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Geochemical Characteristics and Benthic Macrofauna Biomass in Intertidal and Subtidal Sediments of Annapolis Basin, Nova Scotia, 1993

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GEOCHEMICAL CHARACTERISTICS AND BENTHIC MACROFAUNA BIOMASS IN INTERTIDAL AND SUBTIDAL SEDIMENTS OF ANNAPOLIS BASIN, NOVA SCOTIA, 1993

by

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ABSTRACT

Hargrave, B.T., L.I. Doucette, and T.G. Milligan. 1993. Geochemical characteristics and benthic macrofauna biomass in intertidal and subtidal sediments of Annapolis Basin, Nova Scotia, 1993. Can. Data Rep. Fish. Aquat. Sci. 915: iv + 88 p.

Observations of sediment modal grain size, water content, redox potentials, total organic matter, organic carbon and nitrogen, plant pigments (chlorophyll *a* and pheopigments), and macrofauna biomass were determined at 32 intertidal and 47 subtidal stations in Annapolis Basin, Nova Scotia, during June and July 1993. Results are tabulated to serve as a baseline for assessment of impacts associated with potential development of finfish aquaculture.

RÉSUMÉ

Hargrave, B.T., L.I. Doucette, and T.G. Milligan. 1993. Geochemical characteristics and benthic macrofauna biomass in intertidal and subtidal sediments of Annapolis Basin, Nova Scotia, 1993. Can. Data Rep. Fish. Aquat. Sci. 915: iv + 88 p.

On a procédé à des observations de la dimension de grain typique des sédiments, de la teneur en eau, du potentiel d'oxydo-réduction, de la matière organique totale, du carbone et de l'azote organiques, des pigments végétaux (chlorophylle *a* et phéopigments) et de la biomasse macrofaunique en 32 endroits de la zone intertidale et en 47 endroits de la zone subtidale du bassin de l'Annapolis, en Nouvelle-Écosse, en juin et juillet 1993. On en présente les résultats pour qu'ils servent de base à l'évaluation des conséquences du développement éventuel de la pisciculture.

INTRODUCTION

A tidal barrage has existed in Annapolis Basin, Nova Scotia, since 1960 when the Annapolis Causeway was constructed at Annapolis Royal. Hydrographic changes in water column properties associated with the transformation of the estuary from a vertically homogeneous water column into a two-layered salt-wedge type estuary are described by Daborn et al. (1982). No additional hydrographic, sedimentological, or ecological studies in Annapolis Basin were carried until after 1983 when construction of a tidal power-generating facility was completed in the tidal barrage. Stock assessment studies of soft-shell clam (*Mya arenaria* Linné) populations in intertidal sediments of Annapolis Basin were undertaken in 1983 (Angus et al. 1985). Concerns about the possible decline of clam populations due to the tidal power facility were raised in 1985. Studies in 1986 and later years showed the synergistic effects of recruitment failure and predation on clam populations in the intertidal zone of the upper region of the Annapolis Basin (Rowell and Woo 1990; Rowell 1991).

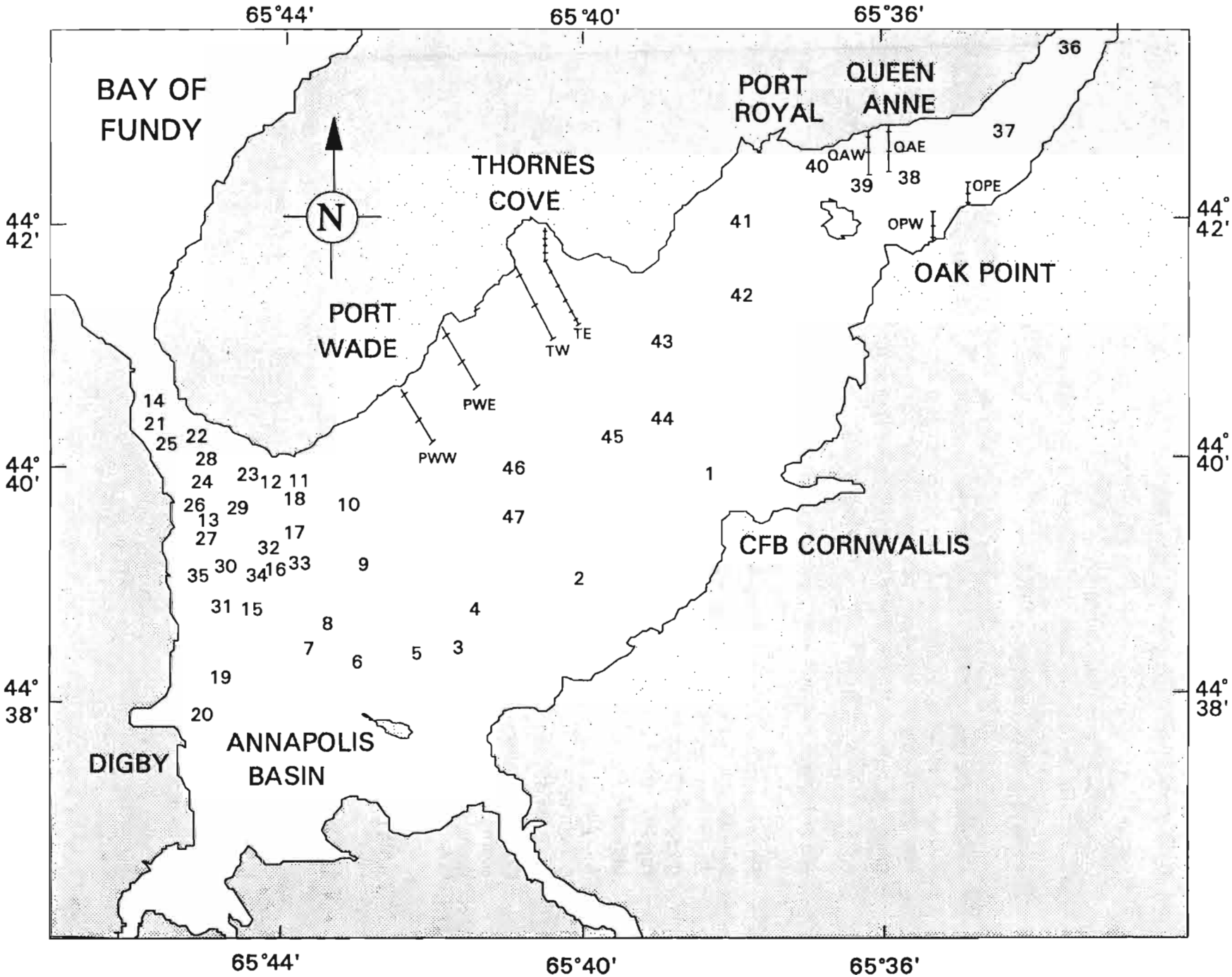
Geochemical characteristics of intertidal and subtidal sediments in the Annapolis Basin were described as part of the LISP investigation - a study of physical and biological variables affecting geotechnical and sedimentary properties (LISP 1991). No previous survey provides similar data for assessing long-term changes in ecological conditions within benthic habitats of Annapolis Basin. The present report provides additional data for geochemical and biological observations along six intertidal transects established by Rowell and Woo (1990) in 1988 and sampled subsequently in 1989 (LISP 1991). Two new intertidal transects were established at Port Wade during the present study. Measurements of sediment modal grain size, organic matter, plant pigments, and macrofauna biomass were carried out at 32 intertidal and 47 subtidal stations during June and July 1993. The data will be used as a baseline for assessment of changes in sedimentological, geochemical, and biological variables associated with sediments of Annapolis Basin prior to the potential development of finfish cage aquaculture. The data can also be compared with previously published data from other intertidal areas such as Minas and Cumberland Basins in the upper reaches of the Bay of Fundy (Hargrave 1978; Hargrave et al. 1983; LISP 1991).

METHODS

STUDY SITES

Samples were collected during periods of low tide from 32 stations along eight intertidal transects shown in Figure 1. Transects at Thornes Cove (TW and TE) and Oak Point (OPE and OPW) were sampled for grain size analysis on May 31 and June 1, respectively. All other variables were measured at sites at Queen Anne Marsh (QAW, 3 stations), Thornes Cove (TE, 11 stations), and Port Wade (PWW, 3 stations) between June 3 and 5, 1993. Subtidal locations in Annapolis Basin (AB, 47 stations)

Figure 1. Intertidal and subtidal sites in Annapolis Basin sampled during June and July 1993. Locations were selected along each intertidal transects to provide high-, mid- and low-tide level sampling sites except for the TE transect at Thornes Cove where 11 stations were sampled across the entire intertidal zone at low tide. Hard substrate at subtidal Stations 7, 8, 11 to 16, and 21 to 34 prevented sample collection.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were sampled between June 14 and 17; and additional samples were collected during low tide at intertidal sites at Oak Point (OPW, OPE, 3 stations each), Queen Anne Marsh (QAE, 3 stations), Thornes Cove (TW, 3 stations), and Port Wade (PWE, 3 stations) between July 5 and 8.

SAMPLE COLLECTION

Samples for determinations of sediment grain size, water, and organic matter content in surface (0 to 1 cm) sediment were collected at all stations using cut-off 5-mL plastic syringes as corers. Triplicate surface sediment taken from each core or grab were placed in separate 25-mL screw-top vials and stored at 4°C until analyzed within 1 wk. Similar samples for plant pigment determinations were placed in vials containing 10 mL of 90% acetone with a few drops of $MgCO_3$ (1 g 100 mL^{-1}), shaken vigorously, and left undisturbed in the dark at 4°C for 48 h.

Sediment for macrofauna biomass determinations was collected from intertidal and subtidal stations using an aluminum box corer (15.5 cm x 15.5 cm, 0.024 m^2) inserted 20 cm into sediment and Van Veen grab (0.063 m^2), respectively. Single samples were taken at all stations with the exception of the TE transect where only three stations (upper-, mid-, and low-tide levels) were sampled. Rock substrate at 22 subtidal stations prevented sample collection. All sediment in each core or grab sample was placed in 4-L plastic buckets covered with tight-fitting lids and stored at 2 to 4°C. The volume of sediment in box cores from intertidal stations was constant (4805 cm^3), but variable amounts of sediment were collected from subtidal stations depending on the depth of grab penetration. Grab sample volume was determined by measuring the height of sediment in each bucket. If volume exceeded 4 L, only one-half of the sample was taken for macrofauna biomass determinations.

ANALYTICAL METHODS

Oxidation-Reduction Potentials

A platinum-tipped micro-electrode was used to measure vertical profiles of oxidation-reduction (Eh) potentials. Depth of profiles was determined by electrode length (maximum 13 cm) or sediment depth in the grab. Electrodes were constructed by inserting a stainless steel wire (0.1 mm o.d.) with a piece of platinum (Pt) wire (0.1 mm o.d.) soldered to the end through a 20 cm length of glass tubing such that the Pt tip protruded 0.05 mm. Epoxy glue was used to provide a water-tight seal at each end of the glass tubing with the Pt wire protruding 0.05 mm from the lower end.

