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Environmental Inventory of A Small Neutral Embayment: Murrells Inlet, South Carolina

by Dale R. Calder Charles M. Bearden and Billy B. Boothe, Jr.

Marine Resources Center
South Carolina Wildlife and Marine Resources Department
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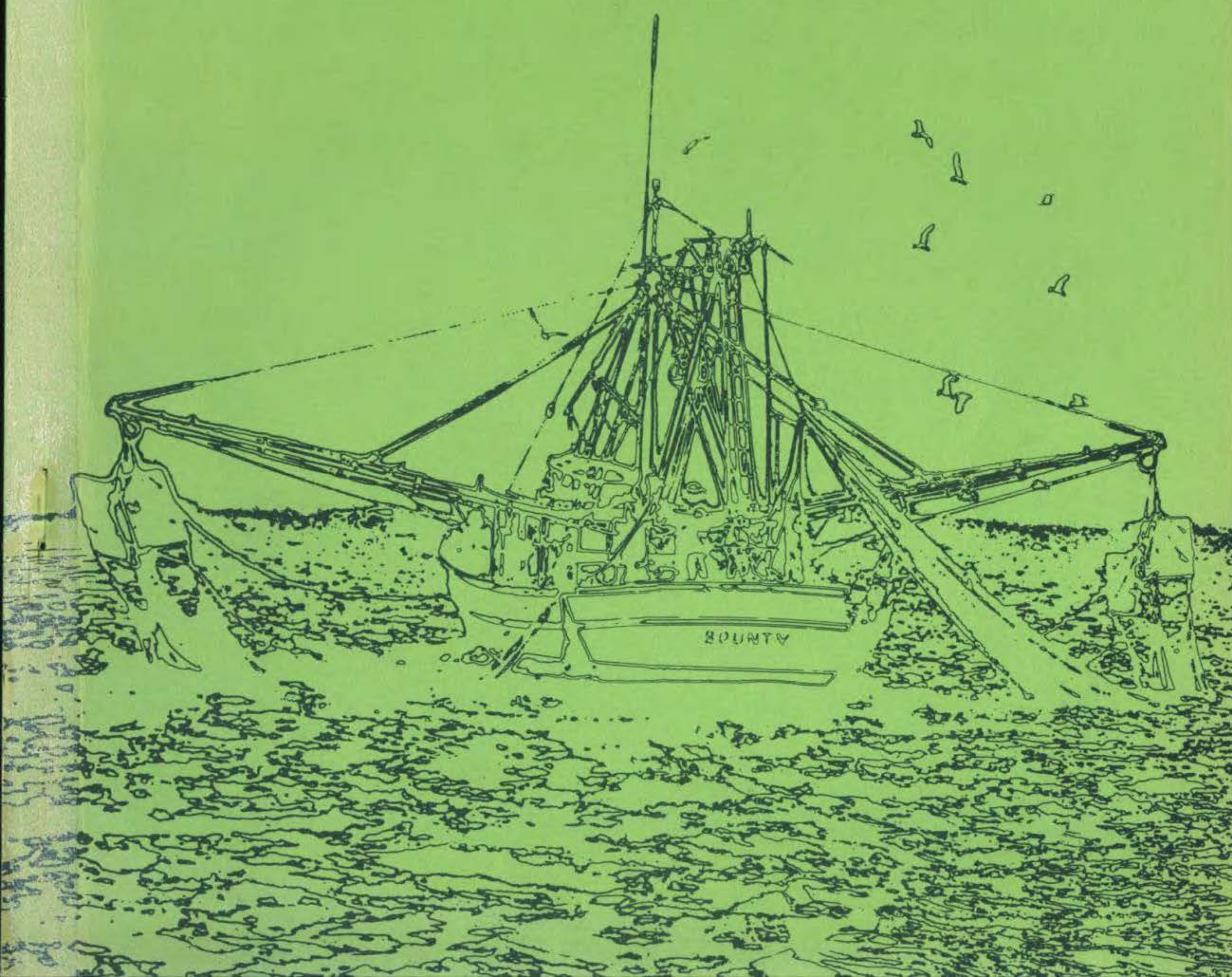

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INTRODUCTION

Along the northern third of the South Carolina coastline is a series of sandy beaches, of value to the tourist industry of the state. Between Winyah Bay and Little River near the North Carolina state line these beaches are interrupted only by a number of high salinity inlets. One of these, Murrells Inlet, is an important harbor for recreational craft and charter fishing boats.

The Murrells Inlet system is significant to the economy of the area in view of its recreational and aesthetic assets. It is a significant nursery area for penaeid shrimp, blue crabs, and finfishes such as black sea bass, sciaenids, and bluefish. It is also an important habitat for a number of adult sport fish species, including spot, sea trout, sheepshead, drum, flounder, and channel bass. The inlet is a productive shellfish growing area, having abundant resources of hard clams and intertidal oysters. In addition to two public oyster grounds, approximately 365 acres are under lease by the state to commercial oystermen in the area. Previous studies by the Marine Resources Division have shown that for its size, Murrells Inlet is the most intensively utilized area in the coastal zone of South Carolina for saltwater sport fishing (David M. Cupka, personal communication).

Encompassing about 3,330 acres, Murrells Inlet is a comparatively small system characterized by ocean beaches, sand and mud flats, intertidal shellfish beds, and expanses of saltmarsh intersected by numerous tidal streams. The inlet receives negligible freshwater inflow and salinities typically approach that of the ocean. The channel at the entrance of the inlet has constantly shifted over the years due to transport of sand by currents and wave action. Extensive deposits of sand at the inlet mouth and in the channel of Main Creek have made navigation difficult and dangerous.

In 1971, the U. S. Congress authorized a project for navigational improvement of Murrells Inlet. The Charleston District, U. S. Army Corps of Engineers, was assigned responsibility for the necessary engineering and design of this undertaking. The Murrells Inlet Navigation Project would provide a stabilized channel of sufficient depth and width for use by commercial and recreational vessels. In addition to channel dredging, the project would include a system of two jetties at the inlet entrance. Channel maintenance dredging about once every three years will also be necessary after completion of the project.

During May of 1975 the Charleston District, U. S. Army Corps of Engineers entered into a contract with the Division of Marine Resources of the South Carolina Wildlife and Marine Resources Department for an environmental inventory of Murrells Inlet. The primary objectives of this project were to conduct studies on the macrobenthic communities, to collect and analyze water and sediment samples, and to classify, survey, and chart the marsh vegetation and intertidal oyster reefs in this small neutral embayment.

Our study was of a short-term nature and was not intended as a comprehensive environmental impact study of the Murrells Inlet Navigation Project.

MATERIALS AND METHODS

Qualitative and quantitative sampling was conducted at 24 stations in the region of Murrells Inlet during 1975 to determine benthic community structure in the area (Fig. 1, Table 1). Sampling of the intertidal macrofauna on Huntington Beach and Garden City Beach adjacent to the inlet was undertaken on 22 May 1975. Stations were chosen at high tide, mid-tide, and low tide levels along a transect on each of the two beaches. Two replicate samples, each consisting of a surface area of 0.10 m^2 and a volume of 10.5 liters, were taken at each station. Samples were washed through sieves of 2.0 and 1.0 mm. Organisms retained on the sieves were removed to bottles and preserved in 10% seawater formaldehyde, stained with rose bengal, and returned to the laboratory for sorting, identification, and enumeration.

Subtidal quantitative samples were collected in Murrells Inlet during 27-28 May 1975 using a 0.13 m^2 modified Petersen Grab. Two replicate samples were taken at each of three stations in the entrance channel, seven stations in Main Creek, and eight stations in adjacent waterways. Samples were sieved and processed as described for the intertidal material.

Qualitative samples of the epifauna were taken with a modified oyster dredge at the three stations in the entrance channel on 27 May, and at stations in the inner channel and adjacent waterways on 29 May. A single five-minute tow was made at each station.

Community structure was analyzed on the basis of several equations from information theory. Species diversity was measured using Shannon's formula (Pielou, 1966):

$$H' = -\Sigma p_i \log_2 p_i$$

where H' is the diversity in bits of information per individual, and p_i equals $\frac{ni}{N}$ or the proportion of the sample belonging to the i^{th} species. Species

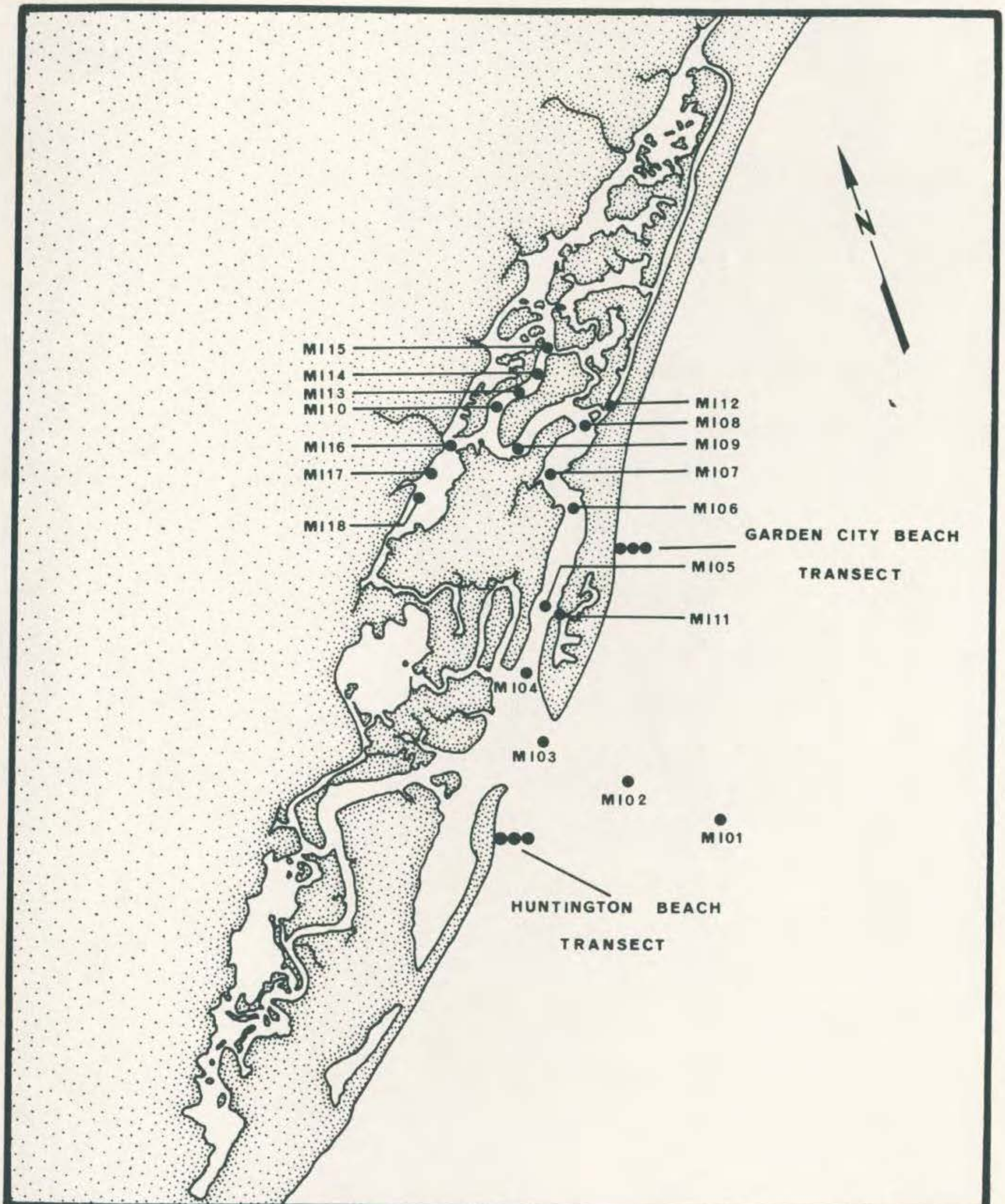

FIGURE 1. The Murrells Inlet area, showing stations where benthic sampling was conducted.

Table 1. Areas sampled during benthic studies in the Murrells Inlet area.

Location	Station No.	Date
Huntington Beach--High Tide	-	22-V-75
Huntington Beach--Mid-Tide	-	22-V-75
Huntington Beach--Low Tide	-	22-V-75
Garden City Beach--High Tide	-	22-V-75
Garden City Beach--Mid-Tide	-	22-V-75
Garden City Beach--Low Tide	-	22-V-75
Entrance Channel	MI01	27-V-75
Entrance Channel	MI02	27-V-75
Entrance Channel	MI03	27-V-75
Inner Channel	MI04	27,29-V-75
Inner Channel	MI05	27,29-V-75
Inner Channel	MI06	27,29-V-75
Inner Channel	MI07	27,29-V-75
Inner Channel	MI08	27,29-V-75
Inner Channel	MI09	27,29-V-75
Inner Channel	MI10	27,29-V-75
Adjacent Waterways	MI11	28,29-V-75
Adjacent Waterways	MI12	28,29-V-75
Adjacent Waterways	MI13	28,29-V-75
Adjacent Waterways	MI14	28,29-V-75
Adjacent Waterways	MI15	28,29-V-75
Adjacent Waterways	MI16	28,29-V-75
Adjacent Waterways	MI17	28,29-V-75
Adjacent Waterways	MI18	28,29-V-75

richness was calculated on the basis of the formula:

$$SR = \frac{S-1}{\ln N}$$

where S is the number of species and lnN is the natural logarithm of the total number of individuals of all species in the sample. Evenness or equitability, the distribution of individuals among the various species, was measured by:

$$J' = \frac{H'}{\log_2 S}$$

where H' is the species diversity in bits of information per individual and S is the number of species.

