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**BIOLOGICAL CONDITION OF MONEY PONT BENTHIC COMMUNITIES,  
SOUTHERN BRANCH OF THE ELIZABETH RIVER (2010 and 2013)**

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## EXECUTIVE SUMMARY

The subtidal macrobenthic communities off Money Point in the Southern Branch of the Elizabeth River were quantitatively sampled in summer 2010 (Dauer 2011). The designated Money Point study area was part of a sediment contaminant remediation effort. The primary objectives of the present study were to: (1) characterize the biological health of the benthos of Money Point comparing pre-remediation (2010) and post-remediation (2013) conditions and (2) assess the effectiveness of the sediment contamination remediation efforts with respect to Money Point benthos. In this report the macrobenthic communities off Money Point were resampled in the summer of 2013 after the completion of the sediment contamination remediation efforts.

Dauer (2011) characterized the benthic community condition off Money Point as consistent with previous characterizations of the Elizabeth River watershed: (1) benthic community species diversity and biomass were below reference condition levels; (2) abundance often above reference condition levels and considered excessive; and (3) community composition was unbalanced with levels of pollution indicative species above, and levels of pollution sensitive species below, reference conditions.

Compared to previous characterizations of the benthos of the Elizabeth River, the Money Point benthos as sampled in 2010 had (1) the lowest average B-IBI value, 2.0, a level characterized as severely degraded; (2) relatively high abundance levels, exceeding 6,000 individuals per m<sup>2</sup>; (3) the lowest Shannon Diversity Index value; and (4) the lowest biomass level. The low level of biomass is probably indicative of poor ecological value of the benthos as a food source for higher trophic levels, i.e fish, crabs, birds, etc.

In 2013 the benthic community showed (1) a significant increase in the value of the B-IBI from 2.0 to 2.3; (2) a highly significant reduction in abundance levels from 6,012 to 2,640 individuals per m<sup>2</sup>; (3) a highly significant increase in the Shannon Diversity Index value from 1.64 to 2.33; and (4) a highly significant increase in the level of biomass from 0.35 to 0.85 AFDW gC per m<sup>2</sup>. The increase in the species diversity (H') was due to both an increase in species richness (the species per sample increase significantly from 9.64 to 11.96) and lower dominance by two pollution indicative polychaete species (*Mediomastus ambiseta* and *Streblospio benedicti*) from a combined level of 4,956 individuals per m<sup>2</sup> in 2010 to 1,244 individuals per m<sup>2</sup> in 2013. Those levels of these two species represented, respectively, 82.4% of the individuals in 2010 and only 47.1% of the individuals in 2013.

## INTRODUCTION

The Money Point region in the Southern Branch of the Elizabeth River was previously characterized by high levels of PAHs in the sediments. As part of a sediment contaminant remediation project the subtidal macrobenthic communities of a designated portion off Money Point in the Southern Branch of the Elizabeth River (Figs. 1-3) was quantitatively characterized based upon samples collected in the summer of 2010 (Dauer 2011). In addition a reference stratum across the channel near Blows Creek (Fig. 4) was also sampled in the summer of 2010 prior to any remediation efforts (Webb 2014).

This study represents a post-remediation assessment of the biological condition of the benthos of Money Point by comparing marcobenthic community condition from samples from Money Point and the Blows Creek strata collected in 2010 and 2013. This comparison emphasizes the values of the Benthic Index of Biotic Integrity (B-IBI) developed for the Chesapeake Bay (Ranasinghe et al. 1994; Weisberg et al. 1997; Alden et al. 2002) and probability-based sampling to calculate confidence intervals around estimates of condition of the benthic communities and allowed estimates of the areal extent of degradation of the benthic communities. In addition the important metrics of abundance, biomass, species diversity and species richness were also compared between strata (Money Point and Blows Creek) and between years (2010 and 2013).

The macrobenthic communities of the Elizabeth River have been studied since the 1969 sampling of Boesch (1973) with three stations in the Mainstem of the river. Other important studies were limited to the Southern Branch of the river including seasonal sampling at 10 sites in 1977-1978 (Hawthorne and Dauer 1983), seasonal sampling at the same 10 sites a decade later in 1987-1988 by Hunley (1993), the establishment of two long-term monitoring stations in 1989 as part of the Virginia Chesapeake Bay Benthic Monitoring Program (Dauer et al. 1999) and summarizations of the two Southern Branch long-term monitoring stations (Dauer 1993; Dauer et al. 1993). The condition of the benthic community of the Elizabeth River watershed was characterized by spatially extensive sampling of the river in 1999 with 175 locations sampled among seven strata (Dauer 2000; Dauer and Llansó 2003). Beginning in 2000 the Elizabeth River watershed was sampled as a single stratum with the benthic community condition characterized at 25 random locations (Dauer 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009).

## RATIONALE

### *Characterizing Benthic Community Condition*

Coastal seas, bays, lagoons and estuaries have become increasingly degraded due to anthropogenic stresses (Nixon 1995). Relationships between land use, levels of nutrients and contaminants, and the condition of the biotic communities of receiving waters are well studied in freshwater ecosystems (Allan et al. 1997) with fewer studies addressing these relationships in estuarine ecosystems (Comeleo et al. 1996; Valiela et al. 1997; Dauer et. al. 2000). Land use patterns in a watershed influence the delivery of nutrients, sediments and

contaminants into receiving waters through surface flow, groundwater flow, and atmospheric deposition (Correll 1983; Correll et al. 1987; Hinga et al. 1991; Correll et al. 1992; Lajtha et al. 1995; Jordan et al. 1997c). Increased nutrient loads are associated with high levels of agricultural and urban land use in both freshwater and coastal watersheds compared to forested watersheds (Klein 1979; Ostry 1982; Duda 1982; Novotny et al. 1985; Ustach et al. 1986; Valiela and Costa 1988; Benzie et al. 1991; Fisher and Oppenheimer 1991; Turner and Rabalais 1991; Correll et al. 1992; Hall et al. 1994; Jaworski et al. 1992; Lowrance 1992; Weiskel and Howes 1992; Balls 1994; Hopkinson and Vallino 1995; Nelson et al. 1995; Hall et al. 1996; Hill 1996; Allan et al. 1997; Correll 1997; Correl et al. 1997; Valiela et al. 1997; Verchot et al. 1997a, 1997b; Gold et al. 1998). At smaller spatial scales, riparian forests and wetlands may ameliorate the effects of agricultural and urban land use (Johnston et al 1990; Correll et al. 1992; Osborne and Kovacic 1993).

Aquatic biotic communities associated with watersheds with high agricultural and urban land use are generally characterized by lower species diversity, less trophic complexity, altered food webs, altered community composition and reduced habitat diversity (Fisher and Likens 1973; Boynton et al. 1982; Conners and Naiman 1984; Malone et al. 1986, 1988, 1996; Mangum 1989; Howarth et al. 1991; Fisher et al. 1992; Grubaugh and Wallace 1995; Lamberti and Berg 1995; Roth et al 1996; Correll 1997). High nutrient loads in coastal ecosystems result in increased algal blooms (Boynton et al. 1982; Malone et al. 1986, 1988; Fisher et al. 1992), increased low dissolved oxygen events (Taft et al. 1980; Officer et al. 1984; Malone et al. 1996), alterations in the food web (Malone 1992) and declines in valued fisheries species (Kemp et al. 1983; USEPA 1983). Sediment and contaminant loads are also increased in watersheds dominated by agricultural and urban development mainly due to storm-water runoff (Wilber and Hunter 1979; Hoffman et al. 1983; Medeiros et al. 1983; Schmidt and Spencer 1986; Beasley and Granillo 1988; Howarth et al. 1991; Vernberg et al. 1992; Lenat and Crawford 1994; Corbett et al. 1997).

Benthic invertebrates are used extensively as indicators of estuarine environmental status and trends because numerous studies have demonstrated that benthos respond predictably to many kinds of natural and anthropogenic stress (Pearson and Rosenberg 1978; Tapp et al. 1993; Wilson and Jeffrey 1994; Dauer et al. 2000). Many characteristics of benthic assemblages make them useful indicators (Bilyard 1987; Dauer 1993), the most important of which are related to their exposure to stress and the diversity of their responses to stress. Exposure to hypoxia is typically greatest in near-bottom waters and anthropogenic contaminants often accumulate in sediments where benthos live. Benthic organisms generally have limited mobility and cannot avoid these adverse conditions. This immobility is advantageous in environmental assessments because, unlike most pelagic fauna, benthic assemblages reflect local environmental conditions (Gray 1979). The structure of benthic assemblages responds to many kinds of stress because these assemblages typically include organisms with a wide range of physiological tolerances, life history strategies, feeding modes, and trophic interactions (Pearson and Rosenberg 1978; Rhoads et al. 1978; Boesch and Rosenberg 1981; Dauer 1993). Benthic community condition in the Chesapeake Bay watershed has been related in a quantitative manner to water quality,

sediment quality, nutrient loads, and land use patterns (Dauer et al. 2000).

### *Estuarine Contaminant Perspective*

Historically our nations' estuarine and coastal waters have been repositories of potentially toxic contaminants through municipal sewage, agricultural runoff, industrial effluents, and various other routes. The accumulation of these contaminants varies between different components of coastal ecosystems and their ecological effects are depended upon the different chemical/biological states of each contaminant.

The ultimate fate of all organisms, particles and compounds is  
to reside at some time in the benthos.

Most contaminant entities become attached to very small suspended particles in the water (e.g. clay sized particles). As these particles sink to the bottom they carry the toxicants with them. The natural interaction of currents, waves and tides results in the accumulation in fine-grained sedimentary deposits. Typically, the concentrations of toxicants are much higher in sediments than in the overlying water. High winds, shallow water depth, strong currents, or changes in ambient chemistry, result in the release, resuspension or dispersion of accumulated contaminants are released. Sediments are both sinks and sources of contaminants and; therefore, can pose serious threats to the health of resident marine life.

### *The Chesapeake Bay Index of Biotic Integrity*

The Benthic Index of Biotic Integrity (B-IBI) was developed for macrobenthic communities of the Chesapeake Bay (Weisberg et al. 1997). The index defines expected conditions based upon the distribution of metrics from reference samples. Reference samples were collected from locations relatively free of anthropogenic stress. In calculating the index, categorical values are assigned for various descriptive metrics by comparison with thresholds of the distribution of metrics from reference samples. The result is a multi-metric index of biotic condition, frequently referred to as an index of biotic integrity (IBI). The analytical approach is similar to the one Karr et al. (1986) used to develop comparable indices for freshwater fish communities. Selection of benthic community metrics and metric scoring thresholds were habitat-dependent but by using categorical scoring comparisons between habitat types are possible.

A six-step procedure was used to develop the index: acquire and standardize data sets from a number of monitoring programs; temporally and spatially stratify data sets to identify seasons and habitat types; identify reference sites; select benthic community metrics; select metric thresholds for scoring; and validate the index with an independent data set (Weisberg et al. 1997). The B-IBI developed for Chesapeake Bay is based upon subtidal, unvegetated, infaunal macrobenthic communities. Hard-bottom communities, e.g., oyster beds, were not sampled as part of the monitoring program because the sampling gears could not obtain adequate samples

to characterize the associated infaunal communities. Infaunal communities associated with submerged aquatic vegetation (SAV) were not avoided, but were rarely sampled due to the limited spatial extent of SAV in Chesapeake Bay. Only macrobenthic data sets based on processing with a sieve of 0.5-mm mesh aperture and identified to the lowest possible taxonomic level were used. A data set of over 2,000 samples collected from 1984 through 1994 was used to develop, calibrate and validate the index (see Table 1 in Weisberg et al. 1997). Because of inherent sampling limitations in some of the data sets, only data from the period of July 15 through September 30 were used to develop the index.

A multivariate cluster analysis of the biological data was performed to define habitat types. Salinity and sediment type were the two important factors defining habitat types and seven habitats were identified - tidal freshwater, oligohaline, low mesohaline, high mesohaline sand, high mesohaline mud, polyhaline and, and polyhaline mud habitats (see Table 5 in Weisberg et al. 1997).

Metrics to include in the index were selected from a candidate list proposed by benthic experts of the Chesapeake Bay. Selected metrics had to (1) differ significantly between reference and all other sites in the data set and (2) differ in an ecologically meaningful manner. Reference sites were selected as those sites which met all three of the following criteria: no sediment contaminant exceeded Long et al.'s (1995) effects range-median (ER-M) concentration, total organic content of the sediment was less than 2%, and bottom dissolved oxygen concentration was consistently high. A total of 11 metrics representing measures of species diversity, community abundance and biomass, species composition, depth distribution within the sediment, and trophic composition were used to create the index (see Table 2 in Weisberg et al. 1997).

The habitat-specific metrics are scored and combined into a single value of the B-IBI. Thresholds for the selected metrics were based on the distribution of values for the metric at the reference sites. The IBI approach involves scoring each metric as 5, 3, or 1, depending on whether its value at a site approximates, deviates slightly, or deviates greatly from conditions at reference sites (Karr et al. 1986). Threshold values are established as approximately the 5th and 50th (median) percentile values for reference sites in each habitat. For each metric, values below the 5th percentile are scored as 1; values between the 5th and 50th percentiles are scored as 3, and values above the 50th percentile are scored as 5. Metric scores are combined into an index by computing the mean score across all metrics for which thresholds were developed. Assemblages with an average score less than three are considered stressed, as they have metric values that on average are less than values at the poorest reference sites. Two of the metrics, abundance and biomass, respond bimodally; that is, the response can be greater than at reference sites with moderate degrees of stress and less than at reference sites with higher degrees of stress (Pearson and Rosenberg 1978; Dauer and Conner 1980; Ferraro et al. 1991). For these metrics, the scoring is modified so that both exceptionally high (those exceeding the 95<sup>th</sup> percentile at reference sites) and low (<5th percentile) responses are scored as a 1. Values between the 5th and 25th percentiles or between the 75th and 95th percentiles

are scored as 3, and values between the 25th and 75th percentiles of the values at reference sites are scored as 5. The index was validated by examining its response at a new set of reference sites and a new set of sites with known environmental stress. Data used for validation were collected between 1992 and 1994 and were independent of data used to calibrate the index. The B-IBI classified 93% of the validation sites correctly (Weisberg et al. 1997).

Values for the B-IBI range from 1.0 to 5.0. Benthic community condition was classified into four levels based on the B-IBI. Values  $\geq 2$  were classified as **severely degraded**; values from 2.1 to 2.6 were classified as **degraded**; values greater than 2.6 but less than 3.0 were classified as **marginal**; and values of 3.0 or more were classified as **meeting the goal**. Values in the marginal category do not meet the Restoration Goals, but they differ from the goals within the range of measurement error typically recorded between replicate samples. These categories are used in annual characterizations of the condition of the benthos in the Chesapeake Bay (Dauer et al. 2006a,b,c).

## METHODS

A glossary of selected terms used in this report is found in Appendix C.

### ***Probability-based Sampling***

A wide variety of sampling designs have been used in marine and estuarine environmental monitoring programs (e.g., see case studies reviewed recently in Kramer, 1994; Kennish, 1998; Livingston, 2001). Allocation of samples in space and time varies depending on the environmental problems and issues addressed (Kingsford and Battershill, 1998) and the type of variables measured (e.g., water chemistry, phytoplankton, zooplankton, benthos, nekton). In the Chesapeake Bay, the benthic monitoring program consists of both fixed-point stations and probability-based samples. The fixed-point stations are used primarily for the determination of long-term trends (e.g., Dauer and Alden, 1995; Dauer, 1997; Dauer et al. 2006a,b,c) and the probability-based samples for the determination of the areal extent of degraded benthic community condition (Llansó et al. 2003; Dauer and Llansó 2003). The probability-based sampling design consists of equal replication of random samples among strata and is, therefore, a stratified simple random design (Kingsford, 1998). Sampling design and methodologies for probability-based sampling are based upon procedures developed by EPA's Environmental Monitoring and Assessment Program (EMAP, Weisberg et al. 1993) and allow unbiased comparisons of conditions between strata (Dauer and Llansó 2003).

Within each stratum (Money Point and Blows Creek) 25 random locations were sampled using a  $0.04\text{ m}^2$  Young grab. The 2010 sampling locations are in Table 1 of Dauer (2011) and for the 2013 sampling in Table 1 of Appendix B of this report. The minimum acceptable depth of penetration of the grab was 7 cm. At each station one grab sample was taken for macrobenthic community analysis and an additional grab sample for sediment particle size analysis and the

determination of total volatile solids. A 50 g subsample of the surface sediment was taken for sediment analyses. Salinity, temperature and dissolved oxygen were measured at the bottom and water depth was recorded.

