

## 9-Offshore Borrow Area Finfish Collection

### Introduction

The principal objective of the offshore borrow area trawl surveys was to collect demersal (bottom-feeding) fishes for analysis of feeding habits (See Chapter 10). Methods of collecting these data varied over the period of the study including changes in trawl size, trawl mesh-size, and the presence or absence of a trawl liner. The number of tows per site also varied among sites and collection dates. Differences in collection efficiency and sample variability resulting from these differences preclude a uniform, quantitative assessment of the finfish assemblages, however there is sufficient scope to characterize species composition and relative abundance and, to a lesser extent, detect large-scale changes in the assemblages over time.

### Methods

**Study Area:** The three Belmar Borrow Areas (BBA) were designated BBA3, BBA5, and BBA6, and were located approximately 3 - 10 km offshore and roughly parallel the shoreline (Figure 9-1). Coordinates for each area are given in Table 9-1. The areas were sampled twice a year: spring (April-June) and late summer (August-September). Sampling began in May 1995 and continued through September 1999. The 1995-1996 (pre-construction) data have been previously summarized (USACE, 1998), as have during-construction (1997) and the first year of post-construction monitoring (USACE, 1999).

**Sampling Methods:** The otter trawl used during the 1995-1996 efforts consisted of a 100 mm mesh net with a liner in the cod end. The dimensions for the net used are as described: 29.3 m sweep which converts into a 9.8 m spread at maximum deployment with a height of 2.4 m to 3.7 m. The net used during the 1997 Spring effort was a 152 mm mesh with no liner. During the Fall 1997 effort and thereafter through the Fall 1999 effort, a 152 mm mesh with a 0.25 mm liner in the wings and cod end was employed.

Trawls were conducted within and adjacent to each of the three BBA sites. Trawls were deployed during daylight hours for 20 minutes, brought on board, and the contents emptied onto a sorting table. Bottom-feeding species were separated from the catch and were then measured [standard length (SL) in cm] and weighed (biomass in kg). Stomach contents of target species were removed, placed into labeled sample containers, and preserved with formalin. Non-target species were counted, measured [total length (TL) in mm], weighed (biomass in kg) and then released. Several taxa were grouped by genus for data analyses: *Urophycis chuss*, *U. regia*, and *U. tenuis* were grouped as *Urophycis* spp.; *Raja eglanteria*, *R. ocellata* and *R. laevis* were grouped as *Raja* spp; *Prionotus carolinus* and *P. evolans* were grouped as *Prionotus* spp. When non-target taxa were collected in large numbers, a randomly selected sub-sample of 25 individuals was measured and weighed, while the remainder was counted and the total number recorded. From these data, a total weight (biomass) was estimated. When non-target taxa were extremely abundant (making it impractical to process the catch between trawls), 25 individuals were counted and weighed, the total weight of the taxa was

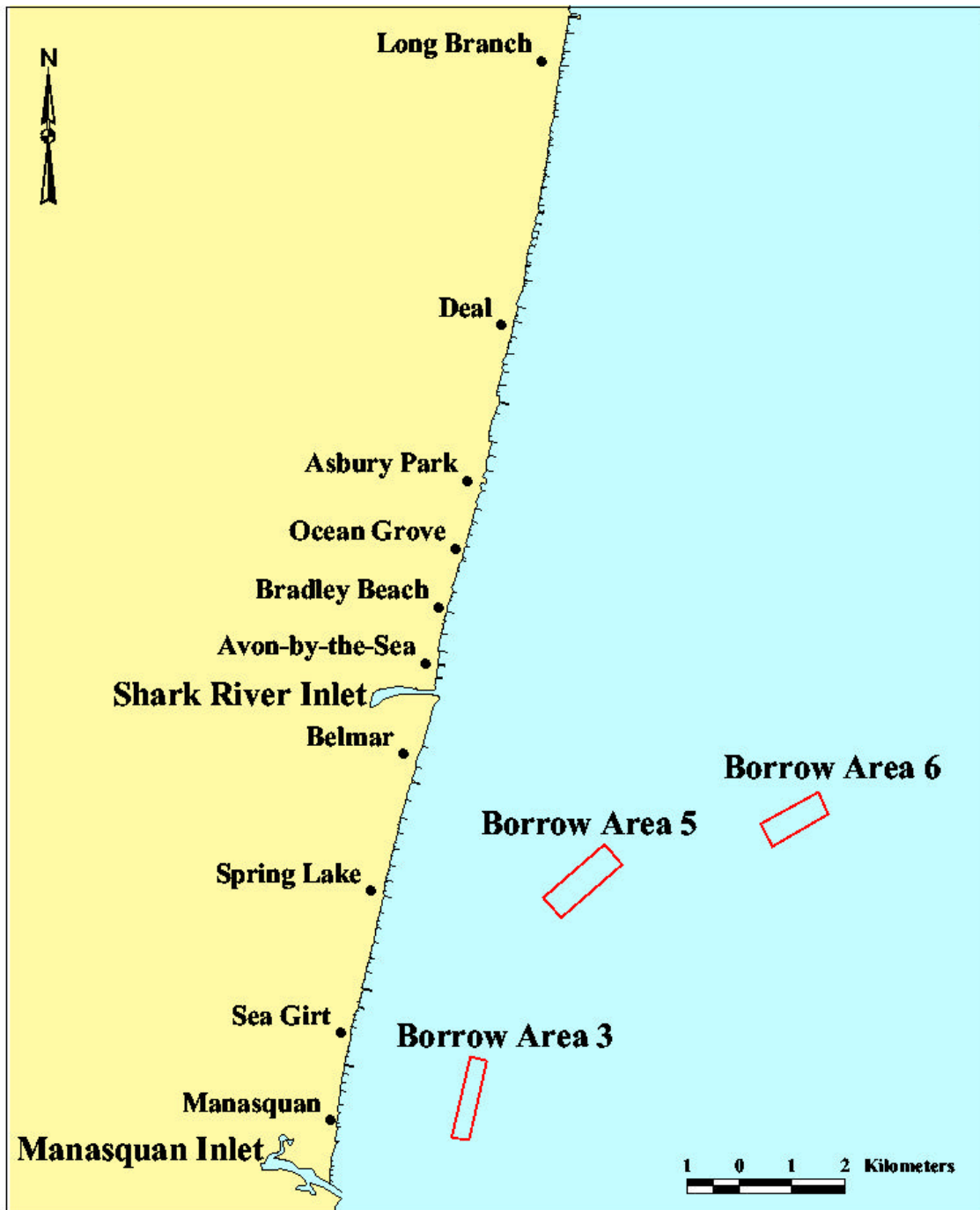


Figure 9-1. Locations of Belmar Borrow Areas.

**Table 9-1. Coordinates for the four corners of each borrow area.**

	Longitude		Latitude	
<b>BBA 3</b>	73	59.94	40	07.44
	74	00.16	40	07.48
	74	00.42	40	06.65
	74	00.19	40	06.62
<b>BBA 5</b>	73	58.33	40	09.65
	73	59.16	40	09.11
	73	58.92	40	08.90
	73	58.10	40	09.44
<b>BBA 6</b>	73	55.45	40	10.16
	73	56.23	40	09.84
	73	56.08	40	09.61
	73	55.33	40	09.93

**Table 9-2. Number of trawls conducted from Spring 1995 through Fall 1999.**

<b>Site</b>	<b>Spring 95</b>	<b>Fall 95</b>	<b>Spring 96</b>	<b>Fall 96</b>	<b>Spring 97</b>	<b>Fall 97</b>	<b>Spring 98</b>	<b>Fall 98</b>	<b>Spring 99</b>	<b>Fall 99</b>	<b>Total</b>
BBA-3	6	7	10	8	4	12	6	10	12	12	87
BBA-5	8	8	9	8	10	18	9	6	14	12	102
BBA-6	4	5	9	6	31	17	7	9	14	9	111
<b>Totals</b>	<b>18</b>	<b>20</b>	<b>28</b>	<b>22</b>	<b>45</b>	<b>47</b>	<b>22</b>	<b>25</b>	<b>40</b>	<b>33</b>	<b>300</b>

**Appendix Table 9-1. Catch Per Tow for the Spring and Fall sampling efforts, 1995-1999.**

	Spring Catch Per Tow (SE)					Fall Catch Per Tow (SE)				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
<i>Anguilla rostrata</i>										0.12 (0.07)
<i>Alectis ciliaris</i>						0.10 (0.10)	0.14 (0.07)			
<i>Alosa pseudoharengus</i>					20.58 (8.49)					
<i>Ammodytes hexapterus</i>	6.94 (4.05)	21.36 (11.98)	0.11 (0.7)	2.91 (1.61)	0.03 (0.03)		0.64 (0.54)	0.70 (0.26)		0.03 (0.03)
<i>Alosa sapidissima</i>										0.12 (0.09)
<i>Anchoa</i> spp.	0.06 (0.06)	0.54 (0.22)		85.45 (74.42)	38.38 (18.26)	21.50 (48.73)		0.13 (0.09)	0.08 (0.08)	777.58 (248.65)
<i>Gadus morhua</i>	0.06 (0.06)	1.96 (0.80)		7.27 (2.34)						
<i>Microponias undulatus</i>						0.45 (0.40)				11.76 (2.55)
<i>Clupea harengus</i>					2.63 (1.55)			0.02 (0.02)		
<i>Scomber scombrus</i>	0.06 (0.06)	0.43 (0.43)					0.05 (0.05)	0.06 (0.04)		
<i>Brevoortia tyrannus</i>					0.05 (0.03)					
<i>Selene setapinnis</i>							0.14 (0.07)			
<i>Dasvatis sabina</i>										0.09 (0.05)
<i>Acipenser oxyrhynchus</i>	0.06 (0.06)				0.05 (0.03)					
<i>Pholis fasciata</i>					0.10 (0.10)					
<i>Seriola zonata</i>						0.05 (0.05)	0.14 (0.14)			0.52 (0.17)
<i>Selar crumenophthalmus</i>						0.05 (0.05)				0.48 (0.19)
<i>Centropristis striata</i>	1.33 (0.24)	0.11 (0.06)	0.31 (0.29)	0.32 (0.12)	1.13 (0.39)	2.60 (0.68)	4.05 (1.53)	2.87 (0.98)	5.16 (2.02)	9.70 (4.76)
<i>Alosa aestivalis</i>	67.61 (63.51)	65.57 (17.60)		146.64 (75.17)	4.13 (3.38)					
<i>Pomatomus saltatrix</i>			0.07 (0.04)		0.63 (0.15)	5.85 (2.36)	0.14 (0.07)	1.45 (0.48)		1.33 (0.43)
<i>Fistularia tabacaria</i>							0.05 (0.05)		0.64 (0.24)	
<i>Peprilus triacanthus</i>	22.89 (8.35)	0.04 (0.04)	0.11 (0.05)	54.23 (36.55)	42.15 (8.87)	86.50 (32.68)	23.82 (102.75)	691.94 (751.66)	67.64 (120.90)	38.52 (6.57)
<i>Conger oceanicus</i>								0.02 (0.02)	0.04 (0.04)	
<i>Rhinoptera bonasus</i>						0.05 (0.05)				0.03 (0.03)
<i>Caranx hippos</i>						1.65 (1.12)				0.27 (0.21)
<i>Tautoglabrus adspersus</i>					0.15 (0.11)	0.05 (0.05)			0.04 (0.04)	
Ophidiidae									0.08 (0.06)	
<i>Upeneus parvus</i>						0.10 (0.07)		0.13 (0.06)		
Zoarcidae	2.50 (1.02)									
<i>Molva molva</i>					0.15 (0.15)					0.03 (0.03)
<i>Monocanthus</i> spp.						0.05 (0.05)	0.05 (0.05)			
<i>Enchelyopus cimbrius</i>								0.02 (0.02)		
<i>Paralichthys oblongus</i>	0.06 (0.06)		0.51 (0.12)	4.77 (0.96)	0.63 (0.15)		0.27 (0.27)	2.57 (0.54)	0.12 (0.12)	0.06 (0.04)
<i>Priacanthus cruentatus</i>							0.41 (0.17)			
<i>Lophius americanus</i>	0.39 (0.12)	0.25 (0.10)	0.91 (0.15)	0.05 (0.05)	0.13 (0.05)					
<i>Balistes capriscus</i>							0.05 (0.05)	0.02 (0.02)		0.03 (0.03)
<i>Seriola dumerili</i>						0.15 (0.08)				0.18 (0.13)
<i>Citharichthys arctifons</i>	0.61 (0.20)					0.20 (0.09)				
<i>Urophycis</i> spp.	213.56 (60.27)	1.96 (0.59)	2.16 (0.36)	2.05 (0.93)	5.80 (2.59)	0.55 (0.39)	3.00 (0.93)	1.81 (0.38)	1.04 (0.30)	0.48 (0.29)
<i>Alosa mediocris</i>						5.75 (2.26)				
<i>Trinectes maculatus</i>						0.10 (0.10)				

Appendix Table 9-1. Catch Per Tow for the Spring and Fall sampling efforts, 1995-1999.

	Spring Catch Per Tow (SE)					Fall Catch Per Tow (SE)				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
<i>Synodus foetens</i>										3.64 (0.58)
<i>Menticirrhus sp.</i>				0.09 (0.06)						11.12 (1.60)
<i>Hippocampus erectus</i>							0.05 (0.05)			
<i>Synodus spp.</i>						0.05 (0.05)				
<i>Selene vomer</i>									0.04 (0.04)	0.06 (0.04)
<i>Scomberomorus cavalla</i>										0.15 (0.08)
<i>Scomberomorus sp.</i>				0.05 (0.05)	0.05 (0.03)					
<i>Decapterus macarellus</i>							21.86 (4.85)	0.02 (0.02)		
Gerridae									0.16 (0.16)	
<i>Fundulus heteroclitus</i>								0.02 (0.02)		
<i>Menticirrhus saxatilis</i>	0.06 (0.06)				0.30 (0.10)	1.30 (0.60)				
<i>Syngnathus fuscus</i>		0.04 (0.04)						0.19 (0.07)		0.03 (0.03)
<i>Sphoeroides maculatus</i>				0.09 (0.09)	0.03 (0.03)	1.05 (0.30)	0.14 (0.07)	0.11 (0.05)		15.97 (2.86)
<i>Hippocampus erectus</i>	0.17 (0.09)	0.07 (0.05)								
<i>Sphyræna borealis</i>						0.05 (0.05)				0.45 (0.19)
<i>Astroscopus guttatus</i>								0.04 (0.03)	0.04 (0.04)	0.09 (0.05)
<i>Macrozoarces americanus</i>	4.06 (2.55)	1.75 (0.41)	0.02 (0.02)		0.10 (0.05)					
<i>Naucrates ductor</i>								0.04 (0.03)		
<i>Serraniculus pumilio</i>								2.11 (1.29)		
<i>Macrozoarces americanus</i>								0.04 (0.03)		0.03 (0.03)
<i>Mullus auratus</i>							0.05 (0.05)			
<i>Trachurus lathami</i>						4.20 (1.33)		0.04 (0.03)	0.44 (0.14)	
<i>Etrumeus teres</i>						0.30 (0.30)	0.18 (0.11)			
<i>Decapterus punctatus</i>								3.70 (0.61)		
<i>Stenotomus chrysops</i>	23.50 (9.90)	0.04 (0.04)	0.13 (0.06)	42.82 (10.17)	118.68 (23.50)	18.10 (5.87)	1.59 (1.13)	2.45 (0.75)	1.24 (0.45)	43.45 (13.46)
<i>Petromyzon marinus</i>	0.11 (0.08)									
<i>Hemitripterus americanus</i>			0.29 (0.13)							
<i>Prionotus spp.</i>	0.89 (0.21)	0.26 (0.11)	0.40 (0.09)	3.64 (0.77)	3.55 (0.73)	104.40 (29.76)	33.05 (5.45)	19.06 (2.20)	32.00 (7.44)	42.88 (4.99)
<i>Pristigenys alta</i>						0.05 (0.05)				
<i>Merluccius bilinearis</i>		0.36 (0.12)		12.64 (2.32)	5.18 (1.45)					0.24 (0.12)
<i>Raja spp.</i>	17.78 (1.37)	7.50 (1.33)	77.76 (7.07)	23.14 (4.78)	18.23 (3.86)	29.00 (14.10)	121.73 (38.61)	12.57 (1.92)	3.44 (0.69)	24.61 (3.13)
<i>Etropus microstomus</i>		0.36 (0.12)	0.04 (0.03)	8.27 (2.44)	1.08 (0.42)		12.91 (3.97)	9.45 (1.30)	1.92 (0.60)	0.12 (0.07)
<i>Mustelus canis</i>		0.04 (0.04)	0.36 (0.09)	1.41 (0.19)	2.25 (0.30)	9.30 (1.58)	1.23 (0.60)	0.47 (0.11)	0.48 (0.24)	6.64 (1.40)
<i>Liopsetta putnami</i>		0.04 (0.04)								
<i>Scomberomorus maculatus</i>								0.02 (0.02)		
<i>Squalus acanthias</i>		4.50 (1.33)								
<i>Leiostomus xanthurus</i>						0.05 (0.05)				
<i>Morone saxatilis</i>	1.67 (0.40)	7.61 (2.09)	0.29 (0.11)	0.95 (0.27)	1.68 (0.28)					
<i>Ophidion marginatum</i>						0.10 (0.10)				0.39 (0.16)
<i>Paralichthys dentatus</i>	0.67 (0.18)	0.82 (0.19)	4.93 (0.39)	7.91 (0.87)	2.96 (0.39)	32.80 (7.66)	34.77 (4.83)	7.13 (0.74)	5.88 (0.96)	8.63 (0.91)
<i>Tautoga onitis</i>	0.22 (0.13)	0.11 (0.06)	0.07 (0.05)	0.05 (0.05)	0.03 (<0.03)				0.04 (0.04)	0.12 (0.06)