Sediment samples were taken at Huntington Beach and at stations MI03, MI05, MI07, MI10, and MI18. These were frozen with dry ice and shipped to the U. S. Army Engineer Division Laboratory, Marietta, Georgia, for processing. Analyses were made on the samples to determine particle size, volatile solids, total organic carbon, COD, Kjeldahl nitrogen, oil and grease, lead, zinc, mercury, total phosphorus as PO_4, iron, and cadmium.

Hydrographic samples were taken during ebb tide at the most seaward and landward stations occupied on 27 May 1975 and 29 May 1975. At each station samples were taken 1.0 m below the surface and 0.3 m above the bottom using Van Dorn bottles. Parameters measured included temperature, salinity, dissolved oxygen, NO_3, NO_2, PO_4, SiO_2, turbidity, suspended solids, and settleable solids. In addition, bottom salinities were measured at each station from MI01 through MI10 on 27 May 1975 to determine whether any salinity gradient could be detected.

An inventory was conducted during June and July of 1975 to determine the acreage and types of marshlands in Murrells Inlet. The area was examined using existing black and white, color, and color-infrared aerial photographs of the Marine Resources Division and the Charleston District, U. S. Army Corps of Engineers. Low-altitude flights were made during June 1975 to obtain additional infrared photographs of the area at scales of 1:3000 and 1:6000. A Cessna 172 aircraft was employed for this work, using a pod-mounted Fairchild "K-17" camera converted to a "T-2" configuration through the addition of a 6-inch focal length Planagon lens. Kodak Aerochrome infrared (2243) film was used. Four field inspection trips were made to Murrells Inlet during the study for ground truth verification and identification of major vegetative species. Information from aerial photographic examination and field inspection was used to prepare a vegetative type map of the area.

Intertidal oyster reefs within 0.5 miles of the centerline of the proposed channel were surveyed during June and July of 1975. This survey was conducted using a 14 foot, shallow draft outboard boat, and ground inspection. Location and size (length and width) of intertidal oyster reefs were recorded in the field on black and white aerial photographs and later transposed to an overlay map. Coverage of each reef by living oysters, whether light, medium or heavy, was also recorded. Aerial infrared photographs were utilized to provide supplemental information on the size and location of intertidal oyster beds situated in shallow flats and inaccessible areas.

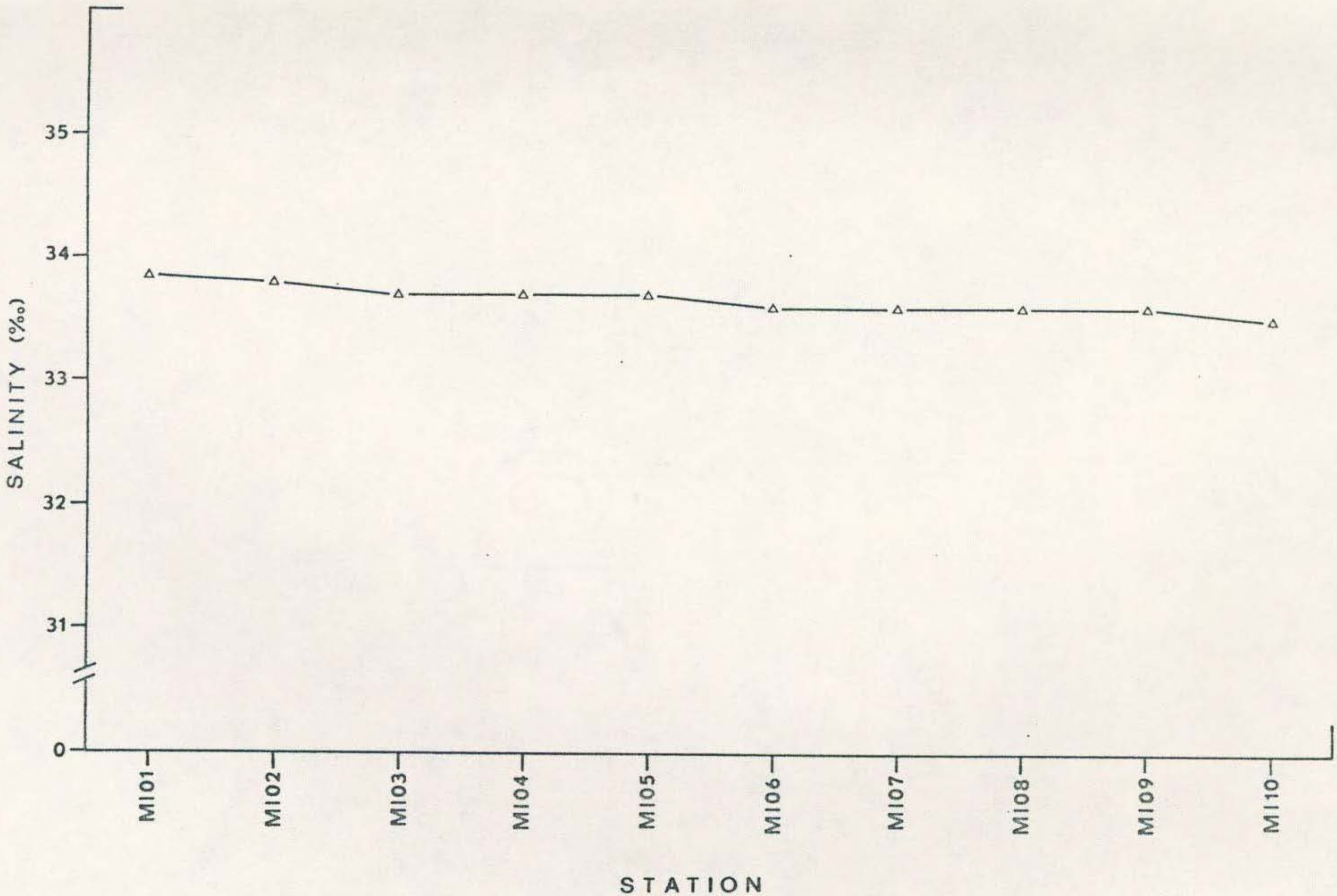

FIGURE 2. Bottom salinities in the entrance channel and inner channel of Murrells Inlet.

RESULTS AND DISCUSSION

Hydrography and Sediments

As a coastal ecological system, Murrells Inlet conforms rather closely to the definition of a neutral embayment (Odum and Copeland, 1974). Such systems have been described by Glooschenko and Harriss (1974) as partially enclosed marine environments receiving negligible fresh water inflow from rivers and with precipitation approximating evaporation. Because there is little or no river discharge, salinities are characteristically in or near the euhaline range (30-40 ^{o}/oo) and fluctuations are rather small.

Bottom salinities taken from stations MI01 through MI10 in Murrells Inlet on 27 May 1975 reflect a pattern characteristic of a neutral embayment (Fig. 2). Salinities were well above 30 ^{o}/oo from the most seaward to the most landward station. No salinity gradient, such as that found from the mouth to the head of an estuary, was present. A difference of less than 0.4 ^{o}/oo was noted from station MI01, located approximately one mile offshore, to station MI10 in Main Creek near the town of Murrells Inlet.

Circulation in Murrells Inlet is accomplished primarily as a result of tidal action, and the connection with high salinity waters of Long Bay between Capes Fear and Romain tends to stabilize the environment. Waters of the inlet are generally less than 5 m in depth, and mixing processes preclude the development of a significant halocline or thermocline (Table 2). Dissolved oxygen values were all moderately high in the inlet at the time of collection.

Glooschenko and Harriss (1974) believed that the most important factors in temperate neutral embayments were temperature, light, and nutrients. Although the inlet creeks are shallow, extremes in water temperature are probably moderated in Murrells Inlet because of its connection with and proximity to the ocean. Turbidity is reduced over that found in estuarine regions of South

Table 2. Hydrographic data collected during benthic studies in Murrells Inlet.

	MI01	MI10	MI04	MI16
Date	27-V-75	27-V-75	29-V-75	29-V-75
Depth (m)	0.5	0.5	0.5	0.5
Temp. (C)	25.4	28.4	26.5	27.2
Salinity ($^{o}/oo$)	33.1	33.6	34.0	34.0
D.O. (mg/1)	7.1	6.8	6.7	6.6
NO_3 (µg/1)	19.2	6.4	1.6	17.8
NO_2 (µg/1)	0.4	1.0	0.8	1.1
PO_4 (µg/1)	0.0	19.0	0.0	0.0
SiO_2 (µg/1)	224.8	927.3	337.2	695.5
Turbidity (FTU)	1.0	14.0	3.8	5.5
Suspended Solids (mg/1)	-	-	66.0	68.8
Settleable Solids (mg/1)	-	-	18.0	21.2
Depth (m)	6.0	3.0	3.0	3.0
Temp. (C)	24.2	28.3	26.6	27.9
Salinity ($^{o}/oo$)	33.9	33.5	34.0	34.0
D.O. (mg/1)	8.1	6.8	6.7	6.3
NO_3 (µg/1)	5.2	4.1	12.0	17.5
NO_2 (µg/1)	0.4	1.1	1.0	1.4
PO_4 (µg/1)	0.0	30.5	0.0	60.0
SiO_2 (µg/1)	105.4	-	498.8	800.8
Turbidity (FTU)	3.2	16.0	5.1	13.0
Suspended Solids (mg/1)	87.6	-	-	-
Settleable Solids (mg/1)	26.0	-	-	-

Table 3. Chemical analyses of sediment samples from the Murrells Inlet area. Values are expressed as percent by weight (dry basis).

	Huntington Beach	MI03	MI05	MI07	MI10	MI18
Volatile Solids	2.64	2.66	2.62	2.12	2.54	1.78
T.V.S. Formula EC	1.43	1.39	1.41	1.66	1.76	1.85
Total Organic Carbon	0.04	0.03	0.03	0.13	0.17	0.20
C.O.D.	0.12	0.07	0.09	0.35	0.45	0.54
Nitrogen, Kjeldahl	0.0107	0.0068	0.0053	0.0246	0.0154	0.0203
Oil and Grease	0.008	0.013	0.010	0.016	0.016	0.015
Lead	0.0004	0.0004	0.0004	0.0007	0.0006	0.0008
Zinc	0.0006	0.0003	0.0004	0.0006	0.0005	0.0005
Mercury	0.00120	0.00045	0.00016	0.00020	0.00003	< 0.00002
Total P as PO_4	0.086	0.144	0.077	0.091	0.063	0.042
Iron	0.256	0.120	0.130	0.220	0.140	0.170
Cadmium		0.00006	0.00006	0.00006	0.00007	0.00007

Carolina because of the lack of a river system with its sediment load flowing into the inlet. Increased water clarity apparently is a factor in the relative abundance of macroalgae in Murrells Inlet as compared with estuarine regions further south along the South Carolina coast. The high productivity evident in the benthic communities of the inlet is probably based primarily upon detritus from salt marshes in the area rather than upon phytoplankton and macroalgae.

Sediment samples from the Murrells Inlet area were predominantly sandy, with varying percentages of shell (Appendices 1-6). Most noteworthy in the chemical analysis of sediments was the high concentration of mercury in four of the six samples taken (Table 3). Values from stations MI03, MI05, and MI07, as well as Huntington Beach, exceeded the maximum limits for the determination of the acceptability of dredge spoil disposal to the nation's waters (U. S. Army Corps of Engineers, South Atlantic Division Laboratory, personal communication). No industries utilizing or discharging mercury occur in the area, and the source of these high mercury concentrations is unknown.

Benthic Community Structure

Analyses of samples from Garden City Beach and especially Huntington Beach (Tables 4, 5) provided results that are rather typical of east coast high energy beaches (Croker, 1970; Dexter, 1969; Shealy, Boothe, and Bearden, 1975). Organisms in such areas of the South Carolina coastal zone are subjected to strong wave and current action, the rise and fall of tides, shifting sediments, heavy predation, and wide fluctuations of temperature and salinity. Under such rigorous environmental conditions the fauna is specialized and highly adapted for survival. While relatively few macrobenthic species inhabit sandy beaches, one or more of those present frequently occur in large numbers. Filter-feeders dominate the fauna of high energy beaches and the system acts as an extensive food-filtering system (Riedl and McMahan, 1974). The invertebrate animals of

Table 4. Species of macroinvertebrates collected on Garden City Beach, and their estimated densities in numbers m^{-2}. Estimates are based on two 0.10 m^2 samples at each of three stations, one at high tide, one at mid-tide, and one at low tide.

Species	High Tide	Mid-Tide	Low Tide
Spionidae (undet.)		65	1280
Donax variabilis		60	5
Caprella sp.	5		30
Gammarus sp.			30
Neohaustorius schmitzi		25	
Parahaustorius longimerus		5	5
Bugula neritina			5
Eteone heteropoda			5
Mitrella lunata			5
Mysidacea			5
Amphiporeia virginiana		5	
Pagurus sp.			5
No. Individuals	5	160	1375
No. Species	1	5	10
Species Richness	0.00	0.79	1.25
Species Diversity (H')	0.00	1.79	0.54
Equitability (J')	0.00	0.78	0.16

Table 5. Species of macroinvertebrates collected on Huntington Beach, and their estimated densities in numbers m^{-2}. Estimates are based on two 0.10 m^2 samples at each of three stations, one at high tide, one at mid-tide, and one at low tide.