The Pt electrode was connected to a Fluke® 8020 B multimeter used as a potentiometer. A Radiometer® KCL electrode was used as a reference electrode. Electrodes were cleaned before use by gentle abrasion using scouring powder and calibrated using 50 mM quinhydrone solution (+275 mv at pH 7.0 and 20°C). Potentials (mv) in oxygenated deionized water were recorded after cleaning, and an average value measured between profiles was used to normalize all measurements during each sampling day to a standard "seawater blank" value. Since all measurements were at 20 ± 5°C, Eh values were calculated by adding +245 mv to measured potentials.

Inorganic Particle Size Distribution

Organic material was removed from subsamples used for particle size analysis by wet digestion in 30% H_2O_2. Disaggregated inorganic sediment was analyzed on a Coulter Multisizer IIE using methods described by Milligan and Kranck (1991). The data were plotted as smoothed histograms of log concentration (equivalent weight %) against log diameter, and modal diameters were determined from the plots.

Water Content

Wet sediment (4 to 5 g) placed in tared boats was weighed (Mettler AE164, ±0.01 mg), dried (24 h, 65°C), and reweighed to calculate water content as the percent weight loss on drying.

Organic Matter

Dry sediment (0.03 to 0.05 g), pulverized using a mortar and pestle, was placed in pre-ashed, tared aluminum foil boats, weighed, combusted (1 h, 550°C), and reweighed to calculate total organic matter as the percent weight loss on ignition. Ignition of samples at temperatures >700°C is required to remove carbonates (P. MacPherson, unpubl. data), and thus it was assumed that only volatile organic matter was removed by combustion at 550°C.

Organic Carbon and Nitrogen

Organic carbon and nitrogen in pulverized dry sediment (5 to 50 mg) were determined by elemental analysis using a Perkin Elmer 240 analyzer. A combustion temperature of 600°C was used to avoid loss of carbonates, and measures of total carbon were assumed to be organic carbon.

Plant Pigments

The fluorometric technique of Holm-Hansen et al. (1965) was used for quantification of sedimentary chlorophyll *a* and pheopigments extractable with 90% acetone. Acetone in sample vials was decanted carefully to avoid sediment resuspension. Florescence was measured using a Turner Model 10 fluorometer (primary filter, 10-050 colour specification 5-60 filter; secondary filter, 10-051 colour specification 2-64 filter; 10-045 daylight white lamp). An acid factor (Range 1) of 1.85 was derived in standardizing the instrument using pure chlorophyll *a* over a concentration range of 2 to 9 ng mL^{-1} (Y. Pan, pers. comm.). Pigment concentrations were expressed as $\mu g\ cm^{-2}$.

Macrofauna Biomass

Sediment was sieved quantitatively through 0.5 mm mesh screen using cold seawater. Macrofauna were removed and placed in cold seawater to remove adhering sediment. Molluscs were enumerated and dissected to remove tissue from shells. Wet weights of major taxa were determined within 1 h of sorting by blotting individuals or tissues on absorbent paper (15 sec) and rapid weighing (15-30 sec). Specimens were held in a 10% buffered formalin solution for 3 to 4 wk, transferred to 90% ethanol, and stored for future analysis of species composition.

DATA PRESENTATION

Data summaries of ranges, means, standard deviations (SD), and within- and between-station coefficients of variation (SD/mean) for all variables from 32 intertidal and 25 subtidal stations are tabulated in Appendix A. Intertidal stations were grouped to allow comparison of data from high-, mid-, and low-tide level sites. Subtidal stations were grouped by location - Series A (Stations 36 to 40), Series B (Stations 1, 2, and 41 to 47), and Series C (Stations 3 to 35) in the upper, central, and western parts of the Annapolis Basin, respectively.

DISCUSSION OF RESULTS

Data summaries in Appendix A show that fine-grained, well-sorted sediments (modal grain size 50 to 75 μm) occurred along the entire Queen Anne Marsh transect and at mid- to low-tide intertidal stations at Oak Point. A similar range of values occurred for subtidal Series A stations. Other subtidal stations, and intertidal sediments along transects at Port Wade and Thornes Cove, consisted of coarser sediments that were less well sorted with a wider range of grain sizes (50 to 600 μm). The observations are similar to those reported for intertidal transects at Oak Point and Queen Anne Marsh where sediments were described as consisting predominantly of silt

and clay except for coarser sandy deposits at the top of each transect (LISP 1991). The shape and size range of grain size spectra are also similar to data reported previously for intertidal sites in Minas Basin (LISP 1991) and Cobequid Bay (K. Kranck in Hargrave 1978).

Redox potentials in surficial intertidal and subtidal sediments from all stations were >100 mv with the exception of lower values (+23 to +144 mv) in subtidal Series A stations. The range of values is similar to data reported by D. Andrews from Cobequid Bay (Hargrave 1978). Macrotidal conditions within the Bay of Fundy lead to well-oxygenated sediments through tidal and wind action that resuspends surface deposits constantly.

Water content in subtidal and intertidal sediments varied from 25 to 60%, similar to the range reported for surface (upper 1 cm) sediment at intertidal stations at Thornes Cove (LISP 1991). Some variability would be caused by drying during low tide when surface deposits were exposed to desiccation for variable time periods before sample collection. Also, heterogeneity in areas such as Thornes Cove could result from the effects of intensive clam harvesting. However, a similar range of values (28 to 47%) was measured in subtidal sediments. As would be expected, fine-grained sediments at lower intertidal transect stations at Queen Anne Marsh and Oak Point and subtidal Series A sediments contained more water (41 to 61%) than more coarse-grained deposits at other stations.

Ranges of values for organic matter (2 to 7%), organic carbon (0.4 to 1.1%), nitrogen (0.06 to 0.23%), and chlorophyll *a* at intertidal and subtidal stations span the range of values observed in other areas such as Minas Basin and Cobequid Bay (Hargrave 1978; LISP 1991). As expected from sediment grain size distributions at the lower intertidal stations at Queen Anne Marsh and Oak Point, fine-grained deposits contained more organic matter. Organic carbon:nitrogen ratios by weight of 4.5 to 5.5 indicate marine-derived freshly produced biogenic organic matter at all stations with no large contribution of terrigenous or marine macrophyte material which typically have C:N ratios >10.

There was a trend toward increasing values of organic content and chlorophyll *a* in surface sediments (approximately two-fold) between high and low intertidal stations at Queen Anne Marsh and Oak Point. A similar trend was observed along three transects each at Queen Anne Marsh and Oak Point (LISP 1991). A similar trend was not observed in Daborn's (1991) study, nor in the present data set, for organic matter along two transects at Thornes Cove. The variability in these trends, along with inorganic grain size distributions, indicates that organic matter accumulates with fine sediments at some lower transect stations determined probably by specific hydrodynamic conditions determined by tidal erosion and deposition of particulate matter and sediments at each location.

The distribution of biomass and species composition of benthic macrofauna in intertidal and subtidal stations sampled during this study will be dealt with in a separate report. Highest between-station coefficients of variation for infauna biomass and numbers of *Mya arenaria* (1.26 to 2.44) occurred at mid- and low-tide stations along the Thornes Cove transect indicative of a heterogeneous distribution of fauna. Similar high (>1) values occurred for infauna in subtidal Series A and B stations. The variability indicated by samples where the standard deviation exceeds the mean shows that large numbers of samples must be collected to obtain an accurate measure of actual biomass and species distribution at these locations. While the present study is useful as a preliminary measure of benthic macrofauna biomass distribution, the data would be of limited value for detecting long-term temporal changes because of this high between-station variance.

The range of wet tissue biomass in benthic macrofauna observed in this study (30 to 3100 g m^{-2}) spans previous observations at various locations in the Bay of Fundy (Wildish et al. 1986).

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REFERENCES

Angus, R.B., C.M. Hawkins, P. Woo, and B. Mullen. 1985. Soft-shell clam survey of the Annapolis Basin, Nova Scotia, 1983. Can. Manuscr. Rep. Fish. Aquat. Sci. 1807.

Daborn, G.R., A.M. Redden, and R.S. Gregory. 1982. Ecological studies of the Annapolis Estuary 1981-82. Acadia University Institute Publ. 29, Wolfville, N.S.

Hargrave, B.T. 1978. Geochemical and biological observations in intertidal sediments from Cobequid Bay, Bay of Fundy, Nova Scotia. Fish. Mar. Serv. Tech. Rep. 782.

Hargrave, B.T., N.J. Prouse, G.A. Phillips, and P.A. Neame. 1983. Primary production and respiration in pelagic and benthic communities at two intertidal sites in the upper Bay of Fundy. Can. J. Fish. Aquat. Sci. 40 (Suppl. 1): 229-243.

Holm-Hansen, O., C.J. Lorenzen, R.W. Homes, and J.D.H. Strickland. 1965. Fluorometric determinations of chlorophyll. J. Cons. Perm. Int. Explor. Mer 30: 3-15.

LISP 1991. Littoral investigation of sediment properties, Minas Basin, 1989. G.R. Daborn [ed.]. Final Report of LISP and Mini-LISP- 1989, Acadia Centre for Estuarine Research Publ. 17, Wolfville, N.S.

Milligan, T.G., and K. Kranck. 1991. Electroresistance particle size analyzers, p. 119-128. In J.P.M. Syvitski [ed.]. Principles, Methods and Applications of Particle Size Analysis. Cambridge University Press, U.K.

Rowell, T.W. and P. Woo. 1990. Predation by the nemertean worm, *Cerebratulus lacteus* Verrill, on the soft-shell clam, *Mya arenaria* Linnaeus, 1758, and its apparent role in the destruction of a clam flat. J. Shellfish Res. 9: 291-297.

Rowell, T.W. 1991. Destruction of a clam population (*Mya arenaria* Linné) through the synergistic effects of habitat change and predation by a nemertean (*Cerebratulus lacteus* Verrill), p. 263-269. In G. Colombo, I. Ferrari, V.U. Ceccherelli, and R. Rossi [ed.]. Marine Eutrophication and Population Dynamics. Olsen & Olsen, Fredensborg, Denmark.

Wildish, D.J., D.L. Peer, and D.A. Greenberg. 1986. Benthic macrofaunal production in the Bay of Fundy and possible effects of a tidal power barrage at Economy Point-Cape Tenny. Can. J. Fish. Aquat. Sci. 43: 2410-2417.

