U.S. Army Corps of Engineers,
New York District

Asharoken and Bayville Nearshore Investigation.

Final 2005 FINFISH, INVERTEBRATE INFAUNA AND WATER QUALITY SUMMARY REPORT

July 2005

Prepared by:
U.S. Army Corps of Engineers
Planning Division
New York District
26 Federal Plaza
New York, New York 10278-0090

EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers, New York District, and the New York State Department of Environmental Conservation have partnered to conduct a feasibility study to look at hurricane and storm damage reduction measures for the communities of Asharoken and Bayville, New York. In order to assess environmental impacts of proposed Federal actions, the District conducted the following "Asharoken and Bayville Nearshore Investigation" to gather information on the baseline biological conditions that would potentially be affected by future actions. Investigation activities included beach seining to collect finfish data, benthic beach cores to collect macroinvertebrate data, and water quality sampling. Baseline investigations took place from September 2003 through July 2004.

A total of 21 species of finfish were collected on Asharoken and Bayville beaches during the Fall 2003, Spring 2004 and Summer 2004 sampling events. Menhaden was the most abundant species accounting for 60% of the overall catch, followed by Atlantic silversides with 29%. At the Asharoken location, both the species richness and abundance of finfish species were greatest in Summer 2004 season. There were no seasonal effects on species richness at the Bayville location, but the abundances were significantly higher in the Summer 2004. At both locations the most commonly found EFH listed species was bluefish, which had the greatest abundance in Summer 2004.

With respect to benthic macroinvertebrates, a total of 8 phyla consisting of 46 taxa were collected throughout the study period. The most commonly abundant phylum was Annelida which was composed of Oligochaetes of various species and accounted for 84.1% of the encountered organisms. At both locations, the benthic macroinvertebrate species richness and abundance was greatest in the Spring/Summer 2004. Long Island Sound samples were also found to have greater abundances at both locations relative to samples collected at their respective bay beach transects.

The above findings describe the finfish and benthic communities encountered at the Asharoken and Bayville locations during 3 seasons in 2003-2004. The findings also suggest that the environmental impacts of any beach nourishing activities could be minimized if they were conducted in the early spring, where finfish species richness and abundances are reduced.

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C	**degrees Celsius (temperature)**
District	**New York District**
DO	**Dissolved oxygen**
EFH	**Essential Fish Habitat**
g	**gram**
Investigation	**Asharoken and Bayville Nearshore Investigation**
LPIL	**lowest possible identification level**
Location	**Asharoken and Bayville Beaches**
mg/l	**milligrams per liter (dissolved oxygen)**
Max	**maximum**
Mean	**average**
Min	**minimum**
mm	**millimeter**
N	**number measured**
NYSDEC	**New York State Department of Environmental Conservation**
PAH	**polyaromatic hydrocarbon**
ppt	**parts per thousand (salinity)**
SD	**standard deviation**
SL	**Standard Length**
Study	**Asharoken & Bayville hurricane and storm damage reduction feasibility Study**
TL	**total length**
USACE	**U.S. Army Corps of Engineers**

1.0 INTRODUCTION

The U.S. Army Corps of Engineers, New York District (District), in partnership with the New York State Department of Environmental Conservation (NYSDEC), is conducting two feasibility phase studies to evaluate hurricane and storm damage reduction measures for two Long Island north shore, New York locations. The study areas include the Village of Bayville and the Village of Asharoken, New York. The investigation discussed in this report was undertaken to provide supporting environmental baseline data for environmental assessment of potential federal action in these areas.

The Village of Asharoken lies on a narrow section of land that connects Eatons Neck peninsula to the mainland of the Town of Huntington and is located in Suffolk County (Figure 1). The length of Asharoken Beach is approximately 2.5 miles, while width varies from 100 feet at the northwestern end to 1,000 feet at the southeastern end. Asharoken Avenue, which generally runs parallel to the Long Island Sound shoreline, provides the only vehicular access to the Village and the Eatons Neck Community. The preservation of this roadway to keep access open during storm events is one of the primary considerations of the feasibility study. Beach erosion is also a primary consideration of the feasibility study. The District is evaluating structural alternatives that could involve placement of sand to create an elevated and wider sand berm, and the construction of a protective sand dune along Asharoken beach.

The Village of Bayville is located on the north shore of Nassau County, generally between Long Island Sound and Oyster Bay (Figure 2). The project study area extends from Long Island Sound on the north, Mill Neck Creek and Oyster Bay Harbor on the south, Centre Island on the east, and to the western municipal boundary of the Village of Bayville. The District is evaluating a number of structural and non-structural alternatives for Bayville. Placement of sand on the beach was initially one of the considered alternatives, which has since been screened from further development. Dissimilar to Asharoken, the Long Island Sound beach at Bayville has not experienced erosion based on analysis of historical and current bathymetry and aerial photographs. Structural alternatives are now focused on fortification of existing seawalls, construction of a protective dune, and construction of protective walls with associated drainage and pump stations along the Oyster Bay/Mill Neck Creek shoreline of the community.

Figure 1. Asharoken beach sample transects and water quality stations.

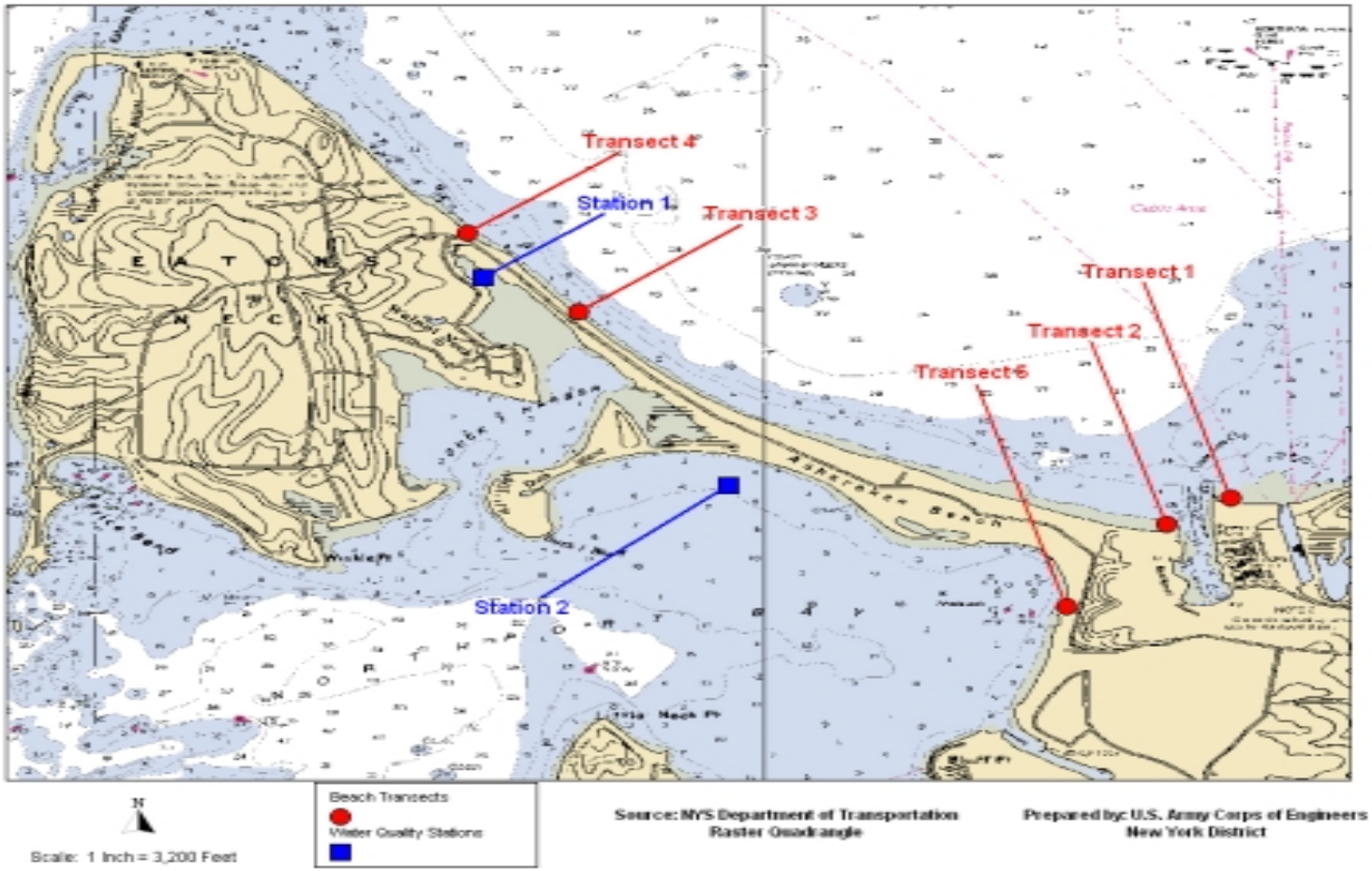
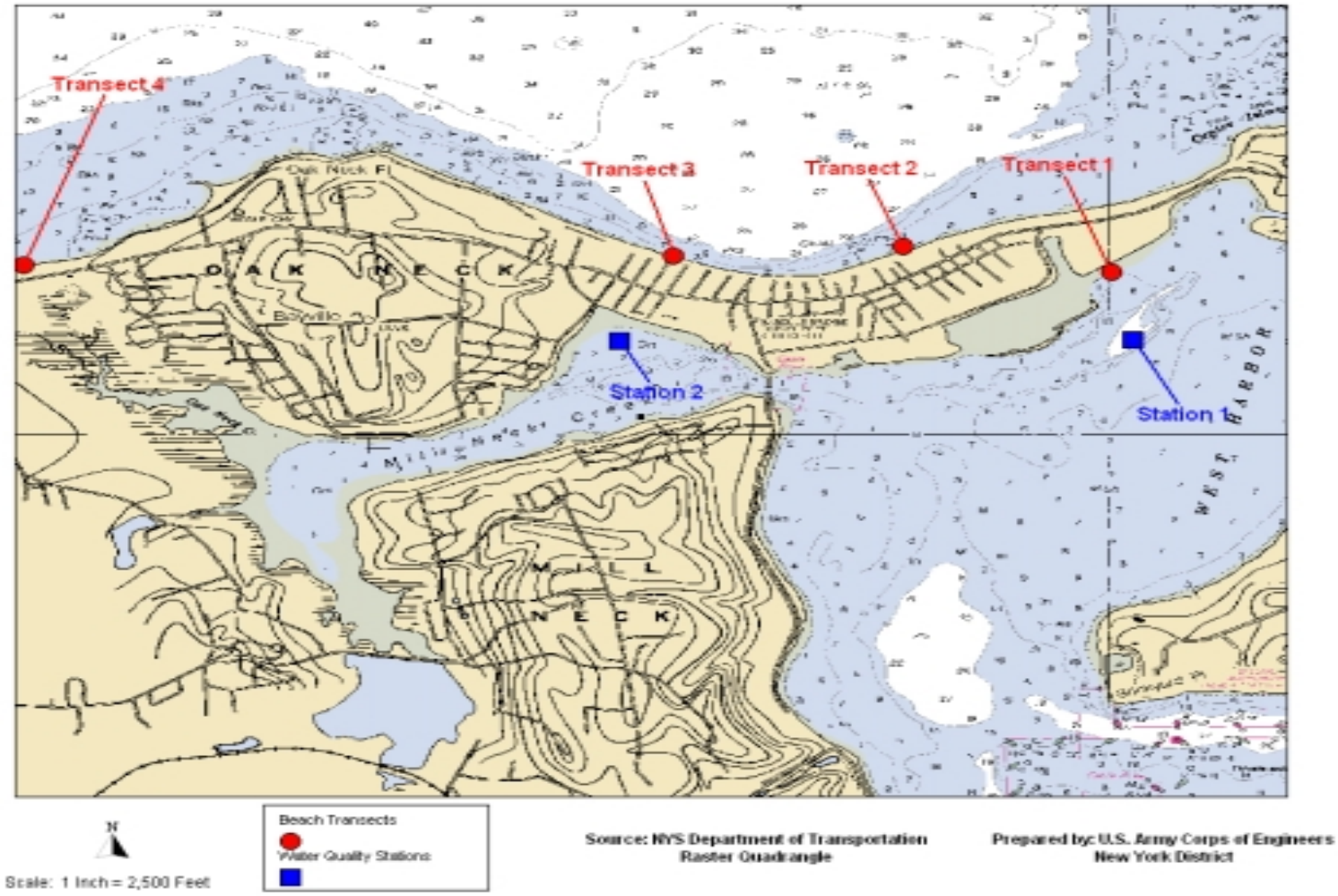


Figure 2. Bayville beach sample transect and water quality stations.



2.0 OBJECTIVES

The primary objective of the Asharoken and Bayville Nearshore Investigation was to collect data to characterize the existing environmental condition of the two feasibility study areas for purposes of environmental assessment of potential federal actions in these locations. As sand placement and dune construction are two alternatives that the District has considered for both study locations, the investigation focused baseline data collection efforts on the beach and intertidal zone environments. Benthic macroinvertebrate and fisheries species found within the intertidal zone community were sampled. Water quality data was collected for the beach intertidal transects and at nearshore locations to establish the condition of the water resources that could potentially be affected by federal actions. Sediment data for beach transects was collected for purposes of benthic macroinvertebrate community analysis, and to also establish the sediment grain size of the beaches. Any potential sand material to be placed on the beaches shall have a comparable grain size to the existing condition.

3.0 SAMPLING METHODOLOGY

Fish and basic water quality data were collected at the two proposed locations, Ahsaroken and Bayville, during the following dates: September 29-30 and October 29-30, 2003 (Fall samples), May 24-25 and June 14-15, 2004 (Spring samples), and July 19-20 and July 26-27, 2004 (Summer samples). Cornell University Cooperative Extension assisted the District in all sampling efforts. Fixed transects were pre-determined for each location (Asharoken: n=5, Bayville: n=4) and included one bayside beach at each location (See Table 1 for GPS coordinates and Figures 1 & 2).

Finfish sampling was conducted using a beach seine (dimension: 15.2 x 1.8 m, with a 1.8 x 1.8 x 1.8m bag and a 6mm square mesh net) that was pulled perpendicular to the shoreline starting at a depth of approximately 1.25 m. Asharoken and Bayville transects were sampled on separate, but consecutive days (Table 2). All fish were identified to the lowest practical taxonomic level and counted immediately after the haul. Standard length (SL= tip of snout to the base of the caudal peduncle) and Total length (TL= tip of snout to end of caudal fin) were measured for the first 100 randomly selected fish from each taxonomic group. When counts exceeded 100 for a species, the additional fish were enumerated. Any fish that passed through the net mesh on the beach were not included in the sample.

Benthic sampling occurred on the same transects as the finfish sampling at each location, but only once for each season (Table 2). Furthermore, Bayville transects (B1-B4) and the Asharoken Bayside transect (A5) were not sampled in the summer 2004. At each transect, three replicate samples were collected beginning at MLW (0 m) and at +1 m and -1 m intervals with a 7.5 cm PVC coring tube to a depth of 10-15 cm. A 0.5 mm sieve was used to separate infauna from the sediment. Infaunal samples were preserved in the field with a buffered 10% formalin solution and stained with 1% Rose Bengal. Samples were transferred to 70% isopropyl alcohol after fixing for sorting and analysis. Organisms were separated from debris and hand picked to identify taxonomy and for enumeration. Identifications were made to the lowest practical identification level (LPIL) when not to the species level. Organisms were then grouped by taxa within each station and wet-weight biomass was determined to 0.01 mg after blotting to remove excess liquid. While sorting, the replicate samples taken from Asharoken transects A1-A4 in Summer 2004, were inadvertently pooled with the Spring

Table 1. Sample station locations.

Site	Station Label	Longitude	Latitude
Asharoken	A1	-73.34029147	40.92727061
Asharoken	A2	-73.34662540	40.92577835
Asharoken	A3	-73.37529552	40.93834905
Asharoken	A4	-73.38098034	40.94390060
Asharoken	A5	-73.35158743	40.92044137
Asharoken	Water Quality Station 1 (WQ1)	-73.38038224	40.94110529
Asharoken	Water Quality Station 2 (WQ2)	-73.36870636	40.92791828
Bayville	B1	-73.53319295	40.90915101
Bayville	B2	-73.54267372	40.91019139
Bayville	B3	-73.55302074	40.90971127
Bayville	B4	-73.58291640	40.90925175
Bayville	Water Quality Station 1 (WQ1)	-73.53210897	40.90595499
Bayville	Water Quality Station 2 (WQ2)	-73.55533197	40.90496600
Note: All coordinates are in New York State Plane (NAD 1983, feet)			

Table 2. Summary of sampling events and measurements taken.

Date	Location	Fishery Survey	Benthic Survey	Grain Size Analysis	Basic Water Chemistry	Chemical Analysis
29-Sep-03	Bayville	X	X	X	X	
30-Sep-03	Asharoken	X	X	X	X	
1-Oct-03	Bayville				X	X
10-Oct-03	Asharoken				X	X
27-Oct-03	Bayville				X	X
28-Oct-03	Asharoken				X	X
29-Oct-03	Bayville	X			X	
30-Oct-03	Asharoken	X			X	
24-May-04	Bayville	X	X	X	X	
25-May-04	Asharoken	X	X	X	X	
14-Jun-04	Asharoken	X			X	
15-Jun-04	Bayville	X			X	
19-Jul-04	Asharoken	X	X	X	X	
20-Jul-04	Bayville	X			X	
26-Jul-04	Asharoken	X			X	
27-Jul-04	Bayville	X			X	

2004 samples. Hence, it is not possible to discriminate between these two seasons, and we categorized them as: Sping-Summer 2004 samples. The Bayville samples were not affected by this merging of samples because there were no summer samples collected; and Asharoken station A5 was also unaffected. Therefore, in our analyses the Asharoken samples that were inadvertently pooled (i.e. A1-A4 Spring 2004 and Summer 2004) were always averaged for the 6 samples at each transect to better reflect the actual number of replicates taken.

Since the benthic data is unbalanced it requires additional explanation for the anlaysis of seasonal and Long Island Sound (Sound) versus bay beach (Bay) transects. To determine seasonal trends we averaged the data from the three replicates at each transect and then pooled these transect averages within each location and season. For the overall average comparison between Sound and the Bay beaches we averaged the transect replicates, and then took an overall average of the transect values. The overall averages were then averaged within each season for the respective Sound and Bay transects at Asharoken and Bayville location. This grand average represents a single core on the Sound and Bay transects respectively.

Concurrent with intertidal benthos sampling, a sediment sample along each station transect was taken. Sediment samples were collected using a 5 cm, PVC coring tube to a depth of 10-15 cm. The samples were transferred to whirl-pack bags processed for grain-size distribution in the lab. We collected a total of 22 samples.

During both the finfish and benthic sampling events, physical measurements were recorded at the beginning of each event. Water quality parameters were measured with a YSI 85 probe at approximate depth of 1 m, and included: temperature, salinity, dissolved oxygen, and conductivity. A sample of water was also collected simultaneously for determination of pH (Oakton pH Testr3 Double Junction) and turbidity (LaMotte Smart 2 colorimeter). Wind velocity and direction data were also estimated at the time of sampling with a (Kestrel 2000) and weather conditions and wave height were also observed and noted.