Species	High Tide	Mid-Tide	Low Tide
Neohaustorius schmitzi	2000	205	220
Parahaustorius longimerus	770	1150	65
Donax variabilis	325	80	90
Mysidacea			175
Spionidae (undet.)	5		45
Chiridotea sp.	10		
Nephtys sp.			5
Syllidae (undet.)			5
Caprella equilibra		5	
Caprella sp.		5	
Lepidopa websteri		5	
Pinnixa cristata			5
No. Individuals	3110	1450	610
No. Species	5	6	8
Species Richness	0.50	0.69	1.09
Species Diversity (H')	1.29	0.98	2.25
Equitability (J')	0.56	0.38	0.75

sandy beaches typically consist largely of haustoriid amphipods, coquina clams, mole crabs, and ghost crabs.

Although only 12 species of invertebrates were present in samples from each of the two beaches studied, moderately high numbers were present. The haustoriid amphipods Neohaustorius schmitzi and Parahaustorius longimerus and the coquina clam, Donax variabilis, accounted for 94.9% of the fauna on Huntington Beach. N. schmitzi was found at a density of 2000 m^{-2} at high tide on this beach, and P. longimerus occurred at a density of 1150 m^{-2} at the mid-tide level. Seven of the 12 species collected (Chiridotea sp., Nephtys sp., Syllidae, Caprella equilibra, Caprella sp., Lepidopa websteri, and Pinnixa cristata) accounted for less than 1% of the total. Fewer animals were collected from Garden City Beach, and an unidentified spionid polychaete was numerically dominant rather than haustoriid amphipods. No particular cause for this was evident, although the beach slope was greater than on Huntington Beach and samples were taken between two rather closely-placed groins.

Because animals from high energy beaches are motile and adapted to dynamic beach processes, such areas would be a more appropriate site for the deposition of dredge spoil, particularly of sandy material, than either waterways within the inlet or marsh areas. Rapid recovery of the fauna on beach areas following disturbances is likely, particularly if the dredge spoil is similar to that of the original beach in grain size and other characteristics (Thompson, 1973). South Carolina beaches typically slope very gradually from high to low tide, and are therefore relatively wide when the tide is out. Any harmful effects of "beach nourishment" on the indigenous fauna could be minimized by depositing dredged material high in the intertidal zone. Fewer species generally are present in this region of a beach and populations lower in the intertidal zone would be relatively unaffected.

Sediments in grab samples from the entrance channel consisted primarily of sand, with relatively little shell. As a result, most of the animals collected from this region were motile and infaunal (Table 6). Neither the number of species nor number of individuals was particularly high at any of the three stations sampled. Of these stations, the fewest number of species and individuals were found at the entrance of the inlet. This was a very shallow, turbulent area with a substrate of clean, medium to fine sand. Dominance by haustoriid amphipods reflected the sandy substrate of the area. Species diversity (Fig. 3) was the highest at the most seaward station (MI01) and lowest at the entrance (MI03).

The relative paucity of such firm substrates as oyster shells in the entrance channel precluded the development of any rich epifaunal communities comparable to those found inside the inlet. As a result, relatively few species were present in dredge samples from the three stations in the entrance channel (Table 7). The sand dollar, *Mellita quinquesperforata*, was the dominant organism in dredge collections from stations MI01 and MI02. Only one species, the bryozoan *Membranipora tenuis*, was collected at station MI03. The brown shrimp, *Penaeus aztecus*, was the only species of commercial value taken at any of the entrance channel stations. While sampling at other times of the year might reveal the presence of other motile species such as blue crabs or white shrimp, there was no indication of any commercially valuable sessile species in the area that would be adversely affected by dredging and jetty construction. Communities found in the entrance channel consist largely of species that are adapted to a naturally dynamic sandy substrate, and no serious detrimental effect to the ecology of the area from the proposed operations is foreseen. In fact, construction of a jetty in the area would provide substrate for the development of epifaunal communities, which are largely lacking at present.

Table 6. Species of macroinvertebrates collected in the Entrance Channel, and their estimated densities in numbers m^{-2}. Estimates are based on two 0.13 m^2 Petersen Grab samples at each of three stations (MI01, MI02, MI03).

Species	MI01	MI02	MI03
Acanthohaustorius intermedius		381	39
Pseudoplatyischnopus floridanus	39	54	
Clymenella torquata		54	4
Polychaeta (undet.)	15	31	12
Tellina sp.		58	
Parahaustorius longimerus		4	54
Nemertina (undet.)	4	46	4
Opheliidae (undet.)		39	12
Magelona sp.	8	8	8
Tellina alternata	23		
Pelecypoda (undet.)			23
Dissodactylus mellitae		19	
Nephtys picta		16	
Dosinia discus	8	8	
Pagurus sp.		15	
Tharyx setigera		12	
Nephtys bucera		4	8
Onuphis eremita	12		
Spiophanes bombyx		12	
Donax variabilis			12
Chiridotea stenops	8	4	
Amphipoda (undet.)	8	4	
Euceramus praelongus		12	

Table 6. (cont.)

Species	MI01	MI02	MI03
Glycera dibranchiata		4	4
Maldanidae (undet.)	8		
Terebra dislocata	8		
Oxyurostylus smithi	8		
Mellita quinquesperforata		8	
Renilla reniformis		4	
Nephtys sp.	4		
Nereis sp.		4	
Owenia fusiformis		4	
Oweniidae (undet.)	4		
Aricidea sp.		4	
Sabellaria vulgaris		4	
Dentalium eboreum	4		
Mercenaria mercenaria		4	
Olivella floralia		4	
Terebra concava	4		
Turbonilla curta	4		
Túrbonilla dalli		4	
Solen viridis	4		
Ostracoda (undet.)	4		
Mysidacea (undet.)	4		
Edotea montosa		4	
Isopoda (undet.)		4	
Ampelisca sp.	4		

Table 6. (cont.)

Species	MI01	MI02	MI03
Erichthonius brasiliensis	4		
Ophiuroidea (undet.)		4	
Branchiostema sp.		4	
No. Individuals	189	841	180
No. Species	22	33	11
Species Richness	4.01	4.75	1.93
Species Diversity (H')	4.03	3.32	2.93
Equitability (J')	0.91	0.66	0.85

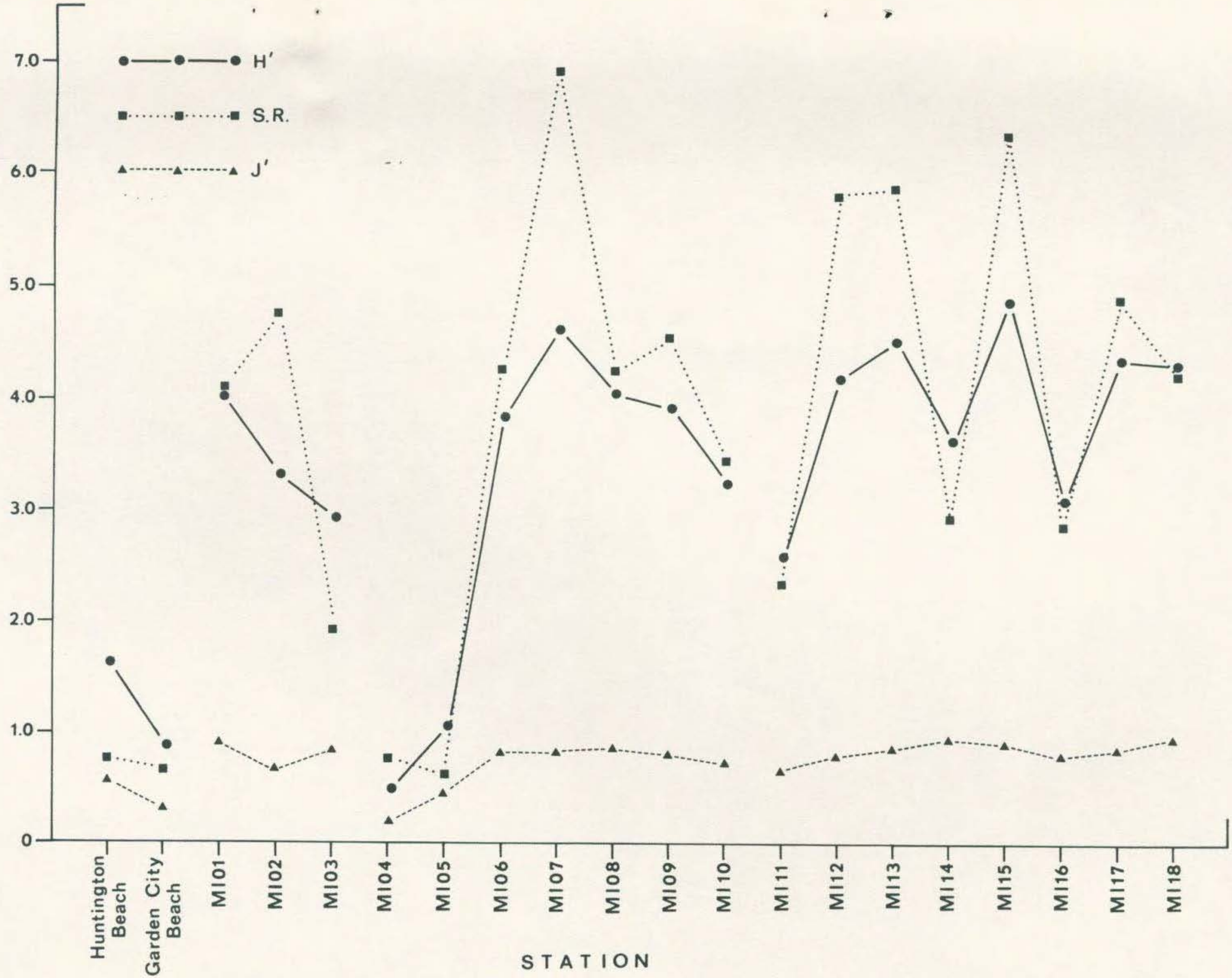

FIGURE 3. Species diversity (H'), species richness (SR), and equitability (J') values for stations in the Murrells Inlet area.

Table 7. Benthic invertebrates from oyster dredge collections made at three stations (MI01, MI02, MI03) in the Entrance Channel.

Species	MI01	MI02	MI03
Phylum Bryozoa			
Membranipora tenuis			+
Phylum Sipunculida			
Siphonosoma cumanense	+		
Phylum Echiurida			
Thalassema hartmani		+	
Phylum Annelida			
Glycera dibranchiata		+	
Clymenella torquata		+	
Sabellaria vulgaris	+		
Phylum Mollusca			
Sinum perspectivum	+	+	
Oliva sayana		+	
Abra lioica		+	
Dentalium eboreum		+	
Phylum Arthropoda			
Unciola serrata		+	
Penaeus a. aztecus		+	
Euceramus praelongus		+	
Pagurus pollicaris		+	
Hepatus epheliticus		+	
Ovalipes ocellatus		+	
Portunus spinimanus		+	
Phylum Echinodermata			
Asterias forbesi		+	
Luidia clathrata	+		
Astropecten articulatus	+	+	
Hemipholis elongata		+	
Mellita quinquesperforata	+	+	
Spatangoidea (undet.)	+		
No. Species	7	18	1

Stations MI04 through MI10 covered the channel of Main Creek from just inside the inlet to the region of the fishing pier adjacent to Captain Dick's marina at the town of Murrells Inlet. The bottom at stations MI04 and MI05 was well-scoured and the biota of these two stations was sparce. Only six species and 141 individuals (an estimated 544 m^{-2}) were present in grab samples from station MI04. At station MI05, five species and 150 individuals (578 m^{-2}) were collected. Most of the individuals at both stations were haustoriid amphipods. Species diversity at these two stations (Fig. 3) was extremely low, with H' values of 0.53 bits/individual at station MI04 and 1.08 bits/individual at MI05. Dredge samples likewise yielded few specimens at any of these stations, and none of those captured were of commercial importance.

Species diversity (Fig. 3), the number of species in both dredge and grab samples (Fig. 4), and biomass began to increase at station MI06, and a "live-bottom" area was encountered at station MI07 (Tables 8, 9). The bottom community here was perhaps the richest of any area sampled in the inlet. The high standing crop of benthic organisms at this station was attributed in large part to the amount of available shell in the area, which provided substrate for a rich epibenthic community. Sponges, bryozoans, and bivalves were dominant members of this community as indicated by dredge samples. Of 46 species taken in grab samples at this station, the most abundant animal was the bivalve *Chione cancellata*. An estimate of over 160 *C. cancellata* per square meter was made for the area sampled based on grab collections. Polychaetes were also well-represented at this station, and most amphipods were epifaunal rather than infaunal. Species richness, equitability (J'), and species diversity (H') all fluctuated somewhat from stations MI08 through MI10 (Figs. 3, 4), but remained high. Polychaetes and the bivalve *Tellina* sp. were numerical dominants in grab samples at these three stations. While several