APPENDIX A. DATA SUMMARIES

Variable: Modal Grain Size (μm)

Location	Sample #	Range	Mean	SD	Within Station c.v.	Between Station c.v.
Port Wade						
upper	2	222.9-588.1	405.5	---	---	---
mid	2	64.0-337.8	200.9	---	---	---
lower	2	121.2-294.1	207.7	---	---	---
Thornes Cove						
upper	4	59.9-512.0	213.7	213.2	---	1.00
mid	5	59.9-205.7	144.9	73.9	---	0.51
lower	5	64.0-211.1	173.2	61.6	---	0.36
Queen Anne						
upper	2	55.7-64.0	59.9	---	---	---
mid	2	52.1-59.9	56.0	---	---	---
lower	2	48.5-48.5	48.5	---	---	---
Oak Point						
upper	2	222.9-388.0	305.5	---	---	---
mid	2	64.0-68.8	66.4	---	---	---
lower	2	64.0-73.5	68.8	---	---	---
Subtidal Series						
A	5	48.5-73.5	59.5	9.6	---	0.16
B	9	73.5-168.9	112.4	33.4	---	0.30
C	11	73.5-588.1	226.4	135.0	---	0.60

Variable: Redox Potential (mv) Surface Layer (0-1 cm)

Location	Sample #	Range	Mean	SD	Within Station c.v.	Between Station c.v.
Port Wade						
upper	2	257-258	258	---	---	---
mid	2	185-211	198	---	---	---
lower	2	146-219	183	---	---	---
Thornes Cove						
upper	3	154-385	269	115	---	0.43
mid	4	159-230	207	33	---	0.16
lower	4	101-239	182	58	---	0.32
Queen Anne						
upper	2	178-187	183	---	---	---
mid	2	137-154	146	---	---	---
lower	2	54-181	118	---	---	---
Oak Point						
upper	2	142-250	196	---	---	---
mid	2	104-228	166	---	---	---
lower	2	139-169	154	---	---	---
Subtidal Series						
A	3	23-144	73	63	---	0.87
B	9	181-308	215	40	---	0.19
C	11	9-343	188	93	---	0.50

Variable: Moisture Content (%)

Location	Sample #	Range	Mean	SD	Within Station c.v.	Between Station c.v.
Port Wade						
upper	6	18.4-43.0	30.9	12.7	0.03	0.41
mid	6	32.9-45.8	42.9	1.5	0.04	0.04
lower	6	23.6-42.8	32.5	8.1	0.07	0.25
Thornes Cove						
upper	12	20.6-41.4	29.3	6.7	0.07	0.23
mid	15	24.8-56.9	34.7	10.3	0.08	0.30
lower	15	24.5-50.4	40.6	8.7	0.08	0.21
Queen Anne						
upper	6	12.0-34.2	25.5	7.8	0.30	0.31
mid	6	31.7-51.0	42.0	8.2	0.56	0.20
lower	6	47.5-57.1	51.4	3.8	0.06	0.07
Oak Point						
upper	6	16.1-33.0	24.3	7.4	0.07	0.31
mid	6	28.7-39.2	33.4	3.8	0.10	0.11
lower	6	54.4-61.4	56.8	2.7	0.04	0.05
Subtidal Series						
A	14	41.0-52.0	47.1	3.5	0.04	0.07
B	27	28.2-45.0	36.2	4.5	0.08	0.12
C	33	12.0-57.8	27.9	12.7	0.10	0.45

Variable: Organic Matter (%)

Location	Sample #	Range	Mean	SD	Within Station c.v.	Between Station c.v.
Port Wade						
upper	6	1.49-4.77	3.02	1.18	0.27	0.39
mid	6	2.77-4.25	3.59	0.50	0.12	0.14
lower	6	2.13-4.13	2.75	0.72	0.21	0.26
Thornes Cove						
upper	12	0.88-6.68	3.84	2.03	0.25	0.53
mid	15	1.29-7.40	3.38	1.95	0.37	0.58
lower	15	1.92-6.87	3.99	1.56	0.14	0.39
Queen Anne						
upper	6	2.21-3.45	2.68	0.45	0.30	0.17
mid	6	3.06-19.83	7.02	6.38	0.44	0.91
lower	6	5.07-10.07	6.69	1.85	0.27	0.28
Oak Point						
upper	6	0.54-3.21	2.05	1.14	0.27	0.55
mid	6	1.85-2.58	2.30	0.33	0.16	0.14
lower	6	4.01-7.49	5.26	1.22	0.14	0.23
Subtidal Series						
A	14	2.41-5.48	3.74	0.98	0.15	0.26
B	27	1.42-5.10	2.99	1.00	0.20	0.33
C	33	0.65-9.93	3.58	2.25	0.45	0.63

Variable: Organic Carbon (%)

Location	Sample #	Range	Mean	SD	Within Station c.v.	Between Station c.v.
Port Wade						
upper	6	0.10-0.87	0.48	0.4	0.11	0.83
mid	6	0.37-0.90	0.63	0.27	0.09	0.43
lower	6	0.11-1.16	0.5	0.43	0.25	0.85
Thornes Cove						
upper	12	0.12-1.12	0.36	0.19	0.23	0.53
mid	15	0.21-1.24	0.46	0.35	0.15	0.76
lower	15	0.39-1.44	0.89	0.34	0.14	0.38
Queen Anne						
upper	6	0.30-0.36	0.34	0.03	0.09	0.09
mid	6	0.49-1.32	0.89	0.38	0.12	0.43
lower	6	0.71-1.32	1.06	0.20	0.20	0.19
Oak Point						
upper	6	0.23-0.53	0.36	0.12	0.14	0.33
mid	5	0.25-0.64	0.44	0.16	-	0.36
lower	6	0.95-1.41	1.09	0.18	0.15	0.17
Subtidal Series						
A	14	0.66-1.34	0.95	0.22	0.12	0.23
B	27	0.31-0.84	0.52	0.16	0.22	0.31
C	33	0.10-1.36	0.44	0.35	0.22	0.80

Variable: Nitrogen (%)

Location	Sample #	Range	Mean	SD	Within Station c.v.	Between Station c.v.
Port Wade						
upper	6	0.03-0.20	0.11	0.08	0.21	0.73
mid	6	0.09-0.24	0.15	0.06	0.16	0.40
lower	6	0.05-0.17	0.10	0.05	0.21	0.50
Thornes Cove						
upper	12	0.02-0.14	0.08	0.04	0.26	0.50
mid	15	0.06-0.19	0.10	0.04	0.21	0.40
lower	15	0.10-0.25	0.17	0.05	0.90	0.29
Queen Anne						
upper	6	0.04-0.08	0.06	0.01	0.17	0.17
mid	6	0.11-0.21	0.17	0.04	0.14	0.24
lower	6	0.15-0.28	0.20	0.05	0.12	0.25
Oak Point						
upper	6	0.05-0.13	0.08	0.03	0.17	0.38
mid	5	0.09-0.10	0.09	0.01	---	0.11
lower	6	0.19-0.27	0.22	0.03	0.11	0.14
Subtidal Series						
A	14	0.18-0.29	0.23	0.03	0.10	0.13
B	27	0.08-0.18	0.13	0.03	0.18	0.23
C	33	0.03-0.28	0.11	0.06	0.24	0.55

Variable: Chl a (µg/g)

Location	Sample #	Range	Mean	SD	Within Station c.v.
Port Wade					
upper	6	92.9-236.1	164.5	49.6	0.25
mid	6	238.3-626.8	385.4	144.6	0.30
lower	6	128.1-305.1	219.6	61.2	0.27
Thornes Cove					
upper	12	231.5-580.4	353.5	94.9	0.24
mid	15	42.7-488.8	284.0	136.9	0.18
lower	15	60.9-619.1	353.9	166.3	0.47
Queen Anne					
upper	6	89.1-667.5	344.8	248.0	0.38
mid	6	84.3-1099.4	506.3	464.4	0.35
lower	6	237.2-727.8	463.3	170.3	0.38
Oak Point					
upper	6	85.1-223.9	136.5	67.4	0.55
mid	6	67.5-427.2	184.1	139.3	0.27
lower	6	99.0-807.1	446.8	307.2	0.39
Subtidal Series					
A	14	44.5-312.4	208.4	88.3	0.15
B	27	35.2-684.6	257.2	165.3	0.50
C	33	14.2-1084.1	241.2	259.9	0.28

Variable: Total Biomass (g/m^2)

Location	Sample #	Range	Mean	SD	Within Station c.v.	Between Station c.v.
Port Wade						
upper	6	53.1-1028.5	363.3	361.7	0.61	1.00
mid	6	103.0-1016.6	296.1	356.2	0.78	1.20
lower	6	44.1-4901.8	931.4	1946.8	1.06	2.09
Thornes Cove						
upper	6	164.8-493.0	365.4	128.3	0.26	0.35
mid	6	31.8-4537.0	1125.6	1740.2	0.71	1.55
lower	6	97.2-6398.7	3114.0	2697.6	0.97	0.87
Queen Anne						
upper	6	47.4-504.7	175.4	165.7	0.64	0.94
mid	6	100.0-1365.9	662.4	438.7	0.67	0.66
lower	6	0.0-4649.8	825.4	1875.1	1.30	2.27
Oak Point						
upper	6	133.3-1308.4	738.9	405.1	0.43	0.55
mid	6	27.2-294.4	137.3	121.7	0.58	0.89
lower	6	6.9-181.9	69.7	63.1	0.85	0.91
Subtidal Series						
A	5	20.6-1296.1	357.1	544.1	---	1.52
B	9	15.3-3082.8	516.1	988.6	---	1.92
C	11	1.7-86.5	33.0	23.0	---	0.70

Variable: Infauna Biomass (g/m^2)

Location	Sample #	Range	Mean	SD	Within Station c.v.	Between Station c.v.
Port Wade						
upper	6	53.1-1028.5	363.3	361.7	0.61	1.00
mid	6	103.0-1016.6	296.1	356.2	0.78	1.20
lower	6	44.1-673.5	197.2	244.8	1.07	1.24
Thornes Cove						
upper	6	164.8-493.0	365.4	128.3	0.26	0.35
mid	6	31.8-2601.8	792.7	1000.5	0.56	1.26
lower	6	0.0-328.0	103.1	117.5	0.86	1.14
Queen Anne						
upper	6	47.4-504.7	175.4	165.7	0.64	0.94
mid	6	48.3-920.9	424.3	335.6	0.46	0.79
lower	6	0.0-196.8	55.8	76.8	0.90	0.73
Oak Point						
upper	6	133.3-1296.6	737.0	401.8	0.42	0.55
mid	6	0.9-294.4	129.3	128.6	0.73	0.99
lower	6	6.9-181.9	69.7	63.1	0.85	0.91
Subtidal Series						
A	5	20.6-369.3	106.5	147.4	---	1.38
B	9	15.3-629.5	189.2	226.2	---	1.20
C	11	1.7-86.5	33.0	23.0	---	0.70

Variable: Mya arenaria (No./ m^2)

Location	Sample #	Range	Mean	SD	Within Station c.v.	Between Station c.v.
Port Wade						
upper	6	0-210	308	461.0	1.07	1.50
mid	6	42-252	101	97.0	1.24	0.96
lower	6	0-42	21	---	---	---
Thornes Cove						
upper	6	42-4242	2224	2141.0	0.42	0.96
mid	6	0-1134	1764	2885.0	0.22	1.64
lower	6	0-42	7	17.1	1.71	2.44
Queen Anne						
upper	6	0-4236	1272	1580.0	1.04	1.24
mid	6	546-7893	3342	3135.0	0.24	0.94
lower	6	0-672	532	121.0	0.78	0.23
Oak Point						
upper	6	336-3024	1449	1110.0	0.48	0.77
mid	6	0-126	77	62.0	0.97	0.81
lower	6	42-252	154	87.0	0.36	0.56

