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New Jersey Department of Environmental Protection
Division of Fish, Game and Shellfish
Bureau of Fisheries
Nacote Creek Research Station

Studies of the Back Bay Systems in Atlantic County

Final Report For Project 3-223-R-3

Volume 1
Physical-Chemical Study
Fish Study
Ichthyoplankton Study
Benthic Study
Use Study

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PHYSICAL-CHEMICAL STUDY

By: John F. Makai

ABSTRACT

The purpose of this portion of the study was to map and/or describe the physical-chemical attributes of the back bays and thorofares in Atlantic City.

Thirty-four water quality stations were selected and scheduled accordingly to be sampled bi-monthly, monthly and/or seasonally from January 1, to December 31, 1977. The following parameters were measured: temperature, tidal stage, water depth, dissolved oxygen, salinity, pH, carbon dioxide, transparency, ammonia nitrogen, nitrite nitrogen, nitrate nitrogen, detergent, BOD, and orthophosphate.

During the survey period, water temperature ranged from - 1.0°C to 28.5°C. Dissolved oxygen concentrations ranged from 0.0 to 14.1 mg O_2/l. pH readings ranged from 4.9 to 9.3. Salinity ranged from .2 to 31.4 o/oo. Carbon dioxide values ranged from 0.0 to 30.8 mg CO_2/l. Secchi disc depth measurements ranged from .2 to 3.7 m. BOD levels ranged from 0.4 to 10.4 mg O_2/l. Nitrite nitrogen ranged from <0.003 to 0.136 mg NO_2/l and nitrate nitrogen ranged from <0.04 to 1.52 mg NO_3/l. Ammonia nitrogen levels ranged from <0.01 to 2.11 mg NH_3/l. Orthophosphate ranged from <0.01 to 1.17 mg PO_4/l. Detergent concentrations ranged from <0.01 to .44 mg/l.

Traces of DDT and its metabolites were detected in 95% of the finfish samples with values ranging up to 246.6 ug/kg. The only other insecticide detected in fish meat was dieldrin, found in only 5% of the samples. DDT levels were also detected in 52% of the shellfish samples with values ranging up to 14.69 ug/kg. Only 41% of the sediment sample contain any traces of DDT with concentrations

ranging up to 95.5 ug/kg. Chlordane was the only other insecticide detected in 74% of the mud samples with values ranging up to 6,400 ug/kg.

Heavy metal analysis of fish, shellfish and sediment samples showed that cadmium, lead, zinc, chromium and mercury were present. No traces of cadmium, chromium and lead werefound in the finfish samples. Zinc ranged from 15.0 to 58.0 mg/1 and mercury from <0.01 to 1.27 mg/kg. Analysis of composite samples of shellfish meat showed cadmium ranged from < 0.05 to 2.0 mg/1; zinc from 10.0 to 214.0 mg/1; lead from <0.1 to 7.0 mg/1; chromium from <0.05 to 4.0 mg/1 and mercury from 0.0 to .29 mg/1. In the sediment samples, chromium ranged from <0.05 to 195.0 mg/kg; lead ranged from 0.1 to 88.6 mg/kg; zinc from 17.0 to 212.0 mg/kg; cadmium from <0.05 to 7.8 and mercury from 0.04 to .94 mg/kg.

INTRODUCTION

Recognizing the need for more background information on New Jersey's estuaries, the Division of Fish, Game and Shellfisheries launched in 1968 an Estuarine Inventory Program. To date, four major estuarine systems along the Atlantic coast have been completed. Studies of the Back Bay Systems in Atlantic County is the final link in a series of selected estuaries extending from Point Pleasant south to Ocean City.

The study area during the mid-70's and even more recently has been a target for development. In the mid-70's, consideration was being given to siting a floating nuclear power plant approximately 2.8 miles S.E. of Little Egg Inlet. Due to financial problems and public opposition, this project was abandoned. The Atlantic City area is presently undergoing extensive economical and social changes due to the restructuring of the area to accommodate legal casino gambling. It is hopful that this study will help both planners and designers in recognizing the ecological importance this system provides to our coastal resources.

ACKNOWLEDGEMENTS

A special appreciation is extended to Thomas LaFisca, Chemist for the Bureau of Fisheries Laboratory, Lebanon, for his nutrient analyses of water samples and the handling of all pesticide and heavy metal analyses on fish, shellfish and sediment. Special thanks to the Foreman Jeffrey Carlson, Senior Fisheries Worker Raymond Townsend and Fisheries Worker Russell Tilton and Joseph (Dan) Vaughan for their fine effort in conducting most of the field work; and to Student Assistants Debra Spencer and Harold Swindell who aided in the collection and analysis of water samples. Senior Fisheries Worker Barry Preim did most of the inking of graphs for this report.

METHODS AND MATERIALS

The study area was defined as including all water acreage extending from Little Egg Inlet south to Great Egg Harbor Inlet. For simplicity in presenting the data, the survey was divided into three main areas with each section subdivided into zones.

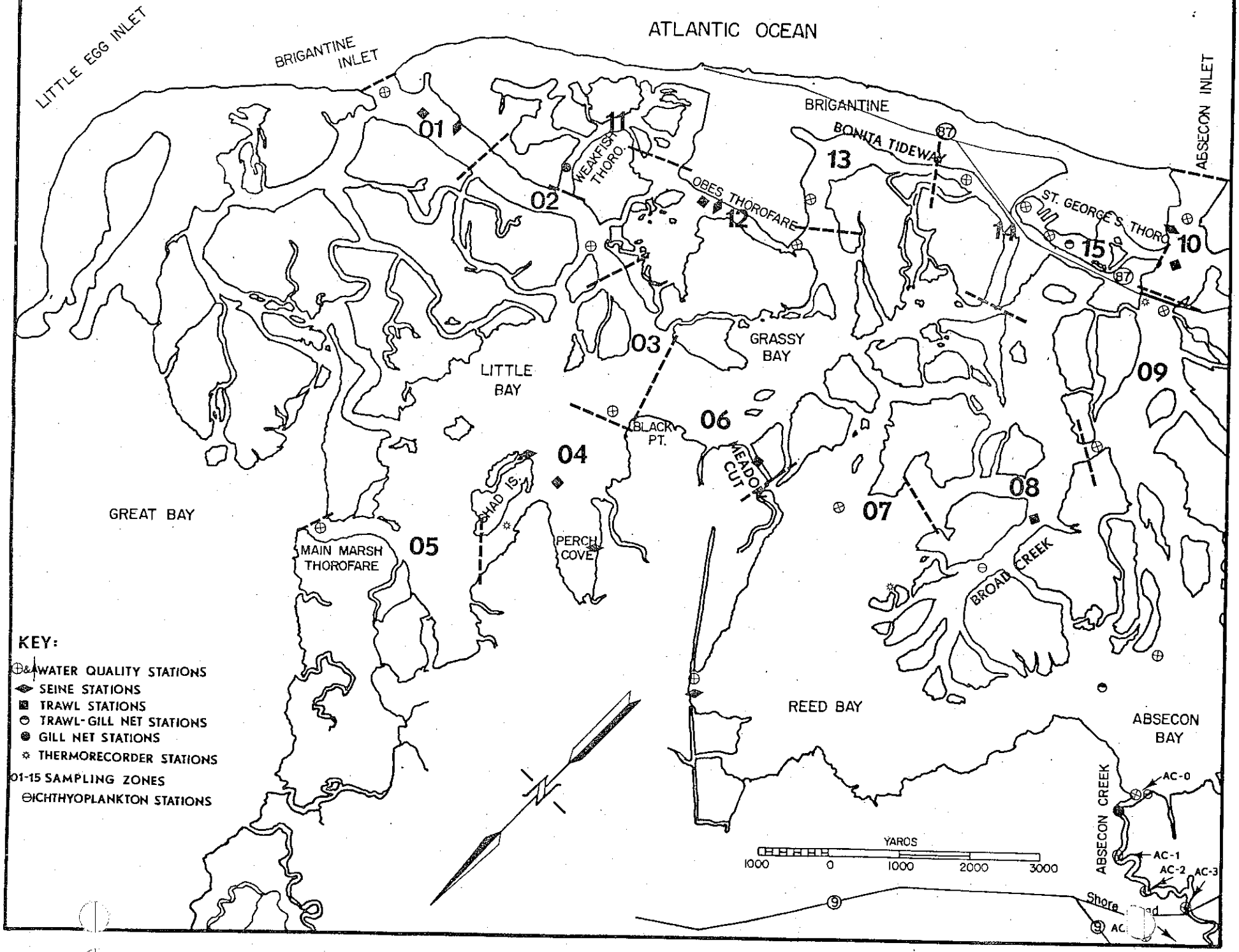
Field sampling was conducted from January 1 to December 31, 1977. During this period, 34 four water quality stations were selected and scheduled accordingly to be sampled bi-monthly, monthly and/or seasonally. Location of all stations can be seen in Figure 1.

Fourteen chemical and physical parameters measured were divided as follows:

Hydro Run Surveys

Bi-monthly sampling of surface and bottom waters were conducted at 20 stations during maximum flood and ebbing tides. The survey area was divided

FIGURE 1 LOCATION OF STATIONS



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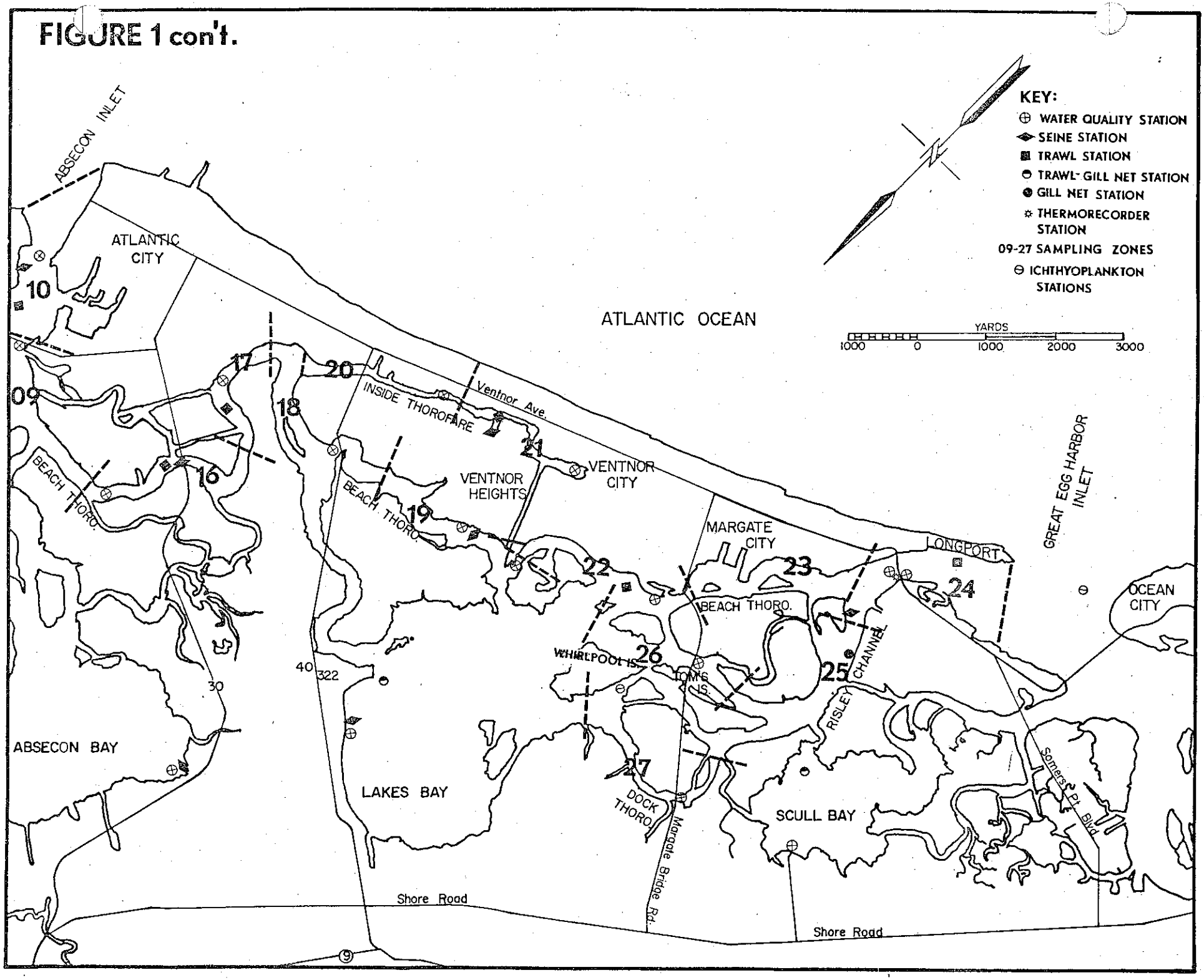


into three sampling regions: Area I included Brigantine Channel (2 stations), Main Marsh Thorofare (2 stations) and Obes Thorofare (1 station); Area II included Absecon Inlet and Intracoastal Waterway (3 stations), St. George's Thorofare (1 station), Bonita Tideway (1 station) and Beach Thorofare (2 stations); Area III included Beach Thorofare (3 stations), Toms Island (1 station), Dock Thorofare (1 station) and Inside Thorofare (2 stations). During this survey all three areas were sampled simultaneously and measured for the following parameters: temperature, tidal stage, water depth, dissolved oxygen, pH, salinity, carbon dioxide and secchi disc depths.

Most of the 20 stations corresponded to the seining, trawling and gill netting stations selected in the fish study. The above water quality data were also collected during all field work of the fish survey.

Nutrient Collection

Surface water samples were collected monthly at 14 of the 34 stations during a falling tide. Two 1,000 ml. polyethylene bottles were filled at each station. One bottle was fixed with 1 ml of H_2SO_4 (sulfuric acid) and both were stored in a cooler packed with ice during field collections. All samples were stored in a refrigerator, freezer or ice chest (depending on hold over time) and transported early the following morning to the Lebanon Laboratory for immediate analysis. Water samples were tested for ammonia, nitrite or nitrate nitrogen, orthophosphate, detergent (all usually within 96 hours after collection) and BOD levels.

Tributary Survey

Five stations were selected in Absecon Creek and scheduled seasonally to be sampled during both a flood and ebb tide. The parameters measured were temperature, water depth, tidal stage, salinity, pH, dissolved oxygen, secchi disc depth and carbon dioxide.

Pesticide and Heavy Metal Survey

Selected fish, shellfish and sediment samples were analyzed for both pesticides (chlorinated hydrocarbons) and heavy metal (mercury, cadmium, lead, chromium and zinc) concentrations. Species of fish chosen included summer flounder, winter flounder, weakfish, bluefish, white perch, yellow perch, windowpane, spot and Atlantic menhaden. Shellfish collected were the smooth and ribbed mussel, hard clam and oyster. Composite samples (20 g) of each species were placed in plastic (polyethylene) bags and kept frozen until time of analysis.