In addition to the general water quality measurements described above, water quality sampling was conducted at two Bay stations in Bayville within Oyster Bay (east and west of the Bayville bridge, Figure 2) and two Bay stations at Asharoken in Duck Island Harbor (Figure 1) during Fall 2003. The first sample event at each location was a non-storm/rain condition and the second sample event was during a storm/post-rainfall event; both at high tide. At Oyster Bay, water samples were collected sub-surface with a Van Dorn sampling bottle and the water was transferred to a polypropylene bottle (500 ml) that was kept on ice and brought to ECOTEST Laboratories, Inc., North Babylon, NY that same day for analysis. ECOTEST Laboratories tested the samples for nitrogen, phosphorous, total suspended solids, pesticides, and a volatile organic compound library search (EPA 8260/8240). In addition to the aforementioned chemical analyses, measures of general water quality including: turbidity, salinity, dissolved oxygen, pH were made at the 2 Oyster Bay stations. The water quality readings for Asharoken only included basic parameters such as: dissolved oxygen, salinity, pH, turbidity and temperature.

4.0 FISH SAMPLING RESULTS

A total of 21 species of finfish were collected on Asharoken and Bayville Beaches during the Fall 2003, Spring 2004 and Summer 2004 field sampling events (Table 3). Results of the beach seining events are provided in Appendix A. Species richness overall was slightly higher in the Summer (15 species) than the Fall (13 species) and Spring (13 species). A detailed list of species for each sampling event is shown in Table 4.

4.1 TOTAL SPECIES COMPOSITION AND ABUNDANCE

Two species accounted for 89.13% of the 12,768 individuals captured over all the seasons and beach seines combined. Menhaden (*Brevortia tyrannus*) was the most abundant species, accounting for 60% of the overall catch, and Atlantic silverside (*Menidia menidia*) was the second most abundant accounting for 29% of the overall catch (Table 4). Menhaden and silversides were also captured during each season, but it is important to note the high abundance of Menhaden was the result of two beach seining events that captured large schools. The top two species overall were also most abundant during the Summer 2004 sampling event. Other abundant species include: bluefish (*Pomatomus saltatrix*), bay anchovy (*Anchoa mitchilli*), weakfish (*Cynoscion regalis*), striped killifish (*Fundulus majalis*) and mummichog (*Fundulus heterclitus*). Sandlance (*Ammodytes americanus*) were also in large abundance in the Spring 2004 sampling event, but many individuals sampled escaped through the net mesh and were under-represented as a result.

4.1.1 Fall 2003 Sampling Event

A total of 13 taxa were collected in the Fall 2003 sampling event at both locations, and 2,809 fish were captured (Table 4). Menhaden was the dominant species and represented 80.3% of the catch. Atlantic silverside was the second most abundant species and accounted for 14.6% of the catch. Other common species included the striped killifish and mummichog.

4.1.2 Spring 2004 Sampling Event

A total of 13 taxa were collected in the Spring 2004 sampling event at both locations and 492 fish were captured (Table 4). Bay anchovy and Atlantic silverside were equally dominant species and represented 31.3% and 30.3% of the catch. Other common species included sandlance and bluefish.

4.1.3 Summer 2004 Sampling Event

A total of 15 taxa were collected in the Summer 2004 sampling event at both locations, and 9,467 fish were captured (Table 4). Menhaden was the dominant species and represented 57.4% of the catch. Atlantic silverside was the second most abundant species and accounted for 33% of the catch. Other common species included bluefish, weakfish, bay anchovy and blueback herring (*Alosa aestivalis*).

Table 3. Fish species collected during the Fall 2003, Spring and Summer 2004 beach surveys.

Family	Scientific Name	Common Name	Total Captured	Percentage of Total Catch
Atherinidae	*Menidia menidia*	Atlantic Silverside	3,684	28.86
Engraulidea	*Anchoa mitchilli*	Bay Anchovy	158	1.24
Labridae	*Tautoga onitis*	Blackfish	1	0.01
Clupeidae	*Alosa aestivalis*	Blueback Herring	109	0.86
Pomatomidae	*Pomatomus saltatrix*	Bluefish	548	4.3
Labridae	*Tautogolabrus adspersus*	Cunner	12	0.1
Cottidae	*Myoxocephalus aenaeus*	Grubby	7	0.06
Clupeidae	*Brevoortia tyrannus*	Menhaden	7,695	60.27
Mugilidae	*Mugil cephalus*	Mullet	3	0.03
Cyprinodontidae	*Fundulus heteroclitus*	Mummichog	103	0.81
Syngnathidae	*Syngnathus fuscus*	Northern Pipefish	29	0.23
Triglidae	*Prionotus carolinus*	Northern Sea Robin	1	0.01
Sparidae	*Stenotomus chrysops*	Porgy	4	0.04
Ammodytidae	*Ammodytes americanus*	Sandlance	67	0.53
Cyprinodontidae	*Cyprinodon variegatus*	Sheepshead Minnow	3	0.03
Moronidae	*Morone saxatilis*	Striped Bass	1	0.01
Cyprinodontidae	*Fundulus majalis*	Striped Killifish	131	1.03
Gadidae	*Microgadus tomcod*	Tomcod	21	0.17
Sciaenidae	*Cynoscion regalis*	Weakfish	157	1.23
Bothidae	*Scophthalmus aquosus*	Windowpane Flounder	2	0.02
Pleuronectidae	*Pleuronectes americanus*	Winter Flounder	32	0.26
		Total # of Organisms Collected	**12,768**	
		Total Number of Taxa Collected	**21**	

* Shaded cells indicate Essential Fish Habitat designated species.

Table 4. Total fish species composition and abundance by season.

			Total Catch				Percentage of Total Catch			
Family	**Common Name**	**Scientific Name**	**Fall**	**Spring**	**Summer**	**TOTAL**	**Fall**	**Spring**	**Summer**	**TOTAL**
Atherinidae	Atlantic Silverside	*Menidia menidia*	409	149	3,126	**3,684**	14.56	30.285	33.02	**28.86**
Engraulidea	Bay Anchovy	*Anchoa mitchilli*	2	154	2	**158**	0.071	31.301	0.0211	**1.24**
Labridae	Blackfish	*Tautoga onitis*	1	--	--	**1**	0.036	--	--	**0.01**
Clupeidae	Blueback Herring	*Alosa aestivalis*	**--**	--	109	**109**	**--**	--	1.1514	**0.86**
Pomatomidae	Bluefish	*Pomatomus saltatrix*	**--**	58	490	**548**	**--**	11.789	5.1759	**4.3**
Labridae	Cunner	*Tautogolabrus adspersus*	8	3	1	**12**	0.285	0.6098	0.0106	**0.1**
Cottidae	Grubby	*Myoxocephalus aenaeus*	**--**	4	3	**7**	**--**	0.813	0.0317	**0.06**
Clupeidae	Menhaden	*Brevoortia tyrannus*	2,255	8	5432	**7,695**	80.28	1.626	57.378	**60.27**
Mugilidea	Mullet	*Mugil cephalus*	3	--	**--**	**3**	0.107	--	--	**0.03**
Cyprinodontidae	Mummichog	*Fundulus heteroclitus*	46	3	54	**103**	1.638	0.6098	0.5704	**0.81**
Syngnathidae	Northern Pipefish	*Syngnathus fuscus*	8	6	15	**29**	0.285	1.2195	0.1584	**0.23**
Triglidae	Northern Sea Robin	*Prionotus carolinus*	**--**	--	1	**1**	**--**	--	0.0106	**0.01**
Sparidae	Porgy	*Stenotomus chrysops*	4	--	**--**	**4**	0.142	--	--	**0.04**
Ammodytidae	Sandlance	*Ammodytes americanus*	**--**	67	**--**	**67**	**--**	13.618	--	**0.53**
Cyprinodontidae	Sheepshead Minnow	*Cyprinodon variegates*	3	--	**--**	**3**	0.107	--	--	**0.03**
Moronidae	Striped Bass	*Morone saxatilis*	**--**	**--**	1	**1**	**--**	--	0.0106	**0.01**
Cyprinodontidae	Striped Killifish	*Fundulus majalis*	65	11	55	**131**	2.314	2.2358	0.581	**1.03**
Gadidae	Tomcod	*Microgadus tomcod*	**--**	20	1	**21**	**--**	4.065	0.0106	**0.17**
Sciaenidae	Weakfish	*Cynoscion regalis*	**--**	--	157	**157**	**--**	--	1.6584	**1.23**
Bothidae	Windowpane Flounder	*Scophthalmus aquosus*	1	1	**--**	**2**	0.036	0.2033	--	**0.02**
Pleuronectidae	Winter Flounder	*Pleuronectes americanus*	4	8	20	**32**	0.142	1.626	0.2113	**0.26**
		Total # of Organisms Collected	**2,809**	**492**	**9,467**	**12,768**				**100**
		Total Number of Taxa Collected	**13**	**13**	**15**	**21**				

* Shaded cells indicate Essential Fish Habitat (EFH) designated species.

4.2 ASHAROKEN- FISH SPECIES COMPOSITION AND ABUNDANCE

There were a total of 20 taxa present at the Asharoken transects across all the seasons sampled. However, two species accounted for 84.6% of the 6,407 individuals captured across all seasons (Table 5). Atlantic silverside was the most abundant species, accounting for 45.89% of the total catch, and Menhaden was the second most abundant accounting for 38.71% of the overall catch. Other abundant species include: weakfish, bay anchovy, stripped killifish and mummichog.

4.2.1 Fall 2003 Sampling Event

A total of 11 taxa were collected in the Fall 2003 sampling event at Asharoken, and 2,674 fish were captured (Table 5). Menhaden was the dominant species and represented 84.3% of the catch during this sampling event. Atlantic silverside was the second most abundant species and accounted for 11.78% of the catch. Few other species were captured in high abundance, except for striped killifish and mummichog.

4.2.2 Spring 2004 Sampling Event

A total of 11 taxa were collected in the Spring 2004 sampling event at Asharoken, and 354 fish were captured (Table 5). Bay anchovy was the most abundant species and represented 43.5% of the catch. Sandlance and bluefish were the next most abundant species and accounted for 18.4% and 16.4% of the catch respectively. Other common species included Atlantic silverside.

4.2.3 Summer 2004 Sampling Event

A total of 14 taxa were collected in the Summer 2004 sampling event at Asharoken, and 3,379 fish were captured (Table 5). Atlantic silverside was the dominant species and represented 76.2% of the catch. Menhaden and bluefish were the next most abundant species and accounted for 6.4% and 6.0% of the catch respectively. Other common species included weakfish and blueback herring.

4.2.4 Long Island Sound Versus Bay Transects

A comparison between the species composition and abundance for the bay transects (Bay) and Long Island Sound (Sound) transects was made for Asharoken. However, it is important to emphasize that there was significantly lower sampling efforts made in the Bay (1 transect) than in the Sound (4 transects) during each sampling event, and the results should be interpreted as such.

Overall, abundance on the Sound transects was higher (5,456 individuals) than the Bay (951 individuals) across all seasons (Table 6). There were also 19 taxa captured in the Sound and 9 taxa in the Bay. Menhaden and Atlantic silverside were equally dominant species in the Sound and accounted for 45.45% and 44.46% of the total catch. Atlantic silverside was the most dominant species in the Bay and accounted for 54.05% of the total catch.

Table 5. Fish species composition and abundance at Asharoken by season.

		Total Catch				Percentage of Total Catch			
Common Name	**Scientific Name**	**Fall**	**Spring**	**Summer**	**TOTAL**	**Fall**	**Spring**	**Summer**	**TOTAL**
Atlantic Silverside	*Menidia menidia*	315	50	2,575	**2,940**	11.78	14.124	76.20598	**45.89**
Bay Anchovy	*Anchoa mitchilli*	2	154	2	**158**	0.0748	43.503	0.059189	**2.47**
Blackfish	*Tautoga onitis*	1	--	--	**1**	0.0374	--	--	**--**
Blueback Herring	*Alosa aestivalis*	--	--	108	**108**	--	--	3.196212	**1.71**
Bluefish	*Pomatomus saltatrix*	--	58	204	**262**	--	16.384	6.037289	**4.09**
Cunner	*Tautogolabrus adspersus*	5	1	1	**7**	0.187	0.2825	0.029595	**0.11**
Grubby	*Myoxocephalus aenaeus*	--	--	--	**--**	--	--	--	**--**
Menhaden	*Brevoortia tyrannus*	2,255	8	217	**2,480**	84.331	2.2599	6.422018	**38.71**
Mullet	*Mugil cephalus*	1	--	--	**1**	0.0374	--	--	**0.02**
Mummichog	*Fundulus heteroclitus*	29	1	34	**64**	1.0845	0.2825	1.006215	**1.0**
Northern Pipefish	*Syngnathus fuscus*	--	2	13	**15**	--	0.565	0.384729	**0.24**
Northern Sea Robin	*Prionotus carolinus*	--	--	1	**1**	--	--	0.029595	**0.02**
Porgy	*Stenotomus chrysops*	1	--	--	**1**	0.0374	--	--	**0.02**
Sandlance	*Ammodytes americanus*	--	65	--	**65**	--	18.362	--	**1.02**
Sheepshead Minnow	*Cyprinodon variegatus*	3	--	--	**3**	0.1122	--	--	**0.05**
Striped Bass	*Morone saxatilis*	--	--	1	**1**	--	--	0.029595	**0.02**
Striped Killifish	*Fundulus majalis*	59	--	46	**105**	2.2064	--	1.36135	**1.64**
Tomcod	*Microgadus tomcod*	--	7	1	**8**	--	1.9774	0.029595	**0.13**
Weakfish	*Cynoscion regalis*	--	--	156	**156**	--	--	4.616751	**2.44**
Windowpane Flounder	*Scophthalmus aquosus*	--	1	--	**1**	--	0.2825	--	**0.02**
Winter Flounder	*Pleuronectes americanus*	3	7	20	**30**	0.1122	1.9774	0.591891	**0.47**
	Total # of Organisms Collected	**2,674**	**354**	**3,379**	**6,407**	100	100	100	100
	Total Number of Taxa Collected	**11**	**11**	**14**	**20**				

* Shaded cells indicate Essential Fish Habitat (EFH) designated species.

The Summer 2004 yielded the highest catch abundances for the Sound (51.72% of total catch) beaches at Asharoken (Table 6). It was observed that Atlantic silverside and menhaden were consistently captured throughout all the seasons sampled in the Sound and were the dominant species in the Summer 2004 and Fall 2003 sample events, representing 76.40% and 89.06% of the catch respectively. Sandlance was observed to be the dominant species in the Sound during the Spring 2004, and represented 63.12% of the catch. The Summer 2004 sampling event produced a higher species richness (taxa=13) than either the Spring (taxa= 9) and Fall (taxa= 9) on the Sound beaches of Asharoken.

The Summer 2004 also produced the highest catch abundances in the Bay (58.57% of total catch) at Asharoken (Table 6). Atlantic silverside were also observed to be consistently captured across all seasons at the Asharoken Bay transect, and was the dominant species in the Fall 2003 and Summer 2004, accounting for 43.36% and 75.22% of the catch respectively. Bay anchovy were observed to be the dominant species in the Spring 2004 sampling event at the Bay transect, and accounted for 60.96% of the catch. The Fall 2003 sampling event yielded a higher species richness (taxa= 6) than either the Spring 2004 (taxa= 5) and Summer 2004 (taxa= 5) in the Sound.

4.3 BAYVILLE FISH SPECIES COMPOSITION AND ABUNDANCE

There were a total of 16 taxa present at the Bayville transects across all the seasons sampled. Menhaden was the most abundant species and accounted for 81.99% of the 6,361 individuals captured across all seasons (Table 7). Atlantic silverside was the second most abundant species, and accounted for 11.7% of the total catch. Other species captured included: bluefish, mummichog, striped killifish and tomcod (*Microgadus tomcod*), but they were at much lower abundance than menhaden and silversides.

4.3.1 Fall 2003 Sampling Event

A total of 9 taxa were collected in the Fall 2003 sampling event at Bayville, and 135 fish were captured (Table 7). Atlantic silverside was the dominant species and represented 69.63% of the catch during this sampling event. The second most abundant species was mummichog and accounted for 12.59% of the catch. Few other species were captured in high abundance.

4.3.2 Spring 2004 Sampling Event

A total of 9 taxa were collected in the Spring 2004 sampling event at Bayville, and 138 fish were captured (Table 7). Atlantic silverside was the dominant species and represented 71.73% of the catch during this sampling event. The next most abundant species were striped killifish and tomcod which accounted for 9.4% and 7.97% of the catch. Few other species were captured in significant abundance.

Table 6. Fish species composition and abundance for Asharoken: Long Island Sound versus Bay transects, by season.

		Total Catch (Long Island Sound)					Total Catch (Bay)				
Common Name	**Scientific Name**	**Fall**	**Spring**	**Summer**	**Total**	**Percent (Total)**	**Fall**	**Spring**	**Summer**	**Total**	**Percent (Total)**
Atlantic Silverside	*Menidia menidia*	253	17	2,156	**2,426**	**44.47**	62	33	419	**514**	**54.05**
Bay Anchovy	*Anchoa mitchilli*	2	1	2	**5**	**0.10**	--	153	--	**153**	**16.09**
Blackfish	*Tautoga onitis*	5	--	--	**5**	**0.10**	--	--	--	--	--
Blueback Herring	*Alosa aestivalis*	**--**	--	108	**108**	**1.98**	--	--	--	--	--
Bluefish	*Pomatomus saltatrix*	**--**	--	150	**150**	**2.75**	--	58	54	**112**	**11.78**
Cunner	*Tautogolabrus adspersus*	**--**	1	1	**2**	**0.04**	1	--	--	**1**	**0.11**
Grubby	*Myoxocephalus aenaeus*	**--**	--	--	--	--	--	--	--	**--**	**--**
Menhaden	*Brevoortia tyrannus*	2,254	8	217	**2,479**	**45.44**	1	--	--	**1**	**0.11**
Mullet	*Mugil cephalus*	--	--	**--**	--	--	1	--	--	**1**	**0.11**
Mummichog	*Fundulus heteroclitus*	1	--	--	**1**	**0.02**	28	1	34	**63**	**6.63**
Northern Pipefish	*Syngnathus fuscus*	--	2	13	**15**	**0.28**	--	--	--	--	--
Northern Sea Robin	*Prionotus carolinus*	**--**	--	1	**1**	**0.02**	--	--	--	--	--
Porgy	*Stenotomus chrysops*	1	--	**--**	**1**	**0.02**	--	--	--	--	--
Sandlance	*Ammodytes americanus*	**--**	65	**--**	**65**	**1.2**	--	--	--	--	--
Sheepshead Minnow	*Cyprinodon variegatus*	3	--	**--**	**3**	**0.06**	--	--	--	--	--
Striped Bass	*Morone saxatilis*	**--**	**--**	1	**1**	**0.02**	--	--	--	--	--
Striped Killifish	*Fundulus majalis*	9	--	1	**10**	**0.19**	50	--	45	**95**	**9.99**
Tomcod	*Microgadus tomcod*	**--**	7	1	**8**	**0.15**	--	--	--	**--**	**--**
Weakfish	*Cynoscion regalis*	**--**	--	156	**156**	**2.86**	--	--	--	**--**	**--**
Windowpane Flounder	*Scophthalmus aquosus*	**--**	1	--	**1**	**0.02**	--	--	--	**--**	**--**
Winter Flounder	*Pleuronectes americanus*	3	1	15	**19**	**0.47**	--	6	5	**11**	**1.16**
	Total # of Organisms Collected	**2,531**	**103**	**2,822**	**5,456**	**100**	**143**	**251**	**557**	**951**	**100**
	Total Number of Taxa Collected	**9**	**9**	**13**	**19**		**6**	**5**	**5**	**19**	

* Shaded cells indicate Essential Fish Habitat (EFH) designated species.

