US Army Corps
of Engineers
New York District

Norton Basin Restoration Project

Baseline Data Collection at Project and Reference Sites - 2000

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

by

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS USED IN THIS REPORT

CPUE – catch per unit effort

DMMP – Dredged Material Management Plan

DO – dissolved oxygen

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

TOC – total organic carbon

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

USAE-WES – U.S. Army Waterways Experiment Station

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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 (USACE 1999). 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. Bathymetric recontouring is a beneficial use alternative with specific application to subaqueous borrow pits, particularly those located within dead-end basins. The goal of the Norton Basin/Little Bay Project is to demonstrate the feasibility of habitat restoration via bathymetric recontouring of Norton Basin and/or Little Bay, 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 a general depth of approximately 15 ft below mean low water (MLW).

Preliminary biological and hydrographic sampling, conducted by the USACE-NYD in 1998-1999, indicated degraded conditions within deeper waters of the study area, particularly in Little Bay. Side slopes of the borrow pits in both basins are nearly vertical, and hydrodynamic isolation has apparently resulted in low mixing rates within deeper waters.

Preliminary benthic grab and sediment profile imagery (SPI) samples from both pits indicate an impoverished benthic community (USACE-NYD, unpublished data). Sediments are highly aqueous/organic and black in color. Additional indicators of poor sediment quality are a high gas void content in SPI samples, a strong odor of hydrogen sulfide, and the seasonal presence of sulfur-oxidizing bacterial mats.

Preliminary fisheries hydro-acoustic surveys conducted by the U.S. Army Engineer Waterways Experiment Station (USAE-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 (D. Clarke, USAE-WES, pers. comm.).

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 preliminary sediment characterization [grain size, total organic carbon (TOC), % solids], collection of water quality depth profiles, and a preliminary survey of living resources (fish, macrocrustaceans) using gill nets, trawls, and seines. These data are intended to provide information on biological and physico-chemical attributes of Norton Basin/Little Bay with comparison to both shallow and deep reference locations, and to guide future data collection efforts during Phase I (Baseline Environmental Studies) of the Norton Basin/Little Bay project.

1.1 Project Goals and Objectives

The purpose of this preliminary study was to collect limited data on a variety of environmental parameters prior to initiation of a comprehensive 13-month environmental characterization study of the Norton Basin/Little Bay complex. An important objective of the study was to determine if conventional sampling techniques (i.e., gill nets, trawls, seines) would be effective, given the unusual bathymetry of the primary study area. Data collected during this preliminary effort will be used by the project's Technical Advisory Team to develop a sampling and data collection plan for the comprehensive study. Additional characterization studies conducted simultaneously with this study include bathymetric surveys of Norton Basin and Little Bay, current speed and direction profile surveys, and seabed classification of the study areas and nearby reference areas using multibeam sonar (CR Environmental 2001, Continental Shelf Associates, 2001).

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. Sediments are usually covered with white flocculent material believed to be colonies of the chemolithotrophic bacteria *Beggiatoa* (Rosenberg and Diaz 1993). Historically, this area supported extensive intertidal salt marsh habitat. In it's 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. Recent side-scan sonar surveys 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 (CR Environmental, Inc. 2001).

2.2 Little Bay

Little Bay is located southeast of the Edgemere Landfill. With its three 60 to 65 ft deep (MLW) borrow pits, 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 pits have 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 (CR Environmental, Inc. 2001).

2.3 Reference Areas

Two reference areas (The Raunt and Grass Hassock 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.

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 flows in a northeasterly direction 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 expansive beds of tube-dwelling amphipods (*Ampelisca abdita*) in the upper reaches. The *Ampelisca* mats gradually transition to hard sand bottom in the lower reaches of the Raunt (CR Environmental, Inc. 2001).

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 (CR Environmental, Inc. 2001).

3.0 METHODS

3.1 Sediment Characterization

A total of 33 samples were collected at 11 stations (n=3) within the project and reference areas (**Figure 3.1.1**) using a 0.1m^2 Smith-Macintyre grab on September 25, 2000 to determine basic physical properties of the sediments. Three sampling sites (GH1, GH2, and GH3) were located in the Grass Hassock reference area, three (R1, R2, and R3) in the Raunt reference area, one (Little Bay Pit, i.e. LBP) in the Little Bay project area, and three (Norton Basin Entrance, Norton Basin Deep, and Norton Basin Pit, i.e. NBE, NBD, and NBP respectively) in the Norton Basin project area . 500 mL and 250 mL aliquots were collected from each sample for total organic carbon (TOC) and % solids, and sediment grain size analyses, respectively. TOC and % solids analyses were performed by Severn Trent Laboratories, Inc. in Mobile, AL. Grain size analyses were performed by Terra Consulting, Mobile, AL using the SEDPIT III: Sedimentary Petrology Analysis Program.

3.2 Water Quality Monitoring

Water quality depth profiles were conducted at each sediment sampling station using a HydroLab® DataSonde® Multiprobe (**Figure 3.2.1**). Readings were taken at one meter depth intervals from bottom to surface. The following parameters were measured: temperature (°C), salinity, pH, and dissolved oxygen (DO) (mg/L). The project areas (Norton Basin/Little Bay) were sampled on September 25, 2000 and the reference areas (Grass Hassock Channel/the Raunt) were sampled on both September 25 and September 29, 2000.

3.3 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. The bottoms of Norton Basin, Little Bay, and both reference channels were sampled on September 25, 2000. Mid-depth (approx. 20-25 ft below surface) samples were collected within Grass Hassock Channel on September 29, 2000. Three gill nets were deployed in each sample area (**Figure 3.3.1**). All fishes and macrocrustaceans captured 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, if possible. Catch per unit effort (CPUE) was calculated by dividing nekton biomass by the number of hours that gill nets were deployed.

3.4 Bottom Trawling

A 30’ otter trawl (1 3/8” mesh walls; 1” mesh cod end) was deployed on September 29, 2000 in the Raunt and Grass Hassock reference areas. Three trawls were pulled for a duration of 10 minutes in each sample area (**Figure 3.4.1**). All fishes and macrocrustaceans captured in trawls

Figure 2.1.1. Norton Basin/Little Bay study area.

were processed in the field. Captured organisms were identified to species, enumerated, weighed, measured (TL or carapace width), and released, if possible. CPUE was calculated by dividing nekton biomass by trawl duration (in minutes).

3.5 Seining

Fish sampling within the intertidal/shallow subtidal zone was attempted at several sites along the periphery of Norton Basin and Little Bay on September 14, 2000 using a 9.1 x 2 m bag seine (3 mm Delta-grade mesh). However, extremely dense growth of sea lettuce in the study area prevented the effective use of this gear type. Although a variety of fish and macrocrustacean species were collected, it was extremely labor-intensive and time-consuming to sort through the large rolls and mats of macroalgae which were captured in the seine to remove organisms. This sampling technique was discontinued for the present study.

4.0 RESULTS

4.1 Sediment Characterization

Sediment grain size data were tabulated to compare Folk's sediment descriptions (Folk 1980) and USACE sediment descriptions. The spatial distribution of sand, silt and clay size fractions was illustrated using ternary graphs. Sediment analyses revealed textural differences between the substrates of the project and reference areas (**Table 4.1.1**). Norton Basin sediments included clay, silty clay, or sandy clay. Little Bay sediments were mostly clay. Sediments from the Raunt were characterized as clayey sand or sandy clay. Grass Hassock Channel sediments were either sand or silty clay. Graphical comparison of sediment texture among the sites (**Fig. 4.1.1**) demonstrates that all four areas have variable amounts of sand and less than 60% silt; however, Norton Basin and Little Bay were, in general, dominated by clay.