### ***Probability-Based Estimation of Degradation***

Areal estimates of degradation of benthic community condition within a stratum can be made because all locations in each stratum are randomly selected. The estimate of the proportion of a stratum failing the Benthic Restoration Goals developed for Chesapeake Bay (Ranasinghe et al. 1994; updated in Weisberg et al. 1997) is the proportion of the 25 samples with B-IBI values of less than 3.0. The process produces a binomial distribution: the percentage of the stratum attaining goals versus the percentage not attaining the goals. With a binomial distribution the 95% confidence interval for these percentages can be calculated as:

$$95\% \text{ Confidence Interval} = p \pm 1.96 (\text{SQRT}(pq/N))$$

where  $p$  = percentage attaining goal,  $q$  = percentage not attaining goal and  $N$  = number of samples. This interval reflects the precision of measuring the level of degradation and indicates that with a 95% certainty the true level of degradation is within this interval. Differences between levels of degradation using a binomial distribution can be tested using the procedure of Schenker and Gentleman (2001).

50 random points were selected using the GIS system of Versar, Inc. Decimal degree reference coordinates were used with a precision of 0.000001 degrees (approximately 1 meter) which is a smaller distance than the accuracy of positioning; therefore, no area of a stratum is excluded from sampling and every point within a stratum has a chance of being sampled. In the field the first 25 acceptable sites are sampled. Sites may be rejected because of inaccessibility by boat, inadequate water depth or inability of the grab to obtain an adequate sample (e.g., on hard bottoms).

### ***Laboratory Analysis***

Each replicate was sieved on a 0.5 mm screen, relaxed in dilute isopropyl alcohol and preserved with a buffered formalin-rose bengal solution. In the laboratory each replicate was sorted and all the individuals identified to the lowest possible taxon and enumerated. Biomass was estimated for each taxon as ash-free dry weight (AFDW) by drying to constant weight at 60 °C and ashing at 550 °C for four hours. Biomass was expressed as the difference between the dry and ashed weight.

Particle-size analysis was conducted using the techniques of Folk (1974). Each sediment sample is first separated into a sand fraction ( $> 63 \mu\text{m}$ ) and a silt-clay fraction ( $< 63 \mu\text{m}$ ). The sand fraction was dry sieved and the silt-clay fraction quantified by pipette analysis. For random stations, only the percent sand and percent silt-clay fraction were estimated. Total volatile

solids of the sediment was estimated by the loss upon ignition method as described above and presented as percentage of the weight of the sediment.

### ***Benthic Index of Biotic Integrity***

#### B-IBI and Benthic Community Status Designations

The B-IBI is a multiple-metric index developed to identify the degree to which a benthic community meets the Chesapeake Bay Program's Benthic Community Restoration Goals (Ranasinghe et al. 1994; Weisberg et al. 1997; Alden et al. 2002). The B-IBI provides a means for comparing relative condition of benthic invertebrate communities across habitat types. It also provides a validated mechanism for integrating several benthic community attributes indicative of community health into a single number that measures overall benthic community condition.

The B-IBI is scaled from 1 to 5, and sites with values of 3 or more are considered to meet the Restoration Goals. The index is calculated by scoring each of several attributes as either 5, 3, or 1 depending on whether the value of the attribute at a site approximates, deviates slightly from, or deviates strongly from the values found at reference sites in similar habitats, and then averaging these scores across attributes. The criteria for assigning these scores are numeric and dependent on habitat type. Application of the index is limited to a summer index period from July 15th through September 30th.

Benthic community condition was classified into four levels based on the B-IBI. Values  $\geq 2$  were classified as **severely degraded**; values from 2.1 to 2.6 were classified as **degraded**; values greater than 2.6 but less than 3.0 were classified as **marginal**; and values of 3.0 or more were classified as **meeting the goal**. Values in the marginal category do not meet the Restoration Goals, but they differ from the goals within the range of measurement error typically recorded between replicate samples. These categories are used in annual characterizations of the condition of the benthos in the Chesapeake Bay (e.g. Dauer et al. 2002a,b; Llansó et al 2004).

#### Further Information concerning the B-IBI

The analytical approach used to develop the B-IBI was similar to the one Karr et al. (1986) used to develop comparable indices for freshwater fish communities. Selection of benthic community metrics and metric scoring thresholds were habitat-dependent but by using categorical scoring comparisons between habitat types were possible. A six-step procedure was used to develop the index: (1) acquiring and standardizing data sets from a number of monitoring programs, (2) temporally and spatially stratifying data sets to identify seasons and habitat types, (3) identifying reference conditions, (4) selecting benthic community metrics, (5) selecting metric thresholds for scoring, and (6) validating the index with an independent data set (Weisberg et al. 1997). The B-IBI developed for Chesapeake Bay is based upon subtidal, unvegetated, infaunal macrobenthic communities. Hard-bottom communities, e.g., oyster beds, were not sampled because the sampling gears could not obtain adequate samples to

characterize the associated infaunal communities. Infaunal communities associated with submerged aquatic vegetation (SAV) were not avoided, but were rarely sampled due to the limited spatial extent of SAV in Chesapeake Bay.

Only macrobenthic data sets based on processing with a sieve of 0.5 mm mesh aperture and identified to the lowest possible taxonomic level were used. A data set of over 2,000 samples collected from 1984 through 1994 was used to develop, calibrate and validate the index (see Table 1 in Weisberg et al. 1997). Because of inherent temporal sampling limitations in some of the data sets, only data from the period of July 15 through September 30 were used to develop the index. A multivariate cluster analysis of the biological data was performed to define habitat types. Salinity and sediment type were the two important factors defining habitat types and seven habitats were identified - tidal freshwater, oligohaline, low mesohaline, high mesohaline sand, high mesohaline mud, polyhaline sand and polyhaline mud habitats (see Table 5 in Weisberg et al. 1997).

Reference conditions were determined by selecting samples which met all three of the following criteria: no sediment contaminant exceeded Long et al.'s (1995) effects range-median (ER-M) concentration, total organic content of the sediment was less than 2%, and bottom dissolved oxygen concentration was consistently high.

A total of 11 metrics representing measures of species diversity, community abundance and biomass, species composition, depth distribution within the sediment, and trophic composition were used to create the index. The habitat-specific metrics were scored and combined into a single value of the B-IBI. Thresholds for the selected metrics were based on the distribution of values for the metric at the reference sites. Data used for validation were collected between 1992 and 1994 and were independent of data used to develop the index. The B-IBI classified 93% of the validation sites correctly (Weisberg et al. 1997).

### ***Statistical Analyses***

Two-way ANOVAs were performed on the BIBI, abundance, biomass, species diversity and species richness with stratum (Money Point versus Blows Creek) and year (2010 and 2013) as the main effects. A significant interaction term between the main effects would indicate that significant changes occurred between the strata and the years. When a significant interaction occurs the main effects must be separately tested and Table 1A shows the rational for the four main tests. The comparisons were made using a t-test with a one-tailed probability for all parameters except abundance. The one-tail test is appropriate when the direction of difference (increases in benthic condition and benthic metrics at Money Point in 2013 after remediation) is known or expected. The direction of change with remediation for abundance was expected to decrease because the Money Point 2010 abundance was higher than expected for the BIBI and a decrease in abundance might be interpreted as indicative of an improvement in the benthic community condition.

## RESULTS AND SUMMARY

### ***Benthic Community Condition using Probability-Based Sampling***

#### **Environmental Parameters**

Physical-chemical parameters are summarized in Tables 2-5 of Appendix B. Salinity was in the polyhaline range (18-32) for all samples and averaged 22.0 ppt essentially unchanged from the 2010 values (Dauer 2011).

Sediments were a mixture of sands and muds. In 2010 the mean silt-clay percentage at Money Point was  $43.8\% \pm 5.8$  (standard error) and the total volatile solids mean value was  $6.9 \pm 0.6$ . After the remediation the silt-clay percentage at Money Point was significantly lower ( $p = 0.040$ ) to a value of  $28.7 \pm 4.1\%$  while the total volatile solids was also significantly lower ( $p > 0.001$ ) to a value of  $2.8 \pm 0.3\%$ . In 2010 the mean silt-clay percentage at Blows Creek was  $27.7 \pm 4.7$  and the mean total volatile solids was  $2.9 \pm 0.4\%$ . In 2013 the silt-clay percentage at Blows Creek was higher  $40.4 \pm 6.4$  but not significantly ( $p = 0.125$ ) and the total volatile solids was also higher  $4.1 \pm 0.6\%$  but not significantly ( $p = 0.133$ ).

#### **Benthic Community Condition**

Benthic community parameters including the B-IBI value, abundance, biomass, Shannon diversity index and species richness were compared between the values in Dauer (2011 and Webb (2014) and this post-remediation study (see Table 1B and Figures 7-11).

Compared to previous characterizations of the benthos of the Elizabeth River, the Money Point benthos as sampled in 2010 had (1) the lowest average B-IBI value, 2.0, a level characterized as severely degraded; (2) relatively high abundance levels, exceeding 6,000 individuals per  $m^2$ ; (3) the lowest Shannon Diversity Index value; and (4) the lowest biomass level. The low level of biomass is probably indicative of poor ecological value of the benthos as a food source for higher trophic levels, i.e fish, crabs, birds, etc.

In comparing the Money Point and Blows Creek strata in 2010, Money Point appeared to be significantly degraded as indicated by significantly lower BIBI value (Table 1B, Figure 7), biomass (Table 1B, Figure 9) and species richness (Table 1B, Figure 11) values compared top Blows Creek. The two strata in 2010 did not significantly differ in abundance (Table 1B, Figure 8) and in species diversity ( $H'$ ) (Table 1B, Figure 10). In comparing the Money Point between 2010 and 2013 the BIBI and the four metrics all were significantly different (Table 1B) with the BIBI increasing from 2.0 to 2.3 (Figure 7), abundance declining from 6,012 to 2,640 individuals per  $m^2$  (Figure 8), biomass increasing from 0.35 to 0.85 AFDW gC per  $m^2$  (Figure 9), species diversity increasing from 1.64 to 2.33 (Figure 10), and species richness increasing 9.64 to 11.96 species per sample (Figure 11). Comparing the Money Point benthic community condition in 2013 with

values at Blows Creek in 2013, the BIBI, biomass, and species richness increased after remediation to levels equal to that at Blows Creek (Figure 7, 9, 11); species diversity increased to a level significantly higher than Blows Creek (Figure 10); and abundance declined to levels significantly lower than Blows Creek (Figure 8). All these patterns are indicative of a significant improvement in the benthic community condition of Money Point after remediation.

### Benthic Community Dominant Species

The dominant taxa of the random sites are summarized in Tables 2 and 3. Consistent with previous studies the Money Point stratum was dominated by annelid species including the polychaete species *Mediomastus ambiseta*, *Streblospio benedicti*, *Parapriionospio pinnata*, *Leitoscoloplos* spp., *Glycinde solitaire*, and the oligochaete taxon *Tubificoides* spp. The only major change was that the two pollution indicative polychaete species (*Mediomastus ambiseta* and *Streblospio benedicti*) at Money Point decreased from a combined level of 4,956 individuals per m<sup>2</sup> in 2010 to 1,244 individuals per m<sup>2</sup> in 2013. Those levels of these two species represented, respectively, 82.4% of the individuals in 2010 and only 47.1% of the individuals in 2013. These two species accounted for 69.0% of the individuals at Blows Creek in 2013.

### Benthic Community Level of Degraded Area

The 2010 level of degraded benthic bottom of Money Point was 96% ± 4.0% - the highest level of degradation recorded by any previous studies in the Elizabeth River watershed. Previous quantitative areal estimates of benthic degradation in the watershed have varied from 52 ± 19.6% in 2001 to 84 ± 12.7% in 2005. In the summer of 2013 the level of degraded benthic bottom off Money Point declined to 76% ± 16.3%.

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# **Figures 1- 11**

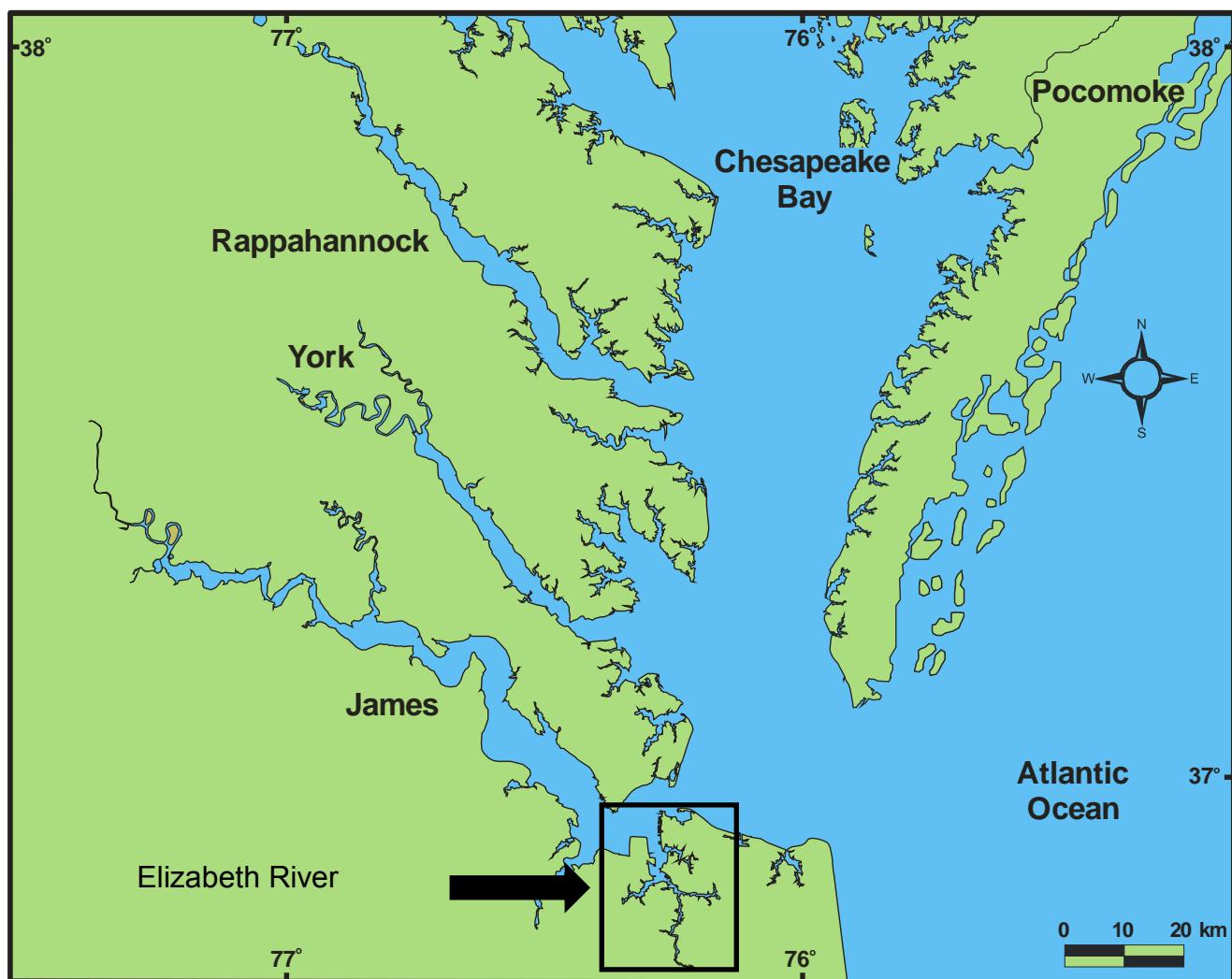


Figure 1. Lower Chesapeake Bay indicating the Elizabeth River watershed.