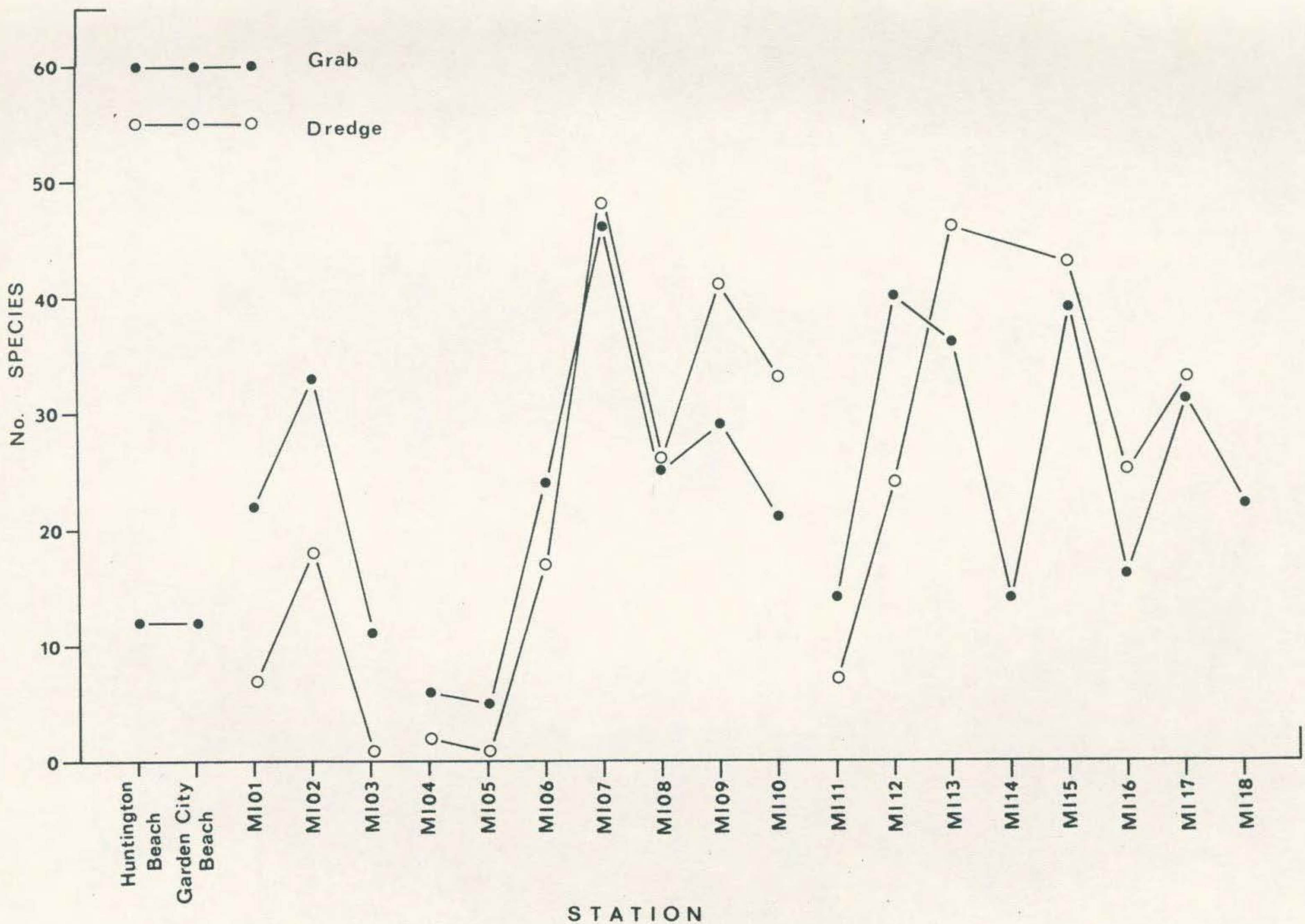

FIGURE 4. Number of species in dredge and grab samples at each station in the Murrells Inlet area.

Table 8. Species of macroinvertebrates collected in the Inner Channel, and their estimated densities in numbers m^{-2}. Estimates are based on two 0.13 m^2 Petersen Grab samples at each of seven stations (MI04, MI05, MI06, MI07, MI08, MI09, MI10).

Species	MI04	MI05	MI06	MI07	MI08	MI09	MI10
Parahaustorius longimerus	501	439	27				
Tellina sp.			4		39	135	135
Chione cancellata				166			
Polychaeta (undet.)	4	8	8	23	46	39	35
Acanthohaustorius intermedius		100	4			4	
Clymenella torquata			4	19	12	54	15
Nephtys bucera	27	27	4			8	39
Tharyx setigera				15		35	35
Nereis succinea			54	4	8	8	4
Nucula proxima			4	19	4	27	4
Capitellidae A (undet.)				50			
Glycera dibranchiata	4			15	8	15	8
Balanus amphitrite niveus				4	39	4	
Spiophanes bombyx			4	19	4	19	
Magelona sp.			31		4		
Paracaprella tenuis			4	27	4		
Arabella iricolor			4	19	8		
Pelecypoda A (undet.)				4	4	15	8
Ampelisca vadorum			8	19		4	
Ophiuroidea (undet.)	4			23			4
Batea catharinensis			4	23			
Glycera americana				4	19		

Table 8. (cont.)

Species	MI04	MI05	MI06	MI07	MI08	MI09	MI10
Onuphis eremita					19	4	
Brachidontes exustus			8			15	
Donax variabilis		4	19				
Isopoda (undet.)						8	15
Syllidae (undet.)			4	15			4
Ampelisca sp.					19		
Erichthonius brasiliensis				19			
Unciola sp.				19			
Podarke obscura				8		8	
Sigambra sp.				8		8	
Lepidonotus sublevis				12	4		
Sabella microphthalma				12		4	
Amphipoda (undet.)				8	4		4
Hemipholis elongata						15	
Capitellidae B (undet.)				4			8
Molgula manhattensis				12			
Actiniaria (undet.)						8	
Nemertina (undet.)					4		4
Drilonereis longa							8
Heteromastus filiformis						8	
Pectinaria gouldii				4	4		
Sabellaria vulgaris				8			
Hydroides dianthus				8			
Sthenelais boa				4		4	
Polydora sp.					8		

Table 8. (cont.)

Species	MI04	MI05	MI06	MI07	MI08	MI09	MI10
Trachycardium muricatum				8			
Dosinia discus						8	
Pelecypoda B (undet.)				4		4	
Gammarus sp.					8		
Stenothoe sp.				8			
Lysianopsis alba						4	4
Pinnixa sayana					8		
Arabella iricolor			4				
Glycera sp.						4	
Maldanidae (undet.)			4				
Nephtys sp.					4		
Diopatra cuprea				4			
Haploscoloplos sp.							4
Phyllodoce arenae				4			
Phyllodocidae (undet.)				4			
Orbiniidae (undet.)	4						
Autolytus sp.				4			
Syllis gracilis			4				
Modiolus sp.				4			
Mulinia lateralis							4
Lyonsia hyalina						4	
Pelecypoda C (undet.)			4				
Cerithiopsis sp.						4	
Seila adamsi				4			
Terebra concava			4				

Table 8. (cont.)

Species	MI04	MI05	MI06	MI07	MI08	MI09	MI10
Terebra sp.					4		
Elasmopus levis							4
Leucothoe sp.				4			
Trichophoxus epistomus				4			
Lembos websteri				4			
Corophium sp.				4			
Euceramus praelongus			4		4		
Pagurus sp.			4				
Pagurus pollicaris			4				
Cancer irroratus				4			
Arbacia punctulata				4			
Ophiothrix angulata							4
No. Individuals	544	578	223	662	289	477	350
No. Species	6	5	24	46	25	29	21
Species Richness	0.79	0.63	4.25	6.93	4.24	4.54	3.41
Species Diversity (H')	0.53	1.08	3.85	4.62	4.05	3.92	3.25
Equitability (J')	0.21	0.47	0.84	0.84	0.88	0.81	0.74

Table 9. Benthic invertebrates from oyster dredge collections made at seven stations (MI04, MI05, MI06, MI07, MI08, MI09, MI10) in the Inner Channel.

Species	MI04	MI05	MI06	MI07	MI08	MI09	MI10
Phylum Porifera							
Haliclona canaliculata				+			
Haliclona loosanoffi						+	
Lissodendoryx carolinensis				+		+	+
Axinella polycapella				+			
Homaxinella rudis		+					
Halichondria bowerbanki			+	+	+		+
Hymeniacidon heliophila			+	+			
Cliona celata			+	+	+	+	+
Phylum Cnidaria							
Ectopleura dumortieri							+
Halecium sp.			+	+			+
Campanulina sp.				+			
Lovenella grandis				+		+	+
Obelia bidentata							+
Dynamena cornicina				+		+	+
Schizotricha tenella				+		+	
Leptogorgia virgulata					+	+	+
Renilla reniformis				+	+		+
Astrangia danae				+	+	+	
Phylum Entoprocta							
Pedicellina cernua				+			
Barentsia gracilis				+		+	
Barentsia laxa				+		+	+
Phylum Bryozoa							
Alcyonidium hauffi						+	
Arachnidium sp.						+	
Sundanella sibogae				+			
Nolella stipata				+	+		
Anguinella palmata				+	+	+	+
Amathia convoluta						+	+
Amathia distans						+	
Bowerbankia gracilis				+			
Aeverrillia armata				+			
Aeverrillia setigera				+	+		+
Membranipora arborescens						+	
Membranipora tenuis			+	+	+	+	+
Electra monostachys			+		+		+
Bugula neritina			+	+	+	+	+
Bugula stolonifera					+		
Schizoporella errata				+	+	+	+
Hippoporina verrilli				+	+	+	

Table 9. (cont.)

Species	MI04	MI05	MI06	MI07	MI08	MI09	MI10
Microporella ciliata			+				
Parasmittina nitida, A-type				+	+	+	+
Parasmittina nitida, B-type			+	+	+	+	+
Cryptosula pallasiana			+	+	+		+
Phylum Sipunculida							
Themiste alutacea					+		
Phylum Annelida							
Nereis succinea							+
Lepidonotus sublevis						+	+
Sabella microphthalma							+
Hydroides dianthus				+		+	
Phylum Mollusca							
Diodora cayenensis				+			
Crepidula plana				+			
Urosalpinx cinerea					+		+
Anadara ovalis							+
Noetia ponderosa						+	
Modiolus modiolus squamosus				+			
Anomia simplex				+			
Atrina serrata				+			
Crassostrea virginica			+	+		+	
Ostrea equestris				+		+	
Mercenaria mercenaria					+		
Chione cancellata				+		+	
Phylum Arthropoda							
Anoplodactylus lentus						+	+
Tanystylum orbiculare						+	
Balanus amphitrite niveus			+	+	+	+	
Balanus improvisus			+		+	+	
Batea catharinensis				+			
Sicyonia laevigata							+
Alpheus normanni				+			
Pagurus longicarpus	+		+				
Pagurus pollicaris			+	+		+	+
Clibanarius vittatus						+	
Neopanope sayi				+			
Panopeus herbstii				+	+	+	
Menippe mercenaria			+	+			+
Libinia dubia						+	
Phylum Echinodermata							
Asterias forbesi							+
Sclerodactyla briareus					+	+	
Ophioderma brevispinum					+		
Ophiothrix angulata					+	+	+

Table 9. (cont.)

Species	MI04	MI05	MI06	MI07	MI08	MI09	MI10
Arbacia punctulata				+			+
Mellita quinquesperforata	+						
Phylum Chordata							
Amaroucium constellatum				+		+	
Didemnum sp.			+			+	
Perophora viridis				+		+	
No. Species	2	1	17	48	26	41	33

commercially important species were found in the dredge at stations MI06 through MI10, including the American oyster, Crassostrea virginica, the hard clam, Mercenaria mercenaria, and the stone crab, Menippe mercenaria, sampling was of insufficient intensity to reliably indicate abundances of these species. Although it is not a commercially-exploited species, the edible cross-barred venus clam Chione cancellata appeared in large numbers at station MI09 as well as MI07. A few small rock shrimp, Sicyonia laevigata, were also collected along this stretch of the inner channel.

Clearly, any dredging operations in the Main Creek channel of Murrells Inlet will most seriously affect the benthos in the region between stations MI06 and MI10. A number of commercially valuable species occur along this reach of the creek, including oysters, hard clams, and stone crabs. Studies made elsewhere comparing natural and altered areas have shown that the resiliency of benthic communities following disruption varies greatly (Gilmore and Trent, 1974; Grassle and Grassle, 1974; Kaplan, Welker, and Kraus, 1974; Reish, 1961; Sanders, 1974), with the magnitude of any reduction in benthic production dependant on numerous factors. While it has generally been accepted that diverse systems such as those found in parts of high-salinity Murrells Inlet are better able to resist disturbances of given magnitude than the lower diversity systems of estuaries, such a belief has recently been challenged in convincing studies by Copeland (1970) and Boesch (1972, 1974), and the reverse would appear to be true. Organisms occurring in brackish waters are generally much more resistant and resilient to stress than those restricted to areas of higher salinity, and an estuarine system would probably be less affected by a given stress than a relatively stable high salinity environment such as Murrells Inlet.

In addition to stations in the entrance channel and Main Creek, a series of stations was selected in adjacent waterways within the inlet. Several of

Table 10. Species of macroinvertebrates collected in the adjacent waterways, and their estimated densities in numbers m^{-2}. Estimates are based on two 0.13 m^2 Petersen Grab samples at each of eight stations (MI11, MI12, MI13, MI14, MI15, MI16, MI17, MI18).

Species	MI11	MI12	MI13	MI14	MI15	MI16	MI17	MI18
Capitellidae A (undet.)	4	185			19	12		8
Lembos websteri		85	19		8		69	
Streblospio benedicti	85	23				4	31	8
Chione cancellata		8	65	4	31	27		
Paraprionospio pinnata	96	8					23	4
Polychaeta (undet.)	4	27	8	8	46	4	31	
Ophiuroidea (undet.)		92	19		15			
Clymenella torquata			4	4	4	69	19	4
Glycera dibranchiata		4	4		19	15	19	12
Ampelisca vadorum		4	50		4		12	
Arabella iricolor	4	42	8		8			
Nucula proxima		4	15	12	19	8		
Notomastus sp.							54	
Melita fresneli		42	12					
Tellina sp.	19		8			12	4	8
Nereis succinea		12			8		31	
Syllidae A (undet.)		31			19			
Panopeus herbstii		35			15			
Nemertina (undet.)	12	4	12			4	8	8
Tharyx setigera	4			4			31	
Corbula sp.	8	8	8	15				
Pista sp.			12	4	19			
Mercenaria mercenaria				4	4	8	4	15

Table 10. (cont.)