4.3.3 Summer 2004 Sampling Event

Similar to the Fall and Spring samples, a total of 9 taxa were collected in the Summer 2004 sampling event at Bayville, but the abundance was much greater with 6,088 fish captured (Table 7). Menhaden was the dominant species and represented 85.66% of the catch during this sampling event. Atlantic silverside was the second most abundant species accounting for 9.05% of the catch, and were followed by bluefish at 4.69% of the catch. Other species captured included mummichog and striped killifish, but they were at an order of magnitude less abundant than the top three species.

4.3.4 Long Island Sound Versus Bay Transects

A comparison between the species composition and abundance for the bay transects (Bay) and Long Island Sound (Sound) transects was also made for Bayville. However, it is important to emphasize that there was a significantly lower sampling effort made in the Bay (1 transect) than on the Sound (3 transects) and these results should be interpreted as such.

Overall, abundance in the Sound was lower across all seasons (825 individuals) compared to the Bay (5,536 individuals, Table 8). However, species richness was greater in the Sound (12 taxa) relative to the Bay (9 taxa). Atlantic silverside was the dominant species in the Sound and accounted for 61.09% of the total catch. Menhaden was the most dominant species in the Bay and accounted for 94.20% of the total catch, but was only captured in a single tow in the Summer 2004 sampling event at Bayville.

The Summer 2004 sampling event produced the highest catch abundances in the Sound (85.57% of total catch) at Bayville (Table 8). It was observed that Atlantic silverside were consistently captured throughout all the seasons sampled in the Sound, and were the dominant species for all seasons sampled: Fall= 84.51%, Spring= 58.33% and Summer= 58.92% of the catches. The Fall 2003 sampling event produced a slightly greater species richness (taxa=7) than either the spring (taxa= 5) and summer (taxa= 5) in the Sound at Bayville.

The Summer 2004 also yielded the highest catch abundances in the Bay (58.57% of total catch) at Bayville (Table 8). Atlantic silverside were also observed to be consistently captured across all seasons in the Bay, and was the dominant species in the Fall 2003 and Spring 2004, accounting for 53.13% and 78.89% of the catch respectively. Menhaden were observed to be the dominant species in the Summer 2004 sampling event in the Bay, and accounted for 96.89% of the catch. The Summer 2004 sampling event yielded a higher species richness (taxa=7) in the Bay than either the fall (taxa= 6) and spring (taxa= 5).

Table 7. Fish species composition and abundance at Bayville by season.

		Total Catch				Percentage of Total Catch			
Common Name	**Scientific Name**	**Fall**	**Spring**	**Summer**	**TOTAL**	**Fall**	**Spring**	**Summer**	**TOTAL**
Atlantic Silverside	*Menidia menidia*	94	99	551	**744**	69.63	71.739	9.050591	**11.7**
Bay Anchovy	*Anchoa mitchilli*	--	--	--	--	--	--	--	--
Blackfish	*Tautoga onitis*	--	--	--	--	--	--	--	--
Blueback Herring	*Alosa aestivalis*	--	--	1	**1**	--	--	0.016426	**0.02**
Bluefish	*Pomatomus saltatrix*	--	--	286	**286**	--	--	4.697766	**4.5**
Cunner	*Tautogolabrus adspersus*	3	2	--	**5**	2.2222	1.4493	--	**0.08**
Grubby	*Myoxocephalus aenaeus*	--	4	3	**7**	--	2.8986	0.049277	**0.12**
Menhaden	*Brevoortia tyrannus*	--	--	5,215	**5,215**	--	--	85.66032	**81.99**
Mullet	*Mugil cephalus*	2	--	--	**2**	1.4815	--	--	**0.04**
Mummichog	*Fundulus heteroclitus*	17	2	20	**39**	12.593	1.4493	0.328515	**0.62**
Northern Pipefish	*Syngnathus fuscus*	8	4	2	**14**	5.9259	2.8986	0.032852	**0.23**
Northern Sea Robin	*Prionotus carolinus*	--	--	--	--	--	--	--	--
Porgy	*Stenotomus chrysops*	3	--	--	**3**	2.2222			**0.05**
Sandlance	*Ammodytes americanus*	--	2	--	**2**	--	1.4493	--	**0.04**
Sheepshead Minnow	*Cyprinodon variegatus*	--	--	--	--	--	--	--	--
Striped Bass	*Morone saxatilis*	--	--	--	--	--	--	--	--
Striped Killifish	*Fundulus majalis*	6	11	9	**26**	4.4444	7.971	0.147832	**0.41**
Tomcod	*Microgadus tomcod*	--	13	--	**13**	--	9.4203	--	**0.21**
Weakfish	*Cynoscion regalis*	--	--	1	**1**	--	--	0.016426	**0.02**
Windowpane Flounder	*Scophthalmus aquosus*	1	--	--	**1**	0.7407	--	--	**0.02**
Winter Flounder	*Pleuronectes americanus*	1	1	--	**2**	0.7407	0.7246	--	**0.04**
	Total # of Organisms Collected	**135**	**138**	**6,088**	**6,361**	100	100	100	**100**
	Total Number of Taxa Collected	**9**	**9**	**9**	**16**				

* Shaded cells indicate Essential Fish Habitat (EFH) designated species.

Table 8. Species composition and abundance for Bayville: Long Island Sound versus Bay transects, by season.

		Total Catch (Long Island Sound)					Total Catch (Bay)				
Common Name	**Scientific Name**	**Fall**	**Spring**	**Summer**	**Total**	**Percent**	**Fall**	**Spring**	**Summer**	**Total**	**Percent**
Atlantic Silverside	*Menidia menidia*	60	28	416	**504**	**61.1**	34	71	135	**240**	**4.34**
Bay Anchovy	*Anchoa mitchilli*	--	--	--	**--**	**--**	--	--	--	**--**	**--**
Blackfish	*Tautoga onitis*	--	--	--	**--**	**--**	--	--	--	**--**	**--**
Blueback Herring	*Alosa aestivalis*	**--**	--	1	**1**	**0.13**	--	--	--	**--**	**--**
Bluefish	*Pomatomus saltatrix*	**--**	--	286	**286**	**34.67**	--	--	--	**--**	**--**
Cunner	*Tautogolabrus adspersus*	2	1	--	**3**	**0.37**	1	1	--	**2**	**0.04**
Grubby	*Myoxocephalus aenaeus*	--	--	2	**2**	**0.25**	--	4	1	**5**	**0.10**
Menhaden	*Brevoortia tyrannus*	--	--	--	**--**	**--**	--	--	5,215	**5,215**	**94.21**
Mullet	*Mugil cephalus*	2	--	**--**	**2**	**0.25**	--	--	--	**--**	**--**
Mummichog	*Fundulus heteroclitus*	1	--	--	**1**	**0.13**	16	13	20	**49**	**0.89**
Northern Pipefish	*Syngnathus fuscus*	2	4	1	**7**	**0.85**	6	--	1	**7**	**0.13**
Northern Sea Robin	*Prionotus carolinus*	**--**	--	--	**--**	**--**	--	--	--	**--**	**--**
Porgy	*Stenotomus chrysops*	3	--	**--**	**3**	**0.37**	--	--	--	**--**	**--**
Sandlance	*Ammodytes americanus*	**--**	2	**--**	**2**	**0.25**	--	--	--	**--**	**--**
Sheepshead Minnow	*Cyprinodon variegates*	--	--	**--**	**--**	**--**	--	--	--	**--**	**--**
Striped Bass	*Morone saxatilis*	--	--	--	**--**	**---**	--	--	--	**--**	**--**
Striped Killifish	*Fundulus majalis*	--	--	--	**--**	**--**	6	--	9	**15**	**0.28**
Tomcod	*Microgadus tomcod*	**--**	13	--	**13**	**1.58**	--	--	--	**--**	**--**
Weakfish	*Cynoscion regalis*	**--**	--	--	**--**	**--**	--	--	1	**1**	**0.02**
Windowpane Flounder	*Scophthalmus aquosus*	1	--	**--**	**1**	**0.13**	--	--	--	**--**	**--**
Winter Flounder	*Pleuronectes americanus*	--	--	--	**--**	**--**	1	1	--	**2**	**0.04**
	Total # of Organisms Collected	**71**	**48**	**706**	**825**	**--**	**64**	**90**	**5,382**	**5,536**	**--**
	Total Number of Taxa Collected	**7**	**5**	**5**	**12**	**--**	**6**	**5**	**7**	**9**	**--**

* Shaded cells indicate Essential Fish Habitat (EFH) designated species.

4.4 ESSENTIAL FISH HABITAT SPECIES

For both locations, the same four essential fish habitat (EFH) designated species were observed: bluefish, porgy (*Stenotomus chrysops*), windowpane flounder (*Scopthalmus aquosus*) and winter flounder (*Plueronectes americanus*). The most abundant EFH species collected was bluefish followed by winter flounder. Winter flounder was the only species collected across all seasons sampled. Standard length statistic data of the EFH designated species collected at both locations is presented in Table 9.

4.4.1 Asharoken

Bluefish was the most abundant EFH species at Asharoken and represented 4.09% of the total catch at that location (Table 4). Bluefish were captured in both the Spring and Summer 2004 sampling events, but not in the Fall 2003 samples (Tables 6 & 9). Winter flounder was the second most abundant EFH species and accounted for 0.47% of the catch at this location. They were also captured during each seasonal sampling event and were present at both the Long Island Sound and the Bay transects.

Length statistic data for Asharoken in the Fall 2003 sampling event yielded three (3) winter flounder in the juvenile stage, with the smallest at 4.5 cm, largest at 5.5 cm and an average of 5.0 cm (Table 9). One porgy was also measured at 6.0 cm in length.

In the Spring 2004 sampling event fifty eight (58) young of the year bluefish were captured with a range of length from 5.0 – 7.4 cm and an average of 6.09 cm. Seven (7) juvenile winter flounder were measured and the smallest was 1.7 cm, the largest 4.4 cm and the average was 3.01 cm. One juvenile windowpane flounder was also captured and measured 6.5 cm in length.

During the Summer 2004 sampling event 204 juvenile bluefish had an average length of 9.24 cm and a maximum length of 12 cm and minimum of 1.1 cm. Twenty winter flounder (20) in the juvenile stage were measured with the smallest at 3.8 cm, largest 6.2 cm and an average of 4.6 cm in length.

4.4.2 Bayville

Bluefish was the most abundant EFH species at Bayville and represented 4.5% of the total catch at that location (Table 7). Bluefish were captured only in the Summer 2004 sampling event and were not present in either the Fall 2003 or Spring 2004 samples (Tables 8 & 9). Bluefish were only observed at the Long Island transects for Bayville. Porgy was the second most abundant EFH species present at Bayville, but only 3 were captured which accounted for 0.05% of the catch at this location. Porgy were only captured in the Fall 2003, and only present at the Long Island Sound transects.

Length statistic data for Bayville in the Fall 2003 sampling event yielded three (3) juvenile porgy; the smallest was 4.5 cm, the largest was 6.0 cm and the average length was 5.33 cm (Table 9). One (1) windowpane flounder measuring 23.5 cm and one (1) juvenile winter flounder measuring 3.75 cm in length were also present.

In the Spring 2004 sampling event only (1) winter flounder in the juvenile stage was captured and measured 3.30 cm in length.

During the Summer 2004 sampling event 286 juvenile bluefish were captured, with the smallest at 7.8 cm, the largest at 11.0 cm and an average length of 9.24 cm

Table 9. Standard length statistics for Essential Fish Habitat designated species by location.

Common Name	Scientific Name	Season	N	Mean	Max	Min	SD
Asharoken							
Porgy	*Stenotomus chrysops*	Fall	1	6.00	6.00	6.00	--
Winter Flounder	*Pleuronectes americanus*	Fall	3	5.00	5.50	4.50	0.50
Bluefish	*Pomatomus saltatrix*	Spring	58	6.09	7.40	5.00	0.59
Windowpane Flounder	*Scophthalmus aquosus*	Spring	1	6.50	6.50	6.50	--
Winter Flounder	*Pleuronectes americanus*	Spring	7	3.01	4.40	1.70	0.86
Bluefish	*Pomatomus saltatrix*	Summer	204	9.24	12.00	1.10	1.24
Winter Flounder	*Pleuronectes americanus*	Summer	20	4.60	6.20	3.80	0.61
Bayville							
Porgy	*Stenotomus chrysops*	Fall	3	5.33	6.0	4.5	0.76
Windowpane Flounder	*Scophthalmus aquosus*	Fall	1	23.50	23.50	23.50	--
Winter Flounder	*Pleuronectes Americanus*	Fall	1	3.75	3.75	3.75	--
Winter Flounder	*Pleuronectes americanus*	Spring	1	3.30	3.30	3.30	--
Bluefish	*Pomatomus saltatrix*	Summer	286	9.24	11.00	7.80	0.69

Key:

N = Number captured
Min = Minimum standard length (cm)
Max = Maximum standard length (cm)
Mean = Average standard length (cm)
SD = Standard deviation

5.0 BENTHIC SAMPLING RESULTS

A total of 8 phyla consisting of 47 taxa were collected and identified throughout the study period. Across all seasons and locations, the total benthic macroinvertebrate abundance was 21,595 with a biomass of 19.5 grams (Table 10).

The most commonly abundant phylum was Annelida which represented 18,152 or 84.1% of the total macroinvertebrates encountered. The majority of the Annelids identified were Oligochaetes of various species. The Nematoda phylum was also abundant (9.2%) followed by Mollusca (2.6%) and Nemertinae (2.0%) to lesser degrees (Figure 3). Despite the relatively low abundance of Mollusca, it represented 15.1 grams or 77.3% of the total biomass. This was largely composed of the Gastropods *Crepidula fornicate* and *Ilyanassa obsolete.* Annelida (20.5%) and Arthropoda (1.34%) also significantly contributed to the total biomass (Figure 4).

The benthic macroinvertebrate data can be found in Appendix B.

5.1 SPECIES COMPOSITION AND ABUNDANCE WITH SEASON

5.1.1 Asharoken

At the Asharoken location, samples were collected in the fall 2003, spring 2004, and the summer 2004 (Sound transects only). However, the spring and summer 2004 L.I. Sound transects were inadvertently pooled together during macroinvertebrate identification (Spring/Summer 2004). This pooling was compensated for by averaging for 6 replicates in the 2004 Sound data as opposed to the 3 in other transects to calculate abundances and biomass. The seasons being compared are therefore the Fall 2003 and Spring/Summer 2004.

The Fall 2003 species richness was limited to 5 phyla consisting of 19 taxa (Table 11). The Spring/Summer data was found to be more diverse with macroinvertebrates spanning all 8 phyla consisting of 31 taxa. The macroinvertebrate abundance was significantly lower in Fall 2003 in comparison to Spring/Summer 2004 (695 vs. 2,046). In both the Fall 2003 and Spring/Summer 2004 (Figure 5), Annelids were the most abundant (84.0% and 90.0% respectively) followed by Nematoda (9.3% and 4.3% respectively). The biomass, however, was significantly higher in the Fall 2003 (1.376 vs. 0.633 grams) but this was due to the presence of a small number of heavy gastropods. The Fall 2003 macroinvertebrate biomass (Figure 6) was dominated by Mollusca (75.0%) and was followed by Annelida (22.3%) and Arthropoda (2.4%). Conversely, the spring/summer biomass (Figure 6) was dominated by Annelida (67.3%) followed by Mollusca (25.9%) and Arthropoda (4.15%).

Table 10: Total macroinvertebrate taxa and abundance by season.

