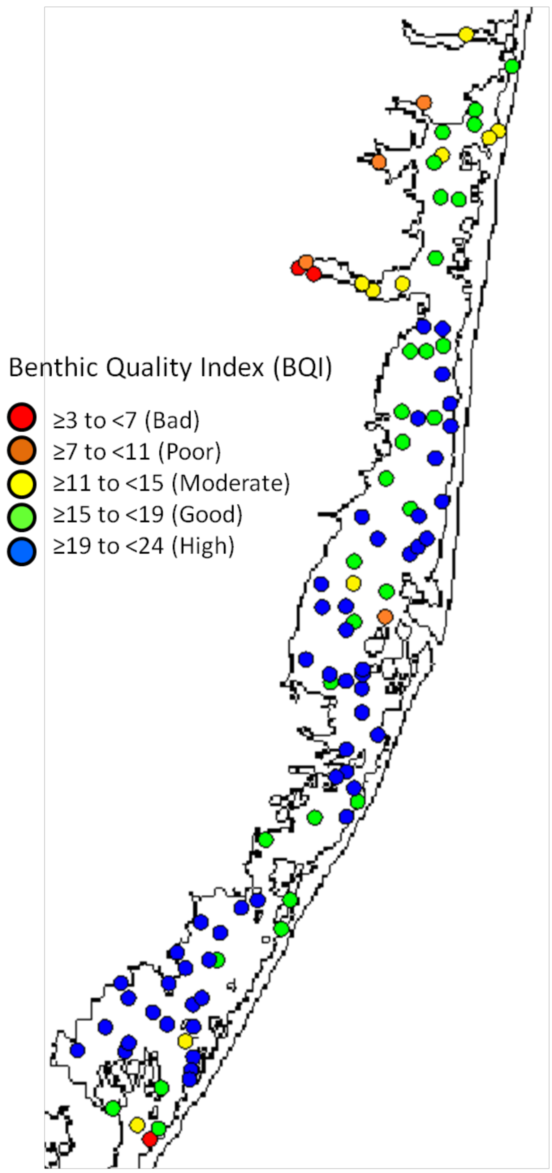
The BQI for a site is the summation of each species' tolerance value scaled by its relative abundance, with the final summation multiplied by the logarithm of the species richness (plus 1) (Rosenberg et al. 2004). The range of BQIs for all sites is divided into five equal intervals, as for M-AMBI, to correspond with the European Water Framework Directive's classifications of bad, poor, moderate, good, or high. Most stations (83) in BB-LEH are classified as good or high by the BQI (Figure 34).

Figure 34. Histogram of frequency distribution of stations as classified by the BQI.



Five of the seven sites classified as bad or poor were associated with locations where fresh water enters the northern section of BB-LEH, one was at Barnegat Inlet, and one was in the southern section of the bay, at Little Egg Harbor Inlet (Figure 35). Sites classified as moderate in these same general areas. Sites classified as good were found throughout the bay. Sites classified as high were concentrated in the central and southern sections of BB-LEH.

Figure 35. Distribution map for stations as classified by BQI.

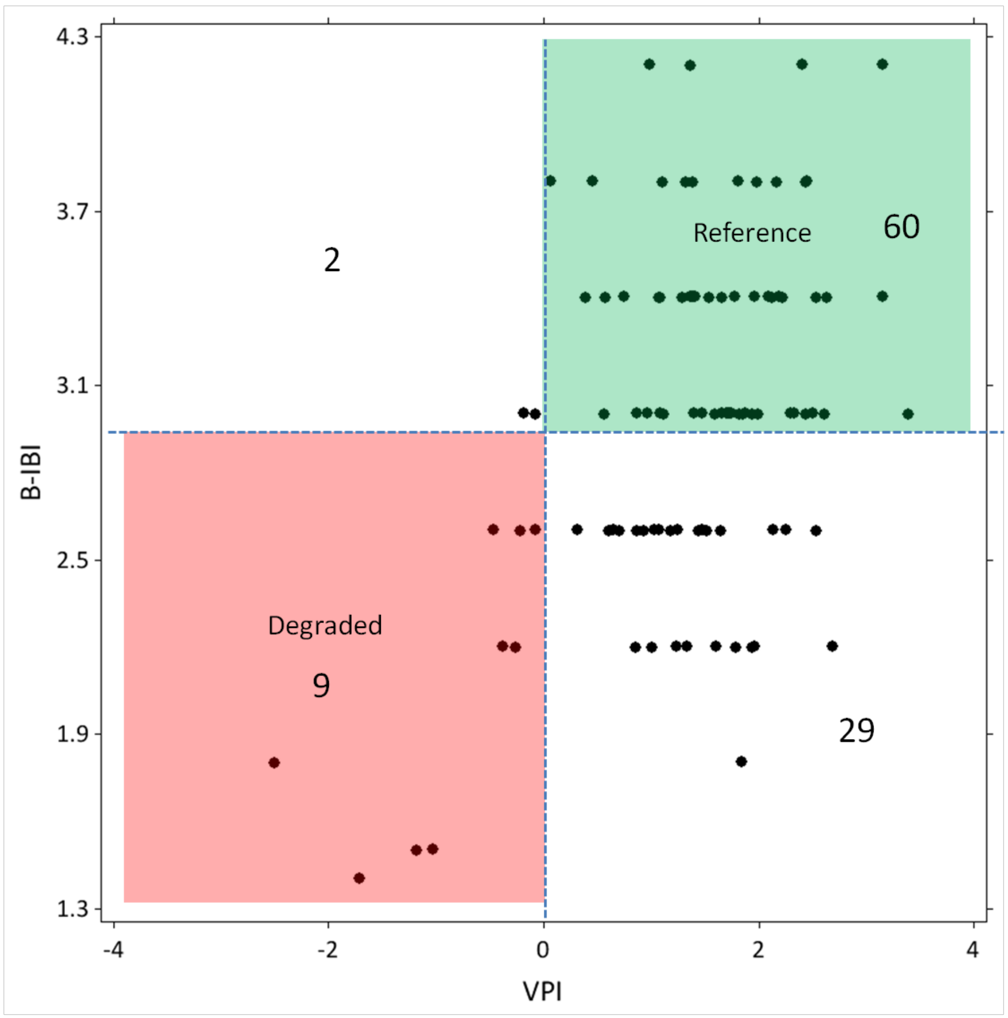


Comparisons among multivariate and multimetric indices

We compared the classifications made by the four indices to determine areas of agreement and disagreement.

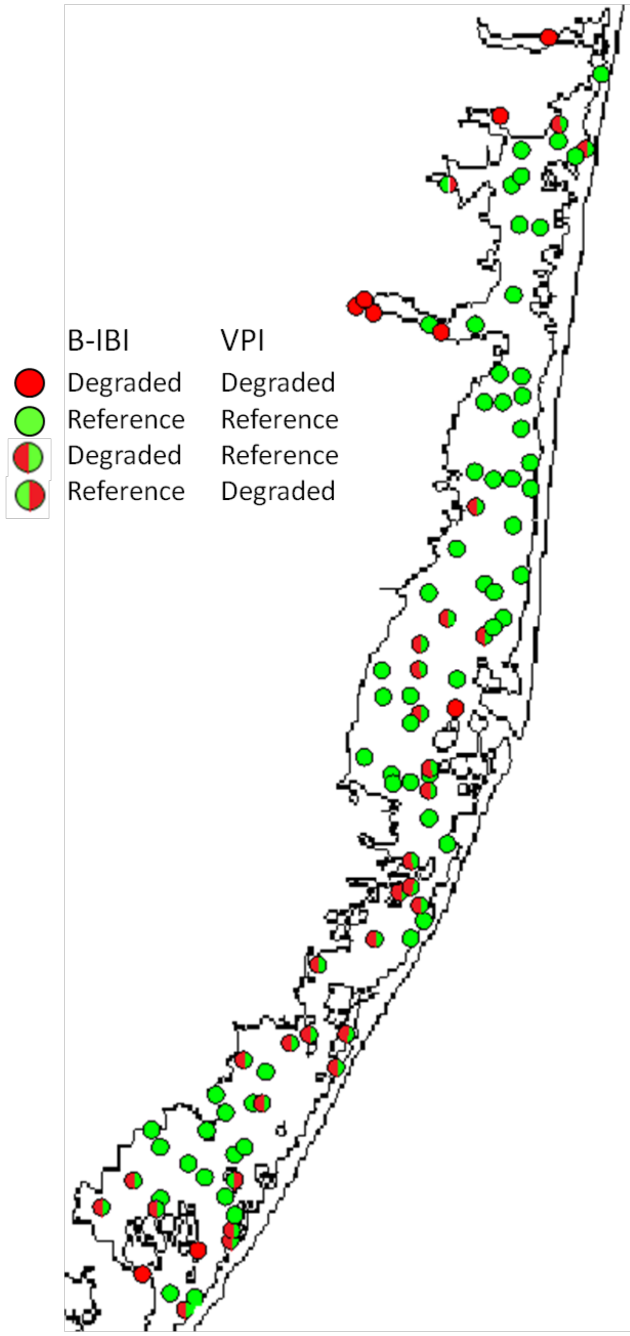
The B-IBI and VPI are both dichotomous indices for the BB-LEH stations, classifying stations as either reference or degraded/severely degraded. The indices agreed for 69 of the sites (Figure 36). Sixty sites were classified as reference by both indices, while nine sites were classified as degraded. Most of the disagreement between the indices arose from sites classified as degraded by the B-IBI but as reference by the VPI.

Figure 36. Comparison of site classifications by the Benthic Index of Biotic Integrity and the Virginian Province Index. Sites in the green-shaded area are classified as reference sites (undegraded) by both indices, sites in the red-shaded area are classified as degraded by both indices. Numbers in each sections denote the number of sites.



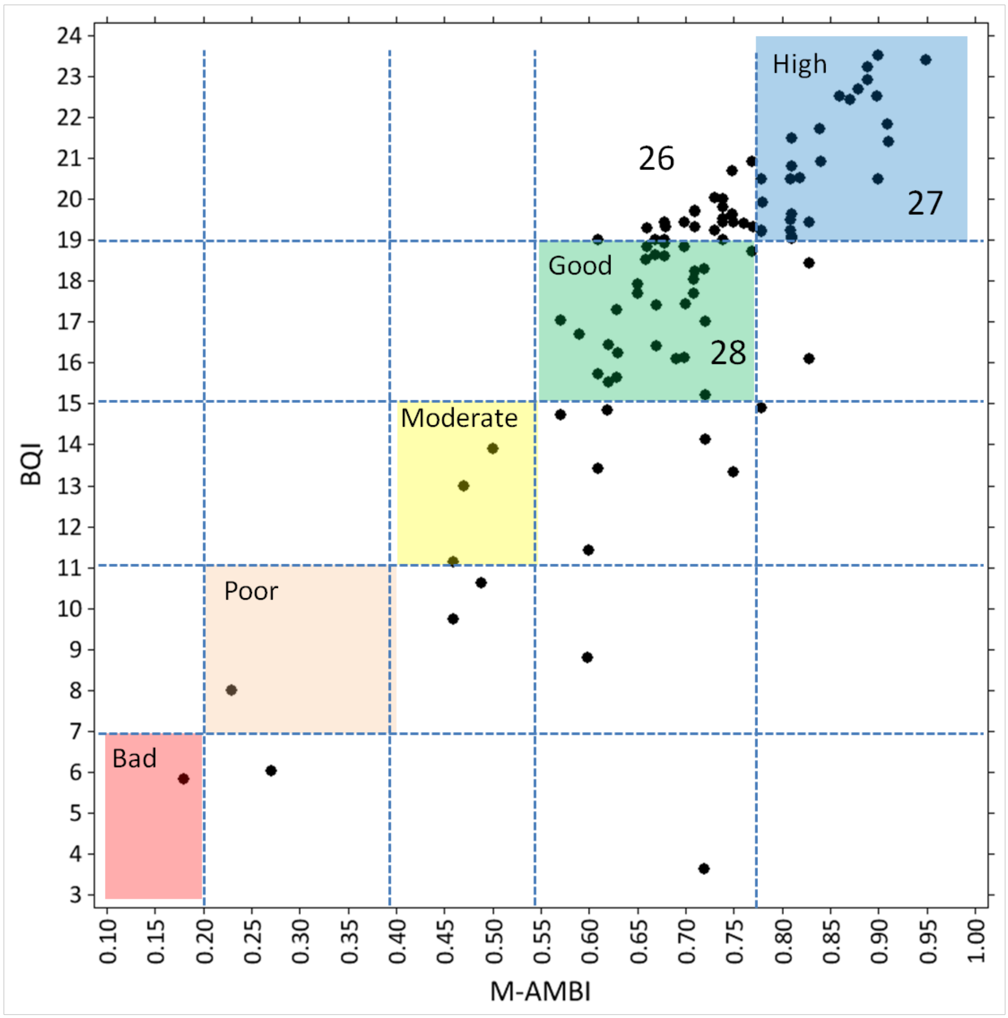
Agreement between the two indices was generally good in the northern section of the bay (Figure 37). Most of the sites where the indices disagreed were in the central and southern sections

Figure 37. Map of comparison of site classifications by the Benthic Index of Biotic Integrity and the Virginian Province Index.



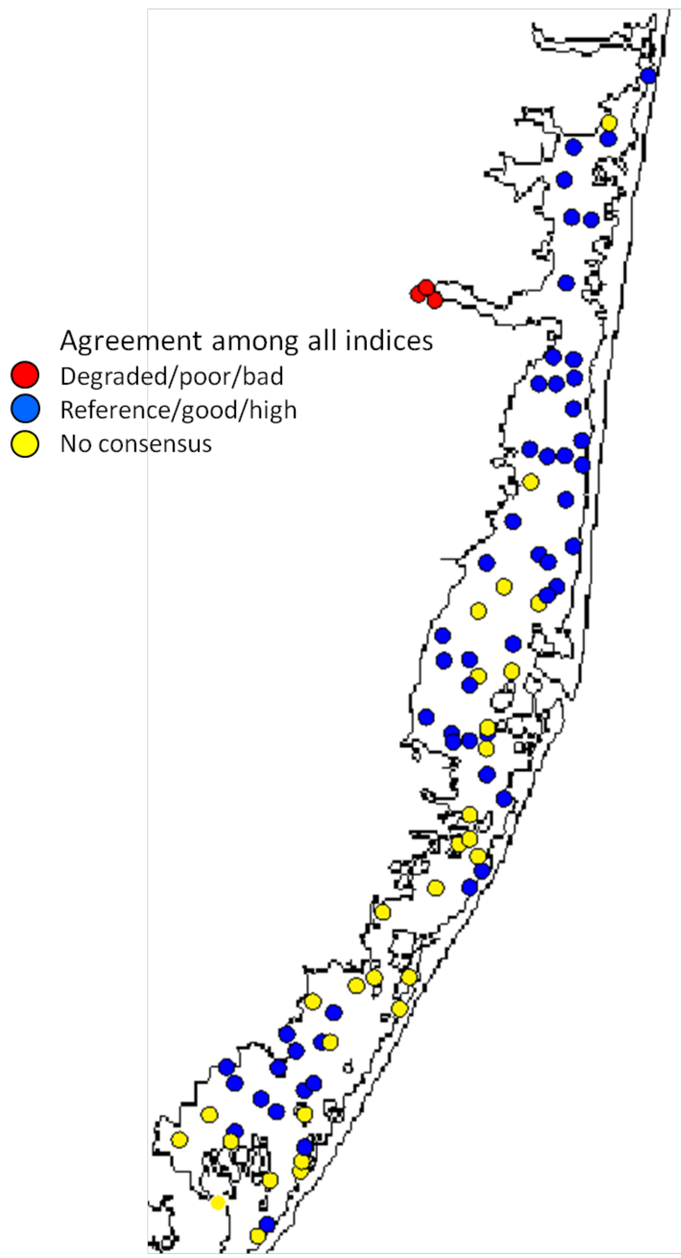
The Multivariate AMBI and the Benthic Quality Index both use the same five verbal descriptions of habitat quality. These indices agreed on classifications for 60 of the stations (Figure 38). Most of the disagreement (26 sites) was for sites classified as good by M-AMBI but as high by BQI.

Figure 38. Comparison of site classifications by the Multivariate AMBI and the Benthic Quality Index. Both indices agree on classifications for sites in the shaded areas. Numbers in sections denote the number of sites.



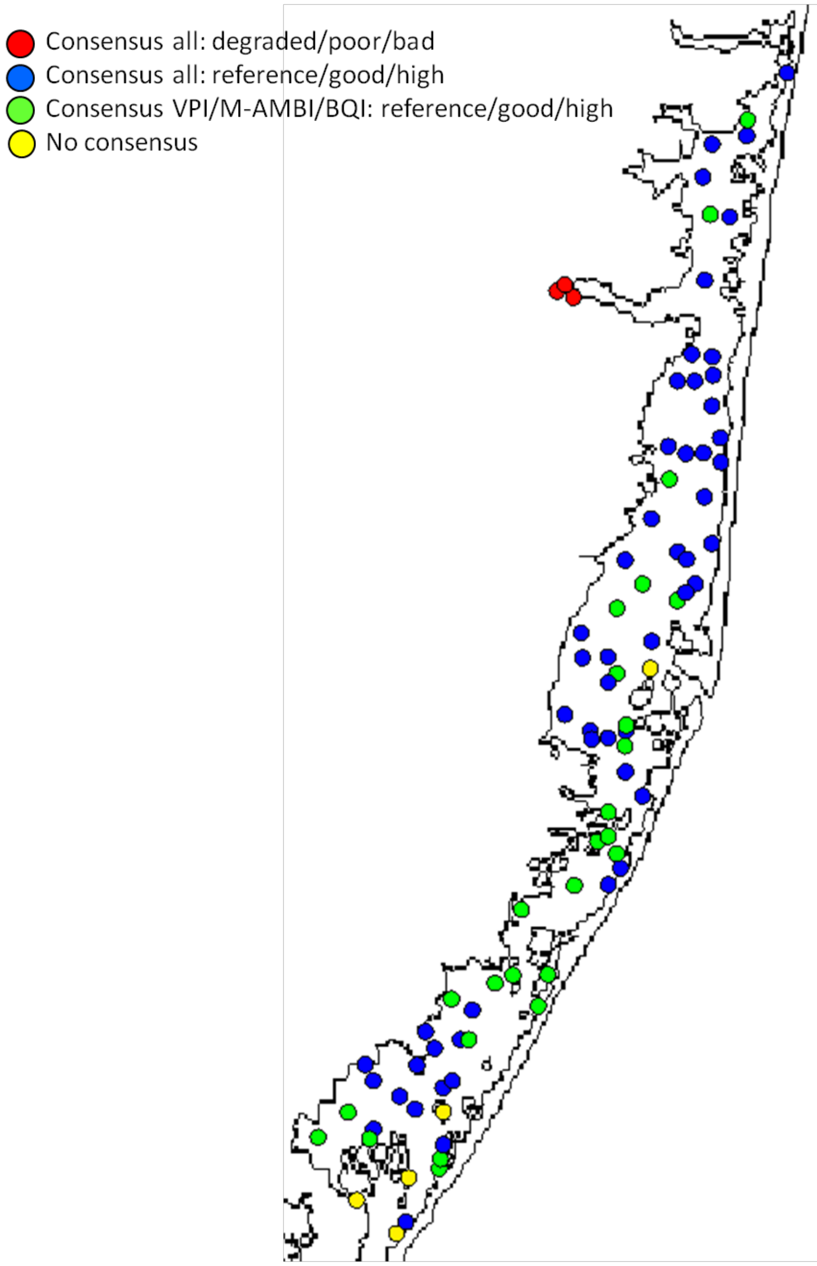
Comparisons among all four indices is not as straightforward, since the B-IBI and VPI are dichotomous, while the M-AMBI and BQI have five classification levels. We combined classification levels from the latter two indices to permit comparison. We consider all indices in agreement if a habitat was classified as degraded and (poor or bad). All indices were also in agreement if a habitat was classified as reference and (good or high). Habitats classified as moderate by either the M-AMBI or BQI (total of 12 sites) were not included in the comparison since it is ambiguous how they fit into the dichotomous classification scheme. There was consensus on three degraded/poor/bad stations at the head of Toms River and for 54 reference/good/high stations spread throughout the bay (Figure 39). For 31 stations there was no consensus among the indices.

