

Gill Net & Otter Trawl Sampling
**Norton Basin, Little Bay, Grass Hassock Channel,
and The Raunt**

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The Port Authority of New York and New Jersey
New York State Department of Environmental Conservation

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TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	STUDY AREA.....	2
2.1	Norton Basin.....	2
2.2	Little Bay.....	2
2.3	Reference Areas	2
2.3.1	The Raunt.....	4
2.3.2	Grass Hassock Channel.....	4
3.0	METHODS.....	4
3.1	Gill Net Sampling.....	4
3.2	Bottom Trawling.....	4
4.0	RESULTS	6
4.1	Gill Net Sampling.....	6
4.2	Bottom Trawling.....	12

LIST OF TABLES

Table 4.1.1.1	Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in gill nets from Norton Basin, August, 2002.	8
Table 4.1.1.2	Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in gill nets from Little Bay, August, 2002.	10
Table 4.1.1.3	Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in gill nets from Grass Hassock Channel, August, 2002.	11
Table 4.1.1.4	Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in gill nets from the Raunt, August, 2002.	13
Table 4.2.1	Total abundance, mean CPUE (biomass in g/min), and total length range of fish and macrocrustaceans collected in otter trawls from Norton Basin, the Raunt, and Grass Hassock Channel, August, 2002.	14

LIST OF FIGURES

Figure 2.1 Locations of study areas (Norton Basin/Little Bay) and reference areas (Grass Hassock Channel and the Raunt).....	3
Figure 3.1.1 Locations of gill net sampling stations, August, 2002.....	5
Figure 3.2.1 Locations of otter trawl lanes, August, 2002.	7
Figure 4.1.1.1 Species composition from gill net sampling efforts, August, 2002.....	9
Figure 4.2.1 Species composition from otter trawl sampling efforts, August, 2002.....	15

ACRONYMS USED IN THIS REPORT

CPUE – catch per unit effort

DMMP – Dredged Material Management Plan

MCY – million cubic yards

MLW – mean low water

NPS-GNRA – National Park Service Gateway National Recreation Area

NYC – New York City

SPI – sediment profile imagery

TL – total length

USACE-NYD – U.S. Army Corps of Engineers, New York District

USACE-WES – U.S. Army Engineers Waterways Experiment Station

1.0 INTRODUCTION

The U.S. Army Corps of Engineers, New York District (USACE-NYD) has developed a Dredged Material Management Plan (DMMP) for the Port of New York/New Jersey. The beneficial use of dredged materials is a significant component of the DMMP, which presents a variety of placement alternatives to be considered as potential solutions to the ongoing dredging crisis in the Port. One such alternative is bathymetric recontouring of artificially deepened habitats (navigation channels, sub-aqueous borrow pits). This alternative has particular application to borrow pits located within dead-end basins, as these areas are often severely degraded due to hydrodynamic isolation, resulting in poor water quality and accumulation of contaminants.

The goal of the Norton Basin/Little Bay Project is to demonstrate the feasibility of habitat restoration via bathymetric recontouring of the Norton Basin/Little Bay complex, located in Jamaica Bay, Far Rockaway, NY. This would be accomplished by filling several borrow pits (55-65 ft. deep) located within Norton Basin/Little Bay using dredged material derived from navigation improvement projects within the Port to an average depth of approximately 15 ft below mean low water (MLW).

Preliminary fisheries hydro-acoustic surveys conducted by the U.S. Army Engineers Waterways Experiment Station (USACE-WES) indicated limited utilization of the Norton Basin/Little Bay borrow pits by fishes. The fishes detected in preliminary hydro-acoustic surveys were presumably small schooling forage species [e.g. bay anchovies (*Anchoa mitchilli*) or Atlantic silversides (*Menidia menidia*)] which do not rely on the structure of the pits as essential habitat.

In September, 2000, a pilot study was conducted in Norton Basin, Little Bay and two reference areas located in Jamaica Bay (The Raunt and Grass Hassock Channel). This study included sediment characterization, water quality profiles, and a preliminary survey of living resources (fish, macrocrustaceans) using gill nets and otter trawls. These data were intended to provide information on the biological and physico-chemical attributes of Norton Basin/Little Bay with comparison to both shallow and deep reference locations, and to guide the data collection efforts to be conducted during Phase I (Baseline Environmental Studies) of the Norton Basin/Little Bay project.

The Phase I Baseline Environmental Study of the Norton Basin/Little Bay project was initiated in 2001. Data is being gathered to further characterize biotic and abiotic conditions within the study and reference areas identified in the pilot study. This study includes water quality monitoring, hydrodynamic monitoring, characterization of benthic invertebrate communities, SPI surveys, and fish surveys (hydro-acoustics, gill nets, trawl surveys). We report here on fish and macrocrustacean communities surveyed during the late summer of 2002, the second year of the Phase I study.

2.0 STUDY AREA

Norton Basin and Little Bay are two dead-end basins located on the north shore of the eastern Rockaway Peninsula, in the Borough of Queens, New York City (NYC) (**Figure 2.1**). The basins are drained by a common channel into the southeastern edge of Jamaica Bay, and have been subjected to nearly four centuries of anthropogenic impacts. Land use of the surrounding area is predominantly dense residential. Deep borrow pits are present within each basin. These borrow pits were excavated in 1938 during the development of Edgemere Landfill, which constitutes the northwest boundary of Little Bay. Sediments within the borrow pits are a fine, black mud with a strong sulfide odor indicative of reduced conditions. Historically, this area supported extensive intertidal salt marsh habitat. In its present condition, the area is not achieving full ecological potential as estuarine habitat available to avian and aquatic species.