	Fall 2003				Spring/Summer 2004				All Benthic Data			
TAXA	Abundance	Percent Composition	Biomass (grams)	Percent Composition	Abundance	Percent Composition	Biomass (grams)	Percent Composition	Abundance	Percent Composition	Biomass (grams)	Percent Composition
Cnidaria												
Anthozoa												
Metridium senile*	0.00	0.00	0.00	0.00	2.00	0.01	0.00	0.01	2.00	0.01	0.00	0.00
Total Cnidaria	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**0.01**	**0.00**	**0.01**	**2.00**	**0.01**	**0.00**	**0.00**
Platyhelminthes												
Turbellaria*												
Unidentified spp.*	0.00	0.00	0.00	0.00	116.00	0.66	0.01	0.08	116.00	0.54	0.01	0.04
Total Platyhelminthes	**0.00**	**0.00**	**0.00**	**0.00**	**116.00**	**0.66**	**0.01**	**0.08**	**116.00**	**0.54**	**0.01**	**0.04**
Nemertinea												
Unidentified Sp.	1.00	0.02	0.01	0.05	421.00	2.41	0.08	0.82	422.00	1.95	0.09	0.44
Total Nemertinae	**1.00**	**0.02**	**0.01**	**0.05**	**421.00**	**2.41**	**0.08**	**0.82**	**422.00**	**1.95**	**0.09**	**0.44**
Nematoda												
Unidentified Sp.	336.00	8.15	0.03	0.31	1653.00	9.46	0.02	0.21	1989.00	9.21	0.05	0.26
Total Nematoda	**336.00**	**8.15**	**0.03**	**0.31**	**1653.00**	**9.46**	**0.02**	**0.21**	**1989.00**	**9.21**	**0.05**	**0.26**
Mollusca												
Gastropoda												
Crepidula fornicata	58.00	1.41	7.38	77.15	0.00	0.00	0.00	0.00	58.00	0.27	7.38	37.79
Crepidula plana	1.00	0.02	0.20	2.12	0.00	0.00	0.00	0.00	1.00	0.00	0.20	1.04
Littorina littorea	1.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
Lacuna vincta*	0.00	0.00	0.00	0.00	1.00	0.01	0.00	0.04	1.00	0.00	0.00	0.02
Hydrobia spp.*	0.00	0.00	0.00	0.00	8.00	0.05	0.03	0.31	8.00	0.04	0.03	0.16
Urosalpinx cinerea*	0.00	0.00	0.00	0.00	1.00	0.01	0.00	0.02	1.00	0.00	0.00	0.01
Ilyanassa obsoleta*	0.00	0.00	0.00	0.00	29.00	0.17	4.15	41.64	29.00	0.13	4.15	21.24
Ilyanassa traivittata*	0.00	0.00	0.00	0.00	4.00	0.02	0.34	3.45	4.00	0.02	0.34	1.76
Ilyanassa egg cases*	0.00	0.00	0.00	0.00	69.00	0.39	0.05	0.51	69.00	0.32	0.05	0.26
Bivalvia												
Mytilus edulis	2.00	0.05	0.00	0.02	6.00	0.03	0.01	0.05	8.00	0.04	0.01	0.03
Gemma gemma	199.00	4.83	0.23	2.45	178.00	1.02	0.55	5.49	377.00	1.75	0.78	4.00
Mya arenaria*	0.00	0.00	0.00	0.00	2.00	0.01	2.15	21.61	2.00	0.01	2.15	11.03
Total Mollusca	**261.00**	**6.33**	**7.82**	**81.74**	**298.00**	**1.71**	**7.28**	**73.13**	**559.00**	**2.59**	**15.10**	**77.35**
Annelida												
Oligochaeta												
Unidentified Sp.	2258.00	54.78	0.19	1.96	12893.00	73.79	0.63	6.35	15151.00	70.16	0.82	4.20
Polychaeta												
Poly Parts	--	--	0.23	2.38	--	--	0.08	0.76	0.00	0.00	0.30	1.55
Ampharetidae												
Melinna cristata	1.00	0.02	0.02	0.21	0.00	0.00	0.00	0.00	1.00	0.00	0.02	0.10
Capitellidae												
Capitella sp.	63.00	1.53	0.02	0.19	78.00	0.45	0.02	0.16	141.00	0.65	0.03	0.17
Cirratulidae												
Tharyx sp.	3.00	0.07	0.00	0.01	19.00	0.11	0.00	0.04	22.00	0.10	0.01	0.03
Dodecaceria spp.*	0.00	0.00	0.00	0.00	1.00	0.01	0.00	0.00	1.00	0.00	0.00	0.00
Glyceridae												
Glycera sp.	1.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
Nereidae												
Nereis sp.	12.00	0.29	0.06	0.64	14.00	0.08	0.55	5.49	26.00	0.12	0.61	3.11
Opheliidae												
Ophelia sp.	28.00	0.68	0.01	0.15	6.00	0.03	0.04	0.40	34.00	0.16	0.05	0.28
Orbinidae												
Leitoscoloplos fragilis	932.00	22.61	0.67	7.01	648.00	3.71	0.56	5.58	1580.00	7.32	1.23	6.28
Leitoscoloplos robustus*	0.00	0.00	0.00	0.00	8.00	0.05	0.01	0.14	8.00	0.04	0.01	0.07
Paraonidae												
Paraonis sp.	7.00	0.17	0.01	0.05	0.00	0.00	0.00	0.00	7.00	0.03	0.01	0.03
Pilargiidae												
Sigambra tentaculata	47.00	1.14	0.01	0.06	128.00	0.73	0.01	0.13	175.00	0.81	0.02	0.10
Phyllodocidae												
Eteone sp.	15.00	0.36	0.01	0.12	37.00	0.21	0.15	1.47	52.00	0.24	0.16	0.80
Spionidae												
Polydora sp.	13.00	0.32	0.00	0.04	38.00	0.22	0.01	0.09	51.00	0.24	0.01	0.07
Scolecolepides viridis	66.00	1.60	0.38	4.01	698.00	3.99	0.31	3.11	764.00	3.54	0.69	3.55
Scolelepis squamata	1.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.01
Spio filicornis*	0.00	0.00	0.00	0.00	2.00	0.01	0.00	0.03	2.00	0.01	0.00	0.02
Streblospio benedicti	5.00	0.12	0.00	0.01	20.00	0.11	0.01	0.14	25.00	0.12	0.01	0.08
Syllidae												
Parapionosyllis longicirrata	26.00	0.63	0.00	0.03	83.00	0.48	0.01	0.06	109.00	0.50	0.01	0.04
Parapionosyllis pinnata*	0.00	0.00	0.00	0.00	1.00	0.01	0.00	0.00	1.00	0.00	0.00	0.00
Total Annelida	**3478.00**	**84.38**	**1.61**	**16.87**	**14674.00**	**83.98**	**2.39**	**23.96**	**18152.00**	**84.06**	**4.00**	**20.49**
Arthropoda												
Merostomata												
Limulus polyphemus‘	0.00	0.00	0.00	0.00	2.00	0.01	0.01	0.09	2.00	0.01	0.01	0.05
Crustacea												
Copepoda												
Unidentified Harpacticoidea‘	0.00	0.00	0.00	0.00	238.00	1.36	0.03	0.33	238.00	1.10	0.03	0.17
Isopoda												
Chiridotea spp.*	0.00	0.00	0.00	0.00	1.00	0.01	0.00	0.00	1.00	0.00	0.00	0.00
Sphaeroma quadridentata	4.00	0.10	0.01	0.05	0.00	0.00	0.00	0.00	4.00	0.02	0.01	0.03
Amphipoda												
Corophiidae												
Corophium sp.	2.00	0.05	0.00	0.01	3.00	0.02	0.00	0.03	5.00	0.02	0.00	0.02
Haustoriidae												
Neohaustorius sp.	40.00	0.97	0.09	0.96	6.00	0.03	0.07	0.73	46.00	0.21	0.17	0.85
Gammaridae												
Gammarus micronatus*	0.00	0.00	0.00	0.00	24.00	0.14	0.04	0.40	24.00	0.11	0.04	0.21
Cirripedia												
Chthalmalus fragilis*	0.00	0.00	0.00	0.00	4.00	0.02	0.00	0.01	4.00	0.02	0.00	0.01
Decapoda												
Unidentified megalopa*	0.00	0.00	0.00	0.00	3.00	0.02	0.01	0.05	3.00	0.01	0.01	0.03
Total Arthropoda	**46.00**	**1.12**	**0.10**	**1.03**	**281.00**	**1.61**	**0.16**	**1.65**	**327.00**	**1.51**	**0.26**	**1.34**
Chordata												
Osteichthyes												
Unidentified fish eggs*	0.00	0.00	0.00	0.00	28.00	0.16	0.02	0.15	28.00	0.13	0.02	0.08
Total Chordata	**0.00**	**0.00**	**0.00**	**0.00**	**28.00**	**0.16**	**0.02**	**0.15**	**28.00**	**0.13**	**0.02**	**0.08**
TOTAL	**4122.00**	**100.00**	**9.56**	**100.00**	**17473.00**	**100.00**	**9.96**	**100.00**	**21595.00**	**100.00**	**19.52**	**100.00**

* denotes new taxa found in spring/summer 2004

Figure 3. Benthic macroinvertebrate abundance: all samples.

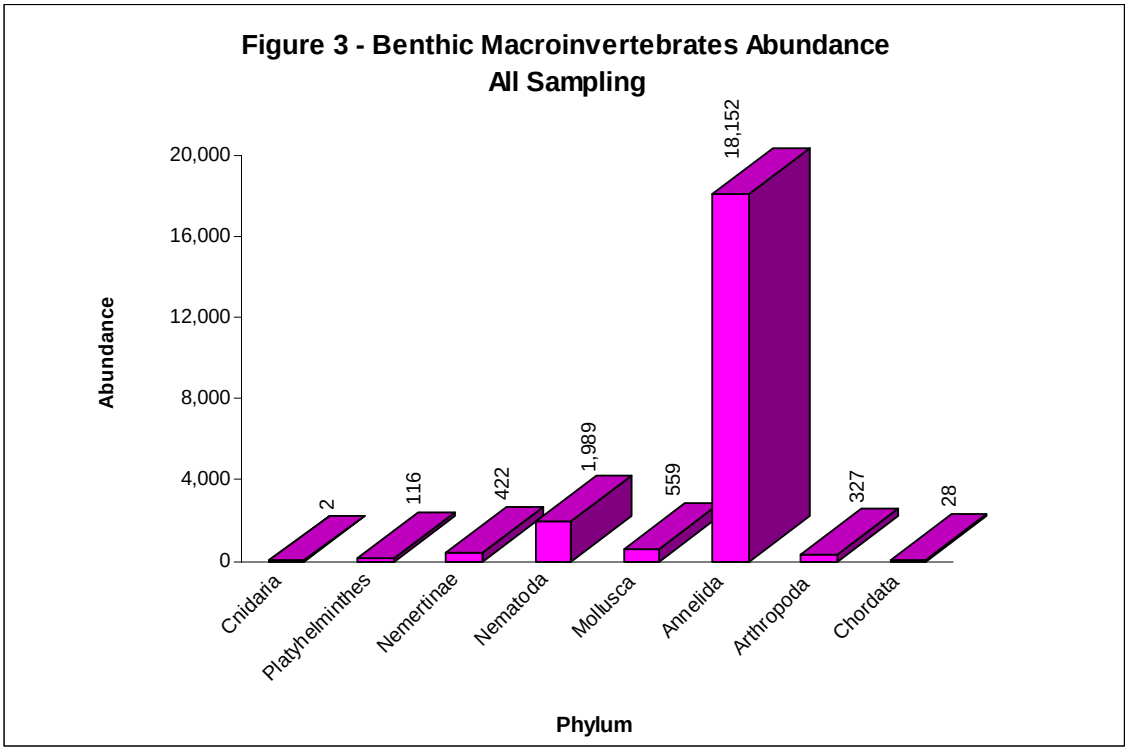


Figure 4. Benthic macroinvertebrate biomass (g): all samples.

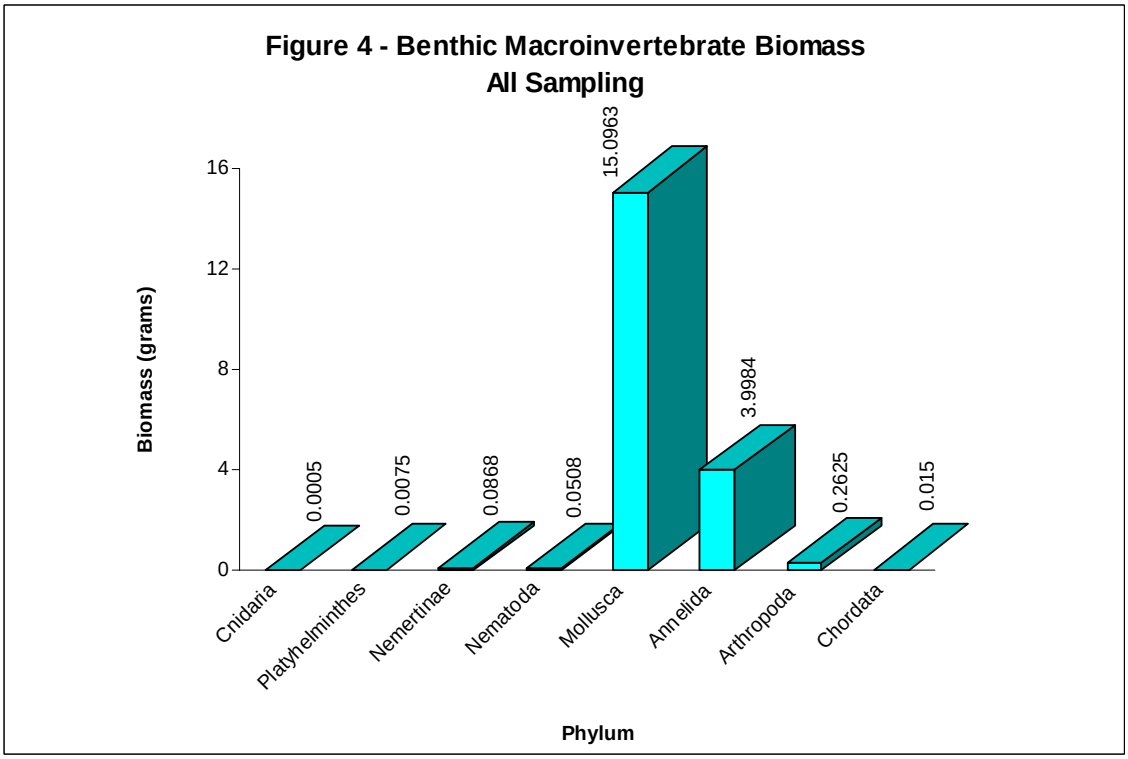


Table 11: Pooled benthicmacroinvertebrate taxa at Asharoken: seasonal effect

		ASHAROKEN	Fall 2003			ASHAROKEN	Spring/Summer 2004			ASHAROKEN	Total: 2003 and 2004	
TAXA	Abundance	Percent Composition	Biomass (grams)	Percent Composition	Abundance	Percent Composition	Biomass (grams)	Percent Composition	Abundance	Percent Composition	Biomass (grams)	Percent Composition
Cnidaria												
Anthozoa												
Metridium senile*	0.00	0.00	0.00	0.00	0.33	0.02	0.00	0.01	0.33	0.01	0.00	0.00
Total Cnidaria	**0.00**	**0.00**	**0.00**	**0.00**	**0.33**	**0.02**	**0.00**	**0.01**	**0.33**	**0.01**	**0.00**	**0.00**
Platyhelminthes												
Turbellaria*												
Unidentified spp.*	0.00	0.00	0.00	0.00	18.67	0.91	0.00	0.19	18.67	0.68	0.00	0.06
Total Platyhelminthes	**0.00**	**0.00**	**0.00**	**0.00**	**18.67**	**0.91**	**0.00**	**0.19**	**18.67**	**0.68**	**0.00**	**0.06**
Nemertinea												
Unidentified Sp.	0.33	0.05	0.00	0.12	36.00	1.76	0.01	1.77	36.33	1.33	0.01	0.64
Total Nemertinae	**0.33**	**0.05**	**0.00**	**0.12**	**36.00**	**1.76**	**0.01**	**1.77**	**36.33**	**1.33**	**0.01**	**0.64**
Nematoda												
Unidentified Sp.	64.33	9.25	0.00	0.28	87.83	4.29	0.00	0.31	152.17	5.55	0.01	0.29
Total Nematoda	**64.33**	**9.25**	**0.00**	**0.28**	**87.83**	**4.29**	**0.00**	**0.31**	**152.17**	**5.55**	**0.01**	**0.29**
Mollusca												
Gastropoda												
Crepidula fornicata	8.67	1.25	0.95	69.36	0.00	0.00	0.00	0.00	8.67	0.32	0.95	47.50
Crepidula plana	0.33	0.05	0.07	4.92	0.00	0.00	0.00	0.00	0.33	0.01	0.07	3.37
Littorina littorea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lacuna vincta*	0.00	0.00	0.00	0.00	0.17	0.01	0.00	0.11	0.17	0.01	0.00	0.03
Hydrobia spp.*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urosalpinx cinerea*	0.00	0.00	0.00	0.00	0.17	0.01	0.00	0.05	0.17	0.01	0.00	0.02
Ilyanassa obsoleta*	0.00	0.00	0.00	0.00	0.17	0.01	0.12	18.51	0.17	0.01	0.12	5.83
Ilyanassa traivittata*	0.00	0.00	0.00	0.00	0.33	0.02	0.03	4.55	0.33	0.01	0.03	1.44
Ilyanassa egg cases*	0.00	0.00	0.00	0.00	8.67	0.42	0.01	0.97	8.67	0.32	0.01	0.31
Bivalvia												
Mytilus edulis	0.67	0.10	0.00	0.04	1.00	0.05	0.00	0.13	1.67	0.06	0.00	0.07
Gemma gemma	21.67	3.12	0.01	0.67	2.83	0.14	0.01	1.55	24.50	0.89	0.02	0.95
Mya arenaria*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Mollusca	**31.33**	**4.51**	**1.03**	**74.98**	**13.33**	**0.65**	**0.16**	**25.88**	**44.67**	**1.63**	**1.20**	**59.50**
Annelida												
Oligochaeta												
Unidentified Sp.	474.67	68.26	0.03	2.24	1523.33	74.47	0.09	13.48	1998.00	72.89	0.12	5.78
Polychaeta												
Poly Parts	0.00	0.00	0.07	5.03	0.00	0.00	0.01	2.09	0.00	0.00	0.08	4.10
Ampharetidae												
Melinna cristata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capitellidae												
Capitella sp.	21.00	3.02	0.01	0.44	13.00	0.64	0.00	0.41	34.00	1.24	0.01	0.43
Cirratulidae												
Tharyx sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dodecaceria spp.*	0.00	0.00	0.00	0.00	0.17	0.01	0.00	0.01	0.17	0.01	0.00	0.00
Glyceridae												
Glycera sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nereidae												
Nereis sp.	3.67	0.53	0.02	1.47	2.33	0.11	0.10	16.40	6.00	0.22	0.12	6.17
Opheliidae												
Ophelia sp.	0.00	0.00	0.00	0.00	0.50	0.02	0.01	1.00	0.50	0.02	0.01	0.32
Orbinidae												
Leitoscoloplos fragilis	55.67	8.01	0.05	3.97	121.17	5.92	0.11	17.01	176.83	6.45	0.16	8.08
Leitoscoloplos robustus*	0.00	0.00	0.00	0.00	1.33	0.07	0.00	0.37	1.33	0.05	0.00	0.12
Paraonidae												
Paraonis sp.	2.33	0.34	0.00	0.12	0.00	0.00	0.00	0.00	2.33	0.09	0.00	0.08
Pilargiidae												
Sigambra tentaculata	0.67	0.10	0.00	0.01	8.17	0.40	0.00	0.27	8.83	0.32	0.00	0.09
Phyllodocidae												
Eteone sp.	3.67	0.53	0.00	0.22	7.83	0.38	0.04	6.29	11.50	0.42	0.04	2.13
Spionidae												
Polydora sp.	1.00	0.14	0.00	0.02	3.67	0.18	0.00	0.11	4.67	0.17	0.00	0.05
Scolecolepides viridis	21.33	3.07	0.12	8.70	145.17	7.10	0.06	9.75	166.50	6.07	0.18	9.03
Scolelepis squamata	0.33	0.05	0.00	0.05	0.00	0.00	0.00	0.00	0.33	0.01	0.00	0.03
Spio filicornis*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Streblospio benedicti	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Syllidae												
Parapionosyllis longicirrata	0.00	0.00	0.00	0.00	13.50	0.66	0.00	0.14	13.50	0.49	0.00	0.04
Parapionosyllis pinnata*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Annelida	**584.33**	**84.04**	**0.31**	**22.26**	**1840.17**	**89.95**	**0.43**	**67.32**	**2424.50**	**88.45**	**0.73**	**36.46**
Arthropoda												
Merostomata												
Limulus polyphemus‘	0.00	0.00	0.00	0.00	0.33	0.02	0.00	0.24	0.33	0.01	0.00	0.07
Crustacea												
Copepoda												
Unidentified Harpacticoidea‘	0.00	0.00	0.00	0.00	39.67	1.94	0.01	0.96	39.67	1.45	0.01	0.30
Isopoda												
Chiridotea spp.*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sphaeroma quadridentata	1.33	0.19	0.00	0.12	0.00	0.00	0.00	0.00	1.33	0.05	0.00	0.08
Amphipoda												
Corophiidae												
Corophium sp.	0.33	0.05	0.00	0.01	0.50	0.02	0.00	0.08	0.83	0.03	0.00	0.03
Haustoriidae												
Neohaustorius sp.	13.33	1.92	0.03	2.23	1.00	0.05	0.01	1.92	14.33	0.52	0.04	2.13
Gammaridae												
Gammarus micronatus*	0.00	0.00	0.00	0.00	2.17	0.11	0.01	0.79	2.17	0.08	0.01	0.25
Cirripedia												
Chthalmalus fragilis*	0.00	0.00	0.00	0.00	0.67	0.03	0.00	0.03	0.67	0.02	0.00	0.01
Decapoda												
Unidentified megalopa*	0.00	0.00	0.00	0.00	0.50	0.02	0.00	0.13	0.50	0.02	0.00	0.04
Total Arthropoda	**15.00**	**2.16**	**0.03**	**2.36**	**44.83**	**2.19**	**0.03**	**4.15**	**59.83**	**2.18**	**0.06**	**2.93**
Chordata												
Osteichthyes												
Unidentified fish eggs*	0.00	0.00	0.00	0.00	4.50	0.22	0.00	0.37	4.50	0.16	0.00	0.12
Total Chordata	**0.00**	**0.00**	**0.00**	**0.00**	**4.50**	**0.22**	**0.00**	**0.37**	**4.50**	**0.16**	**0.00**	**0.12**
TOTAL	**695.33**	**100.00**	**1.38**	**100.00**	**2045.67**	**100.00**	**0.63**	**100.00**	**2741.00**	**100.00**	**2.01**	**100.00**