Figure 39. Comparison of site classifications by the B-IBI, VPI, M-AMBI, and BQI.



Perusal of the sites where there was no consensus among the indices showed that in most cases, 26 of 31, it was because the site was classified as degraded by the B-IBI but as reference/good/high by the VPI, M-AMBI, and BQI. If these 26 sites are now ranked on the basis of consensus by three out of the four indices, then classification remains uncertain for only five sites, all near the two major inlets to the ocean (Figure 40).

Figure 40. Comparison of site classifications by the B-IBI, VPI, M-AMBI, and BQI.



Conclusions

All parameters measured at 100 locations throughout Barnegat Bay-Little Egg Harbor during the period July 2 through July 11, 2012 indicated that, except for a few locations, the benthic environment was in good condition. For the most part, surface sediments had low concentrations of total organic carbon (<2%), total nitrogen (<0.2%), and total phosphorus (<0.075%) (Figures 7-10). Exceptions were several stations in the northern section of the bay, especially sites near major sources of freshwater input, such as the Toms River. Although neither organic contaminants nor heavy metals were measured in this study, it would be surprising if there were elevated levels of these substances in the sediments given the generally low concentrations of organic carbon, except possibly in localized areas as noted above. Bottom water dissolved oxygen concentrations were above 4 mg/L at all sites during the sampling period, and above 5 mg/L at 88 of the 100 sites (Figure 3). Sediment TOC concentrations below 2% and bottom water dissolved oxygen concentrations above 5 mg/L are usually considered characteristics of reference, non-impacted habitats (Pelletier et al. 2010, Pelletier et al. 2012).

Benthic macroinvertebrates were abundant and diverse. Taxa typical of reference, non-impacted estuarine habitats in the Virginian Biogeographic Province dominated the community, again with a few exceptions as noted for sediment chemical properties. Salinity exerted a strong effect on the distribution and abundance of most taxa. Focusing on species which were most abundant at lower (<23) or higher (>24) salinities revealed several taxa potentially responsive to sediment nitrogen and phosphorus concentrations. Further sampling, to be conducted during July 2013, will be needed to evaluate this possibility.

Four multimetric or multivariate indices of habitat quality were evaluated using the benthic macroinvertebrate data. Two of these, the Virginian Province Index and the Benthic Index of Biotic Integrity, were developed specifically for coastal and estuarine habitats within the Virginian Biogeographic Province, in which Barnegat Bay is centrally located. A third, the Multivariate AZTI Marine Biotic Index was originally developed for coastal and estuarine benthic habitats in Europe but has been adapted to the Virginian Biogeographic Province. These three indices include both objective metrics, such as measures of species diversity and abundances of taxa, as well as more subjective metrics based on categorization of feeding behaviors or life history characteristics. A fourth index, the Benthic Quality Index, uses only objective metrics but has the explicit assumption that species diversity is inversely correlated with habitat quality.

All of these indices characterized the substantial majority of the sites as not degraded, good, or high. On a site-by-site comparison, in the substantial majority of cases all indices agreed on the classification of the sites. Because each index emphasizes different metrics derived from the composition of benthic community, the agreement among indices can be taken as further evidence that the overall health of the Barnegat Bay-Little Egg Harbor benthic ecosystem was good in 2012.

Appendix Table A1

Table A1. Station locations and field-collected data: date and time sampled, weather, bay conditions, water depth, surface and bottom water temperature, surface and bottom salinity, surface and bottom dissolved oxygen, surface and bottom pH, characteristics of sediment grab samples, comments.

SITE_ID	Latitude	Longitude	Date	Time arrived	Weather	Bay conditions
BB12-001	39 56.890	-74 6.092	07/10/12	14:05	Sunny	Calm
BB12-002	39 58.657	-74 5.908	07/10/12	13:30	Sunny	Calm
BB12-003	40 1.367	-74 6.546	07/10/12	12:06	Partly sunny	Calm
BB12-004	39 59.646	-74 6.158	07/10/12	12:48	Partly sunny	Calm
BB12-005	39 59.651	-74 8.246	07/10/12	13:07	Partly sunny	Calm
BB12-006	39 59.855	-74 5.858	07/10/12	12:32	Partly sunny	Calm
BB12-007	40 0.504	-74 5.851	07/10/12	11:48	Partly sunny	Calm
BB12-008	39 58.565	-74 5.256	07/10/12	13:45	Sunny	Calm
BB12-009	40 0.541	-74 3.764	07/10/12	11:05	Overcast	Calm
BB12-010	40 1.148	-74 4.628	07/10/12	10:26	Overcast	Calm
BB12-011	40 2.386	-74 3.261	07/10/12	10:05	Overcast	Calm
BB12-012	40 0.342	-74 4.102	07/10/12	11:26	Partly sunny	Calm
BB12-013	40 3.290	-74 4.959	07/10/12	9:30	Overcast	Calm
BB12-014	40 0.725	-74 4.655	07/10/12	10:48	Overcast	Calm
BB12-015	39 56.176	-74 8.846	07/10/12	15:56	Partly sunny	Calm
BB12-016	39 54.947	-74 6.565	07/11/12	9:26	Partly sunny	Calm
BB12-017	39 54.229	-74 6.452	07/11/12	10:20	Partly sunny	Calm
BB12-018	39 56.420	-74 10.661	07/10/12	15:10	Partly sunny	Calm
BB12-019	39 56.619	-74 11.241	07/10/12	14:45	Sunny	Calm
BB12-020	39 56.179	-74 7.347	07/10/12	15:38	Partly sunny	Calm
BB12-021	39 52.507	-74 7.352	07/09/12	14:10	Partly sunny	Calm
BB12-022	39 54.237	-74 7.049	07/11/12	10:40	Partly sunny	Calm
BB12-023	39 50.571	-74 7.957	07/09/12	14:51	Sunny	Calm
BB12-024	39 55.973	-74 8.441	07/10/12	16:20	Sunny	Calm
BB12-025	39 56.778	-74 10.950	07/10/12	14:58	Partly sunny	Calm
BB12-026	39 51.644	-74 7.353	07/09/12	14:28	Sunny	Calm
BB12-027	39 49.920	-74 5.851	07/09/12	12:02	Overcast	Choppy
BB12-028	39 53.579	-74 5.862	07/11/12	11:07	Partly sunny	Calm
BB12-029	39 52.296	-74 6.755	07/09/12	13:48	Partly sunny	Calm
BB12-030	39 52.721	-74 5.562	07/09/12	13:20	Partly sunny	Calm

Appendix Table A1

SITE_ID	Latitude	Longitude	Date	Time arrived	Weather	Bay conditions
BB12-031	39 54.231	-74 5.555	07/11/12	10:10	Partly sunny	Calm
BB12-032	39 54.874	-74 5.852	07/11/12	9:45	Partly sunny	Calm
BB12-033	39 52.312	-74 6.155	07/09/12	13:00	Partly sunny	Calm
BB12-034	39 52.069	-74 5.548	07/09/12	12:41	Partly sunny	Choppy
BB12-035	39 49.700	-74 7.055	07/09/12	11:40	Overcast	Choppy
BB12-036	39 51.157	-74 6.125	07/09/12	12:15	Overcast	Choppy
BB12-037	39 44.753	-74 9.458	07/06/12	11:22	Sunny	Calm
BB12-038	39 48.844	-74 8.249	07/09/12	9:53	Overcast	Choppy
BB12-039	39 44.956	-74 10.067	07/06/12	10:19	Sunny	Calm
BB12-040	39 47.557	-74 9.191	07/06/12	13:45	Sunny	Calm
BB12-041	39 45.389	-74 10.941	07/06/12	9:15	Sunny	Calm
BB12-042	39 44.740	-74 10.048	07/06/12	10:29	Sunny	Calm
BB12-043	39 47.542	-74 10.364	07/06/12	14:07	Sunny	Calm
BB12-044	39 46.468	-74 9.151	07/06/12	12:15	Sunny	Calm
BB12-045	39 46.885	-74 9.454	07/06/12	12:33	Sunny	Calm
BB12-046	39 46.235	-74 9.453	07/06/12	12:02	Sunny	Calm
BB12-047	39 49.483	-74 8.856	07/09/12	15:15	Sunny	Calm
BB12-048	39 48.188	-74 9.163	07/09/12	9:25	Overcast	Choppy
BB12-049	39 48.410	-74 7.067	07/09/12	10:20	Overcast	Choppy
BB12-050	39 47.324	-74 7.948	07/06/12	13:15	Sunny	Calm
BB12-051	39 44.957	-74 8.845	07/06/12	11:30	Sunny	Calm
BB12-052	39 45.181	-74 8.835	07/06/12	11:45	Sunny	Calm
BB12-053	39 49.492	-74 6.746	07/09/12	11:25	Overcast	Choppy
BB12-054	39 48.839	-74 6.443	07/09/12	11:05	Overcast	Choppy
BB12-055	39 45.801	-74 6.481	07/06/12	14:24	Sunny	Calm
BB12-056	39 44.557	-74 8.875	07/06/12	11:05	Sunny	Calm
BB12-057	39 46.684	-74 7.946	07/06/12	13:00	Sunny	Calm
BB12-058	39 48.617	-74 6.762	07/09/12	10:40	Overcast	Choppy
BB12-059	39 39.657	-74 12.392	07/05/12	12:03	Sunny	Calm
BB12-060	39 40.196	-74 12.452	07/05/12	12:27	Sunny	Calm
BB12-061	39 42.119	-74 10.045	07/05/12	14:35	Sunny	Calm
BB12-062	39 38.242	-74 13.356	07/05/12	11:44	Sunny	Calm
BB12-063	39 43.851	-74 8.857	07/06/12	10:42	Sunny	Calm
BB12-064	39 42.782	-74 9.455	07/05/12	15:00	Sunny	Calm
BB12-065	39 41.308	-74 8.905	07/05/12	13:30	Sunny	Calm
BB12-066	39 43.216	-74 8.260	07/05/12	15:30	Sunny	Calm
BB12-067	39 40.838	-74 10.652	07/05/12	12:50	Sunny	Calm

Appendix Table A1

SITE_ID	Latitude	Longitude	Date	Time arrived	Weather	Bay conditions
BB12-068	39 38.473	-74 11.549	07/05/12	10:50	Sunny	Calm
BB12-069	39 38.459	-74 12.748	07/05/12	11:21	Sunny	Calm
BB12-070	39 42.152	-74 9.454	07/05/12	14:05	Sunny	Calm
BB12-071	39 41.690	-74 9.151	07/05/12	13:55	Sunny	Calm
BB12-072	39 40.848	-74 9.458	07/05/12	13:15	Sunny	Calm
BB12-073	39 37.631	-74 11.861	07/05/12	10:30	Sunny	Calm
BB12-074	39 37.524	-74 14.142	07/03/12	14:10	Partly sunny	Calm
BB12-075	39 36.744	-74 14.562	07/03/12	13:18	Partly sunny	Calm
BB12-076	39 35.647	-74 17.564	07/03/12	11:25	Sunny	Calm
BB12-077	39 36.083	-74 17.847	07/03/12	11:50	Sunny	Calm
BB12-078	39 36.965	-74 15.766	07/03/12	12:58	Partly sunny	Calm
BB12-079	39 35.234	-74 16.657	07/02/12	12:47	Sunny	Calm
BB12-080	39 34.353	-74 17.562	07/02/12	13:40	Partly sunny	Calm
BB12-081	39 36.081	-74 16.059	07/03/12	12:00	Sunny	Calm
BB12-082	39 36.519	-74 15.455	07/03/12	12:40	Partly sunny	Calm
BB12-083	39 34.141	-74 19.475	07/02/12	14:09	Partly sunny	Calm
BB12-084	39 34.806	-74 18.439	07/02/12	13:18	Partly sunny	Calm
BB12-085	39 37.828	-74 14.862	07/03/12	14:35	Partly sunny	Calm
BB12-086	39 33.919	-74 17.843	07/02/12	13:56	Partly sunny	Calm
BB12-087	39 33.303	-74 15.292	07/02/12	10:55	Sunny	Calm
BB12-088	39 35.457	-74 15.164	07/03/12	10:45	Sunny	Calm
BB12-089	39 36.321	-74 13.947	07/03/12	13:50	Partly sunny	Calm
BB12-090	39 33.562	-74 15.241	07/02/12	11:13	Sunny	Calm
BB12-091	39 34.817	-74 15.149	07/03/12	9:45	Sunny	Calm
BB12-092	39 35.655	-74 14.838	07/02/12	11:02	Sunny	Calm
BB12-093	39 33.062	-74 16.344	07/03/12	9:30	Sunny	Calm
BB12-094	39 34.891	-74 16.125	07/02/12	12:10	Sunny	Calm
BB12-095	39 31.576	-74 16.768	07/02/12	10:15	Sunny	Calm
BB12-096	39 34.371	-74 15.759	07/02/12	11:54	Sunny	Calm
BB12-097	39 31.984	-74 17.241	07/02/12	15:05	Partly sunny	Calm
BB12-098	39 30.674	-74 17.842	07/03/12	8:53	Sunny	Calm
BB12-099	39 33.945	-74 15.148	07/02/12	11:34	Sunny	Calm
BB12-100	39 32.465	-74 18.143	07/02/12	14:44	Partly sunny	Calm

Appendix Table A1

SITE_ID	Water depth (m)	Surface temp	Surface salinity	Surface DO (mg L-1)	Surface pH	Bottom temp	Bottom salinity	Bottom DO (mg L-1)	Bottom pH
BB12-001	2.7	27.8	18.32	6.89	8.1	27.8	18.57	6.98	8.1
BB12-002	2.0	28	17.9	6.83	7.99	28	17.89	6.82	7.99
BB12-003	1.5	28	16.85	5.57	7.82	27.9	16.85	5.52	7.78
BB12-004	2.3	28	17.85	6.43	7.91	27.4	17.89	6.13	7.86
BB12-005	2.0	28.3	16.74	6.59	7.87	28.2	16.76	6.45	7.85
BB12-006	2.4	27.9	17.72	6.29	7.93	27.3	17.91	6.17	7.91
BB12-007	2.1	27.7	17.6	6.18	7.89	27.5	18.32	6.02	7.87
BB12-008	1.8	27.9	18.07	6.59	7.99	27.7	18.07	6.52	7.99
BB12-009	1.7	27.3	18.62	5.65	7.82	27.2	18.67	5.36	7.82
BB12-010	2.1	27	18.78	5.85	7.87	27.6	20.41	4.40	7.59
BB12-011	3.0	26.5	20.55	5.64	7.82	26.8	22.43	4.72	7.69
BB12-012	2.7	27.3	18.66	5.80	7.85	27.5	19.38	3.98	7.61
BB12-013	2.1	27.2	22.52	5.44	7.68	27.2	24.23	4.92	7.65
BB12-014	2.3	27.4	18.83	5.81	7.84	27.3	20.12	4.82	7.71
BB12-015	2.7	29.3	14.98	7.14	8.08	28.3	18.11	5.71	7.81
BB12-016	2.4	26.8	19.09	6.21	7.94	26.9	20.06	5.81	7.93
BB12-017	1.8	27.1	21.11	6.28	8	27.1	21.32	6.35	8.01
BB12-018	2.4	29.9	13.18	7.09	7.9	29.1	14.3	4.88	7.56
BB12-019	2.1	29.2	7.06	6.98	7.46	29.1	11.26	6.17	7.4
BB12-020	2.7	28.2	17.61	6.91	8.07	28.1	17.88	6.51	7.99
BB12-021	3.0	27.9	24.43	6.23	7.91	27.8	24.51	6.12	7.9
BB12-022	2.7	27.1	20.68	6.50	8.03	27.1	21.86	5.79	7.95
BB12-023	3.7	27.6	27.31	6.67	7.94	27	27.54	4.93	7.77
BB12-024	2.7	28.7	16.75	7.21	8.09	28.1	18.41	5.95	7.9
BB12-025	2.1	29.8	9.78	7.50	7.79	29.5	11.29	6.91	7.71
BB12-026	3.0	27.6	25.53	5.56	7.82	27.4	25.72	5.02	7.78
BB12-027	2.1	27.2	27.4	6.41	7.95	27.2	27.43	6.35	7.94
BB12-028	1.7	27.1	23.95	5.96	7.96	26.9	24.03	5.89	7.97
BB12-029	3.0	27.8	24.8	5.99	7.92	27.8	24.83	5.88	7.92
BB12-030	2.1	27.5	24.82	6.83	8.04	27.6	24.85	6.81	8.03
BB12-031	0.9	27.2	21.25	6.40	8	27.2	21.63	6.18	8
BB12-032	1.4	26.9	20.12	6.27	8.01	27	20.13	6.09	8.02
BB12-033	2.1	27.5	24.46	6.70	8.01	27.5	24.47	6.74	8.01
BB12-034	1.5	27.3	25.01	6.89	8.08	27.3	25.02	6.82	8.08
BB12-035	3.0	27	27.64	5.77	7.89	27	27.65	5.80	7.89
BB12-036	2.1	27.1	25.72	6.78	8.01	27.2	25.72	6.63	8.01
BB12-037	2.1	27.6	28.56	5.65	7.8	27.6	28.54	5.54	7.79