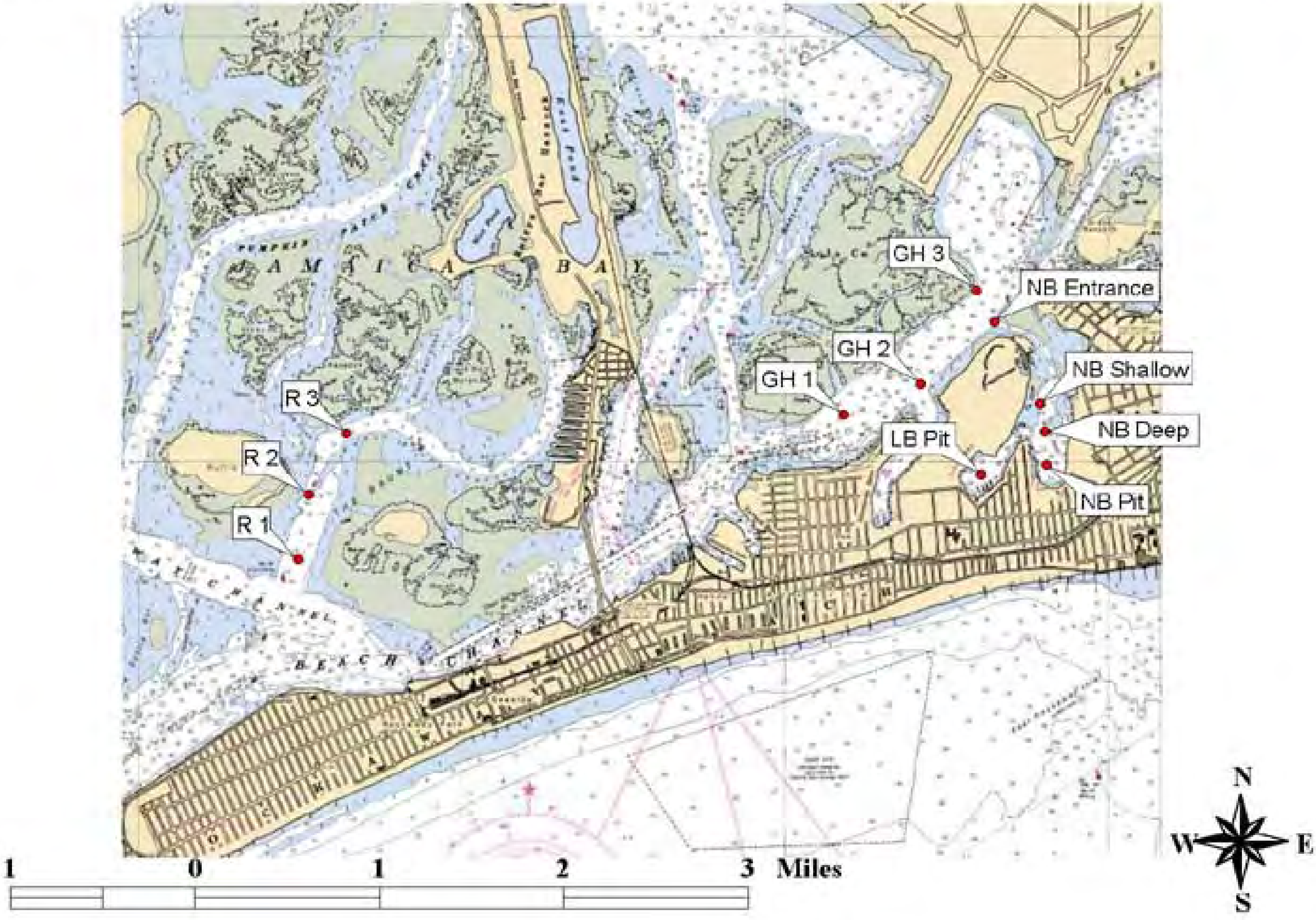
TOC was slightly higher in the project area sediments, except for the Norton Basin entrance channel and Norton Basin shallows. TOC increased with depth in Norton Basin (**Fig. 4.1.2**).

Percent solids was lower in the project areas than in the reference areas with the exceptions of the Norton Basin entrance channel and Norton Basin shallows (**Fig. 4.1.3**).

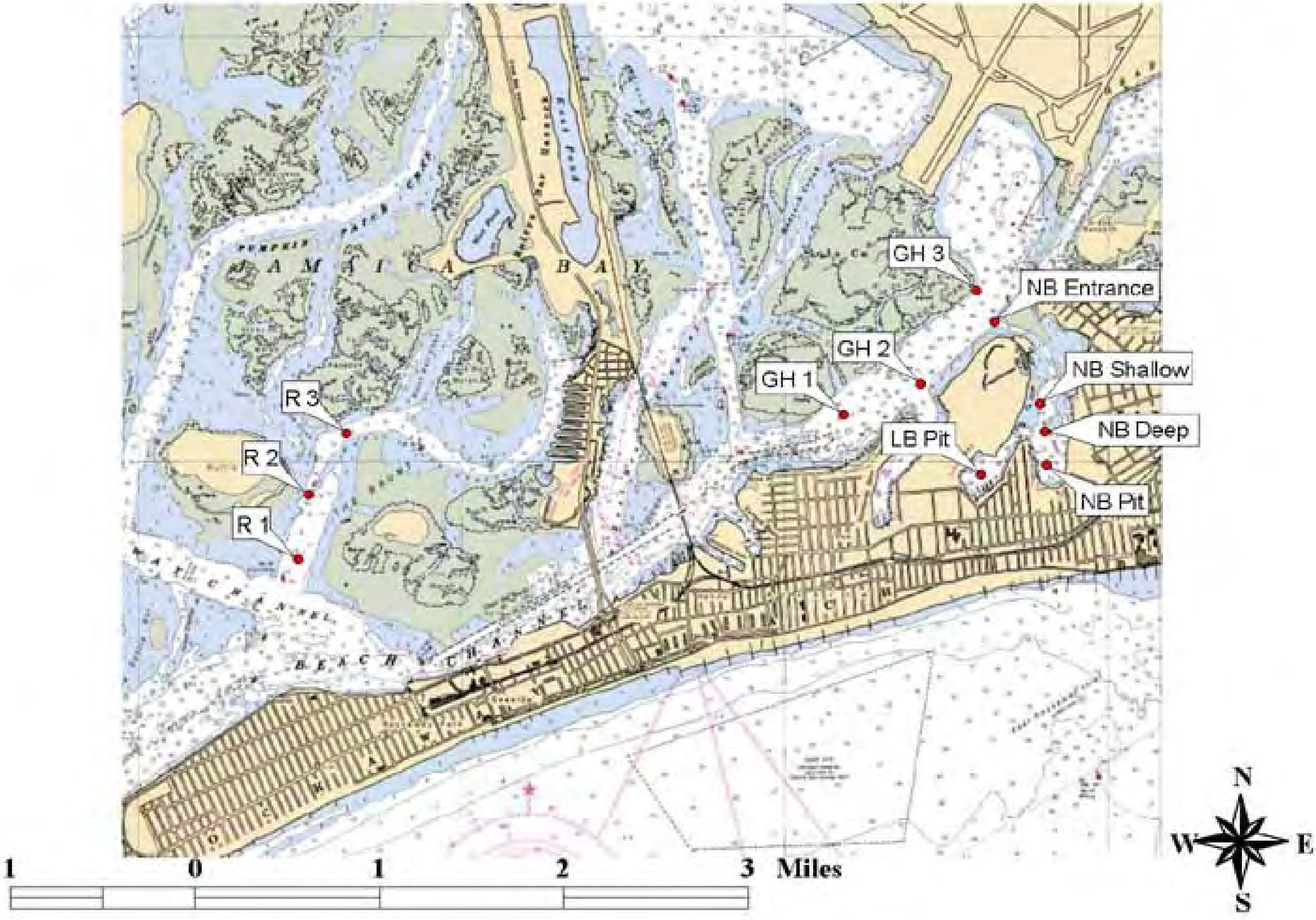
4.2 Water Quality Monitoring

Temperature ranged from 20.2 ˚C to 20.6 ˚C at the Norton Basin deep station, 20.4 ˚C to 20.6 ˚C in the Norton Basin shallows, 20.4 ˚C to 20.6 ˚C in the Norton Basin borrow pit (**Fig. 4.2.1**), 20.0 ˚C to 21.2 ˚C at the Norton Basin entrance channel, and 4.1 ˚C to 20.5 ˚C in the Little Bay borrow pit (**Fig. 4.2.2**). The Little Bay borrow pit profile revealed a distinct thermocline at 8-9 m depth.