**Appendix Table 9-2. Total catch and catch per tow for BBA-3 during the Spring sampling efforts, 1995-1999. Standard error is recorded in parentheses ().**

Taxa	Total Abundance					Catch Per Tow (SE)				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
Alewife ( <i>Alosa pseudoharengus</i> )					205					17.08 (9.86)
American Sand Lance ( <i>Ammodytes hexapterus</i> )	14	3				2.33 (2.14)	0.30 (0.30)			
Anchovy ( <i>Anchoa spp.</i> )		7		1684	1475		0.70 (0.40)		280.67 (271.51)	22.92 (54.66)
Atlantic Cod ( <i>Gadus morhua</i> )		2		10			0.20 (0.20)		1.67 (1.17)	
Atlantic Herring ( <i>Clupea harengus</i> )					18					1.50 (1.16)
Atlantic Mackerel ( <i>Scomber scombrus</i> )		12					1.20 (1.20)			
Atlantic Menhaden ( <i>Brevoortia tyrannus</i> )					1					0.08 (0.08)
Atlantic Sturgeon ( <i>Acipenser oxyrinchus</i> )					1					0.08 (0.08)
Black Sea Bass ( <i>Centropristis striata</i> )	8	3		2	12	1.33 (0.56)	0.30 (0.15)		0.33 (0.21)	1.00 (0.58)
Blueback Herring ( <i>Alosa aestivialis</i> )	3628	1092		3178	165	04.67 (160.36)	09.20 (32.96)		529.67 (215.98)	13.75 (11.10)
Bluefish ( <i>Pomatomus saltatrix</i> )					12					1.00 (0.39)
Butterfish ( <i>Peprilus triacanthus</i> )	150		1	273	632	25.00 (14.38)		0.25 (0.25)	45.50 (36.49)	52.67 (16.53)
Cunner ( <i>Tautoglabrus adspersus</i> )					2					0.17 (0.17)
Eel Pout (Zoarcidae)	5					0.83 (0.54)				
Four Spot Flounder ( <i>Paralichthys oblongus</i> )				6	3				1.00 (0.52)	0.25 (0.13)
Goosefish ( <i>Lophius americanus</i> )	3	5	1			0.50 (0.22)	0.50 (0.22)	0.25 (0.25)		
Gulf Stream Flounder ( <i>Citharichthys arctif</i> )	4					0.67 (0.33)				
Hake ( <i>Urophycis spp.</i> )	1140	35	6	38	106	190.00 (68.24)	3.50 (1.34)	1.50 (0.87)	6.33 (2.72)	8.83 (1.85)
Hickory Shad ( <i>Alosa mediocris</i> )					146					12.17 (7.09)
Mackerel ( <i>Scomberomorus spp.</i> )				1	1				0.17 (0.17)	0.08 (0.08)
Northern Kingfish ( <i>Menticirrhus saxatilis</i> )	1				5	0.17 (0.17)				0.42 (0.23)
Northern Puffer ( <i>Sphoeroides maculatus</i> )					1					0.08 (0.08)
Northern Seahorse ( <i>Hippocampus errectus</i> )	3	1				0.50 (0.22)	0.10 (0.10)			
Ocean Pout ( <i>Macrozoarces americanus</i> )	14	18				2.33 (0.84)	1.80 (0.77)			
Scup ( <i>Stenotomus chrysops</i> )	261	1		323	1421	43.50 (27.83)	0.10 (0.10)		53.83 (19.27)	18.42 (34.19)
Searobin ( <i>Prionotus spp.</i> )	6	4	4	26	79	1.00 (0.37)	0.40 (0.22)	1.00 (0.41)	4.33 (0.80)	6.58 (1.14)
Silver Hake ( <i>Merluccius bilinearis</i> )		2		51	91		0.20 (0.20)		8.50 (1.23)	7.58 (2.25)
Skate ( <i>Raja spp.</i> )	115	73	602	340	428	19.17 (1.78)	8.50 (2.83)	50.50 (14.18)	56.67 (4.80)	35.67 (11.04)
Smallmouth Flounder ( <i>Etropus microstomus</i> )		3	1	18	5		0.30 (0.15)	0.25 (0.25)	3.00 (0.58)	0.42 (0.23)
Smooth Dogfish ( <i>Mustelus canis</i> )		1	1	9	36		0.10 (0.10)	0.25 (0.25)	1.50 (0.43)	3.00 (0.69)
Smooth Flounder ( <i>Liopsetta putnami</i> )		1					0.10 (0.10)			
Spiny Dogfish ( <i>Squalus acanthius</i> )		14					1.40 (1.29)			
Striped Bass ( <i>Morone saxatilis</i> )	12	167	1	8	33	2.00 (0.73)	16.70 (3.82)	0.25 (0.25)	1.33 (0.21)	2.75 (0.41)
Summer Flounder ( <i>Paralichthys dentatus</i> )	4	7	11	51	58	0.67 (0.33)	0.70 (0.26)	2.75 (0.48)	8.50 (1.59)	4.83 (0.76)
Tautog ( <i>Tautoga onitis</i> )		1					0.10 (0.10)			
Weakfish ( <i>Cynoscion regalis</i> )		90			202		9.00 (5.76)			16.83 (16.11)
Windowpane ( <i>Scopthalmus aquosus</i> )	307	237	88	76	107	51.17 (7.81)	23.70 (4.13)	22.00 (2.27)	12.67 (2.80)	8.92 (1.67)
Winter Flounder ( <i>Pleuronectes americanus</i> )	417	253		17	9	69.50 (4.03)	25.30 (4.16)		2.83 (1.08)	0.75 (0.22)
<b>Total Number of Fish Collected:</b>	<b>6092</b>	<b>2032</b>	<b>716</b>	<b>6111</b>	<b>5254</b>	<b>015.33 (102.1)</b>	<b>03.20 (41.44)</b>	<b>79.00 (15.63)</b>	<b>018.50 (271.0)</b>	<b>137.83 (55.18)</b>
<b>Total Number of Taxa Collected:</b>	<b>18</b>	<b>24</b>	<b>10</b>	<b>18</b>	<b>27</b>					

**Appendix Table 9-3. Total catch and catch per tow for BBA-5 during the Spring sampling efforts, 1995-1999. Standard error is recorded in parentheses ().**

Taxa	Total Abundance					Catch Per Tow (SE)				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
Alewife ( <i>Alosa pseudoharengus</i> )					479					34.21 (22.50)
American Sand Lance ( <i>Ammodytes hexa</i> )	17	10		51	1	2.13 (1.09)	1.11 (0.77)		5.67 (3.84)	0.07 (0.07)
Anchovy ( <i>Anchoa sp.</i> )	1	8		196	59		0.89 (0.51)		21.78 (20.79)	4.21 (4.21)
Atlantic Cod ( <i>Gadus morhua</i> )	1	6		142		0.13 (0.13)	0.67 (0.46)		15.78 (4.37)	
Atlantic Menhaden ( <i>Brevoortia tyrannus</i> )					1					0.07 (0.07)
Atlantic Sturgeon ( <i>Acipenser oxyrinchus</i> )	1					0.13 (0.13)				
Black Sea Bass ( <i>Centropristis striata</i> )	9			1		1.13 (0.30)			0.11 (0.11)	
Blueback Herring ( <i>Alosa aestivalis</i> )	3952	431		47		494.00 (69.64)	7.89 (19.31)		5.22 (2.32)	
Bluefish ( <i>Pomatomus saltatrix</i> )			1		8			0.10 (0.10)		0.57 (0.23)
Butterfish ( <i>Peprilus triacanthus</i> )	234			812	920	29.25 (15.61)			90.22 (87.73)	65.71 (18.31)
Eel Pout (Zoarcidae)	10					1.25 (0.77)				
Fourspot Flounder ( <i>Paralichthys oblongus</i> )			8	38	8			0.80 (0.36)	4.22 (1.48)	0.57 (0.31)
Goosefish ( <i>Lophius americanus</i> )	2	1	8		3	0.25 (0.16)	0.11 (0.11)	0.80 (0.33)		0.21 (0.11)
Gulf Stream Flounder ( <i>Citharichthys arc</i> )	6					0.75 (0.37)				
Hake ( <i>Urophycis spp.</i> )	872	18	6	5	119	09.00 (34.79)	2.00 (0.82)	0.60 (0.31)	0.56 (0.56)	8.50 (5.43)
Hickory Shad ( <i>Alosa mediocris</i> )					77					5.50 (1.59)
Northern Kingfish ( <i>Menticirrhus saxatilis</i> )				2	6				0.22 (0.15)	0.43 (0.17)
Northern Pipefish ( <i>Syngnathus fuscus</i> )		1					0.11 (0.11)			
Northern Puffer ( <i>Sphoeroides maculatus</i> )				2					0.22 (0.15)	
Ocean Pout ( <i>Macrozoarces americanus</i> )	12	4				1.50 (0.46)	0.44 (0.18)			
Scup ( <i>Stenotomus chrysops</i> )	138		2	546	2479	17.25 (6.89)		0.20 (0.13)	50.67 (18.79)	77.07 (55.22)
Sea Lamprey ( <i>Petromyzon marinus</i> )	2					0.25 (0.16)				
Searobin ( <i>Prionotus spp.</i> )	5	1	5	45	57	0.63 (0.18)	0.11 (0.11)	0.50 (0.22)	5.00 (1.61)	4.07 (1.47)
Silver Hake ( <i>Merluccius bilinearis</i> )		4		188	89		0.44 (0.24)		20.89 (4.32)	6.36 (3.58)
Skate ( <i>Raja spp.</i> )	150	80	1231	90	146	18.75 (2.53)	8.89 (1.58)	23.10 (13.31)	10.00 (2.55)	10.43 (2.62)
Smallmouth Flounder ( <i>Etropus microstomus</i> )		4		160	28		0.44 (0.25)		17.78 (4.31)	2.00 (1.13)
Smooth Dogfish ( <i>Mustelus canis</i> )				7	29				0.78 (0.15)	2.07 (0.45)
Spiny Dogfish ( <i>Squalus acanthias</i> )		54					6.00 (2.75)			
Striped Bass ( <i>Morone saxatilis</i> )	15	39	2	7	26	1.88 (0.69)	4.33 (2.93)	0.20 (0.13)	0.78 (0.36)	1.86 (0.57)
Summer Flounder ( <i>Paralichthys dentatus</i> )	8	8	45	79	34	1.00 (0.27)	0.89 (0.39)	4.50 (0.86)	8.78 (1.77)	2.43 (0.50)
Tautog ( <i>Tautoga onitis</i> )	3	2			1	0.38 (0.26)	0.22 (0.15)			0.07 (0.07)
Weakfish ( <i>Cynoscion regalis</i> )		3			6		0.33 (0.24)			0.43 (0.20)
Windowpane ( <i>Scophthalmus aquosus</i> )	297	162	212	92	67	37.13 (4.97)	18.00 (2.38)	21.20 (2.56)	10.22 (1.58)	4.79 (1.14)
Winter Flounder ( <i>Pleuronectes american</i> )	282	74	6	173	27	35.25 (7.77)	8.22 (1.60)	0.60 (0.27)	19.22 (4.69)	1.93 (0.47)
<b>Total Number of Fish Collected:</b>	<b>6017</b>	<b>910</b>	<b>1526</b>	<b>2683</b>	<b>4670</b>	<b>52.13 (104.1)</b>	<b>101.11 (33.4)</b>	<b>52.60 (45.06)</b>	<b>8.11 (114.1)</b>	<b>33.57 (67.52)</b>
<b>Total Number of Taxa Collected:</b>	<b>21</b>	<b>19</b>	<b>11</b>	<b>20</b>	<b>23</b>					



**Appendix Table 9-4. Total catch and catch per tow for BBA-6 during the Spring sampling efforts, 1995-1999. Standard error is recorded in parentheses ().**