Sediment samples were collected periodically through the summer months (1977 period) with a 6 inch Eckman bottom dredge. All samples were placed in plastic pint containers while in the field. Within 24 hours after collection, excess water was decanted from the sample and the remainder (mud) was placed in a drying oven at 70°C (158°F). The dry residue was then purverized and stored in 6 ounce wide mouth glass jars until analysis.

Isohaline and Isotherm Distribution Study

Three simultaneous hydro runs (Areas I, II and III), were designed and scheduled to begin sampling approximately one hour before maximum tide at Brigantine Inlet, Absecon Inlet and Longport. Only surface salinity and temperature data measured at selected stations during the Hydro Run Surveys were used to plot distribution.

Water temperatures were recorded with a FT_3 Marine Hydrographic Thermometer and salinity levels were measured by titration with $AgNO_3$ (silver nitrate) for chlorinity determination and converting results with the Knudsen tables.

Laboratory Equipment

Most of the equipment and procedures used in testing water samples have been described in Makai (1971, 1973). However, there were some changes which shall be noted here.

All of the following analytical procedures are according to Standard Methods (American Public Health Association, 1976)

Ammonia - Distillation Method

Nitrite Nitrogen - Naphthylamine - Sulfanilic Acid Method

Nitrate Nitrogen - Ultraviolet Spectrophotometric Method

Orthophosphate - Stannous Chloride Method

Detergents - Methylene Blue Method (ABS)

BOD - (Biochemical Oxygen Demand) 5 day test

Nitrate nitrogen levels were detected on a Beckman DB-4V (visible spectrophotometer). All other colorimetric tests were run with a Bausch and Lomb Colormeter Spectronic 20.

All pesticide samples (chlorinated hydrocarbons) were analyzed by the New Jersey Health Department with a Microtek 220 Electron Capture Gas Chromatograph equiped with a tritium detector. Samples were injected on three different columns (OU-17, SE-30 and OV-210) in order to verify and confirm the presence of pesticides in the sample.

The fish and shellfish samples were analyzed for pesticides according to the methods listed in the Analytical Procedures Outline, Department of Environmental Science, Rutgers University, 1976.

The sediment samples were analyzed for chlorinated hydrocarbons according to the procedures listed in the Manual of Analytical Methods for the Analysis of Pesticide Residues in Human and Environmental Samples, U.S. Environmental Protection Agency Health Effects Research Laboratory, Environmental Toxicology Division, Research Triangle Park, North Carolina.

The sediment, shellfish and finfish samples were digested and analyzed for heavy metals using a Perkin Elmer Model 303 Atomic Absorption Spectrophotometer ac-

cording to procedures listed in the 14th edition of Standard Methods and in the Journal of the Association of Official Analytical Chemists (1973, Vol. 56, No. 2).

Transparency - Secchi disc (30 cm)

Five model D Waterproof Ryan Thermographs were used to record water temperature data. This instrument has a recording span of 45 days and two centigrade ranges: -5° to +25°C and +10° to +40°C. In order to change temperature ranges, the recorder must be sent back to the company for calibration.

All recorders were housed in a protective pipe assembly (Makai, 1971). Only four recorder stations were selected and the fifth instrument was used as a spare. Location and depth were as follows: Great Egg Harbor Inlet - Longport Bridge (8 ft.); Reed Bay (2 ft.); Absecon Inlet - Old Brigantine Bridge (7 ft.); and Main Marsh Thorofare - Pole 36 - (7 ft.).

Tidal data was obtained from the Coast and Geodetic Survey Tide Tables, Atlantic Coast of North American (U.S. Department of Commerce, 1977). Coast and Geodetic Survey Charts with a scale of 1:24,000 and Nautical Chart 824-SC (1:40,000) were used for all bay and tributary morphometric measurements.

Linear measurements were obtained with the use of a map rotometer. All area measurements were computed with a Keuffel and Esser Compensating Polar Planimeter. Profiles were mapped with a Beckman Fathometer.

DESCRIPTION OF AREA

The back bay systems within the study area consisted of all water acreage extending from Little Egg Inlet south to Great Egg Harbor Inlet. This included Little Bay, Grassy Bay, Reed Bay, Absecon Bay, Lakes Bay, Scull Bay along with the associated thorofares and drainage of Absecon Creek. This was a total of

16,548 acres (water) surveyed; the bays comprising 50% of this total.

This estuarine system, located in Atlantic County approximately 35 miles north of Cape May Point, is separated from the Atlantic Ocean by three barrier islands (Little Beach, Brigantine and Atlantic City). Tidal inlets separating these barrier islands and allow access to the ocean are as follows: Little Egg Inlet via Main Marsh Thorofare into Great Bay (upper boundary), Brigantine Inlet, Absecon Inlet and Great Egg Harbor Inlet (lower boundry). The U.S. Corps of Engineers (1966) noted in a survey on problems of beach erosion along the coast that major shoreline changes occur at and adjacent to the ends of the barrier islands where the movement of littoral drift along the shore is influenced by the inlet tidal currents. Significant changes in the location of the pits or extreme ends of these islands have occurred while the shore alignment of the central (major) portion of the islands, although experiencing periods of variable erosion and/or accretion has generally remained relatively constant.

Little Egg Inlet, being larger of the four inlets, is found with the greatest current velocity (5.0 to 5.5 ft/sec) and allows greater saltwater intrusion. Charlesworth (1968) reported that studies of other New Jersey coastal inlets have shown that average maximum current velocities range between 2 and 4 ft/sec, though these values are often exceeded during spring tides. He also reported the main ebb flow for Brigantine Inlet issues as a relatively narrow jet from the main inlet gorge with velocities at least as high as 5.0 ft/sec. The secondary flow from the inlet is southeastward through the channel between the gorge and the north tip of Brigantine Island and the flow to the east over the shoal flanking the northeast side of the main inlet gorge is relatively minor.

For the flood current, Charlesworth noted the flood drains into the inlet from all directions with the seawardmost flow coming from an upcoast direction.

The southern extent of flood influences is not known. In general, flood velocities probably approach at least 2.0 ft/sec outside the inlet gorge and southern channel, and reach at least 4.0 ft/sec inside the inlet.

U.S. Corps of Engineers (1950) reported during their studies of Absecon Inlet, mean maximum ebb current velocity up to 3.4 ft/sec and flood to 3.7 ft/sec. At Great Egg Harbor Inlet, current drogue observations made in 1949 demonstrated that in the main channel ebb currents reach 4 ft/sec and closer to shore maximum ebb velocities approached 2.5 ft/sec. Flood currents up to 3.0 ft/sec were measured in the main channels and secondary channels.

The tide along the New Jersey coast is of the semidiurnal type; there are two high waters and two low waters in a day. Tidal ranges in the bays, thorofares and lagoons behind the barrier islands are generally less than on the open coast. This is due to the inlet between the barrier islands restricting the tidal flow between the ocean and the inner bay. The mean tidal range and mean sea level for each of the inlets from north to south are as follows: Little Egg Inlet, 3.7 ft. and 1.8 ft; Brigantine Inlet, 4.2 ft. and 1.7 ft.; Absecon Inlet, 3.6 ft. and 1.8 ft., and Great Egg Harbor Inlet, 3.8 ft. and 1.9 ft., respectively.

At mean low water, depth within the study area ranges from 0.5 to 40 feet. From the 16,548 water acres, 86% are 6 ft. or less in depth. Access through the 21 mile (statute) water system is provided by the Intracoastal Waterway which extends from Great Bay via Main Marsh Thorofare south along the western portion and continues into Beach Thorofare (eastern shore). Just south of the Atlantic City Expressway Bridge, the Intracoastal Waterway (Beach Thorofare) extends into Inside Thorofare and continues in a southerly direction. Near Ventnor Heights, the waterway changes to a westerly direction via West Canal where it eventually merges again with Beach Thorofare (Flashing Red Light "35"). Resuming a southerly

course, access continues along the eastern shore as far as day beacon "58". At this point the waterway again changes to a westernly direction (Risley Channel) but soon swings south at Flashing Light 5M "1" into Broad Thorofare; where it leaves the study area (Great Egg Harbor System).

Marked navigational channels provide access to most of the developed areas such as the City of Brigantine via Obes Thorofare, and Bar Harbor Development via St. George's Thorofare. Due to the shallows existing in the small bays, access is greatly limited to high flood stages although small channels do link most areas.

Little Beach (Pullen Island) is located south of Long Beach Island and is approximately 2 1/2 miles long and 1/16 to 1 3/4 miles wide. This barrier island (access only by water) is the seaward end of the Brigantine National Wildlife Refuge. The town of Brigantine is located on the south end of Brigantine Island. This island is approximately 6 1/4 miles long and varies in width from 1/2 to 1 1/2 miles wide. Only acess to this developed barrier island is via Route 87 which transverses Absecon Inlet. The north end of Brigantine Island is undeveloped and contains undisturbed beaches, dunes and marshes. Other barrier islands such as Atlantic City is heavily developed, especially during the summer tourist trade. Access to this northern region (Atlantic City) are via Route 30, Atlantic City Expressway and Route 40. Southern entrance to this island is provided by Route 563 (Margate Bridge Road) and Longport Boulevard. This barrier island is approximately 8 miles long and varies from 1/10 to 2 miles in width.

A great deal of the western portion of the study area as well as the numerous islands still remain wetlands. It is estimated that a total of 21,273 acres of wetlands are located in this area. Portions of this total acreage include the Absecon Wildlife Management Area (3,040 acres) managed by the Division of Fish, Game and Shellfisheries and North Brigantine (679 acres) managed by the Division

of Parks and Forestry. The federally owned Brigantine National Wildlife Refuge is located to the southwest of Great Bay (upper boundry). It includes 20,000 acres of beach, salt marsh, fresh water pools and upland habitat. The Refuge also manages 256 acres of the southern tip of Long Beach Island. Approximately 8,316 acres of the Refuge's wetlands are situated within the study area.

MARINE PLANTS

There is very little information on the benthic flora for the back bay systems in Atlantic County. Studies have been conducted on marine algae for the Barnegat Bay system (Ocean County). Both Moeller (1964) and Loveland (1971, 1972) have identified and listed marine algae for that system. Loveland (1969) reported that most algae in Barnegat Bay appear to be unattached and great masses of the dominant species drift with the currents along the bottom. From the total of 119 benthic algae species he identified, only 16 occured over 50% of the time. The more dominant species included Ceramium fastigiatum, Gracilaria verrucosa, Ulva lactuca, Agardhiella temera, and Codium fragile.

During ecological studies conducted from Little Egg Harbor to the Brigantine area, Smith (Ichthyological Associates, 1973) reported finding red algae, Gracilaria foliifera and Agarhiella temera in all bays surveyed. Polysiphonia fibrillosa, usually food at intertidal levels, was occassionally taken in trawl collections in the bay. Porphyra umbilicalis also a red algae resembling Ulva in its general morphology was found on rocks and pilings in Brigantine.

Ichthyological Associates also reported three genera of algae which were not identified to the species but have been observed in shore zones of Brigantine. Fucus sp. is a common rockweed in these areas. It is of commercial value but it is not harvested locally. It is often reported growing on ribbed mussels on marsh banks. Ulva sp. is an abundant alga in all areas. At times it covers exten-

sive areas on the bottom of the bays. It is noted to be an important food source for the wintering brant populations. Entermorpha sp. recognized as an intertidal green alga, is noted to be common in all local bays and estuaries.

During the Physical-Chemical Study, mixtures of Ulva sp. and Fucus sp. were observed along the shore line at Ventnor Heights, Scull Bay, Tom Island and Lakes Bay. Ulva sp. was observed along the intertidal zone in St. George's Thorofare and Longport Bridge.

In the lagoon located in St. George's Thorofare north side of Absecon Inlet, Ichthyological Associates reported finding Ulva, Fucus, Enteromorpha and Agarhiella usually attached and unattached. Ulva was reported to sparse in Reed Bay.

VEGETATION

According to the Wetlands Inventory conducted by the New Jersey Department of Environmental Protection, 23 plant species have been identified on wetland maps for the study area: Spartina alterniflora (tall and short salt marsh cordgrass); Spartina patens (salt meadow cordgrass); Spartina cynosuroides (salt reed grass); Distichlis spicata (spike grass); Iva frutescens (high tide bush); Juncus gerardi (rush); Baccharis halimifolia (sea myrtle); Typha spp. (cattail); Zizania aquatia (wildrice); Nuphar advena (yellow water lily); Peltandra virginica (arrow arum); Phragmites communis (common reed); Polygonum punctatum (water smartweed); Hibiscus palustris (march mallow); Panicum virgatum (switch grass); Scirpus olneyi (Olney's bulrush); Carex spp. (sedge); Eleocharis spp. (spike rush): Juncus spp. (rush); Rosa spp. (rose); and Pluchea spp. (marsh fleabane).

Within the study area, the three species of cordgrass (Spartina) dominated the salt marsh flora; tall and short salt marsh cordgrass (Spartina alterniflora) thrives in low marsh areas regularly inundated by the tides and salt meadow

cordgrass (Spartina patens) occupies extensive areas in the higher, more landward portions of the marsh.

MARSHLAND DEVELOPMENT

Since the implementation of the Wetlands Act of 1970, New Jersey's Department of Environmental Protection has sought to control the permanent alterations or loss of remaining coastal wetlands. Ferrigno (1973) reported that during the past 20 years 23.5% of the 263,000 acres of tidal marsh in New Jersey have been lost to development. Several types of alterations have caused this loss; however, dredging and filling activities are the most common. Such operations provide navigational channels, new lands for housing and industrial development along with access to coastal bays and rivers.

Ferrigno (1972) reported that there are 48,141 acres of wetlands located within Atlantic county. Of this total, 43,156 acres or 90% still remain natural marsh. This loss was reported to be a result of dredge and fill for houses, roads, marinas and navigational channel maintenance. Most spoil disposal has been restricted to upland areas. This type of control has reduced the loss of valuable wetlands. Within the study area it was estimated 21,273 acres of wetlands (including the Brigantine Wildlife Refuge) are present. This would represent 44% of the wetlands in Atlantic county.

Niewsand (1972) reported that over 90% of the total lagoon developments along the New Jersey shore are situated within Ocean county. Atlantic county, on the other hand, has had very little lagoon development. Ocean Harbor and Seaview Harbor are the only two lagoon systems located within the study area. At the time of this study, it was estimated that both systems represent a loss of 50.4 acres with the loss of 3,400 feet of developed shoreline.

POINT SOURCE DISCHARGES

The water quality of our coastal waters is now protected by the New Jersey Department of Environmental Protection and the U.S. Environmental Protection Agency. This is being accomplished through a system of planning, permitting, monitoring and enforcement where necessary. The federal NPDES permit (National Pollution Discahrge Elimination System) is the tool used to control continuous point source discharges. Table 1 provides an inventory of industrial companies, state and/or private agencies for which permits have been issued within the study area. Table 2 provides additional information on some of the companies listed in Table 1.