* denotes new taxa found in spring/summer 2004

Figure 5. Pooled benthic macroinvertebrate abundance: Asharoken

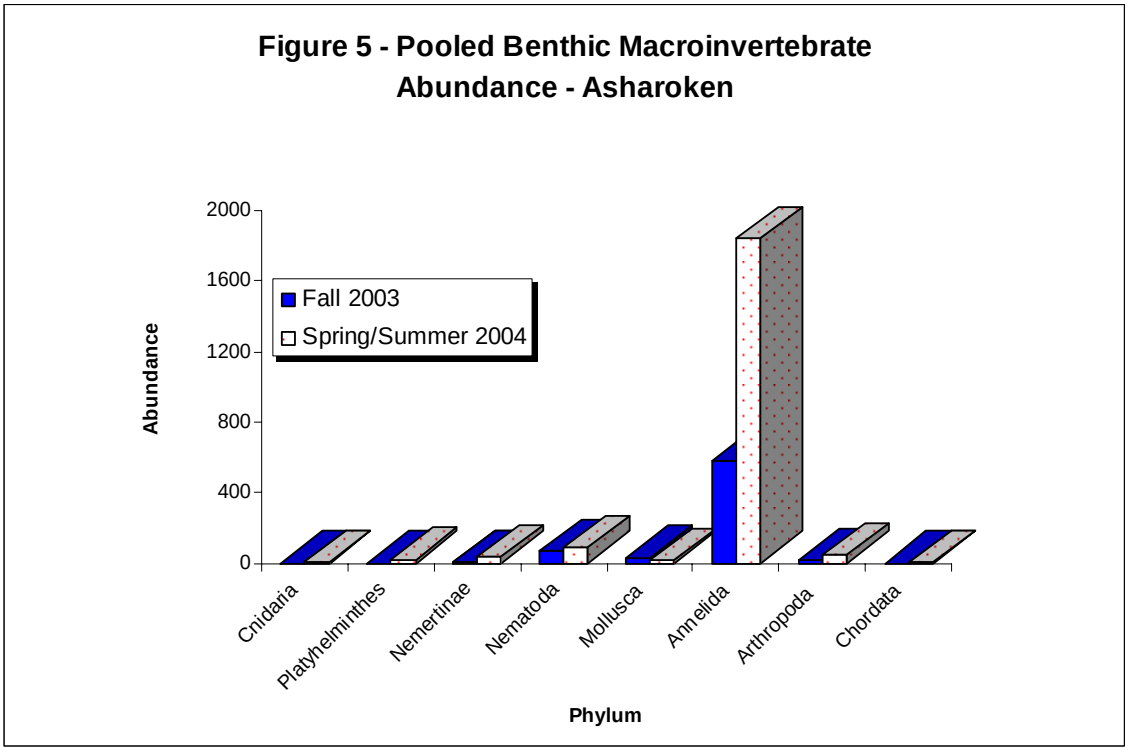


Figure 6. Pooled benthic macroinvertebrate biomass (g)- Asharoken

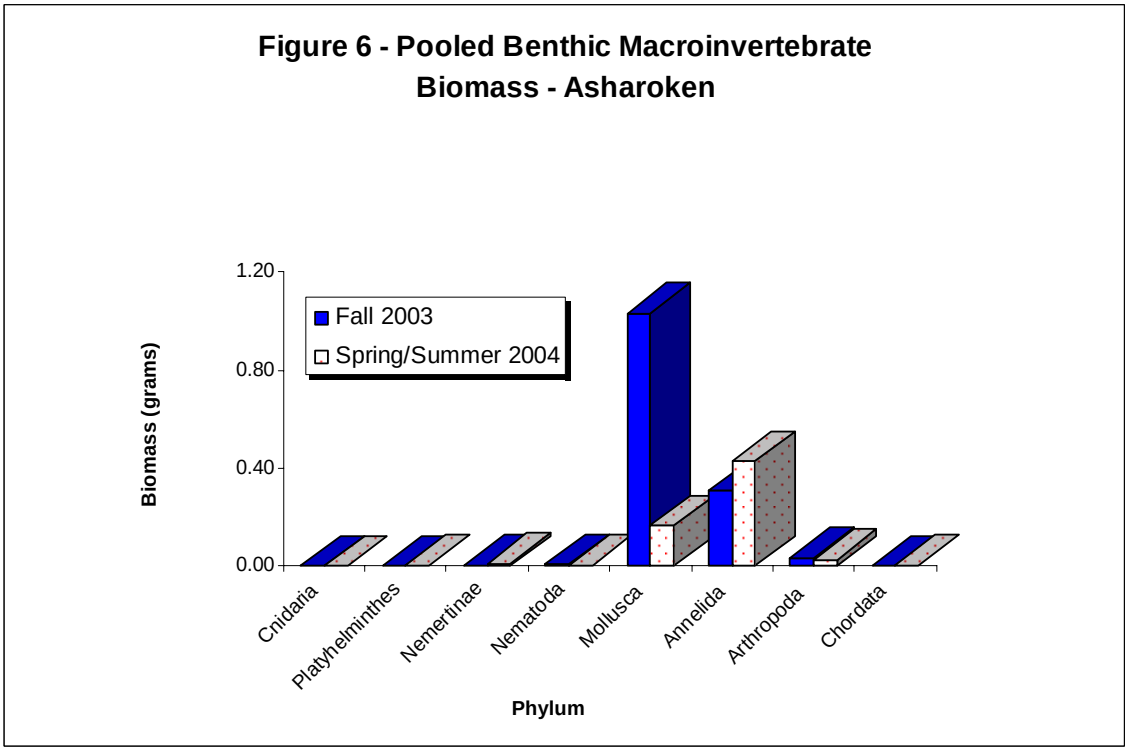


Table 12: Pooled benthic macroinvertebrate taxa at Bayville: seasonal effect.

		BAYVILLE	Fall 2003			BAYVILLE	Spring 2004			BAYVILLE	Total: 2003 and 2004	
TAXA	Abundance	Percent Composition	Biomass (grams)	Percent Composition	Abundance	Percent Composition	Biomass (grams)	Percent Composition	Abundance	Percent Composition	Biomass (grams)	Percent Composition
Cnidaria												
Anthozoa												
Metridium senile*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Cnidaria	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Platyhelminthes												
Turbellaria*												
Unidentified spp.*	0.00	0.00	0.00	0.00	1.33	0.07	0.00	0.00	1.33	0.05	0.00	0.00
Total Platyhelminthes	**0.00**	**0.00**	**0.00**	**0.00**	**1.33**	**0.07**	**0.00**	**0.00**	**1.33**	**0.05**	**0.00**	**0.00**
Nemertinea												
Unidentified Sp.	0.00	0.00	0.00	0.00	68.67	3.47	0.01	0.23	68.67	2.59	0.01	0.13
Total Nemertinae	**0.00**	**0.00**	**0.00**	**0.00**	**68.67**	**3.47**	**0.01**	**0.23**	**68.67**	**2.59**	**0.01**	**0.13**
Nematoda												
Unidentified Sp.	47.67	6.41	0.01	0.33	376.67	19.06	0.00	0.15	424.33	15.98	0.01	0.23
Total Nematoda	**47.67**	**6.41**	**0.01**	**0.33**	**376.67**	**19.06**	**0.00**	**0.15**	**424.33**	**15.98**	**0.01**	**0.23**
Mollusca												
Gastropoda												
Crepidula fornicata	10.67	1.43	1.50	83.06	0.00	0.00	0.00	0.00	10.67	0.40	1.50	37.25
Crepidula plana	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Littorina littorea	0.33	0.04	0.00	0.01	0.00	0.00	0.00	0.00	0.33	0.01	0.00	0.00
Lacuna vincta*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrobia spp.*	0.00	0.00	0.00	0.00	2.67	0.13	0.01	0.46	2.67	0.10	0.01	0.26
Urosalpinx cinerea*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ilyanassa obsoleta*	0.00	0.00	0.00	0.00	9.33	0.47	1.15	51.53	9.33	0.35	1.15	28.42
Ilyanassa traivittata*	0.00	0.00	0.00	0.00	0.67	0.03	0.06	2.56	0.67	0.03	0.06	1.41
Ilyanassa egg cases*	0.00	0.00	0.00	0.00	5.67	0.29	0.00	0.20	5.67	0.21	0.00	0.11
Bivalvia												
Mytilus edulis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gemma gemma	44.67	6.01	0.07	3.81	54.33	2.75	0.17	7.41	99.00	3.73	0.23	5.79
Mya arenaria*	0.00	0.00	0.00	0.00	0.67	0.03	0.72	32.21	0.67	0.03	0.72	17.76
Total Mollusca	**55.67**	**7.49**	**1.57**	**86.88**	**73.33**	**3.71**	**2.10**	**94.37**	**129.00**	**4.86**	**3.68**	**91.01**
Annelida												
Oligochaeta												
Unidentified Sp.	278.00	37.40	0.03	1.74	1329.33	67.26	0.06	2.61	1607.33	60.54	0.09	2.22
Polychaeta												
Poly Parts	0.00	0.00	0.01	0.38	0.00	0.00	0.00	0.20	0.00	0.00	0.01	0.28
Ampharetidae												
Melinna cristata	0.33	0.04	0.01	0.37	0.00	0.00	0.00	0.00	0.33	0.01	0.01	0.17
Capitellidae												
Capitella sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cirratulidae												
Tharyx sp.	1.00	0.13	0.00	0.02	6.33	0.32	0.00	0.06	7.33	0.28	0.00	0.04
Dodecaceria spp.*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Glyceridae												
Glycera sp.	0.33	0.04	0.00	0.01	0.00	0.00	0.00	0.00	0.33	0.01	0.00	0.00
Nereidae												
Nereis sp.	0.33	0.04	0.00	0.01	1.33	0.07	0.00	0.03	1.67	0.06	0.00	0.02
Opheliidae				0.00								
Ophelia sp.	9.33	1.26	0.00	0.26	1.00	0.05	0.00	0.03	10.33	0.39	0.01	0.13
Orbinidae								0.00	0.00	0.00	0.00	0.00
Leitoscoloplos fragilis	255.00	34.30	0.17	9.31	24.67	1.25	0.02	0.78	279.67	10.53	0.19	4.61
Leitoscoloplos robustus*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paraonidae												
Paraonis sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pilargiidae												
Sigambra tentaculata	15.00	2.02	0.00	0.09	32.67	1.65	0.00	0.09	47.67	1.80	0.00	0.09
Phyllodocidae												
Eteone sp.	1.33	0.18	0.00	0.04	4.33	0.22	0.01	0.34	5.67	0.21	0.01	0.21
Spionidae												
Polydora sp.	3.33	0.45	0.00	0.06	9.00	0.46	0.00	0.10	12.33	0.46	0.00	0.08
Scolecolepides viridis	0.67	0.09	0.01	0.44	17.67	0.89	0.01	0.48	18.33	0.69	0.02	0.46
Scolelepis squamata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Spio filicornis*	0.00	0.00	0.00	0.00	0.67	0.03	0.00	0.04	0.67	0.03	0.00	0.02
Streblospio benedicti	1.67	0.22	0.00	0.01	6.67	0.34	0.00	0.22	8.33	0.31	0.00	0.12
Syllidae												
Parapionosyllis longicirrata	8.67	1.17	0.00	0.05	1.00	0.05	0.00	0.02	9.67	0.36	0.00	0.03
Parapionosyllis pinnata	0.00	0.00	0.00	0.00	0.33	0.02	0.00	0.00	0.33	0.01	0.00	0.00
Total Annelida	**575.00**	**77.35**	**0.23**	**12.77**	**1435.00**	**72.61**	**0.11**	**5.01**	**2010.00**	**75.71**	**0.34**	**8.49**
Arthropoda												
Merostomata												
Limulus polyphemus'	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crustacea												
Copepoda												
Unidentified Harpacticoidea'	0.00	0.00	0.00	0.00	17.00	0.86	0.00	0.07	17.00	0.64	0.00	0.04
Isopoda												
Chiridotea spp.*	0.00	0.00	0.00	0.00	0.33	0.02	0.00	0.00	0.33	0.01	0.00	0.00
Sphaeroma quadridentata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Amphipoda												
Corophiidae												
Corophium sp.	0.33	0.04	0.00	0.01	0.00	0.00	0.00	0.00	0.33	0.01	0.00	0.00
Haustoriidae												
Neohaustorius sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gammaridae												
Gammarus micronatus*	0.00	0.00	0.00	0.00	3.67	0.19	0.00	0.15	3.67	0.14	0.00	0.08
Cirripedia												
Chthalmalus fragilis*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Decapoda												
Unidentified megalopa*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Arthropoda	**0.33**	**0.04**	**0.00**	**0.01**	**21.00**	**1.06**	**0.00**	**0.22**	**21.33**	**0.80**	**0.01**	**0.13**
Chordata												
Osteichthyes												
Unidentified fish eggs*	0.00	0.00	0.00	0.00	0.33	0.02	0.00	0.01	0.33	0.01	0.00	0.01
Total Chordata	**0.00**	**0.00**	**0.00**	**0.00**	**0.33**	**0.02**	**0.00**	**0.01**	**0.33**	**0.01**	**0.00**	**0.01**
TOTAL	**678.67**	**91.30**	**1.81**	**100.00**	**1976.33**	**100.00**	**2.23**	**100.00**	**2655.00**	**100.00**	**4.04**	**100.00**

* denotes new taxa found in spring/summer 2004

Figure 7. Pooled benthic macroinvertebrate abundance: Bayville.

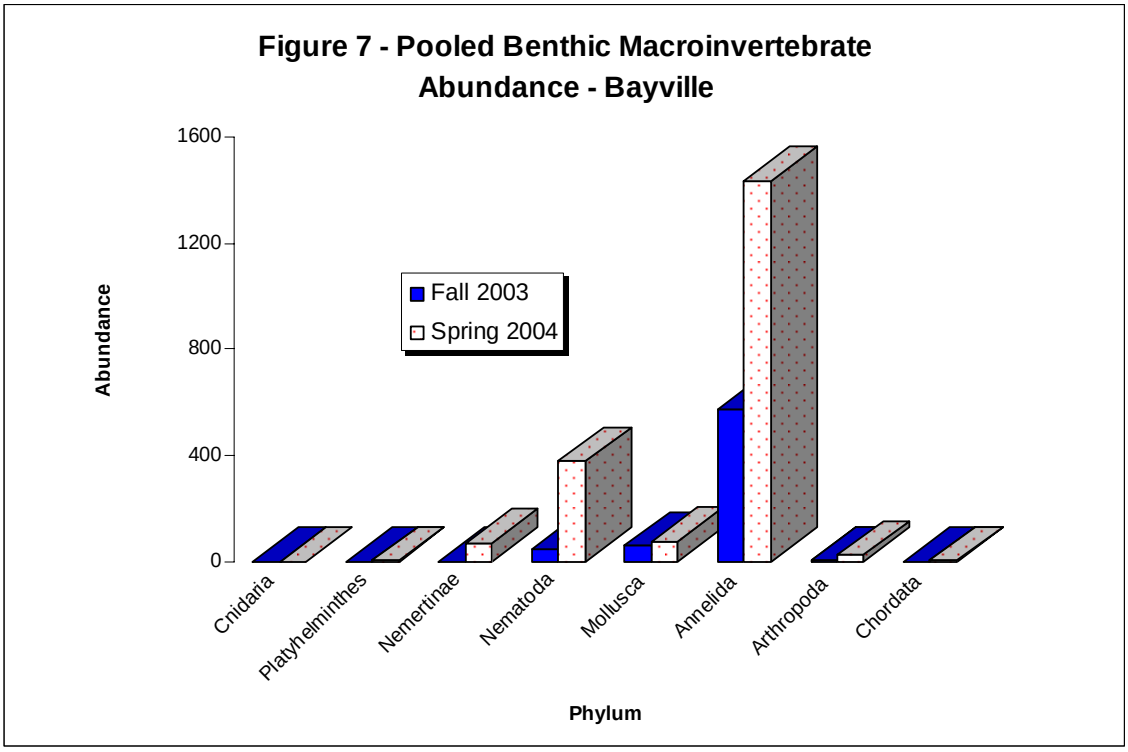
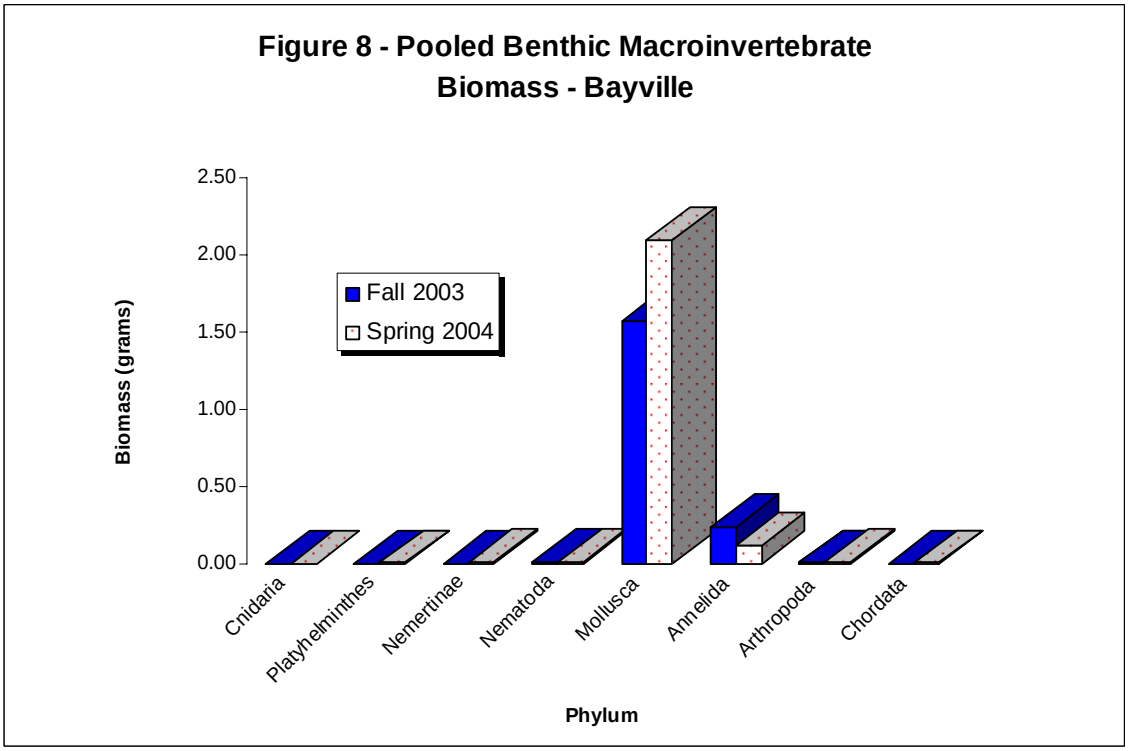


Figure 8. Pooled benthic macroinvertebrate biomass (g): Bayville.