2.1 Norton Basin

Norton Basin is located east of the Edgemere Landfill. With its three 45 to 50 ft deep (MLW) borrow pits, the basin has a planar surface area of approximately 55.5 acres, a bottom surface area of approximately 56.9 acres, and a total volume of approximately 2.3 million cubic yards (MCY). The borrow pits have soft, mud substrates, while shallower areas of the basin include sandy substrates. Side-scan sonar surveys conducted in 2000 have revealed at least two 30 - 40 ft wrecks and extensive debris (i.e. tires, pilings, other structures) on the floor of the basin. There are several small submerged structures along the eastern shore of the basin, which are thought to be smaller boats or automobiles.

2.2 Little Bay

Little Bay is located southeast of the Edgemere Landfill. With its 60 to 65 ft deep (MLW) borrow pit, the basin has a planar surface of approximately 24.5 acres, a bottom surface area of approximately 25.2 acres, and a total volume of approximately 1.2 mcy. The borrow pit has soft, mud substrates, while shallower areas of the inlet tend to have sandy substrates. Side-scan sonar surveys detected several 30 - 40 ft wrecks and extensive debris (i.e. tires, pilings, other structures) on the floor of the basin.

2.3 Reference Areas

Two reference areas (The Raunt and Grass Haddock Channel) located within the National Park Service Gateway National Recreation Area (NPS-GNRA) were selected for comparison to Norton Basin/Little Bay. These reference areas were intended to provide information on biotic and physico-chemical conditions from both shallow and deep estuarine habitats within Jamaica Bay.

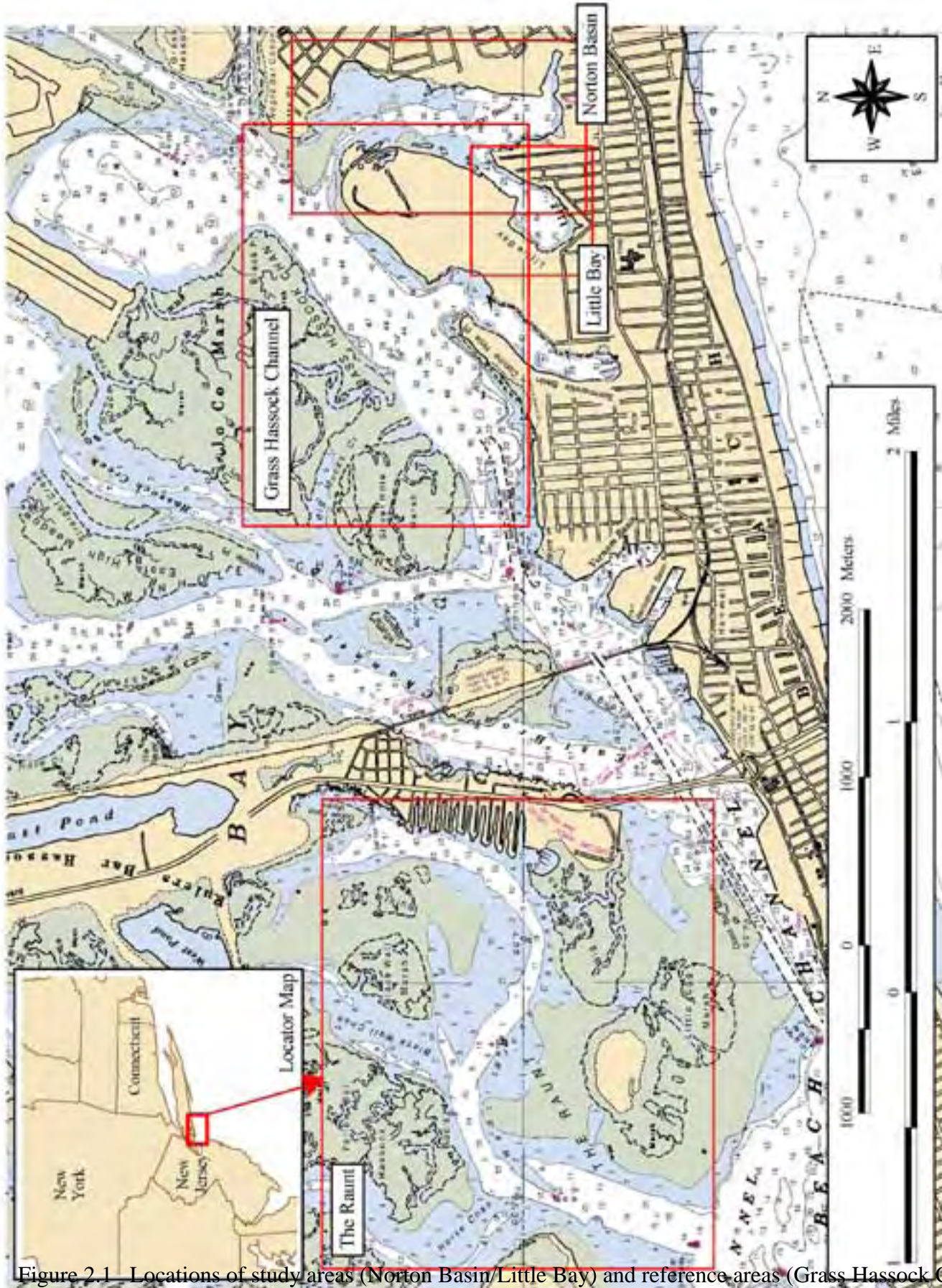


Figure 2.1 Locations of study areas (Norton Basin/Little Bay) and reference areas (Grass Hassock Channel and The Raunt).