On the other hand, the Coastal Area Facility Review Act (P.L. 1973, Chapter 185) requires a permit to be obtained from the State of New Jersey, Division of Marine Services to construct certain facilities, including "waste treatment plants and pipelines" along New Jersey coastal regions. Since the completion of this survey, an ocean outfall pipe has been constructed under the Atlantic County Regional Sewerage Authority Wastewater Management System (projected completion date, February 1978). All existing and/or future discharges will be placed on this regional system; whereby reducing and by-passing an inadequate and over-loaded municipal sewerage system and serve an area which will continue to be developed as a result of casino gambling. Previous excess flows in these back bays and thorofares resulted in nutrient enriched and condemned waters for the harvesting of oysters, clams and mussels.

SHELLFISH*

Commercially important molluscan shellfish of the study area include the

hard clam, Mercenaria mercenaria, the eastern oyster, Crassostrea virginica, the soft clam, Mya arenaria, and the blue mussel, Mytilus edulis.

Oysters are found throughout the numerous creeks and bays but are not usually present in high density. Occasionally, areas with commercial quantities of soft clams and blue mussels are located but the majority of these shellfish are only harvested recreationally. The hard clam is the most important shellfish species located within the study area and is harvested both recreationally and commercially. Harvest methods include: treading, tonging, and raking.

Over 380 acres of bottom in the study area are leased to commercial shellfishermen for the culture of shellfish. The majority of the leased ground is classified as hard clam habitat while there are a few leases which are considered oyster bottom. Most of this leased ground is utilized by the commercial shellfishermen as layout ground to stockpile marketable clams. With the increasing interest in shellfish aquaculture several leasees are experimenting with the planting of seed oysters and clams.

Unfortunately, a large proportion of the water in the study area is condemned for the direct harvest of shellfish due to bacterial contamination. The area condemned extends from Reed Bay south to Great Egg Harbor Inlet. Located within this area is some of the most productive hard clam habitat in New Jersey (see Figure 2).

To provide for the utilization of this resource a hard clam relay program was initiated in 1970. This program involves the harvesting of hard clams from specified condemned areas. These clams are then transported to approved waters in Great Bay where they are planted on "relay lots" leased by the shellfishermen. Following a thirty day purification period shellfish samples are collected and analyzed for bacterial contamination. If the clams are within acceptable bacterial limits the relay lots are opened for harvesting.

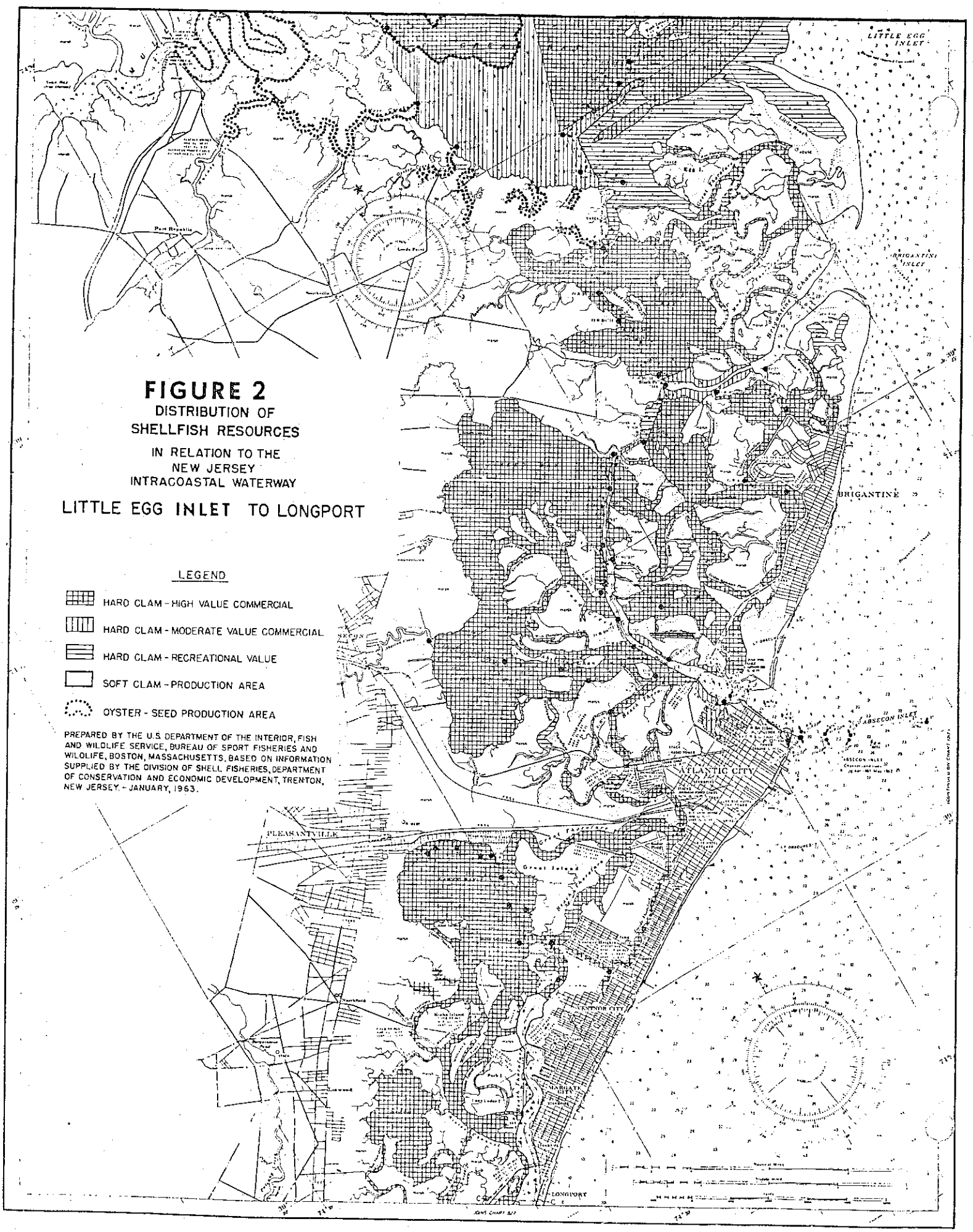


FIGURE 2

DISTRIBUTION OF SHELLFISH RESOURCES

IN RELATION TO THE NEW JERSEY INTRACOASTAL WATERWAY

LITTLE EGG INLET TO LONGPORT

LEGEND

- HARD CLAM - HIGH VALUE COMMERCIAL
- HARD CLAM - MODERATE VALUE COMMERCIAL
- HARD CLAM - RECREATIONAL VALUE
- SOFT CLAM - PRODUCTION AREA
- OYSTER - SEED PRODUCTION AREA

PREPARED BY THE U.S. DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE, BUREAU OF SPORT FISHERIES AND WILDLIFE, BOSTON, MASSACHUSETTS, BASED ON INFORMATION SUPPLIED BY THE DIVISION OF SHELL FISHERIES, DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT, TRENTON, NEW JERSEY. - JANUARY, 1963.

Lakes Bay has been the number one producer of hard clams since the relay program began in 1970 with a harvest exceeding thirty-two million clams.

In 1977 the three major producing areas in the relay program were Lakes Bay (4.0 million clams), Scull Bay (1.0 million) and Great Thorofare (0.6 million). This harvest represented 43% of the commercial hard clam landings from Atlantic County during 1977.

Other areas that have an abundant hard clam resource and have provided a substantial part of the landings through the relay program prior to 1977 include Absecon Bay and Beach Thorofare.

The areas mentioned have one of the best hard clam resources in the state. Hopefully, water quality will improve to the point that these areas can be opened for direct harvest.

* This section was author ed by Thomas McCloy, a Fisheries Biologist with the N.J. Division of Fish, Game and Shellfisheries.

Morphometric Data

Upper and lower boundaries of the back bays and thorofares in Atlantic County were established arbitrarily for the purpose of survey and analysis as follows:

Upper Boundary: Farthest point north of Main Marsh Thorofare indicated by a line from the point at Great Bay across the Intracoastal Waterway to Little Beach (Little Egg Inlet).

Lower Boundary: Indicated by a line extending from the tip of Longport (Great Egg Harbor Inlet) across to the point where Longport Blvd. merges with Ocean Drive (Ocean City Bridge).

The data compiled included the following measurements and calculations made according to Schuster (1959) and Welch (1948):

1. Maximum length (MXL):

Reed Bay:	2.9	statute miles;	2.6	nautical miles	
Absecon Bay:	2.4	" "	2.1	"	"
Lakes Bay:	1.5	" "	1.3	"	"
Scull Bay:	1.7	" "	1.5	"	"

Length of line connecting the two most extreme parts of the bay and crossing no land other than islands.

2. Maximum effective length (MXEL):

Reed Bay:	2.9	statute miles;	2.6	nautical miles	
Absecon Bay:	2.4	" "	2.1	"	"
Lakes Bay:	1.3	" "	1.1	"	"
Scull Bay:	1.7	" "	1.5	"	"

Length of straight line connecting the most remote extremities of the bay which wind and wave action occur without any kind of land interruption.

3. Maximum width (MXW):

Reed Bay:	2.3	statute miles;	2.0	nautical miles	
Absecon Bay:	2.3	" "	2.0	"	"
Lakes Bay:	2.1	" "	1.8		
Scull Bay:	.9	" "	.8	"	"

Length of a straight line connecting the most remote extemities of the bay and crossing no land other than islands. It is a line approximately at right angles to the maximum length axis.

4. Maximum effective width (MXEW):

Reed Bay:	2.3	statute miles;	2.0	nautical miles	
Absecon Bay:	1.2	" "	1.1	"	"
Lakes Bay:	2.1	" "	1.8	"	"
Scull Bay:	.9	" "	.8	"	"

Length of straight line connecting the most remote extremities of the width of the bay along which wind and wave action occur without any kind of land interruption.

5. Mean width (MEW):

Reed Bay:	1.3	statute miles;		1.1	nautical miles	
Absecon Bay:	1.3	"	"	1.1	"	"
Lakes Bay:	1.4	"	"	1.2	"	"
Scull Bay:	.6	"	"	.5	"	"

The area of the bay divided by its maximum length.

6. Maximum depth (MXD):

Reed Bay:	5	ft;	1.5	m;	.8	fathoms
Absecon Bay:	13	"	4.0	"	2.2	"
Lakes Bay:	43	"	13.1	"	7.2	"
Scull Bay:	8	"	2.4	"	1.3	"

The maximum depth is known.

7. Mean depth (MED):

Reed Bay:	1.0	ft;	.2	fathoms
Absecon Bay:	1.7	"	.3	"
Lakes Bay:	1.7	"	.3	"
Scull Bay:	1.1	"	.2	"

The volume of the bay divided by its surface area.

8. Mean depth - Maximum depth relation (MED/MXD)

Reed Bay:	0.20
Absecon Bay:	0.13
Lakes Bay:	0.04
Scull Bay:	0.14

The mean depth divided by the maximum depth. This is expressed as a decimal value and serves as an index figure which indicates in general the character of the approach of basin shape to conical forms.

9. Maximum depth - Surface area relation (MXD/AS):

Reed Bay:	0.10
Absecon Bay:	0.30
Lakes Bay:	1.19
Scull Bay:	0.31

The maximum depth divided by the square root of the surface area. It is expressed as a decimal value and is an indication of the relation of depth to horizontal extent.

10. Total surface area (AS)

Reed Bay:	3.7	square	miles	(statute)	2,381	acres
Absecon Bay:	3.0	"	"	"	1,897	"
Lakes Bay:	2.1	"	"	"	1,311	"
Scull Bay:	1.0	"	"	"	659	"

11. Length of shoreline (LSH):

(A) Eastern Shore - 52 miles (statute)
(B) Western Shore - 45 miles (statute)

12. Volume (V):

Reeds Bay:	108,333,720 ft^3
	810,392,559 gallons.
Absecon Bay:	136,996,200 ft^3
	1,024,802,814 gallons.
Lakes Bay:	99,534,600 ft^3
	744,570,566 gallons.
Scull Bay:	31,967,232 ft^3
	239,131,518 gallons.

* Formula : $V = 1/3\ (A_1\ \&\ A_2\ \&\sqrt{A_1 A_2})\ h$

Where A_1 is the area of the upper surface of a contour stratum and A_2 is the area of the lower surface of the same stratum, the height of the stratum is shown by h. The volume for each stratum is computed from the formula, the sum of the volumes being the total volume at mean low water (Reid 1961)

13. Profiles:

These provide a pictorial representation of the basin configuration along a selected line. All the profiles selected were perpendicular to the ship channel