Species	MI11	MI12	MI13	MI14	MI15	MI16	MI17	MI18
Pelecypoda A (undet.)		35						
Amphipoda (undet.)		15				4	15	
Ophiothrix angulata		35						
Sipunculida (undet.)		19		8	4			
Mulinia lateralis			4		4		15	4
Unciola serrata			4		8		12	
Sabella microphthalma		8			4		12	
Holothuroidea (undet.)			19		4			
Cirratulidae					12			8
Potamilla reniformis		8					12	
Syllidae B (undet.)					12			8
Abra lioica			8		4	4		4
Paracaprella tenuis			12		8			
Sthenelais boa		4	8		4			
Stauronereis rudolphi		12			4			
Nereis sp.					15			
Syllidae C (undet.)					15			
Trachycardium muricatum			15					
Maera sp.		15						
Orbiniidae	8						4	
Pectinaria gouldii			4				8	
Pinnixa sp.			8					4
Hemipholis elongata			4	8				
Capitellidae B (undet.)		8						

Table 10. (cont.)

Species	MI11	MI12	MI13	MI14	MI15	MI16	MI17	MI18
Glycera americana	4	4						
Podarke obscura				4		4		
Axiothella mucosa					8			
Phyllodocidae (undet.)							4	4
Polydora sp.							8	
Spionidae (undet.)					8			
Syllidae D (undet.)					8			
Seila adamsi		8						
Fasciolaria tulipa		8						
Bullidae (undet.)	4			4				
Ostrea equestris		4					4	
Crassostrea virginica		4						4
Trachycardium egmontianum			4					4
Semele proficua			8					
Martesia sp.		8						
Pelecypoda B (undet.)		4					4	
Oxyurostylus smithi					4	4		
Batea catharinensis			4		4			
Melita nitida								8
Gammaridae (undet.)			4					4
Leucothoe spinicarpa		4			4			
Neopanope sayi			8					
Eudendrium sp.							4	
Drilonereis longa							4	

Table 10. (cont.)

Species	MI11	MI12	MI13	MI14	MI15	MI16	MI17	MI18
Marphysa sanguinea		4						
Diopatra cuprea	4							
Lepidametria commensalis					4			
Sabellaria vulgaris								4
Spiophanes bombyx	4							
Syllidae E							4	
Nucula sp.								4
Solemya velum			4					
Barbatia candida			4					
Semele sp.					4			
Chione sp.			4					
Dosinia discus								4
Lyonsia hyalina					4			
Pelecypoda C (undet.)				4				
Callipallene brevirostris			4					
Cumacea (undet.)							4	
Trichophoxus epistomus		4						
Ampelisca sp.				4				
Lÿsianopsis alba					4			
Erichthonius brasiliensis								4
Corophium acherusicum							4	
Corophium sp.						4		
Alpheus armillatus		4						
Pagurus annulipes						4		
Pagurus sp.		4						
Pagurus pollicaris							4	

Table 10. (cont.)

Species	MI11	MI12	MI13	MI14	MI15	MI16	MI17	MI18
Portunus gibbesi			4					
Pinnixa chaetopterana							4	
Decapod juv. (undet.)			4					
Leptosynapta tenuis			4					
No. Individuals	260	837	386	87	392	187	462	135
No. Species	14	40	36	14	39	16	31	22
Species Richness	2.34	5.80	5.88	2.91	6.36	2.87	4.89	4.28
Species Diversity (H')	2.59	4.29	4.58	3.62	4.87	3.19	4.36	4.31
Equitability (J')	0.68	0.81	0.89	0.96	0.92	0.80	0.88	0.97

Table 11. Benthic invertebrates from oyster dredge collections made at eight stations (MI11, MI12, MI13-14, MI15, MI16, MI17-18) in the adjacent waterways.

Species	MI11	MI12	MI13-14	MI15	MI16	MI17-18
Phylum Porifera						
Haliclona canaliculata			+			
Lissodendoryx carolinensis			+	+		
Microciona prolifera			+	+	+	+
Halichondria bowerbanki		+	+	+		
Hymeniacidon heliophila			+	+		
Cliona celata		+	+	+	+	+
Phylum Cnidaria						
Ectopleura dumortieri				+		
Halocordyle disticha			+			
Eudendrium carneum				+		
Halecium sp.		+		+		
Campanulina sp.		+				
Lovenella grandis		+		+		
Dynamena cornicina		+	+	+	+	
Schizotricha tenella		+	+	+	+	+
Leptogorgia virgulata		+	+			+
Renilla reniformis		+				
Phylum Entoprocta						
Loxosomella cricketae			+			
Pedicellina cernua		+	+	+	+	
Barentsia gracilis				+	+	
Barentsia laxa			+	+	+	+
Phylum Bryozoa						
Alcyonidium hauffi		+	+	+		+
Arachnidium sp.		+				
Anguinella palmata			+	+		+
Amathia distans			+	+		+
Zoobotryon verticillatum			+	+		+
Bowerbankia gracilis				+		+
Aeverrillia armata				+		
Aeverrillia setigera				+	+	
Membranipora arborescens			+			
Membranipora tenuis			+	+	+	
Bugula neritina	+	+	+	+	+	
Bugula stolonifera				+	+	+
Schizoporella errata		+		+	+	
Hippoporina verrilli		+	+	+	+	
Microporella ciliata					+	
Parasmittina nitida, A-type			+	+	+	
Parasmittina nitida, B-type		+	+	+	+	+
Cryptosula pallasiana		+			+	

Table 11. (cont.)

Species	MI11	MI12	MI13-14	MI15	MI16	MI17-18
Phylum Annelida						
<u>Pectinaria gouldii</u>				+		
<u>Sabellaria vulgaris</u>			+			
<u>Sabella microphthalma</u>						+
<u>Hydroides dianthus</u>		+	+			
Phylum Mollusca						
<u>Chaetopleura apiculata</u>			+			
<u>Diodora cayenensis</u>			+			+
<u>Crepidula plana</u>	+					+
<u>Urosalpinx cinerea</u>	+					
<u>Pleuroploca gigantea</u>			+			
<u>Anadara ovalis</u>	+					+
<u>Noetia ponderosa</u>					+	+
<u>Brachidontes exustus</u>			+			+
<u>Anomia simplex</u>		+				
<u>Pteria colymbus</u>						+
<u>Crassostrea virginica</u>				+		+
<u>Ostrea equestris</u>			+			
<u>Mercenaria mercenaria</u>					+	+
<u>Chione cancellata</u>		+	+		+	
Phylum Arthropoda						
<u>Callipallene brevirostris</u>			+			
<u>Anoplodactylus lentus</u>		+				
<u>Tanystylum orbiculare</u>				+		+
<u>Balanus amphitrite niveus</u>	+	+		+	+	
<u>Balanus improvisus</u>				+	+	
<u>Melita fresneli</u>			+	+		
<u>Penaeus a. aztecus</u>			+			+
<u>Palaemonetes</u> sp.			+			
<u>Pagurus pollicaris</u>						+
<u>Hepatus epheliticus</u>				+		
<u>Callinectes sapidus</u>				+		
<u>Ovalipes ocellatus</u>		+				
<u>Hexapanopeus angustifrons</u>				+	+	
<u>Panopeus herbstii</u>			+	+	+	+
<u>Menippe mercenaria</u>			+			
<u>Pilumnus sayi</u>			+	+		
<u>Libinia emarginata</u>			+			+
Phylum Echinodermata						
<u>Asterias forbesi</u>	+					
<u>Echinaster serpentarius</u>			+			
<u>Sclerodactyla briareus</u>			+			
<u>Ophioderma brevispinum</u>				+		
<u>Ophiothrix angulata</u>	+		+	+	+	+
<u>Arbacia punctulata</u>						+

Table 11. (cont.)

Species	MI11	MI12	MI13-14	MI15	MI16	MI17-18
Phylum Chordata						
Amaroucium constellatum		+	+			+
Didemnum sp.			+	+		+
Perophora viridis			+	+		+
Styela sp.						+
Molgula manhattensis			+			+
No. Species	7	24	46	43	25	33

the station locations chosen were rather close together because there were few available areas where the water was deep enough for the two boats used during benthic sampling to operate safely. The first of these stations (MI11) was located in an altered area near a development at the southwestern end of Garden City. The bottom type in this area was black, silty mud, and relatively few species were present (Fig. 4). The spionid polychaetes Streblospio benedicti and Paraprionospio pinnata predominated in grab samples at this station. With the exception of MI16, the remaining stations in the adjacent waterways were all relatively rich "live-bottom" areas (Tables 10, 11; Fig. 4). Species of commercial significance in these samples included the American oyster, Crassostrea virginica, the hard clam, Mercenaria mercenaria, and the stone crab, Menippe mercenaria. A few specimens of the brown shrimp, Penaeus aztecus, and the blue crab, Callinectes sapidus, were also present in the samples. As with several stations in Main Creek, the cross-barred venus clam Chione cancellata was common to abundant in samples from these stations. The hard clam, Mercenaria mercenaria, was particularly well-represented in collections from the Parsonage Creek area (stations MI16-MI18).

Marsh Vegetation

The floral composition of the wetlands in Murrells Inlet reflects the high salinity environment of the area. The tidal marshes of the inlet may be divided into two categories, low marsh and high marsh, based upon elevation and vegetation composition. The low marsh is intertidal, extending from the mean low water mark approximately to the mean high tide level; the high marsh ranges above this zone. A monospecific association characterized by Spartina alterniflora represents the low marsh vegetation. In contrast, the high marsh flora is quite varied. A list of marsh plants observed in the area is presented in Table 12.

Table 12. List of observed marsh plants in Murrells Inlet, July 1975.

SCIENTIFIC NAME	COMMON NAME	LOCATION
Spartina alterniflora	Smooth cordgrass	Low & high marshes
Spartina patens	Wiregrass	High marsh
Sporobolus virginicus	Dropseed	High marsh
Borrichia frutescens	Sea ox-eye	High marsh
Limonium carolinianum	Sea lavender	High marsh
Uniola paniculata	Sea oats	High marsh
Hydrocotyle sp.	Pennywort	High marsh
Croton punctatus		High marsh
Solidago sempervirens	Seaside goldenrod	High marsh
Suaeda linearis	Sea-blite	High marsh (spoil area)
Salicornia virginica	Glasswort	High marsh (spoil area)
Distichlis spicata	Spike grass	High marsh
Juncus roemerianus	Needlerush	High marsh
Iva frutescens	High tide bush	High marsh
Fimbristylis spadicea		High marsh
Sabatia stellaris	Sea pink	High marsh
Cyperus ovularis	Sedge	High marsh
Elymus virginicus	Wild ryegrass	High marsh
Opuntia drummondi	Cactus	High marsh
Bacopa monnieri		High marsh

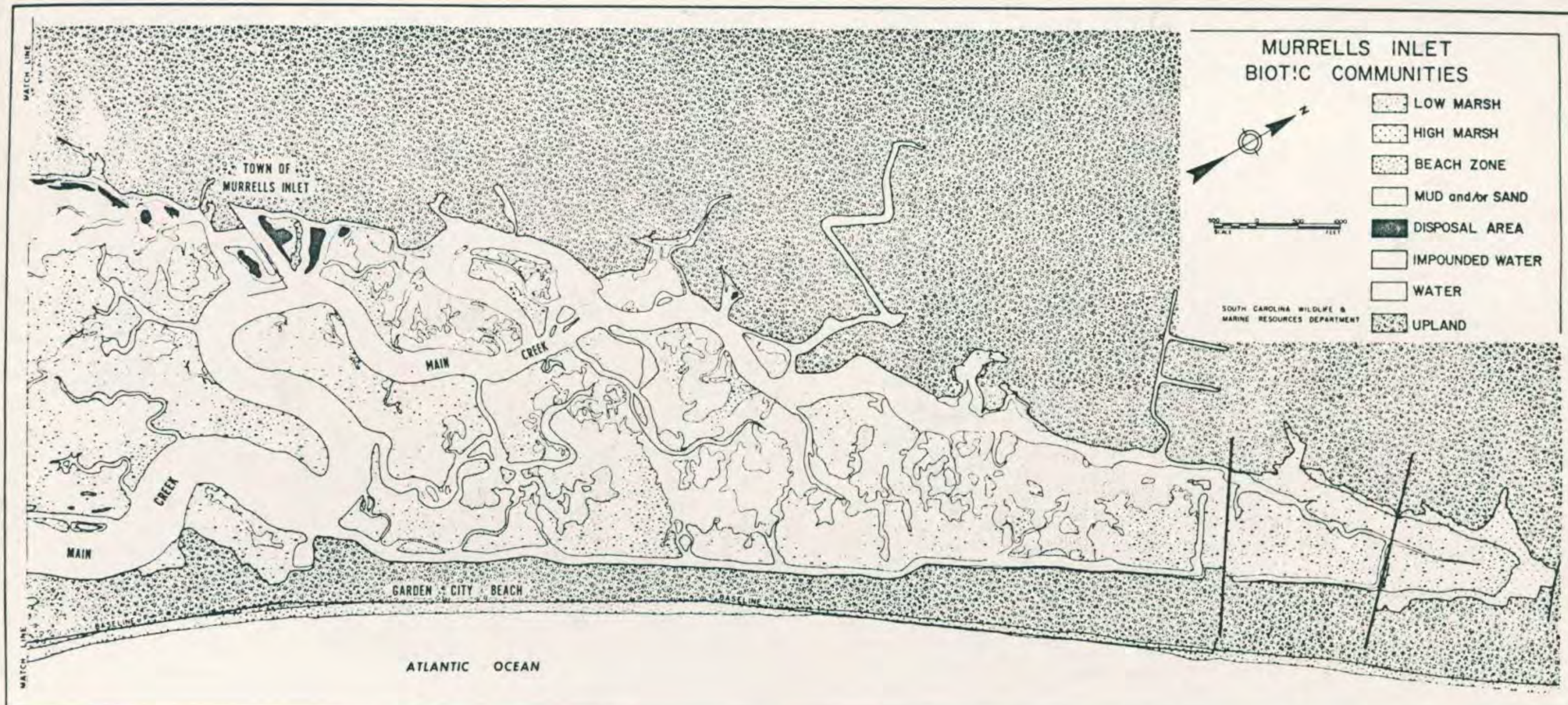

Fig. 5. Habitat types of Murrells Inlet, South Carolina.