2.3.1 The Raunt

The Raunt is a shallow tidal gut which originates at the confluence of Runway Channel and Beach Channel, northeast of Rockaway Inlet. The Raunt passes through Little Egg Marsh, Big Egg Marsh, and Yellow Bar Hassock and terminates at Goose Pond Marsh, in the community of Broad Channel, Queens, NY. Bottom sediments in the Raunt are predominantly sands and silts, with seasonally dense mats of sea lettuce (*Ulva lactuca*) and extensive beds of tube-dwelling amphipods (*Ampelisca* spp.) in the upper reaches. The *Ampelisca* mats gradually transition to hard sand bottom in the lower reaches of the Raunt.

2.3.2 Grass Hassock Channel

Grass Hassock Channel is a wide, deep tidal channel which originates at the confluence of Winhole Channel and Beach Channel, northeast of the Cross Bay Boulevard Bridge, and terminates at the Jo-Co Marsh Pit, east of Runway 4L at JFK Airport. The Channel is bounded by Jo-Co Marsh and Silver Hole Marsh to the west and by Conchs Hole Point, the Edgemere Landfill, Norton Basin, and Motts Point to the east. The substrate of Grass Hassock Channel is very patchy, and includes sand/silt, shell/gravel, extensive *Ampelisca* mats, and dense sponge colonies.

3.0 METHODS

3.1 Gill Net Sampling

Experimental 125' x 8' monofilament gill nets (1", 1.5", 2", 3", and 4" stretch mesh size) were deployed over a range of tidal conditions to characterize fish use of the proposed project and reference areas. On August 12-14, 2002, gill nets were deployed at a total of three deep-water stations (one in the Little Bay borrow pit, one in the larger Norton Basin borrow pit, and one in the Grass Hassock Channel reference area) and three shallow-water stations (one in Little Bay, one in Norton Basin, and one in the Raunt reference area) (**Figure 3.1.1**). Six nets were deployed at each of the deep-water stations (two at the surface, two at mid-water or approximately 20-25 feet below the surface, and two along the bottom). Two nets were deployed at each of the shallow-water stations (bottom only). All fishes and macrocrustaceans collected in gill nets were processed in the field. Captured organisms were identified to species, enumerated, weighed, measured [total length (TL) or carapace width], and released alive, if possible. Catch per unit effort (CPUE) was calculated by dividing fish and macrocrustacean biomass by the number of hours that gill nets were deployed.

3.2 Bottom Trawling

A 16' otter trawl (1 3/8" mesh walls; 1" mesh cod end) was deployed in the Norton Basin project area and the Raunt and Grass Hassock reference areas on August 12-14, 2002. Five