FIGURE 3 PROFILES OF THE BACK BAY SYSTEMS IN ATLANTIC COUNTY AT MEAN HIGH WATER

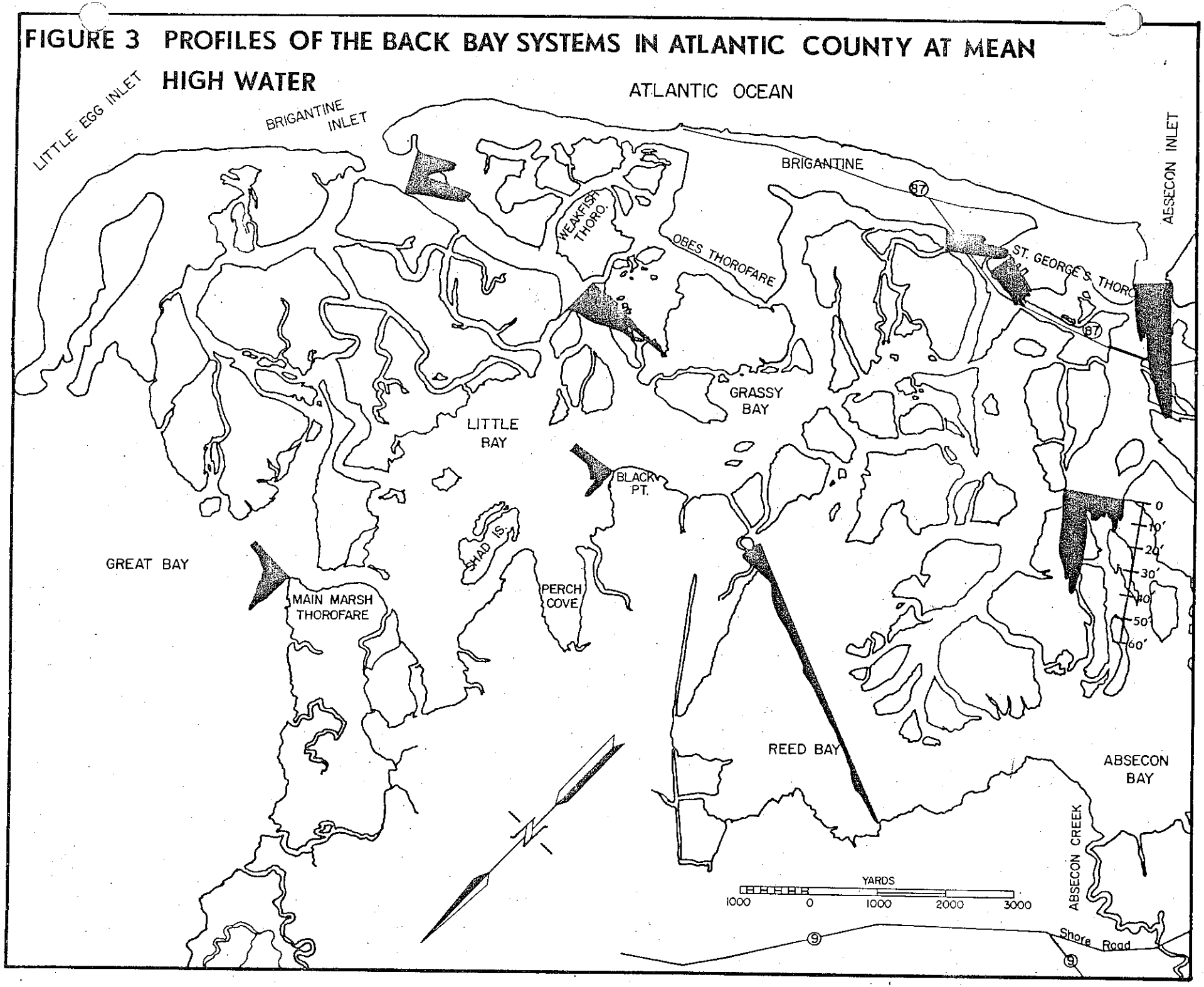
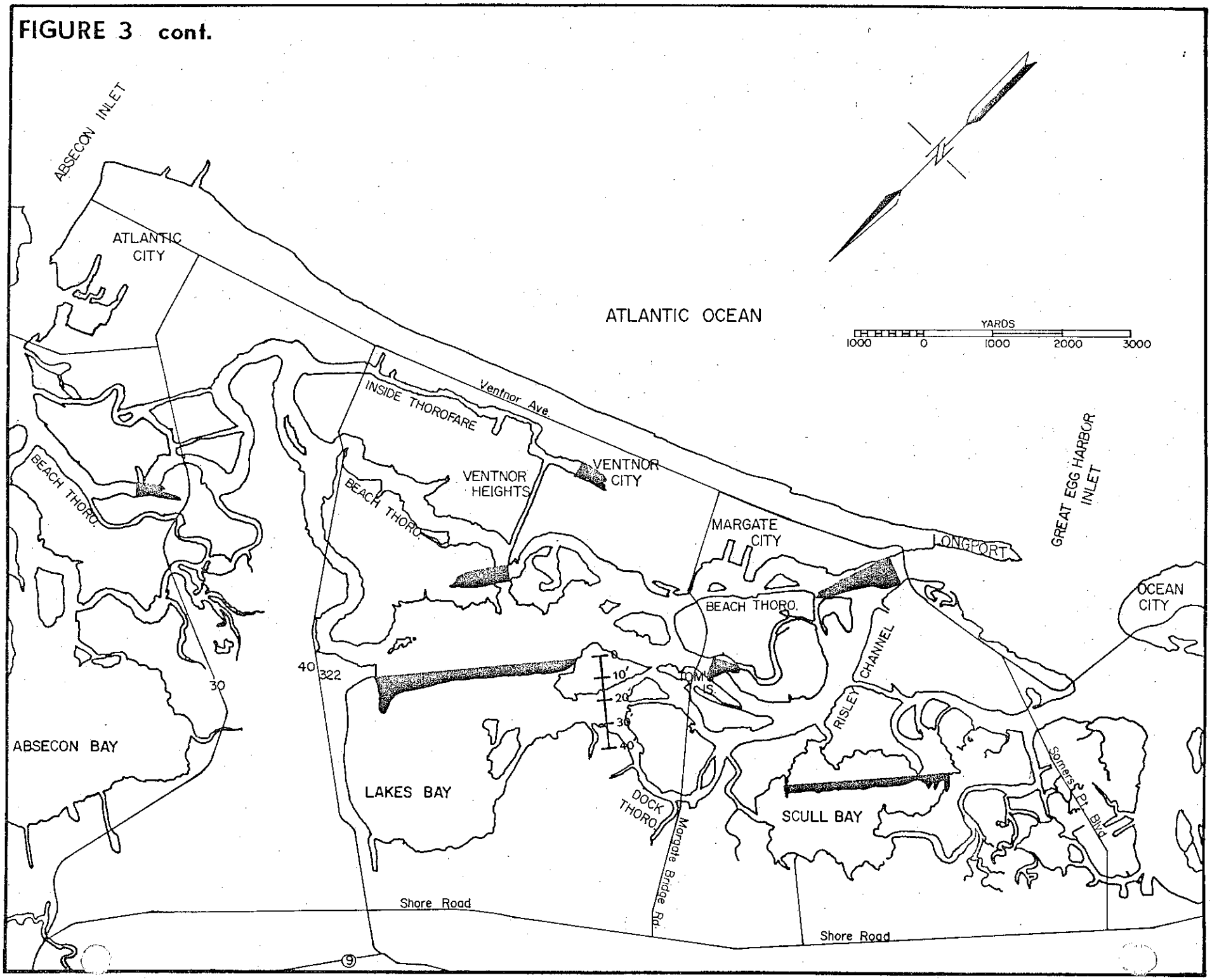


FIGURE 3 cont.



and are illustrated in Figure 3.

FINDINGS

WATER QUALITY DATA

All physical and chemical data collected from January 1 to December 31, 1977 are presented in Tables 1 to 92. This would also include all water quality reported in the Fish Studies section.

Brigantine Inlet

This inlet is relatively shallow and narrow, with a channel permitting only a small volume of tidal water to enter or leave the area. Shoals and mud flats greatly restrict passage of boats to the ocean. Water depth within the channel ranges from 2 to 26 feet.

One water quality station was situated in the channel (zone 01) approximately 200 yards south of Little Beach barrier island. The water depth ranged from 2 to 22 feet at mean low water with a bottom composition of hard sand (fine).

Water temperatures recorded at this station ranged from 3.6 to 25.0 °C and air temperatures from 3.0 to 32.0 °C (see Table 4). Salinity varied from 28.3 to 31.1 0/00. The pH readings were all basic (7.7 to 8.1). Dissolved oxygen levels varied from 4.0 to 10.6 mg O_2/1. Carbon dioxide values were from 2.1 to 10.9 mg O_2/1. Secchi disc depths ranged from .5 to 1.7 m.

B. O. D. concentrations ranged from 0.4 to 2.3 mg O_2/1 (Table 24). Traces of nitrite nitrogen were observed ranging from $<$0.003 to 0.026 mg NO_2-N/1. Nitrate nitrogen ranged from $<$0.04 to 0.33 mg NO_3-N/1. Ammonia nitrogen levels were slight ($<$0.01 to 0.28 mg NH_3-N/1. Orthophosphate levels ranged from $<$0.01 to 0.09 PO_4-P/1.

Brigantine Channel

This waterway located approximately 8.5 miles north of Atlantic Ciy, allows

saltwater intrusion in the upper southeastern boundary area of the Brigantine Wildlife Refuge. No development exists in this area.

One station was situated in the main channel, approximately 100 yards off of Flashing Green "3" (Zone 02). The water depth ranged from 14 to 26 feet at mean low water with a bottom composition of mixtures of sand and silt.

Water temperatures recorded ranged from 3.5 to 25.0 °C and air temperatures from 7.0 to 26.0 °C (Table 5). Salinity varied from 28.3 to 30.7 0/00. The pH readings were all basic (7.7 to 8.1). Dissolved oxygen levels varied from 4.0 to 10.8 mg O_2/1. Carbon dioxide values were from 2.5 to 7.4 mg CO_2/1. Secchi disc depths ranged from .3 to 1.5 m.

Brigantine Barrier Island

The land barrier along the eastern portion of the study area extending from Brigantine Inlet to Absecon Inlet is known as Brigantine. As previously mentioned, a great portion of this area is developed (bulkhead and fill). The northern portion, however, still retains natural shoreline and wetlands (state-owned).

Three water quality stations were situated adjacent to this barrier island; one in Obes Thorofare (zone 12) and two in Bonita Tideway (zones 13 and 14). Water depths ranged from 5 to 28 feet at mean low water with a bottom composition varying from sand to soft mud and detritus.

Water temperatures recorded at these stations ranged from 2.0 and 25.5 °C and air temperatures from 5.0 to 32.0 °C (Tables 8 and 9). Salinity varied from 28.0 to 30.9 0/00. The pH readings were all basic (7.8 to 8.1). Dissolved oxygen levels varied 4.2 to 11.3 mg O_2/1. Carbon dioxide values were .5 to 10.0 mg CO_2/1. Secchi disc depths measured from .5 to 2.4 m.

B.O.D. concentrations ranged from 0.8 to 2.8 mg O_2/1 (Table 26). Slight traces of nitrite nitrogen were observed ($<$0.003 to 0.016 mg NO_2 N/1). Nitrate

nitrogen ranged from < 0.04 to 0.50 mg NO_3-N/1. Ammonia nitrogen levels were slight (< 0.01 to 0.22 mg NH_3-N/1). Orthophosphate ranged from < 0.01 to 0.11 mg PO_4-P/1. Detergent concentrations were from 0.01 to 0.04 mg/1.

Intracoastal Waterway Channel

Access through the 21 mile (statute) study area is provided by the Intracoastal Waterway extending from Main Marsh Thorofare south to Great Egg Harbor system. Parts of this channel are periodically dredged by the Corps of Engineers in order to maintain a depth of 6 feet at mean low water.

The Intracoastal Waterway Channel was subdivided with four water quality stations selected in the main channel of the northern half of the study area: two in Main Marsh Thorofare (zones 03 and 05), one in Gull Island Thorofare (zone 07) and one in Middle Thorofare (zone 09) (see Figure 1). Depths ranged from .7 to 40 feet at mean low water with bottom composition varying from sand to soft mud and detritus.

Water temperature recorded at these stations ranged from 4.0 to 27.0 °C and air temperature from 3.0 to 33.0 °C (Tables 6, 7, 12 and 14). Salinity varied from 26.2 to 30.9 0/00. The pH values were all basic (7.7 to 8.1). Dissolved oxygen concentrations ranged 3.0 to 11.4 mg O_2/1. Carbon dioxide values were from 0.0 to 7.8 mg CO_2/1. Secchi disc depth recorded ranged from .3 to 3.0 m.

B.O.D. levels ranged from 0.5 to 3.4 mg O_2/1 (Table 25). Very slight traces of nitrite were observed (<0.003 to 0.028 mg NO_2-N/1. Nitrate nitrogen ranged from 0.04 to 0.32 mg NO_3-N/1. Ammonia nitrogen levels were slight (<0.01 to 0.29 mg NH_3-N/1. Orthophosphate ranged <0.01 to 0.19 mg PO_4-P/1. Detergent levels measured ranged from <0.01 to .32 mg/1.

Absecon Inlet

This inlet situated between barrier islands Briganitne and Atlantic City is

relatively deep and provides good access to the Atlantic Ocean. Currents are found to be strong, however, good tidal circulation through this central portion of the study is restricted by mud flats and islands. The north side of this inlet still retains natural shoreline, however, a good portion of the south shore is developed (bulkhead).

There were two water quality stations selected in this area: one situated in the main channel (zone 10) and the other taken off the south shore of the Old Brigantine Bridge (zone 09). Water depths ranged from 29 to 36 feet at mean low water with bottom composition of hard sand.

Water temperatures recorded from 2.0 to 24.0 °C and air temperatures from 4.0 to 35.0 °C (Table 10). Salinity ranged from 27.1 to 30.8 0/00. The pH readings were all basic (7.7 to 8.1). Dissolved oxygen levels were from 3.8 to 10.7 mg O_2/1. Carbon dioxide values range from 0.7 to 8.0 mg CO_2/1. Secchi disc depths recorded ranged from .5 to 3.7 m.

B.O.D. values recorded ranged from 0.6 to 2.8 mg O_2/1 (Table 27). Slight traces of nitrite nitrogen were observed ($<$0.003 to 0.026 mg NO_2-N/1. Nitrate nitrogen levels ranged from $<$0.04 to 0.37 mg NO_3-N/1. Ammonia nitrogen values were small ($<$0.01 to 0.18 mg NH_3-N/1). Orthophosphate ranged from $<$0.01 to 0.08 mg PO_4-P/1. Detergent concentrations detected ranged from 0.01 to 0.35 mg/1.

St. George's Thorofare

This water system, located on the northern shore (Brigantine) of Absecon Inlet, is the receiving waters for the sewage treatment plant of Brigantine City. A good portion of both the eastern and western shores are under or being considered for development. Ocean Harbor Lagoon Complex is located on the eastern shore of this cul-de-sac.

There were two water quality stations situated in this water system. Depths ranged from .5 to 14 feet at mean low water with bottom composition of soft mud.

Water temperatures recorded ranged from 5.0 to 26.5 °C and air temperatures ranged from 6.5 to 32.0 °C (Table 11). Salinity varied from 23.9 to 30.9 0/00. The ph readings were all basic (7.7 to 8.8). Dissolved oxygen concentrations ranged from 0.0 to 9.8 mg O_2/1. Carbon dioxide ranged from 0.0 to 11.1 mg CO_2/1. Secchi disc depths recorded ranged from 0.45 to 1.2 m.

B.O.D. values recorded ranged from 1.3 to 10.4 mg O_2/0 (Table 37). Slight traces of nitrite nitrogen were observed (<0.003 to 0.062 mg NO_2-N/1. Nitrate nitrogen levles ranged from <0.04 to 0.62 mg NO_3-N/1. Ammonia nitrogen values ranged from 0.01 to 2.11 mg NH_3-N/1. Orthophosphate ranged from 0.07 to 0.51 mg PO_4-P/1.

Beach Thorofare

This water system, extending from Absecon Channel south along the eastern portion of the study area to the Great Egg Harbor, is part of the Intracoastal Waterway. As was previously mentioned, this stream is the receiving waters for sewage treatment plants located at Atlantic City, Ventnor and Longport. The channel is tidally influenced by both Absecon Inlet and Great Egg Harbor Inlet. Most of the eastern shore is found to be developed.

Eight stations were located in this waterway; five in the main stem and three near shore. Water depths ranged from .5 to 24 feet with bottom composition varying from fine sand to soft mud.

Water temperatures recorded at these stations ranged from 2.0 to 28.5 °C and air temperatures from 4.8 to 36.5 °C (Tables 15-17, 20 and 23). Salinity varied from 23.9 to 31.0 0/00. All ph readings were basic (7.5 to 8.3). Dissolved oxygen concentrations ranged from 2.6 to 12.2 mg O_2/1. Carbon dioxide levels ranged from 0.0 to 13.7 mg CO_2/1. Secchi disc readings ranged from .4 to 2.2 m.

B.O.D. levels ranged from 0.7 to 4.6 mg O_2/l (Tables 29-31). Slight traces of nitrite nitrogen were observed (<0.003 to 0.027 mg NO_2-N/1. Nitrate nitrogen levels measured ranged from <0.04 to 1.48 mg NO_3-N/1. Ammonia nitrogen ranged from <0.01 to 0.33 mg NH_3-N/1. Orthophosphate ranged from <0.01 to 0.32 mg PO_4-P/1. Detergent concentrations detected ranged from 0.02 to 0.36 mg/1.