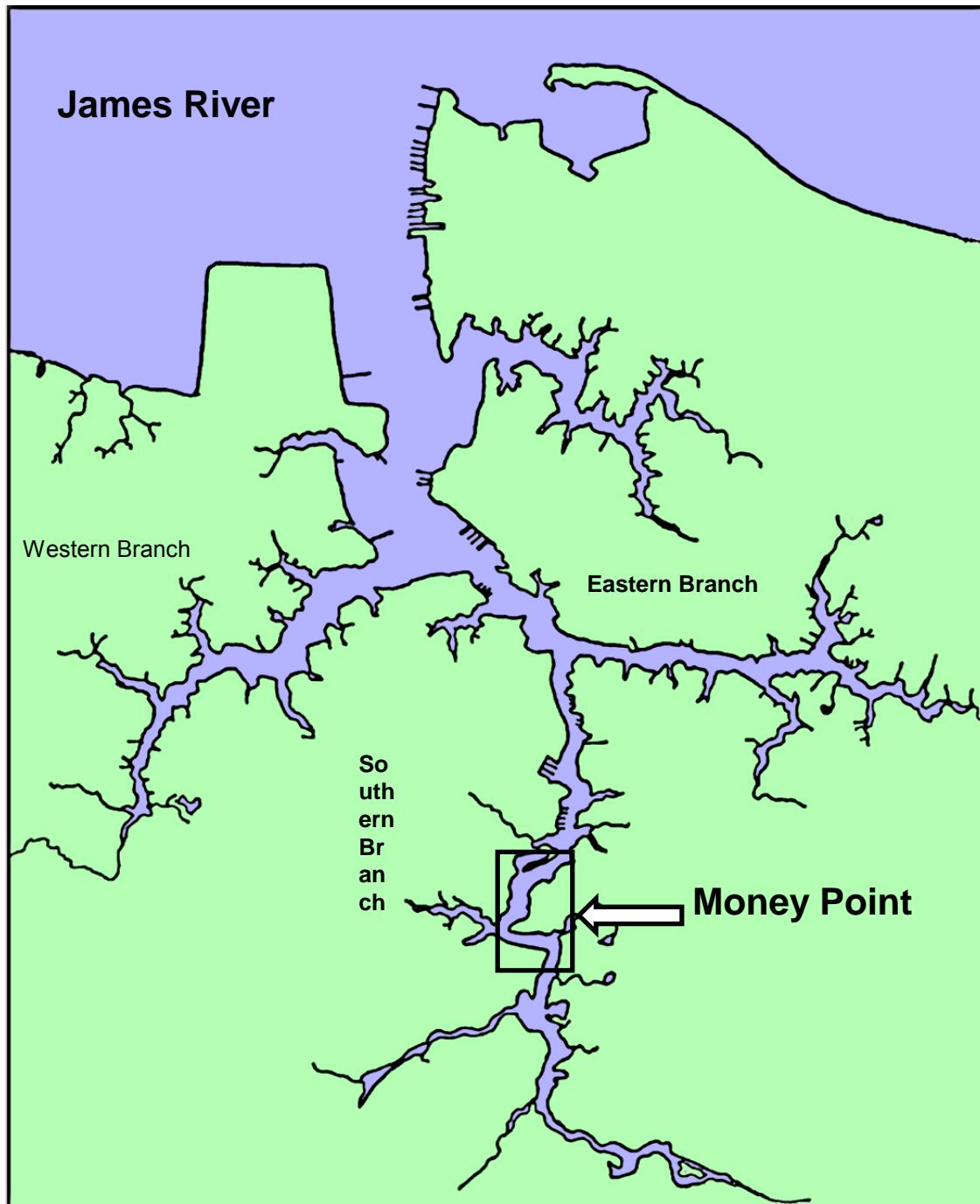


Figure 2. Elizabeth River Watershed indicating the Money Point region of the Southern Branch.



Figure 3. Money Point region of the Southern Branch of the Elizabeth River showing in red the benthic sampling stratum.

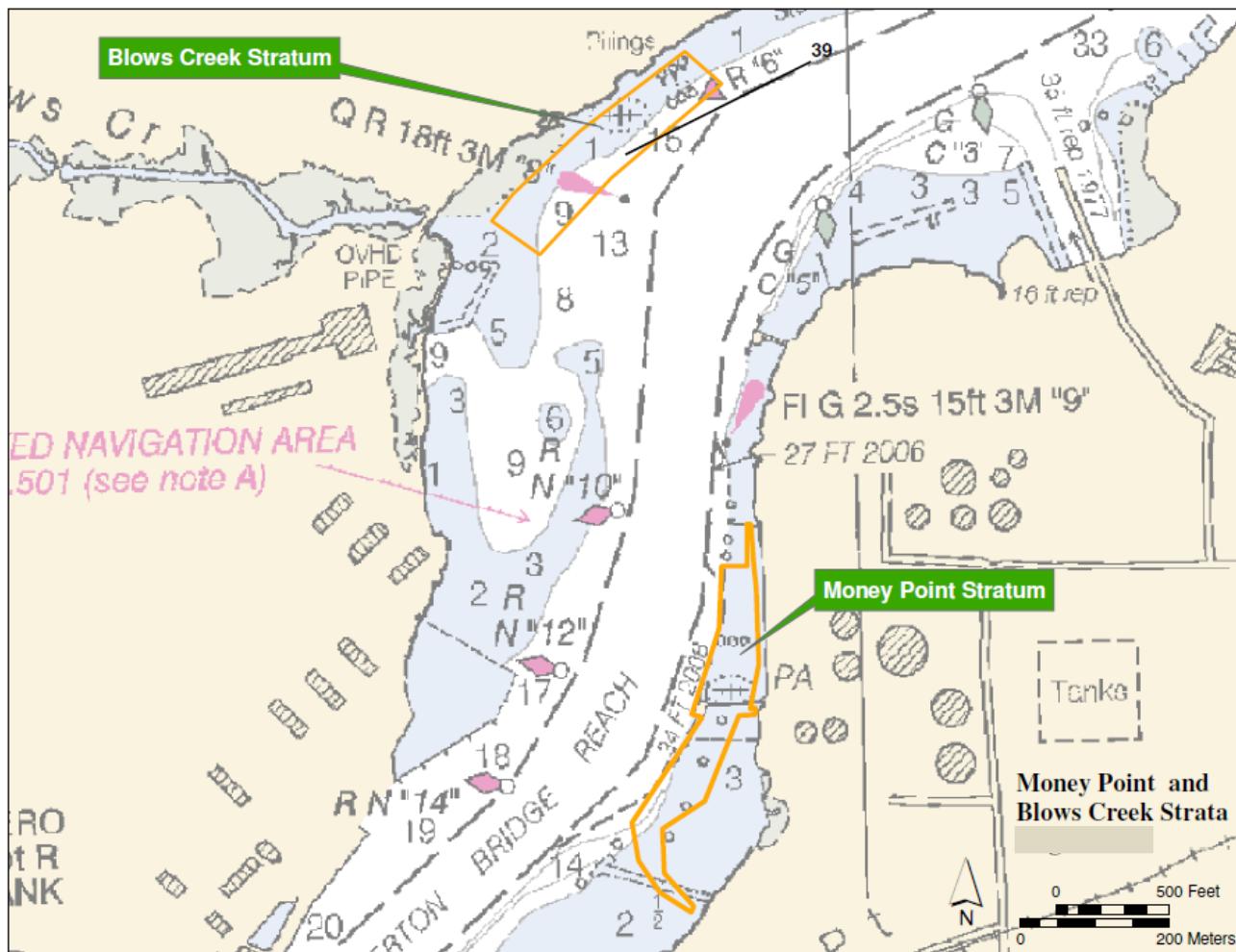


Figure 4. Location of the Money Point and Blows Creek strata in the Southern Branch of the Elizabeth River.

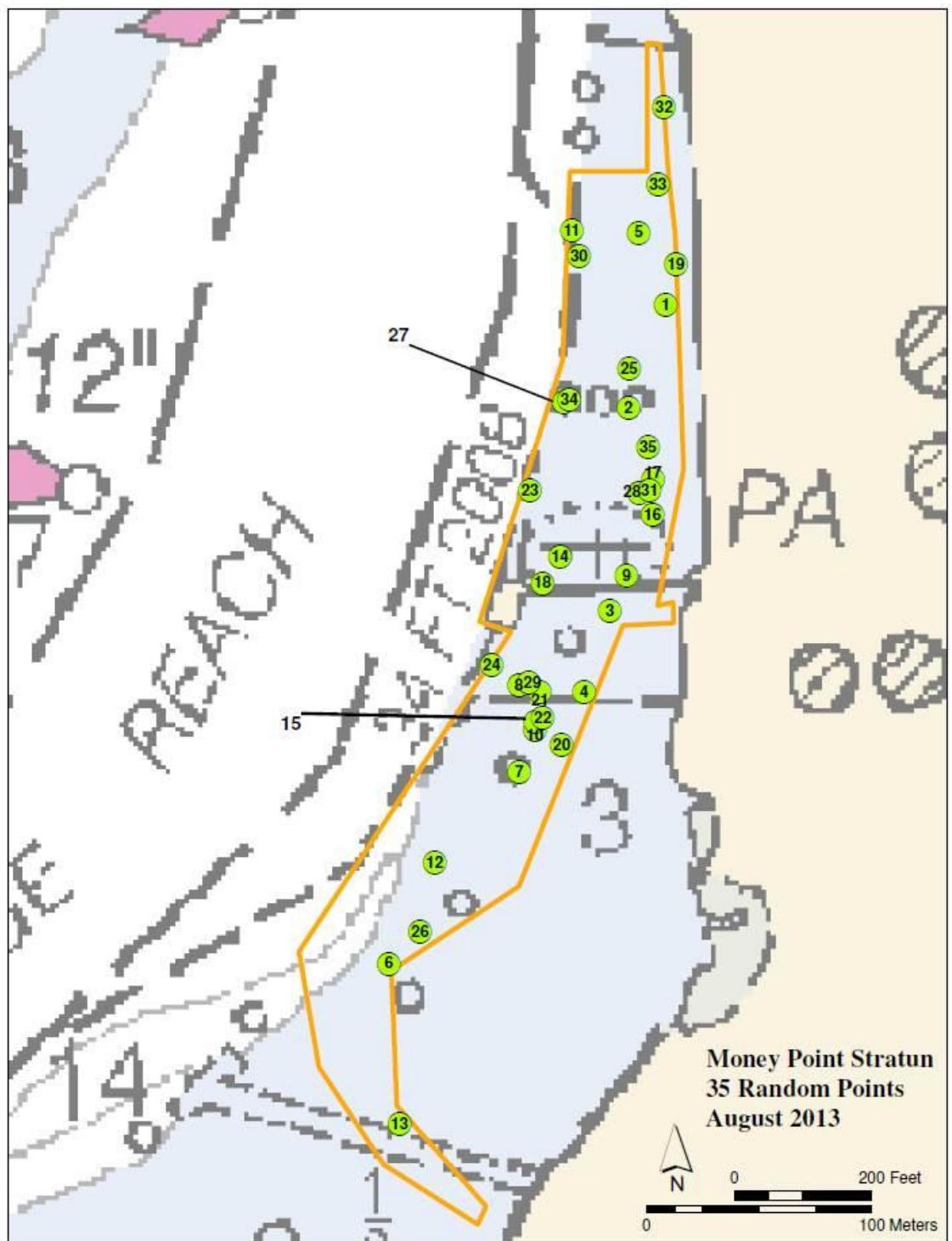


Figure 5. Money Point stratum random locations. 25 samples collected see tables for station numbers collected.

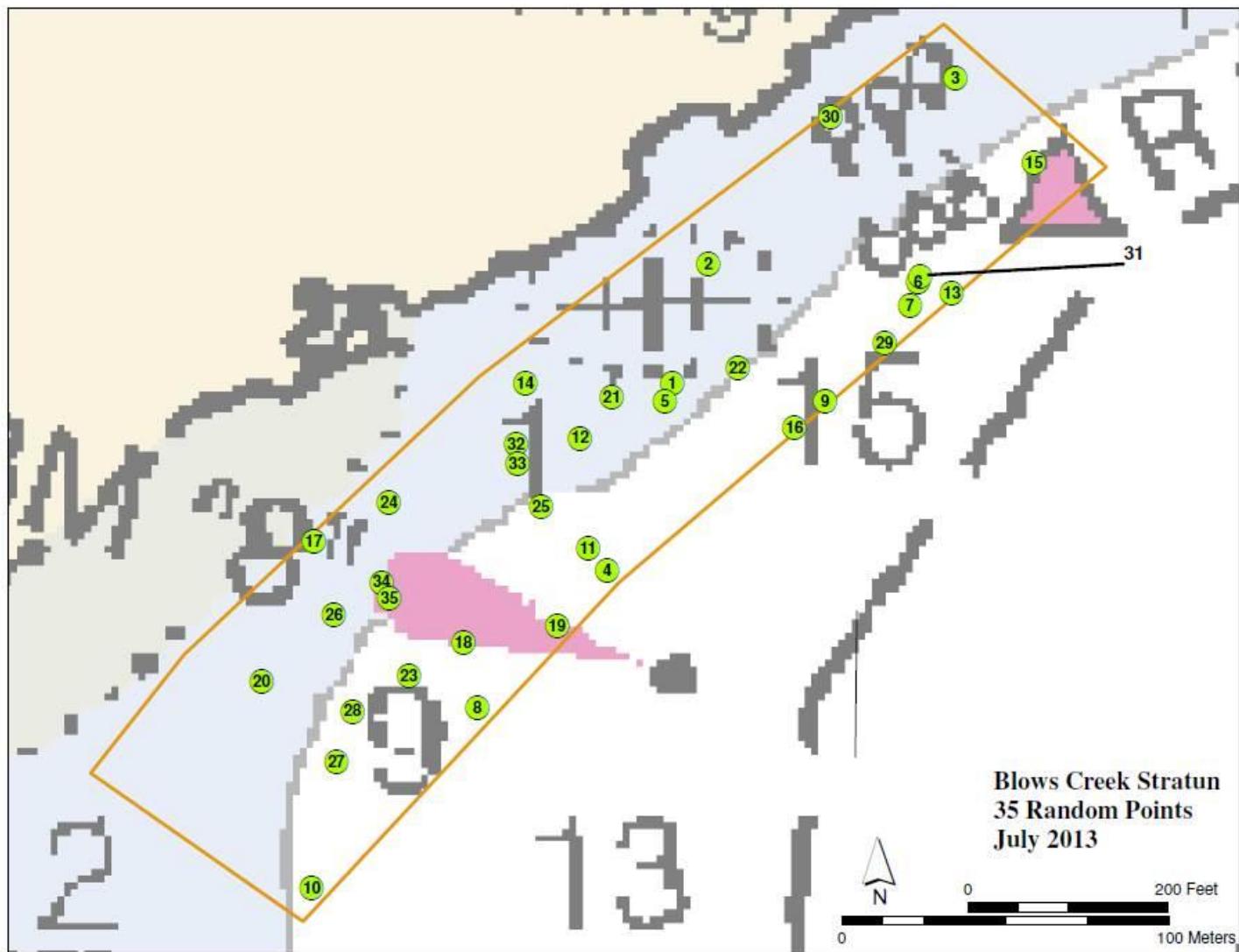


Figure 6. Blows Creek stratum random locations. Locations 1-25 were collected.

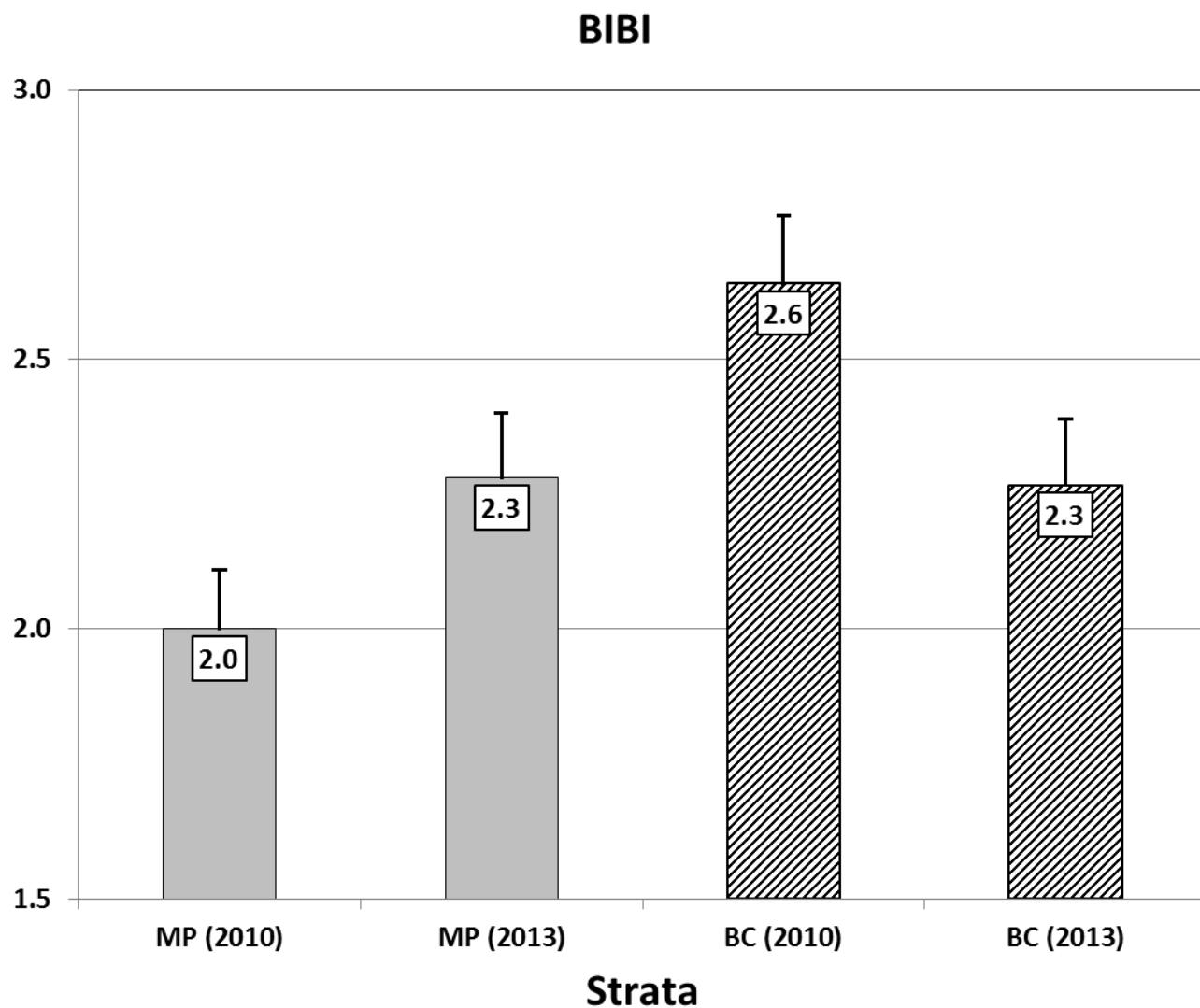


Figure 7. Mean BIBI values (one standard error shown) for the Money Point (MP) and Blows Creek (BC) strata sampled prior to the sediment contaminant remediation (2010) and after the remediation (2013). Mean values indicated at top of each bar. BIBI values range from 1.0 to 5.0 with 3.0 indicating good quality benthic condition. Ordinate truncated to emphasize pattern.