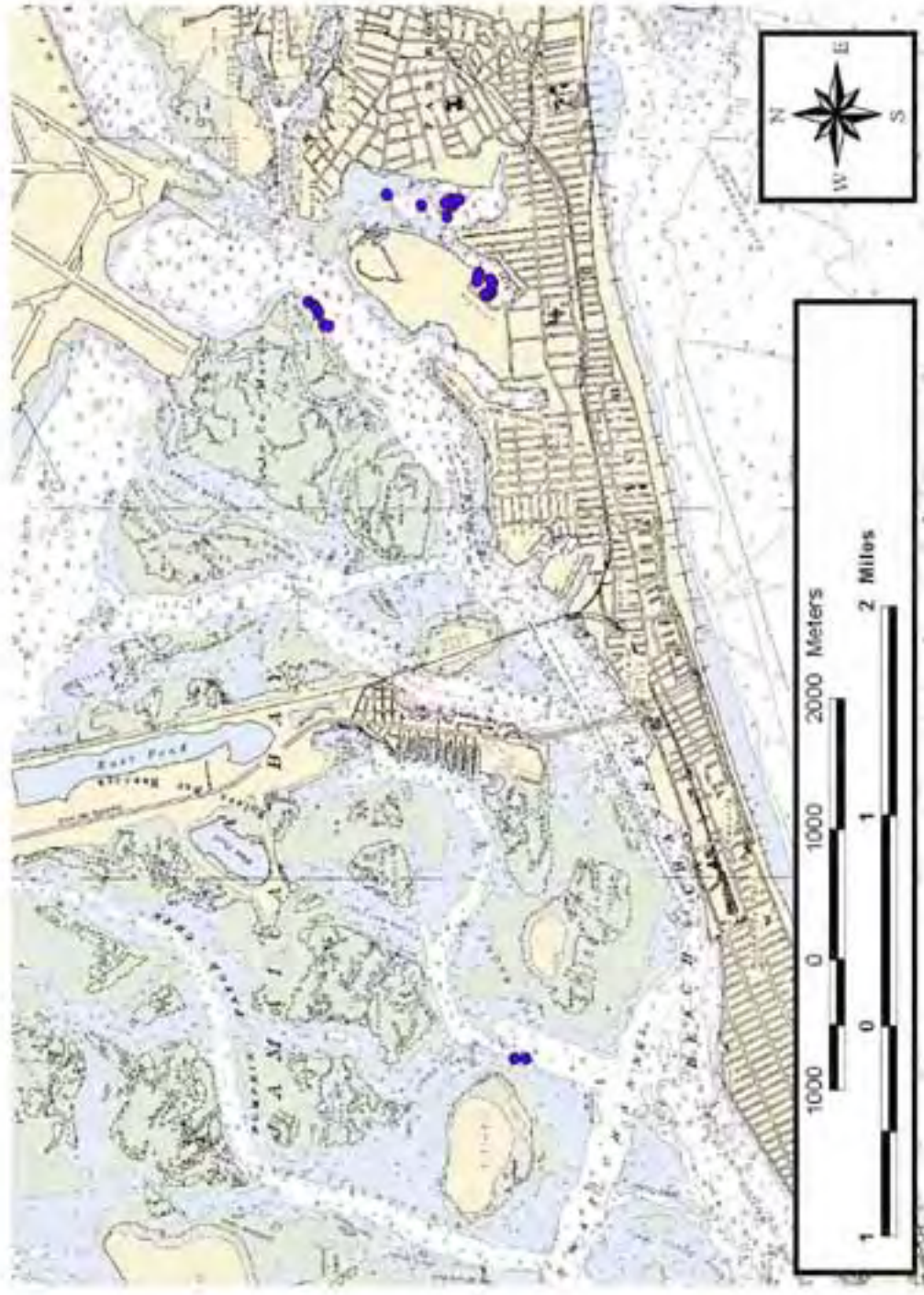


Figure 3.1.1 Locations of gill net sampling stations, August, 2002.

trawls were pulled for a duration of 8 to 9 minutes in Norton Basin and five trawls were pulled for a duration of 10 minutes in each reference area (**Figure 3.2.1**). All fishes and macrocrustaceans captured in trawls were processed in the field. Captured organisms were identified to species, enumerated, weighed, measured (TL or carapace width), and released, if possible. Catch per unit effort (CPUE) was calculated by dividing fish and macrocrustacean biomass by trawl duration (in minutes).

4.0 RESULTS

4.1 Gill Net Sampling

Gill net collections from the bottom of Norton Basin during August (5.5 hrs duration, n=2) yielded 23 individuals representing 7 species (**Table 4.1.1.1**). The dominant species was striped searobin (*Prionotus evolans*). Gill nets deployed at mid-depth in Norton Basin (5.5 hrs duration, n=2) yielded 1 Atlantic menhaden (*Brevoortia tyrannus*) (**Table 4.1.1.1**). Gill nets deployed at the surface of Norton Basin (5 to 5.5 hrs duration, n=2) yielded 2 blue crabs (*Callinectes sapidus*) and an Atlantic menhaden (**Table 4.1.1.1**). Gill net collections from the shallow areas of Norton Basin (5.5 to 6 hrs duration, n=4) yielded 19 individuals representing 6 species (**Table 4.1.1.1**). The dominant species was bluefish (*Pomatomus saltatrix*). Throughout the August gill net sampling in Norton Basin, the dominant species was Atlantic menhaden representing 28.3% of the total collection. Bluefish represented 19.6%, blue crab and striped searobin each represented 15.2%, and all other species represented less than 10% each (**Figure 4.1.1.1**).

Gill net collections from the bottom of Little Bay during August (6.5 hrs duration, n=2) yielded no fish (**Table 4.1.1.2**). Gill net collections at mid-depth in Little Bay (6 hrs duration, n=2) yielded 9 individuals representing 3 species (**Table 4.1.1.2**). The dominant species was Atlantic menhaden. Gill nets deployed at the surface of Little Bay (5.5 hrs duration, n=2) yielded 7 Atlantic menhaden (**Table 4.1.1.2**). Gill net collections from the shallow areas of Little Bay (4.75 to 5 hrs duration, n=2) yielded 13 individuals representing 3 species (**Table 4.1.1.2**). The dominant species was Atlantic menhaden. Throughout the August gill net sampling in Little Bay, the dominant species was Atlantic menhaden representing 79.3% of the total collection. All other species represented less than 10% each (**Figure 4.1.1.1**).

Gill net collections from the bottom of the Grass Hassock Channel during August (5.5 hrs duration, n=2) yielded 48 individuals representing 9 species (**Table 4.1.1.3**). The dominant species were blue crab and weakfish (*Cynoscion regalis*). CPUE at the bottom of Grass Hassock Channel (1559.1 g/hr) was greater than at the bottom of Norton Basin (658.7 g/hr) or the bottom of Little Bay (0.0 g/hr). Gill net collections at mid-depth in Grass Hassock Channel (5.5 hrs duration, n=2) yielded 34 individuals representing 3 species (**Table 4.1.1.3**). The dominant species was bluefish. CPUE at mid-depth in Grass Hassock Channel (925 g/hr) was greater than at mid-depth in Norton Basin (11.8 g/hr) or mid-depth in Little Bay (180.9 g/hr). Gill net collections at the surface of Grass Hassock Channel (5.5 hrs duration, n=2) yielded 35