	Total Abundance					Catch Per Tow (SE)				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
Alewife ( <i>Alosa pseudoharengus</i> )					139					9.93 (4.07)
American Sand Lance ( <i>Ammodytes hex</i> )	94	585	5	13		23.50 (16.87)	55.00 (33.96)	0.16 (0.09)	1.86 (0.55)	
Anchovy ( <i>Anchoa</i> sp.)					1					0.07 (0.07)
Atlantic Cod ( <i>Gadus morhua</i> )		47		8			5.22 (1.82)		1.14 (0.46)	
Atlantic Herring ( <i>Clupea harengus</i> )					87					6.21 (4.23)
Atlantic Mackerel ( <i>Scomber scombrus</i> )	1					0.25 (0.25)				
Atlantic Sturgeon ( <i>Acipenser oxyrhynchus</i> )					1					0.07 (0.07)
Banded Gunnel ( <i>Pholis fasciata</i> )					4					0.29 (0.29)
Black Sea Bass ( <i>Centropristis striata</i> )	7		14	4	33	1.75 (0.48)		0.45 (0.42)	0.57 (0.30)	2.36 (0.92)
Blueback Herring ( <i>Alosa aestivalis</i> )	2637	313		1		659.25 (94.06)	34.78 (33.17)		0.14 (0.14)	
Bluefish ( <i>Pomatomus saltatrix</i> )			2		5			0.06 (0.04)		0.36 (0.17)
Butterfish ( <i>Peprilus triacanthus</i> )	28	1	4	108	134	7.00 (3.51)	0.11 (0.11)	0.13 (0.06)	15.43 (3.50)	9.57 (2.93)
Cunner ( <i>Tautoglabrus adspersus</i> )					4					0.29 (0.29)
Eel Pout (Zoarcidae)	30					7.50 (3.52)				
European Ling ( <i>Molva molva</i> )					6					0.43 (0.43)
Fourspot Flounder ( <i>Paralichthys oblong</i> )	1		15	61	14	0.25 (0.25)		0.48 (0.13)	8.71 (1.23)	1.00 (0.28)
Goosefish ( <i>Lophius americanus</i> )	2	1	32	1	2	0.50 (0.29)	0.11 (0.11)	1.03 (0.19)	0.14 (0.14)	0.14 (0.10)
Gulf Stream Flounder ( <i>Citharichthys ar</i> )	1					0.25 (0.25)				
Hake ( <i>Urophycis</i> spp.)	1832	2	85	2	7	458.00 (218.76)	0.22 (0.15)	2.74 (0.46)	0.29 (0.29)	0.50 (0.31)
Hickory Shad ( <i>Alosa mediocris</i> )					7					0.50 (0.25)
Mackerel ( <i>Scomberomorus</i> spp.)					1					0.07 (0.07)
Northern Kingfish ( <i>Menticirrhus saxatilis</i> )					1					0.07 (0.07)
Northern Seahorse ( <i>Hippocampus erectus</i> )		1					0.11 (0.11)			
Ocean Pout ( <i>Macrozoarces americanus</i> )	47	27	1		4	11.75 (11.75)	3.00 (0.73)	0.03 (0.03)		0.29 (0.13)
Scup ( <i>Stenotomus chrysops</i> )	24		4	73	847	6.00 (3.67)		0.13 (0.08)	10.43 (2.77)	0.50 (17.78)
Sea Raven ( <i>Hemitripteris americanus</i> )			13					0.03 (0.03)		
Searobin ( <i>Prionotus</i> spp.)	5	3	9	9	6	1.25 (0.75)	0.33 (0.24)	0.29 (0.10)	1.29 (0.57)	0.43 (0.17)
Silver Hake ( <i>Merluccius bilinearis</i> )		4		39	27		0.44 (0.18)		5.57 (0.87)	1.93 (0.54)
Skate ( <i>Raja</i> spp.)	55	46	1666	79	155	13.75 (1.65)	5.00 (1.36)	53.74 (4.75)	11.29 (1.69)	11.07 (1.95)
Smallmouth Flounder ( <i>Etropus microstomus</i> )		3	1	4	10		0.33 (0.25)	0.03 (0.03)	0.57 (0.30)	0.71 (0.27)
Smooth Dogfish ( <i>Mustelus canis</i> )			15	15	25			0.48 (0.12)	2.14 (0.26)	1.79 (0.39)
Spiny Dogfish ( <i>Squalus acanthias</i> )		58					6.44 (2.61)			
Striped Bass ( <i>Morone saxatilis</i> )	3	7	10	6	8	0.75 (0.48)	0.78 (0.36)	0.32 (0.15)	0.86 (0.70)	0.57 (0.23)
Summer Flounder ( <i>Paralichthys dentatus</i> )		8	166	44	27		0.89 (0.35)	5.35 (0.47)	6.29 (0.75)	1.93 (0.58)
Tautog ( <i>Tautoga onitis</i> )	1		3	1		0.25 (0.25)		0.10 (0.07)	0.14 (0.14)	
Windowpane ( <i>Scopthalmus aquosus</i> )	111	83	410	46	29	27.75 (3.99)	9.22 (1.37)	13.23 (1.19)	6.57 (1.04)	2.07 (0.44)
Winter Flounder ( <i>Pleuronectes america</i> )	165	153	76	262	116	41.25 (2.59)	17.00 (1.71)	2.45 (0.36)	37.43 (2.68)	8.29 (1.02)
Yellowtail Flounder ( <i>Limanda ferrugin</i> )	1					0.25 (0.25)				
<b>Total Number of Fish Collected:</b>	<b>5045</b>	<b>1342</b>	<b>2531</b>	<b>776</b>	<b>1700</b>	<b>261.25 (312.55)</b>	<b>49.11 (40.61)</b>	<b>181.65 (5.71)</b>	<b>110.86 (7.19)</b>	<b>21.43 (24.65)</b>
<b>Total Number of Taxa Collected:</b>	<b>19</b>	<b>17</b>	<b>19</b>	<b>19</b>	<b>27</b>					

**Appendix Table 9-5. Total catch and catch per tow for BBA-3 during the Fall sampling efforts, 1995-1999. Standard error is recorded in parentheses ().**

Taxa	Total Abundance					Catch Per Tow (SE)				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
American Eel ( <i>Anguilla rostrata</i> )					4					0.33 (0.19)
American Sand Lance ( <i>Ammodytes hexapterus</i> )		1	3				0.13 (0.13)	0.25 (0.18)		
American Shad ( <i>Alosa sapidissima</i> )					4					0.33 (0.26)
Anchovy ( <i>Anchoa</i> spp.)	1532		3	2	11135	218.86 (51.08)		0.50 (0.34)	0.20 (0.20)	927.92 (322.06)
Atlantic Croaker ( <i>Micropogonias undulatus</i> )					260					21.67 (4.19)
Atlantic Mackerel ( <i>Scomber scombrus</i> )		1	1				0.13 (0.13)	0.08 (0.08)		
Atlantic Stingray ( <i>Dasyatis sabina</i> )					1					0.08 (0.08)
Banded Rudderfish ( <i>Seriola zonata</i> )					6					0.50 (0.34)
Black Sea Bass ( <i>Centropristis striata</i> )	33	44	20	3	41	4.71 (0.84)	5.50 (3.15)	1.67 (0.75)	0.30 (0.15)	3.42 (1.12)
Bluefish ( <i>Pomatomus saltatrix</i> )	113	2	23		40	16.14 (4.83)	0.25 (0.16)	1.92 (1.38)	0.00	3.33 (0.96)
Bluespotted Cornetfish ( <i>Fistularia tabacaria</i> )				2					0.20 (0.13)	
Butterfish ( <i>Peprilus triacanthus</i> )	2006	2695	49650	6125	538	286.57 (59.87)	336.88 (282.70)	4137.50 (1165.24)	612.50 (188.00)	44.83 (10.01)
Crevalle Jack ( <i>Caranx hippos</i> )	32				8	4.57 (3.02)				0.67 (0.58)
Cusk-eel (Ophidiidae)				2					0.20 (0.13)	
Dwarf Goatfish ( <i>Upeneus parvus</i> )	2		1			0.29 (0.18)		0.08 (0.08)		
European Ling ( <i>Molva molva</i> )					1					0.08 (0.08)
Fourspot Flounder ( <i>Paralichthys oblongus</i> )			4	3				0.33 (0.19)	0.30 (0.30)	
Glasseye Flounder ( <i>Priacanthus cruentatus</i> )		1					0.13 (0.13)			
Gulf Stream Flounder ( <i>Citharichthys arctifons</i> )	3					0.43 (0.20)				
Hake ( <i>Urophycis</i> spp.)		9	6	9			1.13 (0.23)	0.33 (0.26)	0.90 (0.31)	
Inshore Lizardfish ( <i>Synodus foetens</i> )				1	20					1.58 (0.36)
King Mackerel ( <i>Scomberomorus cavalla</i> )					1					0.08 (0.08)
Lookdown ( <i>Selene vomer</i> )				1					0.10 (0.10)	
Mackerel Scad ( <i>Decapterus macarellus</i> )		108					13.50 (2.95)			
Northern Kingfish ( <i>Menticirrhus saxatilis</i> )	26				162	3.71 (1.34)				13.50 (2.07)
Northern Pipefish ( <i>Syngnathus fuscus</i> )			1					0.08 (0.08)		
Northern Puffer ( <i>Sphoeroides maculatus</i> )	18	2	2		238	2.57 (0.37)	0.25 (0.16)	0.17 (0.11)		19.83 (3.71)
Northern Sennet ( <i>Sphyræna borealis</i> )	1				14	0.14 (0.14)				1.17 (0.46)
Northern Stargazer ( <i>Astroscopus guttatus</i> )			2		2			0.17 (0.11)		0.17 (0.11)
Pygmy Seabass ( <i>Serraniculus pumilio</i> )			18					1.50 (1.50)		
Ocean Pout ( <i>Macrozoarces americanus</i> )			1					0.08 (0.08)		
Rough Scad ( <i>Trachurus lathami</i> )	5		1	6		0.71 (0.29)		0.08 (0.08)	0.60 (0.27)	
Round Scad ( <i>Decaterus punctatus</i> )			58					4.83 (0.84)		
Scup ( <i>Stenotomus chrysops</i> )	343	32	17	9	148	49.00 (8.09)	4.00 (3.02)	1.50 (0.76)	0.90 (0.35)	12.33 (2.75)
Searobin ( <i>Prionotus</i> spp.)	1572	401	300	473	729	224.57 (59.49)	50.13 (10.83)	33.08 (3.29)	47.30 (9.70)	60.75 (5.48)
Short Bigeye ( <i>Pristigenys alta</i> )	1					0.14 (0.14)				
Silver Hake ( <i>Merluccius bilinearis</i> )					2					0.17 (0.17)
Skate ( <i>Raja</i> spp.)	11	860	316	16	257	1.57 (0.65)	107.50 (73.22)	28.33 (4.77)	1.60 (0.50)	21.42 (2.15)
Smallmouth Flounder ( <i>Etropus microstomus</i> )		35	56	25			4.38 (1.24)	4.6 (0.70)	2.50 (0.95)	
Smooth Dogfish ( <i>Mustelus canis</i> )	52		7	1	173	7.43 (1.32)		0.67 (0.31)	0.10 (0.10)	14.42 (2.51)
Spot ( <i>Leiostomus xanthurus</i> )	1					0.14 (0.14)				
Striped Cusk-Eel ( <i>Ophidion marginatum</i> )					8					0.67 (0.35)
Summer Flounder ( <i>Paralichthys dentatus</i> )	255	444	116	58	143	36.43 (3.71)	55.50 (6.81)	9.92 (1.82)	5.80 (0.88)	11.92 (1.25)
Tautog ( <i>Tautoga onitis</i> )					2					0.17 (0.11)
Triggerfish ( <i>Balistes</i> spp.)	2	1				0.29 (0.18)	0.13 (0.13)			
Weakfish ( <i>Cynoscion regalis</i> )	337	1	84	3	2340	48.14 (9.35)	0.13 (0.13)	7.00 (3.71)	0.30 (0.21)	195.00 (41.65)
Windowpane ( <i>Scopthalmus aquosus</i> )	267	139	50	98	315	38.14 (3.65)	17.38 (2.23)	4.17 (0.91)	9.80 (1.95)	26.25 (3.44)
Winter Flounder ( <i>Pleuronectes americanus</i> )	4	3				0.57 (0.20)	0.38 (0.18)			
<b>Total Number of Fish Collected:</b>	<b>6616</b>	<b>4779</b>	<b>50740</b>	<b>6836</b>	<b>16592</b>	<b>45.14 (167.49)</b>	<b>97.38 (270.66)</b>	<b>238.92 (1171.34)</b>	<b>83.60 (195.74)</b>	<b>382.67 (345.49)</b>
<b>Total Number of Taxa Collected:</b>	<b>22</b>	<b>18</b>	<b>24</b>	<b>17</b>	<b>27</b>					

**Appendix Table 9-6. Total catch and catch per tow for BBA-5 during the Fall sampling efforts, 1995-1998. Standard error is recorded in parentheses ().**

Taxa	Total Abundance					Catch Per Tow (SE)				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
African Pompano ( <i>Alectis ciliaris</i> )	2	1				0.25 (0.25)	0.13 (0.13)			
American Sand Lance ( <i>Ammodytes hexapterus</i> )			19		1			1.06 (0.60)		0.08 (0.08)
Anchovy ( <i>Anchoa</i> spp.)	898				14525	12.25 (107.89)				1210.42 (574.98)
Atlantic Croaker ( <i>Microponias undulatus</i> )	8				104	1.00 (1.00)				8.67 (4.19)
Atlantic Herring ( <i>Clupea harengus</i> )			1					0.06 (0.06)		
Atlantic Mackerel ( <i>Scomber scombrus</i> )			4					0.11 (0.08)		
Atlantic Moonfish ( <i>Selene setapinnis</i> )		3					0.38 (0.18)			0.08 (0.08)
Atlantic Stingray ( <i>Dasyatis sabina</i> )					1					0.08 (0.08)
Banded Rudderfish ( <i>Seriola zonata</i> )	1	3			7	0.13 (0.13)	0.38 (0.38)			0.58 (0.29)
Bigeye Scad ( <i>Selar crumenophthalmus</i> )	1				2	0.13 (0.13)				0.17 (0.11)
Black Sea Bass ( <i>Centropristis striata</i> )	1		14	47	11	0.13 (0.13)		0.78 (0.61)	7.83 (1.12)	0.92 (0.40)
Bluefish ( <i>Pomatomus saltatrix</i> )	3		40		2	0.38 (0.26)		2.22 (0.83)		0.17 (0.11)
Bluespotted Cornetfish ( <i>Fistularia tabacaria</i> )		1		12			0.13 (0.13)		2.00 (0.13)	
Butterfish ( <i>Peprilus triacanthus</i> )	854	1571	162372	759	453	106.75 (29.71)	196.38 (58.39)	9020.67 (1262.62)	126.50 (25.65)	37.75 (11.70)
Cownose Ray ( <i>Rhinoptera bonasus</i> )	1				1	0.13 (0.13)				0.08 (0.08)
Creville Jack ( <i>Caranx hippos</i> )	1					0.13 (0.13)				
Dwarf Goatfish ( <i>Upeneus parvus</i> )			1					0.06 (0.06)		
Filefish ( <i>Monocanthus</i> spp.)	1	1				0.13 (0.13)	0.13 (0.13)	0.00		
Fourspot Flounder ( <i>Paralichthys oblongus</i> )			39		2			2.17 (0.84)		0.17 (0.11)
Glasseye Snapper ( <i>Priacanthus cruentatus</i> )		8					1.00 (0.38)			
Greater Amberjack ( <i>Seriola dumerili</i> )	2				2	0.25 (0.16)				0.17 (0.17)
Hake ( <i>Urophycis</i> spp.)	4	13	14		10	0.50 (0.50)	1.63 (0.78)	0.88 (0.34)		0.83 (0.75)
Hogchocker ( <i>Trinectes maculatus</i> )	2					0.25 (0.25)				
Inshore Lizardfish ( <i>Synodus foetens</i> )					57					4.75 (1.21)
Lined Seahorse ( <i>Hippocampus erectus</i> )		1					0.13 (0.13)			
Lizardfish ( <i>Synodus</i> spp.)	1					0.13 (0.13)				
Inshore Lizardfish ( <i>Synodus foetens</i> )					1					0.08 (0.08)
Mackerel Scad ( <i>Decapterus macarellus</i> )		348	1				43.50 (8.49)	0.06 (0.06)		
Mojarra (Gerreidae)				4					0.67 (0.23)	
Mummichog ( <i>Fundulus heteroclitus</i> )			1					0.06 (0.06)		
Northern Kingfish ( <i>Menticirrhus saxatilis</i> )					67					5.58 (1.47)
Northern Pipefish ( <i>Syngnathus fuscus</i> )			3		1			0.17 (0.12)		0.08 (0.08)
Northern Puffer ( <i>Sphoeroides maculatus</i> )	3	1	3		158	0.38 (0.26)	0.13 (0.13)	0.17 (0.09)		13.17 (3.97)
Northern Sennet ( <i>Sphyræna picudilla</i> )					1					0.08 (0.08)
Northern Stargazer ( <i>Astroscopus guttatus</i> )				1					0.17 (0.05)	
Pilotfish ( <i>Naucrates ductor</i> )			1					0.06 (0.06)		
Pygmy Seabass ( <i>Serraniculus pumilio</i> )			65					3.72 (3.21)		
Ocean Pout ( <i>Macrozoarces americanus</i> )										
Rough Scad ( <i>Trachurus lathami</i> )	38		1	5		4.75 (1.63)		0.06 (0.06)	0.83 (0.15)	
Round Scad ( <i>Decaterus punctatus</i> )			92					5.11 (1.36)		
Round Herring ( <i>Etrumeus teres</i> )		2								
Scup ( <i>Stenotomus chrysops</i> )	8	1	19	20	693	1.00 (0.50)	0.25 (0.25)	1.06 (0.47)	3.33 (0.49)	57.75 (31.91)
Searobin ( <i>Prionotus</i> spp.)	278	242	435	291	479	34.75 (23.50)	30.25 (6.64)	24.17 (2.59)	48.50 (6.74)	39.92 (10.25)
Silver Hake ( <i>Merluccius bilinearis</i> )					1					0.08 (0.08)
Skate ( <i>Raja</i> spp.)	93	11	110	19	120	11.63 (3.06)	1.38 (0.46)	6.33 (1.27)	3.17 (0.44)	10.00 (2.58)
Smallmouth Flounder ( <i>Etropus microstomus</i> )		213	221	15	4		26.63 (9.19)	12.28 (2.72)	2.50 (0.61)	0.33 (0.19)
Smooth Dogfish ( <i>Mustelus canis</i> )	48		9		31	6.00 (1.49)		0.50 (0.17)		2.58 (0.74)
Spanish Mackerel ( <i>Scomberomorus maculatus</i> )			1					0.06 (0.06)		
Striped Cusk Eel ( <i>Ophidion marginatum</i> )	2				5	0.25 (0.25)				0.42 (0.26)
Summer Flounder ( <i>Paralichthys dentatus</i> )	213	261	119	66	63	26.63 (15.18)	32.63 (3.95)	6.67 (1.23)	11.00 (0.83)	5.25 (1.30)
Triggerfish ( <i>Balistes</i> spp.)	7					0.88 (0.52)				
Wahoo ( <i>Acanthocybium solanderi</i> )			1					0.06 (0.06)		
Weakfish ( <i>Cynoscion regalis</i> )	22		23		316	2.75 (2.75)		1.28 (0.67)		26.33 (7.05)
Windowpane ( <i>Scophthalmus aquosus</i> )	42	55	71	22	140	5.25 (2.66)	6.88 (1.33)	3.94 (1.10)	3.67 (0.38)	11.67 (2.48)
Winter Flounder ( <i>Pleuronectes americanus</i> )	1	3		1		0.13 (0.13)	0.38 (0.26)		0.17 (0.05)	
<b>Total Number of Fish Collected:</b>	<b>2535</b>	<b>2739</b>	<b>2E+05</b>	<b>1262</b>	<b>17258</b>	<b>16.88 (181.13)</b>	<b>142.40 (70.37)</b>	<b>993.78 (1263.90)</b>	<b>210.33 (87.7)</b>	<b>1438.17 (556.90)</b>
<b>Total Number of Taxa Collected:</b>	<b>27</b>	<b>19</b>	<b>27</b>	<b>11</b>	<b>29</b>					