Appendix Table A1

SITE_ID	Water depth (m)	Surface temp	Surface salinity	Surface DO (mg L-1)	Surface pH	Bottom temp	Bottom salinity	Bottom DO (mg L-1)	Bottom pH
BB12-038	3.4	26.7	28.28	5.82	7.89	26.6	28.33	5.89	7.88
BB12-039	2.7	27.5	28.41	5.67	7.78	27.3	28.63	5.12	7.72
BB12-040	1.5	26.8	29.45	6.74	7.95	26.1	29.67	6.55	7.91
BB12-041	3.0	27.3	28.2	5.81	7.79	27.3	28.95	5.06	7.72
BB12-042	3.0	27.7	28.23	5.74	7.76	27.6	28.22	5.42	7.75
BB12-043	3.4	28	28.78	6.51	7.91	27.5	28.9	6.73	7.9
BB12-044	1.8	24.1	31.12	6.55	7.94	24	31.08	6.40	7.94
BB12-045	2.7	25	30.41	6.17	7.85	24.6	30.56	6.13	7.88
BB12-046	2.1	27.1	28.63	5.65	7.77	26.7	28.8	5.49	7.77
BB12-047	3.4	28.2	28.46	6.83	7.93	27.5	28.69	6.31	7.89
BB12-048	3.4	26.7	29.17	5.75	7.85	26.6	29.27	5.66	7.85
BB12-049	1.5	27	28.49	6.56	8	27.1	28.51	6.58	8
BB12-050	1.2	23.4	31.47	6.94	7.99	22.8	31.48	6.03	7.93
BB12-051	1.8	28.4	27.24	6.52	7.92	27.5	28.02	5.47	7.79
BB12-052	0.9	29.1	26.9	6.50	8.05	28.6	27.61	6.53	7.93
BB12-053	2.4	27.1	28.06	6.28	7.99	27.1	28.06	6.40	7.99
BB12-054	1.8	27.1	27.61	6.47	7.95	27.2	27.63	6.59	7.95
BB12-055	3.4	28.4	28.56	7.00	7.95	25.6	29.87	5.90	7.87
BB12-056	3.0	28	27.22	5.79	7.76	27.5	28.05	5.67	7.78
BB12-057	1.2	24	31.38	7.54	8.02	23.9	31.37	7.28	8.02
BB12-058	1.5	26.9	28.19	6.18	7.91	26.9	28.22	6.13	7.91
BB12-059	2.1	28.2	26.19	5.70	7.75	28.1	26.2	5.51	7.72
BB12-060	1.8	25.6	27.47	6.05	7.71	28	25.93	5.85	7.7
BB12-061	1.2	29.3	24.69	5.44	7.64	29.3	24.7	5.39	7.63
BB12-062	1.8	28.3	26.93	6.62	7.86	28.2	26.95	6.43	7.86
BB12-063	2.1	28.2	26.94	4.57	7.62	28.1	26.93	4.49	7.62
BB12-064	2.1	29.7	24.78	5.77	7.68	29.3	24.83	5.40	7.64
BB12-065	1.5	29.5	25.27	6.62	7.94	29.5	25.27	6.45	7.94
BB12-066	1.2	29.7	25.06	6.62	7.88	29.6	25.06	6.45	7.88
BB12-067	2.4	28.9	25.1	6.09	7.78	28.3	25.75	4.93	7.75
BB12-068	3.7	28.1	26.82	5.06	7.88	27.7	26.92	4.58	7.86
BB12-069	2.1	25.5	29.01	6.52	7.84	27.1	27.74	6.39	7.84
BB12-070	1.8	29.6	25	6.01	7.73	29.5	24.99	5.86	7.73
BB12-071	3.7	29.2	25.25	5.77	7.79	29.1	25.26	5.60	7.78
BB12-072	2.1	28.9	25.69	5.62	7.82	28.7	25.67	5.22	7.8
BB12-073	3.7	28	27.13	4.87	7.85	27.9	27.16	4.55	7.87
BB12-074	1.5	28.1	26.25	7.03	7.84	28.1	26.26	7.00	7.85

Appendix Table A1

SITE_ID	Water depth (m)	Surface temp	Surface salinity	Surface DO (mg L-1)	Surface pH	Bottom temp	Bottom salinity	Bottom DO (mg L-1)	Bottom pH
BB12-075	2.1	27.6	27.2	6.22	7.78	27.5	27.24	5.83	7.75
BB12-076	3.0	27.8	27.79	6.74	7.91	25.8	29.11	4.70	7.66
BB12-077	2.4	27.3	28.04	6.44	7.89	25.7	28.56	6.37	7.9
BB12-078	1.8	28.3	25.51	5.15	7.43	27.5	26.47	5.35	7.56
BB12-079	2.4	27	27.9	5.81	7.75	26	28.59	5.27	7.74
BB12-080	1.8	27.2	28.24	7.01	7.99	27.2	28.24	7.22	7.99
BB12-081	3.0	26.5	28.1	5.92	7.68	25.2	28.83	5.31	7.68
BB12-082	5.5	27.1	27.49	6.01	7.72	26.5	27.68	5.11	7.66
BB12-083	2.1	27.4	27.85	6.44	7.92	27.5	27.84	6.40	7.92
BB12-084	2.1	27.7	27.77	6.74	7.95	27.5	27.86	6.76	7.95
BB12-085	2.1	27.9	25.7	5.55	7.56	27.9	25.75	5.36	7.54
BB12-086	1.1	27.5	28.11	7.61	8.05	27.6	28.1	7.45	8.06
BB12-087	4.8	24.8	29.31	5.19	7.74	24.7	29.39	5.52	7.8
BB12-088	2.7	27.2	28.44	5.38	7.76	25.4	28.96	5.16	7.74
BB12-089	2.1	27.9	27.49	6.18	7.91	28	27.49	6.05	7.9
BB12-090	2.0	25.1	29.13	5.27	7.74	25.1	29.08	4.99	7.73
BB12-091	1.5	25.3	29.35	5.66	7.83	25.3	29.35	5.43	7.83
BB12-092	2.7	27.5	28.14	5.55	7.76	26.1	28.46	5.10	7.76
BB12-093	1.8	24.5	29.49	5.70	7.81	24.5	29.5	5.53	7.81
BB12-094	2.4	26.7	28.47	5.07	7.75	26.5	28.5	5.14	7.73
BB12-095	4.1	21.4	31.04	5.10	7.76	21	31.08	5.31	7.76
BB12-096	1.2	26	28.92	6.20	7.81	26.1	28.95	6.25	7.81
BB12-097	2.1	27.7	28.53	7.07	7.98	27.6	28.79	6.71	7.99
BB12-098	0.9	22.3	30.94	5.69	7.81	22.3	30.94	5.62	7.82
BB12-099	1.5	25.2	29.29	6.55	7.84	24.4	29.62	6.00	7.81
BB12-100	2.0	27.7	27.67	6.73	7.9	27.7	27.68	6.30	7.9

Appendix Table A1

SITE_ID	Grab A depth (cm)	Grab A color	Grab A grain size	Grab A notes	Grab A smell	Grab A surface biology	Grab B depth (cm)	Grab B color	Grab B grain size	Grab B notes	Grab B smell	Grab B surface biology
BB12-001	9	Brown	Muddy sand	Soft	None		9	Brown	Muddy sand	Soft	Sulfur	
BB12-002	9	Brown	Mud	Soft	Sulfur		9	Brown	Mud	Soft	Sulfur	
BB12-003	9	Black	Mud	Oozy	None		9	Black	Mud	Oozy	Sulfur	
BB12-004	9	Black	Mud	Soft	None		9	Black	Mud	Soft	Sulfur	
BB12-005	9	Black	Mud	Soft	None		9	Black	Mud	Soft	None	
BB12-006	9+	Black	Mud	Soft	Sulfur		9+	Black	Mud	Soft	Sulfur	
BB12-007	9	Black	Muddy sand	Soft	Sulfur		9	Black	Muddy sand	Soft	None	
BB12-008	9	Brown	Muddy sand	Soft	None	Vegetation	9	Brown	Muddy sand	Soft	None	Vegetation
BB12-009	9	Brown	Sand	Soft	Sulfur	Worms	9	Brown	Sand	Soft	Sulfur	Worms
BB12-010	9	Brown	Mud	Soft	None	Other	9	Brown	Mud	Soft	None	Other
BB12-011	8	Brown	Muddy sand	Soft	None		8	Brown	Muddy sand	Soft	None	
BB12-012	9	Black	Mud	Soft	Sulfur		9	Black	Mud	Soft	Sulfur	
BB12-013	9	Black	Mud	Oozy	Sulfur	Vegetation	8	Black	Mud	Oozy	Sulfur	Vegetation
BB12-014	9	Brown	Muddy sand	Soft	None		9	Brown	Muddy sand	Soft	None	
BB12-015	9	Black	Sand	Soft	Sulfur	Vegetation	9	Black	Sand	Soft	Sulfur	Vegetation
BB12-016	9	Brown	Muddy sand	Soft	Sulfur		9	Brown	Muddy sand	Soft	Sulfur	
BB12-017	8	Brown	Muddy sand	Soft	Sulfur	Vegetation	9	Brown	Muddy sand	Soft	Sulfur	
BB12-018	9	Brown	Mud	Oozy	None	Molluscs	9	Brown	Mud	Oozy	None	
BB12-019	9	Black	Mud	Oozy	Sulfur	Vegetation	9	Black	Mud	Oozy	Sulfur	
BB12-020	9	Black	Mud	Soft	Sulfur		9	Black	Mud	Soft	Sulfur	Molluscs
BB12-021	9	Brown	Mud	Soft	None		9	Brown	Mud	Soft	None	
BB12-022	9	Brown	Muddy sand	Soft	None		9	Brown	Muddy sand	Soft	None	
BB12-023	9	Brown	Mud	Soft	None		9	Brown	Mud	Soft	None	
BB12-024	9	Black	Mud	Oozy	Sulfur		9	Black	Mud	Oozy	Sulfur	
BB12-025	9	Black	Mud	Oozy	Sulfur		9	Black	Mud	Oozy	Sulfur	
BB12-026	9	Brown	Mud	Soft	None		9	Brown	Mud	Soft	None	
BB12-027	8	Brown	Sand	Soft	None	Vegetation	7.5	Brown	Sand	Soft	None	Vegetation
BB12-028	9	Brown	Muddy sand	Soft	Sulfur		9	Brown	Muddy sand	Soft	Sulfur	
BB12-029	9	Brown	Muddy sand	Soft	None	Worm tubes	9	Brown	Muddy sand	Soft	None	
BB12-030	9	Brown	Muddy sand	Soft	None	Worms	9	Brown	Muddy sand	Soft	None	
BB12-031	9	Brown	Sand	Soft	None		9	Brown	Sand	Soft	None	
BB12-032	8	Brown	Muddy sand	Soft	None	Vegetation	8	Black	Muddy sand	Soft	None	Vegetation
BB12-033	9	Brown	Muddy sand	Soft	None		9	Brown	Muddy sand	Soft	None	
BB12-034	9	Black	Muddy sand	Soft	None	Vegetation	8	Black	Muddy sand	Soft	Sulfur	Vegetation
BB12-035	9	Brown	Mud	Soft	None	Worm tubes	9	Brown	Mud	Soft	None	

Appendix Table A1

SITE_ID	Grab A depth (cm)	Grab A color	Grab A grain size	Grab A notes	Grab A smell	Grab A surface biology	Grab B depth (cm)	Grab B color	Grab B grain size	Grab B notes	Grab B smell	Grab B surface biology
BB12-036	8	Brown	Sand	Soft	None	Worm tubes	8	Brown	Sand	Soft	None	
BB12-037	8	Brown	Sand	Soft	None	Crustaceans	8	Brown	Sand	Soft	None	Worms
BB12-038	8	Brown	Mud	Soft	None	Worm tubes	9	Brown	Mud	Soft	None	
BB12-039	9	Brown	Mud	Soft	None	Worm tubes	9	Brown	Mud	Soft	None	
BB12-040	8	Brown	Sand	Soft	None	Worm tubes	8	Brown	Sand	Soft	None	Crustaceans
BB12-041	8	Brown	Muddy sand	Soft	None	Worm tubes	8	Brown	Muddy sand	Soft	None	Worm tubes
BB12-042	9	Brown	Mud	Soft	None	Worm tubes	9	Brown	Mud	Soft	None	
BB12-043	9	Brown	Muddy sand	Soft	None	Worm tubes	9	Brown	Muddy sand	Soft	None	
BB12-044	8	Brown	Sand	Soft	None		8	Brown	Sand	Soft	None	
BB12-045	9	Brown	Muddy sand	Soft	None	Molluscs	9	Brown	Muddy sand	Soft	None	
BB12-046	7	Brown	Sand	Soft	None	Vegetation	8	Brown	Muddy sand	Soft	None	
BB12-047	8	Brown	Muddy sand	Soft	None		9	Brown	Muddy sand	Soft	None	
BB12-048	9	Brown	Mud	Soft	None	Worms	9	Brown	Mud	Soft	None	Worms
BB12-049	7	Brown	Muddy sand	Soft	None	Vegetation	7	Brown	Muddy sand	Soft	None	Vegetation
BB12-050	8	Brown	Sand	Soft	None		8	Brown	Sand	Soft	None	Other
BB12-051	8	Gray	Muddy sand	Soft	None	Vegetation	8	Gray	Muddy sand	Soft	None	
BB12-052	8	Brown	Sand	Soft	None	Vegetation	8	Brown	Sand	Soft	None	
BB12-053	9	Brown	Muddy sand	Soft	None		8	Brown	Muddy sand	Soft	None	Molluscs
BB12-054	7	Brown	Muddy sand	Soft	None	Vegetation	8	Brown	Muddy sand	Soft	None	Vegetation
BB12-055	9	Brown	Muddy sand	Soft	None	Worm tubes	9	Brown	Muddy sand	Soft	None	Worm tubes
BB12-056	9	Brown	Mud	Soft	None	Other	9	Brown	Mud	Soft	None	
BB12-057	9	Brown	Sand	Soft	None		9	Brown	Sand	Soft	None	
BB12-058	7	Brown	Sand	Soft	None	Vegetation	8	Brown	Sand	Soft	None	Vegetation
BB12-059	8	Brown	Mud	Soft	None	Vegetation	8	Brown	Mud	Soft	None	Molluscs
BB12-060	8	Black	Mud	Soft	None	Worm tubes	8	Black	Mud	Soft	None	Worm tubes
BB12-061	9	Brown	Mud	Soft	None	Vegetation	9	Brown	Mud	Soft	None	Vegetation
BB12-062	8	Brown	Muddy sand	Soft	None	Worms	8	Brown	Muddy sand	Soft	None	Worms
BB12-063	9	Brown	Muddy sand	Soft	None	Molluscs	9	Brown	Muddy sand	Soft	None	
BB12-064	9	Brown	Mud	Soft	None	Worm tubes	9	Brown	Mud	Soft	None	Worm tubes
BB12-065	8	Brown	Muddy sand	Hard	None	Worms	8	Brown	Muddy sand	Hard	None	
BB12-066	8	Brown	Sand	Hard	None		8	Brown	Sand	Hard	None	
BB12-067	8	Brown	Mud	Soft	None	Worm tubes	8	Brown	Mud	Soft	None	Worm tubes
BB12-068	8	Black	Mud	Soft	Sulfur	Vegetation	8	Black	Mud	Soft	Sulfur	Vegetation
BB12-069	8	Brown	Mud	Soft	None	Worms	8	Brown	Mud	Soft	None	Worms
BB12-070	9	Brown	Muddy sand	Soft	None	Molluscs	9	Brown	Muddy sand	Soft	None	

Appendix Table A1

SITE_ID	Grab A depth (cm)	Grab A color	Grab A grain size	Grab A notes	Grab A smell	Grab A surface biology	Grab B depth (cm)	Grab B color	Grab B grain size	Grab B notes	Grab B smell	Grab B surface biology
BB12-071	8	Brown	Muddy sand	Soft	None	Worm tubes	9	Brown	Muddy sand	Soft	None	Worm tubes
BB12-072	8	Brown	Muddy sand	Soft	None	Worm tubes	8	Brown	Muddy sand	Soft	None	
BB12-073	8	Brown	Mud	Soft	None	Worms	8	Brown	Mud	Soft	None	
BB12-074	9	Brown	Mud	Soft	None	Molluscs	9	Brown	Mud	Soft	None	Molluscs
BB12-075	9	Brown	Mud	Soft	None	Worm tubes	9	Brown	Mud	Soft	None	
BB12-076	9	Brown	Mud	Soft	None	Worm tubes	9	Brown	Mud	Soft	None	Worm tubes
BB12-077	9	Brown	Mud	Soft	None	Worm tubes	9	Brown	Mud	Soft	None	Vegetation
BB12-078	9	Black	Mud	Soft	None	Worm tubes	9	Black	Mud	Soft	None	
BB12-079	8	Brown	Mud	Soft	None	Worm tubes	8	Brown	Mud	Soft	None	Worm tubes
BB12-080	9	Brown	Mud	Soft	None	Worm tubes	9	Brown	Mud	Soft	None	Worm tubes
BB12-081	9	Brown	Mud	Soft	None	Vegetation	9	Brown	Mud	Soft	None	
BB12-082	9	Brown	Mud	Soft	None	Worms	9	Brown	Mud	Soft	None	
BB12-083	9	Brown	Mud	Soft	None	Worm tubes	9	Brown	Mud	Soft	None	Worm tubes
BB12-084	8	Brown	Mud	Soft	None	Worm tubes	8	Brown	Mud	Soft	None	Worm tubes
BB12-085	9	Brown	Mud	Soft	None	Worm tubes	9	Brown	Mud	Soft	None	
BB12-086	6	Brown	Muddy sand	Soft	None	Vegetation	8	Brown	Muddy sand	Soft	None	Vegetation
BB12-087	8	Brown	Muddy sand	Rocks	None	Worm tubes	8	Brown	Muddy sand		None	
BB12-088	8	Brown	Muddy sand	Soft	None	Molluscs	8	Brown	Muddy sand	Soft	None	
BB12-089	9	Brown	Mud	Soft	None		9	Brown	Mud	Soft	None	
BB12-090	8	Brown	Muddy sand	Soft	None	Ampelisca tubes	8	Brown	Muddy sand	Soft	None	Ampelisca tubes
BB12-091	9	Brown	Muddy sand	Hard		Vegetation	9	Brown	Muddy sand	Hard	None	Vegetation
BB12-092	8	Brown	Muddy sand	Soft	None		8	Brown	Muddy sand	Soft	None	
BB12-093	8	Brown	Muddy sand	Hard	None	Worm tubes	8	Brown	Muddy sand	Hard	None	
BB12-094	8	Brown	Muddy sand	Soft	None	Worm tubes	8	Brown	Muddy sand	Soft	None	Worm tubes
BB12-095	9	Gray	Sand	Hard	None	Crustaceans	8	Gray	Sand	Hard	None	Molluscs
BB12-096	8	Brown	Muddy sand	Soft	None	Worm tubes	8	Brown	Muddy sand	Soft	None	Worm tubes
BB12-097	8	Brown	Sand	Hard	None		8	Brown	Sand	Hard	None	
BB12-098	9	Brown	Muddy sand	Hard	None		9	Brown	Sand	Hard	None	
BB12-099	8	Brown	Muddy sand	Soft	None		8	Brown	Muddy sand	Soft	None	
BB12-100	8	Brown	Muddy sand	Soft	Sulfur	Vegetation	8	Brown	Muddy sand	Soft	Sulfur	Vegetation