Inside Thorofare

This water system is also considered part of the Intracoastal Waterway. Situated along the eastern shore (near Ventnor), this waterway separates the barrier island of Atlantic City region from Ventnor Heights. Almost the entire waterway is developed; very little natural shoreline remains. Most tidal influences is received from Great Egg Harbor Inlet.

Two water quality stations (zones 20 and 21) were selected in this thorofare. Depths ranged from .5 to 10 feet at mean low water. Bottom composition varied from sand to soft mud.

Water temperatures recorded ranged from 2.0 to 29.0 °C and air temperatures from 6.0 to 32.0 °C (Tables 18 and 19). Salinity varied from 26.4 to 30.7 0/00. The pH readings were found to be basic (7.6 to 8.1). Dissolved oxygen concentrations ranged from 2.7 to 11.8 mg O_2/1. Carbon dioxide values ranged from 0.0 to 9.9 mg CO_2/1. Secchi disc readings ranged from 0.6 to 2.3 m.

B.O.D. levels ranged from 0.9 to 4.0 mg O_2/1 (Table 28). Slight traces of nitrite nitrogen were detected (<0.003 to 0.028 mg NO_2-N/1). Nitrite nitrogen ranged from <0.04 to 0.60 mg NO_3-N/1. Orthophosphate ranged from <0.01 to 0.21 mg PO_4-P/1.

Margate Bridge Road

This roadway, situated approximately 2 1/4 miles north of Longport, links the upland region of Northfield to the barrier island via Margate City. The toll

bridge, traversing Beach Thorofare, Shelter Island Waters and Dock Thorofare is privately owned.

Two water quality stations were selected on the south side of this access road: Toms Island (zone 26) and Dock Thorofare (zone 27). Water depths ranged from .5 to 7 feet at mean low water. Bottom composition was soft mud and detritus.

Water temperatures recorded at these stations ranged from 2.0 to 26.0 °C and air temperatures ranged from 5.0 to 30.0 °C (Tables 21 and 22). Salinity varied from 26.0 to 30.7 0/00. All pH readings were basic (7.6 to 8.3). Dissolved oxygen levels ranged from 3.2 to 11.7 mg O_2/1. Carbon dioxide values ranged from 0.0 to 10.1 mg CO_2/1. Secchi disc readings ranged from .5 to 1.8 m.

B.O.D. concentrations ranged from 1.0 to 4.0 mg O_2/1. (Table 33). Slight traces of nitrite nitrogen were observed ($<$0.003 to 0.019 mg NO_2N/1. Nitrate nitrogen levels ranged from $<$0.04 to 1.05 mg NO_3-N/1. Orthophosphate values ranged from 0.07 to 0.33 mg PO_4-P/1. Detergent concentrations ranged from 0.02 to 0.30 mg/1.

Scull Bay

This shallow bay, situated near the lower boundry of the study area, is tidally influenced by Great Egg Harbor Inlet. Access is greatly limited to high water. Wetlands completely surround this region.

It should be noted that water quality measurements were limited to the fish survey and nutrient collections (see Fish Study). Water depth ranged from .5 to 6 feet at mean low water. Bottom composition was soft mud, detritus and submerged vegetation.

Water temperatures recorded at this station ranged from 3.0 to 28.5 °C and air temperatures from 5.0 to 32.0 °C (Table 32). B.O.D. concentrations ranged from 0.9 to 7.3 mg O_2/1. Slight traces of nitrite nitrogen were observed ($<$0.003 to 0.022 mg NO_2-N/1). Nitrate nitrogen levels ranged from $<$0.04 to 0.92 mg NO_3-N/1.

Orthophosphate ranged from 0.05 to 1.7 mg PO_4-P/1.

Lakes Bay

This water body, approximately 2 1/4 miles north of Scull Bay, is located adjacent to U.S. Routes 40 and 322. Although this region is shallow, access can be gained along the northern shore by a marked navigational channel. There is little developed shoreline.

Water quality measurements were limited to the Fish Survey and nutrient collections. Water depths ranged from .5 to 11 feet at mean low water. Bottom composition was soft mud.

Water temperatures recorded at this station ranged from 2.0 to 25.5 °C and air temperatures from 4.0 to 35.0 °C (Table 34). B.O.D. levels recorded ranged from 1.0 to 4.6 mg O_2/1. Slight traces of nitrite nitrogen were found ($<$0.003 to 0.047 mg NO_2-N/1). Nitrate nitrogen ranged from 0.09 to 0.67 mg NO_3 N/1). Orthophosphate ranged from 0.03 to 0.67 mg PO_4-P/1.

Absecon Bay

Situated in the upper northern portion (adjacent to Route 30) of the study area, this shallow water system is almost completely surrounded by wetlands. Access through the area is provided by a marked navigational channel. This system is tidally influenced from Absecon Inlet and is the receiving water for Absecon Creek and the Pleasantville Treatment Plant (via Jonathan Thorofare).

There were two water quality stations selected, one in the main navigational channel (Flashing Light "9") and the other along the southwestern shore near U.S. Route 30. Water depths ranged from .5 to 5 feet at mean low water. Bottom composition was soft mud.

Water temperatures recorded at these stations ranged from 1.0 to 26.0 °C and

air temperatures from 5.0 to 32.0 °C (Table 13). Salinity varied from 24.9 to 30.1 0/00. All pH readings were basic (7.7 to 8.1). Dissolved oxygen levels ranged from 3.3 to 11.3 mg O_2/1. Carbon dioxide values ranged from .7 to 8.6 mg CO_2/1. Secchi disc readings ranged from 0.3 to 2.15 m.

B.O.D. levels recorded ranged from 1.0 to 4.2 mg O_2/1 (Table 35). Nitrite nitrogen values ranged from <0.003 to 0.07 mg NO_2-N/1. Nitrate nitrogen ranged from <0.04 to 1.52 mg NO_3-N/1. Orthophosphate <0.01 to 0.25 mg PO_4-P/1.

Reed Bay

This water system, the largest of the four major bays, is located near the upper boundary adjacent to the Brigantine Wildlife Refuge. Access to this shallow area is limited to high water; depth ranging from .5 to 3 feet at mean low water.

Water quality parameters were limited to the Fish Survey and nutrient collections. Sampling was restricted to the northern shore, Turtle Cove.

Water temperatures recorded at this station ranged from 1.0 to 24.0 °C and air temperatures ranged from 3.0 to 23.5 °C (Tables 36). B.O.D. values recorded ranged from 1.1 to 3.0 mg O_2/1. Slight traces of nitrite nitrogen were observed (<0.003 to 0.136 mg NO_2-N/1). Nitrate nitrogen ranged from <0.04 to 1.17 mg NO_3-N/1. Orthophosphate ranged from 0.04 to 0.45 mg PO_4-P/1. Detergent values ranged from <0.01 to 0.22 mg/1.

Absecon Creek

This 4.5 mile water system was the only tributary sampled in the study area. Located approximately 5 miles west of Atlantic City along the western shore, this stream is the receiving water for the Atlantic City Reservoir. Saline water entering via Absecon Channel greatly influences this region. Most of the development on this tributary is situated below Shore Road along the northern side. The

rest of this area remains in a natural state. This stream is transvered by Absecon Boulevard (Route 30), Shore Road and Route 9.

Five stations were selected in this system. Station AC-0 was located at the mouth of the creek. Stations AC-1 (adjacent to launching ramp), AC-2 (adjacent to a natural shoreline lagoon), AC-3 (below Absecon Boulevard), and AC-4 (100 yards above Route 9) were situated in the channel (Figure 1).

Water temperatures recorded at these stations ranged from 2.2 to 22.0 °C and air temperatures from 11.5 to 24.0 °C (Table 23A). Salinity ranged from 0.4 to 29.0 0/00. The pH readings varied from slightly acid to basic (6.6 to 8.3). Dissolved oxygen levels were from 3.4 to 11.9 mg O_2/1. Carbon dioxide values ranged from 2.7 to 11.7 mg CO_2/1. Secchi disc depths ranged from 0.3 t0 1.2 m.

THERMOGRAPH DATA

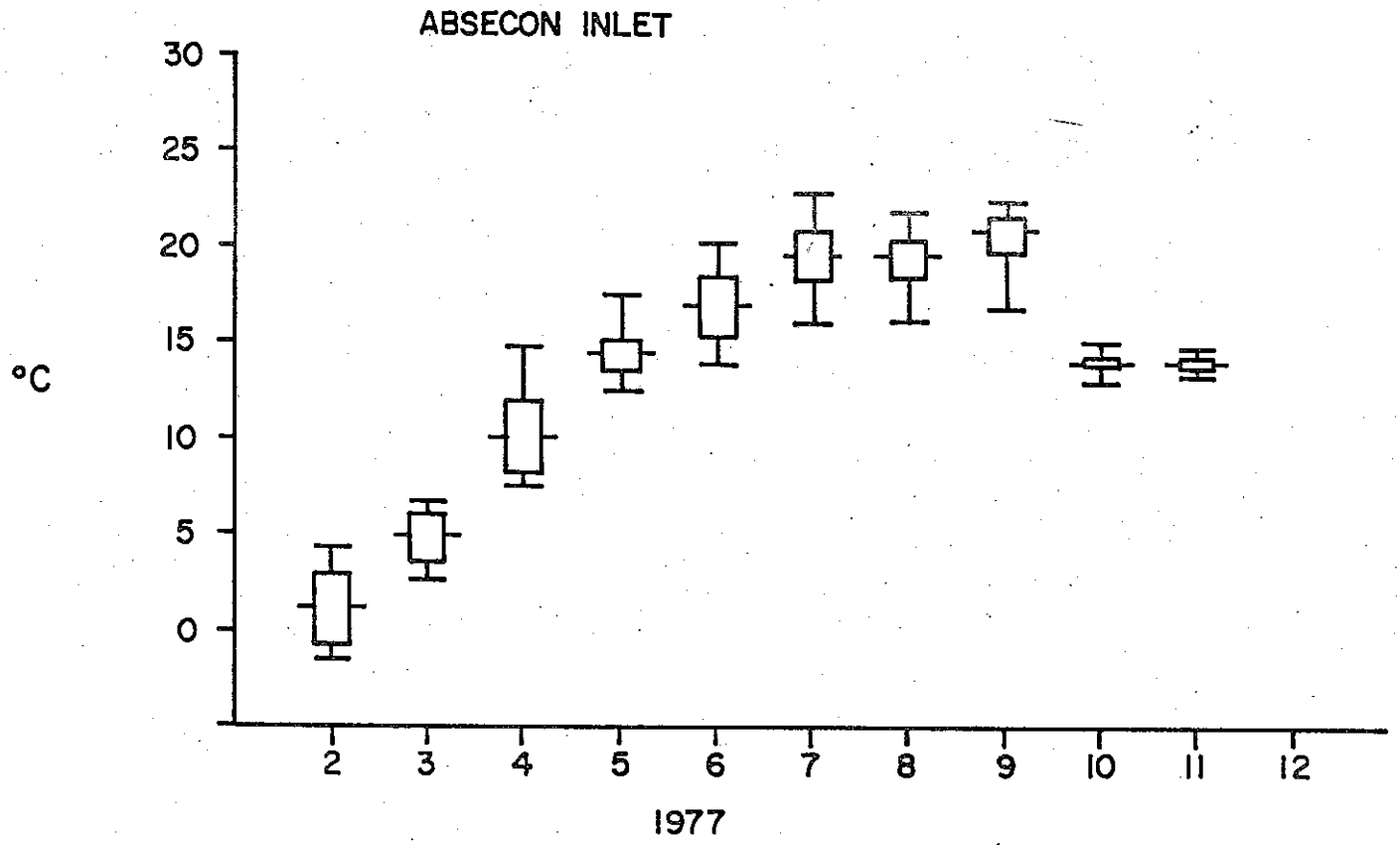
As was previosly mentioned, four thermographs were placed in selected areas to record daily water temperatures over a 45 day period (see Figure 1). No data could be taken during the months of January, February and March in Reed Bay and Main Marsh Thorofare, and during January in Absecon Inlet and Longport. This was due to the extreme cold weather experienced during January and February.

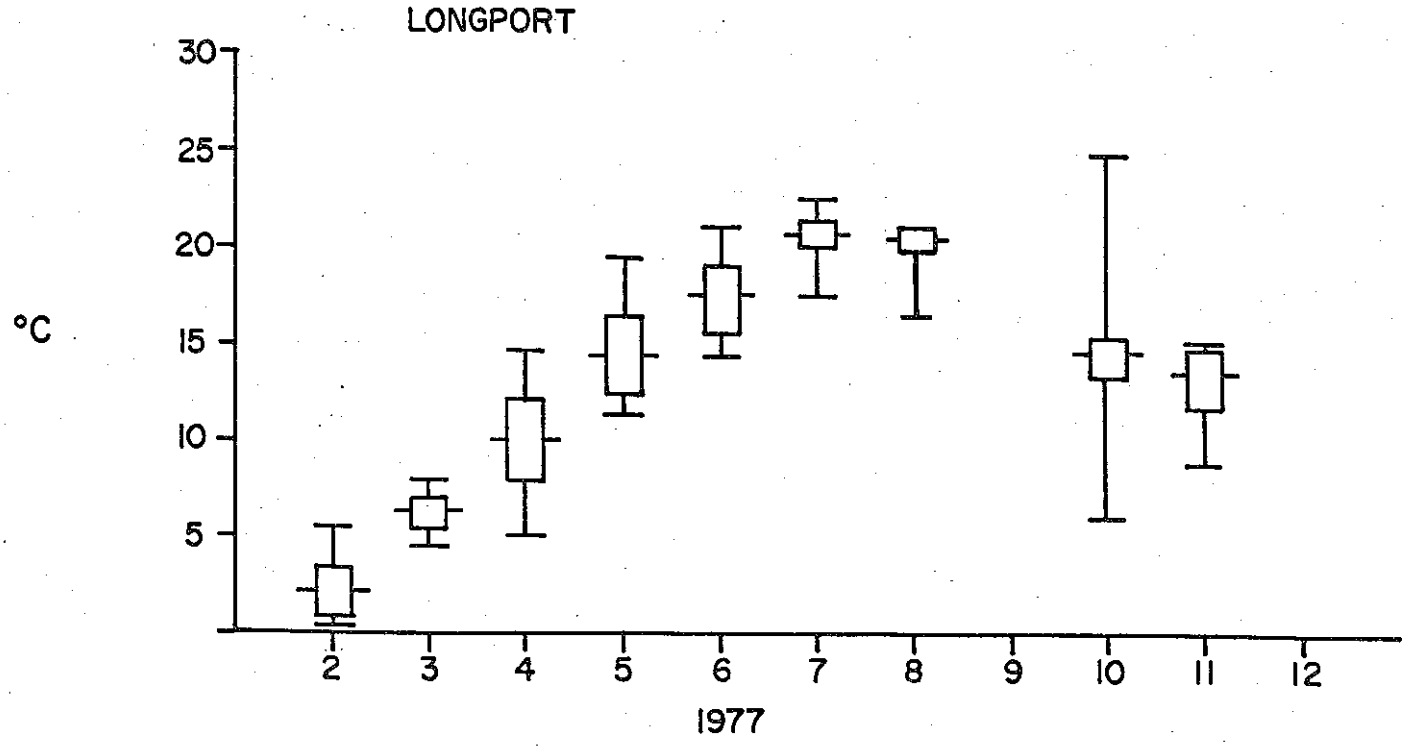
Figure 4 shows monthly mean, standard deviation and ranges of temperatures for each station. This also shows that water temperatures during the survey; whenever recorded, ranged from -1.5 to 31.0 °C. Figure 5 compares monthly mean water temperatures recorded for each station.