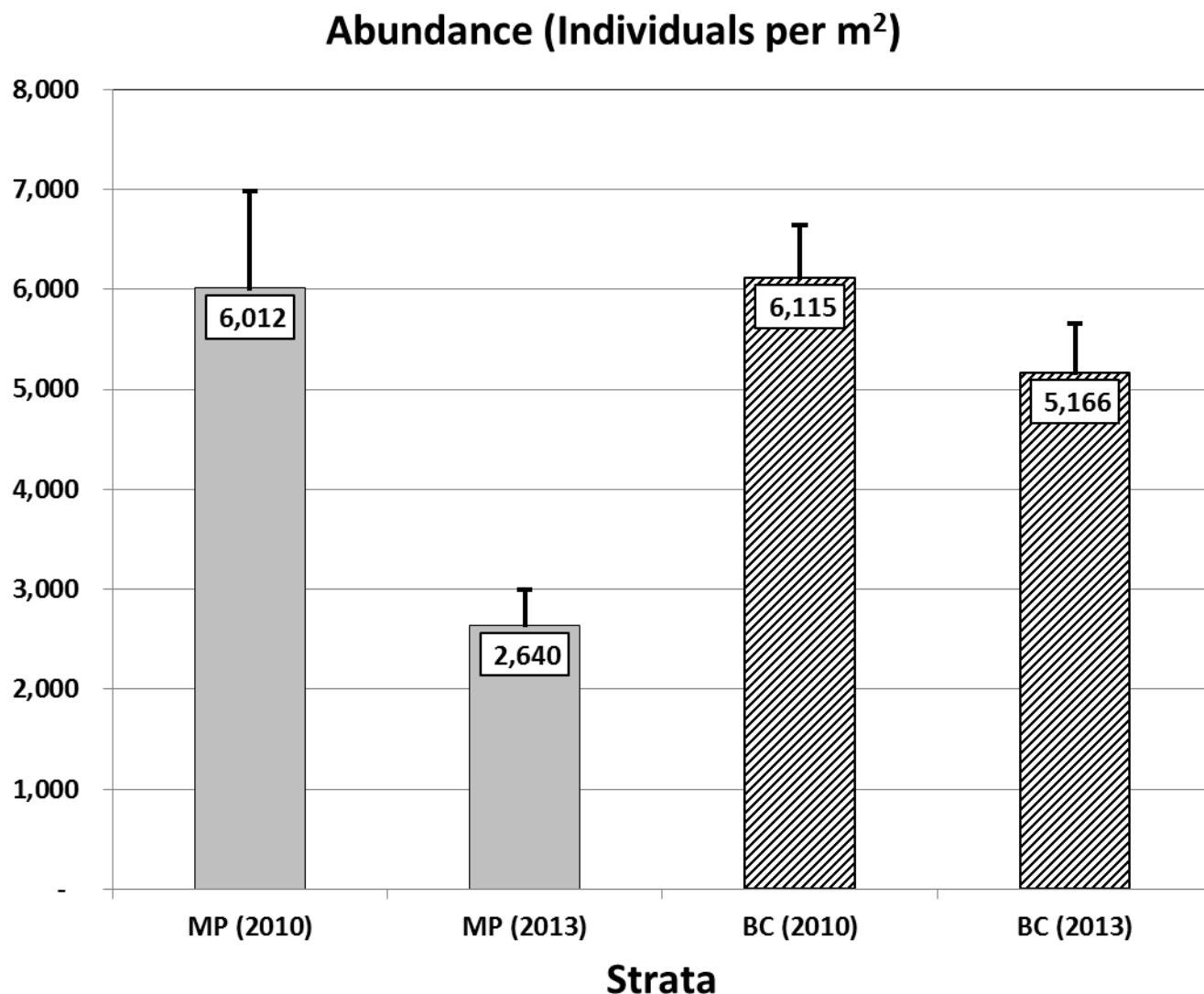


Figure 8. Abundance (one standard error shown) for the Money Point (MP) and Blows Creek (BC) strata sampled prior to the sediment contaminant remediation (2010) and after the remediation (2013). Mean values indicated at top of each bar.

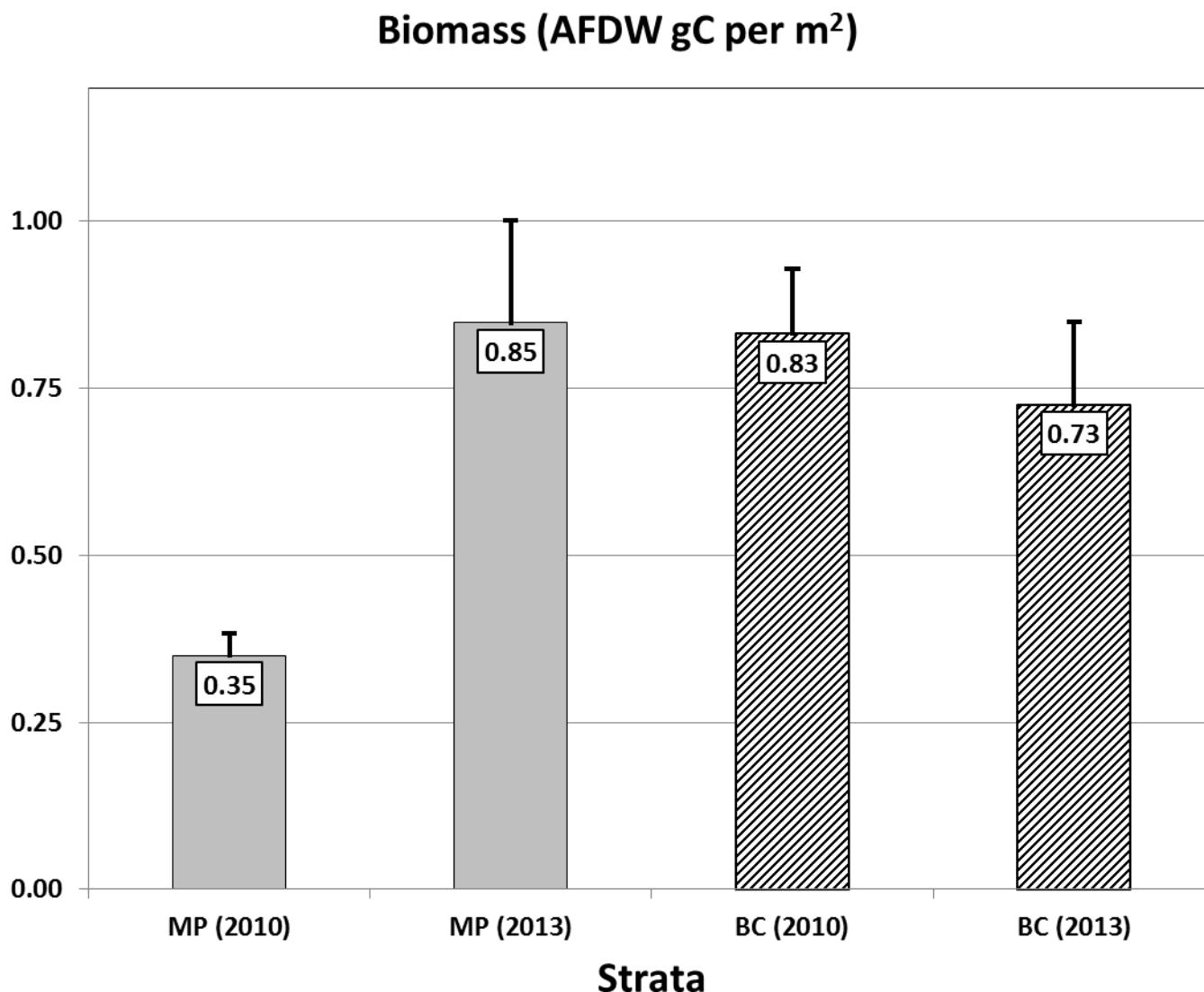


Figure 9. Biomass (one standard error shown) for the Money Point (MP) and Blows Creek (BC) strata sampled prior to the sediment contaminant remediation (2010) and after the remediation (2013). Mean values indicated at top of each bar.

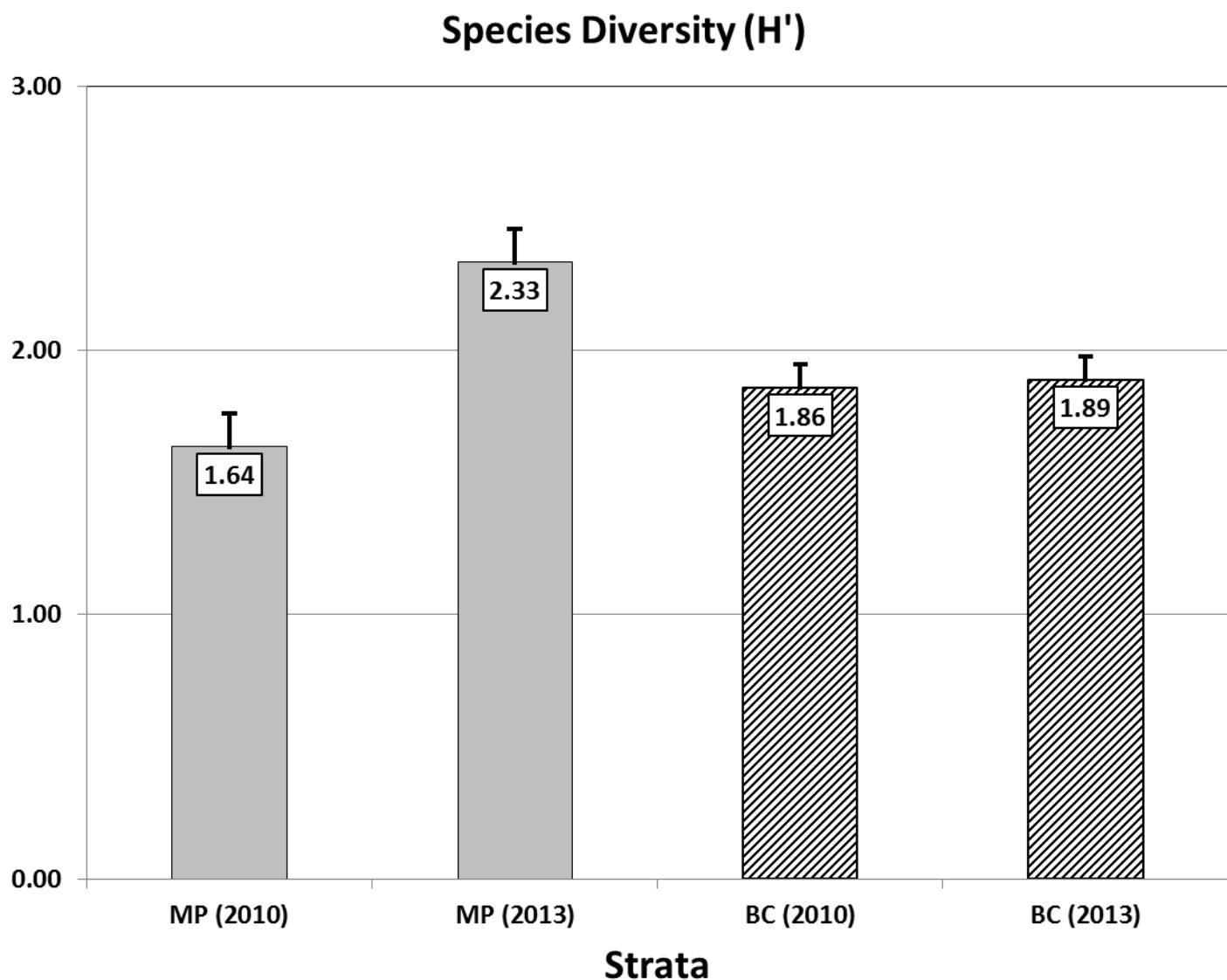


Figure 10. Species Diversity ( $H'$ ) (one standard error shown) for the Money Point (MP) and Blows Creek (BC) strata sampled prior to the sediment contaminant remediation (2010) and after the remediation (2013). Mean values indicated at top of each bar.

## Species Richness (species per sample)

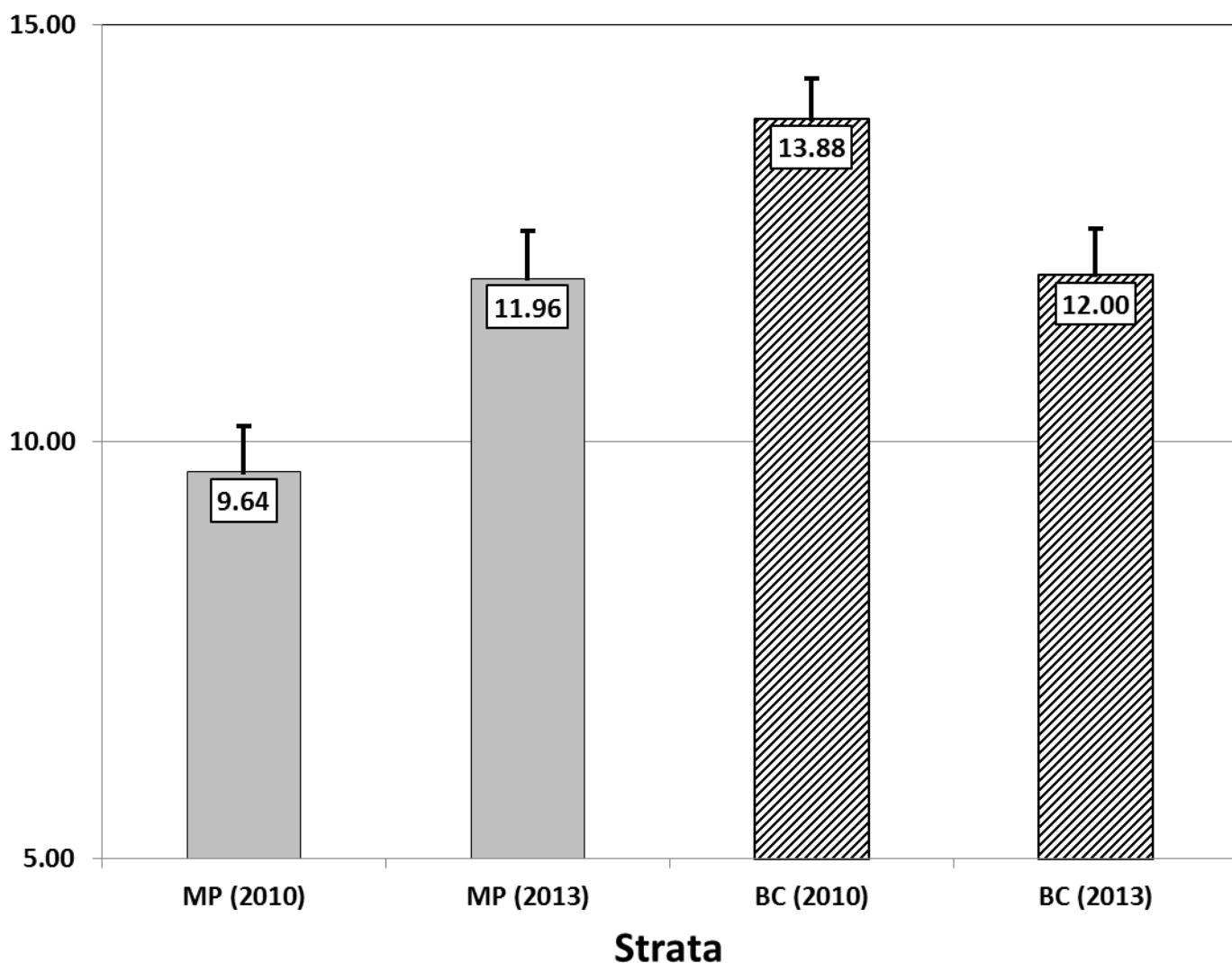


Figure 11. Species richness (one standard error shown) for the Money Point (MP) and Blows Creek (BC) strata sampled prior to the sediment contaminant remediation (2010) and after the remediation (2013). Mean values indicated at top of each bar. Ordinate truncated to emphasize pattern.