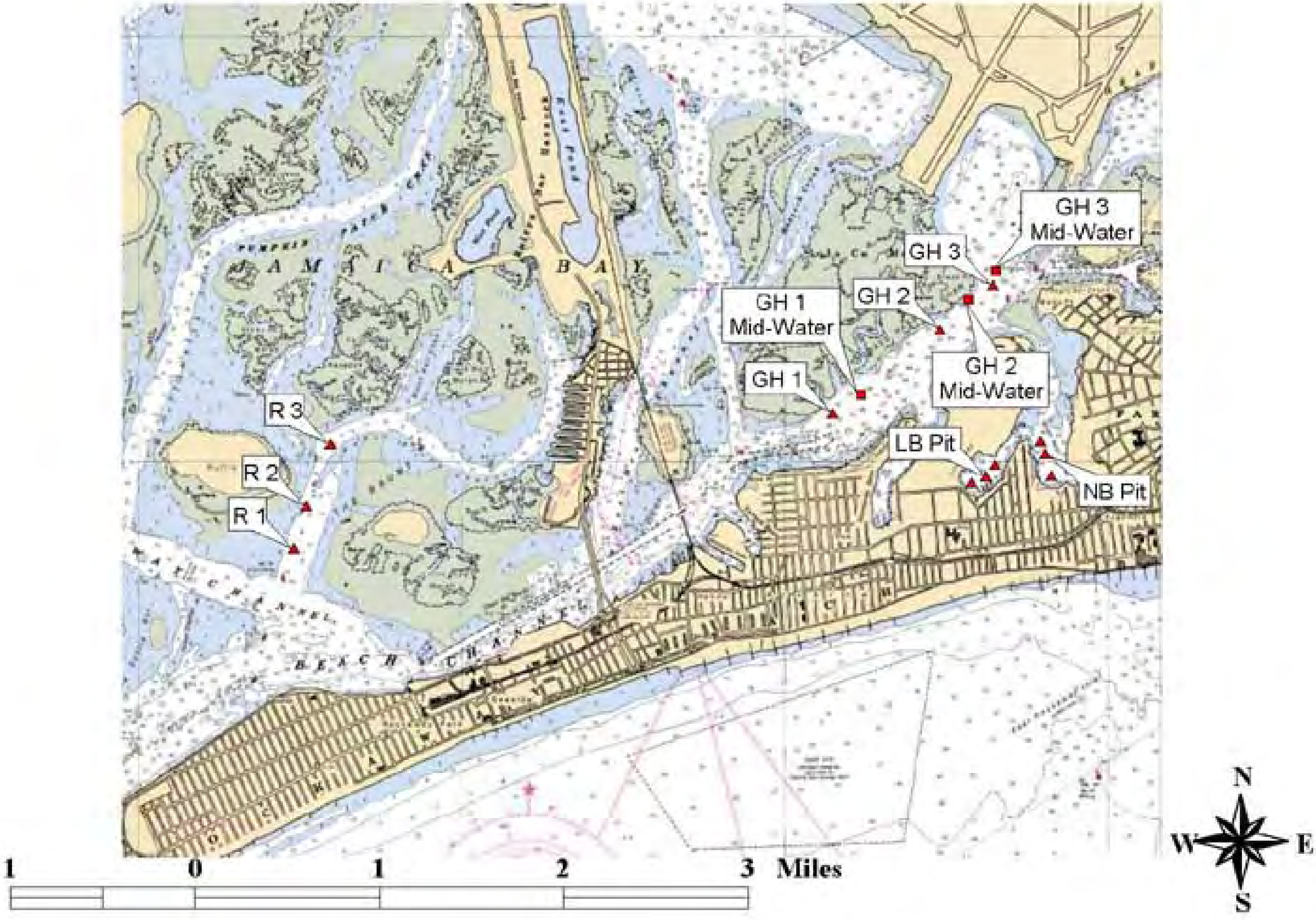
Smith-McIntyre Grabs/Grain Size and TOC



HydroLab Water Quality Profiles



Gill Nets


GH 3
Mid-Water
GH 3
GH 2
GH 1
Mid-Water
GH 1
GH 2
Mid-Water
R 3
R 2
R 1
LB Pit
NB Pit
1 0 1 2 3 Miles
N
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E
S

Otter Trawls

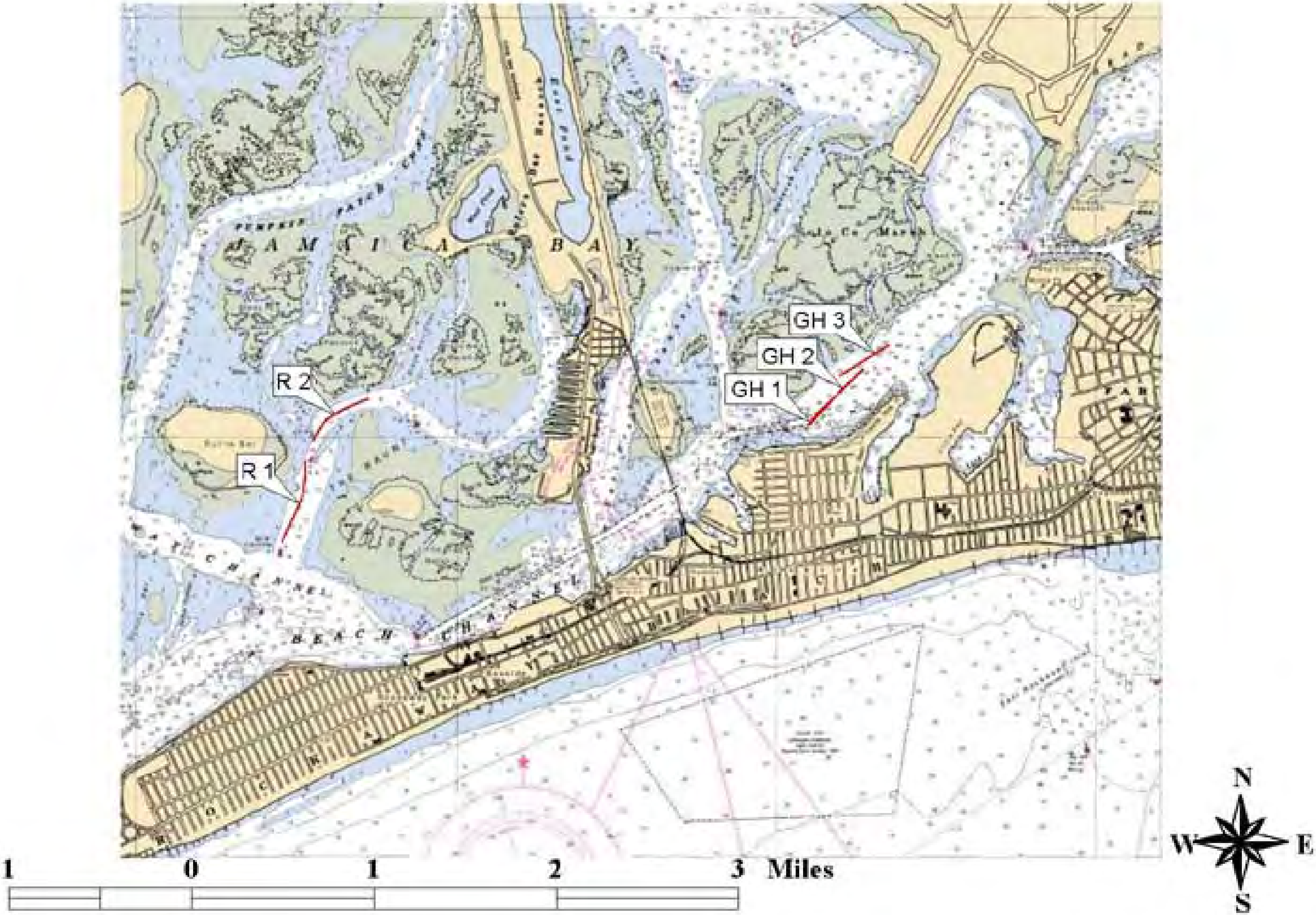
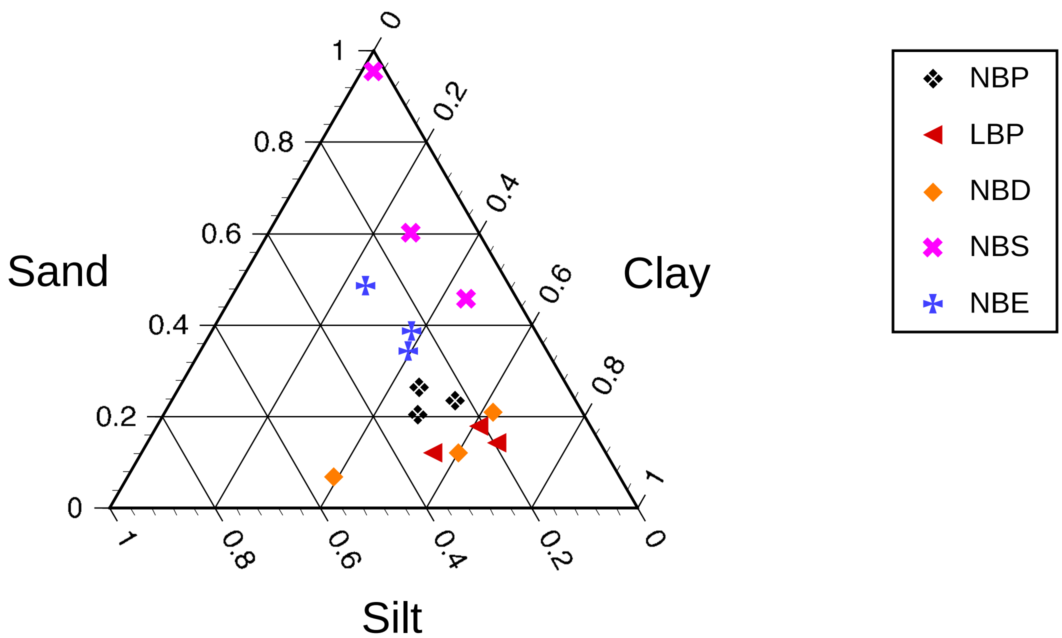


Table 4.1.1. Classification of sediments collected from Norton Basin, Little Bay, the Raunt, and Grass Hassock Channel, September 25, 2000.

Station	Location	Lat.	Long.	Folk's Sediment Description	USACE Sediment Description
NBPA NBPB NBPC	Norton Basin Pit	N 40˚ 35.981'	W 73˚ 46.378'	Sandy mud Sandy mud Sandy clay	Silty Clay Silty Clay Clay
NBSA NBSB NBSC	Norton Basin Shallow	N 40˚ 36.271'	W 73˚ 46.414'	Clayey sand Slightly gravelly sandy mud Slightlyl gravelley sand	Clayey sand Sandy clay Sand
NBDA NBDB NBDC	Norton Basin Deep	N 40˚ 36.138'	W 73˚ 46.387'	Sandy clay Sandy clay Mud	Clay Clay Silty Clay
NBEA NBEB NBEC	Norton Basin Entrance	N 40˚ 36.654'	W 73˚ 46.700'	Sandy mud Slightly gravelly sandy mud Sandy mud	Sandy Clay Clayey sand Sandy Clay
LBPA LBPB LBPC	Little Bay Pit	N 40˚ 35.935'	W 73˚ 46.783'	Sandy clay Sandy clay Sandy mud	Clay Clay Clay
R1A R1B R1C	The Raunt 1	N 40˚ 35.536'	W 73˚ 51.009'	Clayey Sand Muddy Sand Slightly gravelly muddy sand	Clayey Sand Clayey Sand Silty sand
R2A R2B R2C	The Raunt 2	N 40˚ 35.843'	W 73˚ 50.943'	Sand Sandy clay Sandy mud	Sand Sandy clay Sandy clay
R3A R3B R3C	The Raunt 3	N 40˚ 36.130'	W 73˚ 50.709'	Clayey Sand Sandy mud Sandy mud	Sandy Clay Silty Clay Sandy Clay
GH1A GH1B GH1C	Grass Hassock 1	N 40˚ 36.219'	W 73˚ 47.635'	Slightly gravelly muddy sand Slighly gravelly sand Sandy mud	Sand Sand Clayey sand
GH2A GH2B GH2C	Grass Hassock 2	N 40˚ 36.361'	W 73˚ 47.155'	Sandy mud Sandy clay Slightly gravelly sandy mud	Silty Clay Clay Silty Clay
GH3A GH3B GH3C	Grass Hassock 3	N 40˚ 36.802'	W 73˚ 46.812'	Sandy mud Sandy mud Sandy mud	Clay Silty Clay Silty Clay