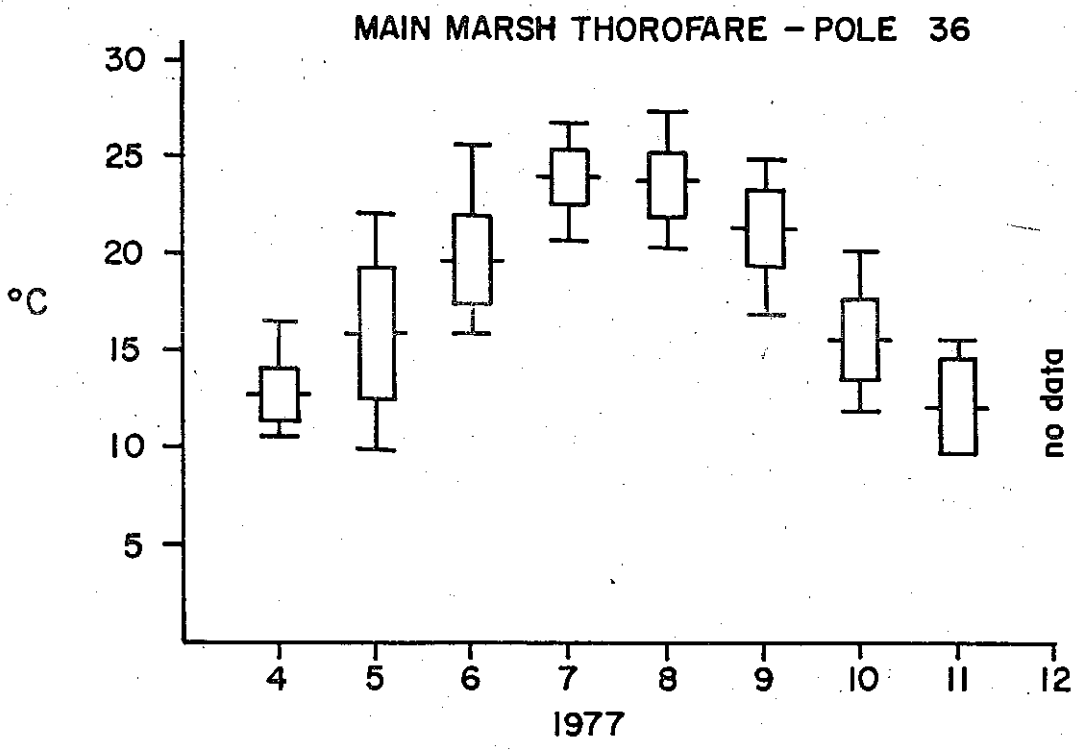
PESTICIDE - HEAVY METAL ANALYSIS

Monthly fish collections showed it was very difficult to collect the same

FIGURE 4. MONTHLY MEAN, STANDARD DEVIATION AND RANGE OF TEMPERATURE IN THE BACK BAYS OF ATLANTIC COUNTY.






MAIN MARSH THOROFARE – POLE 36
°C
30
25
20
15
10
5
4
5
6
7
8
9
10
11
12
1977
no data

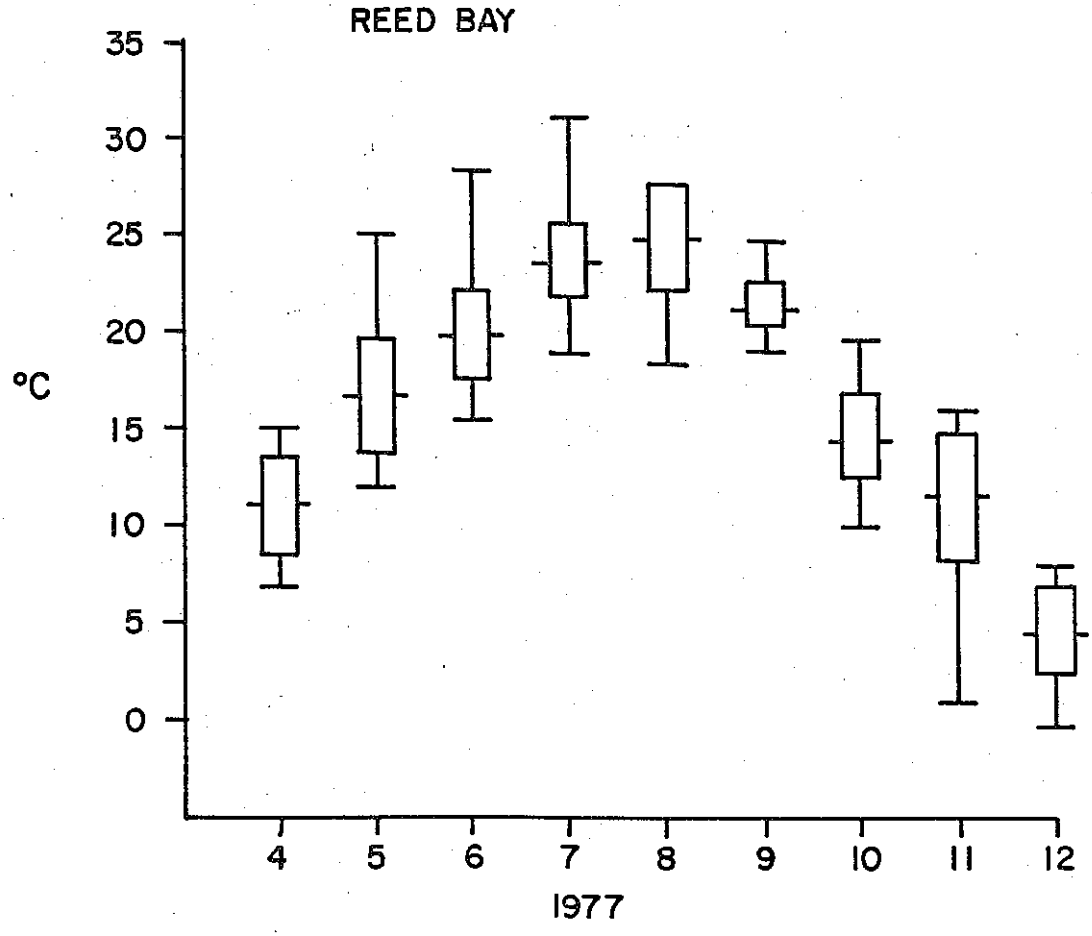
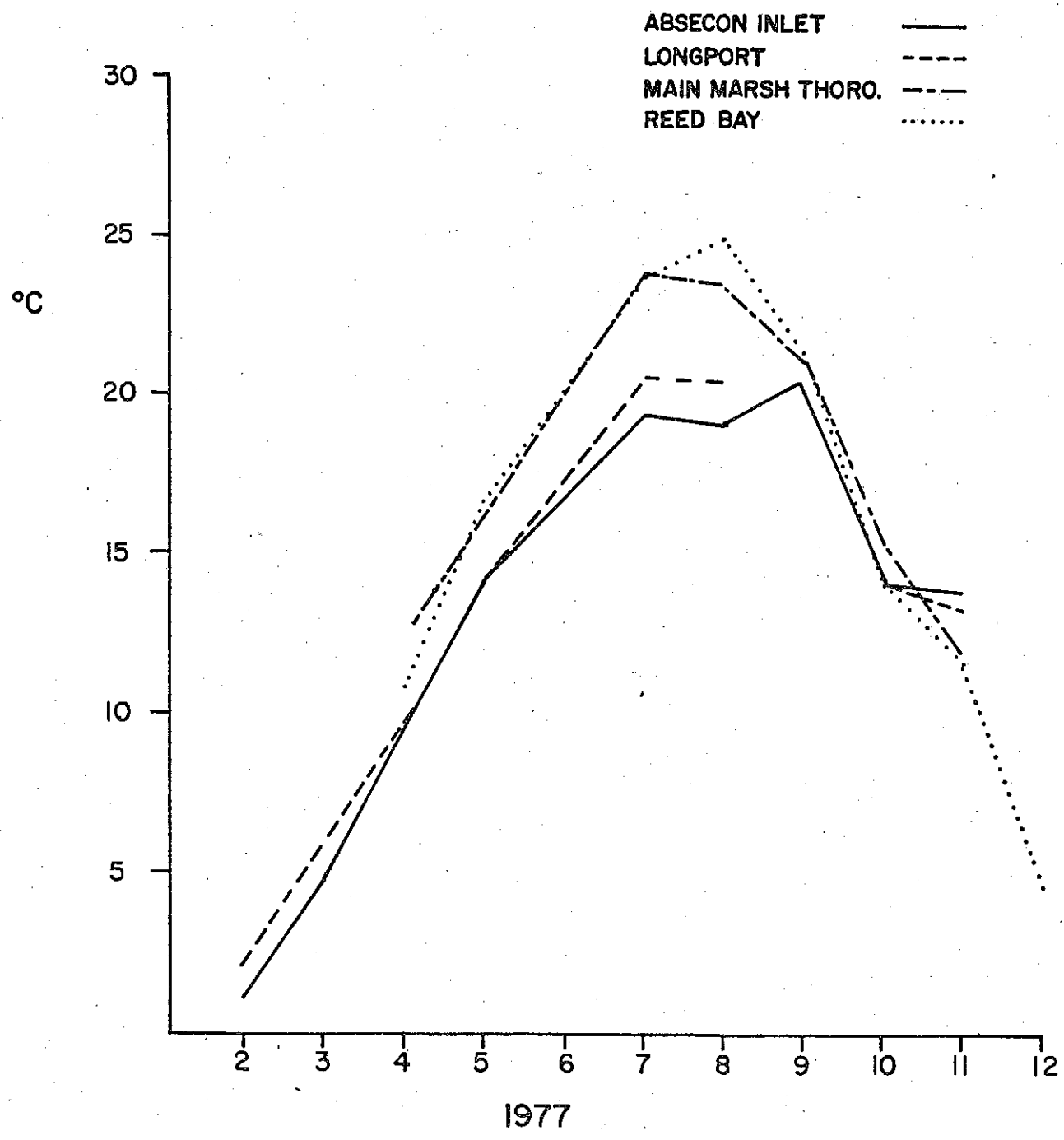

REED BAY
°C
35
30
25
20
15
10
5
0
4
5
6
7
8
9
10
11
12
1977

FIGURE 5. COMPARISON OF MONTHLY MEAN WATER TEMPERATURE RECORDED AT THERMOGRAPH STATIONS IN THE ATLANTIC COUNTY BACK BAYS.



species consistently at selected stations, even more so to collect a sufficient quantity of any species at a particular station. As one would expect, over 75% of the samples were collected during the summer and fall periods. Both sampling stations and fish species were selected according to their availability within specific areas.

Summer flounder, Paralichthys dentatus, winter flounder, Pseudopleuronectes americanus, weakfish, Cynoscion regalis, bluefish, Pomatomus saltatrix, white perch, Roccus americanus, yellow perch, Perca flavescens, windowpane, Scophthalmus aquosus, spot, Leiostomus xanthurus, Atlantic menhaden, Brevoortia tyrannus, and blue crab, Callinectes sapidus, were the selected species in the chlorinated hydrocarbons and heavy metal analysis. Summer flounder, bluefish and white perch made up 65% of the finfish samples.

The hard clam, Mercenaria mercenaria, the eastern oyster, Crassostrea virginica, the blue edible mussel, Mytilus edulis, and the Atlantic ribbed mussel, Modiolus demissus were the shellfish species collected for the pesticide and heavy metal analysis. The hard clam and ribbed mussel made up 90% of the samples. As was mentioned in the shellfish section, the hard clam is the most important shellfish species located within the study area and is harvested both recreationally and commerically. The ribbed mussel, on the other hand, is not commercially important but can be found along the sedge banks (intertidal) of most of the tributaries.

A total of 96 samples were sent to the State of New Jersey Fisheries Laboratory at Lebanon for analysis. Samples were analyzed for the chlorinated hydrocarbons, α BHC, lindane, aldrin, heptachlor expoxide, dieldrin, chlordane and DDT and its metabolites. Heavy metal analysis included cadmium, chromium, lead, zinc and mercury.