Appendix Table 9-7. Total catch and catch per tow for BBA-6 during the Fall sampling efforts, 1995-1999. Standard error is recorded in parentheses ().

Taxa	Total Abundance					Catch Per Tow (SE)				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
African Pompano ( <i>Alectis ciliaris</i> )		2					0.33 (0.21)			
American Sand Lance ( <i>Ammodytes hexapterus</i> )		13	11				2.17 (1.97)	0.65 (0.28)		
Atlantic Croaker ( <i>Micropomias undulatus</i> )	1				24	0.20 (0.20)				2.67 (1.69)
Atlantic Stingray ( <i>Dasyatis sabina</i> )					1					0.11 (0.11)
Banded Rudderfish ( <i>Seriola zonata</i> )					4					0.44 (0.24)
Bigeye Scad ( <i>Selar crumenophthalmus</i> )					14					1.56 (0.53)
Black Sea Bass ( <i>Centropristis striata</i> )	18	45	101	79	268	3.60 (1.75)	7.50 (3.23)	5.94 (2.44)	8.78 (4.82)	29.78 (16.12)
Bluefish ( <i>Pomatomus saltatrix</i> )	1	1	4		2	0.20 (0.20)	0.17 (0.17)	0.29 (0.14)		0.22 (0.15)
Bluespotted Cornetfish ( <i>Fistularia tabacaria</i> )				2					0.22 (0.15)	
Butterfish ( <i>Peprilus triacanthus</i> )	870	658	55499	9807	280	174.00 (64.86)	109.67 (28.90)	3264.65 (912.54)	089.67 (166.74)	131.11 (13.55)
Conger Eel ( <i>Conger oceanicus</i> )			1	1				0.06 (0.06)	0.11 (0.11)	
Creville Jack ( <i>Caranx hippos</i> )					1					0.11 (0.11)
Cunner ( <i>Tautoglabrus adspersus</i> )	1			1		0.20 (0.20)			0.11 (0.11)	
Dwarf Goatfish ( <i>Upeneus parvus</i> )			4					0.24 (0.14)		
Fourbeard Rockling ( <i>Enchelyopus cimbrius</i> )			1					0.06 (0.06)		
Fourspot Flounder ( <i>Paralichthys oblongus</i> )		6	77				1.00 (1.00)	4.59 (1.01)		
Glasseye Snapper ( <i>Priacanthus cruentatus</i> )		1					0.17 (0.17)			
Gray Triggerfish ( <i>Balistes capriscus</i> )			1		1			0.06 (0.06)		0.11 (0.11)
Greater Amberjack ( <i>Seriola dumerili</i> )	1				4	0.20 (0.20)				0.44 (0.44)
Gulf Stream Flounder ( <i>Citharichthys arctifon</i> )	1					0.20 (0.20)				
Hake ( <i>Urophycis</i> spp.)	7	44	65	17	6	1.40 (1.40)	7.33 (2.64)	3.82 (0.74)	1.89 (0.65)	0.67 (0.37)
Inshore Lizardfish ( <i>Synodus foetens</i> )					44					4.89 (0.99)
King Mackerel ( <i>Scomberomorus cavalla</i> )					4					0.44 (0.24)
Mackerel Scad ( <i>Decapterus macarellus</i> )		25					4.17 (2.41)			
Northern Kingfish ( <i>Menticirrhus saxatilis</i> )					138					15.33 (4.20)
Northern Pipefish ( <i>Syngnathus fuscus</i> )			5					0.29 (0.14)		
Northern Puffer ( <i>Spherooides maculatus</i> )					131					14.56 (7.86)
Northern Stargazer ( <i>Astroscopus guttatus</i> )					1					0.11 (0.11)
Pilotfish ( <i>Naukrates ductor</i> )			1					0.06 (0.06)		
Pygmy Seabass ( <i>Serraniculus pumilio</i> )			14					0.82 (0.48)		
Ocean Pout ( <i>Macrozoarces americanus</i> )			1					0.06 (0.06)		
Red Goatfish ( <i>Mullus auratus</i> )		1					0.17 (0.17)			
Rough Scad ( <i>Trachurus lathami</i> )	41					8.20 (4.21)				
Round Herring ( <i>Etrumeus teres</i> )	6	2				1.20 (1.20)	0.33 (0.21)			
Round Scad ( <i>Decapterus punctatus</i> )			24					1.41 (0.26)		
Scup ( <i>Stenotomus chrysops</i> )	11	2	79	2	593	2.20 (1.71)	0.33 (0.21)	4.65 (1.85)	0.22 (0.22)	65.89 (22.74)
Searobin ( <i>Prionotus</i> spp.)	238	84	64	36	207	47.60 (7.22)	14.00 (1.69)	3.76 (0.77)	4.00 (1.09)	23.00 (3.60)
Short Bigeye ( <i>Pristigenys alta</i> )										
Silver Hake ( <i>Merluccius bilinearis</i> )					5					0.56 (0.38)
Skate ( <i>Raja</i> spp.)	476	1807	135	51	435	95.20 (47.64)	301.17 (26.13)	7.94	5.67 (1.30)	48.33 (3.94)
Smallmouth Flounder ( <i>Etropus microstomus</i> )		36	168	8			6.00 (1.73)	9.82 (1.83)	0.89 (0.31)	
Smooth Dogfish ( <i>Mustelus canis</i> )	86	27	5	11	15	17.20 (4.07)	4.50 (1.63)	0.29 (0.11)	1.22 (0.60)	1.67 (0.60)
Summer Flounder ( <i>Paralichthys dentatus</i> )	188	60	98	23	79	37.60 (20.41)	10.00 (2.13)	5.76 (0.72)	2.56 (0.53)	8.78 (1.59)
Tautog ( <i>Tautoga onitis</i> )				1	2				0.11 (0.11)	0.22 (0.15)
Triggerfish ( <i>Balistes</i> spp.)	1					0.20 (0.20)				
Weakfish ( <i>Cynoscion regalis</i> )			2		37			0.12 (0.12)		4.11 (2.76)
Windowpane ( <i>Scopthalmus aquosus</i> )	14	76	33	23	35	2.80 (1.16)	12.67 (0.95)	1.94 (0.45)	2.56 (0.67)	3.89 (0.51)
Winter Flounder ( <i>Pleuronectes americanus</i> )	5	11	1	2		1.00 (0.45)	1.83 (0.48)	0.06 (0.06)	0.22 (0.15)	
Wolfish ( <i>Anarhichas lupus</i> )					1					0.11 (0.11)
<b>Total Number of Fish Collected:</b>	<b>1966</b>	<b>2901</b>	<b>56394</b>	<b>10064</b>	<b>2332</b>	<b>893.20 (40.73)</b>	<b>183.50 (47.76)</b>	<b>317.29 (912.62)</b>	<b>118.22 (168.2)</b>	<b>59.11 (43.99)</b>
<b>Total Number of Taxa Collected:</b>	<b>18</b>	<b>19</b>	<b>24</b>	<b>15</b>	<b>26</b>					



Table 9-3 (Cont.).

Family	Scientific Name	Common Name	Spring					Fall				
			1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
Engraulidae (anchovies)	<i>Anchoa spp.</i>	Anchovy	0.01%	0.35%		19.64%	13.21%	21.86%		0.00%	0.01%	70.92%
Fistulariidae (cornetfishes)	<i>Fistularia tabacaria</i>	Bluespotted Cornetfish						0.00%	0.01%		0.09%	
Gadidae (cods)	<i>Enchelyopus cimbrius</i>	Fourbeard Rockling								0.00%		
	<i>Gadus morhua</i>	Atlantic Cod	0.01%	1.28%		1.67%						
	<i>Merluccius spp.</i>	Hake										
	<i>Merluccius bilinearis</i>	Silver Hake		0.23%		2.90%	1.78%					0.02%
	<i>Molva molva</i>	European Ling					0.05%					0.00%
	<i>Urophycis spp.</i>	Hake	22.41%	1.28%	2.03%	0.47%	2.00%	0.10%	0.63%	0.03%	0.14%	0.04%
		(includes <i>U. chuss, regia &amp; tenuis</i> )										
Gerridae	Gerridae	Mojarra									0.02%	
Labridae (wrasses)	<i>Tautoga onitis</i>	Tautog	0.02%	0.07%	0.06%	0.01%	0.01%				0.01%	0.01%
	<i>Tautoglabrus adspersus</i>	Cunner					0.05%	0.01%			0.01%	
Lophiidae (goosefishes)	<i>Lophius americanus</i>	Goosefish	0.04%	0.16%	0.86%	0.01%	0.04%					
Mullidae (goatfishes)	<i>Mullus auratus</i>	Red Goatfish							0.01%			
	<i>Upeneus parvus</i>	Dwarf Goatfish						0.02%		0.00%		
Myliobatidae (eagle rays)	<i>Rhinoptera bonasus</i>	Cownose Stingray						0.01%				0.00%
Ophidiidae (cusk eels)	<i>Ophidion marginatum</i>	Striped Cusk Eel						0.00%			0.01%	
Percichthyidae (temperate bass)	<i>Morone saxatilis</i>	Striped Bass	0.17%	4.97%	0.27%	0.22%	0.58%					
Petromyzontidae (lampreys)	<i>Petromyzon marinus</i>	Sea Lamprey	0.01%									
Pholidae (gunnels)	<i>Pholis fasciata</i>	Banded Gunnel					0.03%					
Pleuronectidae (righteye flounder)	<i>Limanda ferruginea</i>	Yellowtail Flounder	0.01%									
	<i>Pleuronectes americanus</i>	Winter Flounder	5.04%	11.20%	1.72%	4.72%	1.31%	0.09%	0.16%	0.00%	0.02%	
Pomatomidae (bluefishes)	<i>Pomatomus saltatrix</i>	Bluefish			0.06%		0.22%	1.05%	0.03%	0.02%		0.12%
Priacanthidae (bigeyes)	<i>Priacanthus cruentatus</i>	Glasseye Snapper							0.10%			
	<i>Pristigenys alta</i>	Short Bigeye						0.01%				
Rajidae (skates)	<i>Raja spp.</i>	Skate	1.87%	4.65%	73.31%	5.32%	6.27%	5.22%	25.70%	0.21%	0.47%	2.24%
		(includes <i>R. elantera, ocellata, &amp; laevis</i> )										
Sciaenidae (drums)	<i>Cynoscion regalis</i>	Weakfish		2.17%			1.79%	3.23%	0.01%	0.04%	0.02%	7.44%
	<i>Leiostomus xanthurus</i>	Spot						0.01%				
	<i>Menticirrhus sp.</i>	Kingfish				0.02%						1.01%
	<i>Menticirrhus saxatilis</i>	Northern Kingfish	0.01%				0.10%	0.23%				
Scombridae (mackerels)	<i>Micropogonias undulatus</i>	Atlantic Croaker						0.08%				1.07%
	<i>Acanthocybium solandri</i>	Wahoo										
	<i>Scomber scombrus</i>	Atlantic Mackerel	0.01%	0.28%				0.00%	0.01%	0.00%		

Table 9-3 (Cont.).