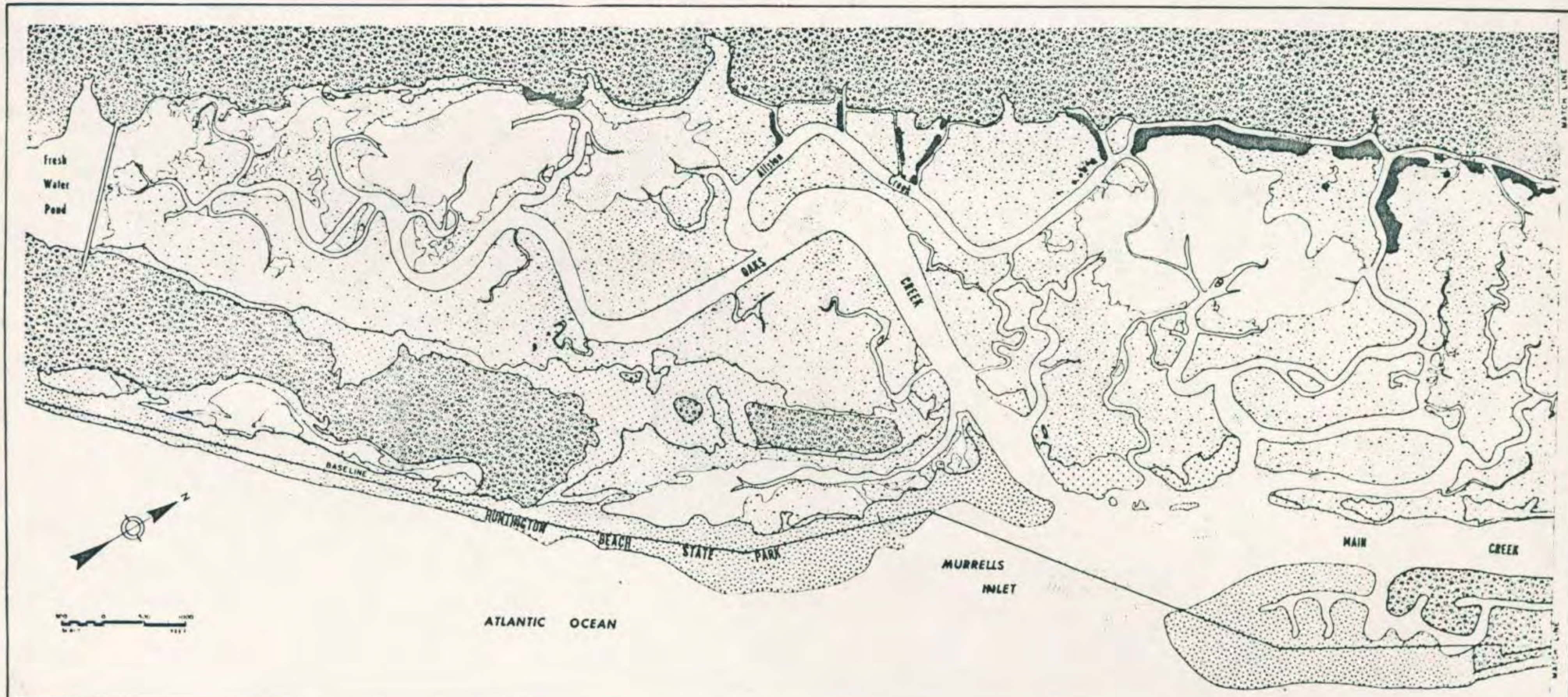

Fig. 5. Continued.

Approximately 1700 acres of tidal marshlands occur in Murrells Inlet; low marsh comprises about 90% of this total (Fig. 5). Along tidal creeks in the low marsh, S. alterniflora grows vigorously to its maximum height of about 2 m. When S. alterniflora is found in the high marsh, its form is typically stunted, reaching only 0.1-0.3 m in height. The low marsh is therefore regarded as the more productive area.

The high marshes adjacent to Main Creek near the mouth of the inlet were fringed by S. alterniflora. Marginal bands of S. patens and Borrichia frutescens were present where low marsh graded into high marsh. Sea oats (Uniola paniculata), typically associated with sand dunes and indicative of the sandy substrate, was quite common in these marshes. Close inspection of these high marshes revealed a fairly dense ground cover of Sporobolus virginicus, with Limonium carolinianum, Fimbristylis spadicea, Solidago sempervirens, Cyperus ovularis, and Opuntia drummondi also being prevalent. Other marsh plants present are listed in Table 12.

Most of the high marsh associated with Murrells Inlet lies on the landward side of Huntington Beach. Here, large areas of sand flats commonly exist. These flats are generally fringed with stunted growths of Salicornia virginica, Spartina alterniflora, and Limonium carolinianum. Proceeding toward the highland from these flats, a vegetative zone characterized by the occurrence of Borrichia frutescens, Distichlis spicata, and Limonium carolinianum appears. Two other marsh plants, Fimbristylis spadicea and Iva frutescens, enter this zone near the edge of the maritime forest. Juncus roemerianus is also a dominant member of the high marsh flora. It occurs either as isolated clumps among the other high marsh plants or as marginal bands adjacent to the upland.

Spoil areas in the Murrells Inlet system were sparsely vegetated with several species, including Spartina alterniflora, Salicornia virginica, Limonium carolinianum, Suaeda linearis, and Borrichia frutescens. S. alterniflora grows in a stunted form in the spoil areas, resembling its growth in the high marshes.

Oyster Reefs

Intertidal oyster reefs within the study area totalled approximately 12 acres. This included shoreline reefs along tidal creeks and isolated reefs located in shoal and flat areas. The location and size of the intertidal oyster reefs within 0.5 miles of the centerline of the proposed channel is shown in Fig. 6. Subtidal oyster reefs are not present to any extent in the Murrells Inlet area, and are limited to small areas immediately adjacent to intertidal reefs and in the headwaters of smaller creeks. No significant subtidal reefs were located within the study area.

Miscellaneous Habitat Types

Important wetland habitat types of the Murrells Inlet area in addition to marshlands and oyster reefs include intertidal sand and/or mud flats, disposal areas, sandy beach zone, open water, and impoundments (Fig. 5). A listing of the acreages of various habitat types, excluding uplands, of Murrells Inlet is given in Table 13.

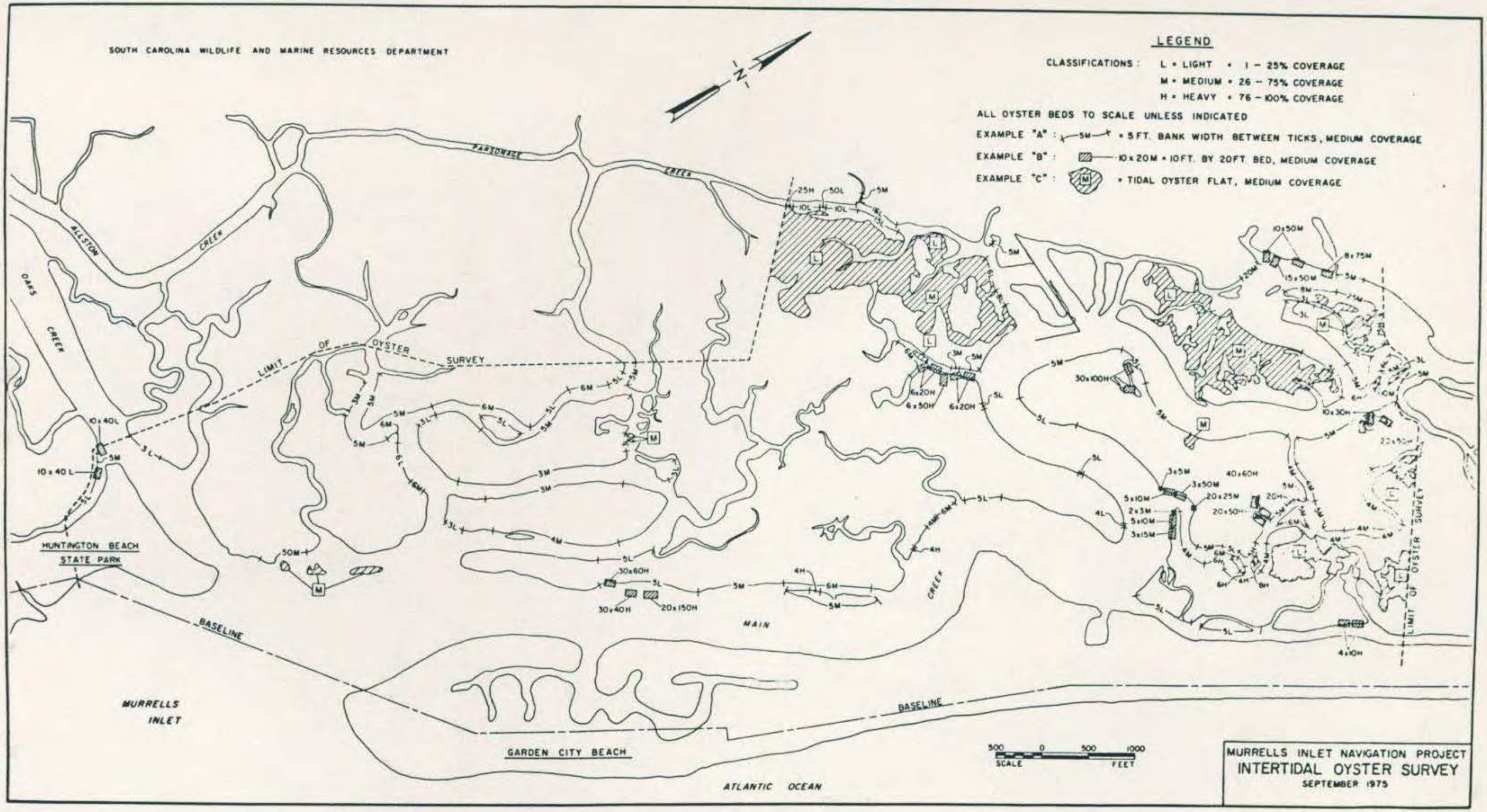

Fig. 6. Location and size of intertidal oyster reefs in Murrells Inlet, South Carolina.

Table 13. Predominant wetland habitat types of the Murrells Inlet region, and the number of acres for each.

HABITAT TYPE	NUMBER OF ACRES	% OF TOTAL
Low marsh	1520	45.7
High marsh	170	5.1
Beach	270	8.1
Mud and/or Sand	660	19.8
Disposal areas	30	0.9
Impounded water	20	0.6
Freshwater pond	30	0.9
Open water	630	18.9
TOTAL ACREAGE	3330	100 %

SUMMARY AND RECOMMENDATIONS

Environmental studies were conducted during late spring and summer of 1975 to inventory the macrobenthic communities, marshlands, oyster reefs, and other wetland areas of Murrells Inlet, South Carolina. This is the first time that benthic communities and wetlands of this high salinity inlet have been studied and charted in detail.

Murrells Inlet is an interesting and unusual coastal area in being isolated from estuarine areas of the state. It conforms rather closely to the definition of a neutral embayment, despite its small size, with little freshwater inflow and with precipitation approximating evaporation. Accordingly, salinities are generally in the euhaline range throughout the inlet. Species diversity, which usually decreases progressively toward the head of an estuary (Carriker, 1967; Remane and Schlieper, 1971; Boesch, 1972), was highest well inside the inlet and lowest at the mouth. Such a pattern is rather typical of a neutral embayment (Glooschenko and Harriss, 1974) and reflected the absence of a salinity gradient. Fluctuations in species diversity were primarily attributable to differences in substrate type.

The Murrells Inlet area serves as a nursery ground for such species as penaeid shrimp, crabs, and finfishes, provides habitat for the adults of several sport-fish species, and is a productive shellfish growing area. It also constitutes an important harbor for recreational craft as well as a number of charter fishing boats. As a result of its recreational fisheries, shellfish resources, and general aesthetic values, the Murrells Inlet system is very important to the economy of the area. This study was undertaken to provide a biological inventory of the area prior to commencement of the Murrells Inlet Navigation Project, which would provide a stabilized channel into the area and would include the construction of two jetties at the entrance.

Dredge and grab collections taken during 1975 indicated that a relatively small number of benthic invertebrate species occur in the entrance channel. Dominant animals in the samples included haustoriid amphipods and the sand dollar, Mellita quinquesperforata. Channel dredging adjacent to the inlet mouth is expected to have only short-term effects on benthic communities and no serious adverse effects on the ecology of this area are likely. Previous studies in other areas along the South Carolina coast by the Marine Resources Division (Shealy, Boothe, and Bearden, 1975; Shealy, Boothe, and Bearden, unpublished data) have indicated that dredging of the depth and magnitude proposed for the entrance channel results in insignificant long-range effects on the bottom fauna. Jetty construction in the area is expected to provide substrate for the development of new epifaunal communities and habitat for numerous fish species.