FIGURE 5A SHELLFISH AND SEDIMENT SAMPLING LOCATIONS

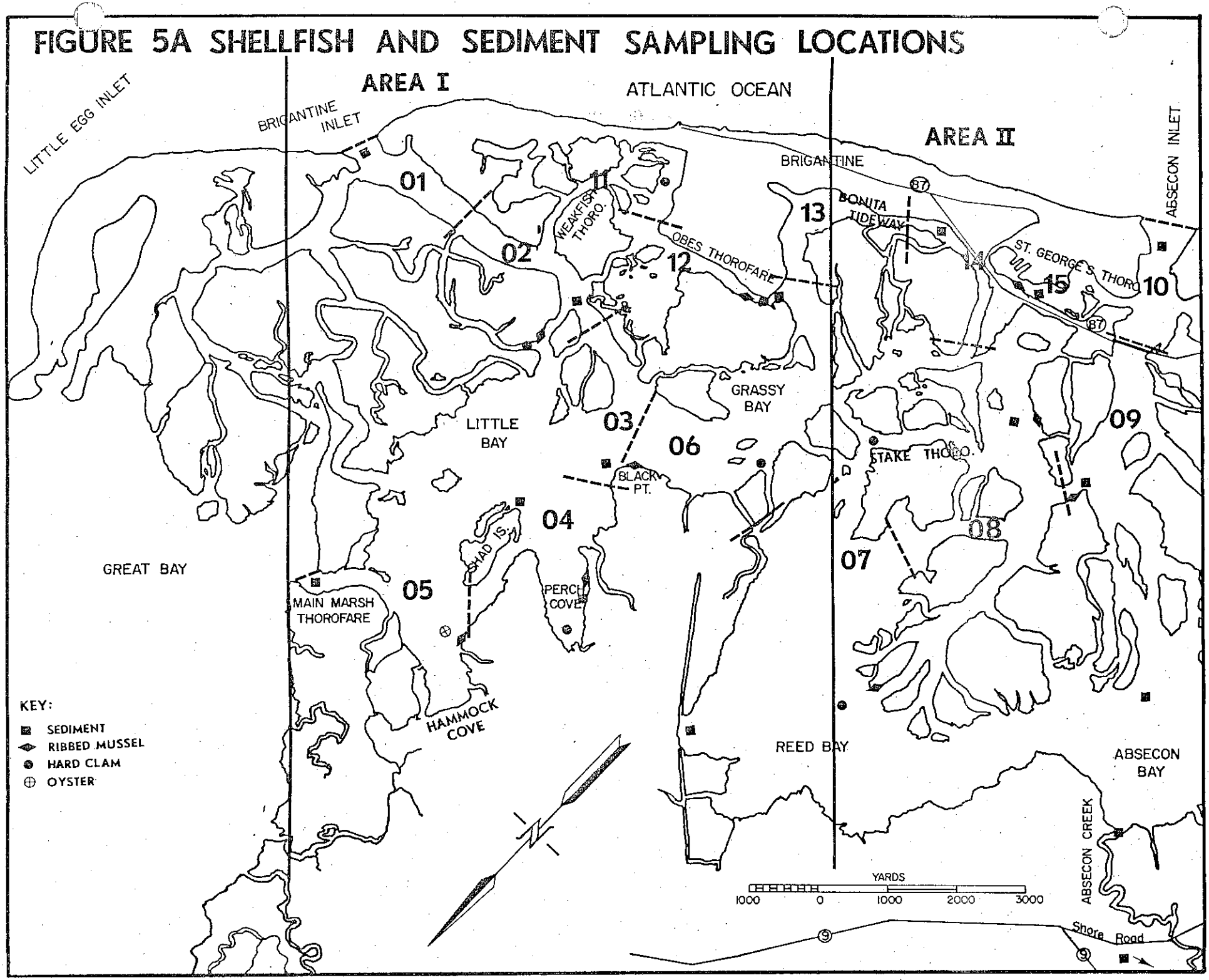
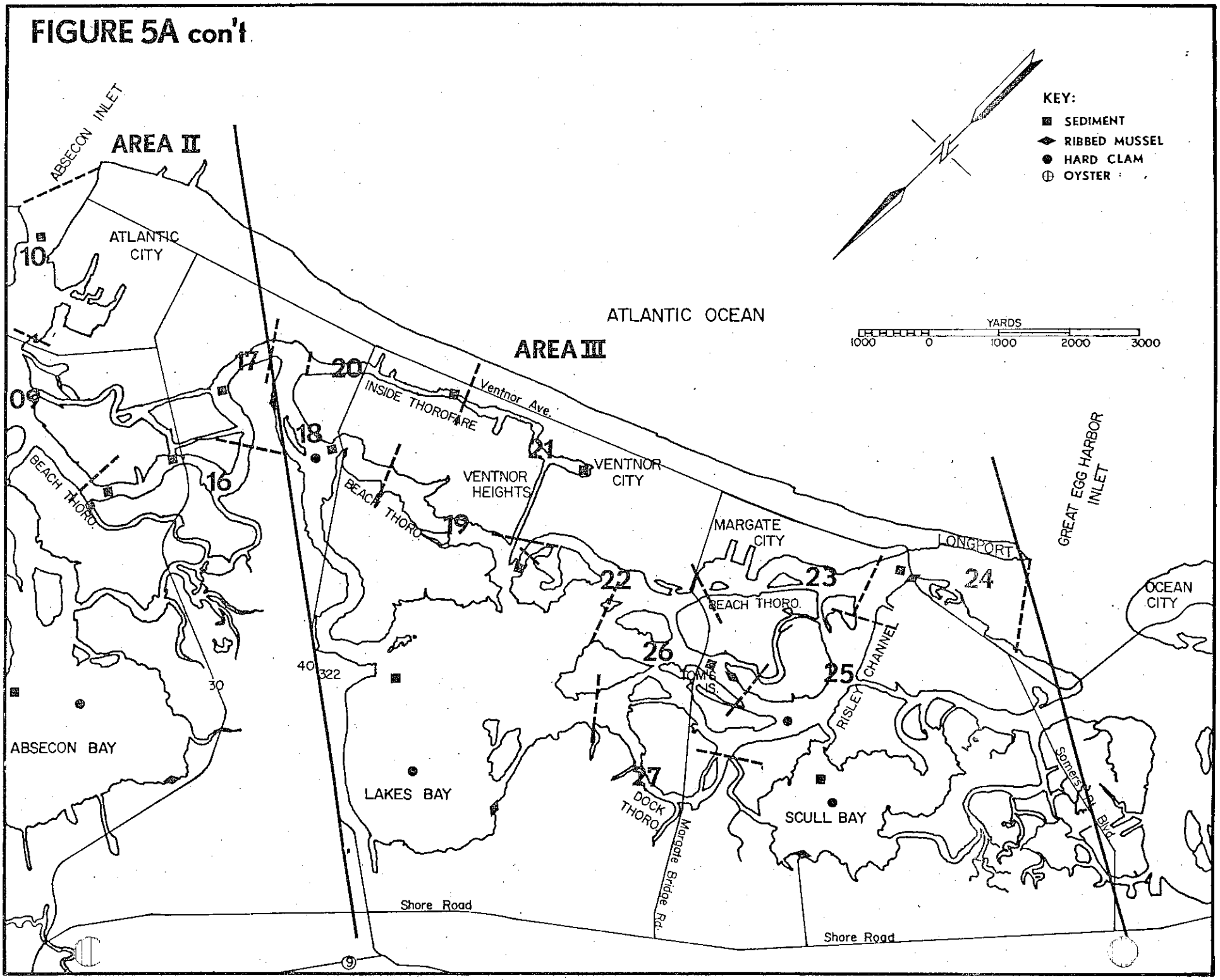


FIGURE 5A con't



Results of residue analysis for the chlorinated hydrocarbons found in fish, sediment and shellfish are listed in Tables 37A to 37D. The data from these analysis are reported in microgram/kilogram (ppb). Results of heavy metal concentrations in fish, sediment and shellfish are listed in Tables 37E to 37I. All data is reported in milligram/kilogram (ppm). See Figure 5A for breakdown of survey area and location of stations.

Pesticide Analysis

Traces of DDT and its metabolites were detected in 95% of the finfish samples with values ranging up to 246.6 ug/kg. Figure 6 shows fish netted in Area I to have higher mean DDT levels than species taken from Areas II, III and the tributary, Absecon Creek. A closer examination of the data suggests that mean DDT levels were highest in the tissue samples of the summer flounder and weakfish (see Figure 7). The single highest concentration was detected in the meat sample from the summer flounder (246.6 ug/kg). This sample was collected in Area I and appears to be the reason why mean values were higher here than the other region. Except for this high reading, mean values were similar for all 3 regions with Absecon Creek having the lowest.

An attempt was made to seasonally compare DDT levels detected in finfish (see Figure 8). No appreciable number of fish could be collected during the winter period. As was previously mentioned, extreme ice conditions prevented this study from getting underway until March. With limited data, the summer period appears to show the highest mean DDT levels.

The only other insecticide detected in fish meat was dieldrin, found only in two or 5% of the samples with values ranging up to 3.6 ug/kg. A closer examination of the data shows the weakfish (3.6 ug/kg) taken in Area I and summer flounder (2.9 ug/kg) in Area II, as the only species with any traces. During the Studies

FIGURE 6. COMPARISON BY AREA OF MEAN LEVELS OF DDT AND ITS METABOLITES DETECTED IN FISH, SEDIMENT AND SHELLFISH TAKEN FROM THE BACK BAY SYSTEMS OF ATLANTIC COUNTY, 1977-78.

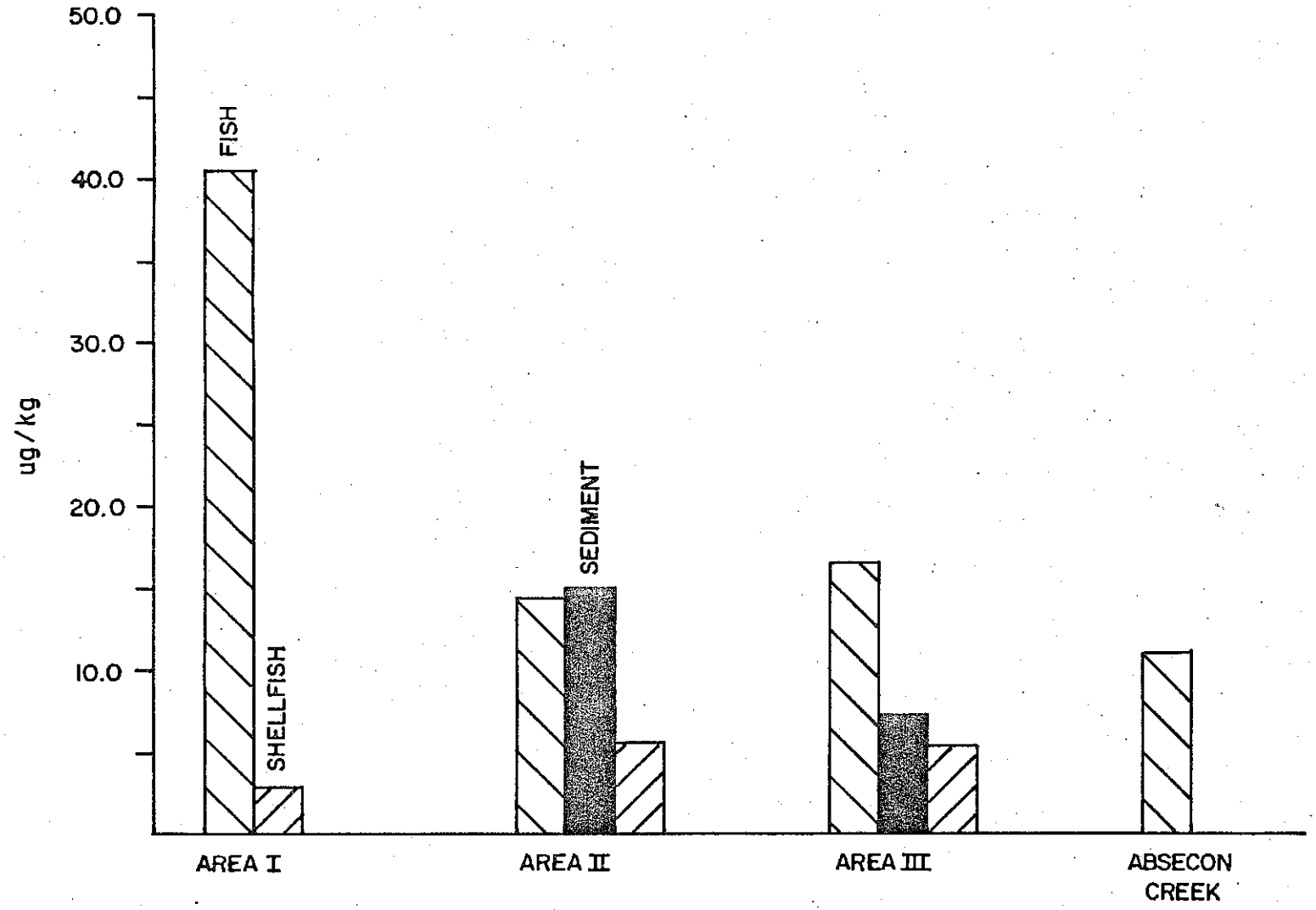


FIGURE 7. COMPARISON OF MEAN LEVELS OF DDT AND ITS METABOLITES DETECTED IN FINFISH AND AND SHELLFISH TAKEN FROM THE BACK BAY SYSTEMS IN ATLANTIC COUNTY, 1977-78.