Family	Scientific Name	Common Name	Spring					Fall					
			1995	1996	1997	1998	1999	1995	1996	1997	1998	1999	
Scombridae (mackerels)	<i>Scomberomorus cavalla</i>	King Mackerel											0.01%
	<i>Scomberomorus macula</i>	Spanish Mackerel											
Serranidae (sea basses)	<i>Centropristis striata</i>	Black Sea Bass	0.14%	0.07%	0.29%	0.07%	0.39%	0.47%	0.85%	0.05%	0.71%	0.88%	
	<i>Serraniculus pumilio</i>	Pygmy Sea Bass								0.04%			
Soleidae (soles)	<i>Trinectes maculatus</i>	Hogchocker						0.02%					
Sparidae (porgies)	<i>Stenotomus chrysops</i>	Scup	2.47%	0.02%	0.13%	9.84%	40.84%	3.26%	0.34%	0.04%	0.17%	3.96%	
Sphyraenidae (barracudas)	<i>Sphyraena borealis</i>	Northern Sennet						0.01%				0.04%	
Squalidae (dogfish sharks)	<i>Squalus acanthias</i>	Spiny Dogfish		2.94%									
Stromateidae (butterfishes)	<i>Peprilus triacanthus</i>	Butterfish	2.40%	0.02%	0.10%	12.47%	14.50%	33.55%	47.26%	98.78%	91.90%	3.51%	
Syngnathidae (pipefishes)	<i>Hippocampus erectus</i>	Lined Seahorse	0.02%	0.05%					0.01%				
	<i>Syngnathus fuscus</i>	Northern Pipefish		0.02%						0.00%		0.00%	
Synodontidae (lizardfishes)	<i>Synodus foetens</i>	Inshore Lizardfish										0.33%	
	<i>Synodus</i> sp.	Lizardfish						0.01%					
Tetraodontidae (puffers)	<i>Sphoeroides maculatus</i>	Northern Puffer				0.02%	0.01%	0.19%	0.03%	0.00%		1.46%	
Triglidae (searobins)	<i>Prionotus</i> spp.	Searobins	0.09%	0.19%	0.38%	0.84%	1.22%	18.78%	6.98%	0.30%	4.40%	3.91%	
Uranoscopidae (stargazers)	<i>Astroscopus guttatus</i>	Northern Stargazer									0.01%	0.01%	
Zoarcidae (eelpouts)	<i>Macrozoarces americanus</i>	Ocean Pout	0.43%	1.14%	0.02%		0.03%			0.00%		0.00%	

**Table 9-4. Catch Per Unit Effort (Fish/20 min Trawl) by Year -1995-1999**

		<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>Average</b>
<b>BBA3</b>	<b>Spring</b>	1015	203	179	1019	438	571
	<b>Fall</b>	945	597	4239	684	1383	1570
<b>BBA5</b>	<b>Spring</b>	752	101	153	298	334	328
	<b>Fall</b>	317	342	9094	210	1438	2280
<b>BBA6</b>	<b>Spring</b>	1261	149	82	111	121	345
	<b>Fall</b>	393	484	3317	1118	259	1114
<b>Average</b>		781	313	2844	573	662	



**Table 9-5. Five most abundant taxa by Borrow Area and Season, 1995-1999.**

Spring	BBA3					BBA5					BBA6				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
<i>Alosa aestivalis</i>	1	1		1		1	1		--		1	2		--	
<i>Alosa pseudoharengus</i>										3					3
<i>Ammodytes hexapterus</i>					--	--	--		--	--	5	1	--	--	
<i>Anchoa spp.</i>		--		2	1		--		3	--					--
<i>Cynoscion regalis</i>		5			5		--			--	4	4	2	--	--
<i>Merluccius bilinearis</i>		--		--	--				4			--		--	--
<i>Morone saxatilis</i>		4				--	--	--	--	--	--	--	--	--	--
<i>Paralichthys dentatus</i>	--	--	3	--	--	--	--	3	--	--		--	3	--	--
<i>Paralichthys oblongus</i>				--	--			--	--	--	--			--	5
<i>Peprilus triacanthus</i>	--		--	5	3	5			1	2	--	--	--	2	4
<i>Pleuronectes americanus</i>	3	2	--	--	--	4	4	--	5	--	--				
<i>Raja spp.</i>	--	--	1	3	4	--	3	1	--	4	--	--	1	3	2
<i>Scophthalmus aquosus</i>	4	3	2			3	2	2	--	--	3	3	5	1	5
<i>Squalus acanthius</i>		--					5					5			
<i>Stenotomus chrysops</i>	5	--		4	2	--	--	--	2	1	--	--	--	4	1
<i>Urophycis spp.</i>	2	--	4	--	--	2	--	--	--	5	2	--	4	--	--

Fall	BBA3					BBA5					BBA6				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
<i>Anchoa spp.</i>	3		--	--	1	1				1					--
<i>Centropristis striata</i>	--	--	--	--	--	--		--	4	--	--	--	4	2	4
<i>Cynoscion regalis</i>	5	--	5	--	2	--		--		5			--		--
<i>Etropus microstomus</i>		--	--	5			5	3	--	--		--	2	--	
<i>Mustelus canis</i>	--		--	--	--	--		--	--	--	5	--	--	--	--
<i>Paralichthys dentatus</i>	--	3	4	4	--	4	4	4	3	--	4	5	5	5	--
<i>Paralichthys oblongus</i>			--	--				--	--	--		--	--		
<i>Peprilus triacanthus</i>	1	1	1	1	4	2	1	1	1	4	1	2	1	1	3
<i>Prionotus spp.</i>	2	4	2	2	3	3	3	2	2	3	3	3		4	5
<i>Raja spp.</i>	--	2	3	--	--	5	--	5	--	--	2	1	--	3	2
<i>Scophthalmus aquosus</i>	--	5	--	3	5	--	--	--	5	--	--	4	--	5	--
<i>Stenotomus chrysops</i>	4	--	--	--	--	--	--	--	--	2	--	--	--	--	1

Number = rank; -- = present but not among 5 most abundant taxa

**Table 9-6. Catch per tow (+SE ) for BBA3 Spring sampling efforts, 1995-1999.**

Taxa	BBA3 Catch Per Tow (SE)				
	1995	1996	1997	1998	1999
<i>Acipenser oxyrhynchus</i>					0.08 (0.08)
<i>Alosa aestivalis</i>	604.67 (160.36)	109.20 (32.96)		529.67 (215.98)	13.75 (11.10)
<i>Alosa mediocris</i>					12.17 (7.09)
<i>Alosa pseudoharengus</i>					17.08 (9.86)
<i>Ammodytes hexapterus</i>	2.33 (2.14)	0.30 (0.30)			
<i>Anchoa spp.</i>		0.70 (0.40)		280.67 (271.51)	122.92 (54.66)
<i>Brevoortia tyrannus</i>					0.08 (0.08)
<i>Centropristis striata</i>	1.33 (0.56)	0.30 (0.15)		0.33 (0.21)	1.00 (0.58)
<i>Citharichthys arctifrons</i>	0.67 (0.33)				
<i>Clupea harengus</i>					1.50 (1.16)
<i>Cynoscion regalis</i>		9.00 (5.76)			16.83 (16.11)
<i>Etropus microstomus</i>		0.30 (0.15)	0.25 (0.25)	3.00 (0.58)	0.42 (0.23)
<i>Gadus morhua</i>		0.20 (0.20)		1.67 (1.17)	
<i>Hemitripterus americanus</i>					
<i>Hippocampus erectus</i>	0.50 (0.22)	0.10 (0.10)			
<i>Liopsetta putnami</i>		0.10 (0.10)			
<i>Lophius americanus</i>	0.50 (0.22)	0.50 (0.22)	0.25 (0.25)		
<i>Macrozoarces americanus</i>	2.33 (0.84)	1.80 (0.77)			
<i>Menticirrhus saxatilis</i>	0.17 (0.17)				0.42 (0.23)
<i>Merluccius bilinearis</i>		0.20 (0.20)		8.50 (1.23)	7.58 (2.25)
<i>Molva molva</i>					
<i>Morone saxatilis</i>	2.00 (0.73)	16.70 (3.82)	0.25 (0.25)	1.33 (0.21)	2.75 (0.41)
<i>Mustelus canis</i>		0.10 (0.10)	0.25 (0.25)	1.50 (0.43)	3.00 (0.69)
<i>Paralichthys dentatus</i>	0.67 (0.33)	0.70 (0.26)	2.75 (0.48)	8.50 (1.59)	4.83 (0.76)
<i>Paralichthys oblongus</i>				1.00 (0.52)	0.25 (0.13)
<i>Peprilus triacanthus</i>	25.00 (14.38)		0.25 (0.25)	45.50 (36.49)	52.67 (16.53)
<i>Petromyzon marinus</i>					
<i>Pholis fasciata</i>					
<i>Pleuronectes americanus</i>	69.50 (4.03)	25.30 (4.16)		2.83 (1.08)	0.75 (0.22)
<i>Pomatomus saltatrix</i>					1.00 (0.39)
<i>Prionotus spp.</i>	1.00 (0.37)	0.40 (0.22)	1.00 (0.41)	4.33 (0.80)	6.58 (1.14)
<i>Raja spp.</i>	19.17 (1.78)	8.50 (2.83)	150.50 (14.18)	56.67 (4.80)	35.67 (11.04)
<i>Scomber scombrus</i>		1.20 (1.20)			
<i>Scomberomorus spp.</i>				0.17 (0.17)	0.08 (0.08)
<i>Scophthalmus aquosus</i>	51.17 (7.81)	23.70 (4.13)	22.00 (2.27)	12.67 (2.80)	8.92 (1.67)
<i>Sphoeroides maculatus</i>					0.08 (0.08)
<i>Squalus acanthius</i>		1.40 (1.29)			
<i>Stenotomus chrysops</i>	43.50 (27.83)	0.10 (0.10)		53.83 (19.27)	118.42 (34.19)
<i>Syngnathus fuscus</i>					
<i>Tautoga onitis</i>		0.10 (0.10)			
<i>Tautoglabrus adspersus</i>					0.17 (0.17)
<i>Urophycis spp.</i>	190.00 (68.24)	3.50 (1.34)	1.50 (0.87)	6.33 (2.72)	8.83 (1.85)
Zoarcidae	0.83 (0.54)				

**Table 9-7. Catch per tow ( $\pm$ SE ) for BBA5 Spring sampling efforts, 1995-1999.**

Taxa	BBA5 Catch Per Tow (SE)				
	1995	1996	1997	1998	1999
<i>Acipenser oxyrhynchus</i>	0.13 (0.13)				
<i>Alosa aestivalis</i>	494.00 (69.64)	47.89 (19.31)		5.22 (2.32)	
<i>Alosa mediocris</i>					5.50 (1.59)
<i>Alosa pseudoharengus</i>					34.21 (22.50)
<i>Ammodytes hexapterus</i>	2.13 (1.09)	1.11 (0.77)		5.67 (3.84)	0.07 (0.07)
<i>Anchoa spp.</i>		0.89 (0.51)		21.78 (20.79)	4.21 (4.21)
<i>Brevoortia tyrannus</i>					0.07 (0.07)
<i>Centropristis striata</i>	1.13 (0.30)			0.11 (0.11)	
<i>Citharichthys arctifrons</i>	0.75 (0.37)				
<i>Clupea harengus</i>					
<i>Cynoscion regalis</i>		0.33 (0.24)			0.43 (0.20)
<i>Etropus microstomus</i>		0.44 (0.25)		17.78 (4.31)	2.00 (1.13)
<i>Gadus morhua</i>	0.13 (0.13)	0.67 (0.46)		15.78 (4.37)	
<i>Hemitripteris americanus</i>					
<i>Hippocampus erectus</i>					
<i>Liopsetta putnami</i>					
<i>Lophius americanus</i>	0.25 (0.16)	0.11 (0.11)	0.80 (0.33)		0.21 (0.11)
<i>Macrozoarces americanus</i>	1.50 (0.46)	0.44 (0.18)			
<i>Menticirrhus saxatilis</i>					
<i>Merluccius bilinearis</i>		0.44 (0.24)		20.89 (4.32)	6.36 (3.58)
<i>Molva molva</i>					
<i>Morone saxatilis</i>	1.88 (0.69)	4.33 (2.93)	0.20 (0.13)	0.78 (0.36)	1.86 (0.57)
<i>Mustelus canis</i>				0.78 (0.15)	2.07 (0.45)
<i>Paralichthys dentatus</i>	1.00 (0.27)	0.89 (0.39)	4.50 (0.86)	8.78 (1.77)	2.43 (0.50)
<i>Paralichthys oblongus</i>			0.80 (0.36)	4.22 (1.48)	0.57 (0.31)
<i>Peprilus triacanthus</i>	29.25 (15.61)			90.22 (87.73)	65.71 (18.31)
<i>Petromyzon marinus</i>	0.25 (0.16)				
<i>Pholis fasciata</i>					
<i>Pleuronectes americanus</i>	35.25 (7.77)	8.22 (1.60)	0.60 (0.27)	19.22 (4.69)	1.93 (0.47)
<i>Pomatomus saltatrix</i>			0.10 (0.10)		0.57 (0.23)
<i>Prionotus spp.</i>	0.63 (0.18)	0.11 (0.11)	0.50 (0.22)	5.00 (1.61)	4.07 (1.47)
<i>Raja spp.</i>	18.75 (2.53)	8.89 (1.58)	123.10 (13.31)	10.00 (2.55)	10.43 (2.62)
<i>Scomber scombrus</i>					
<i>Scomberomorus spp.</i>				0.22 (0.15)	0.43 (0.17)
<i>Scophthalmus aquosus</i>	37.13 (4.97)	18.00 (2.38)	21.20 (2.56)	10.22 (1.58)	4.79 (1.14)
<i>Sphoeroides maculatus</i>				0.22 (0.15)	
<i>Squalus acanthius</i>		6.00 (2.75)			
<i>Stenotomus chrysops</i>	17.25 (6.89)		0.20 (0.13)	60.67 (18.79)	177.07 (55.22)
<i>Syngnathus fuscus</i>		0.11 (0.11)			
<i>Tautoga onitis</i>	0.38 (0.26)	0.22 (0.15)			0.07 (0.07)
<i>Tautogolabrus adspersus</i>					
<i>Urophycis spp.</i>	109.00 (34.79)	2.00 (0.82)	0.60 (0.31)	0.56 (0.56)	8.50 (5.43)
Zoarcidae	1.25 (0.77)				