APPENDIX B. PORT WADE INTERTIDAL TRANSECT DATA

DATE: JUNE 5, 1993 LAT: 44° 40.6' N

LOCATION: PORT WADE LONG: 65° 42.4' W

SAMPLE: PWW 1

Modal Grain Size (um) 588.1

Depth (cm)	Eh (mv)
1	257
3	138
5	95
7	-45

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	19.4	18.4	20.2	19.3	0.9
% Organic	1.49	2.87	2.10	2.15	0.69
% Organic C	0.11	0.10	0.14	0.12	0.02
% Nitrogen	0.03	0.04	0.04	0.04	0.01
Chl a (ug/g)	152.1	92.9	156.7	133.9	35.6
Pheopigments (ug/g)	158.6	101.1	170.6	143.4	37.1
% Chl a	48.9	47.9	47.9	48.2	0.6
Macrofauna Biomass (g/m 2)	195.0	128.4	53.1	125.5	71.0

Major Taxa

molluscs - bivalves (clams)
- gastropods (snails)

crustaceans - amphipods

DATE: JUNE 5, 1993 LAT: 44° 40.4' N

LOCATION: PORT WADE LONG: 65° 42.3' W

SAMPLE: PWW 4

Modal Grain Size (um) 337.8

Depth (cm)	Eh (mv)
1	211
3	185
5	160
7	140
9	108
11	88
13	82

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	32.9	33.1	34.3	33.4	0.8
% Organic	3.78	3.56	4.25	3.86	0.35
% Organic C	0.37	0.39	0.40	0.39	0.01
% Nitrogen	0.09	0.09	0.12	0.10	0.01
Chl a (ug/g)	453.4	351.2	626.8	477.1	139.3
Pheopigments (ug/g)	669.8	440.2	1181.7	763.9	379.6
% Chl a	40.4	44.4	34.7	39.8	4.9
Macrofauna Biomass (g/m 2)	112.7	1016.6	103.0	410.8	524.7

Major Taxa

molluscs - bivalves (clams)
polychaetes

DATE: JUNE 5, 1993 LAT: 44° 40.2' N

LOCATION: PORT WADE LONG: 65° 42.1' W

SAMPLE: PWW 7

Modal Grain Size (um) 294.1

Depth (cm)	Eh (mv)
1	219
3	203
5	180
7	175
9	167
11	202
13	191

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	27.3	23.6	25.3	25.4	1.9
% Organic	2.13	4.13	2.75	3.00	1.02
% Organic C	0.11	0.17	0.16	0.15	0.03
% Nitrogen	0.05	0.06	0.05	0.05	0.01
Chl a (ug/g)	128.1	249.3	305.1	227.5	90.5
Pheopigments (ug/g)	168.9	150.3	323.8	214.3	95.3
% Chl a	43.1	62.4	48.5	51.3	10.0
Macrofauna					
Biomass (g/m 2) (infauna)	44.1	81.3	673.5	266.3	353.1
(mussels)	0.0	0.0	4228.3	1409.4	2441.2
(total)	44.1	81.3	4901.8	1675.7	2793.9

Major Taxa

molluscs - bivalves (mussels)
- gastropods (snails, whelks, limpets)
polychaetes

DATE: JULY 7, 1993 LAT: 44° 41.1' N

LOCATION: PORT WADE LONG: 65° 41.7' W

SAMPLE: PWE 1

Modal Grain Size (um) 222.9

Depth (cm)	Eh (mv)
1	258
3	255
5	250
7	237
9	228
11	186
13	67

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	43.0	41.9	42.6	42.5	0.6
% Organic	4.77	3.87	3.03	3.89	0.87
% Organic C	0.87	0.79	0.85	0.84	0.04
% Nitrogen	0.15	0.20	0.17	0.17	0.03
Chl a (ug/g)	146.1	236.1	203.3	195.2	45.5
Pheopigments (ug/g)	371.2	538.0	516.7	475.3	90.8
% Chl a	28.2	30.5	28.2	29.0	1.3
Macrofauna Biomass (g/m 2)	511.8	263.1	1028.5	601.1	390.4

Major Taxa

molluscs - bivalves (clams)
- gastropods (snails)
polychaetes

DATE: JULY 7, 1993 LAT: 44° 40.9' N

LOCATION: PORT WADE LONG: 65° 41.6' W

SAMPLE: PWE 4

Modal Grain Size (um) 64.0

Depth (cm)	Eh (mv)
1	185
3	135
5	85
7	73
9	69
11	35
13	35

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	41.6	45.8	42.5	43.3	2.2
% Organic	3.61	3.64	2.77	3.34	0.49
% Organic C	0.81	0.90	0.90	0.87	0.05
% Nitrogen	0.24	0.17	0.16	0.19	0.04
Chl a (ug/g)	394.3	248.5	238.3	293.7	87.3
Pheopigments (ug/g)	769.3	533.8	605.6	636.2	120.7
% Chl a	33.9	31.8	28.2	31.3	2.9
Macrofauna Biomass (g/m 2)	127.9	189.4	226.7	181.3	49.9

Major Taxa

molluscs - bivalves (clams)
- gastropods (snails)
crustaceans - amphipods
polychaetes

DATE: JULY 7, 1993 LAT: 44° 40.7' N

LOCATION: PORT WADE LONG: 65° 41.4' W

SAMPLE: PWE 7

Modal Grain Size (um) 121.2

Depth (cm)	Eh (mv)
1	146
3	107
5	101
7	98
9	93
11	93
13	89

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	42.8	38.5	37.4	39.6	2.9
% Organic	2.34	2.71	2.42	2.49	0.19
% Organic C	1.16	0.70	0.73	0.86	0.26
% Nitrogen	0.17	0.12	0.14	0.14	0.03
Chl a (ug/g)	234.5	224.9	175.5	211.6	31.7
Pheopigments (ug/g)	472.8	453.5	316.6	414.3	85.2
% Chl a	33.2	33.2	35.7	34.0	1.4
Macrofauna					
Biomass (g/m 2) (infauna)	90.9	48.1	245.1	128.0	103.6
(mussels)	0.0	177.1	0.0	59.0	102.2
(total)	90.9	225.2	245.1	187.1	83.9

Major Taxa

molluscs - bivalves (clams, mussels)
- gastropods (snails)
polychaetes

APPENDIX C. THORNES COVE INTERTIDAL TRANSECT DATA

DATE: JUNE 3, 1993 LAT: 44° 41.2' N

LOCATION: THORNES COVE LONG: 65° 40.1' W

SAMPLE: TE 20

Modal Grain Size (um) 64.0

Depth (cm)	Eh (mv)
1	203
3	131
5	117
7	109
9	108
11	105
13	37

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	44	47.8	50.2	47.3	3.1
% Organic	6.87	4.50	6.14	5.84	1.21
% Organic C	0.93	0.99	1.21	1.04	0.15
% Nitrogen	0.16	0.15	0.18	0.16	0.02
Chl a (ug/g)	105.4	484.3	210.6	266.8	195.6
Pheopigments (ug/g)	359.0	1205.8	554.7	706.5	443.3
% Chl a	22.7	28.7	27.5	26.3	3.2
Macrofauna					
Biomass (g/m 2) (infauna)	28.2	57.2	97.2	60.9	34.6
(mussels)	5161.3	4748.8	0.0	3303.4	2868.2
(total)	5189.5	4806.0	97.2	3364.2	2835.8

Major Taxa

molluscs - bivalves (mussels)
- gastropods (snails, limpets)
crustaceans - barnacles
polychaetes

DATE: JUNE 3, 1993 LAT: 44° 41.9' N

LOCATION: THORNES COVE LONG: 65° 40.5' W

SAMPLE: TE 1

Modal Grain Size (um) 222.9

Depth (cm)	Eh (mv)
1	385
3	272
5	262
7	247
9	236
11	216
13	212

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	24.5	26.4	33.2	28.0	4.6
% Organic	6.33	2.64	2.57	3.8	2.2
% Organic C	0.52	0.17	0.21	0.30	0.19
% Nitrogen	0.08	0.05	0.06	0.06	0.02
Chl a (ug/g)	403.5	331.5	283.7	339.6	60.3
Pheopigments (ug/g)	410.9	304.4	223.7	313.0	93.9
% Chl a	49.5	52.1	55.9	52.5	3.2
Macrofauna Biomass (g/m 2)	409.2	468.7	493.0	457.0	43.1

Major Taxa

molluscs - bivalves (clams)
- gastropods (snails)
crustaceans - amphipods
polychaetes

DATE: JUNE 3, 1993 LAT: 44° 41.85' N

LOCATION: THORNES COVE LONG: 65° 40.5' W

SAMPLE: TE 3

Modal Grain Size (um) 59.9

Depth (cm)	Eh (mv)
1	154
3	155
5	163
7	75
9	31
11	26
13	24

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	37.1	36.6	41.4	38.4	2.6
% Organic	5.16	6.68	5.23	5.69	0.86
% Organic C	0.60	0.49	0.60	0.56	0.06
% Nitrogen	0.14	0.13	0.13	0.13	0.01
Chl a (ug/g)	280.6	396.7	580.4	419.2	151.2
Pheopigments (ug/g)	749.7	762.9	1163.4	892.0	235.1
% Chl a	27.2	34.2	33.3	31.6	3.8

Macrofauna
Biomass (g/m 2) no samples

Major Taxa

DATE: JUNE 3, 1993 LAT: 44° 41.8' N

LOCATION: THORNES COVE LONG: 65° 40.5' W

SAMPLE: TE 5

Modal Grain Size (um) 59.9

Depth (cm)	Eh (mv)
1	267
3	225
5	212
7	205
9	184
11	163
13	171

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	29.3	28.3	30.2	29.3	1.0
% Organic	4.84	4.81	4.35	4.67	0.27
% Organic C	0.47	0.45	0.38	0.43	0.05
% Nitrogen	0.13	0.09	0.07	0.10	0.03
Chl a (ug/g)	231.5	337.2	287.3	285.3	52.9
Pheopigments (ug/g)	478.9	689.4	452.6	540.3	129.8
% Chl a	32.6	32.8	38.8	34.7	3.5

Macrofauna
Biomass (g/m 2) no samples

Major Taxa

DATE: JUNE 3, 1993 LAT: 44° 41.75' N

LOCATION: THORNES COVE LONG: 65° 40.5' W

SAMPLE: TE 7

Modal Grain Size (um) 69.3

Depth (cm)	Eh (mv)
1	225
3	211
5	122
7	117
9	97
11	83
13	22

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	24.8	25.7	30.4	27.0	3.0
% Organic	6.36	4.70	7.40	6.15	1.36
% Organic C	0.24	0.29	0.28	0.27	0.03
% Nitrogen	0.06	0.08	0.08	0.07	0.01
Chl a (ug/g)	186.4	179.1	193.4	186.3	7.2
Pheopigments (ug/g)	473.8	575.9	440.7	496.8	70.5
% Chl a	28.2	23.7	30.5	27.5	3.5

Macrofauna
Biomass (g/m 2) no samples

Major Taxa

DATE: JUNE 3, 1993 LAT: 44° 41.7' N

LOCATION: THORNES COVE LONG: 65° 40.5' W

SAMPLE: TE 9

Modal Grain Size (um) 205.7

Depth (cm)	Eh (mv)
1	230
3	148
5	132
7	99
9	25
11	8
13	-4

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	28.0	26.2	27.7	27.3	1.0
% Organic	5.34	1.71	1.71	2.92	2.10
% Organic C	0.22	0.34	0.21	0.26	0.07
% Nitrogen	0.08	0.07	0.10	0.08	0.02
Chl a (ug/g)	474.5	430.5	488.8	464.6	30.4
Pheopigments (ug/g)	797.8	480.7	709.6	662.7	163.7
% Chl a	37.3	47.2	40.8	41.8	5.0