# Tables 1-3

Table 1.

A. Stratum comparisons and rationales

<b>Comparisons</b>	<b>Rationale</b>
MP (2010) X BC (2010)	Was the MP ecological condition different from the reference condition (BC) before remediation?
MP (2010) X MP (2013)	Did the MP ecological condition change after remediation? Improved or degraded?
MP (2013) X BC (2013)	Was the MP ecological condition different from the reference condition (BC) after remediation?
BC (2010) X BC (2013)	Did the reference stratum (BC) change over time?

B. Results of t-tests showing the p-value for stratum comparisons for the BIBI, Species Diversity ( $H'$ ), Species Richness (mean species per sample), Biomass and Abundance. Shaded cells indicate a significant difference between strata.

<b>Comparisons</b>	<b>BIBI</b>	<b>Species Diversity</b>	<b>Species Richness</b>	<b>Biomass</b>	<b>Abundance</b>
MP (2010) X BC (2010)	> 0.001	0.157	> 0.001	> 0.001	0.926
MP (2010) X MP (2013)	0.046	> 0.001	0.003	> 0.001	0.002
MP (2013) X BC (2013)	0.939	0.006	0.960	0.539	> 0.001
BC (2010) X BC (2013)	0.039	0.814	0.014	0.504	0.196

Table 2. Top twenty A. Abundance density dominants and B. Biomass density dominants across all stations at Money Point in the Elizabeth River in September 2013. An "\*" in the species name column indicates the species was considered epifaunal. AFDW biomass is expressed in g C.

A. Abundance density dominants		
Taxonomic Group	Taxon Name	# per m <sup>2</sup>
Polychaeta	<i>Mediomastus ambiseta</i>	1144.89
Polychaeta	<i>Parandalia tricuspis</i>	381.93
Polychaeta	<i>Parapriionospio pinnata</i>	283.05
Amphipoda	<i>Grandidierella</i> sp.	180.53
Cumacea	<i>Leucon americanus</i>	113.4
Polychaeta	<i>Streblospio benedicti</i>	99.79
Nemertea	<i>Nemertea</i> spp.	92.53
Polychaeta	<i>Leitoscoloplos</i> spp.	73.48
Polychaeta	<i>Demonax microphthalmus</i>	35.38
Polychaeta	<i>Glycinde solitaria</i>	34.47
Polychaeta	<i>Eteone heteropoda</i>	22.68
Polychaeta	<i>Podarke obscura</i>	18.14
Polychaeta	<i>Phyllodoce arenae</i>	16.33
Polychaeta	<i>Spiochaetopterus costarum</i>	15.42
Polychaeta	<i>Neanthes succinea</i>	14.52
Isopoda	<i>Edotea triloba</i> *	11.79
Gastropoda	<i>Gastropoda</i> spp.*	11.79
Polychaeta	<i>Parahesione luteola</i>	10.89
Polychaeta	<i>Capitella capitata</i>	9.98
Polychaeta	<i>Dorvillea rudolphi</i>	9.07

B. Biomass density dominants		
Taxonomic Group	Taxon Name	AFDW per
Polychaeta	<i>Glycera dibranchiata</i>	0.1787
Gastropoda	<i>Nassarius vibex</i>	0.0844
Polychaeta	<i>Leitoscoloplos</i> spp.	0.0644
Polychaeta	<i>Parandalia tricuspis</i>	0.0608
Polychaeta	<i>Parapriionospio pinnata</i>	0.0499
Decapoda	<i>Alpheus heterochaelis</i>	0.0490
Polychaeta	<i>Loimia medusa</i>	0.0399
Nemertea	<i>Nemertea</i> spp.	0.0363
Polychaeta	<i>Glycera americana</i>	0.0354
Polychaeta	<i>Mediomastus ambiseta</i>	0.0290
Polychaeta	<i>Demonax microphthalmus</i>	0.0245
Amphipoda	<i>Grandidierella</i> sp.	0.0227
Hemichordata	<i>Saccoglossus kowalevskii</i>	0.0181
Polychaeta	<i>Glycinde solitaria</i>	0.0172
Cumacea	<i>Leucon americanus</i>	0.0154
Polychaeta	<i>Streblospio benedicti</i>	0.0145
Polychaeta	<i>Phyllodoce arenae</i>	0.0109
Polychaeta	<i>Clymenella torquata</i>	0.0100
Polychaeta	<i>Spiochaetopterus costarum</i>	0.0091
Polychaeta	<i>Neanthes succinea</i>	0.0082

Table 3. Top twenty A. Abundance density dominants and B. Biomass density dominants across all stations in Blows Creek in the Elizabeth River for September 2013. An "\*" in the species name column indicates the species was considered epifaunal. AFDW biomass is expressed in g C.

A. Abundance density dominants		
Taxonomic Group	Taxon Name	# per m <sup>2</sup>
Polychaeta	<i>Mediomastus ambiseta</i>	3490.91
Polychaeta	<i>Parandalia tricuspis</i>	527.08
Polychaeta	<i>Paraprionospio pinnata</i>	227.71
Polychaeta	<i>Leitoscoloplos</i> spp.	185.98
Cumacea	<i>Leucon americanus</i>	166.92
Phoronida	<i>Phoronis</i> spp.	104.33
Amphipoda	<i>Grandidierella</i> sp.	77.11
Polychaeta	<i>Streblospio benedicti</i>	70.76
Polychaeta	<i>Spiochaetopterus costarum</i>	59.88
Polychaeta	<i>Glycinde solitaria</i>	58.97
Amphipoda	<i>Ampelisca</i> spp.	52.62
Polychaeta	<i>Eteone heteropoda</i>	21.77
Mysidae	<i>Americanensis bigelowi</i> *	19.96
Gastropoda	<i>Gastropoda</i> spp. *	16.33
Nemertea	<i>Nemertea</i> spp.	15.42
Polychaeta	<i>Parahesione luteola</i>	14.52
Polychaeta	<i>Tharyx</i> sp. A Doner	12.7
Oligochaeta	<i>Tubificoides</i> spp. Group I	12.7
Polychaeta	<i>Demonax microphthalmus</i>	8.16
Polychaeta	<i>Phyllodoce arenae</i>	8.16

B. Biomass density dominants		
Taxonomic Group	Taxon Name	AFDW per m <sup>2</sup>
Polychaeta	<i>Leitoscoloplos</i> spp.	0.1406
Polychaeta	<i>Parandalia tricuspis</i>	0.1252
Polychaeta	<i>Glycera dibranchiata</i>	0.1216
Polychaeta	<i>Mediomastus ambiseta</i>	0.0708
Phoronida	<i>Phoronis</i> spp.	0.0381
Polychaeta	<i>Paraprionospio pinnata</i>	0.0290
Polychaeta	<i>Spiochaetopterus costarum</i>	0.0200
Amphipoda	<i>Ampelisca</i> spp.	0.0191
Polychaeta	<i>Glycinde solitaria</i>	0.0191
Polychaeta	<i>Streblospio benedicti</i>	0.0191
Cumacea	<i>Leucon americanus</i>	0.0145
Amphipoda	<i>Grandidierella</i> sp.	0.0118
Decapoda	<i>Alpheus heterochaelis</i>	0.0109
Polychaeta	<i>Eteone heteropoda</i>	0.0109
Polychaeta	<i>Tharyx</i> sp. A Doner	0.0082
Mysidae	<i>Americanensis bigelowi</i> *	0.0073
Nemertea	<i>Nemertea</i> spp.	0.0073
Polychaeta	<i>Phyllodoce arenae</i>	0.0073
Polychaeta	<i>Demonax microphthalmus</i>	0.0064
Gastropoda	<i>Gastropoda</i> spp.*	0.0064

## Appendix A. Taxa collected at MPP Project Monitoring Stations Random 2013

TAXONOMIC GROUP	TAXON
Cnidaria : Anthozoa	Anthozoa spp.
Platyhelminthes : Turbellaria	Euplana gracilis Girard*
	Stylochus ellipticus Girard*
	Turbellaria spp. *
Nemertea	Nemertea spp.
Annelida : Polychaeta	Capitella capitata Fabricius
	Cirratulidae spp.
	Clymenella torquata Leidy
	Demonax microphthalmus (Verrill)
	Diopatra cuprea Bosc
	Dorvillea rudolphi Delle Chiaje
	Eteone heteropoda Hartman
	Glycera americana Leidy
	Glycera dibranchiata Ehlers
	Glycinde solitaria Webster
	Heteromastus filiformis Claparede
	Hobsonia florida Hartman
	Leitoscoloplos spp.
	Loimia medusa Savigny
	Mediomastus ambiseta Hartman
	Neanthes succinea Frey and Leuckart
	Parahesione luteola Webster
	Parandalia tricuspis (Muller)
	Paraprionospio pinnata Ehlers
	Pectinaria gouldii Verrill
	Phyllodoce arenae Webster
	Podarke obscura Verrill
	Podarkeopsis levifuscina Hartmann-Schroder
	Polycirrus eximus Leidy
	Polydora cornuta Webster
	Scoloplos rubra Webster
	Sigambla tentaculata Treadwell
	Spiochaetopterus costarum Webster
	Streblospio benedicti Webster

TAXONOMIC GROUP	TAXON
	<i>Tharyx</i> sp. A Doner
Annelida : Oligochaeta	<i>Tubificoides</i> spp. Group I
Mollusca : Gastropoda	<i>Cyllichnella bidentata</i> Orbigny*
	<i>Gastropoda</i> spp. *
	<i>Haminoea solitaria</i> Say
	<i>Nassarius vibex</i> Say
	<i>Nudibranchia</i> spp. *
	<i>Rictaxis punctostriatus</i> Adams
Mollusca : Bivalvia	<i>Bivalvia</i> spp.
	<i>Gemma gemma</i> Totten
	<i>Macoma balthica</i> Linnaeus
	<i>Tellina agilis</i> Stimpson
	<i>Tellinidae</i> spp.
Arthropoda : Isopoda	<i>Cyathura polita</i> Stimpson
	<i>Edotea triloba</i> Say*
	<i>Erichsonella filiformis</i> Say*
Arthropoda : Amphipoda	<i>Ampelisca</i> spp.
	<i>Corophium</i> spp. *
	<i>Cymadusa compta</i> (Smith)*
	<i>Gitanopsis</i> spp.
	<i>Grandidierella</i> sp.
	<i>Leptocheirus plumulosus</i> Shoemaker
	<i>Listriella barnardi</i> Wigley
	<i>Melita nitida</i> Smith*
	<i>Paracaprella tenuis</i> Mayer*
Arthropoda : Cumacea	<i>Cyclaspis varians</i> Calman
	<i>Leucon americanus</i> Zimmer
	<i>Oxyurostylis smithi</i> Calman
Arthropoda : Mysidacea	<i>Americanysis bigelowi</i> (Tattersall)*
Arthropoda : Tanaidacea	<i>Hargeria rapax</i> (Harger)
Arthropoda : Decapoda	<i>Alpheus heterochaelis</i> Say
	<i>Callinectes sapidus</i> Rathbun*
	<i>Crangon septemspinosa</i> Say*
	<i>Xanthidae</i> spp. *

Taxonomic Group	Taxon
Phoronida	Phoronis spp.
Chordata : Hemichordata	Saccoglossus kowalevskii Agassiz
Chordata : Urochordata	Molgula lutulenta Van Name*

Appendix B. Data by Site  
Coordinates, Physical, Sedimentary and Species  
Abundances and Biomass collected at MPP  
Project Monitoring Stations Random 2013

Table 1. Station Coordinates for the Money Point (MP) and Blows Creek (BC) strata sampled in 2013.

Money Point Stratum			Blows Creek Stratum		
Station	Latitude in Decimal Degrees	Longitude in Decimal Degrees	Station	Latitude in Decimal Degrees	Longitude in Decimal Degrees
20MP01	36.786038	-76.301595	20BC01	36.791865	-76.303378
20MP02	36.785630	-76.301792	20BC02	36.792189	-76.303245
20MP04	36.784501	-76.302045	20BC03	36.792682	-76.302388
20MP05	36.786329	-76.301720	20BC04	36.791353	-76.303613
20MP06	36.783438	-76.303046	20BC05	36.791816	-76.303404
20MP07	36.784188	-76.302376	20BC06	36.792125	-76.302532
20MP08	36.784537	-76.302367	20BC07	36.792061	-76.302560
20MP09	36.784962	-76.301822	20BC08	36.790985	-76.304068
20MP10	36.784358	-76.302294	20BC09	36.791806	-76.302857
20MP11	36.786342	-76.302053	20BC10	36.790503	-76.304647
20MP14	36.785043	-76.302149	20BC11	36.791416	-76.303678
20MP15	36.784388	-76.302290	20BC12	36.791720	-76.303696
20MP16	36.785205	-76.301685	20BC13	36.792093	-76.302417
20MP17	36.785341	-76.301678	20BC14	36.791874	-76.303878
20MP18	36.784940	-76.302239	20BC15	36.792445	-76.302127
20MP19	36.786200	-76.301540	20BC16	36.791735	-76.302965
20MP21	36.784508	-76.302264	20BC17	36.791452	-76.304612
20MP23	36.785310	-76.302291	20BC18	36.791165	-76.304110
20MP24	36.784619	-76.302501	20BC19	36.791207	-76.303790
20MP25	36.785785	-76.301784	20BC20	36.791072	-76.304801
20MP26	36.783562	-76.302887	20BC21	36.791828	-76.303585
20MP27	36.785662	-76.302113	20BC22	36.791903	-76.303152
20MP28	36.785294	-76.301749	20BC23	36.791079	-76.304299
20MP29	36.784546	-76.302318	20BC24	36.791553	-76.304354
20MP30	36.786239	-76.302019	20BC25	36.791535	-76.303835

Table 2. Physical Data for the Money Point (MP) stratum sampled in 2013.

CBP Station Name	Sampling Date	Depth (m)	Salinity (ppt)	Dissolved Oxygen (ppm)	Temperature (deg. C)
20MP01	2013-09-20	1.0	20.4	3.4	24.6
20MP02	2013-09-13	4.5	20.4	3.5	27.1
20MP04	2013-09-13	2.8	20.2	3.4	27.2
20MP05	2013-09-13	1.5	19.7	4.3	27.3
20MP06	2013-09-13	3.2	20.2	3.8	27.3
20MP07	2013-09-13	3.8	20.1	3.5	27.4
20MP08	2013-09-13	4.9	20.1	3.3	27.3
20MP09	2013-09-13	2.3	19.8	4.0	27.6
20MP10	2013-09-13	4.0	20.1	3.4	27.3
20MP11	2013-09-13	9.9	20.4	2.9	27.0
20MP14	2013-09-13	6.5	20.5	2.7	26.9
20MP15	2013-09-13	4.6	20.2	3.8	27.3
20MP16	2013-09-20	1.7	20.5	3.4	25.0
20MP17	2013-09-20	2.0	20.5	3.3	24.7
20MP18	2013-09-13	6.1	20.5	2.8	26.9
20MP19	2013-09-20	1.1	20.5	3.6	24.8
20MP21	2013-09-13	4.3	20.1	3.4	27.3
20MP23	2013-09-13	10.0	20.5	2.6	26.9
20MP24	2013-09-13	5.0	19.8	3.3	27.4
20MP25	2013-09-13	4.4	20.1	3.6	27.3
20MP26	2013-09-13	3.0	20.1	3.7	27.4
20MP27	2013-09-13	13.4	20.5	2.7	26.9
20MP28	2013-09-20	2.8	20.5	3.3	24.7
20MP29	2013-09-13	4.9	20.1	3.4	27.3
20MP30	2013-09-20	8.5	20.6	3.2	24.6

Table 3. Physical Data for the Blows Creek (BC) stratum sampled in 2013.

CBP Station Name	Sampling Date	Depth (m)	Salinity (ppt)	Dissolved Oxygen (ppm)	Temperature (deg. C)
20BC01	2013-09-06	1.5	22.1	4.8	26.4
20BC02	2013-09-06	1.1	21.1	7.7	26.7
20BC03	2013-09-06	1.2	20.8	4.8	26.3
20BC04	2013-09-06	3.6	21.1	6.4	26.7
20BC05	2013-09-06	1.7	21.1	5.0	26.6
20BC06	2013-09-06	4.4	21.0	6.2	26.6
20BC07	2013-09-06	4.8	21.1	4.6	26.5
20BC08	2013-09-06	4.0	21.2	4.5	26.4
20BC09	2013-09-06	6.3	21.1	4.8	26.6
20BC10	2013-09-06	1.9	21.0	6.0	26.7
20BC11	2013-09-06	3.4	21.1	7.1	26.8
20BC12	2013-09-06	1.4	21.0	6.5	26.8
20BC13	2013-09-06	6.0	21.1	4.5	26.5
20BC14	2013-09-06	0.5	20.9	6.4	26.5
20BC15	2013-09-06	4.0	21.2	4.2	26.4
20BC16	2013-09-06	2.8	21.0	5.2	26.7
20BC17	2013-09-06	0.4	21.1	7.5	26.7
20BC18	2013-09-06	2.8	20.8	4.7	26.5
20BC19	2013-09-06	3.0	21.0	5.3	26.6
20BC20	2013-09-06	0.5	21.0	6.1	26.6
20BC21	2013-09-06	1.5	21.1	5.3	26.6
20BC22	2013-09-06	1.5	21.0	4.7	26.6
20BC23	2013-09-06	2.7	20.9	5.3	26.6
20BC24	2013-09-06	0.5	21.1	5.8	26.6
20BC25	2013-09-06	3.2	21.1	6.7	26.9

Table 4. Sedimentary Data for the Money Point (MP) stratum sampled in 2013.