**Table 9-8. Catch per tow ( $\pm$ SE ) for BBA6 pring sampling efforts, 1995-1999.**

Taxa	BBA6 Catch Per Tow (SE)				
	1995	1996	1997	1998	1999
<i>Acipenser oxyrhynchus</i>					
<i>Alosa aestivalis</i>	659.25 (94.06)	34.78 (33.17)		0.14 (0.14)	
<i>Alosa mediocris</i>					0.50 (0.25)
<i>Alosa pseudoharengus</i>					9.93 (4.07)
<i>Ammodytes hexapterus</i>	23.50 (16.87)	65.00 (33.96)	0.16 (0.09)	1.86 (0.55)	
<i>Anchoa spp.</i>					0.07 (0.07)
<i>Brevoortia tyrannus</i>					0.07 (0.07)
<i>Centropristis striata</i>	1.75 (0.48)		0.45 (0.42)	0.57 (0.30)	2.36 (0.92)
<i>Citharichthys arctifrons</i>	0.25 (0.25)				
<i>Clupea harengus</i>					6.21 (4.23)
<i>Cynoscion regalis</i>	27.75 (3.99)	9.22 (1.37)	13.23 (1.19)	6.57 (1.04)	2.07 (0.44)
<i>Etropus microstomus</i>		0.33 (0.25)	0.03 (0.03)	0.57 (0.30)	0.71 (0.27)
<i>Gadus morhua</i>		5.22 (1.82)		1.14 (0.46)	
<i>Hemitripterus americanus</i>			0.03 (0.03)		
<i>Hippocampus erectus</i>		0.11 (0.11)			
<i>Liopsetta putnami</i>					
<i>Lophius americanus</i>	0.50 (0.29)	0.11 (0.11)	1.03 (0.19)	0.14 (0.14)	0.14 (0.10)
<i>Macrozoarces americanus</i>	11.75 (11.75)	3.00 (0.73)	0.03 (0.03)		0.29 (0.13)
<i>Menticirrhus saxatilis</i>					0.07 (0.07)
<i>Merluccius bilinearis</i>		0.44 (0.18)		5.57 (0.87)	1.93 (0.54)
<i>Molva molva</i>					0.43 (0.43)
<i>Morone saxatilis</i>	0.75 (0.48)	0.78 (0.36)	0.32 (0.15)	0.86 (0.70)	0.57 (0.23)
<i>Mustelus canis</i>			0.48 (0.12)	2.14 (0.26)	1.79 (0.39)
<i>Paralichthys dentatus</i>		0.89 (0.35)	5.35 (0.47)	6.29 (0.75)	1.93 (0.58)
<i>Paralichthys oblongus</i>	0.25 (0.25)		0.48 (0.13)	8.71 (1.23)	1.00 (0.28)
<i>Peprilus triacanthus</i>	7.00 (3.51)	0.11 (0.11)	0.13 (0.06)	15.43 (3.50)	9.57 (2.93)
<i>Petromyzon marinus</i>					
<i>Pholis fasciata</i>					0.29 (0.29)
<i>Pleuronectes americanus</i>	0.25 (0.25)				
<i>Pomatomus saltatrix</i>			0.06 (0.04)		0.36 (0.17)
<i>Prionotus spp.</i>	1.25 (0.75)	0.33 (0.24)	0.29 (0.10)	1.29 (0.57)	0.43 (0.17)
<i>Raja spp.</i>	13.75 (1.65)	5.00 (1.36)	53.74 (4.75)	11.29 (1.69)	11.07 (1.95)
<i>Scomber scombrus</i>	0.25 (0.25)				
<i>Scomberomorus spp.</i>					0.07 (0.07)
<i>Scophthalmus aquosus</i>	41.25 (2.59)	17.00 (1.71)	2.45 (0.36)	37.43 (2.68)	8.29 (1.02)
<i>Sphoeroides maculatus</i>					
<i>Squalus acanthius</i>		6.44 (2.61)			
<i>Stenotomus chrysops</i>	6.00 (3.67)		0.13 (0.08)	10.43 (2.77)	60.50 (17.78)
<i>Syngnathus fuscus</i>					
<i>Tautoga onitis</i>	0.25 (0.25)		0.10 (0.07)	0.14 (0.14)	
<i>Tautogolabrus adspersus</i>					0.29 (0.29)
<i>Urophycis spp.</i>	458.00 (218.76)	0.22 (0.15)	2.74 (0.46)	0.29 (0.29)	0.50 (0.31)
Zoarcidae	7.50 (3.52)				

**Table 9-9. Catch per tow ( $\pm$ SE) for BBA-3 during the Fall sampling efforts, 1995**

Taxa	BBA3 Catch Per Tow (SE)				
	1995	1996	1997	1998	1999
<i>Acanthocybium solanderi</i>					
<i>Alectis ciliaris</i>					
<i>Alosa sapidissima</i>					0.33 (0.26)
<i>Ammodytes hexapterus</i>		0.13 (0.13)	0.25 (0.18)		
<i>Anarhichas lupus</i>					
<i>Anchoa</i> spp.	218.86 (51.08)		0.50 (0.34)	0.20 (0.20)	927.92 (322.06)
<i>Anguilla rostrata</i>					0.33 (0.19)
<i>Astroscopus guttatus</i>			0.17 (0.11)		0.17 (0.11)
<i>Balistes capriscus</i>					
<i>Balistes</i> spp.	0.29 (0.18)	0.13 (0.13)			
<i>Caranx hippos</i>	4.57 (3.02)				0.67 (0.58)
<i>Centropristis striata</i>	4.71 (0.84)	5.50 (3.15)	1.67 (0.75)	0.30 (0.15)	3.42 (1.12)
<i>Citharichthys arcifrons</i>	0.43 (0.20)				
<i>Clupea harengus</i>					
<i>Conger oceanicus</i>					
<i>Cynoscion regalis</i>	48.14 (9.35)	0.13 (0.13)	7.00 (3.71)	0.30 (0.21)	195.00 (41.65)
<i>Dasyatis sabina</i>					0.08 (0.08)
<i>Decapterus macarellus</i>		13.50 (2.95)			
<i>Decaterus punctatus</i>			4.83 (0.84)		
<i>Enchelyopus cimbrius</i>					
<i>Etropus microstomus</i>		4.38 (1.24)	4.6 (0.70)	2.50 (0.95)	
<i>Etrumeus teres</i>					
<i>Fistularia tabacaria</i>				0.20 (0.13)	
<i>Fundulus heteroclitus</i>					
Gerreidae					
<i>Hippocampus erectus</i>					
<i>Leiostomus xanthurus</i>	0.14 (0.14)				
<i>Macrozoarces americanus</i>			0.08 (0.08)		
<i>Menticirrhus saxatilis</i>	3.71 (1.34)				13.50 (2.07)
<i>Merluccius bilinearis</i>					0.17 (0.17)
<i>Micropogonias undulatus</i>					21.67 (4.19)
<i>Micropogonias undulatus</i>					
<i>Molva molva</i>					0.08 (0.08)
<i>Monocanthus</i> spp.					
<i>Mullus auratus</i>					
<i>Mustelus canis</i>	7.43 (1.32)		0.67 (0.31)	0.10 (0.10)	14.42 (2.51)
<i>Naucrates ductor</i>					
Ophidiidae				0.20 (0.13)	
<i>Ophidion marginatum</i>					0.67 (0.35)
<i>Paralichthys dentatus</i>	36.43 (3.71)	55.50 (6.81)	9.92 (1.82)	5.80 (0.88)	11.92 (1.25)
<i>Paralichthys oblongus</i>			0.33 (0.19)	0.30 (0.30)	
<i>Peprilus triacanthus</i>	286.57 (59.87)	336.88 (282.70)	137.50 (1165.25)	612.50 (188.00)	44.83 (10.01)
<i>Pleuronectes americanus</i>	0.57 (0.20)	0.38 (0.18)			
<i>Pomatomus saltatrix</i>	16.14 (4.83)	0.25 (0.16)	1.92 (1.38)	0.00	3.33 (0.96)
<i>Priacanthus cruentatus</i>		0.13 (0.13)			
<i>Prionotus</i> spp.	224.57 (59.49)	50.13 (10.83)	33.08 (3.29)	47.30 (9.70)	60.75 (5.48)

**Table 9-9. Catch per tow ( $\pm$ SE) for BBA-3 during the Fall sampling efforts, 1995**

Taxa	BBA3 Catch Per Tow (SE)				
	1995	1996	1997	1998	1999
<i>Pristigenys alta</i>	0.14 (0.14)				
<i>Raja</i> spp.	1.57 (0.65)	107.50 (73.22)	28.33 (4.77)	1.60 (0.50)	21.42 (2.15)
<i>Rhinoptera bonasus</i>					
<i>Scomber scombrus</i>		0.13 (0.13)	0.08 (0.08)		
<i>Scomberomorus cavalla</i>					0.08 (0.08)
<i>Scomberomorus maculatus</i>					
<i>Scophthalmus aquosus</i>	38.14 (3.65)	17.38 (2.23)	4.17 (0.91)	9.80 (1.95)	26.25 (3.44)
<i>Selar crumenophthalmus</i>					
<i>Selene setapinnis</i>					
<i>Selene vomer</i>				0.10 (0.10)	
<i>Seriola dumerili</i>					
<i>Seriola zonata</i>					0.50 (0.34)
<i>Serraniculus pumilio</i>			1.50 (1.50)		
<i>Sphoeroides maculatus</i>	2.57 (0.37)	0.25 (0.16)	0.17 (0.11)		19.83 (3.71)
<i>Sphyaena borealis</i>	0.14 (0.14)				1.17 (0.46)
<i>Stenotomus chrysops</i>	49.00 (8.09)	4.00 (3.02)	1.50 (0.76)	0.90 (0.35)	12.33 (2.75)
<i>Syngnathus fuscus</i>			0.08 (0.08)		
<i>Synodus foetens</i>					1.58 (0.36)
<i>Synodus</i> spp.					
<i>Tautoga onitis</i>					0.17 (0.11)
<i>Tautoglabrus adspersus</i>					
<i>Trachurus lathami</i>	0.71 (0.29)		0.08 (0.08)	0.60 (0.27)	
<i>Trinectes maculatus</i>					
<i>Upeneus parvus</i>	0.29 (0.18)		0.08 (0.08)		
<i>Urophycis</i> spp.		1.13 (0.23)	0.33 (0.26)	0.90 (0.31)	

**Table 9-10. Catch per tow ( $\pm$ SE) for BBA-5 during the Fall sampling efforts, 1995-1999**

Taxa	BBA5 Catch Per Tow (SE)				
	1995	1996	1997	1998	1999
<i>Acanthocybium solanderi</i>			0.06 (0.06)		
<i>Alectis ciliaris</i>	0.25 (0.25)	0.13 (0.13)			
<i>Alosa sapidissima</i>					
<i>Ammodytes hexapterus</i>			1.06 (0.60)		0.08 (0.08)
<i>Anarhichas lupus</i>					
<i>Anchoa</i> spp.	12.25 (107.89)				1210.42 (574.98)
<i>Anguilla rostrata</i>					
<i>Astroscopus guttatus</i>				0.17 (0.05)	
<i>Balistes capriscus</i>					
<i>Balistes</i> spp.	0.88 (0.52)				
<i>Caranx hippos</i>	0.13 (0.13)				
<i>Centropristis striata</i>	0.13 (0.13)		0.78 (0.61)	7.83 (1.12)	0.92 (0.40)
<i>Citharichthys arctifons</i>					
<i>Clupea harengus</i>			0.06 (0.06)		
<i>Conger oceanicus</i>					
<i>Cynoscion regalis</i>	2.75 (2.75)		1.28 (0.67)		26.33 (7.05)
<i>Dasyatis sabina</i>					0.08 (0.08)
<i>Decapterus macarellus</i>		43.50 (8.49)	0.06 (0.06)		
<i>Decapterus punctatus</i>			5.11 (1.36)		
<i>Enchelyopus cimbrius</i>					
<i>Etropus microstomus</i>		26.63 (9.19)	12.28 (2.72)	2.50 (0.61)	0.33 (0.19)
<i>Etrumeus teres</i>		0.25 (0.25)			
<i>Fistularia tabacaria</i>		0.13 (0.13)		2.00 (0.13)	
<i>Fundulus heteroclitus</i>			0.06 (0.06)		
Gerreidae				0.67 (0.23)	
<i>Hippocampus erectus</i>		0.13 (0.13)			
<i>Leiostomus xanthurus</i>					
<i>Macrozoarces americanus</i>					
<i>Menticirrhus saxatilis</i>					5.58 (1.47)
<i>Merluccius bilinearis</i>					0.08 (0.08)
<i>Micropogonias undulatus</i>	1.00 (1.00)				8.67 (4.19)
<i>Microponias undulatus</i>					
<i>Molva molva</i>					
<i>Monocanthus</i> spp.	0.13 (0.13)	0.13 (0.13)	0.00		
<i>Mullus auratus</i>					
<i>Mustelus canis</i>	6.00 (1.49)		0.50 (0.17)		2.58 (0.74)
<i>Naucrates ductor</i>			0.06 (0.06)		
Ophidiidae					
<i>Ophidion marginatum</i>	0.25 (0.25)				0.42 (0.26)
<i>Paralichthys dentatus</i>	26.63 (15.18)	32.63 (3.95)	6.67 (1.23)	11.00 (0.83)	5.25 (1.30)
<i>Paralichthys oblongus</i>			2.17 (0.84)		0.17 (0.11)
<i>Peprilus triacanthus</i>	106.75 (29.71)	196.38 (58.39)	20.67 (1262.6)	126.50 (25.65)	37.75 (11.70)
<i>Pleuronectes americanus</i>	0.13 (0.13)	0.38 (0.26)		0.17 (0.05)	
<i>Pomatomus saltatrix</i>	0.38 (0.26)		2.22 (0.83)		0.17 (0.11)
<i>Priacanthus cruentatus</i>		1.00 (0.38)			
<i>Prionotus</i> spp.	34.75 (23.50)	30.25 (6.64)	24.17 (2.59)	48.50 (6.74)	39.92 (10.25)

**Table 9-10. Catch per tow ( $\pm$ SE) for BBA-5 during the Fall sampling efforts, 199:**

Taxa	BBA5 Catch Per Tow (SE)				
	1995	1996	1997	1998	1999
<i>Pristigenys alta</i>					
<i>Raja</i> spp.	11.63 (3.06)	1.38 (0.46)	6.33 (1.27)	3.17 (0.44)	10.00 (2.58)
<i>Rhinoptera bonasus</i>	0.13 (0.13)				0.08 (0.08)
<i>Scomber scombrus</i>			0.11 (0.08)		
<i>Scomberomorus cavalla</i>					
<i>Scomberomorus maculatus</i>			0.06 (0.06)		
<i>Scophthalmus aquosus</i>	5.25 (2.66)	6.88 (1.33)	3.94 (1.10)	3.67 (0.38)	11.67 (2.48)
<i>Selar crumenophthalmus</i>	0.13 (0.13)				0.17 (0.11)
<i>Selene setapinnis</i>		0.38 (0.18)			
<i>Selene vomer</i>					
<i>Seriola dumerili</i>	0.25 (0.16)				0.17 (0.17)
<i>Seriola zonata</i>	0.13 (0.13)	0.38 (0.38)			0.58 (0.29)
<i>Serraniculus pumilio</i>			3.72 (3.21)		
<i>Sphoeroides maculatus</i>	0.38 (0.26)	0.13 (0.13)	0.17 (0.09)		13.17 (3.97)
<i>Sphyaena borealis</i>					0.08 (0.08)
<i>Stenotomus chrysops</i>	1.00 (0.50)	0.13 (0.13)	1.06 (0.47)	3.33 (0.49)	57.75 (31.91)
<i>Syngnathus fuscus</i>			0.17 (0.12)		0.08 (0.08)
<i>Synodus foetens</i>					4.75 (1.21)
<i>Synodus</i> spp.	0.13 (0.13)				
<i>Tautoga onitis</i>					
<i>Tautoglabrus adspersus</i>					
<i>Trachurus lathami</i>	4.75 (1.63)		0.06 (0.06)	0.83 (0.15)	
<i>Trinectes maculatus</i>	0.25 (0.25)				
<i>Upeneus parvus</i>			0.06 (0.06)		
<i>Urophycis</i> spp.	0.50 (0.50)	1.63 (0.78)	0.88 (0.34)		0.83 (0.75)