Appendix Table A1

SITE_ID	Sed grab depth (cm)	Sed grab color	Sed grab grain size	Sed grab notes	Sed grab smell	Sed grab surface biology	Comments
BB12-001	9	Brown	Muddy sand	Soft	Sulfur		"sfc color brown, btm color black"
BB12-002	9	Brown	Mud	Soft	Sulfur		"sfc color brown, btm color black"
BB12-003	9	Black	Mud	Oozy	None		slight sulfur smell in Grab B. Sea nettles in water column
BB12-004	9	Black	Mud	Soft	Sulfur		"slight sulfer smell Grab B & Sed Grab, sticky mud"
BB12-005	9	Black	Mud	Soft	None		
BB12-006	9+	Black	Mud	Soft	Sulfur		sticky soft mud
BB12-007	9	Black	Muddy sand	Soft	None		
BB12-008	9	Brown	Sand	Soft	None		
BB12-009	9	Brown	Sand	Soft	Sulfur	Worms	"sfc 2-3 cm brown, then black"
BB12-010	9	Brown	Mud	Soft	None		"some dead organics, not much"
BB12-011	7	Brown	Muddy sand	Soft	None		
BB12-012	9	Black	Mud	Soft	Sulfur		10% pre-mixed formalin
BB12-013	9	Black	Mud	Oozy	None		"sfc mud, peat below, sulfur smell in peat layer. 10% pre-mixed formalin"
BB12-014	9	Brown	Muddy sand	Soft	None		
BB12-015	9	Black	Sand	Soft	Sulfur		"sand with mud and coarse grains, veg debris in infaunal grabs. 10% pre-mixed formalin. Sea nettles in water column"
BB12-016	9	Brown	Muddy sand	Soft	Sulfur		
BB12-017	9	Brown	Muddy sand	Soft	None		"Grab A is only 3/4 of a grab, w/ dead vegetation"
BB12-018	9	Brown	Mud	Oozy	None		"Black & Brown Seds. Grab A Tellina and leak debris. Up Tom's River, farthest East"
BB12-019	9	Black	Mud	Oozy	Sulfur		Grab A vegetation is decomposing desiduous tree leaves
BB12-020							Grab B Tellina. Mouth of Tom's River.
BB12-021	9	Brown	Mud	Soft	None		
BB12-022	9	Brown	Muddy sand	Soft	None		
BB12-023	9	Brown	Mud	Soft	None		
BB12-024	9	Black	Mud	Oozy	Sulfur		
BB12-025	9	Black	Mud	Oozy	Sulfur		Moderate sulfur smell. Up Tom's River
BB12-026	9	Brown	Mud	Soft	None		
BB12-027	8	Brown	Sand	Soft	None		Eel grass & other fine bladed grass. Grab A very fine sand
BB12-028	9	Brown	Muddy sand	Soft	Sulfur		
BB12-029	9	Brown	Muddy sand	Soft	None		Maldanid Tubes
BB12-030	9	Brown	Muddy sand	Soft	None		Pectinaria
BB12-031	9	Brown	Sand	Soft	None		"1000 ft west of target shallow. Sediment Grab patches brown on surface, w/ underlying black sand, some black on surface"

Appendix Table A1

SITE_ID	Sed grab depth (cm)	Sed grab color	Sed grab grain size	Sed grab notes	Sed grab smell	Sed grab surface biology	Comments
BB12-032	7	Brown	Muddy sand	Soft	None	Vegetation	Rupia
BB12-033	8	Brown	Muddy sand	Soft	None		Grab A: a little sulfur smell
BB12-034	9	Black	Muddy sand	Soft	None		Eel Grass. Grab A and Sed Grab: very surfacde seds were brown
BB12-035	9	Brown	Mud	Soft	None		Maldanid worm tubes. Tagelus and Solemya molluscs
BB12-036	8	Brown	Sand	Soft	None		
BB12-037	8	Brown	Sand	Soft	None		Grab A: Isopods and Nemerteans. Grab B: Worms (Phylodocid?) and Tagalus molluscs
BB12-038	9	Brown	Mud	Soft	None		Grab A: Maldanid worm tubes and Tagelus molluscs
BB12-039	9	Brown	Mud	Soft	None		Location changed to A044 from original station 039 coordinates; too much oyster shell debris at 039 to get full grabs. Grab A: Worm tubes and Tagelus molluscs.
BB12-040	8	Brown	Sand	Soft	None		" very fine sand. Grab A: Diapatra tubes, Tellina, & mussels. Grab B: Amphipods"
BB12-041	9	Brown	Muddy sand	Soft	None	Worm tubes	"sticky muddy sand. Grabs A & B: maldanid tubes, Tagelus molluscs. Sed Grab: Diapatra tube."
BB12-042	9	Brown	Mud	Soft	None		"Sticky mud, Grab A: Maldanid tubes and Tagelus molluscs"
BB12-043	8	Brown	Muddy sand	Soft	None		"Maldanid tubes, Tagelus molluscs"
BB12-044	8	Brown	Sand	Soft	None		very fine sand. Goes right through 500µm. Clear water.
BB12-045	9	Brown	Muddy sand	Soft	None		Grab A: Large Mercenaria
BB12-046	7	Brown	Muddy sand	Soft	None		"Fine sand, or muddy sand. Grab A: red algae and eel grass"
BB12-047	9	Brown	Muddy sand	Soft	None		
BB12-048	9	Brown	Mud	Soft	None		"Grabs A & B: worms, Maldanid tubes, Molluscs"
BB12-049	7	Brown	Muddy sand	Soft	None	Vegetation	All grabs: 2/3 full & Eelgrass
BB12-050	7	Brown	Sand	Soft	None		"Grab B and Sed Grab: part brown, part black, & part mud, part sand. Also Sipunculid present in Grab B"
BB12-051	8	Gray	Muddy sand	Soft	None		very fine sand and muddy sand. Grab A: Eelgrass
BB12-052	6	Brown	Sand	Soft	None		fine sand. Grab A: Eelgrass bed
BB12-053	9	Brown	Muddy sand	Soft	None		Grab B: Mercenaria
BB12-054	7	Brown	Muddy sand	Soft	None	Vegetation	"Grabs A & B: 2/3 full, Eelgrass. Sed Grab: 1/2 grab, okay for sediment chemistry."
BB12-055	9	Brown	Muddy sand	Soft	None		"Location changed to A048 from original station 055 coordinates; could not get full grabs at original station. Grabs A & B: Maldanid worm tubes, Tagelus. Grab B: Mercenaria also."
BB12-056	9	Brown	Mud	Soft	None		Sticky mud. Grab A: Encrusting Bryozoans

Appendix Table A1

SITE_ID	Sed grab depth (cm)	Sed grab color	Sed grab grain size	Sed grab notes	Sed grab smell	Sed grab surface biology	Comments
BB12-057	9	Brown	Sand	Soft	None		
BB12-058	8	Brown	Sand	Soft	None		"Very fine sand. Eelgrass. Sed Grab: only 1/2 grab, OK for sediment chemistry"
BB12-059	8	Brown	Mud	Soft	None		Grab A: a little decaying Eelgrass. Grab B: a lot of Tagelus molluscs
BB12-060	8	Black	Mud	Soft	None		Grabs A&B: Maldanid tubes and Tagelus molluscs
BB12-061	9	Brown	Mud	Soft	None	Vegetation	Eelgrass in all grabs
BB12-062	8	Brown	Muddy sand	Soft	None	Vegetation	"Grabs A & B: Glycerid worms, Maldanid tubes, Eelgrass. Sed Chemistry grab has Eelgrass"
BB12-063	7	Brown	Muddy sand	Soft	None		Grab A: Mercenaria
BB12-064	9	Brown	Mud	Soft	None		"Grabs A & B: worm tubes, small pieces of vegetation"
BB12-065	8	Brown	Muddy sand	Hard	None		Grab A: Sipunculid
BB12-066	8	Brown	Sand	Hard	None		
BB12-067	8	Brown	Mud	Soft	None		"Grabs A & B: Maldanid tubes, Tagelus molluscs"
BB12-068	8	Black	Mud	Soft	Sulfur	Vegetation	Very strong sulfur smell. Decomposing eelgrass
BB12-069	8	Brown	Mud	Soft	None		"Grabs A & B: Glycerid worms, Maldanid tubes, Tagelus molluscs"
BB12-070	9	Brown	Muddy sand	Soft	None		"all grabs: brown surface, black bottom. Grab A: clay balls on bottom, and Tagelus molluscs"
BB12-071	9	Brown	Muddy sand	Soft	None		
BB12-072	8	Brown	Muddy sand	Soft	None		"Grab A: Maldanid tubes, Ceerianthus tubes, Tagelus molluscs"
BB12-073	8	Brown	Mud	Soft	None		
BB12-074	9	Brown	Mud	Soft	None		"Grabs A & B: Mercenaria. Grab B: Tagelus, small razor clam"
BB12-075	9	Brown	Mud	Soft	None		"All Grabs: brown surface, black bottom soft cohesive mud. Grab A: Maldanid tubes, mud balls"
BB12-076	9	Brown	Mud	Soft	None		Grabs A & B: Maldanid tubes. Grab A: Bivalve Molluscs
BB12-077	9	Brown	Mud	Soft	None	Vegetation	"Grab A: a lot of Maldanid tubes, Eelgrass. Grab B: a lot of red algae and ulva Sed Grab: A lot of red algae "
BB12-078	9	Black	Mud	Soft	None	Vegetation	"Grab A: Maldanid tubes, Bivalve Molluscs. Sed Grab: partial washout or slumped grab. Ulva vegetation."
BB12-079	8	Brown	Mud	Soft	None		All Grabs: mud and muddy sand. Grabs A & B: Maldanid tubes
BB12-080	9	Brown	Mud	Soft	None	Worm tubes	All Grabs: Maldanid worm tubes
BB12-081	9	Brown	Mud	Soft	None		"All Grabs: brown surface, black bottom. Grab A: some shell hash and chuncks of clay. Dead bits of vegetation."
BB12-082	9	Brown	Mud	Soft	None		Grab A: big worm

Appendix Table A1

SITE_ID	Sed grab depth (cm)	Sed grab color	Sed grab grain size	Sed grab notes	Sed grab smell	Sed grab surface biology	Comments
BB12-083	9	Brown	Mud	Soft	None	Worm tubes	A lot of Maldanid worm tubes
BB12-084	8	Brown	Mud	Soft	None	Worm tubes	All Grabs: Maldanid worm tubes
BB12-085	9	Brown	Mud	Soft	None		Grab A: Maldanid worm tubes
BB12-086	8	Brown	Muddy sand	Soft	None	Vegetation	"Grab A: 6 cm, slumped. All Grabs: have seaweed."
BB12-087	8	Brown	Muddy sand		None	Ampelisca tubes	Grab A: rocks with Serpulids. Ulva in water. Sed Grab: has darker streaks deep in grab. Cored for Danielle for Ampelisca tubes.
BB12-088	8	Brown	Muddy sand	Soft	None		Grab A: Mercenaria
BB12-089	8	Brown	Mud	Soft	None		Location changed to A098 from original station 089 coordinates; too much eelgrass at 089 to get full grabs.
BB12-090	8	Brown	Muddy sand	Soft	None	Ampelisca tubes	
BB12-091	8	Brown	Muddy sand	Hard	None		Grab A: Eelgrass. Grab B: A lot of Ulva and Eelgrass.
BB12-092	8	Brown	Muddy sand	Soft	None		
BB12-093	8	Brown	Muddy sand	Hard	None		Grab B & Sed. Grab a little muddier than grab A:
BB12-094	8	Brown	Muddy sand	Soft	None		"All Grabs: some black seds. Grab A: Maldanid tubes, dead Eelgrass. Grab B: Diapatra tubes, Ulvam Mussel set"
BB12-095	8	Gray	Sand	Hard	None		"Grab A: Amphipods. Grab B: a few shells, Gastropods & juv Mytilus, a few shells. Sed Grab: molluscs, a few shells"
BB12-096	8	Brown	Muddy sand	Soft	None	Worm tubes	
BB12-097	8	Brown	Sand	Hard	None		Grabs A & B: fine sand over black mud
BB12-098	9	Brown	Sand	Hard	None		"Location changed to A090 from original station 098 coordinates; station 098 hard packed bottom, shelly, could not sample. "
BB12-099	8	Brown	Muddy sand	Soft	None		
BB12-100	8	Brown	Muddy sand	Soft	Sulfur	Vegetation	All Grabs: a little sulfur smell & Ulva.

Appendix Table A2

Table A2. Sediment particle size data for samples collected in 2012.

Station	% gravel	% sand	% silt	% clay	Sediment class	Median ϕ	Mean ϕ	Std Dev	Skewness	Kurtosis
BB12-001	0.05	75.4	24.54	0	Sand	3.26	3.38	1.01	0.27	1.12
BB12-002	0	83.47	16.52	0	Sand	3.22	3.26	0.83	0.18	1.21
BB12-003	0	27.35	72.65	0	Sandy silt	4.5	4.07	1.54	-0.34	1.67
BB12-004	0	64.19	35.8	0	Silt Sand	3.57	3.56	1.18	0.05	1.07
BB12-005	0	18.02	81.98	0	SILT	4.52	4.56	0.91	0	2.12
BB12-006	0	58.92	41.08	0	Silt Sand	3.79	3.83	0.93	0.12	1.26
BB12-007	0	74.17	25.84	0	Silt Sand	2.23	2.62	1.47	0.32	0.7
BB12-008	0	94.65	5.33	0.02	Sand	2.58	2.63	0.77	0.09	1.22
BB12-009	0	98.65	1.33	0.01	Sand	1.54	1.56	0.55	0.09	1.43
BB12-010	0	48.46	51.54	0	Sandy silt	4.05	3.8	1.14	-0.24	0.97
BB12-011	0.17	91.5	8.34	0	Sand	1.51	1.68	1.14	0.35	1.59
BB12-012	0.53	70.15	29.31	0	Silt Sand	3.19	3.27	1.21	0.08	0.97
BB12-013	0.71	60.01	39.27	0	Silt Sand	2.59	2.79	1.75	0.13	0.75
BB12-014	0	84.39	15.62	0	Sand	2.33	2.61	1.18	0.37	1.14
BB12-015	2.09	66.19	31.72	0	Silt Sand	1.56	2.25	1.96	0.43	0.73
BB12-016	0.11	85.55	14.35	0	Sand	1.76	2.19	1.15	0.6	1.51
BB12-017	0	87.18	12.82	0	Sand	2.87	3	0.82	0.29	1.12
BB12-018	0.05	39.33	60.6	0	Sandy silt	4.35	3.87	1.73	-0.36	0.97
BB12-019	2	49.17	48.83	0	Silt Sand	3.91	3.56	1.54	-0.24	0.87
BB12-020	0.02	21.25	78.73	0	SILT	4.5	4.47	1.01	-0.11	2.13
BB12-021	0	47.78	52.22	0	Sandy silt	4.06	3.98	1.26	-0.17	1.68
BB12-022	2.81	49.85	47.35	0	Silt Sand	3.89	3.56	1.5	-0.25	1.02
BB12-023	0.23	28.18	71.59	0	Sandy silt	4.41	4.27	1.07	-0.23	1.96
BB12-024	0.09	32.19	67.72	0	Sandy silt	4.39	4.05	1.28	-0.32	1.45
BB12-025	0	54.07	45.94	0	Silt Sand	3.85	3.59	1.37	-0.19	1
BB12-026	0.21	44.05	55.73	0	Sandy silt	4.15	3.93	1.12	-0.24	1.24
BB12-027	0	97.05	2.92	0.01	Sand	2.54	2.56	0.48	0.18	1.55

Appendix Table A2

Station	% gravel	% sand	% silt	% clay	Sediment class	Median ϕ	Mean ϕ	Std Dev	Skewness	Kurtosis
BB12-028	0	61.09	38.91	0	Silt Sand	3.77	3.87	0.89	0.25	1.4
BB12-029	0.16	79.14	20.71	0	Sand	1.63	2.3	1.61	0.54	0.92
BB12-030	0	93.52	6.47	0	Sand	2.52	2.57	0.76	0.15	1.47
BB12-031	0	98.11	1.85	0.03	Sand	1.5	1.51	0.55	0.1	1.62
BB12-032	0.16	95.7	4.15	0	Sand	2.24	2.2	0.94	-0.02	1.11
BB12-033	0	97.47	2.5	0.02	Sand	2.01	2.05	0.66	0.15	1.05
BB12-034	0.05	94.92	5.02	0	Sand	1.86	2.04	0.85	0.39	1.17
BB12-035	0.08	74.36	25.56	0	Silt Sand	3.47	3.51	0.84	0.11	1.1
BB12-036	0.13	94.27	5.61	0	Sand	2.52	2.54	0.86	0.05	1.12
BB12-037	0	95.58	4.42	0	Sand	2.5	2.51	0.58	0.12	1.74
BB12-038	0	57.85	42.16	0	Silt Sand	3.83	3.91	0.83	0.2	1.28
BB12-039	0.03	81.98	18	0	Sand	2.9	3.12	0.93	0.43	1.16
BB12-040	0	98.15	1.85	0.02	Sand	2.58	2.61	0.4	0.25	1.43
BB12-041	0.04	48.66	51.3	0	Sandy silt	4.03	4	1.05	-0.04	1.52
BB12-042	0.31	60.52	39.17	0	Silt Sand	3.65	3.69	1.21	0.13	1.05
BB12-043	0.09	81.42	18.5	0	Sand	2.53	2.77	1.21	0.28	0.91
BB12-044	0	97.21	2.75	0.04	Sand	2.85	2.91	0.55	0.18	0.95
BB12-045	0.07	73.91	26.03	0	Silt Sand	3.52	3.57	0.85	0.16	1.29
BB12-046	0	83.45	16.56	0	Sand	3.28	3.29	0.84	0.18	1.33
BB12-047	0.01	67.56	32.42	0	Silt Sand	3.17	3	1.46	-0.14	0.67
BB12-048	0.66	50.94	48.38	0	Silt Sand	3.96	4	0.87	0.12	1.28
BB12-049	0	90.62	9.38	0	Sand	2.94	3.03	0.7	0.23	1.06
BB12-050	0.34	92.18	7.48	0	Sand	2.51	2.55	0.87	0.11	1.45
BB12-051	0	95.61	4.39	0	Sand	2.7	2.8	0.57	0.28	1.11
BB12-052	0	95	4.99	0.01	Sand	2.8	2.9	0.57	0.28	1
BB12-053	0.01	95.3	4.7	0	Sand	2.61	2.69	0.52	0.33	1.46
BB12-054	0.01	95.37	4.62	0.01	Sand	2.59	2.66	0.56	0.27	1.46
BB12-055	0	65.1	34.89	0	Silt Sand	3.74	3.87	0.72	0.38	1.34
BB12-056	0	50.93	49.07	0	Silt Sand	3.98	4.07	1.02	0.21	1.28