Station	Sand (% Weight)	Silt-Clay (% Weight)	Volatile Solids (%)
20MP01	96.59	3.41	0.55
20MP02	74.13	25.87	2.61
20MP04	85.49	14.51	2.00
20MP05	92.86	7.14	1.76
20MP06	88.40	11.60	1.21
20MP07	80.52	19.48	3.22
20MP08	47.78	52.22	6.07
20MP09	88.42	11.58	0.68
20MP10	85.88	14.12	2.17
20MP11	77.27	22.73	2.44
20MP14	63.34	36.66	3.48
20MP15	53.23	46.77	4.87
20MP16	96.00	4.00	0.27
20MP17	84.18	15.82	1.29
20MP18	90.69	9.31	0.79
20MP19	92.27	7.73	1.68
20MP21	43.58	56.42	2.39
20MP23	37.48	62.52	4.61
20MP24	33.92	66.08	4.89
20MP25	84.25	15.75	1.15
20MP26	53.42	46.58	3.79
20MP27	36.11	63.89	5.35
20MP28	93.32	6.68	1.66
20MP29	47.74	52.26	6.06
20MP30	56.18	43.82	3.97

Table 5. Sedimentary Data for the Blows Creek (BC) stratum sampled in 2013.

Station	Sand (% Weight)	Silt-Clay (% Weight)	Volatile Solids (%)
20BC01	96.50	3.50	0.53
20BC02	85.56	14.44	1.26
20BC03	96.61	3.39	0.72
20BC04	2.47	97.53	7.38
20BC05	96.71	3.29	0.59
20BC06	71.45	28.55	2.85
20BC07	39.04	60.96	5.40
20BC08	24.93	75.07	6.05
20BC09	38.68	61.32	6.02
20BC10	46.29	53.71	6.15
20BC11	20.37	79.63	8.62
20BC12	96.35	3.65	0.63
20BC13	29.44	70.56	7.40
20BC14	97.16	2.84	0.69
20BC15	74.25	25.75	2.58
20BC16	58.46	41.54	4.11
20BC17	96.15	3.85	0.75
20BC18	28.16	71.84	6.58
20BC19	21.79	78.21	7.82
20BC20	92.02	7.98	1.53
20BC21	96.26	3.74	1.58
20BC22	94.38	5.62	0.65
20BC23	24.78	75.22	7.35
20BC24	40.48	59.52	5.77
20BC25	22.16	77.84	8.67

Table 6. Total Community Parameters for the Money Point (MP) stratum sampled in 2013.

CBP Station Name	Total Species	Ind/sq.m	Biomass (gC/sq.m)
20MP01	18	1610.28	2.2000
20MP02	11	1134.00	0.3856
20MP04	8	7053.48	0.5216
20MP05	11	1247.40	0.2722
20MP06	11	1701.00	3.7649
20MP07	16	1247.40	0.4990
20MP08	8	2698.92	0.3856
20MP09	14	2789.64	0.9299
20MP10	13	4989.60	0.3175
20MP11	19	1927.80	0.5897
20MP14	14	1950.48	0.3629
20MP15	13	3923.64	1.3381
20MP16	17	3538.08	0.7258
20MP17	12	1496.88	0.9072
20MP18	18	2517.48	1.2928
20MP19	19	2880.36	1.0660
20MP21	9	7144.20	0.7258
20MP23	19	5556.60	1.3608
20MP24	11	3606.12	0.6124
20MP25	9	1020.60	0.2722
20MP26	11	748.44	0.2495
20MP27	10	1859.76	0.5443
20MP28	18	1723.68	0.6804
20MP29	9	1723.68	0.4536
20MP30	12	1156.68	1.6556

Table 7. Total Community Parameters for the Blows Creek (BC) stratum sampled in 2013

CBP Station Name	Total Species	Ind/sq.m	Biomass (gC/sq.m)
20BC01	14	5397.84	0.5443
20BC02	16	5488.56	0.8845
20BC03	15	5806.08	0.7711
20BC04	9	3243.24	0.5216
20BC05	13	5375.16	0.4536
20BC06	16	7733.88	0.7711
20BC07	12	3583.44	0.7484
20BC08	14	6282.36	3.5154
20BC09	13	7756.56	0.5216
20BC10	16	1859.76	0.5443
20BC11	8	3447.36	0.2948
20BC12	12	3107.16	0.7711
20BC13	12	3742.20	0.4082
20BC14	9	1995.84	0.6350
20BC15	12	4105.08	0.3629
20BC16	10	771.12	0.2495
20BC17	12	7030.80	0.9072
20BC18	10	7234.92	0.5216
20BC19	12	7257.60	0.7031
20BC20	19	10704.96	1.2928
20BC21	17	4105.08	0.5443
20BC22	22	9956.52	0.7938
20BC23	10	7393.68	0.5670
20BC24	14	2903.04	0.7484
20BC25	9	4082.40	0.4990

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC01**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	4	0.001
Annelida : Polychaeta	<i>Eteone heteropoda</i>	1	0.001
	<i>Glycinde solitaria</i>	2	0.001
	<i>Leitoscoloplos</i> spp.	3	0.001
	<i>Mediomastus ambiseta</i>	159	0.003
	<i>Parandalia tricuspis</i>	18	0.002
	<i>Parapriionospio pinnata</i>	1	0.001
	<i>Spiochaetopterus costarum</i>	12	0.001
	<i>Streblospio benedicti</i>	2	0.001
	<i>Tharyx</i> sp. A Doner	2	0.001
Mollusca : Gastropoda	<i>Gastropoda</i> spp.	2	0.001
Arthropoda : Isopoda	<i>Edotea triloba</i>	1	0.001
Arthropoda : Amphipoda	<i>Grandidierella</i> sp.	11	0.001
Phoronida	<i>Phoronis</i> spp.	20	0.008
<b>STATION</b>		<b>238</b>	<b>0.024</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC02**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	3	0.001
Annelida : Polychaeta	<i>Eteone heteropoda</i>	3	0.001
	<i>Glycinde solitaria</i>	1	0.001
	<i>Hobsonia florida</i>	1	0.001
	<i>Leitoscoloplos</i> spp.	7	0.008
	<i>Mediomastus ambiseta</i>	151	0.002
	<i>Parandalia tricuspis</i>	31	0.013
	<i>Parapriionospio pinnata</i>	2	0.001
	<i>Spiochaetopterus costarum</i>	4	0.001
	<i>Streblospio benedicti</i>	2	0.001
Mollusca : Gastropoda	<i>Gastropoda</i> spp.	4	0.001
Mollusca : Bivalvia	<i>Gemma gemma</i>	3	0.001
	<i>Tellina agilis</i>	1	0.001
Arthropoda : Amphipoda	<i>Ampelisca</i> spp.	2	0.001
	<i>Grandidierella</i> sp.	16	0.001
Phoronida	<i>Phoronis</i> spp.	11	0.004
<b>STATION</b>		<b>242</b>	<b>0.039</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC03**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Platyhelminthes : Turbellaria	<i>Stylochus ellipticus</i>	2	0.001
Annelida : Polychaeta	<i>Eteone heteropoda</i>	2	0.001
	<i>Glycinde solitaria</i>	1	0.001
	<i>Leitoscoloplos spp.</i>	6	0.005
	<i>Mediomastus ambiseta</i>	167	0.004
	<i>Parandalia tricuspis</i>	37	0.009
	<i>Phyllodoce arenae</i>	1	0.001
	<i>Spiochaetopterus costarum</i>	14	0.004
	<i>Streblospio benedicti</i>	4	0.001
Mollusca : Gastropoda	<i>Gastropoda spp.</i>	3	0.001
Mollusca : Bivalvia	<i>Tellinidae spp.</i>	2	0.002
Arthropoda : Amphipoda	<i>Ampelisca spp.</i>	1	0.001
	<i>Grandidierella sp.</i>	10	0.001
	<i>Leptocheirus plumulosus</i>	3	0.001
Phoronida	<i>Phoronis spp.</i>	3	0.001
<b>STATION</b>		<b>256</b>	<b>0.034</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC04**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	<i>Leitoscoloplos</i> spp.	10	0.005
	<i>Mediomastus ambiseta</i>	76	0.002
	<i>Parandalia tricuspis</i>	28	0.010
	<i>Parapriionospio pinnata</i>	10	0.001
	<i>Spiochaetopterus costarum</i>	1	0.001
	<i>Streblospio benedicti</i>	1	0.001
Mollusca : Gastropoda	<i>Rictaxis punctostriatus</i>	1	0.001
Arthropoda : Amphipoda	<i>Ampelisca</i> spp.	2	0.001
Arthropoda : Cumacea	<i>Leucon americanus</i>	14	0.001
<b>STATION</b>		<b>143</b>	<b>0.023</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC05**

Taxonomic Group	TAXON	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	<i>Eteone heteropoda</i>	1	0.001
	<i>Leitoscoloplos</i> spp.	1	0.001
	<i>Mediomastus ambiseta</i>	164	0.003
	<i>Parandalia tricuspis</i>	21	0.002
	<i>Paraprionospio pinnata</i>	2	0.001
	<i>Spiochaetopterus costarum</i>	3	0.001
	<i>Streblospio benedicti</i>	4	0.001
Mollusca : Gastropoda	<i>Gastropoda</i> spp.	3	0.001
Arthropoda : Amphipoda	<i>Ampelisca</i> spp.	6	0.001
	<i>Grandidierella</i> sp.	5	0.001
	<i>Leptocheirus plumulosus</i>	1	0.001
Arthropoda : Mysidacea	<i>Americamysis bigelowi</i>	4	0.001
Phoronida	<i>Phoronis</i> spp.	22	0.005
<b>STATION</b>		<b>237</b>	<b>0.020</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC06**

Taxonomic Group	TAXON	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Eteone heteropoda	3	0.001
	Glycinde solitaria	4	0.001
	Leitoscoloplos spp.	13	0.007
	Mediomastus ambiseta	225	0.003
	Parahesione luteola	3	0.001
	Parandalia tricuspis	50	0.009
	Parapriionospio pinnata	21	0.002
	Phyllodoce arenae	1	0.001
	Podarkeopsis levifuscina	1	0.001
	Spiochaetopterus costarum	4	0.002
	Tharyx sp. A Doner	1	0.001
Mollusca : Gastropoda	Gastropoda spp.	1	0.001
Arthropoda : Isopoda	Edotea triloba	2	0.001
Arthropoda : Amphipoda	Ampelisca spp.	2	0.001
Arthropoda : Cumacea	Leucon americanus	9	0.001
Chordata : Hemichordata	Saccoglossus kowalevskii	1	0.001
<b>STATION</b>		<b>341</b>	<b>0.034</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC07**

Taxonomic Group	TAXON	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Glycinde solitaria	2	0.001
	Leitoscoloplos spp.	9	0.006
	Mediomastus ambiseta	80	0.002
	Parahesione luteola	8	0.001
	Parandalia tricuspis	33	0.004
	Parapronionospio pinnata	12	0.002
	Streblospio benedicti	1	0.001
	Tharyx sp. A Doner	1	0.001
Mollusca : Gastropoda	Gastropoda spp.	1	0.001
Arthropoda : Amphipoda	Ampelisca spp.	8	0.001
Arthropoda : Cumacea	Leucon americanus	2	0.001
Arthropoda : Decapoda	Alpheus heterochaelis	1	0.012
<b>STATION</b>		<b>158</b>	<b>0.033</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC08**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Demonax microphthalmus	1	0.004
	Glycera dibranchiata	1	0.122
	Glycinde solitaria	7	0.001
	Leitoscoloplos spp.	13	0.007
	Mediomastus ambiseta	194	0.005
	Parandalia tricuspis	17	0.008
	Parapriionospio pinnata	23	0.001
	Phyllodoce arenae	1	0.001
	Streblospio benedicti	3	0.001
Mollusca : Gastropoda	Rictaxis punctostriatus	1	0.001
Mollusca : Bivalvia	Tellina agilis	2	0.001
Arthropoda : Amphipoda	Ampelisca spp.	6	0.001
	Grandidierella sp.	1	0.001
Arthropoda : Cumacea	Leucon americanus	7	0.001
<b>STATION</b>		<b>277</b>	<b>0.155</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC09**

Taxonomic Group	TAXON	Abundance	Ash Free Dry Wt. (g C)
Nemertea	Nemertea spp.	1	0.001
Annelida : Polychaeta	Glycinde solitaria	5	0.001
	Leitoscoloplos spp.	11	0.007
	Mediomastus ambiseta	237	0.005
	Parandalia tricuspis	5	0.001
	Parapriionospio pinnata	19	0.001
	Phyllodoce arenae	1	0.001
	Streblospio benedicti	2	0.001
Annelida : Oligochaeta	Tubificoides spp. Group I	11	0.001
Arthropoda : Amphipoda	Ampelisca spp.	3	0.001
Arthropoda : Cumacea	Leucon americanus	45	0.001
Phoronida	Phoronis spp.	1	0.001
Chordata : Hemichordata	Saccoglossus kowalevskii	1	0.001
<b>STATION</b>		<b>342</b>	<b>0.023</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC10**

Taxonomic Group	TAXON	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Demonax microphthalmus	1	0.001
	Eteone heteropoda	1	0.001
	Glycinde solitaria	5	0.001
	Leitoscoloplos spp.	8	0.005
	Loimia medusa	2	0.001
	Mediomastus ambiseta	31	0.001
	Parahesione luteola	3	0.001
	Parandalia tricuspis	11	0.003
	Parapriionospio pinnata	6	0.002
	Phyllodoce arenae	1	0.001
	Spiochaetopterus costarum	1	0.001
	Streblospio benedicti	2	0.001
Mollusca : Gastropoda	Rictaxis punctostriatus	2	0.001
Mollusca : Bivalvia	Macoma balthica	1	0.001
Arthropoda : Amphipoda	Ampelisca spp.	2	0.001
Phoronida	Phoronis spp.	5	0.002
<b>STATION</b>		<b>82</b>	<b>0.024</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC11**

Taxonomic Group	TAXON	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Glycinde solitaria	3	0.001
	Leitoscoloplos spp.	6	0.002
	Mediomastus ambiseta	108	0.003
	Parandalia tricuspis	5	0.002
	Paraprionospio pinnata	16	0.002
	Streblospio benedicti	5	0.001
Arthropoda : Amphipoda	Ampelisca spp.	2	0.001
Arthropoda : Cumacea	Leucon americanus	7	0.001
<b>STATION</b>		<b>152</b>	<b>0.013</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC12**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Glycera dibranchiata	1	0.007
	Glycinde solitaria	2	0.001
	Leitoscoloplos spp.	8	0.004
	Mediomastus ambiseta	65	0.001
	Parandalia tricuspis	28	0.007
	Streblospio benedicti	3	0.001
Arthropoda : Isopoda	Edotea triloba	1	0.001
Arthropoda : Amphipoda	Ampelisca spp.	2	0.001
	Grandidierella sp.	4	0.001
Arthropoda : Cumacea	Leucon americanus	1	0.001
Arthropoda : Mysidacea	Americanysis bigelowi	3	0.001
Phoronida	Phoronis spp.	19	0.008
<b>STATION</b>		<b>137</b>	<b>0.034</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC13**