Project Areas



Reference Areas

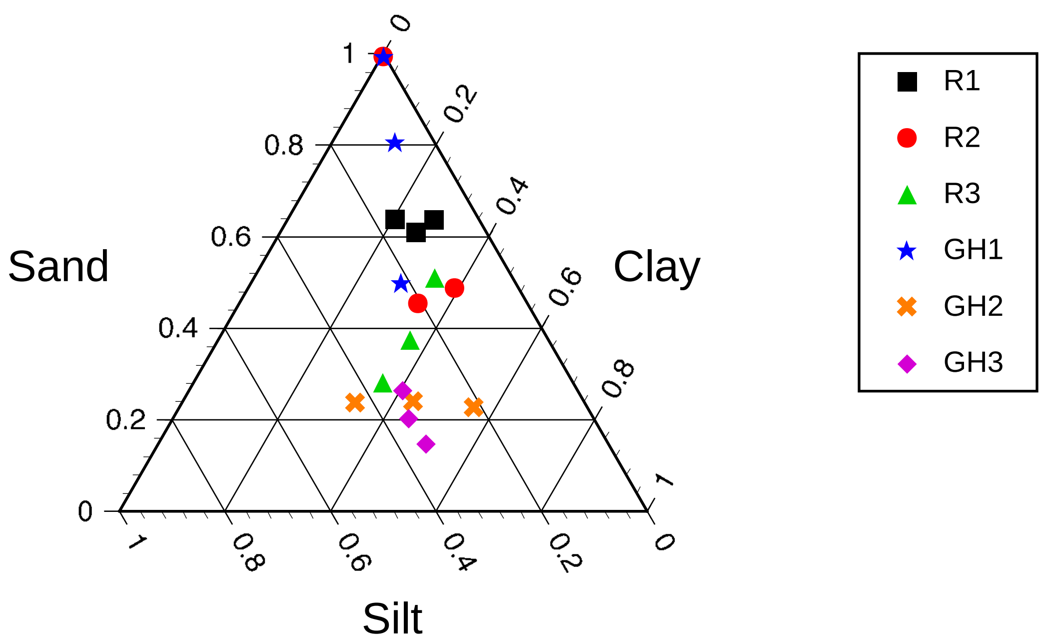


Figure 4.1.1. Comparison of sand:silt:clay ratios among sampling locations within Norton Basin, Little Bay, the Raunt, and Grass Hassock Channel.

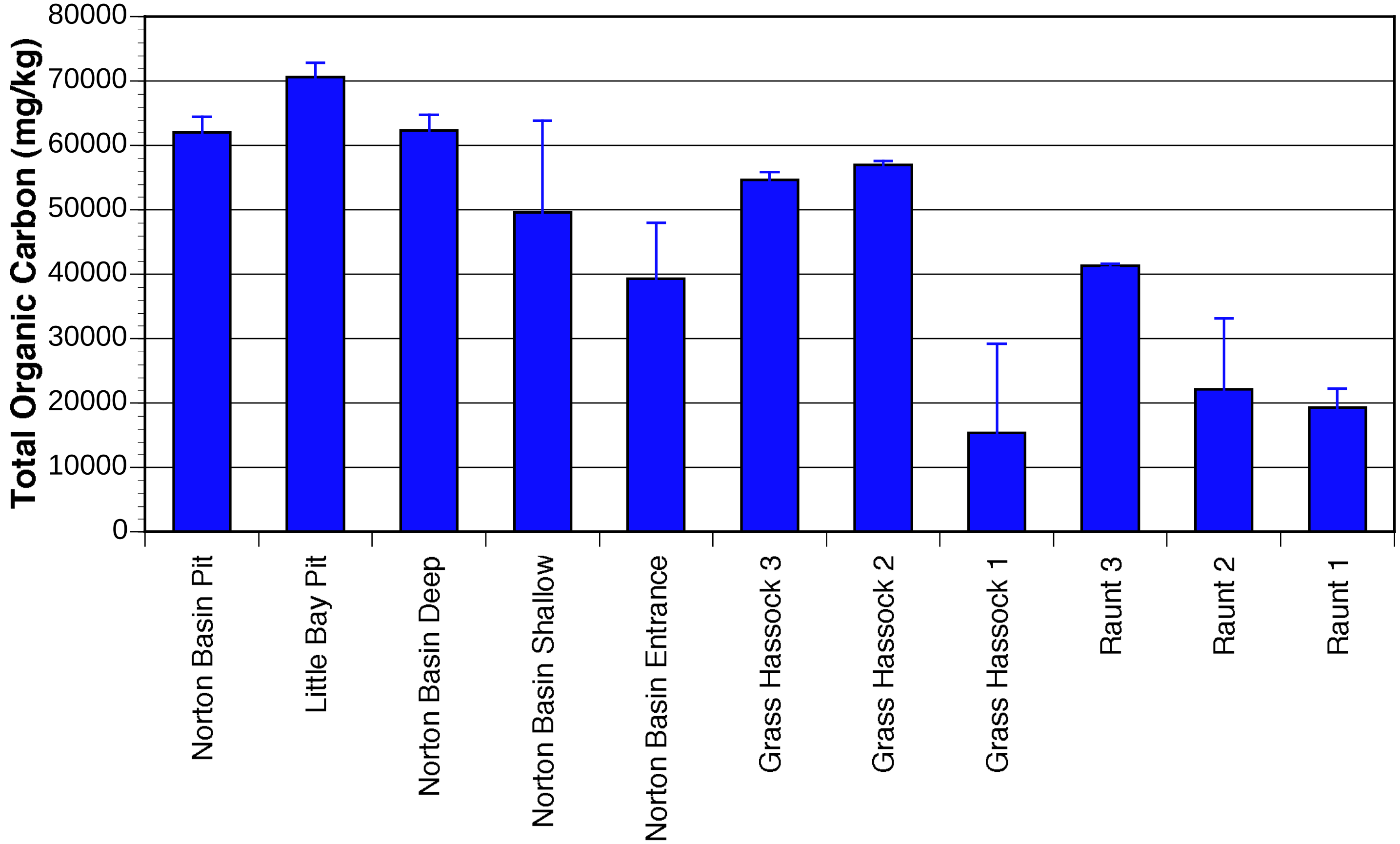


Figure 4.1.2. Comparison of total organic carbon (mg/kg) among sampling locations within Norton Basin, Little Bay, the Raunt, and Grass Hassock Channel.