5.1.2 Bayville

At the Bayville location, samples were collected in the Fall 2003 and Spring 2004 only. The Fall 2003 macroinvertebrate species richness was limited to 4 phyla and 18 taxa (Table 12). The Bayville Spring 2004 data was found to be more diverse with 7 phyla consisting of 26 taxa. The macroinvertebrate abundance was significantly lower in the Fall 2003 in comparison to Spring 2004 (679 vs. 1,976). In both the Fall 2003 and spring 2004 (Figure 7), Annelids were the most abundant (77.4% and 72.6% respectively). Other significantly abundant phyla in Fall 2003 were Mollusca (7.5%) and Nematoda (6.4%); and Nematoda (19.1%) for Spring 2004. The Macroinvertebrate biomass was slightly lower in the Fall 2003 in comparison to the Spring 2004 (1.81 vs. 2.23 grams). In both the Fall 2003 and Spring 2004 (Figure 8) the total biomass was dominated by the Mollusca (86.9% and 94.4% respectively) and to a lesser extent by Annelida (12.8% and 5.0% respectively).

5.2 LONG ISLAND SOUND VERSUS BAY TRANSECTS

5.2.1 Asharoken

Asharoken had 4 Sound transects and only 1 Bay transect. In order to make the data sets more comparable, the 4 Sound transects were averaged together. Since seasonal effects were addressed in the previous section (5.1), the data between seasons was also averaged yielding a single abundance and biomass representing a typical Sound or Bay core.

The Asharoken Bay species richness was represented by 5 phyla consisting of 16 taxa (Table 13). The average Asharoken Sound core exhibited greater species richness with all 8 phyla present and consisting of 35 taxa. The average abundance was significantly lower in the Bay as opposed to the Sound (175 versus 299). Both the Bay and Sound (Figure 9) average cores were dominated by Annelida (92.7% and 87.8% respectively). However, the next most abundant phylum for the Bay was Arthropoda (5.3%) while for the Sound it was Nematoda (6.1%). The average benthic macroinvertebrate biomass was similar between the Bays and the Sound (0.21 versus 0.20). However, the majority of the Bays biomass can be attributed to the Annelida (98.2%) while it was spread across the Mollusca (75.2%) and Annelida (20.1%) on the Sound side (Figure 10).

5.2.2 Bayville

Bayville had 3 Sound transects and only 1 Bay transect. In order to make the data sets more comparable, the 3 Sound transects were averaged together prior to any comparisons.

The Bayville Bay beach species richness was represented by 5 phyla consisting of 26 taxa (Table 14). Unlike Asharoken, the average Bayville Sound core exhibited a lower species richness with only 18 taxa within 7 phyla. However, the average benthic macroinvertebrate abundance was significantly lower on the Bay as opposed to the Sound (154 versus 391). The Bay abundance (Figure 11) was mostly represented by Annelida (50.0%) and Mollusca (38.9%) while the Sound abundance was mostly composed by Annelida (79.1%) and Nematoda (17.3%). The average biomass was greater in the Bay as opposed to the Sound (1.84 versus 0.061 grams) due to the presence of a few heavy Mollusca. Consequently, the majority of the biomass in the Bay (Figure 12) can be attributed to

Table 13: Averaged Asharoken benthic macroinvertebrate taxa: Long Island Sound versus Bay Transects.

	Asharoken				Asharoken				Asharoken			
	Bay Side	Bay Side	Bay Side	Bay Side	Sound Side	Sound Side	Sound Side	Sound Side	Average	Average	Average	Average
TAXA	Number	% Occurrence	Weight (g)	% Weight	Number	% Occurrence	Weight (g)	% Weight	Number	% Occurrence	Weight (g)	% Weight
Cnidaria												
Anthozoa												
Metridium senile*	0.00	0.00	0.00	0.00	0.04	0.01	0.00	0.01	0.02	0.01	0.00	0.00
Total Cnidaria	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.01**	**0.00**	**0.01**	**0.02**	**0.01**	**0.00**	**0.00**
Platyhelminthes												
Turbellaria*												
Unidentified spp.*	0.00	0.00	0.00	0.00	2.33	0.78	0.00	0.08	1.17	0.33	0.00	0.03
Total Platyhelminthes	**0.00**	**0.00**	**0.00**	**0.00**	**2.33**	**0.78**	**0.00**	**0.08**	**1.17**	**0.33**	**0.00**	**0.03**
Nemertinea												
Unidentified Sp.	0.17	0.10	0.00	0.08	4.50	1.51	0.00	0.79	2.33	0.67	0.00	0.37
Total Nemertinae	**0.17**	**0.10**	**0.00**	**0.08**	**4.50**	**1.51**	**0.00**	**0.79**	**2.33**	**0.67**	**0.00**	**0.37**
Nematoda												
Unidentified Sp.	2.83	1.62	0.00	0.10	18.31	6.13	0.00	0.34	10.57	3.02	0.00	0.19
Total Nematoda	**2.83**	**1.62**	**0.00**	**0.10**	**18.31**	**6.13**	**0.00**	**0.34**	**10.57**	**3.02**	**0.00**	**0.19**
Mollusca												
Gastropoda												
Crepidula fornicata	0.00	0.00	0.00	0.00	1.08	0.36	0.12	60.12	0.54	0.15	0.06	25.56
Crepidula plana	0.00	0.00	0.00	0.00	0.04	0.01	0.01	4.26	0.02	0.01	0.00	1.81
Littorina littorea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lacuna vincta*	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.04	0.01	0.00	0.00	0.02
Hydrobia spp.*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urosalpinx cinerea*	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.02	0.01	0.00	0.00	0.01
Ilyanassa obsoleta*	0.00	0.00	0.00	0.00	0.02	0.01	0.01	7.38	0.01	0.00	0.01	3.14
Ilyanassa traivittata*	0.00	0.00	0.00	0.00	0.04	0.01	0.00	1.82	0.02	0.01	0.00	0.77
Ilyanassa egg cases*	0.00	0.00	0.00	0.00	1.08	0.36	0.00	0.39	0.54	0.15	0.00	0.17
Bivalvia												
Mytilus edulis	0.17	0.10	0.00	0.04	0.17	0.06	0.00	0.07	0.17	0.05	0.00	0.05
Gemma gemma	0.33	0.19	0.00	0.55	2.98	1.00	0.00	1.05	1.66	0.47	0.00	0.70
Mya arenaria*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Mollusca	**0.50**	**0.29**	**0.00**	**0.59**	**5.46**	**1.83**	**0.15**	**75.15**	**2.98**	**0.85**	**0.08**	**32.23**
Annelida												
Oligochaeta												
Unidentified Sp.	49.17	28.10	0.01	5.30	237.46	79.45	0.01	5.91	143.31	41.00	0.01	4.91
Polychaeta												
Poly Parts	0.00	0.00	0.04	16.76	0.00	0.00	0.00	0.74	0.00	0.00	0.02	7.89
Ampharetidae												
Melinna cristata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capitellidae												
Capitella sp.	3.83	2.19	0.00	0.43	3.29	1.10	0.00	0.43	3.56	1.02	0.00	0.38
Cirratulidae												
Tharyx sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dodecaceria spp.*	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.00
Glyceridae												
Glycera sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nereidae												
Nereis sp.	0.83	0.48	0.02	10.67	0.54	0.18	0.01	4.98	0.69	0.20	0.02	6.94
Opheliidae												
Ophelia sp.	0.00	0.00	0.00	0.00	0.06	0.02	0.00	0.40	0.03	0.01	0.00	0.17
Orbinidae												
Leitoscoloplos fragilis	50.17	28.67	0.04	20.55	9.56	3.20	0.01	4.77	29.86	8.54	0.03	11.31
Leitoscoloplos robustus*	0.00	0.00	0.00	0.00	0.17	0.06	0.00	0.15	0.08	0.02	0.00	0.06
Paraonidae												
Paraonis sp.	0.00	0.00	0.00	0.00	0.29	0.10	0.00	0.10	0.15	0.04	0.00	0.04
Pilargiidae												
Sigambra tentaculata	3.17	1.81	0.00	0.27	0.31	0.10	0.00	0.05	1.74	0.50	0.00	0.14
Phyllodocidae												
Eteone sp.	5.17	2.95	0.02	9.76	0.15	0.05	0.00	0.10	2.66	0.76	0.01	4.46
Spionidae												
Polydora sp.	1.83	1.05	0.00	0.16	0.13	0.04	0.00	0.02	0.98	0.28	0.00	0.08
Scolecolepides viridis	47.83	27.33	0.07	34.23	8.85	2.96	0.00	2.34	28.34	8.11	0.04	16.46
Scolelepis squamata	0.00	0.00	0.00	0.00	0.04	0.01	0.00	0.04	0.02	0.01	0.00	0.02
Spio filicornis*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Streblospio benedicti	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Syllidae												
Parapionosyllis longicirrata	0.17	0.10	0.00	0.03	1.65	0.55	0.00	0.05	0.91	0.26	0.00	0.03
Parapionosyllis pinnata*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Annelida	**162.17**	**92.67**	**0.21**	**98.16**	**262.52**	**87.84**	**0.04**	**20.07**	**212.34**	**60.74**	**0.12**	**52.89**
Arthropoda												
Merostomata												
Limulus polyphemus'	0.00	0.00	0.00	0.00	0.04	0.01	0.00	0.09	0.02	0.01	0.00	0.04
Crustacea												
Copepoda												
Unidentified Harpacticoidea'	8.50	4.86	0.00	0.63	2.83	0.95	0.00	0.22	5.67	1.62	0.00	0.38
Isopoda												
Chiridotea spp.*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sphaeroma quadridentata	0.67	0.38	0.00	0.40	0.00	0.00	0.00	0.00	0.33	0.10	0.00	0.18
Amphipoda												
Corophiidae												
Corophium sp.	0.17	0.10	0.00	0.04	0.06	0.02	0.00	0.03	0.11	0.03	0.00	0.03
Haustoriidae												
Neohaustorius sp.	0.00	0.00	0.00	0.00	1.79	0.60	0.01	2.70	0.90	0.26	0.00	1.15
Gammaridae												
Gammarus micronatus*	0.00	0.00	0.00	0.00	0.27	0.09	0.00	0.32	0.14	0.04	0.00	0.13
Cirripedia												
Chthalmalus fragilis*	0.00	0.00	0.00	0.00	0.08	0.03	0.00	0.01	0.04	0.01	0.00	0.00
Decapoda												
Unidentified megalopa*	0.00	0.00	0.00	0.00	0.06	0.02	0.00	0.05	0.03	0.01	0.00	0.02
Total Arthropoda	**9.33**	**5.33**	**0.00**	**1.07**	**5.15**	**1.72**	**0.01**	**3.42**	**7.24**	**2.07**	**0.00**	**1.94**
Chordata												
Osteichthyes												
Unidentified fish eggs*	0.00	0.00	0.00	0.00	0.56	0.19	0.00	0.15	0.28	0.08	0.00	0.06
Total Chordata	**0.00**	**0.00**	**0.00**	**0.00**	**0.56**	**0.19**	**0.00**	**0.15**	**0.28**	**0.08**	**0.00**	**0.06**
TOTAL	**175.00**	**100.00**	**0.21**	**100.00**	**298.88**	**100.00**	**0.20**	**100.00**	**236.94**	**67.78**	**0.20**	**100.00**

* denotes new taxa found in spring/summer 2004

Figure 9. Average benthic macroinvertebrate abundance: Asharoken, Sound vs. Bay.

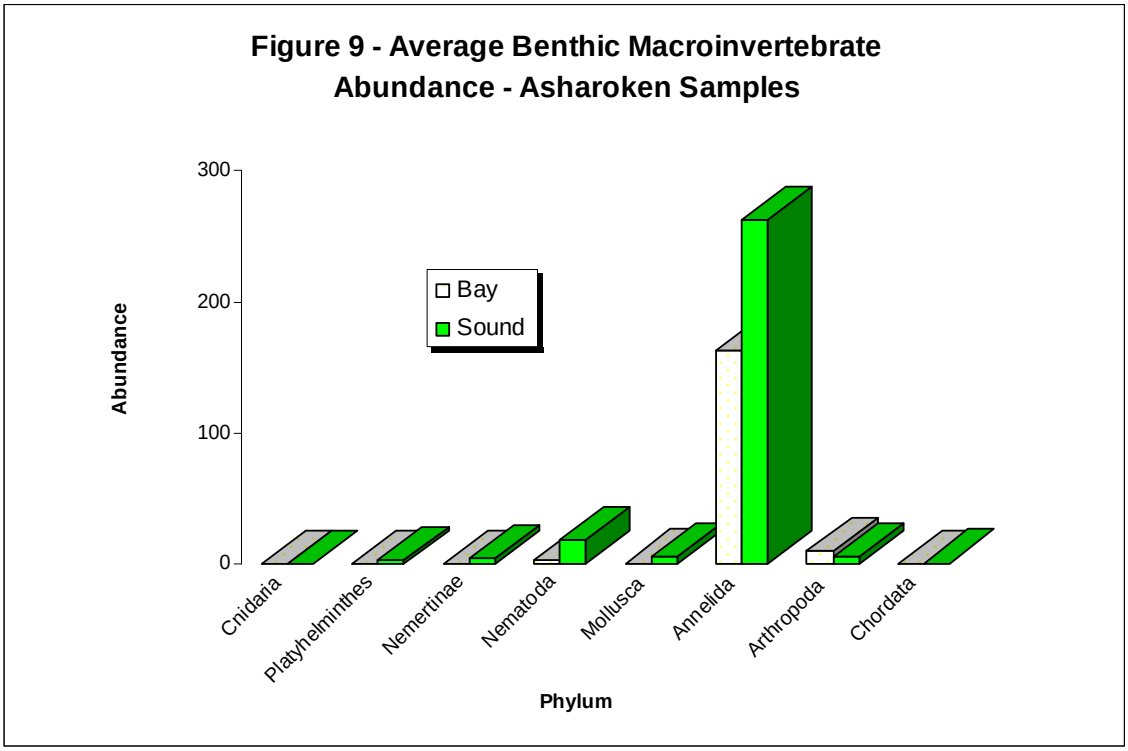


Figure 10. Average benthic macroinvertebrate biomass (g): Asharoken, Sound vs. Bay.

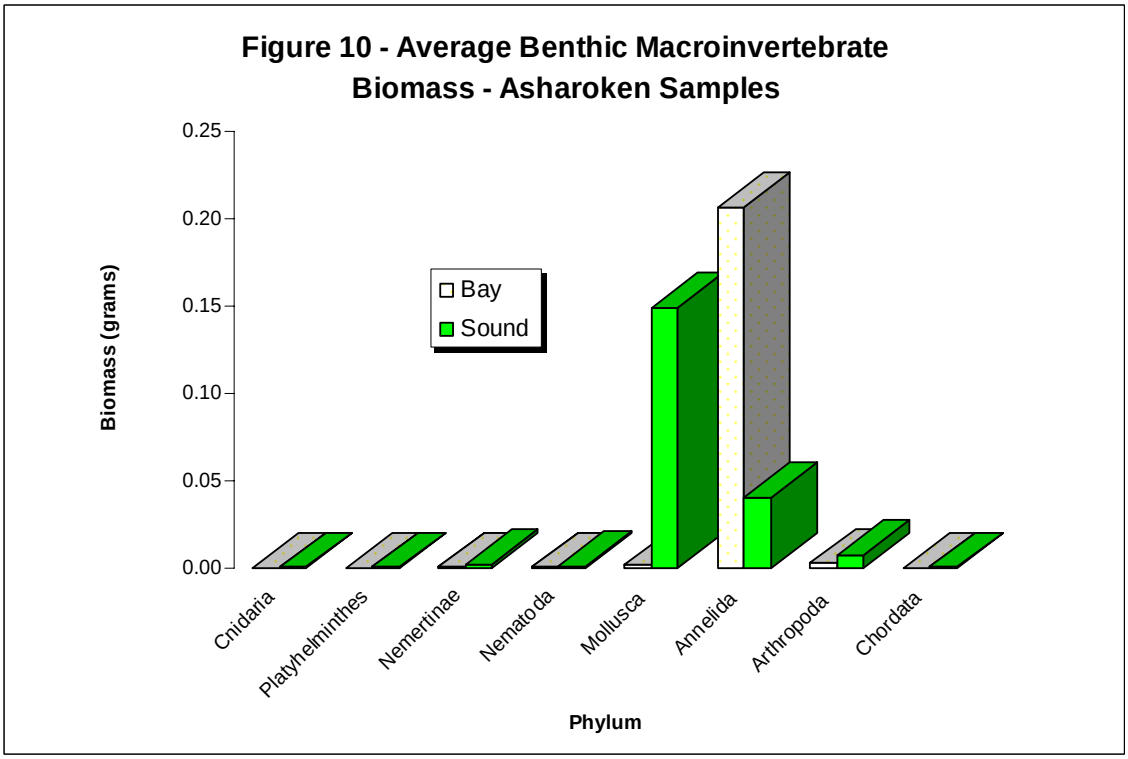


Table 14: Averaged Bayville benthic macroinvertebrate taxa: Long Island Sound versus Bay Transects.