Taxonomic Group	TAXON	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	<i>Eteone heteropoda</i>	1	0.001
	<i>Glycinde solitaria</i>	1	0.001
	<i>Leitoscoloplos spp.</i>	4	0.003
	<i>Mediomastus ambiseta</i>	109	0.002
	<i>Parandalia tricuspis</i>	6	0.003
	<i>Parapriionospio pinnata</i>	17	0.002
	<i>Spiochaetopterus costarum</i>	1	0.001
	<i>Streblospio benedicti</i>	2	0.001
Mollusca : Gastropoda	<i>Rictaxis punctostriatus</i>	3	0.001
Arthropoda : Isopoda	<i>Edotea triloba</i>	1	0.001
Arthropoda : Amphipoda	<i>Ampelisca spp.</i>	3	0.001
Arthropoda : Cumacea	<i>Leucon americanus</i>	17	0.001
<b>STATION</b>		<b>165</b>	<b>0.018</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC14**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	<i>Leitoscoloplos</i> spp.	11	0.011
	<i>Mediomastus ambiseta</i>	30	0.001
	<i>Parandalia tricuspis</i>	25	0.010
	<i>Spiochaetopterus costarum</i>	5	0.001
	<i>Streblospio benedicti</i>	5	0.001
Annelida : Oligochaeta	<i>Tubificoides</i> spp. Group I	2	0.001
Mollusca : Bivalvia	<i>Gemma gemma</i>	3	0.001
Arthropoda : Amphipoda	<i>Grandidierella</i> sp.	2	0.001
Arthropoda : Mysidacea	<i>Americanysis bigelowi</i>	5	0.001
<b>STATION</b>		<b>88</b>	<b>0.028</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC15**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Eteone heteropoda	3	0.001
	Glycinde solitaria	8	0.001
	Leitoscoloplos spp.	8	0.002
	Mediomastus ambiseta	90	0.002
	Parandalia tricuspis	25	0.002
	Parapriionospio pinnata	18	0.002
	Spiochaetopterus costarum	2	0.001
	Streblospio benedicti	1	0.001
Arthropoda : Isopoda	Edotea triloba	1	0.001
Arthropoda : Amphipoda	Ampelisca spp.	3	0.001
Arthropoda : Cumacea	Leucon americanus	18	0.001
Phoronida	Phoronis spp.	4	0.001
<b>STATION</b>		<b>181</b>	<b>0.016</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC16**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Glycinde solitaria	3	0.001
	Leitoscoloplos spp.	1	0.002
	Mediomastus ambiseta	11	0.001
	Parandalia tricuspis	1	0.001
	Paraprionospio pinnata	11	0.001
	Phyllodoce arenae	1	0.001
	Spiochaetopterus costarum	2	0.001
	Tharyx sp. A Doner	1	0.001
Arthropoda : Amphipoda	Ampelisca spp.	1	0.001
Arthropoda : Cumacea	Leucon americanus	2	0.001
<b>STATION</b>		<b>34</b>	<b>0.011</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC17**

Taxonomic Group	TAXON	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Eteone heteropoda	3	0.001
	Leitoscoloplos spp.	17	0.020
	Mediomastus ambiseta	234	0.004
	Parahesione luteola	1	0.001
	Parandalia tricuspis	23	0.005
	Spiochaetopterus costarum	10	0.003
	Streblospio benedicti	6	0.001
Mollusca : Bivalvia	Gemma gemma	1	0.001
Arthropoda : Isopoda	Cyathura polita	1	0.001
Arthropoda : Amphipoda	Cymadusa compta	2	0.001
	Grandidierella sp.	10	0.001
Phoronida	Phoronis spp.	2	0.001
<b>STATION</b>		<b>310</b>	<b>0.040</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC18**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Nemertea	Nemertea spp.	1	0.001
Annelida : Polychaeta	Glycinde solitaria	2	0.001
	Leitoscoloplos spp.	6	0.003
	Mediomastus ambiseta	248	0.004
	Parahesione luteola	1	0.001
	Parandalia tricuspis	28	0.008
	Parapriionospio pinnata	22	0.002
Arthropoda : Amphipoda	Ampelisca spp.	1	0.001
Arthropoda : Cumacea	Leucon americanus	8	0.001
Arthropoda : Mysidacea	Americamysis bigelowi	2	0.001
<b>STATION</b>		<b>319</b>	<b>0.023</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC19**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Glycinde solitaria	1	0.001
	Leitoscoloplos spp.	8	0.007
	Mediomastus ambiseta	224	0.005
	Parandalia tricuspis	21	0.008
	Paraprionospio pinnata	17	0.003
	Podarke obscura	4	0.001
	Spiochaetopterus costarum	1	0.001
	Streblospio benedicti	10	0.001
Annelida : Oligochaeta	Tubificoides spp. Group I	1	0.001
Mollusca : Bivalvia	Bivalvia spp.	1	0.001
Arthropoda : Amphipoda	Ampelisca spp.	2	0.001
Arthropoda : Cumacea	Leucon americanus	30	0.001
<b>STATION</b>		<b>320</b>	<b>0.031</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC20**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	7	0.003
Annelida : Polychaeta	<i>Demonax microphthalmus</i>	5	0.001
	<i>Glycinde solitaria</i>	2	0.001
	<i>Leitoscoloplos</i> spp.	13	0.018
	<i>Mediomastus ambiseta</i>	365	0.009
	<i>Neanthes succinea</i>	1	0.001
	<i>Parandalia tricuspis</i>	49	0.012
	<i>Parapriionospio pinnata</i>	2	0.001
	<i>Phyllodoce arenae</i>	1	0.001
	<i>Podarke obscura</i>	1	0.001
	<i>Podarkeopsis levifuscina</i>	1	0.001
	<i>Spiochaetopterus costarum</i>	1	0.001
	<i>Streblospio benedicti</i>	10	0.001
	<i>Tharyx</i> sp. A Doner	1	0.001
Mollusca : Gastropoda	<i>Cylichnella bidentata</i>	1	0.001
	<i>Rictaxis punctostriatus</i>	1	0.001
Arthropoda : Isopoda	<i>Erichsonella filiformis</i>	1	0.001
Arthropoda : Amphipoda	<i>Grandidierella</i> sp.	6	0.001
Arthropoda : Mysidacea	<i>Americamysis bigelowi</i>	4	0.001
<b>STATION</b>		<b>472</b>	<b>0.057</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC21**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Demonax microphthalmus	2	0.001
	Eteone heteropoda	2	0.001
	Glycinde solitaria	1	0.001
	Leitoscoloplos spp.	4	0.006
	Mediomastus ambiseta	118	0.001
	Parandalia tricuspis	29	0.002
	Paraprionospio pinnata	1	0.001
	Streblospio benedicti	3	0.001
	Tharyx sp. A Doner	6	0.002
Mollusca : Gastropoda	Rictaxis punctostriatus	1	0.001
Mollusca : Bivalvia	Gemma gemma	1	0.001
	Tellina agilis	1	0.001
Arthropoda : Isopoda	Edotea triloba	1	0.001
Arthropoda : Amphipoda	Ampelisca spp.	3	0.001
	Grandidierella sp.	6	0.001
Arthropoda : Mysidacea	Americanensis bigelowi	1	0.001
Phoronida	Phoronis spp.	1	0.001
<b>STATION</b>		<b>181</b>	<b>0.024</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC22**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Cnidaria : Anthozoa	<i>Anthozoa</i> spp.	1	0.001
Platyhelminthes : Turbellaria	<i>Stylochus ellipticus</i>	1	0.001
Nemertea	<i>Nemertea</i> spp.	1	0.001
Annelida : Polychaeta	<i>Eteone heteropoda</i>	3	0.001
	<i>Glycera dibranchiata</i>	1	0.005
	<i>Glycinde solitaria</i>	6	0.001
	<i>Hobsonia florida</i>	1	0.001
	<i>Leitoscoloplos</i> spp.	4	0.003
	<i>Mediomastus ambiseta</i>	363	0.006
	<i>Parandalia tricuspis</i>	22	0.002
	<i>Parapriionospio pinnata</i>	4	0.001
	<i>Phyllodoce arenae</i>	2	0.001
	<i>Podarke obscura</i>	1	0.001
	<i>Scoloplos rubra</i>	1	0.001
	<i>Streblospio benedicti</i>	9	0.001
	<i>Tharyx</i> sp. A Doner	1	0.001
Mollusca : Gastropoda	<i>Gastropoda</i> spp.	4	0.001
Arthropoda : Amphipoda	<i>Ampelisca</i> spp.	5	0.001
	<i>Grandidierella</i> sp.	2	0.001
Arthropoda : Cumacea	<i>Leucon americanus</i>	1	0.001
Arthropoda : Mysidacea	<i>Americanamysis bigelowi</i>	2	0.001
Phoronida	<i>Phoronis</i> spp.	4	0.002
<b>STATION</b>		<b>439</b>	<b>0.035</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC23**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Glycinde solitaria	4	0.001
	Leitoscoloplos spp.	16	0.009
	Mediomastus ambiseta	230	0.005
	Parandalia tricuspis	16	0.002
	Paraprionospio pinnata	38	0.003
	Podarke obscura	2	0.001
	Spiochaetopterus costarum	3	0.001
Arthropoda : Amphipoda	Ampelisca spp.	2	0.001
	Grandidierella sp.	1	0.001
Arthropoda : Cumacea	Leucon americanus	14	0.001
<b>STATION</b>		<b>326</b>	<b>0.025</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC24**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Glycinde solitaria	1	0.001
	Leitoscoloplos spp.	5	0.005
	Mediomastus ambiseta	46	0.001
	Parandalia tricuspis	33	0.009
	Spiochaetopterus costarum	2	0.001
	Streblospio benedicti	1	0.001
	Tharyx sp. A Doner	1	0.001
Mollusca : Gastropoda	Haminoea solitaria	1	0.001
Mollusca : Bivalvia	Bivalvia spp.	1	0.001
Arthropoda : Amphipoda	Ampelisca spp.	1	0.001
	Grandidierella sp.	11	0.001
Arthropoda : Cumacea	Leucon americanus	1	0.001
Arthropoda : Mysidacea	Americanysis bigelowi	1	0.001
Phoronida	Phoronis spp.	23	0.008
<b>STATION</b>		<b>128</b>	<b>0.033</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=. Station=20BC25**

Taxonomic Group	TAXON	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Eteone heteropoda	1	0.001
	Glycinde solitaria	4	0.001
	Leitoscoloplos spp.	13	0.008
	Mediomastus ambiseta	123	0.003
	Parandalia tricuspis	19	0.004
	Parapronionospio pinnata	9	0.002
	Streblospio benedicti	2	0.001
Arthropoda : Amphipoda	Ampelisca spp.	1	0.001
Arthropoda : Cumacea	Leucon americanus	8	0.001
<b>STATION</b>		<b>180</b>	<b>0.022</b>
<b>STRATCODE</b>		<b>5748</b>	<b>0.819</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP01**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Platyhelminthes : Turbellaria	Euplana gracilis	1	0.001
Nemertea	Nemertea spp.	2	0.002
Annelida : Polychaeta	Demonax microphthalmus	3	0.005
	Eteone heteropoda	2	0.001
	Glycinde solitaria	1	0.001
	Hobsonia florida	1	0.001
	Leitoscoloplos spp.	1	0.001
	Mediomastus ambiseta	3	0.001
	Neanthes succinea	3	0.002
	Parandalia tricuspidis	15	0.002
	Podarke obscura	1	0.001
	Spiochaetopterus costarum	1	0.001
	Streblospio benedicti	1	0.001
Mollusca : Gastropoda	Gastropoda spp.	5	0.001
	Nassarius vibex	2	0.069
Arthropoda : Amphipoda	Grandidierella sp.	26	0.003
Arthropoda : Mysidacea	Americanysis bigelowi	1	0.001
Phoronida	Phoronis spp.	2	0.003
<b>STATION</b>		<b>71</b>	<b>0.097</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP02**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	<i>Clymenella torquata</i>	1	0.001
	<i>Demonax microphthalmus</i>	2	0.005
	<i>Glycinde solitaria</i>	1	0.001
	<i>Leitoscoloplos spp.</i>	1	0.001
	<i>Neanthes succinea</i>	1	0.001
	<i>Parandalia tricuspis</i>	34	0.002
	<i>Parapriionospio pinnata</i>	5	0.001
	<i>Phyllodoce arenae</i>	1	0.001
	<i>Tharyx sp. A Doner</i>	1	0.001
Arthropoda : Cumacea	<i>Leucon americanus</i>	2	0.001
Chordata : Hemichordata	<i>Saccoglossus kowalevskii</i>	1	0.002
<b>STATION</b>		<b>50</b>	<b>0.017</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP04**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Glycera dibranchiata	1	0.008
	Glycinde solitaria	1	0.001
	Hobsonia florida	2	0.001
	Leitoscoloplos spp.	11	0.005
	Mediomastus ambiseta	279	0.004
	Parandalia tricuspis	11	0.002
	Parapriionospio pinnata	5	0.001
	Scoloplos rubra	1	0.001
<b>STATION</b>		<b>311</b>	<b>0.023</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP05**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	8	0.001
Annelida : Polychaeta	<i>Capitella capitata</i>	11	0.001
	<i>Demonax microphthalmus</i>	3	0.001
	<i>Dorvillea rudolphi</i>	5	0.001
	<i>Eteone heteropoda</i>	1	0.001
	<i>Hobsonia florida</i>	1	0.001
	<i>Neanthes succinea</i>	3	0.001
	<i>Parahesione luteola</i>	1	0.001
	<i>Parandalia tricuspis</i>	9	0.001
	<i>Streblospio benedicti</i>	3	0.001
Arthropoda : Amphipoda	<i>Grandidierella</i> sp.	10	0.002
<b>STATION</b>		<b>55</b>	<b>0.012</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP06**

Taxonomic Group	TAXON	Abundance	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	1	0.001
Annelida : Polychaeta	<i>Glycera dibranchiata</i>	2	0.155
	<i>Glycinde solitaria</i>	1	0.001
	<i>Leitoscoloplos</i> spp.	1	0.001
	<i>Mediomastus ambiseta</i>	56	0.002
	<i>Parandalia tricuspis</i>	7	0.001
	<i>Phyllodoce arenae</i>	2	0.001
	<i>Streblospio benedicti</i>	1	0.001
Arthropoda : Amphipoda	<i>Ampelisca</i> spp.	1	0.001
	<i>Paracaprella tenuis</i>	1	0.001
Phoronida	<i>Phoronis</i> spp.	2	0.001
<b>STATION</b>		<b>75</b>	<b>0.166</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP07**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	2	0.001
Annelida : Polychaeta	<i>Glycinde solitaria</i>	5	0.001
	<i>Leitoscoloplos</i> spp.	1	0.001
	<i>Mediomastus ambiseta</i>	26	0.001
	<i>Parandalia tricuspis</i>	6	0.001
	<i>Parapronospio pinnata</i>	5	0.001
	<i>Phyllodoce arenae</i>	1	0.001
	<i>Tharyx</i> sp. A Doner	1	0.001
Arthropoda : Isopoda	<i>Cyathura polita</i>	1	0.001
	<i>Edotea triloba</i>	1	0.001
Arthropoda : Amphipoda	<i>Ampelisca</i> spp.	1	0.001
	<i>Grandidierella</i> sp.	1	0.001
Arthropoda : Cumacea	<i>Leucon americanus</i>	1	0.001
Arthropoda : Mysidacea	<i>Americanysis bigelowi</i>	1	0.001
Arthropoda : Decapoda	<i>Callinectes sapidus</i>	1	0.007
Phoronida	<i>Phoronis</i> spp.	1	0.001
<b>STATION</b>		<b>55</b>	<b>0.022</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP08**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	3	0.001
Annelida : Polychaeta	<i>Glycinde solitaria</i>	2	0.001
	<i>Hobsonia florida</i>	1	0.001
	<i>Leitoscoloplos</i> spp.	4	0.003
	<i>Mediomastus ambiseta</i>	49	0.001
	<i>Parandalia tricuspis</i>	13	0.006
	<i>Parapriionospio pinnata</i>	29	0.003
Arthropoda : Cumacea	<i>Leucon americanus</i>	18	0.001
<b>STATION</b>		<b>119</b>	<b>0.017</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP09**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	11	0.004
Annelida : Polychaeta	<i>Demonax microphthalmus</i>	3	0.002
	<i>Glycinde solitaria</i>	3	0.001
	<i>Leitoscoloplos</i> spp.	1	0.001
	<i>Loimia medusa</i>	2	0.020
	<i>Mediomastus ambiseta</i>	30	0.001
	<i>Parandalia tricuspis</i>	59	0.004
	<i>Pectinaria gouldii</i>	1	0.001
	<i>Phyllodoce arenae</i>	1	0.001
	<i>Podarke obscura</i>	3	0.001
	<i>Spiochaetopterus costarum</i>	4	0.001
Arthropoda : Amphipoda	<i>Grandidierella</i> sp.	2	0.001
Arthropoda : Cumacea	<i>Leucon americanus</i>	2	0.001
Arthropoda : Decapoda	<i>Crangon septemspinosa</i>	1	0.002
<b>STATION</b>		<b>123</b>	<b>0.041</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP10**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Glycinde solitaria	4	0.001
	Leitoscoloplos spp.	4	0.001
	Loimia medusa	1	0.001
	Mediomastus ambiseta	159	0.002
	Parandalia tricuspis	15	0.001
	Parapriionospio pinnata	20	0.001
	Spiochaetopterus costarum	2	0.001
	Streblospio benedicti	1	0.001
Arthropoda : Isopoda	Edotea triloba	6	0.001
Arthropoda : Amphipoda	Ampelisca spp.	1	0.001
	Grandidierella sp.	1	0.001
Arthropoda : Cumacea	Leucon americanus	5	0.001
Arthropoda : Mysidacea	Americamysis bigelowi	1	0.001
<b>STATION</b>		<b>220</b>	<b>0.014</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP11**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Platyhelminthes : Turbellaria	Turbellaria spp.	1	0.001
Nemertea	Nemertea spp.	3	0.001
Annelida : Polychaeta	Demonax microphthalmus	3	0.002
	Eteone heteropoda	2	0.001
	Glycinde solitaria	2	0.001
	Leitoscoloplos spp.	5	0.004
	Loimia medusa	1	0.001
	Mediomastus ambiseta	14	0.001
	Neanthes succinea	1	0.001
	Parahesione luteola	3	0.001
	Parandalia tricuspidis	1	0.001
	Parapriionospio pinnata	26	0.004
	Podarke obscura	2	0.001
	Podarkeopsis levifuscina	2	0.001
	Streblospio benedicti	2	0.001
	Tharyx sp. A Doner	2	0.001
Annelida : Oligochaeta	Tubificoides spp. Group I	1	0.001
Arthropoda : Amphipoda	Melita nitida	1	0.001
Arthropoda : Cumacea	Leucon americanus	13	0.001
<b>STATION</b>		<b>85</b>	<b>0.026</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP14**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	1	0.001
Annelida : Polychaeta	<i>Demonax microphthalmus</i>	2	0.001
	<i>Leitoscoloplos</i> spp.	3	0.001
	<i>Mediomastus ambiseta</i>	19	0.001
	<i>Parahesione luteola</i>	1	0.001
	<i>Parandalia tricuspis</i>	10	0.001
	<i>Parapriionospio pinnata</i>	20	0.003
	<i>Spiochaetopterus costarum</i>	1	0.001
	<i>Streblospio benedicti</i>	2	0.001
Arthropoda : Isopoda	<i>Edotea triloba</i>	1	0.001
Arthropoda : Amphipoda	<i>Ampelisca</i> spp.	1	0.001
	<i>Grandidierella</i> sp.	2	0.001
Arthropoda : Cumacea	<i>Leucon americanus</i>	21	0.001
Arthropoda : Mysidacea	<i>Americanamysis bigelowi</i>	2	0.001
<b>STATION</b>		<b>86</b>	<b>0.016</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP15**