Appendix Table A2

Station	% gravel	% sand	% silt	% clay	Sediment class	Median ϕ	Mean ϕ	Std Dev	Skewness	Kurtosis
BB12-057	0	98.6	1.39	0	Sand	1.71	1.77	0.62	0.12	1.06
BB12-058	0.06	92.37	7.56	0	Sand	2.9	2.99	0.65	0.24	1.02
BB12-059	0.03	37.43	62.54	0	Sandy silt	4.33	4.2	1.3	-0.15	1.32
BB12-060	0.04	19.09	80.87	0	SILT	4.56	4.64	0.97	0.09	1.71
BB12-061	0	36.27	63.73	0	Sandy silt	4.3	4.26	0.97	0.01	1.33
BB12-062	0	65.73	34.28	0	Silt Sand	3.61	3.69	1.06	0.21	1.22
BB12-063	0.12	92.74	7.13	0	Sand	2.43	2.42	0.78	0.1	1.64
BB12-064	0	37.33	62.67	0	Sandy silt	4.3	4.04	1.2	-0.25	1.26
BB12-065	0.02	97.8	2.18	0.01	Sand	1.89	1.94	0.56	0.14	0.94
BB12-066	0	95.62	4.36	0.01	Sand	2.17	2.15	0.72	0.08	1.27
BB12-067	0	47.35	52.66	0	Sandy silt	4.06	4.13	0.84	0.24	1.21
BB12-068	0	12.42	87.59	0	SILT	4.63	4.77	0.93	0.12	1.83
BB12-069	0.19	45.32	54.49	0	Sandy silt	4.12	4.09	1.05	0.03	1.2
BB12-070	0	82.21	17.78	0	Sand	2.42	2.64	1.32	0.23	0.95
BB12-071	0	69.77	30.23	0	Silt Sand	2.21	2.76	1.57	0.51	0.73
BB12-072	0.06	78.92	21.01	0	Sand	3.25	3.33	0.98	0.24	1.26
BB12-073	0	42.03	57.96	0	Sandy silt	4.2	4.2	1.01	0.05	1.21
BB12-074	0	75.07	24.91	0	Sand	3.5	3.55	0.84	0.16	1.27
BB12-075	0	61.04	38.96	0	Silt Sand	3.77	3.93	0.89	0.34	1.3
BB12-076	0	16.09	83.9	0	SILT	4.57	4.64	0.78	0.13	1.51
BB12-077	0	9.12	90.9	0	SILT	4.55	4.59	0.62	0.2	1.91
BB12-078	0	14.88	85.12	0	SILT	4.56	4.62	0.83	0.03	2.02
BB12-079	0	77.84	22.16	0	Sand	3.18	3.33	0.97	0.33	1.15
BB12-080	0.14	82.57	17.3	0	Sand	3.09	3.21	0.85	0.31	1.15
BB12-081	0.1	26.86	73.04	0	Sandy silt	4.43	4.41	0.85	-0.01	1.39
BB12-082	0	35.36	64.64	0	Sandy silt	4.31	4.28	0.91	0	1.24
BB12-083	0.03	38.61	61.36	0	Sandy silt	4.25	4.26	0.84	0.11	1.13
BB12-084	0.06	42.19	57.76	0	Sandy silt	4.17	4.18	0.85	0.1	1.18
BB12-085	0	13.31	86.69	0	SILT	4.6	4.64	0.74	-0.02	1.67

Appendix Table A2

Station	% gravel	% sand	% silt	% clay	Sediment class	Median ϕ	Mean ϕ	Std Dev	Skewness	Kurtosis
BB12-086	0.05	91.81	8.14	0	Sand	2.92	3.01	0.64	0.25	1.01
BB12-087	2.98	91.54	5.48	0	Sand	1.63	1.72	1.07	0.19	1.44
BB12-088	0	79.81	20.19	0	Sand	2.84	3.14	0.97	0.51	1.09
BB12-089	0	64.55	35.45	0	Silt Sand	3.58	3.68	1.1	0.23	1.08
BB12-090	1.99	92.93	5.07	0	Sand	2.64	2.57	1.01	-0.16	1.12
BB12-091	0.12	72.66	27.22	0	Silt Sand	3.47	3.53	0.92	0.17	1.14
BB12-092	0.31	73.86	25.84	0	Silt Sand	3.37	3.45	0.98	0.23	1.15
BB12-093	0	95.56	4.45	0	Sand	2.48	2.42	0.96	-0.1	1.18
BB12-094	0.18	75.52	24.3	0	Sand	3.27	3.4	1.03	0.32	1.21
BB12-095	0.32	98.6	1.06	0.02	Sand	1.92	1.93	0.59	0	0.93
BB12-096	0	97.54	2.42	0.03	Sand	2.65	2.72	0.48	0.3	1.25
BB12-097	2.62	95.4	1.95	0.02	Sand	2.06	2.01	0.68	-0.17	1.07
BB12-098	0	97.87	2.11	0.02	Sand	2.28	2.21	0.65	-0.12	1.15
BB12-099	0	83.19	16.82	0	Sand	3.37	3.36	0.83	0.16	1.51
BB12-100	0.36	66.66	32.98	0	Silt Sand	3.5	3.65	1.16	0.28	1.11

Appendix Table A2

Station	Verbal sediment description	PHI_11	PHI_10	PHI_9	PHI_8	PHI_7	PHI_6	PHI_5	PHI_4	PHI_3	PHI_2	PHI_1	PHI_0
BB12-001	POORLY SORTED; FINE SKEWED; LEPTOKURTIC	99.99	99.99	99.99	99.39	96.21	92.01	75.45	39.73	2.34	0.09	0.07	0.05
BB12-002	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	99.99	99.99	99.99	99.4	97.11	94.27	83.47	39.56	1.32	0.08	0	0
BB12-003	POORLY SORTED; STRONGLY COARSE SKEWED; VERY LEPTOKURTIC	100	100	100	99.66	90.8	77.2	27.35	21.47	13.1	2.72	0.11	0
BB12-004	POORLY SORTED; NEAR SYMMETRICAL; MESOKURTIC	99.99	99.99	99.99	99.46	95.88	90.12	64.19	31.65	7.97	0.8	0	0
BB12-005	MODERATELY SORTED; NEAR SYMMETRICAL; VERY LEPTOKURTIC	100	100	100	99.9	92.32	79.06	18.02	7.6	3.29	0.17	0.1	0
BB12-006	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	100	100	100	99.25	95.81	91.04	58.92	15.23	1.47	0.19	0.05	0
BB12-007	POORLY SORTED; STRONGLY FINE SKEWED; PLATYKURTIC	100.01	100.01	100.01	99.61	97.53	94.72	74.17	62.37	45	10.76	0.37	0
BB12-008	MODERATELY SORTED; NEAR SYMMETRICAL; LEPTOKURTIC	100	100	99.98	99.62	99.01	98.2	94.65	72.27	18.24	1.51	0.04	0
BB12-009	MODERATELY WELL SORTED; NEAR SYMMETRICAL; LEPTOKURTIC	99.99	99.99	99.98	99.91	99.8	99.67	98.65	97.92	82.33	11.75	0.3	0
BB12-010	POORLY SORTED; COARSE SKEWED; MESOKURTIC	100	100	100	99.86	96.42	89.78	48.46	26.78	6.28	1.58	0.15	0
BB12-011	POORLY SORTED; STRONGLY FINE SKEWED; VERY LEPTOKURTIC	100.01	100.01	100.01	99.54	98.41	97.11	91.67	86.39	72.19	24.18	1.05	0.17
BB12-012	POORLY SORTED; NEAR SYMMETRICAL; MESOKURTIC	99.99	99.99	99.99	99.64	97.19	93	70.68	44.55	13.24	3	1.01	0.53
BB12-013	POORLY SORTED; FINE SKEWED; PLATYKURTIC	99.99	99.99	99.99	99.91	96.92	90.43	60.72	56.29	36.38	15.13	4.09	0.71
BB12-014	POORLY SORTED; STRONGLY FINE SKEWED; LEPTOKURTIC	100.01	100.01	100.01	99.7	97.92	95.44	84.39	73.2	36.41	1.77	0.12	0
BB12-015	POORLY SORTED; STRONGLY FINE SKEWED; PLATYKURTIC	100	100	100	99.96	96.33	90.67	68.28	66.34	62.73	26.2	8.13	2.09
BB12-016	POORLY SORTED; STRONGLY FINE SKEWED; VERY LEPTOKURTIC	100.01	100.01	100.01	99.82	97.86	95.44	85.66	82.15	61.66	4.62	0.15	0.11
BB12-017	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	100	100	100	99.65	98.04	96.36	87.18	55.83	6.3	0.39	0	0
BB12-018	POORLY SORTED; STRONGLY COARSE SKEWED; MESOKURTIC	99.98	99.98	99.98	99.56	91.09	78.19	39.38	32.31	17.38	6.92	2.67	0.05

Appendix Table A2

Station	Verbal sediment description	PHI_11	PHI_10	PHI_9	PHI_8	PHI_7	PHI_6	PHI_5	PHI_4	PHI_3	PHI_2	PHI_1	PHI_0
BB12-019	POORLY SORTED; COARSE SKEWED; PLATYKURTIC	100	100	100	99.7	94.46	85.67	51.17	43.55	18.79	4.98	2.64	2
BB12-020	POORLY SORTED; COARSE SKEWED; VERY LEPTOKURTIC	100	100	100	99.75	92.66	79.37	21.27	9.46	4.49	0.41	0.02	0.02
BB12-021	POORLY SORTED; COARSE SKEWED; VERY LEPTOKURTIC	100	100	100	99.82	94.22	86.34	47.78	16.46	7	5.16	0.09	0
BB12-022	POORLY SORTED; COARSE SKEWED; MESOKURTIC	100.01	100.01	100.01	99.82	94.93	87.11	52.66	32.84	16.96	5.48	2.88	2.81
BB12-023	POORLY SORTED; COARSE SKEWED; VERY LEPTOKURTIC	100	100	100	100	94.11	83.34	28.41	11.46	5.54	3.63	1.64	0.23
BB12-024	POORLY SORTED; STRONGLY COARSE SKEWED; LEPTOKURTIC	100	100	100	99.54	93.04	82.59	32.28	19.62	8.37	1.54	0.55	0.09
BB12-025	POORLY SORTED; COARSE SKEWED; MESOKURTIC	100.01	100.01	100.01	99.47	95.31	88.45	54.07	31.34	14.36	1.68	0.11	0
BB12-026	POORLY SORTED; COARSE SKEWED; LEPTOKURTIC	99.99	99.99	99.99	99.93	95.82	88.73	44.26	19.47	6.12	1.99	0.77	0.21
BB12-027	WELL SORTED; FINE SKEWED; VERY LEPTOKURTIC	99.98	99.98	99.97	99.86	99.69	99.4	97.05	85.73	7.04	0.45	0	0
BB12-028	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	100	100	100	98.84	95.26	90.38	61.09	10.49	1.26	0.18	0.11	0
BB12-029	POORLY SORTED; STRONGLY FINE SKEWED; MESOKURTIC	100.01	100.01	100.01	99.73	96.85	93.42	79.3	72.33	63.61	18.29	0.88	0.16
BB12-030	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	99.99	99.99	99.99	99.99	99.99	99.99	93.52	77.94	18.44	0.93	0	0
BB12-031	MODERATELY WELL SORTED; FINE SKEWED; VERY LEPTOKURTIC	99.99	99.99	99.96	99.72	99.28	98.92	98.11	96.45	85.52	12.65	0.22	0
BB12-032	MODERATELY SORTED; NEAR SYMMETRICAL; LEPTOKURTIC	100.01	100.01	100.01	99.78	99.21	98.57	95.86	81.84	40.25	9.99	0.48	0.16
BB12-033	MODERATELY WELL SORTED; FINE SKEWED; MESOKURTIC	99.99	99.99	99.97	99.78	99.53	99.25	97.47	92.24	49.42	1.55	0	0
BB12-034	MODERATELY SORTED; STRONGLY FINE SKEWED; LEPTOKURTIC	99.99	99.99	99.99	99.64	99	98.32	94.97	85.57	56.55	4.12	0.1	0.05
BB12-035	MODERATELY SORTED; FINE SKEWED; MESOKURTIC	100	100	100	99.98	97.53	94.24	74.44	27.05	1.1	0.2	0.1	0.08
BB12-036	MODERATELY SORTED; NEAR SYMMETRICAL; LEPTOKURTIC	100.01	100.01	100.01	99.75	99.12	98.43	94.4	72.92	24.99	2.94	0.18	0.13
BB12-037	MODERATELY WELL SORTED; FINE SKEWED; VERY LEPTOKURTIC	100	100	100	99.71	99.18	98.6	95.58	85.66	12.89	0.57	0.01	0

Appendix Table A2

Station	Verbal sediment description	PHI_11	PHI_10	PHI_9	PHI_8	PHI_7	PHI_6	PHI_5	PHI_4	PHI_3	PHI_2	PHI_1	PHI_0
BB12-038	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	100.01	100.01	100.01	99.83	96.14	90.99	57.85	8.95	1.34	0.38	0.23	0
BB12-039	MODERATELY SORTED; STRONGLY FINE SKEWED; LEPTOKURTIC	100.01	100.01	100.01	99.85	96.75	93.76	82.01	54.28	3.26	0.28	0.1	0.03
BB12-040	WELL SORTED; FINE SKEWED; LEPTOKURTIC	100.02	100.02	100	99.84	99.56	99.24	98.15	85.36	0.22	0.01	0	0
BB12-041	POORLY SORTED; NEAR SYMMETRICAL; VERY LEPTOKURTIC	100	100	100	99.43	94.52	88.47	48.7	13.03	5.54	0.72	0.24	0.04
BB12-042	POORLY SORTED; FINE SKEWED; MESOKURTIC	100	100	100	99.99	93.83	86.4	60.83	29.71	5.22	1	0.4	0.31
BB12-043	POORLY SORTED; FINE SKEWED; MESOKURTIC	100.01	100.01	100.01	99.92	97.9	95.29	81.51	64.89	30.24	2.06	0.19	0.09
BB12-044	MODERATELY WELL SORTED; FINE SKEWED; MESOKURTIC	100	100	99.96	99.56	99.01	98.58	97.21	58.68	0.99	0.74	0.03	0
BB12-045	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	100.01	100.01	100.01	100	97.01	93.23	73.98	22.64	0.81	0.27	0.11	0.07
BB12-046	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	100.01	100.01	100.01	99.28	96.39	93.86	83.45	36.11	0.89	0.3	0.09	0
BB12-047	POORLY SORTED; COARSE SKEWED; PLATYKURTIC	99.99	99.99	99.99	99.95	97.76	94.29	67.57	47.11	35.59	8.99	0.28	0.01
BB12-048	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	99.98	99.98	99.98	99.98	95.99	89.05	51.6	8.71	2.44	1.41	1.04	0.66
BB12-049	MODERATELY WELL SORTED; FINE SKEWED; MESOKURTIC	100	100	100	99.7	98.75	97.61	90.62	52.57	2.45	0.36	0.05	0
BB12-050	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	100	100	100	99.87	98.96	98.03	92.52	76.06	22.11	3.41	0.7	0.34
BB12-051	MODERATELY WELL SORTED; FINE SKEWED; LEPTOKURTIC	100	100	100	99.65	99.05	98.41	95.61	68.74	3.92	0.36	0.03	0
BB12-052	MODERATELY WELL SORTED; FINE SKEWED; MESOKURTIC	100	100	99.99	99.78	99.46	99.02	95	62.02	0.57	0.07	0.02	0
BB12-053	MODERATELY WELL SORTED; STRONGLY FINE SKEWED; LEPTOKURTIC	100.01	100.01	100.01	99.78	99.32	98.79	95.31	78.61	2.87	0.17	0.04	0.01
BB12-054	MODERATELY WELL SORTED; FINE SKEWED; LEPTOKURTIC	100.01	100.01	100	99.81	99.42	98.95	95.38	78.75	6.81	0.23	0.03	0.01
BB12-055	MODERATELY SORTED; STRONGLY FINE SKEWED; LEPTOKURTIC	99.99	99.99	99.99	99.69	96.18	92.02	65.1	4.27	0.77	0.17	0.05	0
BB12-056	POORLY SORTED; FINE SKEWED; LEPTOKURTIC	100	100	100	99.68	91.67	83.54	50.93	10.29	1.32	0.24	0.05	0

Appendix Table A2

Station	Verbal sediment description	PHI_11	PHI_10	PHI_9	PHI_8	PHI_7	PHI_6	PHI_5	PHI_4	PHI_3	PHI_2	PHI_1	PHI_0
BB12-057	MODERATELY WELL SORTED; FINE SKEWED; MESOKURTIC	99.99	99.99	99.99	99.99	99.99	99.99	98.6	97.47	67.01	8.65	0.16	0
BB12-058	MODERATELY WELL SORTED; FINE SKEWED; MESOKURTIC	99.99	99.99	99.99	99.68	98.94	98.03	92.43	55.08	1.79	0.28	0.08	0.06
BB12-059	POORLY SORTED; COARSE SKEWED; LEPTOKURTIC	100	100	100	100	92.16	77.73	37.46	16.92	7.59	1.08	0.05	0.03
BB12-060	MODERATELY SORTED; NEAR SYMMETRICAL; VERY LEPTOKURTIC	100	100	100	100	90.65	74.04	19.13	6.64	1.91	0.14	0.06	0.04
BB12-061	MODERATELY SORTED; NEAR SYMMETRICAL; LEPTOKURTIC	100	100	100	99.83	92.53	82.02	36.27	8.5	1.23	0.12	0.03	0
BB12-062	POORLY SORTED; FINE SKEWED; LEPTOKURTIC	100.01	100.01	100.01	99.8	94.82	88.75	65.73	23.85	1.57	0.03	0.01	0
BB12-063	MODERATELY SORTED; FINE SKEWED; VERY LEPTOKURTIC	99.99	99.99	99.99	99.6	98.55	97.61	92.86	82.86	23.54	1.87	0.22	0.12
BB12-064	POORLY SORTED; COARSE SKEWED; LEPTOKURTIC	100	100	100	99.99	93.98	83.47	37.33	19.44	6.08	1.64	0.08	0
BB12-065	MODERATELY WELL SORTED; FINE SKEWED; MESOKURTIC	100.01	100.01	100	99.85	99.65	99.39	97.82	96.64	55.77	1.38	0.06	0.02
BB12-066	MODERATELY SORTED; NEAR SYMMETRICAL; LEPTOKURTIC	99.99	99.99	99.98	99.61	99.05	98.42	95.62	91.22	40.97	2.1	0.03	0
BB12-067	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	100.01	100.01	100.01	100.01	94.25	85.68	47.35	3.49	0.48	0.06	0.01	0
BB12-068	MODERATELY SORTED; FINE SKEWED; VERY LEPTOKURTIC	100.01	100.01	100.01	100.01	90.46	70.95	12.42	6.02	2.98	0.26	0.05	0
BB12-069	POORLY SORTED; NEAR SYMMETRICAL; LEPTOKURTIC	100	100	100	100	93.56	83.32	45.51	13.55	1.24	0.27	0.19	0.19
BB12-070	POORLY SORTED; FINE SKEWED; MESOKURTIC	99.99	99.99	99.99	99.83	97.39	95.13	82.21	66.72	36.27	7.91	0.37	0
BB12-071	POORLY SORTED; STRONGLY FINE SKEWED; PLATYKURTIC	100	100	100	100	95.19	89.03	69.77	59.59	45.9	3.46	0.01	0
BB12-072	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	99.99	99.99	99.99	99.41	95.81	92.97	78.98	39.15	2.84	0.19	0.07	0.06
BB12-073	POORLY SORTED; NEAR SYMMETRICAL; LEPTOKURTIC	99.99	99.99	99.99	99.99	93.49	81.44	42.03	10.01	1.45	0.19	0.06	0
BB12-074	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	99.98	99.98	99.98	99.98	97.19	93.33	75.07	23.63	0.26	0.06	0.03	0
BB12-075	MODERATELY SORTED; STRONGLY FINE SKEWED; LEPTOKURTIC	100	100	100	100	94.99	87.46	61.04	8.74	0.38	0.09	0.05	0
BB12-076	MODERATELY SORTED; FINE SKEWED; VERY LEPTOKURTIC	99.99	99.99	99.99	99.99	93.56	75.14	16.09	2.9	0.6	0.05	0.02	0