	Bayville				Bayville				Bayville			
TAXA	Bay Side	Bay Side	Bay Side	Bay Side	Sound Side	Sound Side	Sound Side	Sound Side	Average	Average	Average	Average
	Number	% Occurrence	Weight (g)	% Weight	Number	% Occurrence	Weight (g)	% Weight	Number	% Occurrence	Weight (g)	% Weight
Cnidaria												
Anthozoa												
Metridium senile*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Cnidaria	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Platyhelminthes												
Turbellaria*												
Unidentified spp.*	0.00	0.00	0.00	0.00	0.22	0.06	0.00	0.02	0.11	0.04	0.00	0.00
Total Platyhelminthes	**0.00**	**0.00**	**0.00**	**0.00**	**0.22**	**0.06**	**0.00**	**0.02**	**0.11**	**0.04**	**0.00**	**0.00**
Nemertinea												
Unidentified Sp.	0.50	0.32	0.00	0.01	11.28	2.88	0.00	1.30	5.89	2.16	0.00	0.05
Total Nemertinae	**0.50**	**0.32**	**0.00**	**0.01**	**11.28**	**2.88**	**0.00**	**1.30**	**5.89**	**2.16**	**0.00**	**0.05**
Nematoda												
Unidentified Sp.	8.67	5.62	0.00	0.05	67.83	17.35	0.00	2.00	38.25	14.03	0.00	0.11
Total Nematoda	**8.67**	**5.62**	**0.00**	**0.05**	**67.83**	**17.35**	**0.00**	**2.00**	**38.25**	**14.03**	**0.00**	**0.11**
Mollusca												
Gastropoda												
Crepidula fornicata	5.00	3.24	0.74	40.20	0.11	0.03	0.00	7.84	2.56	0.94	0.37	39.15
Crepidula plana	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Littorina littorea	0.17	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.03	0.00	0.00
Lacuna vincta*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrobia spp.*	1.33	0.86	0.01	0.28	0.00	0.00	0.00	0.00	0.67	0.24	0.00	0.27
Urosalpinx cinerea*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ilyanassa obsoleta*	4.67	3.02	0.57	31.27	0.00	0.00	0.00	0.00	2.33	0.86	0.29	30.26
Ilyanassa traivittata*	0.00	0.00	0.00	0.00	0.11	0.03	0.01	15.49	0.06	0.02	0.00	0.50
Ilyanassa egg cases*	1.00	0.65	0.00	0.06	0.61	0.16	0.00	0.57	0.81	0.30	0.00	0.08
Bivalvia												
Mytilus edulis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gemma gemma	47.50	30.78	0.12	6.29	0.67	0.17	0.00	0.82	24.08	8.83	0.06	6.12
Mya arenaria*	0.33	0.22	0.36	19.54	0.00	0.00	0.00	0.00	0.17	0.06	0.18	18.91
Total Mollusca	**60.00**	**38.88**	**1.79**	**97.66**	**1.50**	**0.38**	**0.02**	**24.72**	**30.75**	**11.28**	**0.90**	**95.30**
Annelida												
Oligochaeta												
Unidentified Sp.	30.17	19.55	0.01	0.29	257.83	65.93	0.01	21.43	144.00	52.81	0.01	0.98
Polychaeta												
Poly Parts	0.00	0.00	0.01	0.29	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.29
Ampharetidae												
Melinna cristata	0.17	0.11	0.00	0.18	0.00	0.00	0.00	0.00	0.08	0.03	0.00	0.18
Capitellidae												
Capitella sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cirratulidae												
Tharyx sp.	3.67	2.38	0.00	0.05	0.00	0.00	0.00	0.00	1.83	0.67	0.00	0.04
Dodecaceria spp.*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Glyceridae												
Glycera sp.	0.00	0.00	0.00	0.00	0.06	0.01	0.00	0.05	0.03	0.01	0.00	0.00
Nereidae												
Nereis sp.	0.67	0.43	0.00	0.02	0.06	0.01	0.00	0.05	0.36	0.13	0.00	0.02
Opheliidae												
Ophelia sp.	1.00	0.65	0.00	0.03	1.39	0.36	0.00	1.18	1.19	0.44	0.00	0.06
Orbinidae												
Leitoscoloplos fragilis	14.33	9.29	0.01	0.31	41.83	10.70	0.03	47.50	28.08	10.30	0.02	1.83
Leitoscoloplos robustus*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paraonidae												
Paraonis sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pilargiidae												
Sigambra tentaculata	0.00	0.00	0.00	0.00	7.94	2.03	0.00	1.01	3.97	1.46	0.00	0.03
Phyllodocidae												
Eteone sp.	2.67	1.73	0.00	0.22	0.06	0.01	0.00	0.05	1.36	0.50	0.00	0.22
Spionidae												
Polydora sp.	6.17	4.00	0.00	0.09	0.00	0.00	0.00	0.00	3.08	1.13	0.00	0.09
Scolecolepides viridis	8.83	5.72	0.01	0.49	0.11	0.03	0.00	0.18	4.47	1.64	0.00	0.48
Scolelepis squamata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Spio filicornis*	0.33	0.22	0.00	0.03	0.00	0.00	0.00	0.00	0.17	0.06	0.00	0.03
Streblospio benedicti	4.17	2.70	0.00	0.14	0.00	0.00	0.00	0.00	2.08	0.76	0.00	0.13
Syllidae												
Parapionosyllis longicirrata	4.17	2.70	0.00	0.03	0.22	0.06	0.00	0.08	2.19	0.80	0.00	0.03
Parapionosyllis pinnata*	0.17	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.03	0.00	0.00
Total Annelida	**76.50**	**49.57**	**0.04**	**2.16**	**309.50**	**79.14**	**0.04**	**71.67**	**193.00**	**70.78**	**0.04**	**4.41**
Arthropoda												
Merostomata												
Limulus polyphemus'	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crustacea												
Copepoda												
Unidentified Harpacticoidea'	6.50	4.21	0.00	0.02	0.67	0.17	0.00	0.20	3.58	1.31	0.00	0.03
Isopoda												
Chiridotea spp.*	0.17	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.03	0.00	0.00
Sphaeroma quadridentata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Amphipoda												
Corophiidae												
Corophium sp.	0.17	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.03	0.00	0.00
Haustoriidae												
Neohaustorius sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gammaridae												
Gammarus micronatus*	1.83	1.19	0.00	0.09	0.00	0.00	0.00	0.00	0.92	0.34	0.00	0.09
Cirripedia												
Chthalmalus fragilis*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Decapoda												
Unidentified megalopa*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Arthropoda	**8.67**	**5.62**	**0.00**	**0.12**	**0.67**	**0.17**	**0.00**	**0.20**	**4.67**	**1.71**	**0.00**	**0.12**
Chordata												
Osteichthyes												
Unidentified fish eggs*	0.00	0.00	0.00	0.00	0.06	0.01	0.00	0.09	0.03	0.01	0.00	0.00
Total Chordata	**0.00**	**0.00**	**0.00**	**0.00**	**0.06**	**0.01**	**0.00**	**0.09**	**0.03**	**0.01**	**0.00**	**0.00**
TOTAL	**154.33**	**100.00**	**1.84**	**100.00**	**391.06**	**100.00**	**0.06**	**100.00**	**272.69**	**100.00**	**0.95**	**100.00**

* denotes new taxa found in spring/summer 2004

Figure 11. Average benthic macroinvertebrate abundance: Bayville, Sound vs. Bay.

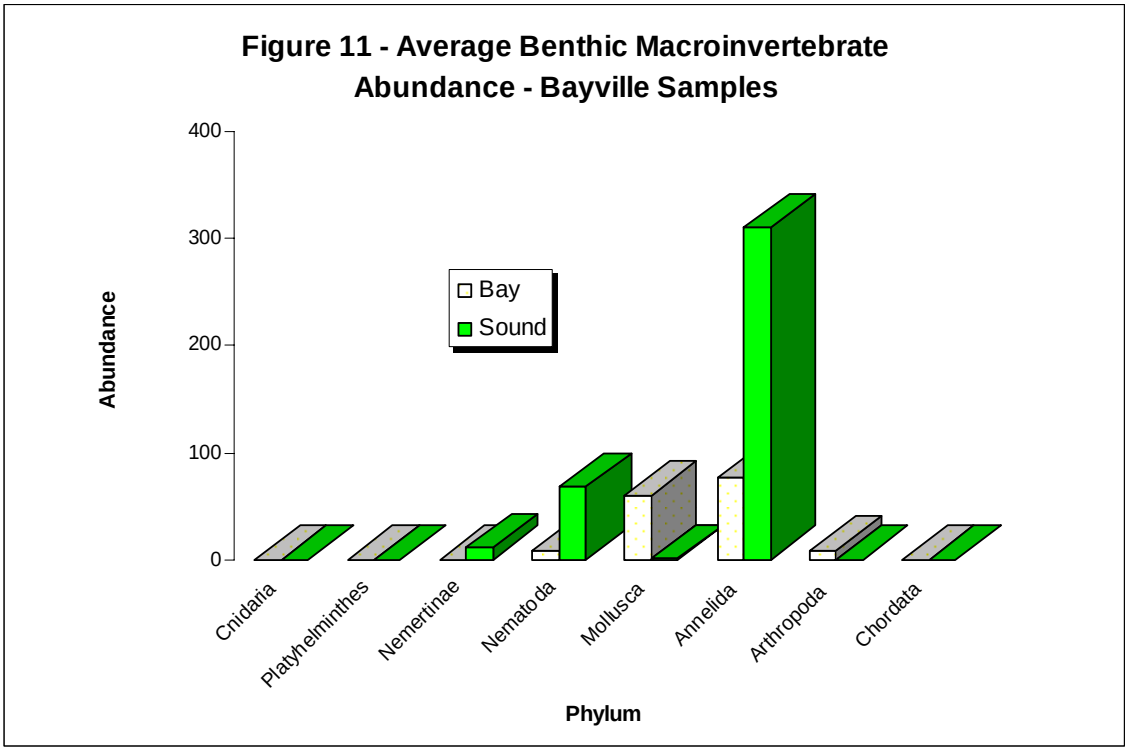
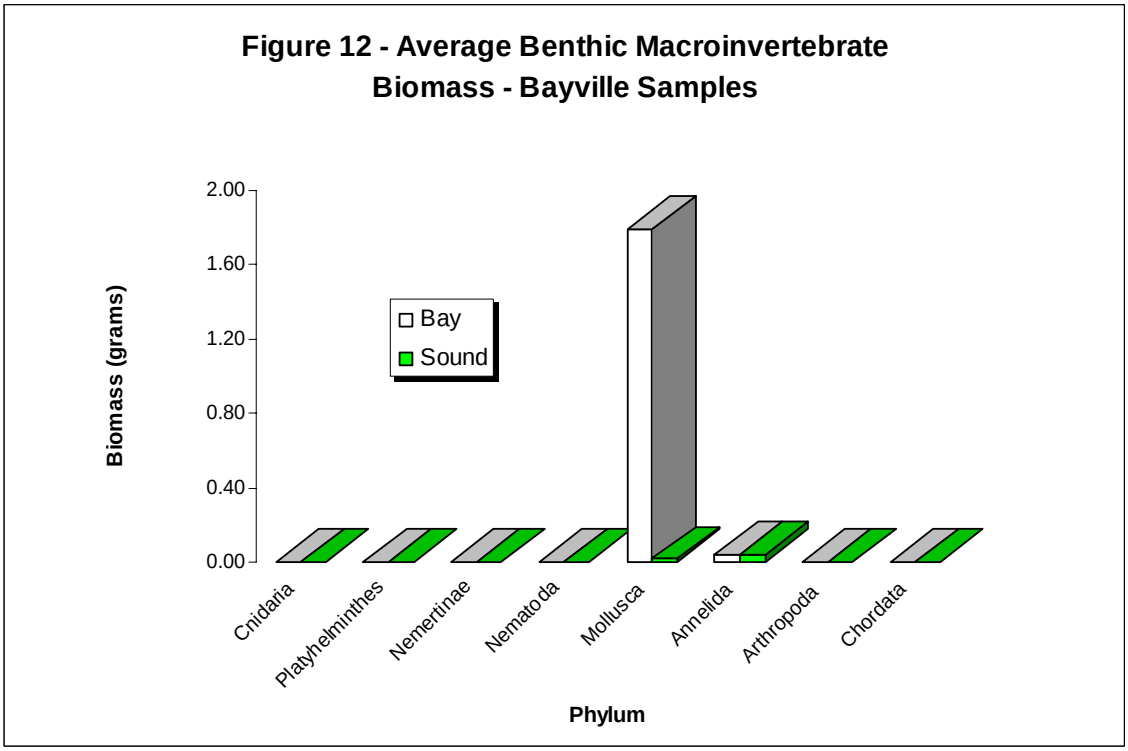


Figure 12. Average benthic macroinvertebrate biomass (g): Bayville, Sound vs. Bay.



Mollusca (97.7%) while the Sound biomass is spread across Annelida (71.7%) and to a lesser extent Mollusca (24.7%).

5.3 GRAIN SIZE ANALYSIS

Results of the grain size analysis are provided in Appendix C.

5.3.1 Asharoken

Gravel and sand were found throughout the Asharoken samples, with sand being the dominant sediment size collected in 13 out of 14 samples (Table 15). In addition, silt and clay were present in all the samples, but in very low quantity (typically less than 2% of the sample). Figure 13 illustrates the averaged grain size distribution of beach material at the Sound transects for Asharoken (A1-A4). As shown in this figure, the sediment samples from transects A1 and A2 are comprised of more sand material (>80% sand) than transects A3 and A4 (< 60%). It should be noted that sand material east of the Keyspan plant and jetty (transect A1) is generally finer sand, and some of this material from the vicinity and inflow/outflow channels is dredged and placed by the Keyspan Northport Power Station on the beach in the vicinity of transect A2. Sand bypassing was a considered design alternative for the District's study, but it was determined that the material was too fine to match the grain size of beach areas to the west that contain more gravel (transects A3 and A4 with gravel > 38%). Other existing condition features have eliminated sand bypassing as an alternative as well.

5.3.2 Bayville

Both gravel and sand were found throughout the Bayville samples, with sand being the dominant sediment size collected in 6 out of the 8 samples (Table 15). Transect B3 displayed a slight dominance of gravel, but sand was still present at a relatively high proportion. Silt and clay were present in all the samples, but were also in very low abundance and typically around 1% of the sediment composition. The sediment composition of the Bay beach had the highest sand composition for all of the Bayville samples.

6.0 WATER CHEMISTRY

Basic water quality measurements were collected at each of the fish sampling events and are shown in Tables 16 and 17. The sampling events at Asharoken yielded the following (Table 16): water temperature ranged from 12.3 to 24.5 degrees Celsius (˚C) (mean = 18.74˚C), salinity ranged from 24.30 to 27.50 parts per thousand (ppt) (mean = 26.38 ppt), dissolved oxygen ranged from 3.98 to 8.15 milligrams per liter (mg/l) (mean = 6.40 mg/l) and pH ranged from 6.97 to 8.20 (mean = 7.70).

The Bayville sampling events produced the following general water quality measures (Table 17): water temperature ranged from 13.2 to 23.7˚C (mean = 19.19˚C), salinity ranged from 24.9 to 26.7 ppt (mean = 25.88 ppt), dissolved oxygen ranged from 4.11 to 9.96 milligrams per liter (mg/l) (mean = 6.78 mg/l) and pH ranged from 7.04 to 8.23 (mean = 7.74).

During the individual sampling events there were very little variation seen amongst the water quality parameters that were measured. However, seasonal variation was observed where temperature peaked during the summer months and declined in the fall and were coolest in the spring. Dissolved

oxygen levels also showed a negative correlation with temperature, where the amount of dissolved oxygen decreased with increased temperatures.

The water quality and chemical analyses for Bayville during both the storm/post-rainfall condition and the non-storm/rain condition did not yield any significant results for pesticides or volatile organic compounds (EPA 8260/608). With the exception of nutrients, all measures were below the limits of laboratory detection (See Appendix D). The basic water quality measures taken during the wet and dry weather sampling are also shown in Table 18.

Table 15. Grain size analysis (percent composition).

Date	Transect	Gravel (%)	Sand (%)	Silt/Clay (%)
9/30/2003	A1	0.5	96.5	3
7/19/2004	A1	39.1	59.2	1.7
5/25/2004	A1	13.7	84.7	1.6
9/30/2003	A2	12.8	85.6	1.6
5/25/2004	A2	0.4	97.7	1.9
7/19/2004	A2	6.3	92.3	1.4
9/30/2003	A3	20.1	75.5	4.4
5/25/2004	A3	59.9	40	0.1
7/19/2004	A3	35.7	63.9	0.4
9/30/2003	A4	48.9	49.7	1.4
5/25/2004	A4	48.6	51.3	0.1
7/19/2004	A4	47.8	52.1	0.1
9/30/2003	A5	15.7	82.3	2
5/25/2004	A5	20.4	78.7	0.9
9/29/2003	B1	9.8	85.6	4.6
5/24/2004	B1	26.6	72.3	1.1
9/29/2003	B2	19.7	79.2	1.1
5/24/2004	B2	33.8	65.5	0.7
9/29/2003	B3	53.5	46	0.5
5/24/2004	B3	53.7	45.7	0.6
9/29/2003	B4	44.3	54.5	1.2
5/24/2004	B4	43.1	56.4	0.5

Figure 13. Percent grain size (average per transect) for Asharoken Long Island Sound Transects.

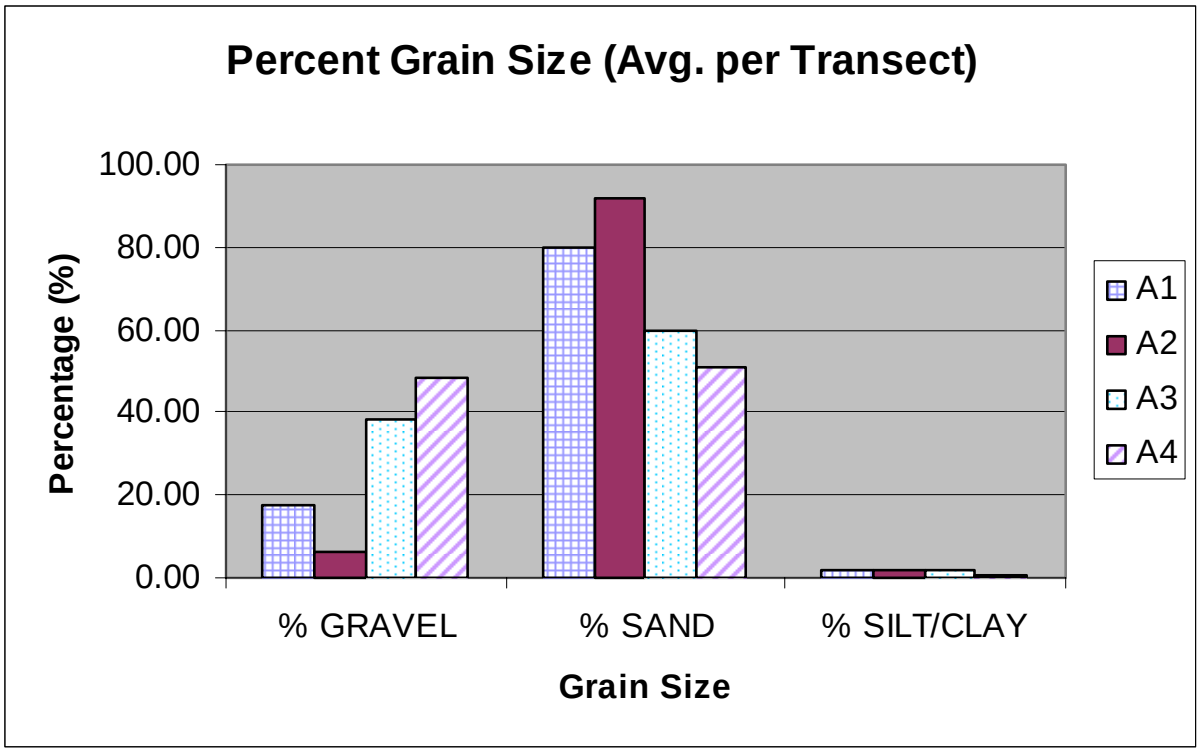


Table 16: Basic water quality collected during fish sampling events at Asharoken ***(* indicates sampling equipment failure).***