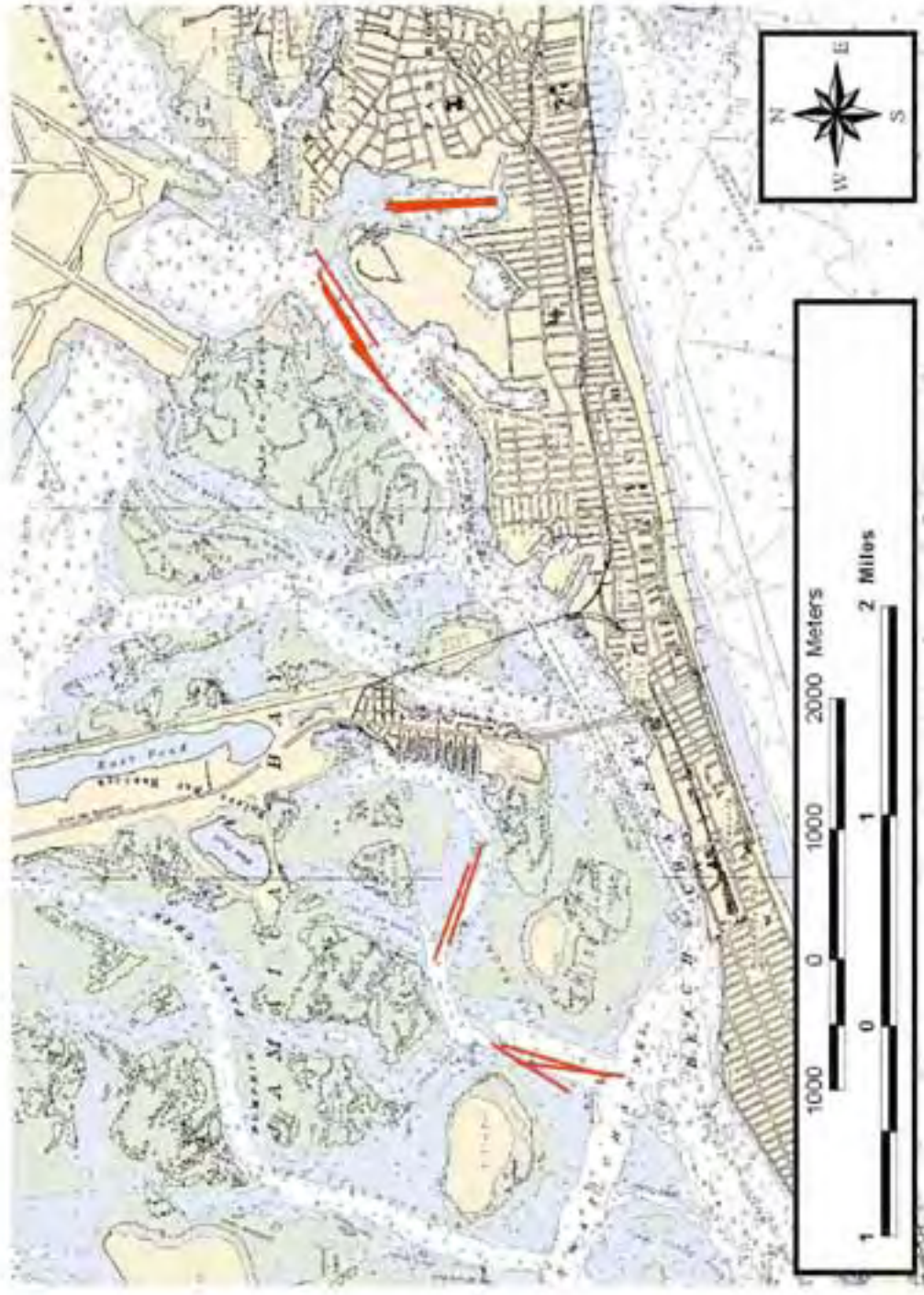


Figure 3.2.1 Locations of otter trawl lanes, August, 2002.

Table 4.1.1.1 Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in gill nets from Norton Basin, August, 2002.

Norton Basin, Bottom (n=2)

Duration of set: 5.5 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
<i>Prionotus evolans</i>	Striped Searobin	7	270.27	279-362
<i>Brevoortia tyrannus</i>	Atlantic Menhaden	5	49.39	83-381
<i>Callinectes sapidus</i>	Blue Crab	3	48.28	64-191
<i>Cynoscion regalis</i>	Weakfish	3	39.14	89-318
<i>Pomatomus saltatrix</i>	Bluefish	2	46.60	349-362
<i>Morone saxatilis</i>	Striped Bass	2	186.39	413-489
<i>Prionotus carolinus</i>	Northern Searobin	1	18.64	203
Total:		23	658.71	64-489

Norton Basin, Mid-Depth (n=2)

Duration of set: 5.5 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
<i>Brevoortia tyrannus</i>	Atlantic Menhaden	1	2.05	127
Total:		1	2.05	127

Norton Basin, Surface (n=2)

Duration of set: 5 to 5.5 hrs

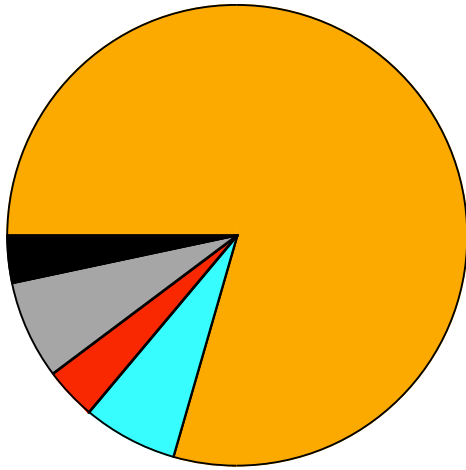
Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
<i>Callinectes sapidus</i>	Blue Crab	2	28.65	102-152
<i>Brevoortia tyrannus</i>	Atlantic Menhaden	1	0.48	83
Total:		3	29.13	83-152

Norton Basin, Shallow Area (n=4)