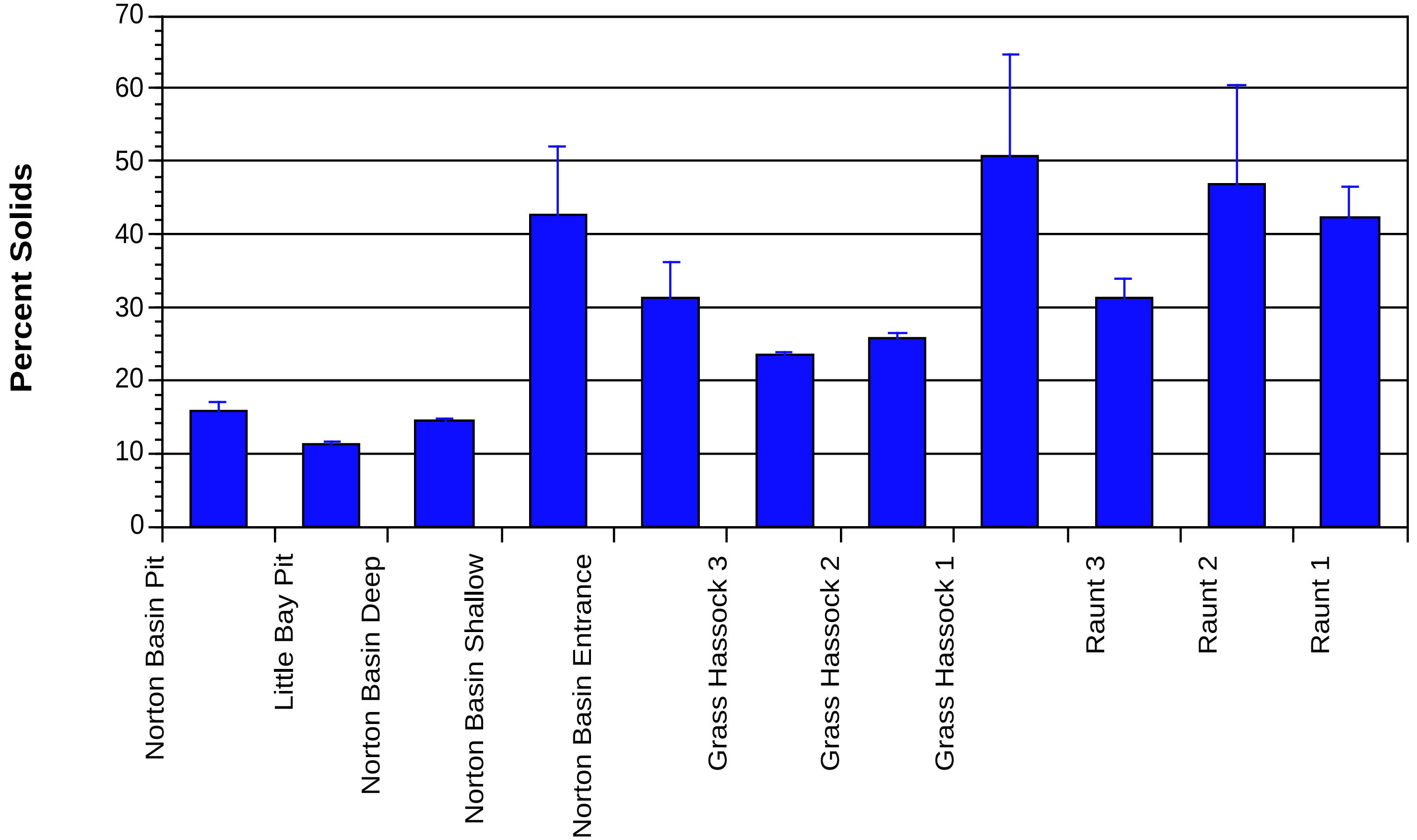


Figure 4.1.3. Comparison of percent solids (sediment) among sampling locations within Norton Basin, Little Bay, the Raunt, and Grass Hassock Channel.

Temperatures in the Raunt ranged from 19.0 ˚C to 19.3 ˚C on Sept. 25(**Fig. 4.2.3**) and from 17.3 ˚C to 17.6 ˚C on Sept. 29 (**Fig. 4.2.4**). Temperatures in Grass Hassock Channel ranged from 19.8 ˚C to 20.4 ˚C on Sept. 25 (**Fig. 4.2.5**) and from 17.3 ˚C to 18.3 ˚C on Sept. 29 (**Fig. 4.2.6**).

Salinity profiles were taken in Norton Basin and Little Bay on Sept. 25. Salinity ranged from 26.2 to 27.2 among all Norton Basin stations (**Figs. 4.2.1, 4.2.2)**, and from 26.2 to 28.4 in the Little Bay Borrow Pit (**Fig. 4.2.2**).

Salinity in the Raunt ranged from 27.1 to 28.6 on Sept. 25 (**Fig. 4.2.3**) and from 29.3 to 30.5 on Sept. 29 (**Fig. 4.2.4**). Salinity in Grass Hassock Channel ranged from 26.0 to 27.3 on Sept. 25 (**Fig. 4.2.5**) and from 26.7 to 27.9 on Sept. 29 (**Fig. 4.2.6**).

Measured pH ranged from 7.3 to 7.5 among all sample locations and depths on Sept. 25 and Sept. 29, except for the bottom of the Little Bay borrow pit. A pH of 6.8 was measured below the thermocline (>8 m from surface) within the Little Bay borrow pit.

DO profiles were taken in Norton Basin and Little Bay on Sept. 25. DO ranged from 5.4 mg/L to 5.8 mg/L at Norton Basin deep, 5.4 mg/L to 5.9 mg/L in the Norton Basin shallows, 5.1 mg/L to 5.8 mg/L in the Norton Basin borrow pit (**Figure 4.2.4.1**), 4.5 mg/L to 6.0 mg/L at the Norton Basin entrance channel, and 0.8 mg/L to 5.6 mg/L in the Little Bay borrow pit (**Figure 4.2.4.2**).

DO levels in The Raunt ranged from 5.3 mg/L to 6.4 mg/L on Sept. 25 (**Figure 4.2.4.3**) and from 5.5 mg/L to 5.9 mg/L on Sept. 29 (**Figure 4.2.4.4**). DO in Grass Hassock Channel ranged from 4.4 mg/L to 5.6 mg/L on Sept. 25 (**Figure 4.2.4.5**) and from 5.3 mg/L to 5.9 mg/L on Sept. 29 (**Figure 4.2.4.6**).

4.3 Gill Net Sampling

Gill net collections in Norton Basin (22 hrs duration) yielded 58 individuals representing nine species (**Table 4.3.1**). The dominant species (expressed as CPUE) were striped searobin (*Prionotus evolans*), bluefish (*Pomatomus saltatrix*), and blueback herring (*Alosa aestivalis*). Three gill nets were deployed at the bottom of Little Bay for 21 hours and failed to catch a single fish or macrocrustacean.

Gill net collections in Grass Hassock Channel (3-5 hrs) yielded 18 individuals representing 5 species (**Table 4.3.1**). Total CPUE in Grass Hassock Channel (828.41g/hr) was markedly greater than that observed in Norton Basin (358.30 g/hr). Gill net collections in the Raunt (1-2 hrs) yielded 12 individuals representing 3 species (**Table 4.3.1**). Observed CPUE in the Raunt (956.67 g/hr) was also much higher than in Norton Basin. Gill nets deployed at mid-depth within Grass Hassock Channel captured 8 individuals representing 3 species (**Table 4.3.1**). CPUE for mid-depth collections was relatively low (148.45 g/hr).

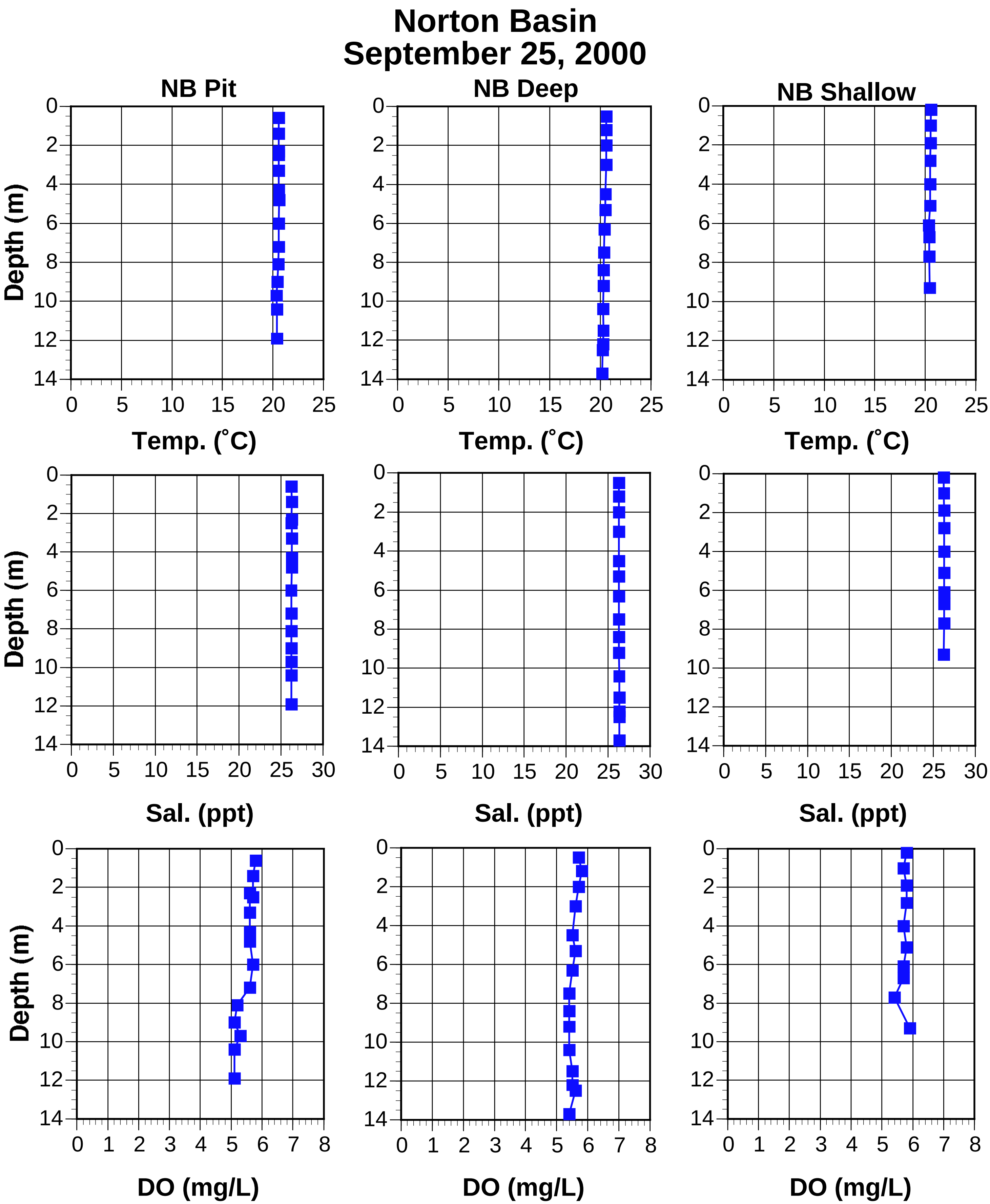
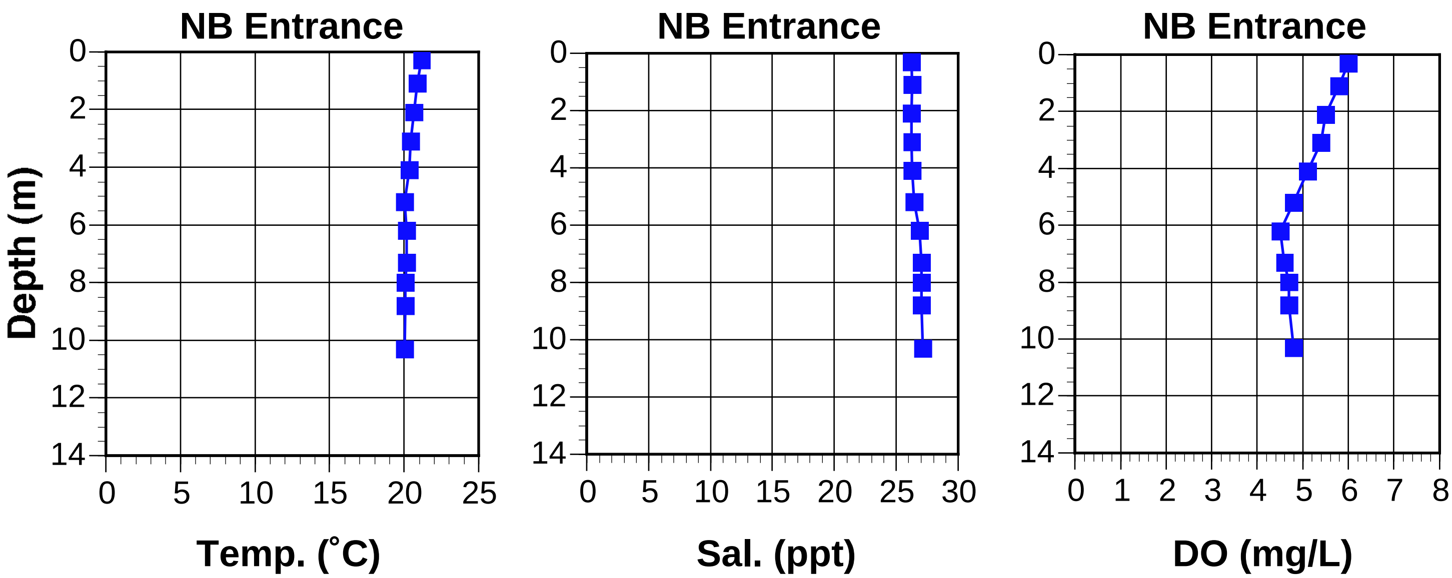