Date	Transect	Wind (mph)	Wind Direction	Wave Height (ft)	Air Temp (F)	Water Temp (C)	Salinity (ppt)	Cond	D.O. (mg/l)	Turbidity (FTU)	PH
9/30/03	A1	9.00	NW	1.50	57.60	23.80	27.40	41.58	5.38	5.00	7.97
10/30/03	A1	7.70	W-SW	0.75	*	19.90	27.40	38.44	6.85	8.00	8.14
5/25/04	A1		N-NE	0.25	64.90	13.70	26.20	32.18	6.61	8.00	7.70
6/14/04	A1	7.40	S-SW	2.00	73.40	16.40	25.50	33.65	6.10	5.00	7.86
7/19/04	A1	2.30	S-SE	0.80	70.70	24.50	25.10	38.59	3.98	53.00*	6.97
7/26/04	A1	5.50	N-NE	1.00	69.90	21.00	25.80	37.17	5.58	48.00*	7.02
9/30/03	A2	9.00	NW	1.50	57.60	18.10	27.40	36.94	6.16	6.00	8.04
10/30/03	A2	1.20	N-NW	4.00	*	13.00	27.20	32.80	7.43	10.00	8.20
5/25/04	A2	1.50	N-NE	0.25	*	13.90	26.20	32.25	7.40	0.00	7.89
6/14/04	A2	4.20	S-SW	2.00	*	16.60	25.00	34.51	6.55	7.00	7.89
7/19/04	A2	4.60	SW	1.00	69.10	21.60	26.90	39.11	4.90	5.00	7.27
7/26/04	A2	7.00	NNE	1.00	70.10	21.70	27.10	39.33	6.01	9.00	7.26
9/30/03	A3	1.40	W	0.00	67.50	19.90	27.40	38.38	6.57	2.00	8.07
10/30/03	A3	4.30	SW	0.00	*	14.60	27.50	34.15	6.64	6.00	8.12
5/25/04	A3	3.20	N	0.80	60.90	15.80	26.20	33.73	8.15	7.00	7.79
6/14/04	A3	2.40	S-SW	1.00	85.10	17.30	25.90	34.49	7.92	0.00	8.01
7/19/04	A3	1.2	SE	1.00	80.1	22.13	26.80	39.20	5.35	6.00	7.20
7/26/04	A3	7.30	N-NE	2.00	70.20	22.10	26.90	39.61	6.15	16.00	7.20
9/30/03	A4	1.40	W	0.00	67.50	19.00	27.40	37.64	6.32	2.00	8.03
10/30/03	A4	1.50	N-NW	0.00	*	14.10	27.40	33.75	6.70	5.00	8.16
5/25/04	A4	2.90	N-NE	0.50	71.30	16.20	26.10	33.88	7.35	6.00	7.76
6/14/04	A4	2.10	W	1.00	78.30	17.70	25.80	34.85	8.01	4.00	8.03
7/19/04	A4	0.60	SE	1.00	83.20	22.10	26.80	39.20	5.40	22.00	7.25
7/26/04	A4	2.20	N-NE	1-3"	78.40	22.90	26.40	39.26	5.12	3.00	6.99
9/30/03	A5	3.00	W	0.00	62.60	18.90	25.70	35.39	6.50	8.00	7.96
10/30/03	A5	4.20	W-SW	0.75	*	12.30	24.30	29.08	7.46	9.00	8.06
5/25/04	A5	4.60	N-NE	0.00	64.90	17.40	25.50	34.04	5.86	12.00	7.73
6/14/04	A5	5.40	S-SW	1.00	79.30	21.60	25.10	36.03	8.11	11.00	8.10
7/19/04	A5	0.60	S	0.00	83.00	22.20	26.50	39.27	5.44	5.00	7.14
7/26/04	A5	6.00	N-NE	1-2'	68.90	21.70	26.90	39.15	5.92	29.00	7.27
Mean		**3.90**		**0.86**	**71.19**	**18.74**	**26.38**	**36.26**	**6.40**	**10.53**	**7.70**
SD		**2.59**		**0.89**	**8.14**	**3.51**	**0.88**	**2.99**	**1.03**	**12.42**	**0.42**
Max		**9.00**		**4.00**	**85.10**	**24.50**	**27.50**	**41.58**	**8.15**	**53.00**	**8.20**
Min		**0.60**		**0.00**	**57.60**	**12.30**	**24.30**	**29.08**	**3.98**	**0.00**	**6.97**

Table 17. Basic water quality collected during fish sampling events at Bayville.

Date	Transect	Wind (Avg) mph	Wind Direction	Wave Height (ft)	Air Temp (F)	Water Temp (C)	Salinity (ppt)	Cond	D.O. (mg/l)	Turbidity (FTU)	PH
9/29/03	B1	2.90	NW	0.00	60.30	20.40	26.30	37.36	4.11	8.00	7.76
10/29/03	B1	12.00	NNW	0.00	*	13.20	25.80	31.32	6.70	3.00	8.03
5/24/04	B1	5.00	N-NE	0.00	*	17.90	25.30	34.22	7.13	11.00	7.82
6/15/04	B1	5.80	wsw	2.00	84.70	23.70	24.90	37.36	6.19	14.00	7.77
7/20/04	B1	2.80	wsw	0.00	75.80	23.60	25.90	38.90	5.66	9.00	7.04
7/27/04	B1	5.30	N-NE	0.30	70.00	23.40	25.90	39.27	6.42	5.00	7.18
9/29/03	B2	2.70	N	0.50	64.60	19.80	26.70	37.40	5.67	7.00	7.92
10/29/03	B2	10.70	NNE	3.50	*	14.50	26.10	32.31	7.35	14.00	8.13
5/24/04	B2	6.50	NE	1.50	*	15.60	25.50	32.74	7.72	5.00	7.99
6/15/04	B2	6.40	ssw	1.00	89.00	20.40	25.30	35.87	9.22	4.00	8.13
7/20/04	B2	2.30	sw	0.50	74.30	21.70	26.30	38.21	6.72	5.00	7.32
7/27/04	B2	1.20	N-NE	2.30	70.30	20.80	26.50	37.97	6.55	6.00	7.40
9/29/03	B3	3.00	N	0.50	63.00	20.40	26.60	37.89	5.63	4.00	7.88
10/29/03	B3	10.70	NE	2.00	*	14.50	26.50	32.93	7.38	11.00	8.12
5/24/04	B3	9.00	NE	1.50	*	15.40	25.40	32.45	8.54	14.00	7.98
6/15/04	B3	3.50	wsw	1.00	89.50	20.30	25.20	36.06	7.80	2.00	8.08
7/20/04	B3	1.90	W-SW	0.50	79.90	21.00	26.40	38.02	5.49	0.00	7.19
7/27/04	B3	7.40	N-NE	2.30	71.20	20.90	26.40	37.87	6.35	3.00	7.31
9/29/03	B4	4.40	NW	0.50	58.50	19.60	26.70	37.37	5.01	4.00	7.89
10/29/03	B4	10.70	NE	2.00	*	14.50	25.40	31.74	7.65	16.00	8.11
5/24/04	B4	9.00	NE	1.00	*	15.30	24.90	31.38	6.90	14.00	7.89
6/15/04	B4	6.70	wsw	1.00	89.00	21.30	25.10	36.57	9.96	0.00	8.23
7/20/04	B4	3.50	W-SW	0.50	*	21.30	25.90	37.66	6.13	2.00	7.32
7/27/04	B4	9.00	N-NE	1.50	69.50	21.00	26.20	38.85	6.38	6.00	7.23
Mean		**5.93**		**1.08**	**73.97**	**19.19**	**25.88**	**35.91**	**6.78**	**6.96**	**7.74**
SD		**3.24**		**0.91**	**10.48**	**3.21**	**0.59**	**2.71**	**1.31**	**4.82**	**0.38**
Max		**12.00**		**3.50**	**89.50**	**23.70**	**26.70**	**39.27**	**9.96**	**16.00**	**8.23**
Min		**1.20**		**0.00**	**58.50**	**13.20**	**24.90**	**31.32**	**4.11**	**0.00**	**7.04**

(* indicates sampling equipment failure).

Table 18. Basic water quality parameters measured at the time of water chemistry collections (Wet vs. Dry weather) for Asharoken and Bayville.

Date	Location	Transect	Avg Wind (mph)	Wind Direction	Air Temp (F)	Water Temp (C)	Salinity (ppt)	Conductivty	D.O. (mg/l)	Turbidity (FTU)	PH
10/1/03	Bayville	BWQ1	6.1	W-NW	57.0	18.5	26.4	36.17	5.67	7	7.83
10/1/03	Bayville	BWQ2	4.0	N-NW	56.4	18.6	25.6	35.18	4.66	5	7.74
10/10/03	Asharoken	AWQ1	7.6	SE	65.0	16.6	12.4	17.52	5.92	3	8.10
10/10/03	Asharoken	AWQ2	7.4	SE	65.0	16.9	26.6	34.98	4.22	5	8.08
10/27/03	Bayville	BWQ1	10.0	S-SE	65.0	13.3	25.5	31.14	7.36	2	8.05
10/27/03	Bayville	BWQ2	4.5	W-SW	65.2	13.5	25.7	31.39	6.86	1	8.02
10/28/03	Asharoken	AWQ1	0.7	E-NE	*	13.2	26.1	31.69	9.55	1	8.11
10/28/03	Asharoken	AWQ2	0.7	NE	*	13.9	25.8	31.84	6.94	0	8

(indicates sampling equipment failure)*

7.0 DISCUSSION

This investigation characterized the presence/absence of finfish and benthic macroinvertebrates in the nearshore areas of Asharoken and Bayville during the Fall 2003, Spring 2004 and Summer 2004 sampling periods. The investigation also characterized the baseline water quality conditions in the nearshore area during sampling events. Lastly, grain size distribution analysis for Asharoken and Bayville beach materials was determined as a result of this investigation.

The data discussed herein provides a baseline of the biological resources that are present in these two locations at different seasons of the year. The information will aid in the District's National Environmental Policy Act, Essential Fish Habitat, Endangered Species, and Fish and Wildlife Coordination Act evaluations of potential impacts for considered beach nourishment and other structural alternatives in the nearshore environment. The data will also serve as a guide for future monitoring of finfish and benthic macroinvertebrates during and after any potential storm damage reduction measures are implemented. More specifically, the results of this nearshore investigation provide the species composition and abundance for finfish and benthic invertebrates, their size distributions, biomass, and the abundance of Essential Fish Habitat (EFH) species at three different times of the year at Bayville and Asharoken.

Overall, the species richness of finfish was greatest in the Summer 2004 sampling event with 15 out of a total of 21 taxa collected. Of the 21 finfish species collected, four were identified as Essential Fish Habitat species and included: bluefish, porgy, windowpane flounder and winter flounder. The Summer 2004 sampling event also yielded the highest abundances of finfish as well, with menhaden and Atlantic silverside being the dominant fish species. Only eight (8) of the 21 fish species were consistently captured during all seasons; and included menhaden and Atlantic silversides, as well as other baitfish species such as striped killifish and mummichog. Of those eight species captured across all seasons, winter flounder was the only EFH species, and it had an abundance that was lower than all, but two of the seven other species. All of the winter flounder were in the juvenile stage and were in greatest abundance in the Summer 2004 sample.

While there was some shift in the finfish species composition with the seasonal changes, the changes were not dramatic as reflected by our beach seines. Several migratory (i.e. typically move to deeper offshore water or southward as the water cools) species appeared in our Spring 2004 and Summer 2004 sampling events as recently recruited juveniles and included: weakfish, winter flounder, tomcod, bluefish, menhaden, bay anchovy and sandlance. The Long Island Sound has been recognized as an important recruitment habitat for these species and has been designated as essential fish habitat areas for winter flounder and bluefish.

At Asharoken finfish samples were highest in abundance in the Summer 2004 sampling event and were also dominated by menhaden and Atlantic silversides. Species richness was highest in the Summer 2004 sampling event, but by only 3 more species than in the Fall 2003 and Spring 2004 sampling events. Four EFH species were present at Asharoken, but only winter flounder and bluefish were in high abundances. In addition, almost 40% of the catch of winter flounder and bluefish at Asharoken were at the Bay station, which had only a single transect. Shallow embayment are known to be important recruitment habitats for the juveniles of many finfish species such as bluefish and winter flounder (Bigelow and Schroeder 2002).

As a comparison, nekton data is available from a 1972 survey conducted in the vicinity of the Asharoken Beach area. Otter trawls, mid-water trawls and seining with a 100' seine were sample methods used during that survey effort. Winter species surveyed included winter flounder, silversides, white perch (*Morone americanus*), and hake (*Urophycis Spp.*). The spring species composition consisted predominantly of migrant fish including windowpane flounder, menhaden, anchovy and blueback herring. Summer species included blackfish (*Tautoga Onitis*), hogchoker (*Trinectes maculatus*), sea robin (*Prionotus evolans*), toadfish (*Ospanus tau*), and also menhaden, anchovies and eel (*Anguilla rostrata*) in less abundance than during spring (Austin *et. al*. 1973). As with our findings, the summer species composition appears to be more diverse.

Finfish samples taken at Bayville exhibited similar trends as Asharoken with greatest abundance in the Summer 2004 sampling, with menhaden being the dominant species. Although the species composition changed with the seasons, overall species richness did not, as the Fall 2003, Spring 2004 and Summer 2004 all had 9 taxa present. It is also of interest to note that even though the overall abundance of finfish at Bayville was similar to Asharoken, the species richness was lower overall, as well as within a given season. Although the same four EFH species were found at Bayville as in Asharoken; only juvenile bluefish were captured in high abundance. Furthermore, with the exception of the single large menhaden catch at the Bay transect in Summer 2004, the abundance and species diversities for the Bay and the Long Island Sound transects were quite similar. The New York State Department of State has identified Oyster Bay Harbor as a significant nursing and feeding habitat for 8 species including: striped bass, scup, summer flounder, bluefish, Atlantic silverside, menhaden, winter flounder, and blackfish during the months of April through November (NYSDOS 1987). We captured 5 of those species in this study.

The invertebrate populations of the benthos are important foraging sources for many species of marine fish (Bigelow and Schroeder 2002). In addition, invertebrates of the swash zone, and those found within the abundant wrack material may provide a valuable food source to shorebirds. In the current study a total of 8 phyla consisting of 47 taxa were collected and identified with Annelida being by far the most abundant. The phylum which had the greatest influence on biomass however, was Mollusca, where a few heavy organisms were able to significantly impact the total benthic macroinvertebrate biomass.

The benthic macroinvertebrate data was examined per separate season for each of the study beaches. At Asharoken, the Spring/Summer 2004 collection was found to have a greater species richness as well as macroinvertebrate abundance in comparison to the Fall 2003 data. However, the biomass was higher in Fall 2003 collection due to the presence of a few large Mollusca. For the Bayville location, Fall 2003 collection was found to have a lower species richness, lower abundance, and slightly lower biomass in comparison to the Summer 2004 data.

Benthic macroinvertebrate data was also analyzed to compare Long Island Sound transect data versus Bay transect samples. At Asharoken, cores taken from the Sound side were found to have a greater species richness and greater abundance, but a similar biomass in comparison to the Bay beaches. At the Bayville location, cores taken from the Sound were found to be less diverse, but had a greater benthic macroinvertebrate abundance.

At both sampling locations, little variation was seen amongst the measured water quality parameters. With respect to seasonal variation the temperatures peaked during the summer months, declined in the fall, and were lowest in the spring. As expected, the DO levels showed a negative correlation with temperature, where the DO level decreased with increased temperatures. However, the levels did not seem to drop to a point where it was suspected to adversely impact the catch, species richness, or abundance. In addition, there were no measurable differences in the water quality and chemical analyses for Bayville between the non-storm/rain condition and the storm/post-rain event. Since there was very limited chemical analyses conducted (there were only 2 stations and 2 sampling events), the lack of differences between the sampling events should be interpreted with caution.

In summary, data collected from this investigation characterizes existing fish and benthic macroinvertebrate communities that utilize the intertidal and nearshore areas of Asharoken and Bayville beaches. It was determined that both the fish species richness and abundance was greatest in the Summer 2004 season. In addition, the abundance of EFH species collected was greatest in the same season. Similarly, for both locations the benthic invertebrates were found to have the greatest species richness and abundance in the Summer 2004 sampling event.

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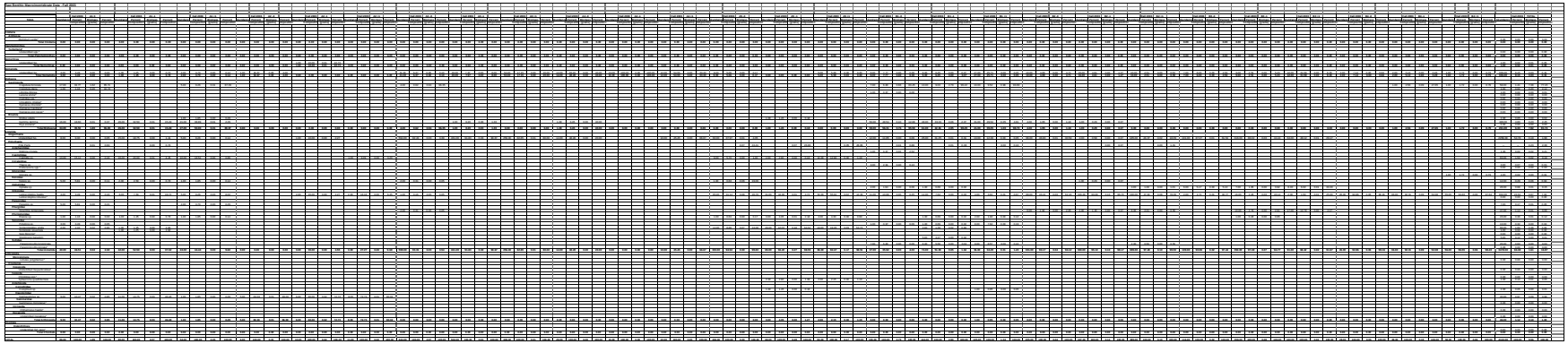
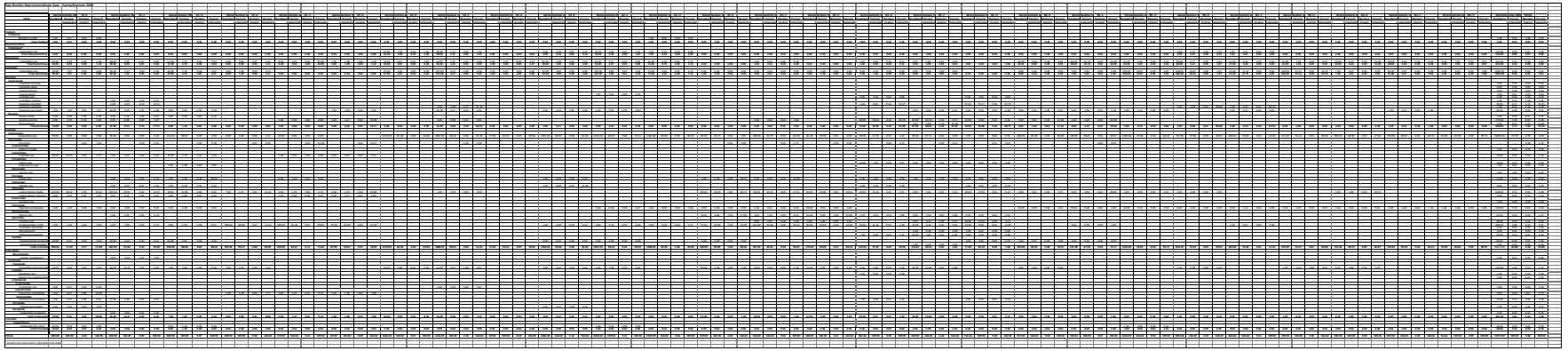
Appendix A

Fish Data Organized by Season

Appendix B

Benthic Macroinvertebrate Data Organized by Season





Appendix C

Grain Size Data

Appendix D

Water Quality Chemical Analysis