**Table 9-11. Catch per tow ( $\pm$ SE) for BBA-6 during the Fall sampling efforts, 1995-1998.**

Taxa	BBA6 Catch Per Tow (SE)				
	1995	1996	1997	1998	1999
<i>Acanthocybium solanderi</i>					
<i>Alectis ciliaris</i>		0.33 (0.21)			
<i>Alosa sapidissima</i>					
<i>Ammodytes hexapterus</i>		2.17 (1.97)	0.65 (0.28)		
<i>Anarhichas lupus</i>					0.11 (0.11)
<i>Anchoa</i> spp.					
<i>Anguilla rostrata</i>					
<i>Astroscopus guttatus</i>					0.11 (0.11)
<i>Balistes capriscus</i>			0.06 (0.06)		0.11 (0.11)
<i>Balistes</i> spp.	0.20 (0.20)				
<i>Caranx hippos</i>					0.11 (0.11)
<i>Centropristis striata</i>	3.60 (1.75)	7.50 (3.23)	5.94 (2.44)	8.78 (4.82)	29.78 (16.12)
<i>Citharichthys arcifons</i>	0.20 (0.20)				
<i>Clupea harengus</i>					
<i>Conger oceanicus</i>			0.06 (0.06)	0.11 (0.11)	
<i>Cynoscion regalis</i>			0.12 (0.12)		4.11 (2.76)
<i>Dasyatis sabina</i>					0.11 (0.11)
<i>Decapterus macarellus</i>		4.17 (2.41)			
<i>Decaterus punctatus</i>			1.41 (0.26)		
<i>Enchelyopus cimbrius</i>			0.06 (0.06)		
<i>Etmopus microstomus</i>		6.00 (1.73)	9.82 (1.83)	0.89 (0.31)	
<i>Etrumeus teres</i>	1.20 (1.20)	0.33 (0.21)			
<i>Fistularia tabacaria</i>				0.22 (0.15)	
<i>Fundulus heteroclitus</i>					
Gerreidae					
<i>Hippocampus erectus</i>					
<i>Leiostomus xanthurus</i>					
<i>Macrozoarces americanus</i>			0.06 (0.06)		
<i>Menticirrhus saxatilis</i>					15.33 (4.20)
<i>Merluccius bilinearis</i>					0.56 (0.38)
<i>Micropogonias undulatus</i>					
<i>Micropogonias undulatus</i>	0.20 (0.20)				2.67 (1.69)
<i>Molva molva</i>					
<i>Monocanthus</i> spp.					
<i>Mullus auratus</i>		0.17 (0.17)			
<i>Mustelus canis</i>	17.20 (4.07)	4.50 (1.63)	0.29 (0.11)	1.22 (0.60)	1.67 (0.60)
<i>Naucrates ductor</i>			0.06 (0.06)		
Ophidiidae					
<i>Ophidion marginatum</i>					
<i>Paralichthys dentatus</i>	37.60 (20.41)	10.00 (2.13)	5.76 (0.72)	2.56 (0.53)	8.78 (1.59)
<i>Paralichthys oblongus</i>		1.00 (1.00)	4.59 (1.01)		
<i>Peprilus triacanthus</i>	174.00 (64.86)	109.67 (28.90)	264.65 (912.54)	089.67 (166.74)	31.11 (13.55)
<i>Pleuronectes americanus</i>	1.00 (0.45)	1.83 (0.48)	0.06 (0.06)	0.22 (0.15)	
<i>Pomatomus saltatrix</i>	0.20 (0.20)	0.17 (0.17)	0.29 (0.14)		0.22 (0.15)
<i>Priacanthus cruentatus</i>		0.17 (0.17)			
<i>Prionotus</i> spp.	47.60 (7.22)	14.00 (1.69)	3.76 (0.77)	4.00 (1.09)	23.00 (3.60)

**Table 9-11. Catch per tow ( $\pm$ SE) for BBA-6 during the Fall sampling efforts, 1995-1998.**

Taxa	BBA6 Catch Per Tow (SE)				
	1995	1996	1997	1998	1999
<i>Pristigenys alta</i>					
<i>Raja</i> spp.	95.20 (47.64)	301.17 (26.13)	7.94	5.67 (1.30)	48.33 (3.94)
<i>Rhinoptera bonasus</i>					
<i>Scomber scombrus</i>					
<i>Scomberomorus cavalla</i>					0.44 (0.24)
<i>Scomberomorus maculatus</i>					
<i>Scophthalmus aquosus</i>	2.80 (1.16)	12.67 (0.95)	1.94 (0.45)	2.56 (0.67)	3.89 (0.51)
<i>Selar crumenophthalmus</i>					1.56 (0.53)
<i>Selene setapinnis</i>					
<i>Selene vomer</i>					
<i>Seriola dumerili</i>	0.20 (0.20)				0.44 (0.44)
<i>Seriola zonata</i>					0.44 (0.24)
<i>Serraniculus pumilio</i>			0.82 (0.48)		
<i>Sphoeroides maculatus</i>					14.56 (7.86)
<i>Sphyraena borealis</i>					
<i>Stenotomus chrysops</i>	2.20 (1.71)	0.33 (0.21)	4.65 (1.85)	0.22 (0.22)	65.89 (22.74)
<i>Syngnathus fuscus</i>			0.29 (0.14)		
<i>Synodus foetens</i>					4.89 (0.99)
<i>Synodus</i> spp.					
<i>Tautoga onitis</i>				0.11 (0.11)	0.22 (0.15)
<i>Tautogolabrus adspersus</i>	0.20 (0.20)			0.11 (0.11)	
<i>Trachurus lathami</i>	8.20 (4.21)				
<i>Trinectes maculatus</i>					
<i>Upeneus parvus</i>			0.24 (0.14)		
<i>Urophycis</i> spp.	1.40 (1.40)	7.33 (2.64)	3.82 (0.74)	1.89 (0.65)	0.67 (0.37)

**Table 9-12. Water quality data collected during the Spring 1996-1998 sampling efforts.**

Water quality data collected during the Spring 1996 sampling effort.

<b>Station</b>	<b>Date</b>	<b>Time</b>	<b>Depth (m)</b>	<b>pH</b>	<b>Temp ( C)</b>	<b>Salinity (ppt)</b>	<b>DO (mg/l)</b>	<b>Turbidity (NTU)</b>
<b>BBA 3</b>	27-Apr-96	6:45	14.5	8.41	9.17	34.1	9.34	6.3
			8.5	8.38	6.29	34.2	8.90	2.7
			0.9	8.36	6.60	34.3	8.68	2.8
<b>BBA 3</b>	28-Apr-96	6:41	14.4	8.57	5.65	34.4	9.00	7.5
			6.7	8.47	6.79	33.9	8.77	1.4
			1.0	8.71	8.26	28.0	9.86	1.9
<b>BBA 5</b>	27-Apr-96	9:30	14.0	8.52	5.36	34.4	9.00	0.4
			7.5	8.47	5.85	34.3	8.85	0.0
			1.0	8.44	6.10	34.2	8.65	0.7
<b>BBA 5</b>	28-Apr-96	9:11	15.5	8.60	5.43	34.5	9.03	2.4
			7.5	8.48	6.77	34.1	8.67	1.7
			1.0	8.70	8.20	29.0	9.98	2.0
<b>BBA 6</b>	27-Apr-96	12:08	18.5	8.58	5.28	34.2	5.25	0.2
			8.5	8.50	6.13	34.2	6.71	0.0
			0.9	8.48	6.50	34.0	8.92	0.0
<b>BBA 6</b>	28-Apr-96	12:07	17.0	8.64	5.25	34.4	9.12	3.8
			8.4	8.52	6.71	33.9	8.89	3.7
			0.8	8.77	8.99	29.2	10.30	6.2

Water quality data collected during the Spring 1997 sampling effort.

<b>Station</b>	<b>Date</b>	<b>Time</b>	<b>Depth (m)</b>	<b>pH</b>	<b>Temp (°C)</b>	<b>Salinity (ppt)</b>	<b>DO (mg/l)</b>	<b>Turbidity (NTU)</b>
<b>BBA 6</b>	27-May-97	8:30	17.9	8.09	8.6	35.1	6.73	5.0
			8.5	8.09	12.1	33.7	8.29	3.6
			Surface	8.10	12.2	33.7	8.31	0.0
<b>BBA 5</b>	27-May-97	12:44	16.1	7.85	9.1	34.7	6.05	6.6
			8.8	8.14	12.3	33.1	8.71	4.0
			Surface	8.16	12.7	32.8	8.81	4.8
<b>BBA 3</b>	28-May-97	6:24	14.1	7.93	9.1	34.8	5.91	5.6
			7.4	8.21	12.3	33.1	8.42	3.8
			Surface	8.29	12.4	31.2	9.31	4.1
<b>BBA 6</b>	28-May-97	9:10	16.7	8.00	9.0	34.9	6.67	5.5
			8.5	8.13	12.7	33.6	8.04	3.7
			Surface	8.20	12.6	33.1	8.48	0.0
<b>BBA 5</b>	28-May-97	3:47	16.1	7.89	8.9	35.0	5.87	7.6
			9.2	8.17	12.4	33.4	8.63	4.1
			Surface	8.25	14.2	31.8	9.65	4.7
<b>BBA 6</b>	29-May-97	7:10	18.4	7.98	9.1	35.1	6.52	6.2
			9.4	8.13	12.5	33.7	8.03	3.7
			Surface	8.22	12.5	32.6	8.98	3.8

**Table 9-12. Water quality data collected during the Spring 1996-1998 sampling efforts.**

Water quality data collected during the Spring 1998 sampling effort.

<b>Station</b>	<b>Date</b>	<b>Time</b>	<b>Depth (m)</b>	<b>pH</b>	<b>Temp (°C)</b>	<b>Salinity (ppt)</b>	<b>DO (mg/l)</b>	<b>Turbidity (NTU)</b>
<b>BBA 6</b>	26-May-98	7:42	21.9	7.77	9.19	33.7	8.01	17.7
			11.8	7.95	11.82	32.6	9.22	12.9
			0.3	8.04	13.76	30.5	9.09	9.0
<b>BBA 5</b>	26-May-98	10:05	16.6	7.72	9.58	33.6	6.83	31.1
			7.7	7.97	11.58	32.5	8.69	16.4
			0.8	8.03	14.00	30.0	8.58	14.3
<b>BBA 3</b>	26-May-98	1:30	12.8	7.79	9.87	33.1	8.49	30.4
			5.3	8.00	11.81	34.5	9.22	19.7
			0.5	8.01	13.27	31.0	8.99	10.8
<b>BBA 5</b>	26-May-98	3:10	15.2	7.74	9.71	33.4	7.11	41.3
			8.4	7.95	11.34	32.7	8.29	20.3
			0.3	8.06	14.72	30.2	8.74	92.3

Mean water quality data collected during the Spring 1999 sampling effort.

<b>Station</b>	<b>Date MMDDYY</b>	<b>Time</b>	<b>Depth (m)</b>	<b>pH Units</b>	<b>Temp ( C)</b>	<b>Salinity (ppt)</b>	<b>DO mg/l</b>
<b>BBA 3</b>	24-May-99	N/A	13.7	8.3	12.3	33.3	8.4
			7.1	8.4	13.2	33.1	8.9
			0.3	8.4	13.9	21.2	9.6
<b>BBA 5</b>	24-May-99	N/A	14.8	8.4	12.2	33.2	8.6
			8.3	8.5	13.0	32.7	8.9
			0.5	8.4	14.8	31.9	9.5
<b>BBA 6</b>	25-May-99	N/A	19.6	8.3	11.7	33.5	8.6
			10.3	8.4	12.3	33.4	8.8
			3.7	8.4	13.6	32.8	9.3

**Table 9-13. Water quality data collected during the Fall 1996-1998 sampling efforts.**

Water quality data collected during the Fall 1996 sampling effort.

Station	Date	Time	Depth (m)	pH	Temp ( C)	Salinity (ppt)	DO (mg/l)	Turbidity (NTU)
<b>BBA 3</b>		6:40	7.7	8.50	21.41	30.3	5.62	4.2
		6:41	7.7	8.57	21.60	30.2	6.33	4.0
		6:42	0.6	8.66	22.26	29.9	6.97	3.7
<b>BBA 3</b>		7:27	15.9	8.15	17.86	31.6	4.30	5.9
		7:28	7.0	8.45	21.13	31.0	6.91	4.0
		7:29	0.8	8.75	22.77	28.8	9.06	3.7
<b>BBA 3</b>		7:26	14.9	8.13	16.48	31.5	4.55	6.2
		7:27	8.3	8.48	20.45	31.3	7.72	3.3
		7:28	0.9	8.48	21.09	30.9	7.35	4.5
<b>BBA 5</b>		11:13	16.1	8.27	18.84	31.3	3.86	4.8
		11:15	8.4	8.68	22.44	29.8	7.07	4.6
		11:16	0.6	8.69	22.61	29.6	7.05	0.0
<b>BBA 5</b>		11:03	8.1	8.50	20.61	31.1	7.76	2.9
		11:04	0.8	8.76	22.92	28.4	9.14	7.1
<b>BBA 6</b>		15:05	20.1	8.11	16.39	31.8	4.16	6.3
		15:06	10.3	8.52	20.66	30.9	7.77	3.2
		15:08	0.6	8.68	23.11	29.8	8.80	6.1
<b>BBA 6</b>		15:51	19.8	8.15	16.36	31.9	4.77	6.7
		15:52	9.2	8.48	20.56	31.0	7.73	4.3
		15:53	0.4	8.74	23.35	29.0	8.82	4.5
<b>BBA 6</b>		9:08	18.8	8.28	16.43	32.0	6.25	4.0
		9:09	11.1	8.30	19.40	31.3	5.24	5.1
		9:10	0.3	8.54	21.54	30.5	7.41	4.5

Water quality data collected during the Fall 1997 sampling effort.

Station	Date	Time	Depth (m)	pH	Temp (°C)	Salinity (ppt)	DO (mg/l)	Turbidity (NTU)
<b>BBA 6</b>	25-Aug-97	8:56	19.5	7.34	18.0	33.5	2.30	ND*
		8:59	10.0	7.81	22.0	33.1	6.70	ND
		9:00	surface	7.91	22.4	33.0	7.52	ND
<b>BBA 5</b>	25-Aug-97	12:02	14.2	7.58	20.7	33.1	4.56	ND
		12:03	7.3	7.86	22.2	32.9	7.26	ND
		12:04	surface	7.98	22.8	32.8	9.03	ND
<b>BBA 3</b>	25-Aug-97	15:40	15.0	7.58	50.6	33.3	5.27	ND
		15:42	6.2	7.90	22.2	33.0	8.60	ND
		15:44	surface	7.97	22.8	32.9	8.26	ND
<b>BBA 3</b>	26-Aug-97	6:33	13.0	7.68	20.7	33.3	5.85	ND
		6:34	5.7	7.92	22.3	33.0	7.75	ND
		6:34	surface	7.94	22.3	33.0	8.00	ND
<b>BBA 5</b>	26-Aug-97	9:13	14.1	7.61	20.7	33.1	4.75	ND
		9:15	7.0	7.96	22.4	32.9	8.32	ND
		9:17	surface	7.97	22.5	32.9	8.38	ND
<b>BBA 6</b>	26-Aug-97	11:35	20.3	7.39	18.4	33.6	3.29	ND
		11:37	10.3	7.81	21.9	33.1	6.31	ND
		11:39	0.5	7.88	22.6	33.1	7.35	ND
<b>BBA 5</b>	26-Aug-97	14:42	15.7	7.58	20.7	ND	5.55	ND
		14:44	8.6	7.82	22.0	ND	7.24	ND
		14:46	0.3	7.90	22.8	ND	8.22	ND
<b>BBA 3</b>	26-Aug-97	16:09	12.6	7.60	33.4	33.1	4.74	ND
		16:11	6.1	7.90	22.4	33.1	7.70	ND
		16:13	0.4	7.90	23.3	32.6	8.64	ND
<b>BBA 3</b>	27-Aug-97	6:30	11.9	7.73	20.5	33.2	5.27	ND
		6:32	5.8	7.74	21.6	33.1	5.95	ND
		6:34	0.7	7.90	22.1	32.5	7.67	ND
<b>BBA 5</b>	27-Aug-97	7:50	14.0	7.65	20.5	33.3	5.68	ND

		7:57	7.6	7.82	23.0	33.3	6.89	ND
		7:59	surface	7.91	23.0	33.1	7.43	ND
<b>BBA 6</b>	27-Aug-97	10:03	19.0	7.42	18.7	33.4	3.81	ND
		10:05	11.3	7.84	21.8	33.1	7.03	ND
		10:07	0.9	7.91	22.6	33.0	7.55	ND
<b>BBA 3</b>	27-Aug-97	15:51	11.6	7.77	21.1	33.3	6.72	ND
		15:55	5.8	7.88	22.0	32.7	7.43	ND
		15:57	0.5	7.97	22.6	32.5	8.28	ND

\* ND = No Data

Water quality data collected during the Fall 1998 sampling effort.