Figure 4.2.1. Temperature, salinity, and dissolved oxygen profiles from Norton Basin borrow pit, deep, and shallow stations, September 25,2000.

Entrance to Norton Basin
September 25, 2000



Little Bay
September 25, 2000

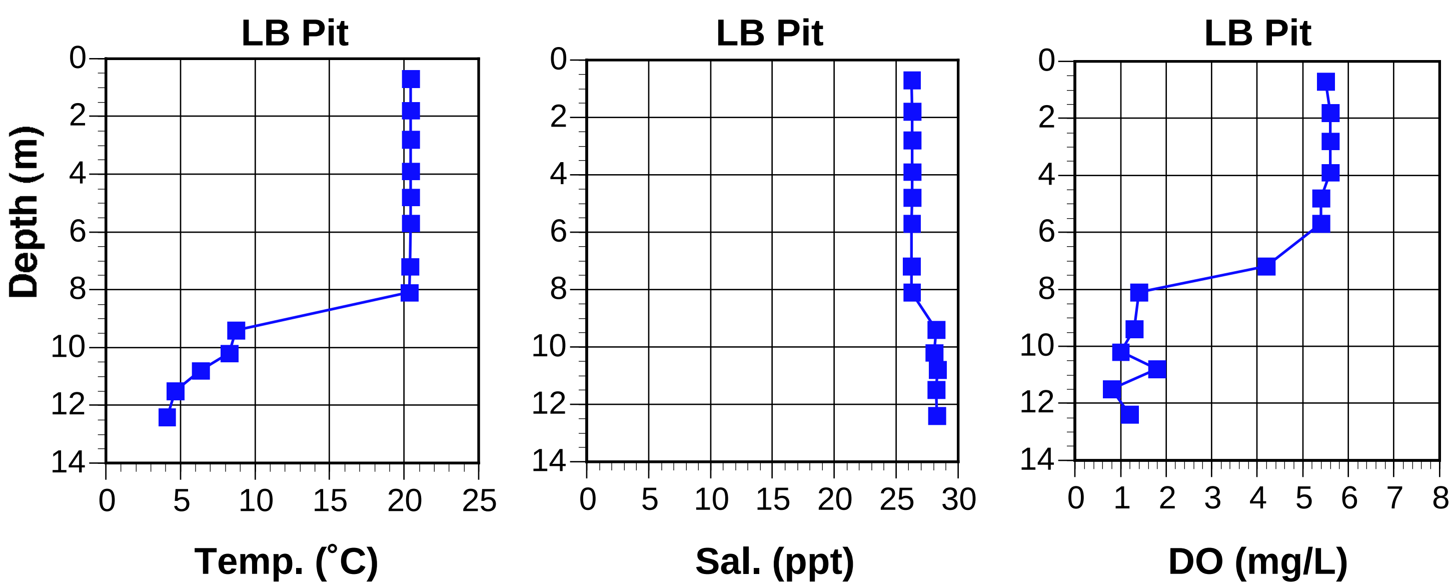


Figure 4.2.2. Temperature, salinity, and dissolved oxygen profiles from Norton Basin entrance channel and Little Bay borrow pit stations, September 25, 2000.

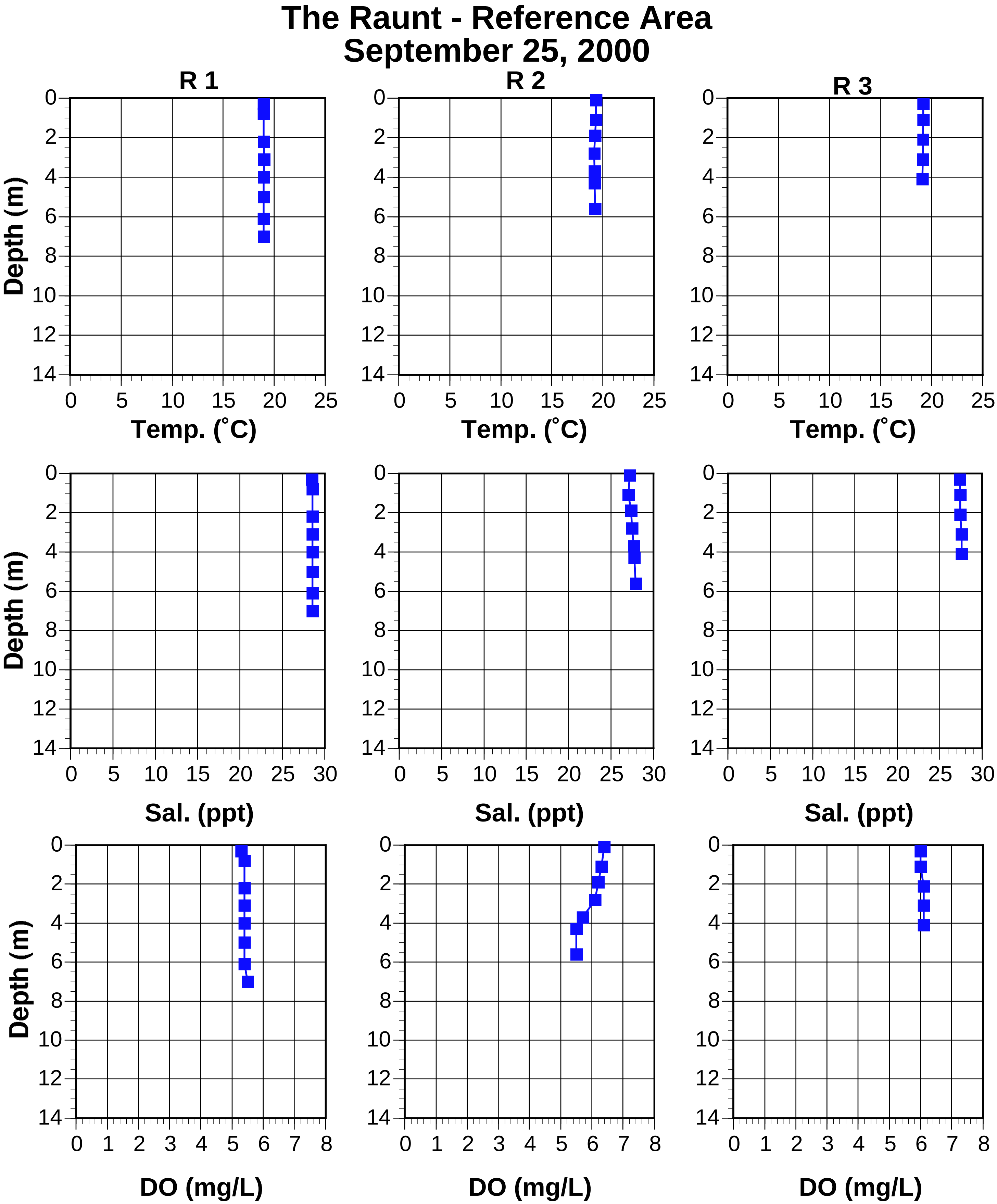


Figure 4.2.3. Temperature, salinity, and dissolved oxygen profiles from the Raunt, September 25, 2000.