Appendix Table A2

Station	Verbal sediment description	PHI_11	PHI_10	PHI_9	PHI_8	PHI_7	PHI_6	PHI_5	PHI_4	PHI_3	PHI_2	PHI_1	PHI_0
BB12-077	MODERATELY WELL SORTED; FINE SKEWED; VERY LEPTOKURTIC	100.02	100.02	100.02	99.97	93.5	82.36	9.12	2.04	0.68	0.06	0	0
BB12-078	MODERATELY SORTED; NEAR SYMMETRICAL; VERY LEPTOKURTIC	100	100	100	100	93.79	77.78	14.88	6.57	2.45	0.25	0	0
BB12-079	MODERATELY SORTED; STRONGLY FINE SKEWED; LEPTOKURTIC	100	100	100	99.96	96.24	92.45	77.84	42.84	0.62	0	0	0
BB12-080	MODERATELY SORTED; STRONGLY FINE SKEWED; LEPTOKURTIC	100.01	100.01	100.01	100.01	97.28	94.09	82.71	46.24	0.52	0.22	0.18	0.14
BB12-081	MODERATELY SORTED; NEAR SYMMETRICAL; LEPTOKURTIC	100	100	100	100	94.74	80.23	26.96	5.6	1.91	0.78	0.31	0.1
BB12-082	MODERATELY SORTED; NEAR SYMMETRICAL; LEPTOKURTIC	100	100	100	100	94.78	81.62	35.36	7.19	1.56	0.25	0.02	0
BB12-083	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	100	100	100	100	95.05	82.56	38.64	3.9	0.85	0.19	0.04	0.03
BB12-084	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	100.01	100.01	100.01	100.01	95.04	84.91	42.25	5.62	0.78	0.12	0.08	0.06
BB12-085	MODERATELY SORTED; NEAR SYMMETRICAL; VERY LEPTOKURTIC	100	100	100	100	96.91	75.43	13.31	5.48	1.54	0.04	0	0
BB12-086	MODERATELY WELL SORTED; FINE SKEWED; MESOKURTIC	100	100	100	99.62	99.03	98.31	91.86	54.14	0.57	0.15	0.08	0.05
BB12-087	POORLY SORTED; FINE SKEWED; LEPTOKURTIC	100	100	100	99.73	98.71	97.94	94.52	88.76	66.53	20.49	4.16	2.98
BB12-088	MODERATELY SORTED; STRONGLY FINE SKEWED; MESOKURTIC	100	100	100	99.88	96.48	93.79	79.81	57.24	2.84	0.09	0	0
BB12-089	POORLY SORTED; FINE SKEWED; MESOKURTIC	100	100	100	100	94.41	87.6	64.55	28.22	0.65	0.04	0	0
BB12-090	POORLY SORTED; COARSE SKEWED; LEPTOKURTIC	99.99	99.99	99.99	99.72	98.93	98.2	94.92	64.81	25.26	8.48	2.76	1.99
BB12-091	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	100	100	100	99.95	96.85	92.63	72.78	28.32	0.91	0.34	0.17	0.12
BB12-092	MODERATELY SORTED; FINE SKEWED; LEPTOKURTIC	100.01	100.01	100.01	99.98	96.08	92.4	74.17	34.3	1.35	0.41	0.34	0.31
BB12-093	MODERATELY SORTED; NEAR SYMMETRICAL; LEPTOKURTIC	100.01	100.01	100.01	99.7	99.15	98.7	95.56	74.35	28.04	8.88	0.19	0
BB12-094	POORLY SORTED; STRONGLY FINE SKEWED; LEPTOKURTIC	100	100	100	99.96	95.38	91.22	75.7	39.1	1.09	0.56	0.38	0.18

Appendix Table A2

Station	Verbal sediment description	PHI_11	PHI_10	PHI_9	PHI_8	PHI_7	PHI_6	PHI_5	PHI_4	PHI_3	PHI_2	PHI_1	PHI_0
BB12-095	MODERATELY WELL SORTED; NEAR SYMMETRICAL; MESOKURTIC	100	100	99.98	99.89	99.71	99.3	98.92	98.36	53.71	5.6	0.82	0.32
BB12-096	WELL SORTED; STRONGLY FINE SKEWED; LEPTOKURTIC	99.99	99.99	99.96	99.74	99.42	99.13	97.54	75.93	0.96	0.06	0	0
BB12-097	MODERATELY WELL SORTED; COARSE SKEWED; MESOKURTIC	99.99	99.99	99.97	99.82	99.5	99.23	98.02	95.49	47.11	7.37	3.13	2.62
BB12-098	MODERATELY WELL SORTED; COARSE SKEWED; LEPTOKURTIC	100	100	99.98	99.79	99.6	99.45	97.87	91.94	33.77	3.56	0.04	0
BB12-099	MODERATELY SORTED; FINE SKEWED; VERY LEPTOKURTIC	100.01	100.01	100.01	100.01	96.69	92.84	83.19	29.29	0.49	0.07	0.02	0
BB12-100	POORLY SORTED; FINE SKEWED; LEPTOKURTIC	100	100	100	100	93.5	86.21	67.02	30.96	1.67	0.79	0.6	0.36

Appendix Table A3

Table A3. Sediment TOC, TN, and TP (weight basis) for samples collected in 2012.

Station	ave %N	ave %C	ave %P	mmoles N/mg sediment	mmoles C/mg sediment	mmoles P/mg sediment	C:N (molar)	N:P (molar)	C:P (molar)
BB12-001	1.116E-01	1.091E+00	4.623E-02	7.968E-05	9.084E-04	1.49E-05	11.4	5.3	60.9
BB12-002	8.769E-02	8.223E-01	3.525E-02	6.261E-05	6.846E-04	1.14E-05	10.9	5.5	60.1
BB12-003	4.396E-01	4.733E+00	5.797E-02	3.138E-04	3.940E-03	1.87E-05	12.6	16.8	210.5
BB12-004	1.437E-01	1.417E+00	4.370E-02	1.026E-04	1.180E-03	1.41E-05	11.5	7.3	83.6
BB12-005	3.746E-01	3.568E+00	6.821E-02	2.674E-04	2.970E-03	2.2E-05	11.1	12.1	134.9
BB12-006	1.301E-01	1.230E+00	5.189E-02	9.292E-05	1.024E-03	1.64E-05	11.0	5.7	62.4
BB12-007	6.419E-02	6.894E-01	2.643E-02	4.582E-05	5.740E-04	8.53E-06	12.5	5.4	67.3
BB12-008	3.322E-02	3.148E-01	1.287E-02	2.372E-05	2.621E-04	4.16E-06	11.1	5.7	63.1
BB12-009	1.124E-02	7.113E-02	1.768E-03	8.027E-06	5.922E-05	5.71E-07	7.4	14.1	103.7
BB12-010	1.840E-01	2.316E+00	4.814E-02	1.313E-04	1.928E-03	1.55E-05	14.7	8.4	124.1
BB12-011	5.374E-02	4.743E-01	1.592E-02	3.837E-05	3.949E-04	5.14E-06	10.3	7.5	76.8
BB12-012	1.742E-01	1.711E+00	4.611E-02	1.244E-04	1.424E-03	1.49E-05	11.5	8.4	95.7
BB12-013	3.580E-01	4.030E+00	6.009E-02	2.556E-04	3.355E-03	1.94E-05	13.1	13.2	172.9
BB12-014	4.926E-02	4.348E-01	2.371E-02	3.517E-05	3.620E-04	7.66E-06	10.3	4.6	47.3
BB12-015	1.630E-01	1.882E+00	4.159E-02	1.164E-04	1.567E-03	1.34E-05	13.5	8.7	116.7
BB12-016	7.695E-02	7.054E-01	1.142E-02	5.494E-05	5.873E-04	3.69E-06	10.7	14.9	159.2
BB12-017	4.673E-02	4.523E-01	4.097E-02	3.336E-05	3.765E-04	1.32E-05	11.3	2.5	28.5
BB12-018	7.183E-01	1.020E+01	1.010E-01	5.128E-04	8.493E-03	3.26E-05	16.6	15.7	260.5
BB12-019	6.839E-01	1.055E+01	9.793E-02	4.883E-04	8.784E-03	3.16E-05	18.0	15.4	277.8
BB12-020	4.956E-01	5.018E+00	8.323E-02	3.538E-04	4.178E-03	2.69E-05	11.8	13.2	155.5
BB12-021	1.615E-01	1.712E+00	6.483E-02	1.153E-04	1.425E-03	2.09E-05	12.4	5.5	68.1
BB12-022	2.323E-01	2.017E+00	5.659E-02	1.658E-04	1.679E-03	1.83E-05	10.1	9.1	91.9
BB12-023	2.250E-01	2.304E+00	7.197E-02	1.606E-04	1.919E-03	2.32E-05	11.9	6.9	82.6
BB12-024	4.635E-01	5.194E+00	7.811E-02	3.309E-04	4.324E-03	2.52E-05	13.1	13.1	171.5
BB12-025	7.820E-01	1.221E+01	1.111E-01	5.583E-04	1.017E-02	3.59E-05	18.2	15.6	283.5
BB12-026	1.772E-01	2.019E+00	4.866E-02	1.265E-04	1.681E-03	1.57E-05	13.3	8.1	107.0
BB12-027	2.547E-02	1.743E-01	8.050E-03	1.818E-05	1.451E-04	2.6E-06	8.0	7.0	55.8
BB12-028	1.112E-01	1.039E+00	5.022E-02	7.940E-05	8.653E-04	1.62E-05	10.9	4.9	53.4
BB12-029	7.867E-02	7.886E-01	1.571E-02	5.617E-05	6.566E-04	5.07E-06	11.7	11.1	129.4
BB12-030	3.852E-02	3.604E-01	1.147E-02	2.750E-05	3.001E-04	3.7E-06	10.9	7.4	81.0

Appendix Table A3

Station	ave %N	ave %C	ave %P	mmoles N/mg sediment	mmoles C/mg sediment	mmoles P/mg sediment	C:N (molar)	N:P (molar)	C:P (molar)
BB12-031	1.489E-02	9.474E-02	2.454E-03	1.063E-05	7.888E-05	7.92E-07	7.4	13.4	99.5
BB12-032	4.025E-02	3.484E-01	1.154E-02	2.873E-05	2.901E-04	3.72E-06	10.1	7.7	77.9
BB12-033	1.744E-02	1.049E-01	3.712E-03	1.245E-05	8.734E-05	1.2E-06	7.0	10.4	72.9
BB12-034	4.032E-02	2.802E-01	8.455E-03	2.879E-05	2.332E-04	2.73E-06	8.1	10.5	85.4
BB12-035	8.181E-02	7.526E-01	4.244E-02	5.840E-05	6.266E-04	1.37E-05	10.7	4.3	45.7
BB12-036	3.016E-02	2.553E-01	9.808E-03	2.153E-05	2.126E-04	3.17E-06	9.9	6.8	67.1
BB12-037	2.551E-02	1.788E-01	1.128E-02	1.821E-05	1.488E-04	3.64E-06	8.2	5.0	40.9
BB12-038	1.082E-01	1.003E+00	5.829E-02	7.722E-05	8.352E-04	1.88E-05	10.8	4.1	44.4
BB12-039	5.896E-02	4.604E-01	3.124E-02	4.209E-05	3.834E-04	1.01E-05	9.1	4.2	38.0
BB12-040	2.050E-02	1.142E-01	1.989E-02	1.464E-05	9.511E-05	6.42E-06	6.5	2.3	14.8
BB12-041	1.045E-01	8.437E-01	5.410E-02	7.464E-05	7.024E-04	1.75E-05	9.4	4.3	40.2
BB12-042	1.196E-01	1.186E+00	4.734E-02	8.541E-05	9.875E-04	1.53E-05	11.6	5.6	64.6
BB12-043	6.198E-02	4.829E-01	2.150E-02	4.425E-05	4.021E-04	6.94E-06	9.1	6.4	57.9
BB12-044	1.968E-02	1.077E-01	2.319E-02	1.405E-05	8.967E-05	7.49E-06	6.4	1.9	12.0
BB12-045	1.039E-01	7.403E-01	5.072E-02	7.416E-05	6.163E-04	1.64E-05	8.3	4.5	37.6
BB12-046	8.264E-02	5.377E-01	4.372E-02	5.900E-05	4.477E-04	1.41E-05	7.6	4.2	31.7
BB12-047	6.461E-02	5.989E-01	4.219E-02	4.613E-05	4.986E-04	1.36E-05	10.8	3.4	36.6
BB12-048	1.534E-01	1.260E+00	6.500E-02	1.095E-04	1.049E-03	2.1E-05	9.6	5.2	50.0
BB12-049	6.117E-02	4.628E-01	2.470E-02	4.367E-05	3.854E-04	7.98E-06	8.8	5.5	48.3
BB12-050	2.997E-02	2.364E-01	1.338E-02	2.140E-05	1.968E-04	4.32E-06	9.2	5.0	45.6
BB12-051	2.589E-02	1.949E-01	1.704E-02	1.848E-05	1.623E-04	5.5E-06	8.8	3.4	29.5
BB12-052	2.737E-02	1.726E-01	1.897E-02	1.954E-05	1.437E-04	6.13E-06	7.4	3.2	23.5
BB12-053	3.118E-02	2.137E-01	1.426E-02	2.226E-05	1.779E-04	4.6E-06	8.0	4.8	38.7
BB12-054	3.887E-02	3.323E-01	1.201E-02	2.775E-05	2.766E-04	3.88E-06	10.0	7.2	71.3
BB12-055	4.672E-02	5.121E-01	5.353E-02	3.335E-05	4.264E-04	1.73E-05	12.8	1.9	24.7
BB12-056	1.167E-01	1.328E+00	6.316E-02	8.330E-05	1.106E-03	2.04E-05	13.3	4.1	54.2
BB12-057	9.615E-03	5.205E-02	3.540E-03	6.865E-06	4.333E-05	1.14E-06	6.3	6.0	37.9
BB12-058	6.203E-02	4.412E-01	2.653E-02	4.429E-05	3.673E-04	8.57E-06	8.3	5.2	42.9
BB12-059	1.983E-01	2.114E+00	5.927E-02	1.416E-04	1.760E-03	1.91E-05	12.4	7.4	92.0
BB12-060	2.518E-01	2.822E+00	6.904E-02	1.798E-04	2.350E-03	2.23E-05	13.1	8.1	105.4
BB12-061	1.803E-01	1.583E+00	5.837E-02	1.287E-04	1.318E-03	1.88E-05	10.2	6.8	69.9
BB12-062	1.710E-01	1.311E+00	5.007E-02	1.221E-04	1.092E-03	1.62E-05	8.9	7.6	67.5

Appendix Table A3

Station	ave %N	ave %C	ave %P	mmoles N/mg sediment	mmoles C/mg sediment	mmoles P/mg sediment	C:N (molar)	N:P (molar)	C:P (molar)
BB12-063	2.662E-02	1.984E-01	8.968E-03	1.901E-05	1.652E-04	2.9E-06	8.7	6.6	57.1
BB12-064	2.193E-01	2.073E+00	5.995E-02	1.566E-04	1.726E-03	1.94E-05	11.0	8.1	89.2
BB12-065	1.835E-02	1.341E-01	3.964E-03	1.310E-05	1.116E-04	1.28E-06	8.5	10.2	87.2
BB12-066	2.384E-02	1.712E-01	6.453E-03	1.702E-05	1.425E-04	2.08E-06	8.4	8.2	68.4
BB12-067	1.337E-01	1.188E+00	6.127E-02	9.546E-05	9.888E-04	1.98E-05	10.4	4.8	50.0
BB12-068	4.346E-01	3.841E+00	8.907E-02	3.103E-04	3.198E-03	2.88E-05	10.3	10.8	111.2
BB12-069	1.660E-01	1.454E+00	5.560E-02	1.185E-04	1.211E-03	1.8E-05	10.2	6.6	67.4
BB12-070	5.466E-02	4.560E-01	2.020E-02	3.902E-05	3.797E-04	6.52E-06	9.7	6.0	58.2
BB12-071	1.159E-01	1.065E+00	3.004E-02	8.275E-05	8.867E-04	9.7E-06	10.7	8.5	91.4
BB12-072	8.436E-02	6.462E-01	3.490E-02	6.023E-05	5.380E-04	1.13E-05	8.9	5.3	47.7
BB12-073	2.177E-01	2.093E+00	6.588E-02	1.554E-04	1.742E-03	2.13E-05	11.2	7.3	81.9
BB12-074	6.272E-02	5.694E-01	4.363E-02	4.478E-05	4.741E-04	1.41E-05	10.6	3.2	33.7
BB12-075	9.038E-02	8.161E-01	5.821E-02	6.453E-05	6.794E-04	1.88E-05	10.5	3.4	36.1
BB12-076	1.550E-01	1.715E+00	7.639E-02	1.107E-04	1.428E-03	2.47E-05	12.9	4.5	57.9
BB12-077	1.197E-01	1.223E+00	6.901E-02	8.544E-05	1.018E-03	2.23E-05	11.9	3.8	45.7
BB12-078	2.750E-01	2.883E+00	7.856E-02	1.964E-04	2.400E-03	2.54E-05	12.2	7.7	94.6
BB12-079	6.565E-02	5.456E-01	4.079E-02	4.687E-05	4.542E-04	1.32E-05	9.7	3.6	34.5
BB12-080	5.561E-02	4.440E-01	4.799E-02	3.970E-05	3.696E-04	1.55E-05	9.3	2.6	23.9
BB12-081	1.778E-01	1.909E+00	6.320E-02	1.269E-04	1.590E-03	2.04E-05	12.5	6.2	77.9
BB12-082	2.000E-01	2.022E+00	6.032E-02	1.428E-04	1.684E-03	1.95E-05	11.8	7.3	86.5
BB12-083	1.196E-01	9.994E-01	6.906E-02	8.539E-05	8.321E-04	2.23E-05	9.7	3.8	37.3
BB12-084	1.358E-01	1.165E+00	7.859E-02	9.695E-05	9.700E-04	2.54E-05	10.0	3.8	38.2
BB12-085	2.758E-01	2.875E+00	7.461E-02	1.969E-04	2.394E-03	2.41E-05	12.2	8.2	99.4
BB12-086	2.590E-02	1.699E-01	3.867E-02	1.849E-05	1.414E-04	1.25E-05	7.6	1.5	11.3
BB12-087	3.084E-02	1.976E-01	7.186E-03	2.202E-05	1.645E-04	2.32E-06	7.5	9.5	70.9
BB12-088	7.028E-02	5.088E-01	3.785E-02	5.017E-05	4.236E-04	1.22E-05	8.4	4.1	34.7
BB12-089	1.210E-01	9.423E-01	5.220E-02	8.639E-05	7.845E-04	1.69E-05	9.1	5.1	46.5
BB12-090	3.133E-02	2.266E-01	2.117E-02	2.237E-05	1.887E-04	6.84E-06	8.4	3.3	27.6
BB12-091	9.956E-02	7.839E-01	4.858E-02	7.108E-05	6.527E-04	1.57E-05	9.2	4.5	41.6
BB12-092	8.376E-02	6.550E-01	4.631E-02	5.980E-05	5.453E-04	1.5E-05	9.1	4.0	36.5
BB12-093	2.704E-02	1.425E-01	2.048E-02	1.930E-05	1.186E-04	6.61E-06	6.1	2.9	17.9
BB12-094	1.021E-01	8.388E-01	5.327E-02	7.288E-05	6.983E-04	1.72E-05	9.6	4.2	40.6