Macrofauna
Biomass (g/m 2) no samples

Major Taxa

DATE: JUNE 3, 1993 LAT: 44° 41.6' N

LOCATION: THORNES COVE LONG: 65° 40.1' W

SAMPLE: TE 11

Modal Grain Size (um) 205.7

Depth (cm)	Eh (mv)
1	212
3	165
5	108
7	87
9	36
11	6

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	33.5	32.8	31.1	32.5	1.2
% Organic	2.00	1.95	2.38	2.11	0.24
% Organic C	0.34	0.37	0.32	0.34	0.03
% Nitrogen	0.10	0.09	0.09	0.09	0.01
Chl a (ug/g)	362.4	286.2	484.5	377.7	100.0
Pheopigments (ug/g)	609.8	534.3	867.2	670.4	174.5
% Chl a	37.3	34.9	35.8	36.0	1.2
Macrofauna Biomass (g/m 2)	96.0	84.9	31.8	70.9	34.3

Major Taxa

molluscs - gastropods (snails)
polychaetes

DATE: JUNE 3, 1993 LAT: 44° 41.5' N

LOCATION: THORNES COVE LONG: 65° 40.1' W

SAMPLE: TE 13

Modal Grain Size (um) 183.8

Depth (cm)	Eh (mv)
1	159
3	94
5	113
7	124
9	103
11	68
13	-26

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	35.4	27.9	36.8	33.4	4.8
% Organic	1.84	2.04	2.77	2.22	0.49
% Organic C	0.35	0.28	0.30	0.31	0.04
% Nitrogen	0.07	0.09	0.07	0.08	0.01
Chl a (ug/g)	228.3	271.6	269.9	256.6	24.5
Pheopigments (ug/g)	445.5	457.0	519.0	473.8	39.5
% Chl a	33.9	37.3	34.2	35.1	1.9

Macrofauna
Biomass (g/m 2) no samples

Major Taxa

DATE: JUNE 3, 1993 LAT: 44° 41.4' N

LOCATION: THORNES COVE LONG: 65° 40.1' W

SAMPLE: TE 15

Modal Grain Size (um) 189.3

Depth (cm)	Eh (mv)
1	185
3	144
5	154
7	191
9	148
11	75
13	26

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	36.8	36.8	42.8	38.8	3.5
% Organic	2.85	2.26	1.92	2.34	0.47
% Organic C	0.41	0.45	0.39	0.42	0.03
% Nitrogen	0.11	0.10	0.11	0.11	0.01
Chl a (ug/g)	329.9	387.4	371.4	362.9	29.7
Pheopigments (ug/g)	600.2	745.0	1069.1	804.8	240.1
% Chl a	35.5	34.2	25.8	31.8	5.3

Macrofauna
Biomass (g/m 2) no samples

Major Taxa

DATE: JUNE 3, 1993 LAT: 44° 41.3' N

LOCATION: THORNES COVE LONG: 65° 40.1' W

SAMPLE: TE 17

Modal Grain Size (um) 211.1

Depth (cm)	Eh (mv)
1	239
3	93
5	56
7	52
9	3
11	9
13	-47

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	24.5	26.9	25.8	25.7	1.2
% Organic	2.28	2.38	2.43	2.36	0.08
% Organic C	0.53	0.69	0.68	0.63	0.09
% Nitrogen	0.12	0.15	0.25	0.17	0.07
Chl a (ug/g)	384.5	426.4	170.5	327.1	137.3
Pheopigments (ug/g)	724.9	561.6	332.6	539.7	197.1
% Chl a	34.7	43.2	33.9	37.3	5.2

Macrofauna
Biomass (g/m 2) no samples

Major Taxa

DATE: JUNE 3, 1993 LAT: 44° 41.25' N

LOCATION: THORNES COVE LONG: 65° 40.1' W

SAMPLE: TE 19

Modal Grain Size (um) 200.9

Depth (cm)	Eh (mv)
1	101
3	96
5	76
7	26
9	-12
11	-80
13	-85

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	41.9	50.4	44.4	45.6	4.4
% Organic	4.52	5.50	4.36	4.79	0.62
% Organic C	1.04	1.44	1.26	1.25	0.20
% Nitrogen	0.21	0.22	0.20	0.21	0.01
Chl a (ug/g)	562.8	392.9	543.0	499.6	92.9
Pheopigments (ug/g)	1031.7	998.3	1884.3	1304.8	502.2
% Chl a	35.3	28.3	22.4	28.7	6.5

Macrofauna
Biomass (g/m 2) no samples

Major Taxa

DATE: JULY 6, 1993 LAT: 44° 41.6' N

LOCATION: THORNES COVE LONG: 65° 40.9' W

SAMPLE: TW 1

Modal Grain Size (um) 512.0

Depth (cm) Eh (mv) no data

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	21.8	22.1	20.6	21.5	0.8
% Organic	1.08	0.88	1.53	1.16	0.33
% Organic C	0.12	0.13	0.13	0.13	0.01
% Nitrogen	0.02	0.03	0.03	0.03	0.01
Chl a (ug/g)	453.4	297.8	357.9	369.7	0.0
Pheopigments (ug/g)	282.6	229.5	328.7	280.3	49.6
% Chl a	61.6	56.5	52.1	56.7	4.8
Macrofauna Biomass (g/m 2)	164.8	256.2	400.3	273.8	118.7

Major Taxa

molluscs - bivalves (clams)
- gastropods (snails)
polychaetes

DATE: JULY 6, 1993 LAT: 44° 41.3' N

LOCATION: THORNES COVE LONG: 65° 40.6' W

SAMPLE: TW 5

Modal Grain Size (um) 59.9

Depth (cm) Eh (mv) no data

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	50.1	52.8	56.9	53.3	3.4
% Organic	1.29	4.93	4.29	3.50	1.94
% Organic C	1.05	1.12	1.24	1.14	0.10
% Nitrogen	0.15	0.19	0.19	0.18	0.02
Chl a (ug/g)	42.7	227.6	133.7	134.7	92.5
Pheopigments (ug/g)	386.1	727.7	458.2	524.0	180.1
% Chl a	10.0	23.8	22.6	18.8	7.6
Macrofauna					
Biomass (g/m 2 m 2) (infauna)	742.9	1198.6	2601.8	1514.4	968.9
(mussels)	0.0	62.4	1935.2	665.9	1099.7
(total)	742.8	1261.0	4537.0	2180.3	2057.4

Major Taxa

molluscs - bivalves (clams, mussels)
- gastropods (snails, whelks)
crustaceans - amphipods
polychaetes

DATE: JULY 6, 1993 LAT: 44° 41.0' N

LOCATION: THORNES COVE LONG: 65° 40.4' W

SAMPLE: TW 11

Modal Grain Size (um) 200.9

Depth (cm) Eh (mv) no data

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	44.5	48.7	42.8	45.3	3.0
% Organic	4.41	5.26	4.21	4.63	0.56
% Organic C	1.17	1.16	0.83	1.05	0.19
% Nitrogen	0.18	0.21	0.14	0.18	0.04
Chl a (ug/g)	260.0	619.1	60.9	313.3	282.9
Pheopigments (ug/g)	836.1	1573.4	244.7	884.7	665.7
% Chl a	23.7	28.2	19.9	23.9	4.2
Macrofauna					
Biomass (g/m 2) (infauna)	0.0	328.0	107.9	145.3	167.2
(mussels)	1864.5	0.0	6290.8	2718.4	3231.2
(total)	1864.5	328.0	6398.7	2863.7	3156.3

Major Taxa

molluscs - bivalves (clams, mussels)
- gastropods (snails, whelks, limpets)
crustaceans - barnacles, amphipods, rock crabs
polychaetes

APPENDIX D. QUEEN ANNE MARSH INTERTIDAL TRANSECT DATA

DATE: JUNE 2, 1993 LAT: 44° 42.7' N

LOCATION: QUEEN ANNE MARSH LONG: 65° 36.2' W

SAMPLE: QAW 2

Modal Grain Size (um) 64.0

Depth (cm)	Eh (mv)
1	178
3	128
5	109
7	55
9	-14
11	-27
13	-30

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	22.3	34.2	12.0	22.8	11.1
% Organic	2.31	2.46	2.21	2.33	0.13
% Organic C	0.36	0.36	0.30	0.34	0.03
% Nitrogen	0.06	0.05	0.04	0.05	0.01
Chl a (ug/g)	605.7	667.5	374.0	549.1	154.7
Pheopigments (ug/g)	1200.5	1232.8	1249.2	1227.5	24.8
% Chl a	33.5	35.1	23.0	30.5	6.6
Macrofauna Biomass (g/m 2)	140.7	504.7	141.8	262.4	209.8

Major Taxa

molluscs - bivalves (clams)
crustaceans - amphipods
polychaetes

DATE: JUNE 2, 1993 LAT: 44° 42.6' N

LOCATION: QUEEN ANNE MARSH LONG: 65° 36.2' W

SAMPLE: QAW 5

Modal Grain Size (um) 52.1

Depth (cm)	Eh (mv)
1	137
3	174
5	151
7	175
9	149
11	129
13	107

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	51.0	48.5	48.4	49.3	1.5
% Organic	---	5.80	5.85	3.88	---
% Organic C	1.32	1.23	1.14	1.23	0.09
% Nitrogen	0.20	0.21	0.19	0.20	0.01
Chl a (ug/g)	1099.4	1000.5	604.6	901.5	261.8
Pheopigments (ug/g)	1449.8	1361.6	879.9	1230.4	306.8
% Chl a	43.1	42.4	40.7	42.1	1.2
Macrofauna Biomass (g/m 2)	920.9	640.2	553.5	704.9	192.0

Major Taxa

molluscs - bivalves (clams)
polychaetes

DATE: JUNE 2,1993 LAT: 44° 42.4' N

LOCATION: QUEEN ANNE MARSH LONG: 65° 36.2' W

SAMPLE: QAW 7

Modal Grain Size (um) 48.5

Depth (cm)	Eh (mv)
1	181
3	141
5	115
8	111
9	121
11	133
13	143

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	51.3	50.0	47.5	49.6	1.9
% Organic	5.93	10.07	5.07	7.02	2.67
% Organic C	1.03	1.32	1.01	1.12	0.17
% Nitrogen	0.16	0.17	0.15	0.16	0.01
Chl a (ug/g)	339.2	507.2	727.8	524.7	194.9
Pheopigments (ug/g)	773.0	1155.8	1205.2	1044.7	236.6
% Chl a	30.5	30.5	37.7	32.9	4.2
Macrofauna Biomass (g/m 2)	4.9	9.9	0.0	4.9	5.0