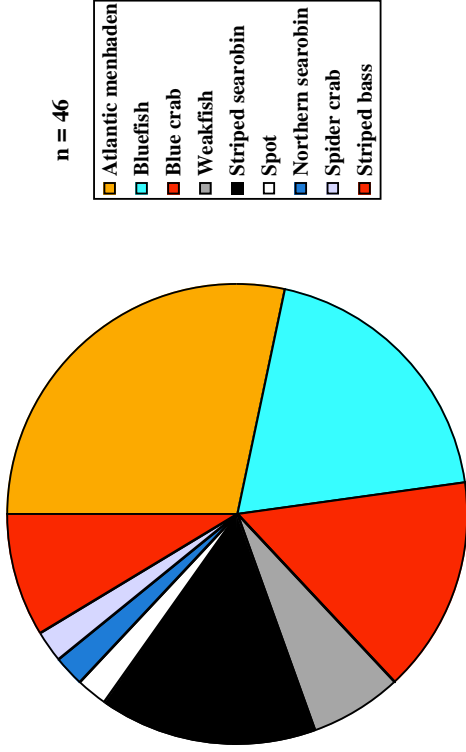
Duration of set: 5.5 to 6 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
<i>Pomatomus saltatrix</i>	Bluefish	7	299.15	330-406
<i>Brevoortia tyrannus</i>	Atlantic Menhaden	6	3.16	76-89
<i>Callinectes sapidus</i>	Blue Crab	2	34.19	89-152
<i>Morone saxatilis</i>	Striped Bass	2	59.83	267-318
<i>Libinia emarginata</i>	Common Spider Crab	1	19.23	83
<i>Leiostomus xanthurus</i>	Spot	1	3.93	140
Total:		19	419.49	76-406

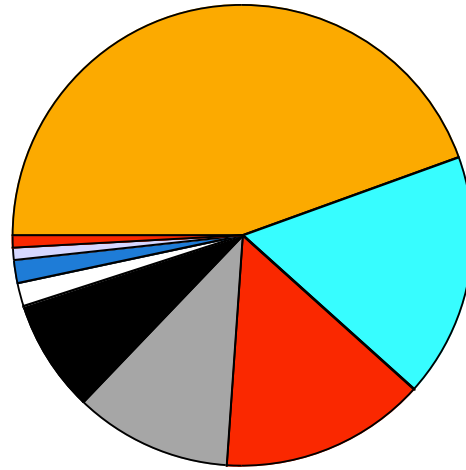
Species Composition
Gill Nets
Little Bay
August 2002



Species Composition
Gill Nets
Norton Basin
August 2002



Species Composition
Gill Nets
Grass Hassock Channel
August 2002



Species Composition
Gill Nets
The Raunt
August 2002

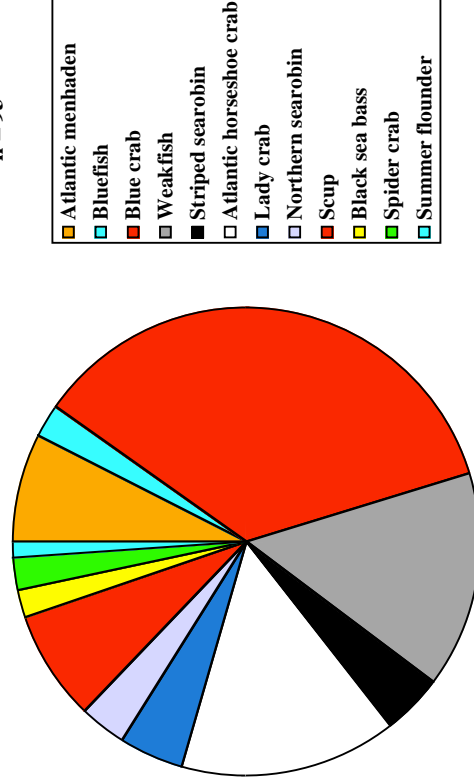


Figure 4.1.1.1 Species composition from gill net sampling efforts, August, 2002.

Table 4.1.1.2 Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in gill nets from Little Bay, August, 2002.

Little Bay, Bottom (n=2)

Duration of set: 6.5 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Total:		0	0.00	0

Little Bay, Mid-Depth (n=2)

Duration of set: 6 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
<i>Brevoortia tyrannus</i>	Atlantic Menhaden	6	87.91	76-330
<i>Pomatomus saltatrix</i>	Bluefish	2	67.62	330-337
<i>Alosa pseudoharengus</i>	Alewife	1	25.36	95
Total:		9	180.90	76-337

Little Bay, Surface (n=2)

Duration of set: 5.5 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
<i>Brevoortia tyrannus</i>	Atlantic Menhaden	7	19.59	133-133
Total:		7	19.59	133-133

Little Bay, Shallow Area (n=2)

Duration of set: 4.75 to 5 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
<i>Brevoortia tyrannus</i>	Atlantic Menhaden	10	7.65	76-92
<i>Leiostomus xanthurus</i>	Spot	2	9.82	146-159
<i>Limulus polyphemus</i>	Atlantic Horseshoe Crab	1	134.44	216
Total:		13	151.91	76-216

Table 4.1.1.3 Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in gill nets from Grass Haddock Channel, August, 2002.