Appendix Table A3

Station	ave %N	ave %C	ave %P	mmoles N/mg sediment	mmoles C/mg sediment	mmoles P/mg sediment	C:N (molar)	N:P (molar)	C:P (molar)
BB12-095	3.481E-03	1.520E-02	2.030E-03	2.485E-06	1.265E-05	6.55E-07	5.1	3.8	19.3
BB12-096	2.077E-02	1.139E-01	2.180E-02	1.483E-05	9.481E-05	7.04E-06	6.4	2.1	13.5
BB12-097	8.283E-03	4.227E-02	4.348E-03	5.913E-06	3.519E-05	1.4E-06	6.0	4.2	25.1
BB12-098	1.413E-02	7.769E-02	5.314E-03	1.009E-05	6.468E-05	1.72E-06	6.4	5.9	37.7
BB12-099	7.049E-02	4.868E-01	4.751E-02	5.032E-05	4.053E-04	1.53E-05	8.1	3.3	26.4
BB12-100	1.312E-01	9.778E-01	6.717E-02	9.366E-05	8.141E-04	2.17E-05	8.7	4.3	37.5

Table A4. List of species collected in 2012. Taxa highlighted in yellow were omitted from statistical analyses, for reasons given (see text for further explanation).

Phylum	Class	Order	Family	Taxon	Reason for removal
Annelida	Clitellata	Haplotaxida	Tubificidae	Tubificoides sp.	
Annelida	Clitellata			Oligochaeta sp.	
Annelida	Polychaeta	"unassigned"	Arenicolidae	Arenicola marina	
Annelida	Polychaeta	"unassigned"	Capitellidae	Amastigos caperatus	
Annelida	Polychaeta	"unassigned"	Capitellidae	Capitella capitata	
Annelida	Polychaeta	"unassigned"	Capitellidae	Heteromastus filiformis	
Annelida	Polychaeta	"unassigned"	Capitellidae	Mediomastus ambiseta	
Annelida	Polychaeta	"unassigned"	Capitellidae	Notomastus sp. A Ewing	
Annelida	Polychaeta	"unassigned"	Cossuridae	Cossura sp. A Maciolek	
Annelida	Polychaeta	"unassigned"	Maldanidae	Clymenella torquata	
Annelida	Polychaeta	"unassigned"	Maldanidae	Clymenella zonalis	
Annelida	Polychaeta	"unassigned"	Maldanidae	Maldanidae sp. indeter.	Likely belongs to an already identified species
Annelida	Polychaeta	"unassigned"	Maldanidae	Sabaco elongatus	
Annelida	Polychaeta	"unassigned"	Orbiniidae	Leitoscoloplos robustus	
Annelida	Polychaeta	"unassigned"	Orbiniidae	Scoloplos (Leodamas) rubra	
Annelida	Polychaeta	"unassigned"	Paraonidae	Aricidea (Acmira) catherinae	
Annelida	Polychaeta	"unassigned"	Paraonidae	Aricidea (Aricidea) wassi	
Annelida	Polychaeta	"unassigned"	Paraonidae	Cirrophorus sp. B	
Annelida	Polychaeta	"unassigned"	Paraonidae	Paraonis fulgens	
Annelida	Polychaeta	"unassigned"	Polygordiidae	Polygordius jouinae	
Annelida	Polychaeta	Eunicida	Dorvilleidae	Parougia caeca	
Annelida	Polychaeta	Eunicida	Dorvilleidae	Schistomeringos rudolphii	
Annelida	Polychaeta	Eunicida	Eunicidae	Marphysa bellii	
Annelida	Polychaeta	Eunicida	Lumbrinereidae	Scoletoma tenuis	
Annelida	Polychaeta	Eunicida	Oenonidae	Arabella iricolor	
Annelida	Polychaeta	Eunicida	Oenonidae	Drilonereis longa	

Appendix Table A4

Phylum	Class	Order	Family	Taxon	Reason for removal
Annelida	Polychaeta	Eunicida	Oenonidae	Notocirrus spinifera	
Annelida	Polychaeta	Eunicida	Onuphidae	Diopatra cuprea	
Annelida	Polychaeta	Phyllodocida	Glyceridae	Glycera americana	
Annelida	Polychaeta	Phyllodocida	Glyceridae	Glycera dibranchiata	
Annelida	Polychaeta	Phyllodocida	Glyceridae	Glycera sp. juvenile	Likely belongs to an already identified species
Annelida	Polychaeta	Phyllodocida	Goniadidae	Glycinde multidens	
Annelida	Polychaeta	Phyllodocida	Hesionidae	Microphthalmus sczelkowii	
Annelida	Polychaeta	Phyllodocida	Hesionidae	Oxydromus obscurus	
Annelida	Polychaeta	Phyllodocida	Hesionidae	Parahesione luteola	
Annelida	Polychaeta	Phyllodocida	Hesionidae	Podarkeopsis levifuscina	
Annelida	Polychaeta	Phyllodocida	Nephtyidae	Aglaophamus circinata	
Annelida	Polychaeta	Phyllodocida	Nephtyidae	Nephtys incisa	
Annelida	Polychaeta	Phyllodocida	Nephtyidae	Nephtys picta	
Annelida	Polychaeta	Phyllodocida	Nereididae	Alitta succinea	
Annelida	Polychaeta	Phyllodocida	Nereididae	Alitta virens	
Annelida	Polychaeta	Phyllodocida	Nereididae	Neanthes arenaceodentata	
Annelida	Polychaeta	Phyllodocida	Nereididae	Nereididae sp. juvenile	Likely belongs to an already identified species
Annelida	Polychaeta	Phyllodocida	Nereididae	Platynereis dumerilii	
Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eumida sanguinea	
Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Hypereteone foliosa	
Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Hypereteone heteropoda	
Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Paranaitis speciosa	
Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Phyllodoce arenae	
Annelida	Polychaeta	Phyllodocida	Pilargidae	Ancistrosyllis hartmanae	
Annelida	Polychaeta	Phyllodocida	Pilargidae	Cabira incerta	
Annelida	Polychaeta	Phyllodocida	Polynoidae	Harmothoe extenuata	
Annelida	Polychaeta	Phyllodocida	Polynoidae	Lepidametria commensalis	
Annelida	Polychaeta	Phyllodocida	Polynoidae	Lepidonotus sublevis	
Annelida	Polychaeta	Phyllodocida	Sigalionidae	Sthenelais boa	

Appendix Table A4

Phylum	Class	Order	Family	Taxon	Reason for removal
Annelida	Polychaeta	Phyllodocida	Sphaerodoridae	Sphaerodoropsis sp. A Maciolek	
Annelida	Polychaeta	Phyllodocida	Syllidae	Brania wellfleetensis	
Annelida	Polychaeta	Phyllodocida	Syllidae	Erinaceusyllis erinaceus	
Annelida	Polychaeta	Phyllodocida	Syllidae	Exogone (Exogone) dispar	
Annelida	Polychaeta	Phyllodocida	Syllidae	Proceraea cornuta	
Annelida	Polychaeta	Phyllodocida	Syllidae	Salvatoria clavata	
Annelida	Polychaeta	Phyllodocida	Syllidae	Sphaerosyllis brevidentata	
Annelida	Polychaeta	Phyllodocida	Syllidae	Streptosyllis websteri	
Annelida	Polychaeta	Phyllodocida	Syllidae	Syllides convolutus	
Annelida	Polychaeta	Phyllodocida	Syllidae	Syllides verrilli	
Annelida	Polychaeta	Phyllodocida	Syllidae	Syllis alternata	
Annelida	Polychaeta	Sabellida	Oweniidae	Owenia fusiformis	
Annelida	Polychaeta	Sabellida	Sabellaridae	Sabellaria vulgaris	
Annelida	Polychaeta	Sabellida	Sabellidae	Parasabella microphthalma	
Annelida	Polychaeta	Sabellida	Serpulidae	Hydroides dianthus	Encrusting, epifaunal
Annelida	Polychaeta	Sabellida	Serpulidae	Hydroides protulicola	Encrusting, epifaunal
Annelida	Polychaeta	Sabellida	Spirorbiidae	Spirorbis corrugatus	Encrusting, epifaunal
Annelida	Polychaeta	Spionida	Chaetopteridae	Spiochaetopterus costarum oculatus	
Annelida	Polychaeta	Spionida	Magelonidae	Magelona sp. A Jones, 1968	
Annelida	Polychaeta	Spionida	Magelonidae	Magelona sp. B Day, 1973	
Annelida	Polychaeta	Spionida	Spionidae	Boccardiella hamata	
Annelida	Polychaeta	Spionida	Spionidae	Carazziella hobsonae	
Annelida	Polychaeta	Spionida	Spionidae	Dipolydora commensalis	
Annelida	Polychaeta	Spionida	Spionidae	Dipolydora socialis	
Annelida	Polychaeta	Spionida	Spionidae	Marenzelleria viridis	
Annelida	Polychaeta	Spionida	Spionidae	Paraprionospio pinnata	
Annelida	Polychaeta	Spionida	Spionidae	Polydora cornuta	
Annelida	Polychaeta	Spionida	Spionidae	Prionospio heterobranchia	

Appendix Table A4

Phylum	Class	Order	Family	Taxon	Reason for removal
Annelida	Polychaeta	Spionida	Spionidae	Prionospio pygmaeus	
Annelida	Polychaeta	Spionida	Spionidae	Pygospio elegans	
Annelida	Polychaeta	Spionida	Spionidae	Scolelepis (Parascolelepis) bousfieldi	
Annelida	Polychaeta	Spionida	Spionidae	Scolelepis (Parascolelepis) texana	
Annelida	Polychaeta	Spionida	Spionidae	Spio setosa	
Annelida	Polychaeta	Spionida	Spionidae	Spiophanes bombyx	
Annelida	Polychaeta	Spionida	Spionidae	Streblospio benedicti	
Annelida	Polychaeta	Terebellida	Ampharetidae	Asabellides oculata	
Annelida	Polychaeta	Terebellida	Ampharetidae	Melinna maculata	
Annelida	Polychaeta	Terebellida	Cirratulidae	Caulleriella venefica	
Annelida	Polychaeta	Terebellida	Cirratulidae	Cirratulus grandis	
Annelida	Polychaeta	Terebellida	Cirratulidae	Monticellina cf. dorsobranchialis	
Annelida	Polychaeta	Terebellida	Cirratulidae	Tharyx sp. A (MWRA)	
Annelida	Polychaeta	Terebellida	Pectinariidae	Pectinaria gouldii	
Annelida	Polychaeta	Terebellida	Terebellidae	Amphitrite ornata	
Annelida	Polychaeta	Terebellida	Terebellidae	Loimia medusa	
Annelida	Polychaeta	Terebellida	Terebellidae	Lysilla alba	
Annelida	Polychaeta	Terebellida	Terebellidae	Pista cristata	
Annelida	Polychaeta	Terebellida	Terebellidae	Pista palmata	
Annelida	Polychaeta	Terebellida	Terebellidae	Polycirrus eximius	
Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca abdita	
Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca vadorum	
Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca verrilli	
Arthropoda	Malacostraca	Amphipoda	Ampithoidae	Ampithoe longimana	
Arthropoda	Malacostraca	Amphipoda	Ampithoidae	Cymadusa compta	
Arthropoda	Malacostraca	Amphipoda	Aoridae	Globosolembos smithi	
Arthropoda	Malacostraca	Amphipoda	Aoridae	Microdeutopus gryllotalpa	
Arthropoda	Malacostraca	Amphipoda	Bateidae	Batea catharinensis	

Appendix Table A4

Phylum	Class	Order	Family	Taxon	Reason for removal
Arthropoda	Malacostraca	Amphipoda	Bathyporeiidae	Bathyporeia quoddyensis	
Arthropoda	Malacostraca	Amphipoda	Caprellidae	Caprella penantis	Epifaunal
Arthropoda	Malacostraca	Amphipoda	Caprellidae	Paracaprella tenuis	Epifaunal
Arthropoda	Malacostraca	Amphipoda	Corophiidae	Apocorophium acutum	
Arthropoda	Malacostraca	Amphipoda	Corophiidae	Monocorophium acherusicum	
Arthropoda	Malacostraca	Amphipoda	Corophiidae	Monocorophium tuberculatum	
Arthropoda	Malacostraca	Amphipoda	Gammaridae	Gammarus mucronatus	
Arthropoda	Malacostraca	Amphipoda	Haustoriidae	Acanthohaustorius intermedius	
Arthropoda	Malacostraca	Amphipoda	Haustoriidae	Acanthohaustorius millsi	
Arthropoda	Malacostraca	Amphipoda	Haustoriidae	Parahaustorius attenuatus	
Arthropoda	Malacostraca	Amphipoda	Haustoriidae	Parahaustorius longimerus	
Arthropoda	Malacostraca	Amphipoda	Haustoriidae	Protohaustorius cf. deichmannae	
Arthropoda	Malacostraca	Amphipoda	Haustoriidae	Pseudohaustorius caroliniensis	
Arthropoda	Malacostraca	Amphipoda	Ischyroceridae	Cerapus sp. C LeCroy, 2007	Epifaunal
Arthropoda	Malacostraca	Amphipoda	Ischyroceridae	Ericthonius punctatus	Epifaunal
Arthropoda	Malacostraca	Amphipoda	Ischyroceridae	Jassa marmorata	Epifaunal
Arthropoda	Malacostraca	Amphipoda	Liljeborgiidae	Listriella barnardi	
Arthropoda	Malacostraca	Amphipoda	Lysianassidae	Lysianopsis alba	
Arthropoda	Malacostraca	Amphipoda	Maeridae	Elasmopus levis	
Arthropoda	Malacostraca	Amphipoda	Melitidae	Melita nitida	
Arthropoda	Malacostraca	Amphipoda	Microprotopidae	Microprotopus raneyi	Epifaunal
Arthropoda	Malacostraca	Amphipoda	Oedicerotidae	Americhelidium americanum	
Arthropoda	Malacostraca	Amphipoda	Oedicerotidae	Ameroculodes spp. complex	
Arthropoda	Malacostraca	Amphipoda	Phoxocephalidae	Eobrolgus spinosus	
Arthropoda	Malacostraca	Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	
Arthropoda	Malacostraca	Amphipoda	Stenothoidae	Parametopella cypris	
Arthropoda	Malacostraca	Amphipoda	Stenothoidae	Stenothoe minuta	
Arthropoda	Malacostraca	Amphipoda	Unciolidae	Rudilemboides naglei	

Appendix Table A4

Phylum	Class	Order	Family	Taxon	Reason for removal
Arthropoda	Malacostraca	Amphipoda	Unciolidae	Unciola dissimilis	
Arthropoda	Malacostraca	Amphipoda	Unciolidae	Unciola irrorata	
Arthropoda	Malacostraca	Amphipoda	Unciolidae	Unciola serrata	
Arthropoda	Malacostraca	Cumacea	Bodotriidae	Cyclaspis varians	
Arthropoda	Malacostraca	Cumacea	Diastylidae	Oxyurostylis smithi	
Arthropoda	Malacostraca	Cumacea	Leuconidae	Leucon americanus	
Arthropoda	Malacostraca	Decapoda	Callianassidae	Gilvossius setimanus	
Arthropoda	Malacostraca	Decapoda	Cancridae	Cancer irroratus	
Arthropoda	Malacostraca	Decapoda	Crangonidae	Crangon septemspinosa	Highly motile undergoes seasonal migrations
Arthropoda	Malacostraca	Decapoda	Epialtidae	Libinia emarginata	
Arthropoda	Malacostraca	Decapoda	Hippolytidae	Hippolyte zostericola	Epifaunal
Arthropoda	Malacostraca	Decapoda	Paguridae	Pagurus longicarpus	
Arthropoda	Malacostraca	Decapoda	Palaemonidae	Palaemonetes sp. indeterminate	
Arthropoda	Malacostraca	Decapoda	Panopeidae	Dyspanopeus sayi	
Arthropoda	Malacostraca	Decapoda	Pinnotheridae	Pinnixa sp. indeter.	Commensal
Arthropoda	Malacostraca	Decapoda	Upogebiidae	Upogebia affinis	
Arthropoda	Malacostraca	Isopoda	Anthuridae	Cyathura burbancki	
Arthropoda	Malacostraca	Isopoda	Anthuridae	Ptilanthura tenuis	
Arthropoda	Malacostraca	Isopoda	Chaetiliidae	Chiridotea coeca	
Arthropoda	Malacostraca	Isopoda	Idoteidae	Edotia triloba	
Arthropoda	Malacostraca	Isopoda	Idoteidae	Erichsonella attenuata	
Arthropoda	Malacostraca	Isopoda	Idoteidae	Erichsonella filiformis	
Arthropoda	Malacostraca	Isopoda	Idoteidae	Idotea balthica	
Arthropoda	Malacostraca	Isopoda	Janiridae	Ianiropsis nr. tridens	
Arthropoda	Malacostraca	Isopoda	Janiridae	Janira alta	
Arthropoda	Malacostraca	Mysida	Mysidae	Americamysis bahia	Epifaunal, highly motile
Arthropoda	Malacostraca	Mysida	Mysidae	Heteromysis (Heteromysis) formosa	Epifaunal, highly motile