Main Creek is sparsely populated with benthic invertebrates near the entrance, but elsewhere in this creek rich communities of both epifaunal and infaunal organisms are present. The most serious environmental effects from dredging in the Murrells Inlet area would occur in Main Creek between stations MI06 and MI10. The diverse benthic communities along this reach of the creek would be disturbed to a considerable extent, and the rate and degree of recovery would depend in large part upon the characteristics of the substrate once dredging is completed.

Haustoriid amphipods dominated in the intertidal samples from Huntington Beach. A rather sparse fauna dominated by the polychaete Nerinides unidentata was found on Garden City Beach. Rapid recovery of the intertidal communities of these beaches is anticipated should these areas be selected as sites for "beach nourishment".

Except in a canal area near the southwestern tip of Garden City, biomass and number of species was high in the adjacent waterways. Little effect on these populations from dredging activities is expected.

Marshlands in the inlet were distinguishable as high and low marsh areas depending upon elevation and vegetation composition. About 90% of a total of about 1700 acres of marshlands in the area is low marsh. Spartina alterniflora dominates the flora of the low marsh, considered the more productive of the two types. Greater floral diversity is present in the high marsh. Vegetation in spoil areas is sparse. Considering the limited acreage of existing wetlands, it is recommended that no regularly flooded marsh areas in Murrells Inlet be utilized as disposal areas for dredged material. Upland sites, open water ocean disposal, or use of dredged sandy material for beach nourishment are suggested alternatives.

Finally, oyster reefs in the inlet totalled about 22 acres, practically all of which were intertidal. Limited adverse effects on intertidal oyster reefs within the project area are expected if dredged materials are disposed of within a confined upland area and possibly on adjacent beaches. We do not foresee that dredging will be conducted close enough to existing intertidal oyster reefs to cause physical damage to these communities.

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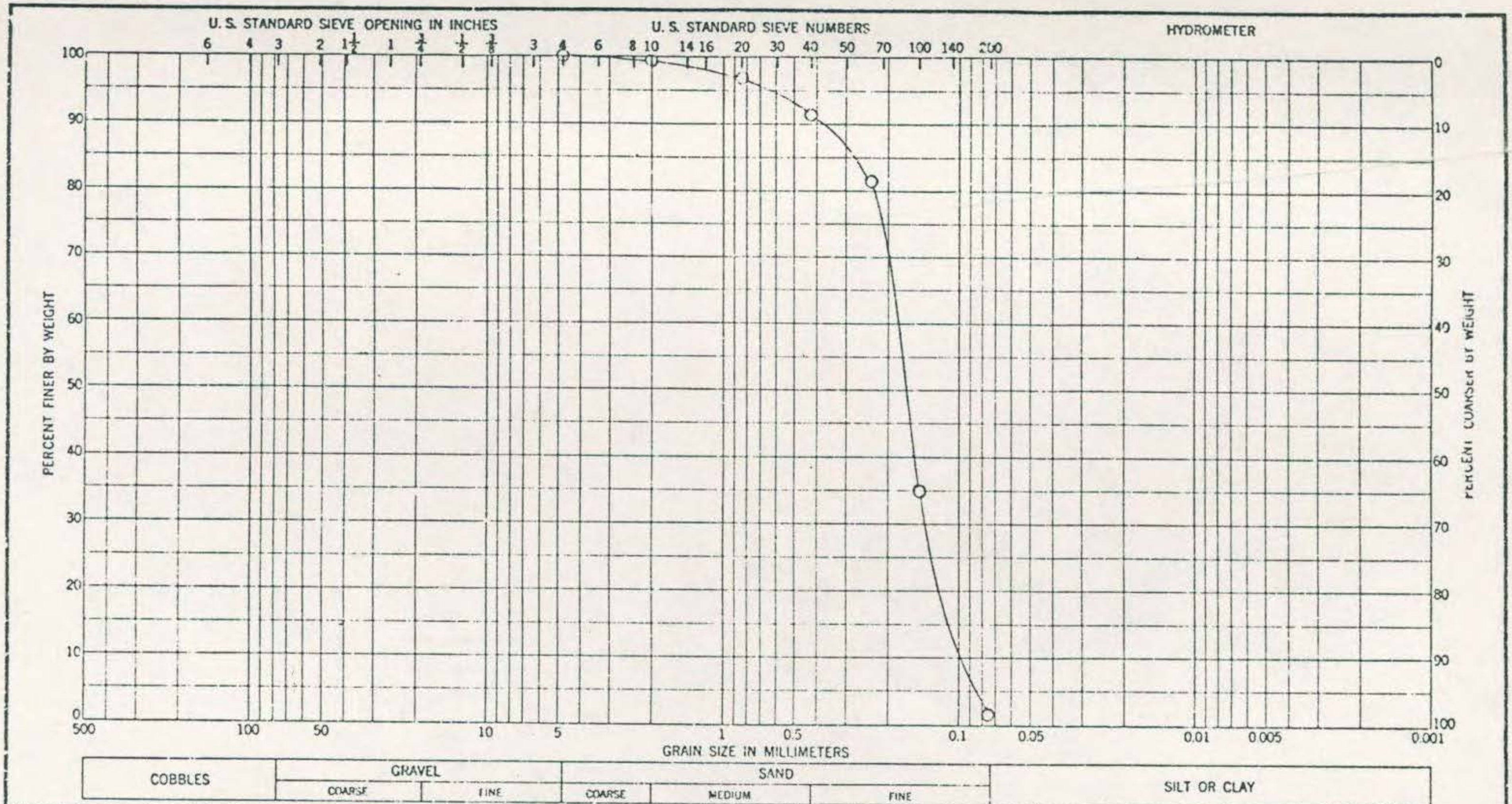


Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
75-019		Gray poorly graded sand	--	--.	--	--
		(SP) w/tr shell				
		Shell approx. 3%				

CHARLESTON DISTRICT

Project Murrells Inlet, S. C.

Lab. No. 3X-570*

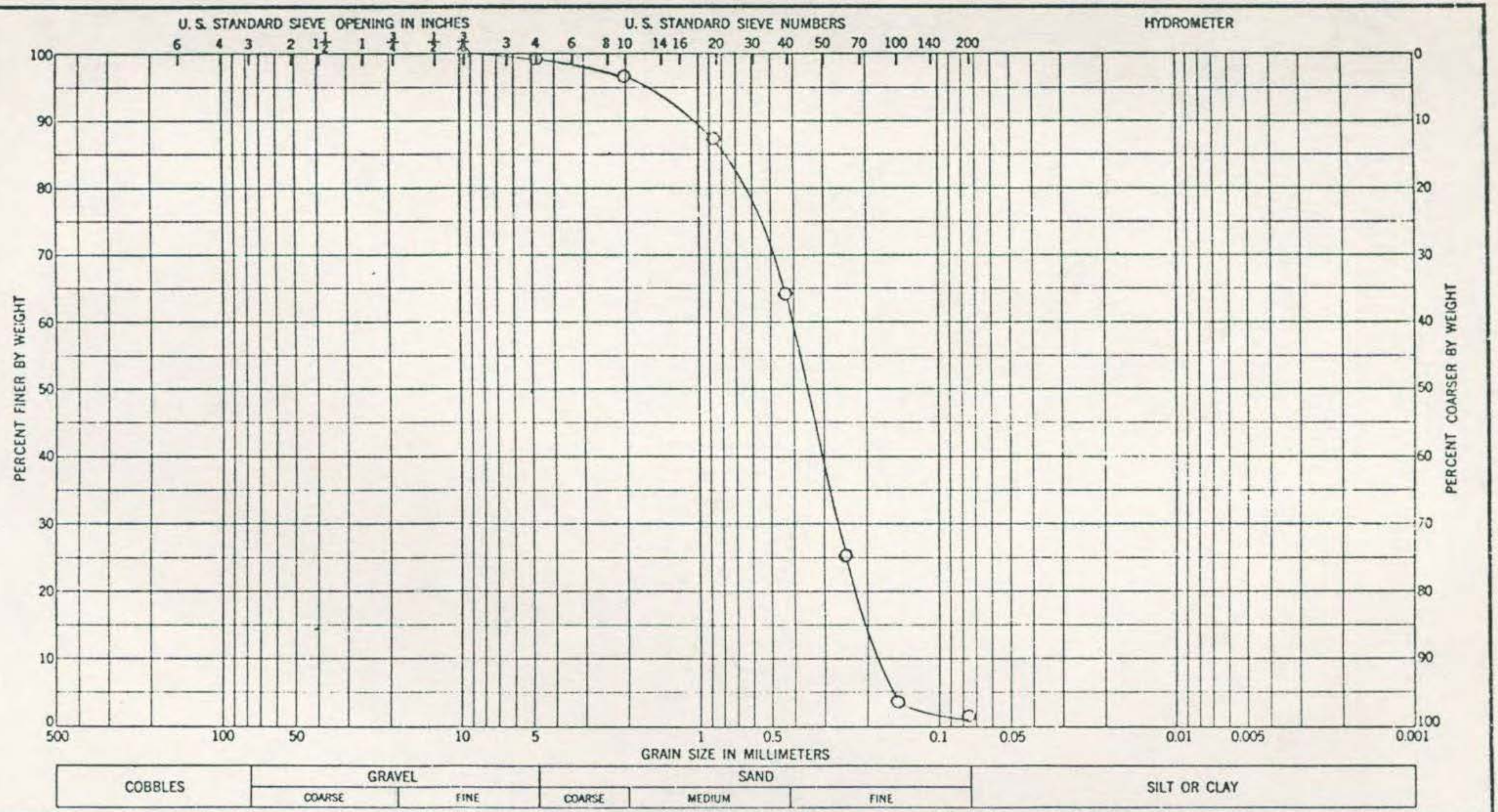
Area --

Boring No. -- Field Sample No. 75-019

Date 11 July 1975

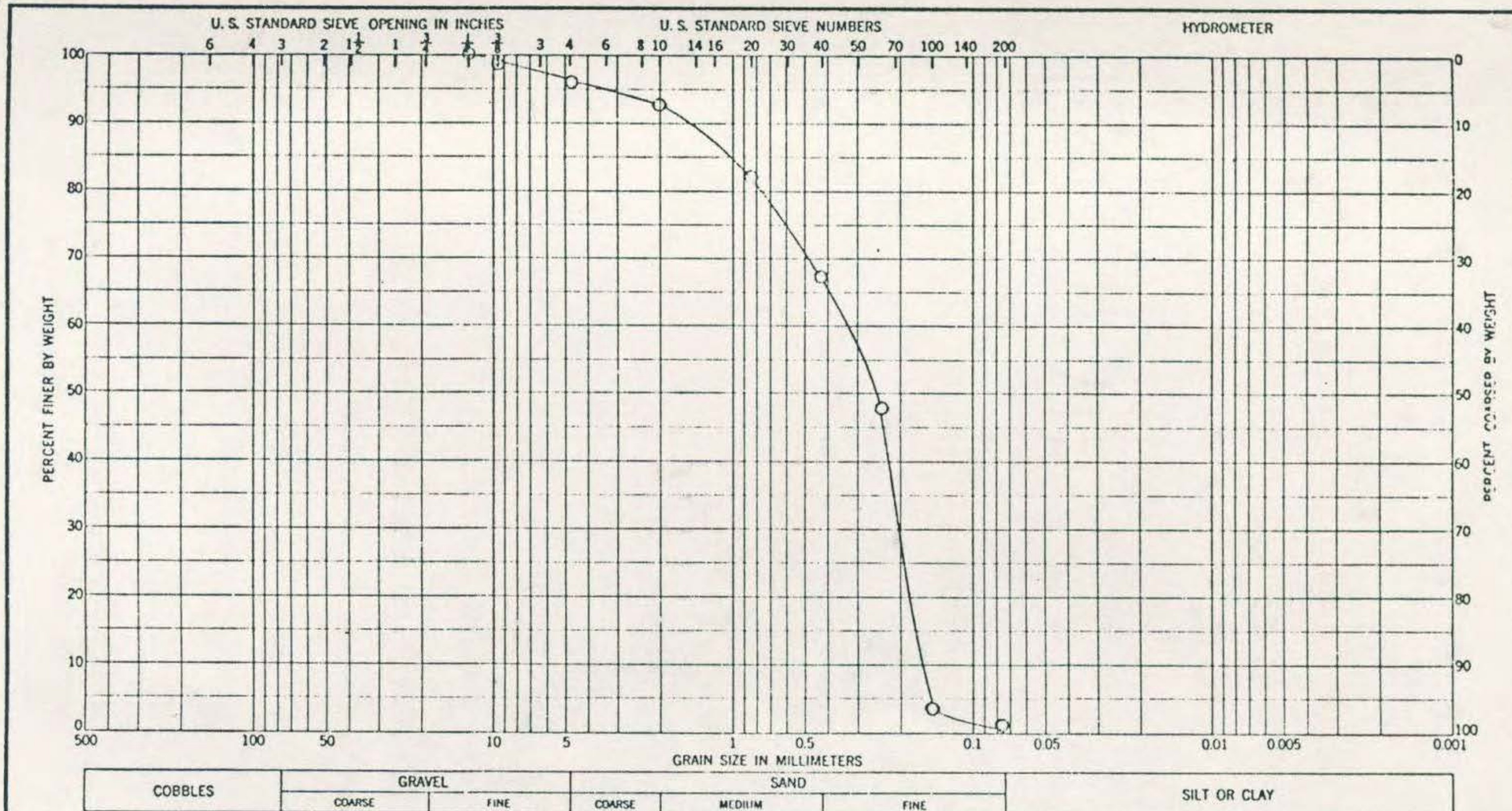
GRADATION CURVES

Appendix 1. Particle size analysis for sediments collected at Huntington Beach.