Major Taxa

molluscs - bivalves (clams)
polychaetes

DATE: JULY 8, 1993 LAT: 44° 42.7' N

LOCATION: QUEEN ANNE MARSH LONG: 65° 35.9' W

SAMPLE: QAE 1

Modal Grain Size (um) 55.7

Depth (cm)	Eh (mv)
1	187
3	72
5	-18
7	-41
9	-56
11	-70
13	-86

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	27.2	31.4	25.6	28.1	3.0
% Organic	2.78	2.85	3.45	3.0	0.4
% Organic C	0.32	0.36	0.32	0.33	0.03
% Nitrogen	0.06	0.08	0.07	0.07	0.01
Chl a (ug/g)	217.5	114.9	89.1	140.5	67.9
Pheopigments (ug/g)	626.2	359.7	261.5	415.8	188.7
% Chl a	24.2	25.4	17.7	22.4	4.1
Macrofauna Biomass (g/m 2)	82.7	47.4	135.3	88.5	44.2

Major Taxa

molluscs - bivalves (clams, macoma)
- gastropods (snails, whelks)
polychaetes

DATE: JULY 8, 1993 LAT: 44° 42.6' N

LOCATION: QUEEN ANNE MARSH LONG: 65° 35.9' W

SAMPLE: QAE 3

Modal Grain Size (um) 59.9

Depth (cm)	Eh (mv)
1	154
3	134
5	119
7	106
9	108
11	128
13	133

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	37.1	31.7	35.4	34.7	2.8
% Organic	3.56	3.06	4.04	3.55	0.49
% Organic C	0.51	0.49	0.65	0.55	0.09
% Nitrogen	0.12	0.11	0.16	0.13	0.03
Chl a (ug/g)	85.7	84.3	163.3	111.1	45.2
Pheopigments (ug/g)	400.1	363.4	607.7	457.1	131.7
% Chl a	17.7	18.8	21.2	19.2	1.8
Macrofauna					
Biomass (g/m 2) (infauna)	232.5	150.3	48.3	143.7	92.3
(mussels)	1133.4	243.8	51.7	476.3	577.1
(total)	1365.9	394.1	100.0	620.0	662.5

Major Taxa

molluscs - bivalves (clams, mussels)
- gastopods (snails)
crustaceans - barnacles, rock crabs
polychaetes

DATE: JULY 8, 1993 LAT: 44° 42.4' N

LOCATION: QUEEN ANNE MARSH LONG: 65° 36.9' W

SAMPLE: QAE 7

Modal Grain Size (um) 48.5

Depth (cm)	Eh (mv)
1	54
3	130
5	140
7	129
9	97
11	99
13	90

Upper 1 cm		A	B	C	MEAN	SD
% Moisture		47.9	57.1	54.5	53.2	4.7
% Organic		5.15	7.04	6.85	6.35	1.04
% Organic C		0.71	1.11	1.15	0.99	0.24
% Nitrogen		0.19	0.28	0.23	0.23	0.04
Chl a (ug/g)		537.7	237.2	430.9	401.9	152.3
Pheopigments (ug/g)		683.0	490.8	547.3	573.7	98.8
% Chl a		44.1	32.6	44.1	40.3	6.6
Macrofauna						
Biomass (g/m 2)	(infauna)	90.9	196.8	32.5	106.7	83.3
	(mussels)	0.0	0.0	4617.3	1539.1	2665.8
	(total)	90.9	196.8	4649.8	1645.8	2602.1

Major Taxa

molluscs - bivalves (clams, mussels)
- gastropods (snails, whelks)
crustaceans - barnacles, rock crabs
polychaetes

APPENDIX E. OAK POINT INTERTIDAL TRANSECT DATA

DATE: JULY 5, 1993 LAT: 44° 42.1' N

LOCATION: OAK POINT LONG: 65° 34.8' W

SAMPLE: OPE 1

Modal Grain Size (um) 222.9

Depth (cm)	Eh (mv)
1	142
3	121
5	92
7	-53
9	-72
11	-78
13	-90

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	30.5	29.4	33.0	31.0	1.8
% Organic	3.21	2.78	3.12	3.04	0.23
% Organic C	0.46	0.42	0.53	0.47	0.06
% Nitrogen	0.09	0.10	0.13	0.11	0.02
Chl a (ug/g)	85.2	102.9	222.1	136.7	74.5
Pheopigments (ug/g)	241.7	242.2	598.6	360.8	205.9
% Chl a	26.1	29.8	27.1	27.7	1.9
Macrofauna					
Biomass (g/m 2) (infauna)	891.8	938.4	1296.6	1042.3	221.5
(mussels)	0.0	0.0	11.8	3.9	6.8
(total)	891.8	938.4	1308.4	1046.2	228.3

Major Taxa

molluscs - bivalves (clams, mussels)
polychaetes

DATE: JULY 5, 1993 LAT: 44° 42.2' N

LOCATION: OAK POINT LONG: 65° 34.8' W

SAMPLE: OPE 4

Modal Grain Size (um) 68.8

Depth (cm)	Eh (mv)
1	104
3	74
5	5
7	1
9	-35
11	-75
13	-8

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	30.4	32.3	33.7	32.1	1.7
% Organic	1.94	2.55	2.35	2.28	0.31
% Organic C	0.25	0.34	0.39	0.33	0.07
% Nitrogen	0.09	0.09	0.09	0.09	0.00
Chl a (ug/g)	205.1	427.2	239.9	290.7	119.5
Pheopigments (ug/g)	400.1	1085.6	690.6	725.4	344.1
% Chl a	33.9	28.2	25.8	29.3	4.2
Macrofauna					
Biomass (g/m 2) (infauna)	68.4	43.5	0.9	37.6	34.1
(mussels)	21.8	0.0	26.3	16.0	14.1
(total)	90.2	43.5	27.2	53.6	32.7

Major Taxa

molluscs - bivalves (clams, mussels)
polychaetes

DATE: JULY 5, 1993 LAT: 44° 42.3' N

LOCATION: OAK POINT LONG: 65° 34.8' W

SAMPLE: OPE 8

Modal Grain Size (um) 64.0

Depth (cm)	Eh (mv)
1	169
3	148
5	124
7	107
9	101
11	37
13	

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	55.3	61.4	58.6	58.4	3.1
% Organic	5.20	7.49	5.57	6.09	1.23
% Organic C	0.96	1.41	1.11	1.16	0.23
% Nitrogen	0.21	0.27	0.23	0.24	0.03
Chl a (ug/g)	669.3	807.1	667.4	714.6	80.1
Pheopigments (ug/g)	1700.7	1521.8	1608.5	1610.3	89.5
% Chl a	28.2	34.7	29.3	30.7	3.5
Macrofauna Biomass (g/m 2)	91.3	52.8	66.7	70.3	19.5

Major Taxa

molluscs - bivalves (clams)
polychaetes

DATE: JULY 5, 1993 LAT: 44° 41.8' N

LOCATION: OAK POINT LONG: 65° 35.3' W

SAMPLE: OPW 1

Modal Grain Size (um) 388.0

Depth (cm)	Eh (mv)
1	250
3	186
5	132
7	81
9	-15
11	-30
13	

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	16.1	19.1	17.9	17.7	1.5
% Organic	1.12	1.52	0.54	1.06	0.49
% Organic C	0.23	0.24	0.30	0.26	0.04
% Nitrogen	0.05	0.07	0.06	0.06	0.01
Chl a (ug/g)	85.1	99.5	223.9	136.2	76.3
Pheopigments (ug/g)	166.0	242.2	331.2	246.5	82.7
% Chl a	33.9	29.1	40.3	34.4	5.6
Macrofauna Biomass (g/m 2)	490.6	133.3	671.0	431.6	273.7

Major Taxa

molluscs - bivalves (clams)
crustaceans - amphipods
polychaetes

DATE: JULY 5, 1993 LAT: 44° 41.9' N

LOCATION: OAK POINT LONG: 65° 35.3' W

SAMPLE: OPW 4

Modal Grain Size (um) 64.0

Depth (cm)	Eh (mv)
1	228
3	213
5	191
7	171
9	140
11	126
13	101

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	28.7	35.8	39.2	34.6	5.4
% Organic	1.85	2.53	2.58	2.32	0.41
% Organic C	0.64	0.58	---	0.41	---
% Nitrogen	0.10	0.10	---	0.07	---
Chl a (ug/cm2)	76.6	67.5	88.3	77.5	10.4
Pheopigments (ug/cm2)	285.2	370.7	276.5	310.8	52.1
% Chl a	21.2	15.4	24.2	20.3	4.5
Macrofauna Biomass (g/m 2)	288.8	79.9	294.4	221.0	122.3

Major Taxa

molluscs - bivalves (clams)
polychaetes

DATE: JULY 5, 1993 LAT: 44° 42.0' N

LOCATION: OAK POINT LONG: 65° 35.3' W

SAMPLE: OPW 8

Modal Grain Size (um) 73.5

Depth (cm)	Eh (mv)
1	139
3	-96
5	-141
7	-181
9	-198
11	-204
13	-198

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	54.4	56.4	54.7	55.2	1.1
% Organic	4.01	4.69	4.59	4.43	0.37
% Organic C	0.95	1.13	0.95	1.01	0.10
% Nitrogen	0.19	0.21	0.22	0.21	0.02
Chl a (ug/cm2)	99.0	317.0	121.0	179.0	120.0
Pheopigments (ug/cm2)	353.7	618.5	256.2	409.5	187.5
% Chl a	21.9	33.9	32.1	29.3	6.5
Macrofauna Biomass (g/m 2)	18.6	6.9	181.9	69.1	97.8

Major Taxa

molluscs - bivalves (clams)
- gastropods (whelks)
polychaetes

APPENDIX F. ANNAPOLIS BASIN SUBTIDAL STATION DATA

DATE: JUNE 14, 1993 LAT: 44° 39.9' N

LOCATION: STN 1 LONG: 65° 38.2' W

SAMPLE: AB 1

Modal Grain Size (um) 128.0

Sediment Volume in Grab (cm3) 3290.4

Depth (cm)	Eh (mv)
1	217
3	207

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	34.5	30.3	30.5	31.8	2.4
% Organic	3.62	4.13	4.17	3.97	0.31
% Organic C	0.84	0.36	0.42	0.54	0.26
% Nitrogen	0.14	0.09	0.08	0.10	0.03
Chl a (ug/g)	98.8	259.4	29.0	129.1	118.1
Pheopigments (ug/g)	511.0	921.5	265.3	565.9	331.5
% Chl a	16.2	22.0	9.9	16.0	6.1

Macrofauna
Biomass (g/m 2) 44.5

Major Taxa

crustaceans - amphipods
polychaetes

DATE: JUNE 14, 1993 LAT: 44° 39.1' N

LOCATION: STN 2 LONG: 65° 40.2' W

SAMPLE: AB 2

Modal Grain Size (um) 147.0

Sediment Volume in Grab (cm3) 4502.6

Depth (cm)	Eh (mv)
1	308
3	288
5	308
7	276
9	82

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	33.7	32.0	31.0	32.2	1.4
% Organic	3.99	5.10	4.13	4.41	0.60
% Organic C	0.55	0.35	0.37	0.42	0.11
% Nitrogen	0.17	0.09	0.11	0.12	0.04
Chl a (ug/g)	158.7	59.1	35.2	84.3	65.5
Pheopigments (ug/g)	728.2	429.9	400.5	519.5	181.3
% Chl a	14.1	12.1	8.1	11.4	3.1