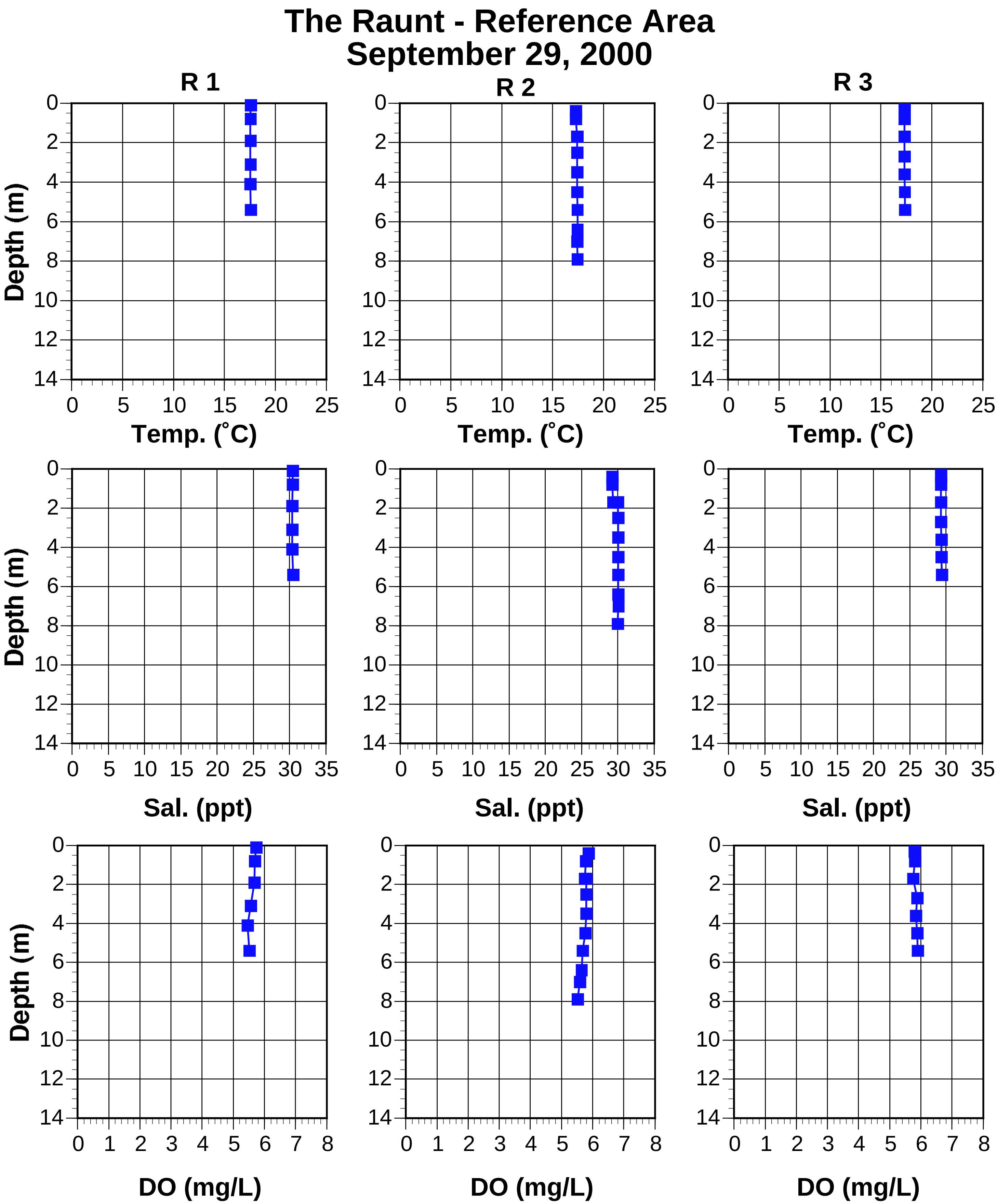


Figure 4.2.4. Temperature, salinity, and dissolved oxygen profiles from the Raunt, September 29, 2000.

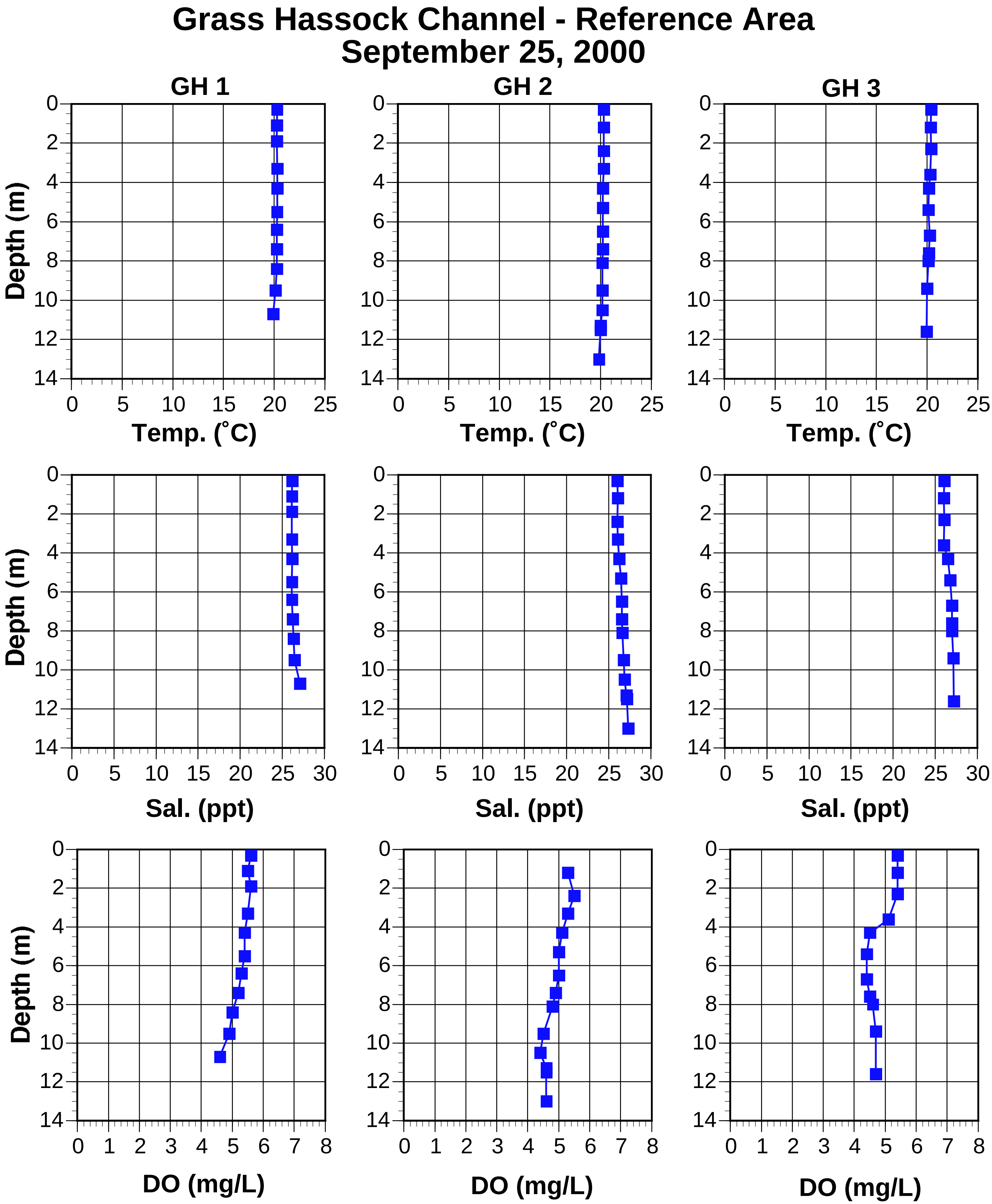


Figure 4.2.5. Temperature, salinity, and dissolved oxygen profiles from Grass Hassock Channel, September 25, 2000.