Grass Haddock Channel, Bottom (n=2)

Duration of set: 5.5 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
<i>Callinectes sapidus</i>	Blue Crab	13	242.54	83-178
<i>Cynoscion regalis</i>	Weakfish	13	522.39	102-508
<i>Prionotus evolans</i>	Striped Searobin	9	289.18	267-330
<i>Brevoortia tyrannus</i>	Atlantic Menhaden	5	47.20	76-343
<i>Pomatomus saltatrix</i>	Bluefish	2	102.61	356-375
<i>Limulus polyphemus</i>	Atlantic Horseshoe Crab	2	270.52	203-241
<i>Leiostomus xanthurus</i>	Spot	2	18.66	152-184
<i>Prionotus carolinus</i>	Northern Searobin	1	0.75	203
<i>Mustelus canis</i>	Smooth Dogfish	1	65.30	533
Total:		48	1559.14	76-533

Grass Haddock Channel, Mid-Depth (n=2)

Duration of set: 5.5 hrs

Scientific Name	Common Name	Total Abund.	MeanCPUE (g/hr)	TL Range (mm)
<i>Pomatomus saltatrix</i>	Bluefish	18	857.14	343-400
<i>Brevoortia tyrannus</i>	Atlantic Menhaden	13	7.59	83-89
<i>Callinectes sapidus</i>	Blue Crab	3	60.27	102-178
Total:		34	925.00	83-400

Grass Haddock Channel, Surface (n=2)

Duration of set: 5.5 hrs

Scientific Name	Common Name	Total Abund.	MeanCPUE (g/hr)	TL Range (mm)
<i>Brevoortia tyrannus</i>	Atlantic Menhaden	34	26.64	82-102
<i>Callinectes sapidus</i>	Blue Crab	1	0.70	51
Total:		35	27.34	51-102

individuals representing 2 species (**Table 4.1.1.3**). The dominant species again was Atlantic menhaden. CPUE at the surface of Grass Haddock Channel (27.3 g/hr) was less than at the surface of Norton Basin (29.1 g/hr) and greater than at the surface of Little Bay (19.6 g/hr). Throughout the August gill net sampling in Grass Haddock Channel, the dominant species was Atlantic menhaden representing 44.4% of the total collection. Bluefish represented 17.1%, blue crab represented 14.5%, weakfish represented 11.1%, and all other species represented less than 10% each (**Figure 4.1.1.1**).

Gill net collections from the shallow areas of the Raunt during August (5.75 hrs duration, n=2) yielded 93 individuals representing 12 species (**Table 4.1.1.4**). The dominant species in the Raunt was the blue crab. CPUE at the shallow areas of the Raunt (2161.2 g/hr) was greater than at the shallow areas of Norton Basin (419.5 g/hr) or the shallow areas of Little Bay (151.9 g/hr). Throughout the August gill net sampling in the Raunt, the dominant species was blue crab representing 35.5% of the total collection. Atlantic horseshoe crab (*Limulus polyphemus*) and weakfish each represented 15.1%, and all other species represented less than 10% each (**Figure 4.1.1.1**).

4.2 Bottom Trawling

Otter trawls conducted in Norton Basin during August (8 to 9 min duration, n=5) yielded a total of 28 individuals representing 5 species (**Table 4.2.1**). The dominant species in Norton Basin was blue crab representing 75% of the total collection. Atlantic horseshoe crab represented 14.3% and all other species represented less than 5% each (**Figure 4.2.1**). Trawls conducted in Grass Haddock Channel during August (10 min duration, n=5) yielded a total of 1 bay anchovy, 1 Atlantic menhaden, and 1 weakfish (**Table 4.2.1**). Trawls conducted in the Raunt during August (10 min duration, n=5) yielded a total of 32 individuals representing 10 species (**Table 4.2.1**). The dominant species in the Raunt was blue crab representing 34.4% of the total collection. Lady Crab (*Ovalipes ocellatus*) represented 25.0%, winter flounder (*Pleuronectes americanus*) represented 12.5%, Atlantic horseshoe crab represented 9.4%, and all other species represented less than 5% each (**Figure 4.2.1**). Mean CPUE for Norton Basin during August (288.76 g/min) was greater than that for the Raunt (124.98 g/min) or Grass Haddock Channel (0.22 g/min) (**Table 4.2.1**).

Table 4.1.1.4 Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in gill nets from the Raunt, August, 2002.

The Raunt, Shallow Area (n=2)

Duration of set: 5.75 hrs

Scientific Name	Common Name	Total Abund.	MeanCPUE (g/hr)	TL Range (mm)
<i>Callinectes sapidus</i>	Blue crab	33	497.82	102-178
<i>Limulus polyphemus</i>	Atlantic Horseshoe Crab	14	1196.51	152-241
<i>Cynoscion regalis</i>	Weakfish	14	25.33	89-133
<i>Brevoortia tyrannus</i>	Atlantic Menhaden	7	9.43	64-152
<i>Stenotomus chrysops</i>	Scup	7	66.81	159-229
<i>Ovalipes ocellatus</i>	Lady Crab	4	12.66	30-57
<i>Prionotus evolans</i>	Striped Searobin	4	61.66	83-305
<i>Prionotus carolinus</i>	Northern Searobin	3	26.20	178-203
<i>Centropristis striata</i>	Black Sea Bass	2	80.35	184-191
<i>Pomatomus saltatrix</i>	Bluefish	2	104.80	362-432
<i>Libinia emarginata</i>	Common Spider Crab	2	9.78	51-76
<i>Paralichthys dentatus</i>	Summer Flounder	1	69.87	381
Total:		93	2161.22	30-432

Table 4.2.1 Total abundance, mean CPUE (biomass in g/min), and total length range of fish and macrocrustaceans collected in otter trawls from Norton Basin, the Raunt, and Grass Hassock Channel, August, 2002.