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI	
02-75 026	--	Tan poorly graded sand (SP) w/a little coarse and medium sand size shell	--	--	--	--	CHARLESTON DISTRICT Project Murrells Inlet, S. C. Lab. No. 3M-571*
							Area --
		Shell approx. 12%					Boring No. --Field Sample No. 02-75 026
GRADATION CURVES							Date 11 July 1975

Appendix 2. Particle size analysis for sediments collected at station MI03.

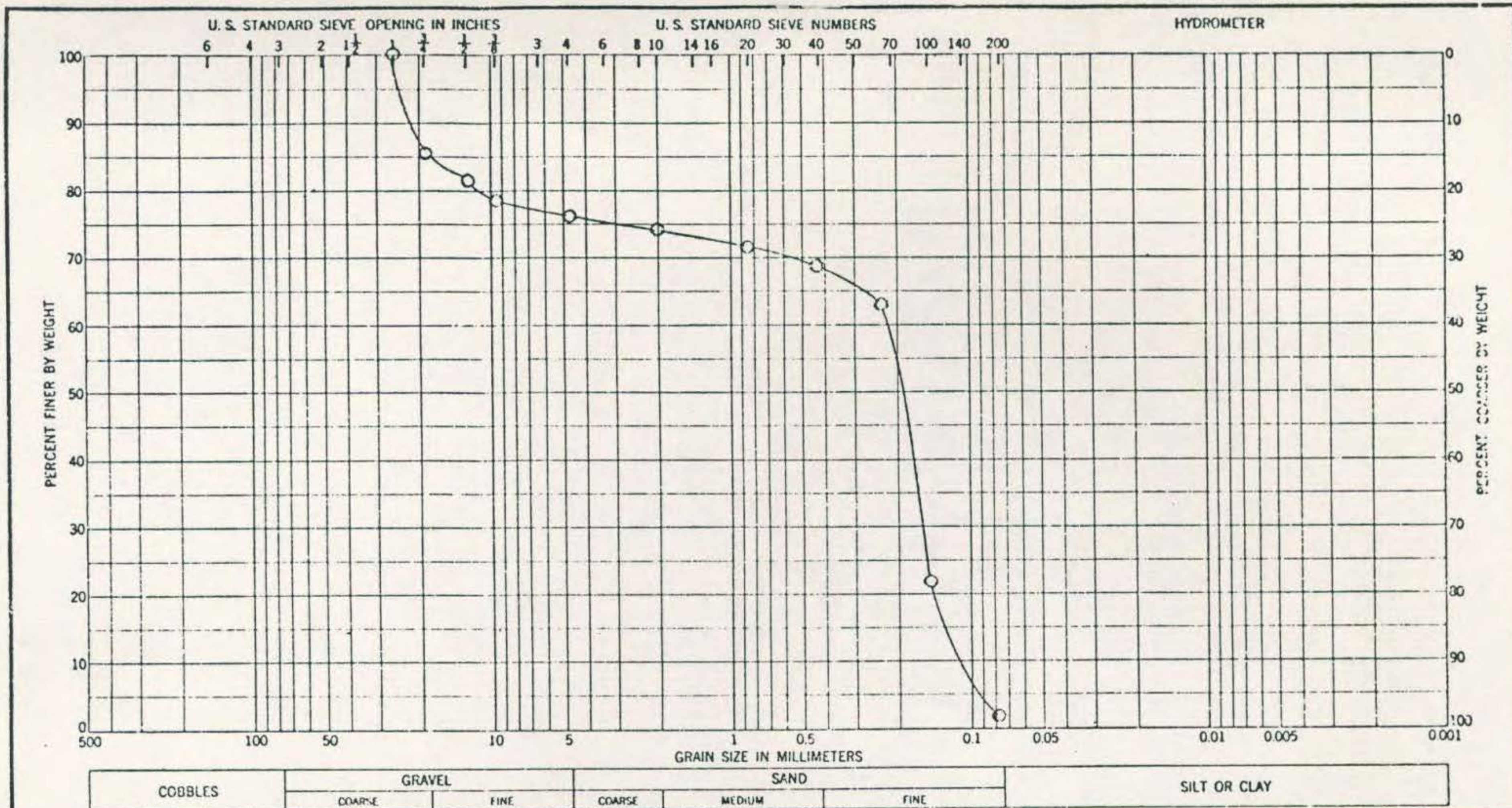


Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
02-75 028	--	Tan poorly graded sand (SP) w/a little gravel size, coarse and medium sand size shell	--	--	--	--
		Shell approx. 11%				

Project: CHARLESTON DISTRICT Murrells Inlet, S. C.
Lab. No. 3M-572 *
Area --
Boring No. -Field Sample No. 02-75 028
Date 11 July 1975

GRADATION CURVES

Appendix 3. Particle size analysis for sediments collected at station MI05.

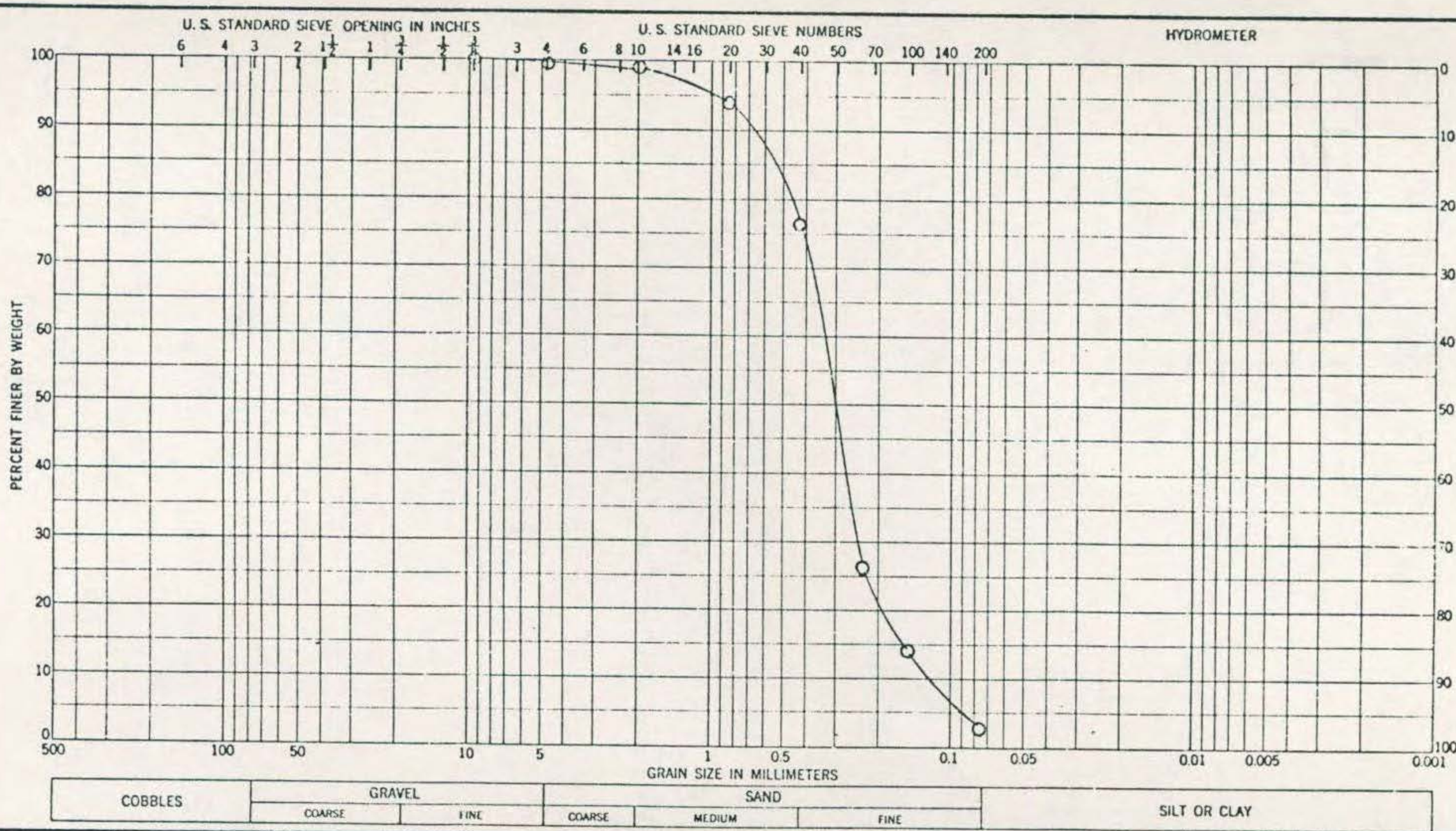


Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
02-75 030	--	Gray poorly graded sand(SP) w/some gravel size, coarse and medium sand size shell	--	--	--	--
		Shell approx. 28%				

GRADATION CURVES

Project: CHARLESTON DISTRICT Murrells Inlet, S. C.
Lab. No. 3M-573?
Area: --
Boring No. Field Sample No. 02-75 030
Date: 11 July 1975

Appendix 4. Particle size analysis for sediments collected at station MI07.

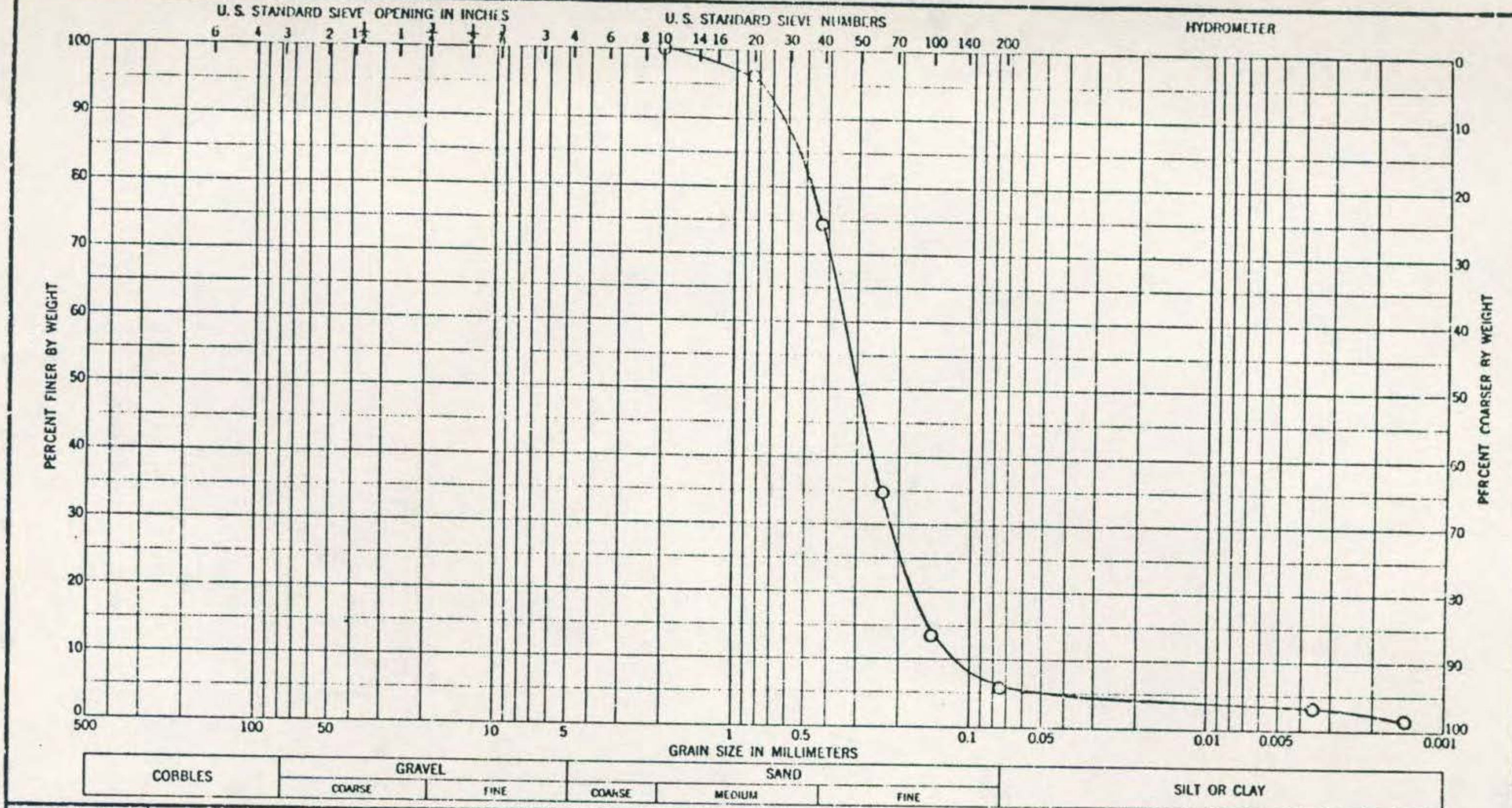


Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
02-75 033	--	Gray poorly graded sand (SP) w/tr shell	--	--	--	--
		Shell approx. 2%				

Project	CHARLESTON DISTRICT Murrells Inlet, S. C.
	Lab. No. 3M-574*
Area	--
Boring No.	Field Sample No. 02-75 033
Date	11 July 1975

GRADATION CURVES

Appendix 5. Particle size analysis for sediments collected at station MI10.



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
02-75 041	--	Gray poorly graded silty sand (SP-SM)	23.0	--	--	--

Project	CHARLESTON DISTRICT Murrells Inlet, S. C.
	Lab. No. 3M-575*
Area	--
Boring No.	Field Sample No. 02-75 041
Date	11 July 1975

GRADATION CURVES

Appendix 6. Particle size analysis for sediments collected at station MI18.