Macrofauna
Biomass (g/m 2) 629.5

Major Taxa

molluscs - bivalves (quahaugs)
crustaceans - amphipods
polychaetes

DATE: JUNE 14, 1993 LAT: 44° 38.8' N

LOCATION: STN 3 LONG: 65° 41.6' W

SAMPLE: AB 3

Modal Grain Size (um) 194.0

Sediment Volume in Grab (cm3) 4502.6

Depth (cm)	Eh (mv)
1	220
3	184
5	180
7	171

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	29.1	28.6	29.7	29.1	0.6
% Organic	4.45	3.18	4.86	4.16	0.88
% Organic C	0.30	0.29	0.41	0.33	0.07
% Nitrogen	0.11	0.09	0.12	0.11	0.02
Chl a (ug/g)	238.7	153.2	144.3	178.7	52.1
Pheopigments (ug/g)	848.1	750.8	536.9	711.9	159.2
% Chl a	22.0	16.9	21.2	20.0	2.7

Macrofauna
Biomass (g/m 2) 6.9

Major Taxa

molluscs - bivalves (clams, razor clams)
- gastropods (snails)
polychaetes

DATE: JUNE 14, 1993 LAT: 44° 38.9' N

LOCATION: STN 4 LONG: 65° 41.6' W

SAMPLE: AB 4

Modal Grain Size (um) 194.0

Sediment Volume in Grab (cm3) 1385.4

Depth (cm)	Eh (mv)
1	241
3	215

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	25.7	27.1	26.0	26.3	0.7
% Organic	1.98	2.00	2.81	2.26	0.47
% Organic C	0.30	0.24	0.34	0.29	0.05
% Nitrogen	0.09	0.08	0.11	0.09	0.02
Chl a (ug/g)	164.6	249.6	206.5	206.9	42.5
Pheopigments (ug/g)	529.4	568.8	524.7	541.0	24.2
% Chl a	23.7	30.5	28.2	27.5	3.5

Macrofauna
Biomass (g/m 2) 22.1

Major Taxa

molluscs - bivalves (quahaugs)
crustaceans - amphipods
polychaetes

DATE: JUNE 14, 1993 LAT: 44° 38.6' N

LOCATION: STN 5 LONG: 65° 42.3' W

SAMPLE: AB 5

Modal Grain Size (um) 222.9

Sediment Volume in Grab (cm3) 2424.5

Depth (cm)	Eh (mv)
1	160
3	170
5	125

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	27.0	26.5	27.1	26.9	0.3
% Organic	3.74	4.91	3.21	3.95	0.87
% Organic C	0.56	0.34	0.40	0.43	0.11
% Nitrogen	0.13	0.08	0.12	0.11	0.03
Chl a (ug/g)	148.5	174.9	125.6	149.7	24.7
Pheopigments (ug/g)	640.1	981.4	527.1	716.2	236.5
% Chl a	18.8	15.1	19.3	17.7	2.3

Macrofauna
Biomass (g/m 2) 1.7

Major Taxa

molluscs - gastropods (whelks)
polychaetes

DATE: JUNE 15, 1993 LAT: 44° 38.5' N

LOCATION: STN 6 LONG: 65° 43.0' W

SAMPLE: AB 6

Modal Grain Size (um) 222.9

Sediment Volume in Grab (cm3) 2944.1

Depth (cm)	Eh (mv)
1	232
3	189
5	183

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	22.8	25.3	29.4	25.8	3.3
% Organic	6.80	2.81	3.59	4.40	2.11
% Organic C	0.28	0.32	0.31	0.30	0.02
% Nitrogen	0.10	0.09	0.12	0.10	0.02
Chl a (ug/g)	146.2	302.5	161.5	203.4	86.2
Pheopigments (ug/g)	414.7	1125.6	410.5	650.3	411.7
% Chl a	26.1	21.2	28.2	25.2	3.6

Macrofauna
Biomass (g/m 2) 47.6

Major Taxa

molluscs - bivalves (quahaugs, clinocardium)
crustaceans - amphipods, hermit crab
polychaetes

DATE: JUNE 15, 1993 LAT: 44° 38.9'

LOCATION: STN 9 LONG: 65° 43.2' W

SAMPLE: AB 9

Modal Grain Size (um) 294.1

Sediment Volume in Grab (cm3) 1905.0

Depth (cm)	Eh (mv)
1	343
3	251

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	16.5	13.3	14.8	14.9	1.6
% Organic	2.03	3.48	---	1.84	---
% Organic C	---	0.15	0.24	0.13	---
% Nitrogen	---	0.07	0.09	0.05	---
Chl a (ug/g)	37.8	60.0	44.0	47.3	11.5
Pheopigments (ug/g)	172.5	272.7	186.7	210.6	54.2
% Chl a	18.0	18.0	19.1	18.4	0.6

Macrofauna
Biomass (g/m 2) 86.5

Major Taxa

molluscs - bivalves (clams, quahaugs)
- gastropods (whelks, limpets)
crustaceans - amphipods
polychaetes
echinoderms - brittle stars

DATE: JUNE 15, 1993 LAT: 44° 39.2' N

LOCATION: STN 10 LONG: 65° 43.1' W

SAMPLE: AB 10

Modal Grain Size (um) 222.9

Sediment Volume in Grab (cm3) 1212.3

Depth (cm)	Eh (mv)
1	226
3	36

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	14.8	26.5	14.8	18.7	6.8
% Organic	2.55	0.87	1.23	1.55	0.88
% Organic C	0.20	0.15	0.19	0.18	0.03
% Nitrogen	0.06	0.06	0.07	0.06	0.01
Chl a (ug/g)	29.9	14.2	49.4	31.2	17.6
Pheopigments (ug/g)	308.6	103.6	250.4	220.9	105.6
% Chl a	8.8	12.1	16.5	12.5	3.9

Macrofauna
Biomass (g/m 2) 45.2

Major Taxa

molluscs - bivalves (quahaugs, clinocardium)
- gastropods (whelks, limpets)
polychaetes

DATE: JUNE 15, 1993 LAT: 44° 39.2' N

LOCATION: STN 17 LONG: 65° 43.8' W

SAMPLE: AB 17

Modal Grain Size (um) 588.1

Sediment Volume in Grab (cm3) 865.9

Depth (cm)	Eh (mv)
1	264
3	115

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	17.0	12.0	12.1	13.7	2.9
% Organic	1.32	0.91	1.62	1.28	0.36
% Organic C	0.15	0.20	0.10	0.15	0.05
% Nitrogen	0.08	0.08	0.05	0.07	0.02
Chl a (ug/g)	58.0	104.2	97.0	86.4	24.9
Pheopigments (ug/g)	234.4	372.5	290.5	299.1	69.5
% Chl a	19.8	21.9	25.0	22.2	2.6

Macrofauna
Biomass (g/m 2) 28.2

Major Taxa

molluscs - bivalves (quahaugs)
- gastropods (limpets)
crustaceans - amphipods
polychaetes

DATE: JUNE 16, 1993 LAT: 44° 39.5' N

LOCATION: STN 18 LONG: 65° 44.1' W

SAMPLE: AB 18

Modal Grain Size (um) 222.9 Sediment Volume in Grab (cm3) 1731.8

Depth (cm)	Eh (mv)
1	9
3	-10

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	18.5	16.4	16.3	17.1	1.2
% Organic	4.10	1.52	2.09	2.57	1.36
% Organic C	0.12	0.23	0.17	0.17	0.06
% Nitrogen	0.03	0.05	0.08	0.05	0.03
Chl a (ug/g)	34.3	38.7	---	36.5	---
Pheopigments (ug/g)	127.7	194.0	---	107.2	---
% Chl a	21.2	16.6	---	12.6	---

Macrofauna
Biomass (g/m 2) 40.0

Major Taxa

molluscs - bivalves (clinocardium)
- gastropods (whelks, limpets)
polychaetes
echinoderms - sand dollar

DATE: JUNE 17, 1993 LAT: 44° 38.2' N

LOCATION: STN 19 LONG: 65° 44.9' W

SAMPLE: AB 19

Modal Grain Size (um) 97.0

Sediment Volume in Grab (cm3) 3463.6

Depth (cm)	Eh (mv)
1	144
3	156
5	142
7	154
9	157
11	163

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	38.8	44.0	42.8	41.9	2.7
% Organic	3.19	6.80	6.96	5.65	2.13
% Organic C	0.64	1.08	0.79	0.84	0.22
% Nitrogen	0.13	0.20	0.14	0.16	0.04
Chl a (ug/g)	350.5	364.9	477.6	397.7	69.6
Pheopigments (ug/g)	807.8	841.2	957.4	868.8	78.5
% Chl a	30.3	30.3	33.3	31.3	1.7

Macrofauna
Biomass (g/m 2) 36.0

Major Taxa
polychaetes

DATE: JUNE 17, 1993 LAT: 44° 37.7' N

LOCATION: STN 20 LONG: 65° 45.0' W

SAMPLE: AB 20

Modal Grain Size (um) 73.5

Sediment Volume in Grab (cm3) 4675.9

Depth (cm)	Eh (mv)
1	66
3	55
5	51
7	62
9	57

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	57.8	54.1	56.1	56.0	1.9
% Organic	9.93	6.15	8.01	8.03	1.89
% Organic C	1.30	1.16	1.36	1.27	0.10
% Nitrogen	0.22	0.21	0.28	0.24	0.04
Chl a (ug/g)	476.8	1062.9	1084.1	874.6	344.7
Pheopigments (ug/g)	986.5	1969.2	2057.0	1670.9	594.3
% Chl a	32.6	35.1	34.5	34.1	1.3

Macrofauna
Biomass (g/m 2) 20.1

Major Taxa

crustaceans - amphipods
polychaetes

DATE: JUNE 17, 1993 LAT: 44° 39.0' N

LOCATION: STN 35 LONG: 65° 44.6' W

SAMPLE: AB 35

Modal Grain Size (um) 158.0

Sediment Volume in Grab (cm3) 3290.4

Depth (cm)	Eh (mv)
1	166
3	125
5	128

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	40.8	33.6	36.6	37.0	3.6
% Organic	3.75	3.04	0.65	2.48	1.62
% Organic C	0.66	0.49	0.52	0.56	0.09
% Nitrogen	0.19	0.16	0.16	0.17	0.02
Chl a (ug/g)	240.0	344.2	534.2	372.8	149.2
Pheopigments (ug/g)	455.5	505.4	1168.3	709.7	397.9
% Chl a	34.5	40.5	31.4	35.5	4.6

Macrofauna Biomass (g/m 2) 28.6

Major Taxa

polychaetes

DATE: JUNE 17, 1993 LAT: 44° 43.08' N

LOCATION: STN 36 LONG: 65° 34.00' W

SAMPLE: AB 36

Modal Grain Size (um) 48.5 Sediment Volume in Grab (cm3) 9351.8

Depth (cm) Eh (mv) no data

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	50.2	51.3	52.0	51.2	0.9
% Organic	4.23	4.37	4.32	4.31	0.07
% Organic C	1.34	1.28	1.27	1.30	0.04
% Nitrogen	0.28	0.28	0.25	0.27	0.02
Chl a (ug/g)	210.7	216.7	114.0	180.5	57.6
Pheopigments (ug/g)	1032.6	866.9	747.2	882.2	143.3
% Chl a	16.9	20.0	13.2	16.7	3.4