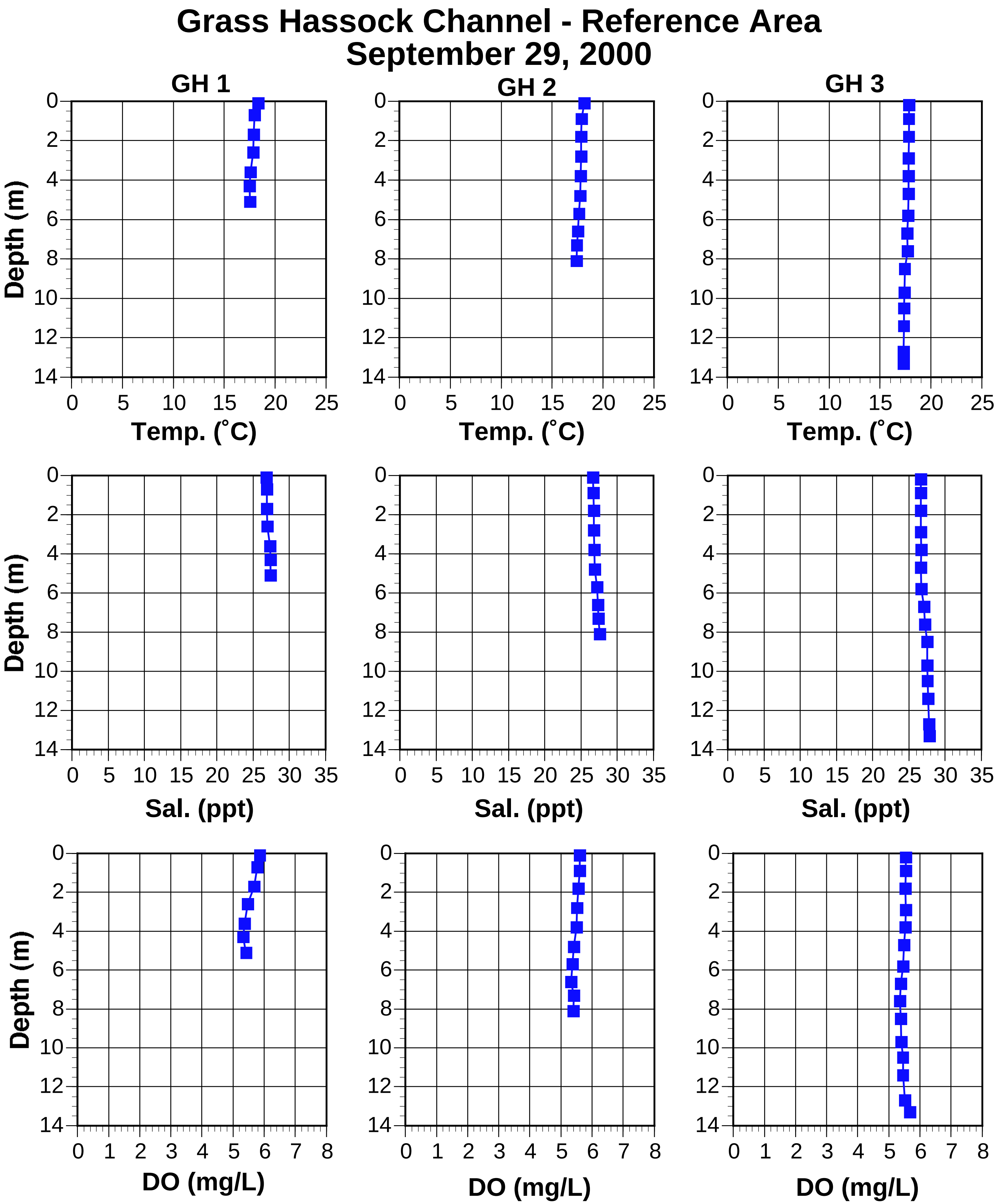


Figure 4.2.6. Temperature, salinity, and dissolved oxygen profiles from Grass Hassock Channel, September 29, 2000.

4.4 Bottom Trawling

The bathymetric conditions within Norton Basin and Little Bay prevented effective deployment of the 30 ft otter trawl.

Trawls conducted in Grass Hassock Channel yielded 175 individuals representing 15 species (**Table 4.4.1**). Seabord goby (*Gobiosoma ginsburgi*), blue crab (*Callinectes sapidus*), and sand shrimp (*Crangon septemspinosa*) were the numerically dominant species. Blue crab, Atlantic horseshoe crab (*Limulus polyphemus*), and summer flounder (*Paralichthys dentatus*) dominated in terms of biomass.

Trawls conducted in the Raunt yielded 28 individuals of 10 species (**Table 4.4.1**). Dagger-blade Grass shrimp (*Palaemonetes pugio*) was the numerically dominant species. Atlantic horseshoe crab dominated in terms of biomass. Overall, CPUE for the Raunt was less than that for Grass Hassock Channel (**Figure 4.4.1**).

5.0 CONCLUSIONS AND RECOMMENDATIONS

These preliminary investigations have improved our understanding of the physico-chemical and biological attributes of Norton Basin and Little Bay, as there is little data available on the ecology of this area. Sediment quality is poor in Little Bay and areas of Norton Basin. Water quality is generally poor in Little Bay, with evidence of extended stratification and resulting hypoxic/anoxic conditions below the thermocline. Norton Basin, in contrast, does not seem to experience these conditions. Additional long-term monitoring of DO and other water quality parameters will be necessary to affirm this.

With regards to sampling of living resources, it is recommended that seine collections be conducted earlier in the year (e.g. late April - early June), before macroalgal mats achieve peak seasonal biomass. As an alternative, intertidal and shallow subtidal habitats could be sampled using a small (e.g., 1 m^2) drop sampler or throw trap (Rozas and Odum 1987), an effective method for collecting quantitative samples within densely vegetated estuarine habitats.

Gill netting appears to be effective in sampling natant macrofauna in the borrow pits and other areas. Little Bay appears to be devoid of fish and macrocrustaceans in response to extended anoxia/hypoxia. Norton Basin, in contrast, appears to support a relatively diverse and abundant fauna. Additional sampling throughout the year would be needed to affirm this.

If future trawl surveys are to be conducted in Norton Basin/Little Bay, it is recommended that a 16’ otter trawl and a smaller boat (15-35 ft length, <3 ft draft) be used. It is also recommended that the trawl vessel be equipped with Hypack navigation software and a DGPS system. This would enable the helmsman to identify and avoid submerged wrecks and other obstacles in determining trawl lanes. Specific obstacles would be located using the Hypack software, and returned for further investigation at a later date, if desired (CR Environmental 2001).

Table 4.3.1 Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in gill nest from Norton Basin, Little Bay, the Raunt, and Grass Hassock Channel, September 25 and 29, 2000.

Norton Basin, Bottom of Basin (n=3)
Duration of set: 22 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Prionotus evolans	Striped Searobin	18	91.26	165 - 335
Pomatomus saltatrix	Bluefish	15	95.85	180 - 431
Alosa aestivalis	Blueback Herring	11	85.70	130 - 385
Callinectes sapidus	Blue Crab	5	12.22	105 - 175
Leiostomus xanthurus	Spot	5	7.48	178 - 185
Limulus polyphemus	Atlantic Horseshoe Crab	1	44.74	290
Paralichthys dentatus	Summer Flounder	1	3.41	290
Prionotus carolinus	Northern Searobin	1	1.19	213
Mustelus canis	Smooth Dogfish	1	16.44	790
Total:		58	358.30	105 - 790

Grass Hassock Channel, Bottom of Channel (n=3)
Duration of set: 3-5 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Callinectes sapidus	Blue Crab	5	122.56	131 - 160
Pomatomus saltatrix	Bluefish	5	402.56	405 - 450
Cynoscion regalis	Weakfish	4	77.64	112 - 329
Prionotus evolans	Striped Searobin	2	95.90	323 - 334
Alosa aestivalis	Blueback Herring	2	129.74	365 - 368
Total:		18	828.41	112 - 450

The Raunt, Bottom of Channel (n=3)
Duration of set: 1-2 hrs

Scientific Name	Common Name	Total Abund.	MeanCPUE (g/hr)	TL Range (mm)
Callinectes sapidus	Blue Crab	7	350.00	127 - 151
Ovalipus ocellatus	Lady Crab	4	73.33	36 - 74
Limulus polyphemus	Atlantic Horseshoe Crab	1	533.33	288
Total:		12	956.67	36 - 288

Grass Hassock Channel, Mid-Depth in Channel (n=3)
Duration of set: 3-5 hrs

Scientific Name	Common Name	Total Abund.	MeanCPUE (g/hr)	TL Range (mm)
Callinectes sapidus	Blue Crab	6	56.70	131 - 150
Paralichthys dentatus	Summer Flounder	1	38.83	380
Pomatomus saltatrix	Bluefish	1	52.92	422
Total:		8	148.45	131 - 422

Table 4.4.1. Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in otter trawls from Norton Basin, Little Bay, the Raunt, and Grass Hassock Channel, September 25 and 29, 2000.

Grass Hassock Channel (n=3)
Trawl duration: 10 min.

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/min.)	TL Range (mm)
Gobiosoma ginsburgi	Seaboard Goby	53	0.73	25 - 46
Callinectes sapidus	Blue Crab	32	98.83	36 - 166
Crangon septemspinosa	Sand Shrimp	27	0.17	16 - 38
Palaemonetes pugio	Dagger-Blade Grass Shrimp	20	0.13	14 - 42
Centropristis striata	Black Sea Bass	16	0.97	40 - 178
Prionotus evolans	Striped Searobin	6	1.37	75 - 104
Syngnathus fuscus	Northern Pipefish	5	0.07	68 - 178
Pseudopleuronectes americanus	Winter Flounder	4	7.73	100 - 210
Limulus polyphemus	Atlantic Horseshoe Crab	3	63.93	180 - 270
Libinia emarginata	Common Spider Crab	2	2.83	55 - 60
Paralichthys dentatus	Summer Flounder	2	25.50	257 - 380
Etropus microstomus	Smallmouth Flounder	2	1.97	139 - 143
Hippocampus erectus	Lined Seahorse	1	0.17	135
Menticirrhus saxatilis	Northern Kingfish	1	0.50	136
Cynoscion regalis	Weakfish	1	0.30	106
Total:		175	205.2	14 - 380

The Raunt (n=2)
Trawl duration: 10 min.

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/min.)	TL Range (mm)
Palaemonetes pugio	Dagger-Blade Grass Shrimp	11	0.22	26 - 40
Limulus polyphemus	Atlantic Horseshoe Crab	4	161.94	125 - 200
Tautogolabrus adspersus	Cunner	4	0.56	46 - 81
Syngnathus fuscus	Northern Pipefish	3	0.06	115 - 122
Gobiosoma ginsburgi	Seaboard Goby	1	0.00	32
Callinectes sapidus	Blue Crab	1	7.78	132
Libinia emarginata	Common Spider Crab	1	0.94	46
Hippocampus erectus	Lined Seahorse	1	0.56	135
Tautoga onitis	Tautog	1	0.83	116
Menidia menidia	Atlantic Silverside	1	0.11	89
Total:		28	173	26 - 200

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