Taxonomic Group	TAXON	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Glycinde solitaria	1	0.001
	Leitoscoloplos spp.	10	0.007
	Mediomastus ambiseta	81	0.001
	Neanthes succinea	1	0.001
	Parandalia tricuspis	49	0.007
	Parapriionospio pinnata	18	0.003
	Phyllodoce arenae	3	0.001
Arthropoda : Isopoda	Edotea triloba	1	0.001
Arthropoda : Amphipoda	Corophium spp.	1	0.001
	Grandidierella sp.	3	0.001
	Melita nitida	1	0.001
Arthropoda : Cumacea	Leucon americanus	2	0.001
Arthropoda : Decapoda	Alpheus heterochaelis	2	0.033
<b>STATION</b>		<b>173</b>	<b>0.059</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP16**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Platyhelminthes : Turbellaria	Turbellaria spp.	2	0.001
Nemertea	Nemertea spp.	28	0.010
Annelida : Polychaeta	Cirratulidae spp.	1	0.001
	Demonax microphthalmus	4	0.001
	Diopatra cuprea	1	0.001
	Eteone heteropoda	5	0.001
	Heteromastus filiformis	1	0.001
	Mediomastus ambiseta	8	0.001
	Neanthes succinea	3	0.001
	Parahesione luteola	2	0.001
	Parandalia tricuspidis	16	0.001
	Parapriionospio pinnata	2	0.001
	Podarke obscura	2	0.001
	Spiochaetopterus costarum	1	0.001
Mollusca : Gastropoda	Gastropoda spp.	8	0.001
Arthropoda : Amphipoda	Grandidierella sp.	71	0.007
Arthropoda : Cumacea	Oxyurostylis smithi	1	0.001
<b>STATION</b>		<b>156</b>	<b>0.032</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP17**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	7	0.006
Annelida : Polychaeta	<i>Glycera dibranchiata</i>	1	0.006
	<i>Glycinde solitaria</i>	2	0.001
	<i>Leitoscoloplos</i> spp.	2	0.002
	<i>Loimia medusa</i>	1	0.016
	<i>Mediomastus ambiseta</i>	11	0.001
	<i>Parandalia tricuspis</i>	32	0.003
	<i>Parapriionospio pinnata</i>	3	0.001
	<i>Spiochaetopterus costarum</i>	1	0.001
Mollusca : Bivalvia	<i>Gemma gemma</i>	1	0.001
Arthropoda : Amphipoda	<i>Grandidierella</i> sp.	4	0.001
Arthropoda : Mysidacea	<i>Americamysis bigelowi</i>	1	0.001
<b>STATION</b>		<b>66</b>	<b>0.040</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP18**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	27	0.006
Annelida : Polychaeta	<i>Clymenella torquata</i>	4	0.010
	<i>Eteone heteropoda</i>	1	0.001
	<i>Glycera dibranchiata</i>	1	0.003
	<i>Mediomastus ambiseta</i>	30	0.001
	<i>Parandalia tricuspis</i>	16	0.002
	<i>Parapriionospio pinnata</i>	2	0.001
	<i>Phyllodoce arenae</i>	6	0.002
	<i>Podarke obscura</i>	3	0.001
	<i>Scoloplos rubra</i>	2	0.001
	<i>Spiochaetopterus costarum</i>	2	0.001
	<i>Streblospio benedicti</i>	4	0.001
Arthropoda : Isopoda	<i>Edotea triloba</i>	2	0.001
Arthropoda : Amphipoda	<i>Grandidierella</i> sp.	3	0.001
Arthropoda : Cumacea	<i>Leucon americanus</i>	4	0.001
Arthropoda : Decapoda	<i>Alpheus heterochaelis</i>	1	0.021
	<i>Xanthidae</i> spp.	1	0.001
Chordata : Hemichordata	<i>Saccoglossus kowalevskii</i>	2	0.002
<b>STATION</b>		<b>111</b>	<b>0.057</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP19**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Demonax microphthalmus	1	0.002
	Dorvillea rudolphi	1	0.001
	Eteone heteropoda	13	0.002
	Hobsonia florida	2	0.001
	Leitoscoloplos spp.	10	0.001
	Mediomastus ambiseta	5	0.001
	Parandalia tricuspis	14	0.002
	Pectinaria gouldii	1	0.001
	Podarke obscura	1	0.001
	Polydora cornuta	1	0.001
	Streblospio benedicti	7	0.001
Mollusca : Gastropoda	Cyllichnella bidentata	2	0.001
	Nassarius vibex	1	0.024
Mollusca : Bivalvia	Macoma balthica	1	0.001
Arthropoda : Isopoda	Edotea triloba	1	0.001
Arthropoda : Amphipoda	Grandidierella sp.	59	0.003
Arthropoda : Cumacea	Leucon americanus	1	0.001
Arthropoda : Mysidacea	Americamysis bigelowi	3	0.001
Arthropoda : Tanaidacea	Hargeria rapax	3	0.001
<b>STATION</b>		<b>127</b>	<b>0.047</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP21**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Nemertea	Nemertea spp.	1	0.001
Annelida : Polychaeta	Glycera dibranchiata	1	0.017
	Glycinde solitaria	3	0.001
	Leitoscoloplos spp.	3	0.001
	Mediomastus ambiseta	245	0.003
	Parandalia tricuspis	19	0.004
	Parapriionospio pinnata	40	0.003
Arthropoda : Cumacea	Cyclaspis varians	1	0.001
	Leucon americanus	2	0.001
<b>STATION</b>		<b>315</b>	<b>0.032</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP23**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Nemertea	Nemertea spp.	2	0.001
Annelida : Polychaeta	Demonax microphthalmus	1	0.001
	Dorvillea rudolphi	1	0.001
	Eteone heteropoda	1	0.001
	Glycinde solitaria	1	0.001
	Leitoscoloplos spp.	8	0.024
	Mediomastus ambiseta	105	0.003
	Neanthes succinea	3	0.001
	Parahesione luteola	3	0.001
	Parandalia tricuspis	7	0.001
	Paraprionospio pinnata	35	0.012
	Podarkeopsis levifuscina	2	0.001
	Polycirrus eximius	1	0.001
	Sigambra tentaculata	1	0.001
	Streblospio benedicti	66	0.002
Annelida : Oligochaeta	Tubificoides spp. Group I	1	0.001
Arthropoda : Amphipoda	Grandidierella sp.	3	0.001
Arthropoda : Cumacea	Leucon americanus	1	0.001
Chordata : Urochordata	Molgula lutulenta	3	0.005
<b>STATION</b>		<b>245</b>	<b>0.060</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP24**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	2	0.001
Annelida : Polychaeta	<i>Glycinde solitaria</i>	2	0.001
	<i>Leitoscoloplos</i> spp.	3	0.002
	<i>Mediomastus ambiseta</i>	90	0.001
	<i>Parandalia tricuspis</i>	15	0.011
	<i>Parapriionospio pinnata</i>	34	0.006
	<i>Phyllodoce arenae</i>	2	0.001
	<i>Spiochaetopterus costarum</i>	1	0.001
	<i>Streblospio benedicti</i>	2	0.001
Annelida : Oligochaeta	<i>Tubificoides</i> spp. Group I	1	0.001
Arthropoda : Cumacea	<i>Leucon americanus</i>	7	0.001
<b>STATION</b>		<b>159</b>	<b>0.027</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP25**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Glycera dibranchiata	1	0.002
	Glycinde solitaria	2	0.001
	Hobsonia florida	2	0.001
	Mediomastus ambiseta	18	0.001
	Parandalia tricuspis	12	0.001
	Parapriionospio pinnata	4	0.001
	Phyllodoce arenae	1	0.003
	Streblospio benedicti	2	0.001
Arthropoda : Cumacea	Leucon americanus	3	0.001
<b>STATION</b>		<b>45</b>	<b>0.012</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP26**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Glycinde solitaria	1	0.001
	Leitoscoloplos spp.	1	0.001
	Mediomastus ambiseta	8	0.001
	Parandalia tricuspis	10	0.001
	Phyllodoce arenae	1	0.001
	Podarke obscura	1	0.001
	Spiochaetopterus costarum	3	0.001
	Streblospio benedicti	2	0.001
Arthropoda : Isopoda	Cyathura polita	1	0.001
Arthropoda : Amphipoda	Grandidierella sp.	4	0.001
Phoronida	Phoronis spp.	1	0.001
<b>STATION</b>		<b>33</b>	<b>0.011</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP27**

Taxonomic Group	TAXON	Abundance	Ash Free Dry Wt. (g C)
Nemertea	Nemertea spp.	1	0.001
Annelida : Polychaeta	Leitoscoloplos spp.	8	0.009
	Mediomastus ambiseta	6	0.001
	Parahesione luteola	2	0.001
	Parapriionospio pinnata	35	0.007
	Podarkeopsis levifuscina	1	0.001
	Streblospio benedicti	2	0.001
Arthropoda : Amphipoda	Listriella barnardi	1	0.001
Arthropoda : Cumacea	Leucon americanus	25	0.001
Chordata : Hemichordata	Saccoglossus kowalevskii	1	0.001
<b>STATION</b>		<b>82</b>	<b>0.024</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP28**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	1	0.001
Annelida : Polychaeta	<i>Demonax microphthalmus</i>	17	0.007
	<i>Dorvillea rudolphi</i>	3	0.001
	<i>Glycera dibranchiata</i>	1	0.006
	<i>Glycinde solitaria</i>	2	0.001
	<i>Mediomastus ambiseta</i>	4	0.001
	<i>Neanthes succinea</i>	1	0.001
	<i>Parandalia tricuspis</i>	22	0.001
	<i>Parapriionospio pinnata</i>	1	0.001
	<i>Podarke obscura</i>	7	0.002
	<i>Podarkeopsis levifuscina</i>	1	0.001
	<i>Streblospio benedicti</i>	1	0.001
Mollusca : Gastropoda	<i>Nudibranchia</i> spp.	1	0.001
Arthropoda : Isopoda	<i>Edotea triloba</i>	1	0.001
Arthropoda : Amphipoda	<i>Gitanopsis</i> spp.	1	0.001
	<i>Grandidierella</i> sp.	10	0.001
	<i>Paracaprella tenuis</i>	1	0.001
Arthropoda : Decapoda	<i>Callinectes sapidus</i>	1	0.001
<b>STATION</b>		<b>76</b>	<b>0.030</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP29**

Taxonomic Group	Taxon	Abundance	Ash Free Dry Wt. (g C)
Nemertea	<i>Nemertea</i> spp.	2	0.001
Annelida : Polychaeta	<i>Glycinde solitaria</i>	3	0.001
	<i>Leitoscoloplos</i> spp.	2	0.002
	<i>Mediomastus ambiseta</i>	12	0.001
	<i>Parandalia tricuspis</i>	28	0.010
	<i>Parapriionospio pinnata</i>	19	0.002
	<i>Spiochaetopterus costarum</i>	1	0.001
Arthropoda : Amphipoda	<i>Listriella barnardi</i>	1	0.001
Arthropoda : Cumacea	<i>Leucon americanus</i>	8	0.001
<b>STATION</b>		<b>76</b>	<b>0.020</b>

Table 8. Numbers of individuals and Ash-Free Dry Weight Biomass at MPP Project Monitoring Stations (Random Cruise 2013) (Continued).

**Stratum=Virginia Mainstem Station=20MP30**

TAXONOMIC GROUP	TAXON	ABUNDANCE	Ash Free Dry Wt. (g C)
Annelida : Polychaeta	Glycera americana	1	0.039
	Glycinde solitaria	1	0.001
	Leitoscoloplos spp.	2	0.003
	Loimia medusa	1	0.006
	Mediomastus ambiseta	4	0.001
	Parandalia tricuspis	1	0.001
	Paraprionospio pinnata	9	0.003
	Podarkeopsis levifuscina	1	0.001
	Streblospio benedicti	14	0.001
Arthropoda : Amphipoda	Listriella barnardi	5	0.001
Arthropoda : Cumacea	Leucon americanus	10	0.001
Chordata : Hemichordata	Saccoglossus kowalevskii	2	0.015
<b>STATION</b>		<b>51</b>	<b>0.073</b>
<b>STRATCODE</b>		<b>2965</b>	<b>0.975</b>
		<b>8713</b>	<b>1.794</b>

## Appendix C. Glossary of terms

## Glossary of selected terms

**Benthos** - refers to organisms that dwell on or within the bottom. Includes both hard substratum habitats (e.g. oyster reefs) and sedimentary habitats (sand and mud bottoms).

**B-IBI** - the benthic index of biotic integrity of Weisberg et al. (1997). This is a multi-metric index that compares the condition of a benthic community to reference conditions.

**Fixed Point Stations** - stations for long-term trend analysis whose location is unchanged over time.

**Habitat** - a local environment that has a benthic community distinct from other such habitat types. For the B-IBI of Chesapeake Bay seven habitat types were defined as combinations of salinity and sedimentary types - tidal freshwater, oligohaline, low mesohaline, high mesohaline sand, high mesohaline mud, polyhaline sand and polyhaline mud.

**Macrobenthos** - a size category of benthic organisms that are retained on a mesh of 0.5 mm.

**Metric** - a parameter or measurement of benthic community structure (e.g., abundance, biomass, species diversity).

**Probability based sampling** - all locations within a stratum have an equal chance of being sampled. Allows estimation of the percent of the stratum meeting or failing the benthic restoration goals.

**Random Station** - a station selected randomly within a stratum. In every succeeding sampling event new random locations are selected.

**Reference condition** - the structure of benthic communities at reference sites.

**Reference sites** - sites determined to be minimally impacted by anthropogenic stress. Conditions at these sites are considered to represent goals for restoration of impacted benthic communities. Reference sites were selected by Weisberg et al. (1997) as those outside highly developed watersheds, distant from any point-source discharge, with no sediment contaminant effect, with no low dissolved oxygen effect and with a low level of organic matter in the sediment.

**Restoration Goal** - refers to obtaining an average B-IBI value of 3.0 for a benthic community indicating that values for metrics approximate the reference condition.

**Stratum** - a geographic region of unique ecological condition or managerial interest. In this study the primary strata were the Mainstem of the river, the Lafayette River, the Eastern Branch, Western Branch and Southern Branch. In future years the entire Elizabeth River watershed will be sampled as a single stratum.

**Threshold** - a value of a metric that determines the B-IBI scoring. For all metrics except abundance and biomass, two thresholds are used - the lower 5<sup>th</sup> percentile and the 50<sup>th</sup> percentile (median) of the distribution of values at reference sites. Samples with metric values less than the lower 5<sup>th</sup> percentile are scored as a 1. Samples with values between the 5<sup>th</sup> and 50<sup>th</sup> metrics are scored as 3 and values greater than the 50<sup>th</sup> percentile are scored as 5. For abundance and biomass, values below the 5<sup>th</sup> and above the 95<sup>th</sup> percentile are scored as 1, values between the 5<sup>th</sup> and 25<sup>th</sup> and the

75<sup>th</sup> and 95<sup>th</sup> percentiles are scored as 3 and values between the 25<sup>th</sup> and 75<sup>th</sup> percentiles are scored as 5.