Grass Hassock Channel (n=5)

Trawl duration: 10 min.

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/min.)	TL Range (mm)
<i>Anchoa mitchilli</i>	Bay Anchovy	1	0.00	44
<i>Brevoortia tyrannus</i>	Atlantic Menhaden	1	0.10	76
<i>Cynoscion regalis</i>	Weakfish	1	0.12	83
Total:		3	0.22	44-83

The Raunt (n=5)

Trawl duration: 10 min.

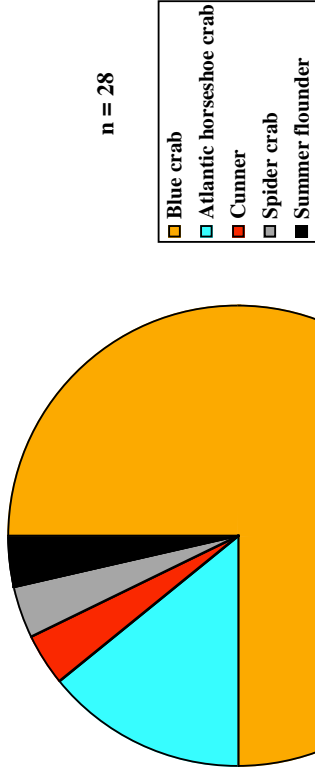
Scientific Name	Common Name	Total Abund.	Mean CPUE (g/min.)	TL Range (mm)
<i>Callinectes sapidus</i>	Blue Crab	11	54.82	76-152
<i>Ovalipes ocellatus</i>	Lady Crab	8	8.04	19-70
<i>Pleuronectes americanus</i>	Winter Flounder	4	0.54	64-121
<i>Limulus polyphemus</i>	Atlantic Horseshoe Crab	3	60.00	203-210
<i>Libinia emarginata</i>	Common Spider Crab	1	1.30	64
<i>Prionotus evolans</i>	Striped Searobin	1	0.12	73
<i>Cancer irroratus</i>	Rock Crab	1	0.08	25
<i>Tautogolabrus adspersus</i>	Cunner	1	0.06	60
<i>Centropristis striata</i>	Black Sea Bass	1	0.02	44
<i>Syngnathus fuscus</i>	Northern Pipefish	1	0.00	108
Total:		32	124.98	19-210

Norton Basin (n=5)

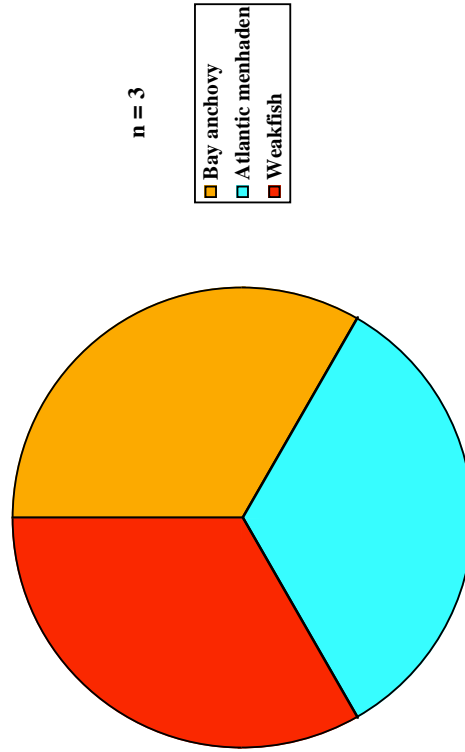
Trawl duration: 8 to 9 min.

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/min.)	TL Range (mm)
<i>Callinectes sapidus</i>	Blue Crab	21	52.02	76-178
<i>Limulus polyphemus</i>	Atlantic Horseshoe Crab	4	223.81	203-267
<i>Paralichthys dentatus</i>	Summer Flounder	1	11.90	330
<i>Libinia emarginata</i>	Common Spider Crab	1	0.88	51
<i>Tautogolabrus adspersus</i>	Cunner	1	0.14	70
Total:		28	288.76	51-330

Species Composition
16' Otter Trawl
Norton Basin
August 2002



Species Composition
16' Otter Trawl
Grass Hassock Channel
August 2002



Species Composition
16' Otter Trawl
The Raunt
August 2002

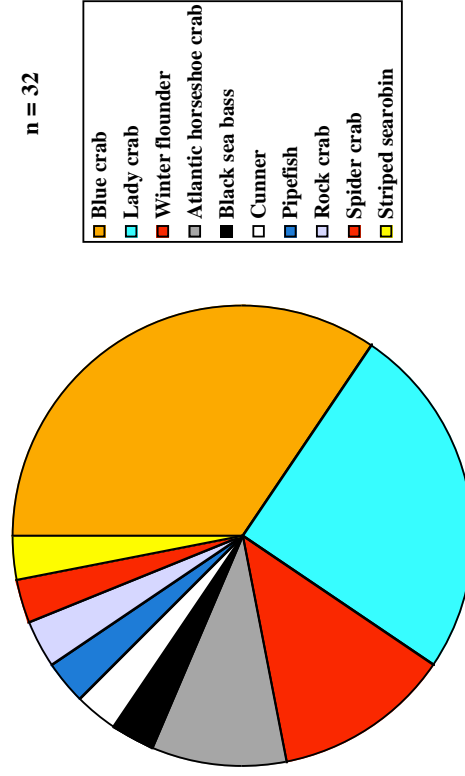


Figure 4.2.1 Species composition from otter trawl sampling efforts, August, 2002