<b>Station</b>	<b>Date</b>	<b>Time</b>	<b>Depth (m)</b>	<b>pH</b>	<b>Temp (°C)</b>	<b>Salinity (ppt)</b>	<b>DO (mg/l)</b>	<b>Turbidity (NTU)</b>
<b>BBA 3</b>	24-Aug-98	8:40	16.80	8.43	16.60	32.60	4.11	0.00
		8:41	9.00	8.54	19.84	31.80	3.88	0.00
		8:41	0.10	8.77	23.39	29.30	5.63	12.90
<b>BBA 5</b>	24-Aug-98	11:12	12.50	8.37	17.71	32.30	3.49	0.00
		11:13	8.20	8.79	23.33	31.00	5.42	10.30
		11:13	0.20	8.84	23.79	30.30	6.28	7.20
<b>BBA 6</b>	24-Aug-98	13:56	17.60	8.26	14.97	32.90	2.85	9.30
		13:57	8.70	8.81	23.68	31.20	6.24	14.20
		13:58	0.10	8.86	24.28	30.20	6.81	7.20
<b>BBA 6</b>	25-Aug-98	7:13	16.80	8.35	14.41	33.10	3.66	11.60
		7:13	8.40	8.81	23.71	31.20	6.08	23.70
		7:14	0.00	8.86	24.08	30.70	6.50	10.70
<b>BBA 3</b>	25-Aug-98	12:13	12.20	8.32	17.14	32.50	2.58	11.60
		12:14	6.60	8.75	22.23	31.40	5.79	19.30
		12:14	0.10	8.77	23.88	30.80	6.09	15.00

Mean water quality data collected during the Fall 1999 sampling effort.

<b>Station</b>	<b>Date MMDDYY</b>	<b>Time</b>	<b>Depth (m)</b>	<b>pH Units</b>	<b>Temp ( C)</b>	<b>Sal (ppt)</b>	<b>DO (mg/l)</b>
<b>BBA 3</b>	13-Sep-99	N/A	14.6	8.5	21.0	33.4	5.5
			7.4	8.8	21.9	33.1	7.7
			0.5	8.9	22.1	31.4	9.7
<b>BBA 5</b>	13-Sep-99	N/A	13.7	8.6	21.3	33.2	6.5
			7.0	8.9	22.1	33.0	8.2
			0.6	8.9	22.2	31.4	9.0
<b>BBA 6</b>	15-Sep-99	N/A	19.6	8.5	20.7	33.3	4.4
			10.1	8.7	21.9	33.0	5.8
			0.6	8.9	22.4	33.0	7.9

**Table 9-14. Summary Data from Grosslein and Azarovitz (1982)\***

<b>Scientific Name</b>	<b>Common Name</b>	<b>Spring</b>	<b>Fall</b>
<i>Scophthalmus aquosus</i>	Windowpane	97	45
<i>Pleuronectes americanus</i>	Winter Flounder	95	3
<i>Merluccius bilinearis</i>	Silver Hake	92	42
<i>Raja</i> spp.	Skate	88	12
<i>Urophycis</i> spp.	Hake	76	6
<i>Macrozoarces americanus</i>	Ocean Pout	68	-
<i>Limanda ferruginea</i>	Yellowtail Flounder	63	3
<i>Hemitripterus americanus</i>	Sea Raven	56	-
<i>Paralichthys dentatus</i>	Summer Flounder	47	58
<i>Gadus morhua</i>	Atlantic Cod	37	-
<i>Alosa pseudoharengus</i>	Alewife	34	-
<i>Lophius americanus</i>	Goosefish	34	3
<i>Paralichthys oblongus</i>	Fourspot Flounder	27	6
<i>Peprilus triacanthus</i>	Butterfish	25	67
<i>Prionotus</i> spp.	Searobins	25	36
<i>Alosa sapidissima</i>	American Shad	14	-
<i>Tautoglabrus adspersus</i>	Cunner	14	6
<i>Mustelus canis</i>	Smooth Dogfish	8	64
<i>Clupea harengus</i>	Atlantic Herring	8	-
<i>Ammodytes hexapterus</i>	American Sand Lance	7	3
<i>Alosa aestivalis</i>	Blueback Herring	7	-
<i>Etropus microstomus</i>	Smallmouth Flounder	5	-
<i>Morone saxatilis</i>	Striped Bass	5	-
<i>Monocanthus</i> spp.	Filefish	-	27
<i>Caranx hippos</i>	Crevalle Jack	-	6
<i>Decapterus macrellus</i>	Mackerel Scad	-	24
<i>Etrumeus teres</i>	Round Herring	-	27
<i>Cynoscion regalis</i>	Weakfish	-	21
<i>Menticirrhus saxatilis</i>	Northern Kingfish	-	3
<i>Sphyraena borealis</i>	Northern Sennet	-	9
<i>Sphoeroides maculatus</i>	Northern Puffer	-	9

\* Data is frequency of occurrence (%) for inshore collections - Delaware Bay to Martha's Vineyard

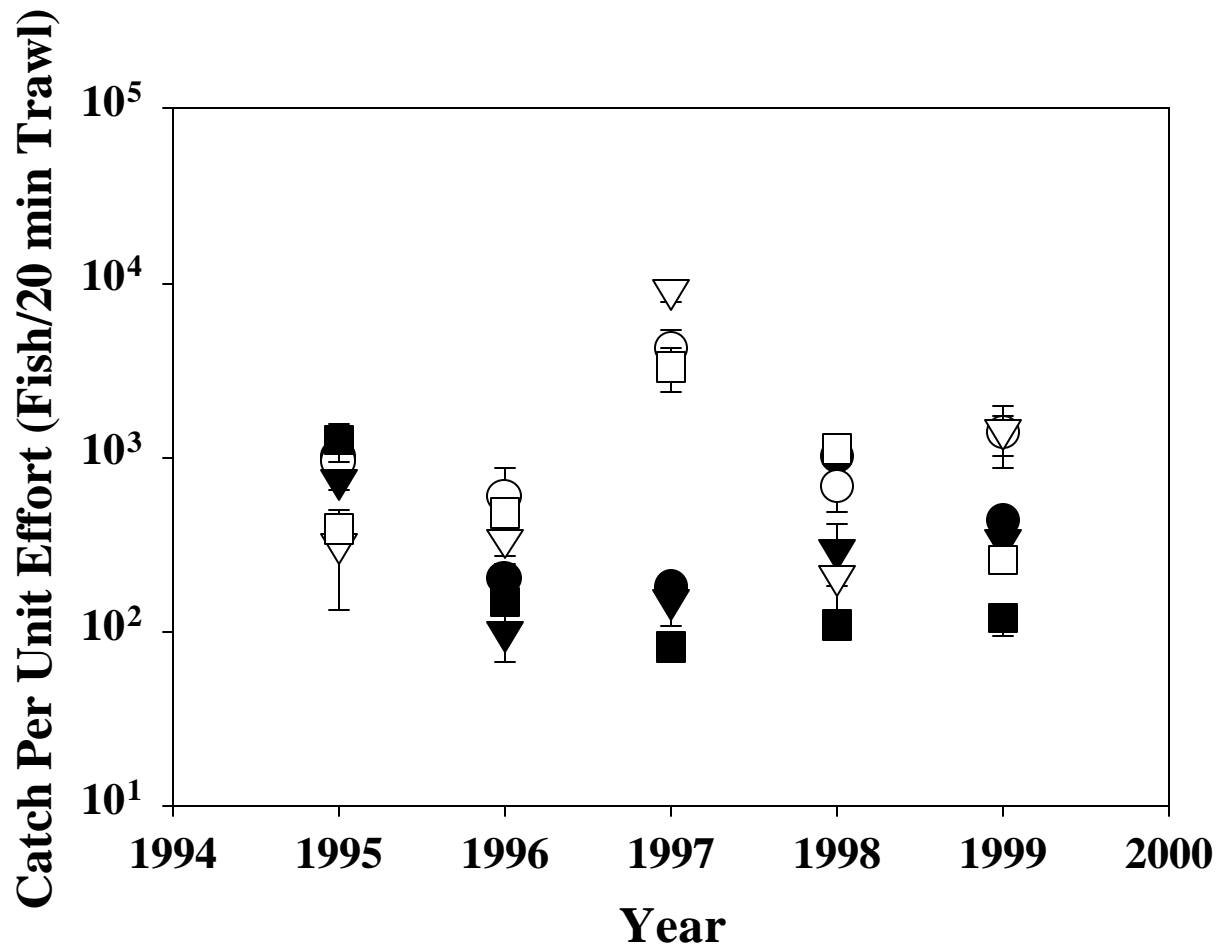


Figure 9-2. Catch Per Unit Effort (CPUE) by Year, Area, and Season. Values = mean fish/20 min trawl  $\pm$  Standard Error; Circles = BBA3. Triangles = BBA5, Squares = BBA6; Solid = Spring, Open = Fall.



measured and an estimate of total abundance was made (total weight/ average weight = total number).

Observations on weather conditions, trawl deployment and retrieval times, and trawl start/end longitudes and latitudes were recorded. Water quality measurements (temperature, pH, conductivity, salinity, dissolved oxygen, turbidity) were taken with a calibrated HydroLab DataSonde® prior to trawling activities within each borrow area.

## Results

A total of 84 taxa representing 44 families was collected during the study (Table 9-3). The most diverse group present was the carangids (jacks) which comprised 11 taxa, while clupeids (herrings) were represented by 7 taxa. Gadids (cods) provided 6 taxa, bothids (left-eye flounders) and sciaenids (drums) both contributed 5 taxa, and scombrids (mackerels) were represented by 4 taxa. The remaining families each contributed either one or two taxa. In general, fall samples had more taxa than those taken in the spring (Table 9-3). Of the 84 taxa, half were collected exclusively in the fall, 16 were taken only in the spring, and the remainder occurred in samples from both time periods. Jacks were found exclusively in fall samples, herring were most common in spring samples, and left-eye flounders were found in samples in both time periods.

**Seasonal Assemblages:** Blueback herring (*Alosa aestivalis*) dominated spring collections in three of the five years (Table 9-4). In the remaining two years, skates (*Raja* spp.) and anchovies (*Anchoa* spp.) were most abundant. Skates were also among the five most abundant taxa throughout the period 1997-1999, while anchovies were the second most abundant taxon in Spring 1998. Other taxa dominant in the spring included windowpane flounder (*Scophthalmus aquosus*), which was among the five most abundant taxa between 1995 and 1997, and scup (*Stenotomus chrysops*) which was a dominant in 1995 and again in 1998 and 1999.

Butterfish (*Peprilus triacanthus*) was the most abundant fish species in fall collections between 1995 and 1998, and was fifth most abundant in 1999 (Table 9-4). Searobins (*Prionotus* spp.) were among the five most abundant taxa in four of the five fall sample periods (all but 1997), while skates and windowpane flounder were dominants in three of the five collections (1995, 1996, and 1999).

**Taxa Distributions Among Borrow Areas:** Species composition was similar among the borrow areas within seasons and years (Table 9-5). Although the rank order of dominance changed between sites and over time, many of the same species were consistently among the five most abundant taxa at all three areas. For instance, blueback herring, windowpane flounder, and hake (*Urophycis* spp.) were among the most abundant taxa in all three areas in the spring of 1995. Blueback herring and windowpane flounder were among the dominants again in Spring 1996. Skates, windowpane flounder, and summer flounder (*Paralichthys dentatus*) were the most abundant taxa at all three areas in Spring 1997, while in Spring 1998 and 1999 butterfish, skates, and scup were among the dominants. Species composition of fall collections was more predictable with

butterfish, searobins, and summer flounder consistently among the most abundant taxa at all three areas (Table 9-5).

**Catch-Per-Unit-Effort:** With the exception of 1995, catch-per-unit-effort (CPUE) was higher during the fall than the spring (Figure 9-2). This pattern was particularly evident in 1997 when spring catches averaged less than 200 fish/trawl, while fall CPUE averaged above 3,000 fish/trawl. Overall, spring CPUE averaged 414 fish/trawl, whereas fall CPUE averaged 1,654 fish/trawl (Table 9-6). In 1995, fall catches at BBA5 and BBA6 were less than those of BBA3 or the 1995 spring catches (Figure 9-3). Conversely, the fall catch at BBA5 in 1998 was less than one third that at the other borrow areas, while the spring BBA3 catch in this year was 4-5 times that of the other borrow areas. In 1999, the catch at BBA6 was lower than the other borrow areas during both spring and fall.

**Water Quality:** Prior to trawling activities within any given borrow area, water quality measurements were recorded including water depth, pH, temperature, specific conductance, salinity, dissolved oxygen (DO) and turbidity (Tables 9-12; 9-13). Spatial and temporal variability of water quality parameters was low between stations within each of the seasonal sampling efforts. Water temperature ranged from 9.19 °C in Spring 1998 to 24.3 °C in Fall 1998; salinity ranged from 28 ppt in Spring 1996 to 35.1 ppt in Spring 1997; and dissolved oxygen concentrations varied between 2.3 mg/l in the fall of 1997 and 10.3 mg/l in the spring of 1996. Spring values were generally higher than those from fall sampling efforts and surface water concentrations were usually higher than those from bottom waters. Dissolved oxygen values were particularly low (< 4 mg/l) in the bottom waters of BBA6 during dredging in the fall of 1997 (Table 9-13). Similar values were found in the bottom waters of all three borrow areas in the fall of 1998.

## Conclusions

Taxonomic composition of the finfish assemblage present at the offshore borrow areas was similar in most regards to that described by Grosslein and Azarovitz (1982) for inshore areas between Delaware Bay and Martha's Vineyard. They reported the most commonly encountered species (in order of frequency of occurrence) in the spring to be windowpane and winter flounder, silver hake, skate, hake, ocean pout, yellowtail flounder, sculpin, and summer flounder (Table 9-14). Clupeids such as alewife, American shad, and blueback and Atlantic herring were also common in spring samples. Taxa most frequently encountered in autumn collections included butterfish, smooth dogfish, searobins, summer and windowpane flounder, and silver hake. Carangids such as crevalle jack and mackerel scad also tended to be most common in fall collections. These results closely match those from the New Jersey borrow areas in regards to the species present and their seasonal periodicity and relative importance. Specifically, the strong association between winter flounder and clupeids with spring collection periods, the equally strong association between summer flounder, carangids, and butterfish in the fall, and the presence of windowpane flounder, skate, smooth dogfish, and searobins throughout the year is the same as reported by Grosslein and Azarovitz (1982).

There was no great difference in species composition or CPUE among areas within any given collection period. Likewise, there was no evidence of a dramatic change in assemblage structure or catch after dredging at any of the sites in 1997 or 1999. The overall conclusion from this portion of the study is that the offshore finfish assemblage typical of that previously described for the region and that no large scale change in the composition or abundance of the assemblage occurred in relation to dredging of the borrow areas.

### **Literature Cited**

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