Macrofauna
Biomass (g/m 2) * 50.5

Major Taxa
polychaetes

* Biomass determined by analysis of 50% of sediment volume in grab

DATE: JUNE 17, 1993 LAT: 44° 42.58' N

LOCATION: STN 37 LONG: 65° 35.00' W

SAMPLE: AB 37

Modal Grain Size (um) 55.7

Sediment Volume in Grab (cm3) 9351.8

Depth (cm)	Eh (mv)
1	23
3	15
5	32
7	30
9	30
11	42
13	51
15	51

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	49.4	48.9	49.9	49.4	0.5
% Organic	3.20	2.81	3.48	3.16	0.34
% Organic C	0.93	0.94	0.89	0.92	0.03
% Nitrogen	0.22	0.22	0.22	0.22	0.00
Chl a (ug/g)	303.0	216.8	136.4	218.7	83.3
Pheopigments (ug/g)	1485.3	960.2	691.8	1045.8	403.6
% Chl a	16.9	18.4	16.5	17.3	1.0

Macrofauna
Biomass (g/m 2) * 369.3

Major Taxa

molluscs - bivalves (quahaugs)
polychaetes

* Biomass determined by analysis of 50% of sediment volume in grab

DATE: JUNE 17, 1993 LAT: 44° 42.50' N

LOCATION: STN 38 LONG: 65° 36.00' W

SAMPLE: AB 38

Modal Grain Size (um) 55.7

Sediment Volume in Grab (cm3) 9351.8

Depth (cm)	Eh (mv)
1	52
3	37
5	22
7	36
9	30
11	45

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	42.9	44.2	43.9	43.7	0.7
% Organic	2.55	2.41	3.78	2.91	0.75
% Organic C	0.86	0.74	0.97	0.86	0.12
% Nitrogen	0.21	0.21	0.21	0.21	0.00
Chl a (ug/g)	193.6	175.7	183.5	184.3	9.0
Pheopigments (ug/g)	629.2	610.8	682.7	640.9	37.4
% Chl a	23.5	22.4	21.2	22.4	1.2

Macrofauna
Biomass (g/m 2) * 48.9

Major Taxa
polychaetes

* Biomass determined by analysis of 50% of sediment volume in grab

DATE:	JUNE 17, 1993	LAT:	44° 42.59' N
LOCATION:	STN 39	LONG:	65° 36.28' W
SAMPLE:	AB 39		

Modal Grain Size (um) 64.0

Sediment Volume in Grab (cm3) 9351.8

Depth (cm)	Eh (mv)
1	144
3	125
5	124
7	136
9	138
11	139

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	43.2	47.5	46.9	45.9	2.3
% Organic	3.16	2.71	4.80	3.56	1.10
% Organic C	0.78	0.74	1.10	0.87	0.20
% Nitrogen	0.18	0.20	0.25	0.21	0.04
Chl a (ug/g)	312.4	302.9	299.1	304.8	6.9
Pheopigments (ug/g)	840.0	974.2	961.7	925.3	74.1
% Chl a	27.1	23.7	23.7	24.8	2.0

Macrofauna
Biomass (g/m 2) * 20.6

Major Taxa

crustaceans - amphipods
polychaetes

* Biomass determined by analysis of 50% of sediment volume in grab

DATE: JUNE 17, 1993 LAT: 44° 42.50' N

LOCATION: STN 40 LONG: 65° 37.00' W

SAMPLE: AB 40

Modal Grain Size (um) 73.5 Sediment Volume in Grab (cm3) 1212.3

Depth (cm) Eh (mv) no data

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	47.9	41.0	---	29.6	---
% Organic	5.02	5.48	---	3.50	---
% Organic C	0.85	0.66	---	0.50	---
% Nitrogen	0.29	0.21	---	0.17	---
Chl a (ug/g)	124.5	44.5	---	56.3	---
Pheopigments (ug/g)	720.8	488.2	---	403.0	---
% Chl a	14.7	8.4	---	7.7	---

Macrofauna
Biomass (g/m 2) (infauna) 43.3
(mussels) 1252.8
(total) 1296.1

Major Taxa
molluscs - bivalves (horse mussels)
- gastropods (limpets)
polychaetes

DATE: JUNE 17, 1993 LAT: 44° 42.00' N

LOCATION: STN 41 LONG: 65° 38.00' W

SAMPLE: AB 41

Modal Grain Size (um) 73.5

Sediment Volume in Grab (cm3) 9351.8

Depth (cm)	Eh (mv)
1	181
3	172
5	180
7	191
9	85

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	45.0	41.0	39.5	41.8	2.8
% Organic	3.71	3.62	3.53	3.62	0.09
% Organic C	0.83	0.74	0.61	0.73	0.11
% Nitrogen	0.17	0.18	0.12	0.16	0.03
Chl a (ug/g)	431.0	394.5	258.2	361.2	91.1
Pheopigments (ug/g)	1313.4	1135.4	960.8	1136.5	176.3
% Chl a	24.7	25.8	21.2	23.9	2.4

Macrofauna
Biomass (g/m 2) * 43.9

Major Taxa
crustaceans - amphipods
polychaetes

* Biomass determined by analysis of 50% of sediment volume in grab

DATE: JUNE 17, 1993 LAT: 44° 41.50' N

LOCATION: STN 42 LONG: 65° 38.00' W

SAMPLE: AB 42

Modal Grain Size (um) 73.5 Sediment Volume in Grab (cm3) 9351.8

Depth (cm)	Eh (mv)
1	197
3	191
5	167
7	167
9	171
11	171

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	42.8	40.9	42.5	42.1	1.0
% Organic	3.84	3.26	1.90	3.00	1.00
% Organic C	0.69	0.75	0.63	0.69	0.06
% Nitrogen	0.15	0.16	0.15	0.15	0.01
Chl a (ug/g)	684.6	633.4	333.4	550.5	189.7
Pheopigments (ug/g)	931.6	755.1	628.6	771.8	152.2
% Chl a	42.4	45.6	34.7	40.9	5.6

Macrofauna
Biomass (g/m 2) * 15.3

Major Taxa
polychaetes

* Biomass determined by analysis of 50% of sediment volume in grab

DATE: JUNE 17, 1993 LAT: 44° 41.00' N

LOCATION: STN 43 LONG: 65° 39.00' W

SAMPLE: AB 43

Modal Grain Size (um) 84.4

Sediment Volume in Grab (cm3) 9351.8

Depth (cm)	Eh (mv)
1	207
3	212
5	208
7	198
9	197
11	196

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	38.6	36.6	35.1	36.8	1.8
% Organic	2.86	2.63	1.97	2.49	0.46
% Organic C	0.63	0.57	0.48	0.56	0.08
% Nitrogen	0.16	0.12	0.12	0.13	0.02
Chl a (ug/g)	268.0	197.5	477.3	314.3	145.5
Pheopigments (ug/g)	760.1	589.3	956.8	768.7	183.9
% Chl a	26.1	25.1	33.3	28.2	4.5

Macrofauna
Biomass (g/m 2) * 102.3

Major Taxa
polychaetes

* Biomass determined by analysis of 50% of sediment volume in grab

DATE: JUNE 17, 1993 LAT: 44° 40.58' N

LOCATION: STN 44 LONG: 65° 39.08' W

SAMPLE: AB 44

Modal Grain Size (um) 97.0

Sediment Volume in Grab (cm3) 7966.2

Depth (cm)	Eh (mv)
1	194
3	188
5	186
7	196
9	197

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	34.9	38.1	35.6	36.2	1.7
% Organic	2.09	1.62	2.29	2.00	0.34
% Organic C	0.50	0.35	0.50	0.45	0.09
% Nitrogen	0.10	0.10	0.12	0.11	0.01
Chl a (ug/g)	164.4	173.5	266.6	201.5	56.6
Pheopigments (ug/g)	844.7	1106.1	1306.8	1085.9	231.7
% Chl a	16.3	13.6	16.9	15.6	1.8

Macrofauna *

Biomass (g/m 2)		
	(infauna)	140.6
	(mussels)	2851.0
	(sponges)	91.2
	(total)	3082.8

Major Taxa

molluscs - bivalves (mussels, clams)
crustaceans - amphipods
polychaetes
echinoderms - brittle stars
sponges

* Biomass determined by analysis of 50% of sediment volume in grab

DATE: JUNE 17, 1993 LAT: 44° 40.02' N

LOCATION: STN 45 LONG: 65° 40.07' W

SAMPLE: AB 45

Modal Grain Size (um) 168.9

Sediment Volume in Grab (cm3) 7966.2

Depth (cm)	Eh (mv)
1	247
3	225
5	207

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	28.2	32.0	38.8	33.0	5.4
% Organic	1.81	2.60	2.43	2.28	0.42
% Organic C	0.34	0.38	0.31	0.34	0.04
% Nitrogen	0.08	0.09	0.09	0.09	0.01
Chl a (ug/g)	122.7	332.6	203.6	219.6	105.9
Pheopigments (ug/g)	601.4	1488.6	1094.0	1061.3	444.5
% Chl a	16.9	18.2	15.7	16.9	1.3

Macrofauna
Biomass (g/m 2) * 530.6

Major Taxa

molluscs - bivalves (quahaugs)
crustaceans - amphipods
polychaetes

* Biomass determined by analysis of 50% of sediment volume in grab

DATE: JUNE 17, 1993 LAT: 44° 40.00' N

LOCATION: STN 46 LONG: 65° 41.00' W

SAMPLE: AB 46

Modal Grain Size (um) 111.4

Sediment Volume in Grab (cm3) 8312.6

Depth (cm)	Eh (mv)
1	198
3	162
5	156

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	37.6	34.7	30.1	34.1	3.8
% Organic	2.40	2.28	1.42	2.03	0.53
% Organic C	0.56	0.48	0.37	0.47	0.10
% Nitrogen	0.13	0.12	0.11	0.12	0.01
Chl a (ug/g)	272.1	241.3	67.4	193.6	110.4
Pheopigments (ug/g)	1066.2	850.7	363.7	760.2	359.9
% Chl a	20.3	22.1	15.6	19.3	3.4

Macrofauna
Biomass (g/m 2) * 89.8

Major Taxa

molluscs - bivalves (clams)
crustaceans - amphipods
polychaetes

* Biomass determined by analysis of 50% of sediment volume in grab

DATE: JUNE 17, 1993 LAT: 44° 39.50' N

LOCATION: STN 47 LONG: 65° 41.00' W

SAMPLE: AB 47

Modal Grain Size (um) 128.0

Sediment Volume in Grab (cm3) 9351.8

Depth (cm)	Eh (mv)
1	185
3	138
5	157

Upper 1 cm	A	B	C	MEAN	SD
% Moisture	33.3	42.3	36.9	37.5	4.5
% Organic	1.76	3.53	4.16	3.15	1.24
% Organic C	0.37	0.50	0.66	0.51	0.15
% Nitrogen	0.11	0.18	0.16	0.15	0.04
Chl a (ug/g)	135.4	349.9	295.5	260.3	111.5
Pheopigments (ug/g)	408.1	613.9	460.2	494.1	107.0
% Chl a	24.9	36.3	39.1	33.4	7.5

Macrofauna
Biomass (g/m 2) * 106.2

Major Taxa

crustaceans - amphipods
polychaetes

* Biomass determined by analysis of 50% of sediment volume in grab