Appendix Table A4

Phylum	Class	Order	Family	Taxon	Reason for removal
Arthropoda	Malacostraca	Mysida	Mysidae	Neomysis americana	Epifaunal, highly motile
Arthropoda	Malacostraca	Tanaidacea	Leptocheliidae	Hargeria rapax	
Arthropoda	Malacostraca	Tanaidacea	Tanaissuidae	Tanaissus psammophilus	
Arthropoda	Pycnogonida	Pantopoda	Callipallenidae	Callipallene brevirostris	
Arthropoda	Pycnogonida	Pantopoda	Phoxichilidiidae	Anoplodactylus petiolatus	
Cnidaria	Anthozoa	Actiniaria	Diadumenidae	Diadumene leucolena	Epifaunal
Cnidaria	Anthozoa	Actiniaria	Edwardsiidae	Edwardsia elegans	
Cnidaria	Anthozoa	Actiniaria	Haloclavidae	Haloclava producta	
Cnidaria	Anthozoa	Actiniaria	Sagartiidae	Actinothoe modesta	
Cnidaria	Anthozoa	Ceriantharia	Cerianthidae	Ceriantheopsis americanus	
Echinodermata	Holothuroidea	Apodida	Synaptidae	Leptosynapta tenuis	
Echinodermata	Holothuroidea	Dendrochirotida	Phyllophoridae	Havelockia scabra	
Echinodermata	Holothuroidea	Dendrochirotida	Phyllophoridae	Pentamera pulcherrima	
Hemichordata	Enteropneusta	Enteropneusta	Harrimaniidae	Saccoglossus kowalevskii	
Mollusca	Bivalvia	Anomalodesmata	Lyonsiidae	Lyonsia hyalina	
Mollusca	Bivalvia	Arcoida	Arcidae	Anadara transversa	
Mollusca	Bivalvia	Euheterodonta	Pharidae	Ensis directus	
Mollusca	Bivalvia	Myoida	Myidae	Mya arenaria	
Mollusca	Bivalvia	Mytiloida	Mytilidae	Mytilus edulis	Epifaunal
Mollusca	Bivalvia	Nuculida	Nuculanoida	Yoldia limatula	
Mollusca	Bivalvia	Nuculida	Nuculidae	Nucula proxima	
Mollusca	Bivalvia	Solemyoida	Solemyidae	Solemya velum	
Mollusca	Bivalvia	Veneroida	Lasaeidae	Aligena elevata	
Mollusca	Bivalvia	Veneroida	Mactridae	Mulinia lateralis	
Mollusca	Bivalvia	Veneroida	Mactridae	Spisula solidissima	
Mollusca	Bivalvia	Veneroida	Montacutidae	Mysella planulata	
Mollusca	Bivalvia	Veneroida	Solencurtidae	Tagelus divisus	
Mollusca	Bivalvia	Veneroida	Tellinidae	Angulus agilis	

Appendix Table A4

Phylum	Class	Order	Family	Taxon	Reason for removal
Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma tenta	
Mollusca	Bivalvia	Veneroida	Tellinidae	Tellinidae sp. indeter.	Likely belongs to an already identified species
Mollusca	Bivalvia	Veneroida	Veneridae	Gemma gemma	
Mollusca	Bivalvia	Veneroida	Veneridae	Mercenaria mercenaria	
Mollusca	Bivalvia	Veneroida	Veneridae	Petricolaria pholadiformis	
Mollusca	Bivalvia	Veneroida	Veneridae	Spisula solidissima	
Mollusca	Bivalvia			Bivalvia sp. indeter.	Likely belongs to an already identified species
Mollusca	Gastropoda	"unassigned"	Acteonidae	Japonactaeon punctostriatus	
Mollusca	Gastropoda	"unassigned"	Pyramidellidae	Eulimastoma engonia	
Mollusca	Gastropoda	"unassigned"	Pyramidellidae	Odostomia sp. juv./indeter.	
Mollusca	Gastropoda	"unassigned"	Pyramidellidae	Turbonilla interrupta	
Mollusca	Gastropoda	Caenogastropoda	Cerithiidae	Bittiolum alternatum	
Mollusca	Gastropoda	Caenogastropoda	Epitoniidae	Epitonium rupicola	
Mollusca	Gastropoda	Cephalaspidea	Cylichnidae	Acteocina canaliculata	
Mollusca	Gastropoda	Cephalaspidea	Haminoeidae	Haminoea solitaria	
Mollusca	Gastropoda	Littorinimorpha	Calyptraeidae	Crepidula convexa	Epifaunal
Mollusca	Gastropoda	Littorinimorpha	Calyptraeidae	Crepidula fornicata	Epifaunal
Mollusca	Gastropoda	Littorinimorpha	Calyptraeidae	Crepidula plana	Epifaunal
Mollusca	Gastropoda	Littorinimorpha	Hydrobiidae	Littoridinops tenuipes	
Mollusca	Gastropoda	Littorinimorpha	Naticidae	Naticidae sp. indeter.	Likely belongs to an already identified species
Mollusca	Gastropoda	Littorinimorpha	Naticidae	Neverita duplicata	
Mollusca	Gastropoda	Neogastropoda	Columbellidae	Costoanachis avara	
Mollusca	Gastropoda	Neogastropoda	Muricidae	Muricidae sp. indeter.	Likely belongs to an already identified species
Mollusca	Gastropoda	Neogastropoda	Muricidae	Urosalpinx cinerea	
Mollusca	Gastropoda	Neogastropoda	Nassariidae	Ilyanassa obsoleta	
Mollusca	Gastropoda	Neogastropoda	Nassariidae	Nassarius vibex	
Mollusca	Gastropoda	Nudibranchia	Facelinidae	Cratena pilata	Epifaunal
Mollusca	Gastropoda	Nudibranchia	Onchidorididae	Corambe obscura	Epifaunal
Mollusca	Gastropoda	Nudibranchia		Nudibranchia sp.	Epifaunal

Appendix Table A4

Phylum	Class	Order	Family	Taxon	Reason for removal
Mollusca	Gastropoda	Sacoglossa	Plakobranchidae	Elysia chlorotica	Epifaunal
Mollusca	Gastropoda			Gastropoda sp. indeter.	Likely belongs to an already identified species
Nemertea	Anopla	"unassigned"	Carinomidae	Carinoma tremaphoros	
Nemertea	Anopla	"unassigned"	Carinomidae	Carinomella lactea	
Nemertea	Anopla	"unassigned"	Lineidae	Cerebratulus lacteus	
Nemertea	Anopla	"unassigned"	Lineidae	Lineus pallidus	
Nemertea	Anopla	"unassigned"	Lineidae	Lineus ruber	
Nemertea	Anopla	"unassigned"	Lineidae	Micrura sp.	
Nemertea	Enopla	Monostilifera	Amphipoidae	Amphiporus bioculatus	
Nemertea	Enopla	Monostilifera	Amphipoidae	Amphiporus ochraceus	
Nemertea	Enopla	Monostilifera	Amphipoidae	Zygonemertes virescens	
Nemertea	Enopla	Monostilifera	Tetrastemmatidae	Tetrastemma elegans	
Nemertea	Enopla	Monostilifera	Tetrastemmatidae	Tetrastemma sp. A	
Nemertea	Enopla	Monostilifera	Tetrastemmatidae	Tetrastemma vermiculus	
Nemertea	Palaeonemertea	"unassigned"	Cephalothricidae	Cephalothrix spiralis	
Phoronida				Phoronis psammophila	
Platyhelminthes	Rhabditophora	Polycladida	Euplanidae	Euplana gracilis	
Platyhelminthes	Rhabditophora	Polycladida	Stylochidae	Stylochus ellipticus	
Platyhelminthes	Rhabditophora	Seriata		Tricladida sp. B	
Platyhelminthes	Turbellaria			Turbellaria sp. A (LTBA)	
Sipuncula	Spunculidea	Golfingiida	Phascolionidae	Phascolion (Phascolion) strombus	

Appendix Table A5

Table A5. Tolerance values, $E(S_{50})_{0.05}$, for all taxa with >20 total individuals in all samples.

Phylum	Class	Order	Family	Taxon	$E(S50)_{0.05}$
Arthropoda	Malacostraca	Amphipoda	Haustoriidae	Acanthohaustorius millsi	5.22
Mollusca	Gastropoda	Cephalaspidea	Cylichnidae	Acteocina canaliculata	11.44
Mollusca	Bivalvia	Veneroida	Lasaeidae	Aligena elevata	11.53
Annelida	Polychaeta	Phyllodocida	Nereididae	Alitta succinea	10.48
Annelida	Polychaeta	unassigned	Capitellidae	Amastigos caperatus	11
Arthropoda	Malacostraca	Amphipoda	Oedicerotidae	Ameroculodes spp. complex	14.19
Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca abdita	14.34
Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca vadorum	12.03
Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	Ampelisca verrilli	12.21
Nemertea	Enopla	Monostilifera	Amphipoidae	Amphiporus bioculatus	11.95
Nemertea	Enopla	Monostilifera	Amphipoidae	Amphiporus ochraceus	11.4
Arthropoda	Malacostraca	Amphipoda	Ampithoidae	Ampithoe longimana	13.85
Mollusca	Bivalvia	Veneroida	Tellinidae	Angulus agilis	10.83
Arthropoda	Pycnogonida	Pantopoda	Phoxichilidiidae	Anoplodactylus petiolatus	10.48
Arthropoda	Malacostraca	Amphipoda	Corophiidae	Apocorophium acutum	12.83
Annelida	Polychaeta	Eunicida	Oenonidae	Arabella iricolor	13.7
Annelida	Polychaeta	unassigned	Arenicolidae	Arenicola marina	18.16
Annelida	Polychaeta	unassigned	Paraonidae	Aricidea (Acmira) catherinae	12.6
Arthropoda	Malacostraca	Amphipoda	Bateidae	Batea catharinensis	15.15
Mollusca	Gastropoda	Caenogastropoda	Cerithiidae	Bittiolum alternatum	16.34
Annelida	Polychaeta	Phyllodocida	Syllidae	Brania wellfleetensis	11.41
Annelida	Polychaeta	unassigned	Capitellidae	Capitella sp.	11.95
Nemertea	Anopla	unassigned	Carinomidae	Carinomella lactea	10.85
Annelida	Polychaeta	unassigned	Maldanidae	Clymenella torquata	9.5
Annelida	Polychaeta	unassigned	Maldanidae	Clymenella zonalis	11.47
Annelida	Polychaeta	unassigned	Cossuridae	Cossura sp. A Maciolek	9.48
Arthropoda	Malacostraca	Isopoda	Anthuridae	Cyathura burbancki	13.89
Arthropoda	Malacostraca	Amphipoda	Ampithoidae	Cymadusa compta	14.17
Annelida	Polychaeta	Eunicida	Onuphidae	Diopatra cuprea	12.07
Arthropoda	Malacostraca	Decapoda	Panopeidae	Dyspanopeus sayi	9.39
Arthropoda	Malacostraca	Isopoda	Idoteidae	Edotia triloba	11.97
Cnidaria	Anthozoa	Actiniaria	Edwardsiidae	Edwardsia elegans	12.25
Arthropoda	Malacostraca	Amphipoda	Maeridae	Elasmopus levis	14.15

Appendix Table A5

Phylum	Class	Order	Family	Taxon	$E(S50)_{0.05}$
Arthropoda	Malacostraca	Amphipoda	Phoxocephalidae	Eobrolgus spinosus	13.04
Arthropoda	Malacostraca	Isopoda	Idoteidae	Erichsonella attenuata	16.52
Arthropoda	Malacostraca	Isopoda	Idoteidae	Erichsonella filiformis	16.21
Annelida	Polychaeta	Phyllodocida	Syllidae	Erinaceusyllis erinaceus	11.52
Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eteone heteropoda	11.02
Mollusca	Gastropoda	unassigned	Pyramidellidae	Eulimastoma engonia	11.39
Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Eumida sanguinea	14.52
Annelida	Polychaeta	Phyllodocida	Syllidae	Exogone (Exogone) dispar	13.53
Arthropoda	Malacostraca	Amphipoda	Gammaridae	Gammarus mucronatus	11.22
Mollusca	Bivalvia	Veneroida	Veneridae	Gemma gemma	5.6
Arthropoda	Malacostraca	Amphipoda	Aoridae	Globosolembos smithi	14.23
Annelida	Polychaeta	Phyllodocida	Glyceridae	Glycera americana	11.83
Annelida	Polychaeta	Phyllodocida	Goniadidae	Glycinde multidens	12.16
Cnidaria	Anthozoa	Actiniaria	Haloclavidae	Haloclava producta	13.7
Mollusca	Gastropoda	Cephalaspidea	Haminoeidae	Haminoea solitaria	11.01
Annelida	Polychaeta	unassigned	Capitellidae	Heteromastus filiformis	9.9
Arthropoda	Malacostraca	Isopoda	Idoteidae	Idotea balthica	11.01
Mollusca	Gastropoda	Neogastropoda	Nassariidae	Ilyanassa obsoleta	13.26
Mollusca	Gastropoda	unassigned	Acteonidae	Japonactaeon punctostriatus	12.02
Annelida	Polychaeta	unassigned	Orbiniidae	Leitoscoloplos robustus	11.17
Echinodermata	Holothuroidea	Apodida	Synaptidae	Leptosynapta tenuis	10.27
Arthropoda	Malacostraca	Cumacea	Leuconidae	Leucon americanus	9.76
Arthropoda	Malacostraca	Amphipoda	Liljeborgiidae	Listriella barnardi	11.22
Annelida	Polychaeta	Terebellida	Terebellidae	Loimia medusa	12.14
Arthropoda	Malacostraca	Amphipoda	Lysianassidae	Lysianopsis alba	13.96
Mollusca	Bivalvia	Veneroida	Tellinidae	Macoma tenta	11.97
Annelida	Polychaeta	unassigned	Capitellidae	Mediomastus ambiseta	10.86
Annelida	Polychaeta	Terebellida	Ampharetidae	Melinna maculata	13.11
Mollusca	Bivalvia	Veneroida	Veneridae	Mercenaria mercenaria	11.01
Arthropoda	Malacostraca	Amphipoda	Aoridae	Microdeutopus gryllotalpa	13.7
Annelida	Polychaeta	Phyllodocida	Hesionidae	Microphthalmus sczelkowii	10.84
Arthropoda	Malacostraca	Amphipoda	Corophiidae	Monocorophium acherusicum	12.2
Annelida	Polychaeta	Terebellida	Cirratulidae	Monticellina cf. dorsobranchialis	14.45
Mollusca	Bivalvia	Veneroida	Mactridae	Mulinia lateralis	10.84
Annelida	Polychaeta	unassigned	Capitellidae	Notomastus sp. A Ewing	9.05

Appendix Table A5

Phylum	Class	Order	Family	Taxon	$E(S50)_{0.05}$
Mollusca	Bivalvia	Nuculida	Nuculidae	Nucula proxima	11.98
Annelida	Clitellata			Oligochaeta sp.	10.27
Arthropoda	Malacostraca	Cumacea	Diastylidae	Oxyurostylis smithi	11.05
Annelida	Polychaeta	Spionida	Spionidae	Paraprionospio pinnata	11.98
Annelida	Polychaeta	Sabellida	Sabellidae	Parasabella microphthalma	12.77
Annelida	Polychaeta	Terebellida	Pectinariidae	Pectinaria gouldii	12.24
Echinodermata	Holothuroidea	Dendrochirotida	Phyllophoridae	Pentamera pulcherrima	14.07
Annelida	Polychaeta	Phyllodocida	Phyllodocidae	Phyllodoce arenae	11.34
Annelida	Polychaeta	Phyllodocida	Nereididae	Platynereis dumerilii	15.19
Annelida	Polychaeta	Phyllodocida	Hesionidae	Podarke obscura	12.12
Annelida	Polychaeta	Phyllodocida	Hesionidae	Podarkeopsis levifuscina	11.91
Annelida	Polychaeta	Terebellida	Terebellidae	Polycirrus eximius	12.16
Annelida	Polychaeta	Spionida	Spionidae	Polydora cornuta	11.4
Annelida	Polychaeta	Spionida	Spionidae	Prionospio heterobranchia	15.53
Arthropoda	Malacostraca	Amphipoda	Haustoriidae	Protohaustorius cf. deichmannae	8.35
Annelida	Polychaeta	Spionida	Spionidae	Pygospio elegans	11.11
Arthropoda	Malacostraca	Amphipoda	Phoxocephalidae	Rhepoxynius hudsoni	8.49
Arthropoda	Malacostraca	Amphipoda	Unciolidae	Rudilemboides naglei	15.29
Annelida	Polychaeta	unassigned	Maldanidae	Sabaco elongatus	13.23
Annelida	Polychaeta	Sabellida	Sabellaridae	Sabellaria vulgaris	16.59
Hemichordata	Enteropneusta	Enteropneusta	Harrimaniidae	Saccoglossus kowalevskii	13.56
Annelida	Polychaeta	Phyllodocida	Syllidae	Salvatoria clavata	13.57
Annelida	Polychaeta	Spionida	Spionidae	Scolelepis (Parascolelepis) bousfieldi	13.86
Annelida	Polychaeta	Spionida	Spionidae	Scolelepis (Parascolelepis) texana	13.56
Annelida	Polychaeta	Eunicida	Lumbrinereidae	Scoletoma tenuis	12.64
Mollusca	Bivalvia	Solemyoida	Solemyidae	Solemya velum	13.09
Annelida	Polychaeta	Phyllodocida	Syllidae	Sphaerosyllis brevidentata	11.96
Annelida	Polychaeta	Spionida	Chaetopteridae	Spiochaetopterus costarum oculatus	13.66
Annelida	Polychaeta	Spionida	Spionidae	Spiophanes bombyx	10.85
Annelida	Polychaeta	Phyllodocida	Sigalionidae	Sthenelais boa	11.22
Annelida	Polychaeta	Spionida	Spionidae	Streblospio benedicti	4.48
Platyhelminthes	Rhabditophora	Polycladida	Stylochidae	Stylochus ellipticus	11.61
Annelida	Polychaeta	Phyllodocida	Syllidae	Syllis alternata	15.45

Appendix Table A5

Phylum	Class	Order	Family	Taxon	$E(S50)_{0.05}$
Mollusca	Bivalvia	Veneroida	Solencurtidae	Tagelus divisus	11.04
Nemertea	Enopla	Monostilifera	Tetrastemmatidae	Tetrastemma elegans	10.64
Nemertea	Enopla	Monostilifera	Tetrastemmatidae	Tetrastemma sp. A	13.67
Annelida	Polychaeta	Terebellida	Cirratulidae	Tharyx sp. A (MWRA)	10.99
Platyhelminthes	Rhabditophora	Seriata		Tricladida sp. B	14
Annelida	Clitellata	Haplotaxida	Tubificidae	Tubificoides sp.	10.56
Mollusca	Gastropoda	unassigned	Pyramidellidae	Turbonilla interrupta	11.96
Arthropoda	Malacostraca	Amphipoda	Unciolidae	Unciola irrorata	15.14
Nemertea	Enopla	Monostilifera	Amphipoidae	Zygonemertes virescens	14.31

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