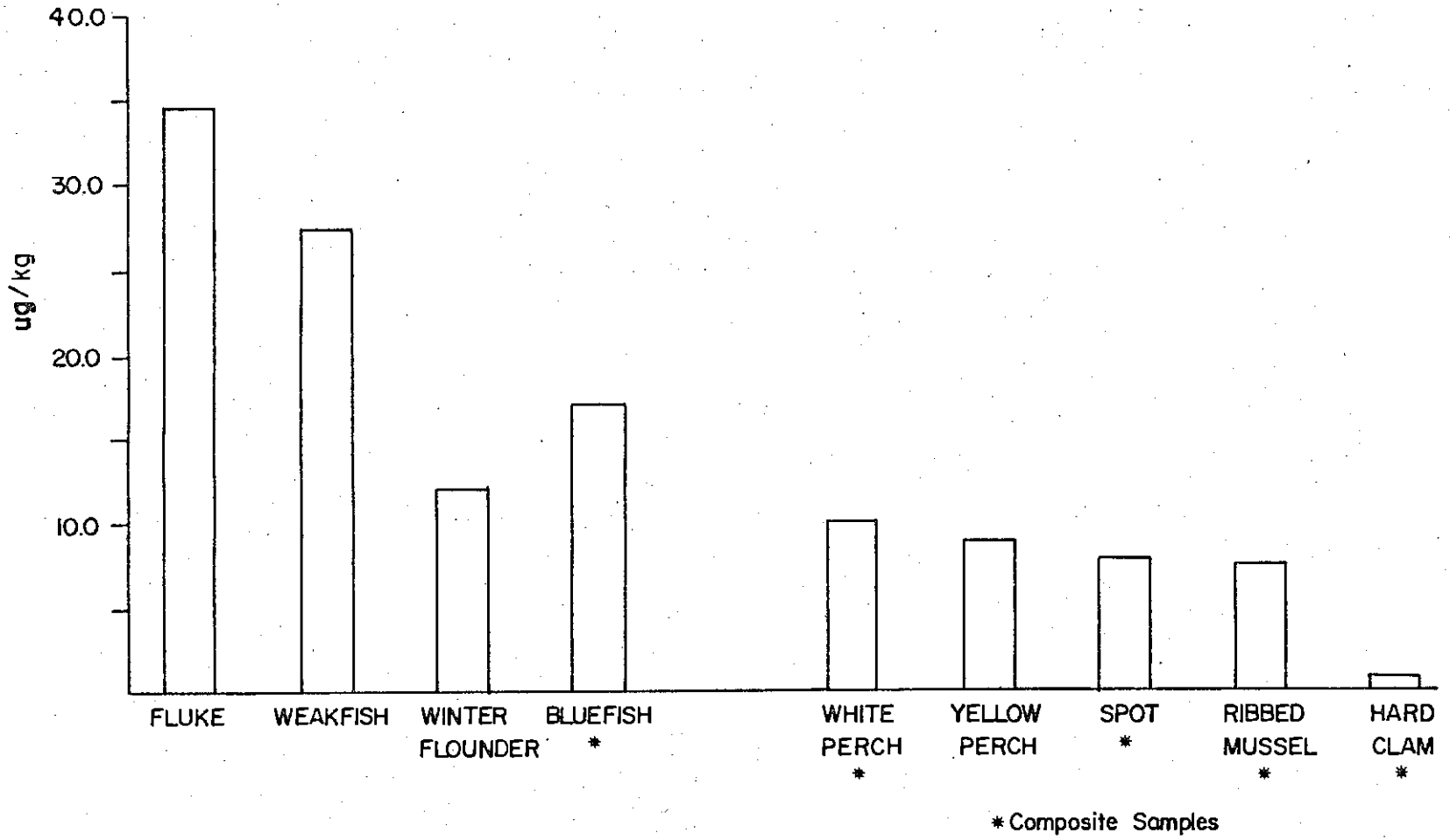
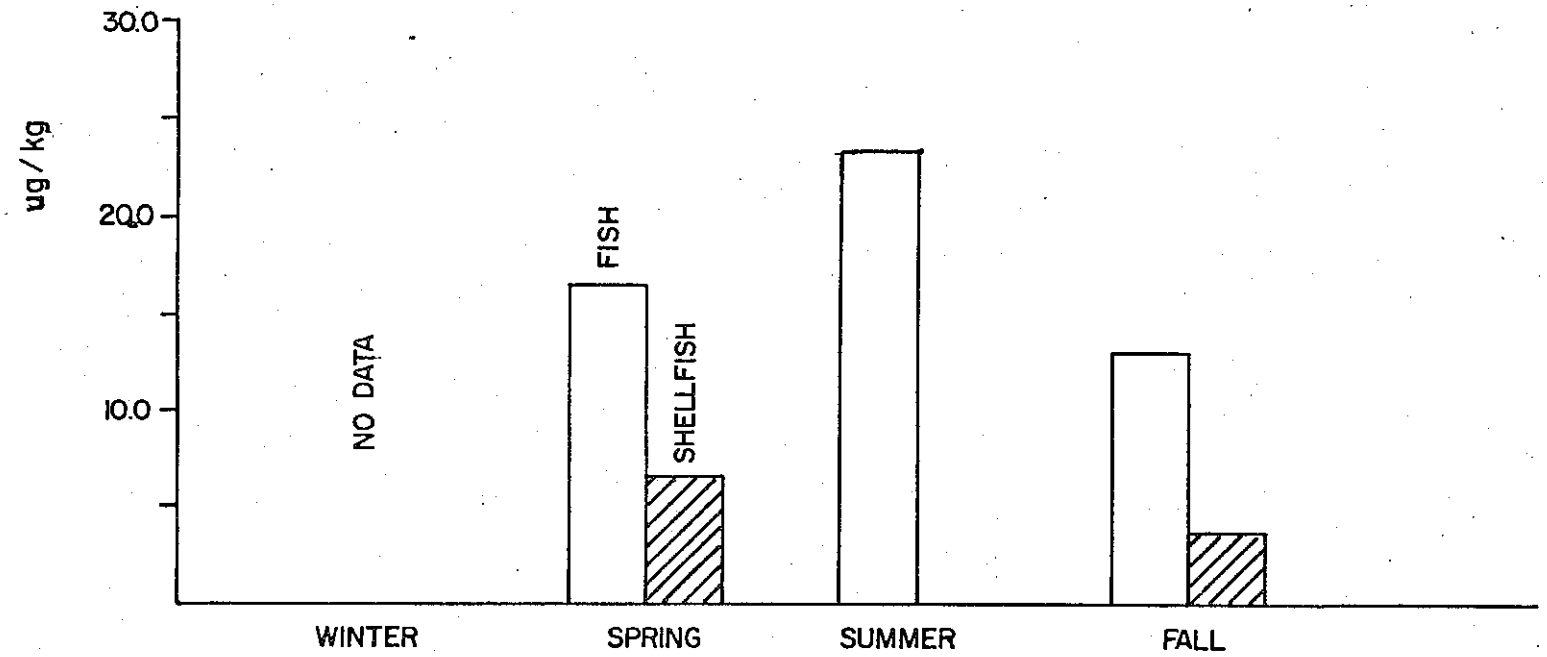


FIGURE 8. SEASONAL COMPARISON OF MEAN LEVELS OF DDT AND ITS METABOLITES DETECTED IN FISH AND SHELLFISH TAKEN FROM THE BACK BAY SYSTEMS IN ATLANTIC COUNTY, 1977-78.



of the Maurice River and Cove System (1978), α BHC was the only other insecticide detected in 10% of the fish.

Analysis of shellfish meat for DDT revealed that 52% of the samples measured to a sensitivity of <2.5 ug/kg did show traces with values ranging up to 14.69 ug/kg. Concentrations were found to be lower in the shellfish as compared to the fish. A closer examination of the data showed, only one reading of 3.37 ug/kg of DDT in the hard clam (Figure 7). It would suggest that the ribbed mussel, situated at or just below the high water line tended to accumulate DDT concentrations (see Table 37C). The oyster, however, was found with a concentration of 12.24 ug/kg. No other insecticide was detected.

DDT analysis of sediment also showed that 41% of the samples measured to a sensitivity of <2.5 ug/kg did show traces with values ranging up to 95.5 ug/kg. The highest concentration was detected in a bottom sample taken in St. George's Thorofare (zone 15). Figure 6 shows mean DDT levels to be slightly higher in Area II as compared to Area III and Absecon Creek. No traces of DDT were found in the mud samples collected in Area I.

Chlordane was the only other insecticide detected in 74% of the mud samples with values ranging up to 6,400 ug/kg. Figure 9 shows mean levels of chlordane to be high in Area II and Absecon Creek. The highest concentrations were found in bottom grabs taken from St. George's Thorofare (6,400 ug/kg), Inside Thorofare (1,190 ug/kg) and mouth of Absecon Creek (792.2 ug/kg).

It is well recognized that once pesticides such as DDT and chlordane enter the marine environment, they will accumulate in the food chains. A residue accumulation of up to 2 million times was calculated for fish from the field data of Reinert (1970). Butler (1966) observed that DDT may be concentrated to a level 25,000 times that found in surrounding sea water within 10 days. In some instances,

FIGURE 9. COMPARISON OF MEAN LEVELS OF CHLORDANE DETECTED IN SEDIMENT TAKEN FROM THE BACK BAY SYSTEMS OF ATLANTIC COUNTY, 1977-78.

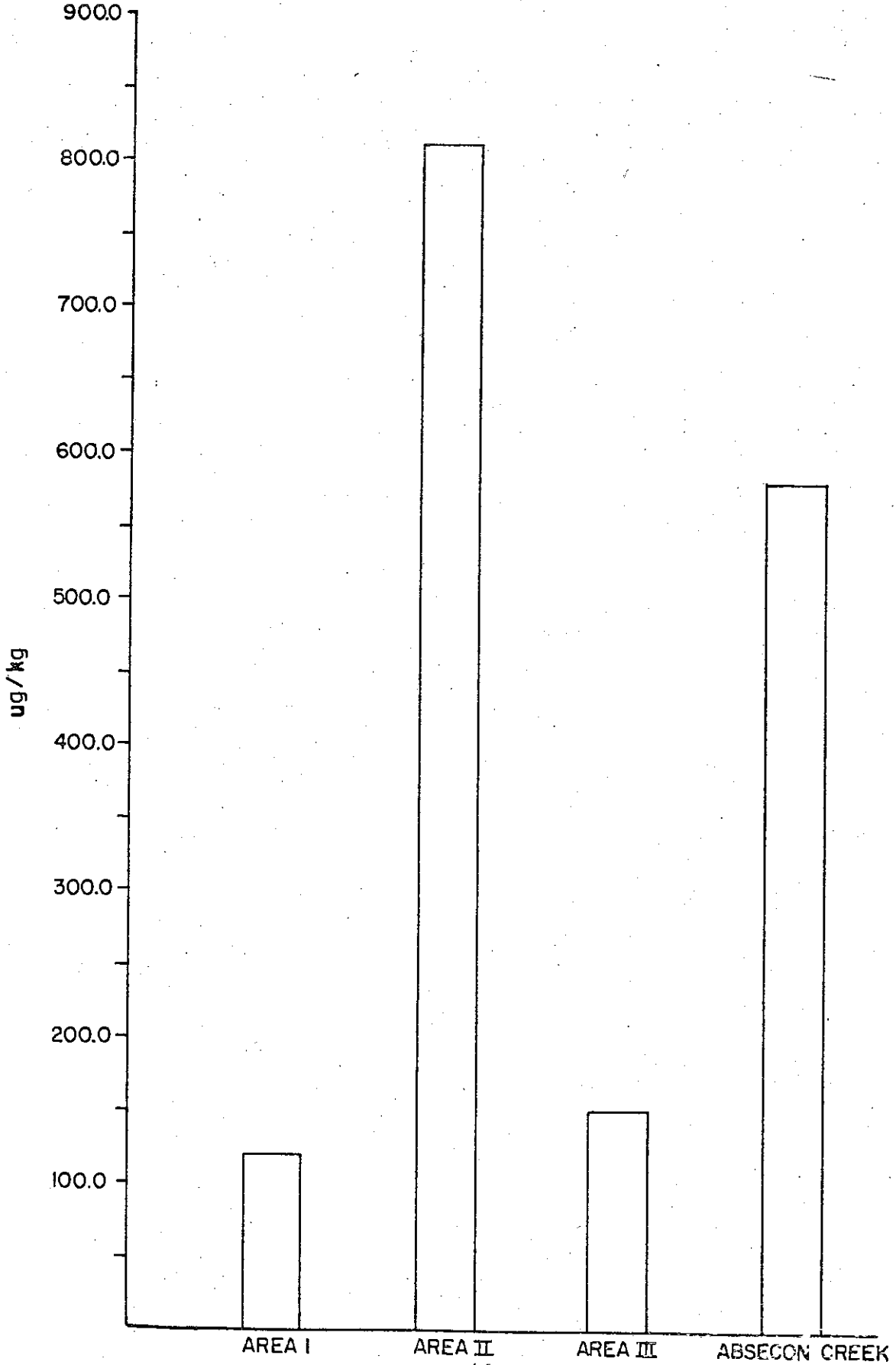
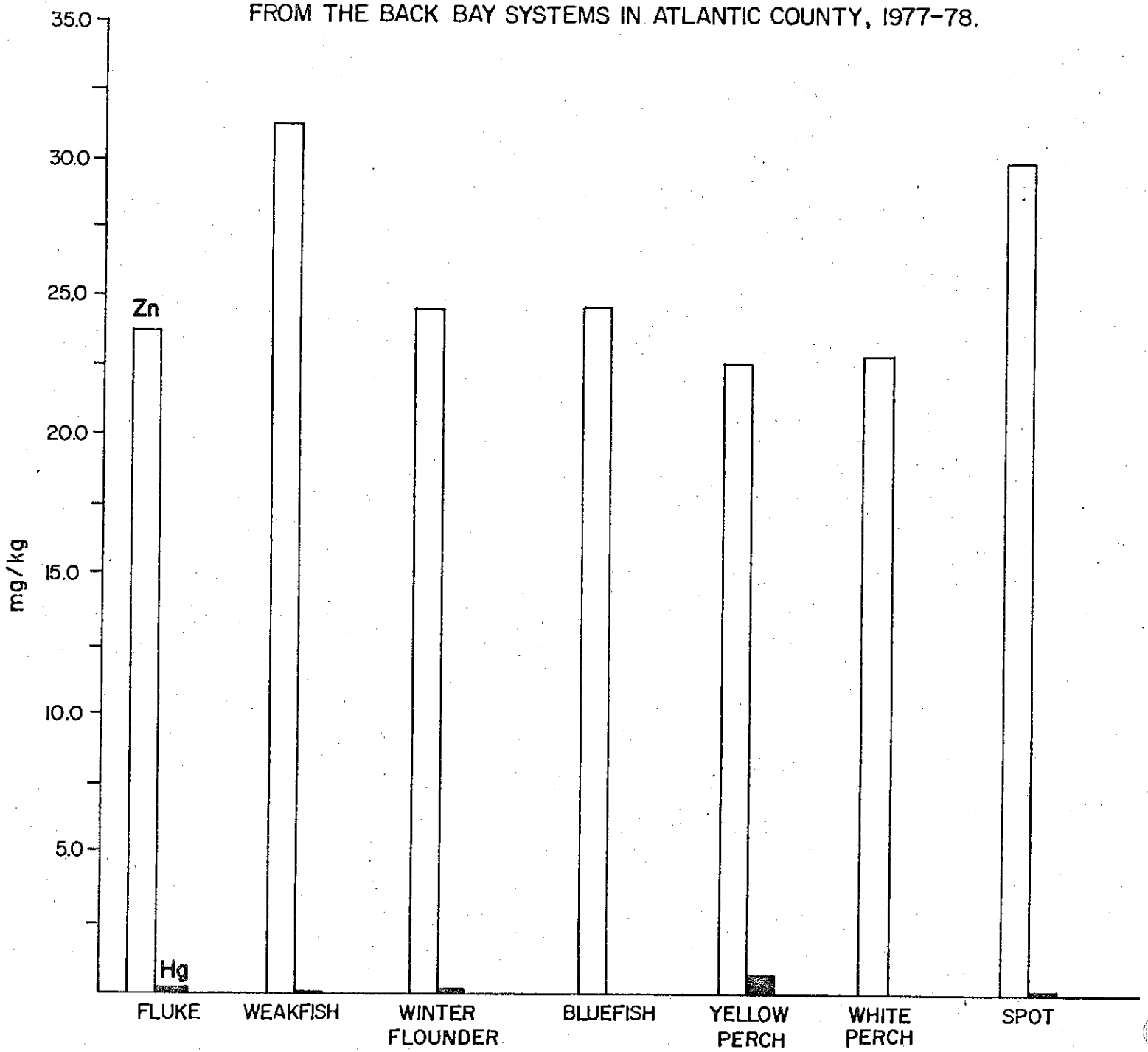


FIGURE 10. COMPARISON OF MEAN LEVELS OF FIVE HEAVY METALS DETECTED IN FISH TAKEN FROM THE BACK BAY SYSTEMS IN ATLANTIC COUNTY, 1977-78.



depending upon water temperature, duration of exposure and concentration of DDT in the surrounding water, he reports biological magnification may be 70,000 times. Cardwell (1975) reports that fishes can concentrate chlordane directly from water by a factor of 1,000 to 3,000 times and invertebrates may concentrate to twice this magnitude.

Butler (1960) determined that 24 hours' exposure of the oyster, Crassostrea virginicia, to 10 ug/l chlordane produced growth inhibition. Korn and Earnest (1974) found the 96-hour LC_{50} of chlordane to be 11.8 ug/l for the striped bass, Morone saxatilis. The Bureau of Commercial Fisheries, at the Milford, Connecticut laboratory, reported that DDT was found to be very toxic to oysters and clam larvae. Calabrese (1972) reported DDT at 0.05 ppm, caused over 90% mortality of oyster larvae and almost completely prevented growth in the survivors.

It would appear that DDT and chlordane concentrations recorded during this study are in sufficient quantities to possibly have sub-lethal effects on estuarine organisms.

Heavy Metal Analysis

Analysis of fish, shellfish and sediment samples showed that all five elements were present. Minimum, maximum and mean levels of cadmium, lead, zinc, chromium and mercury are compared in fish, sediment and shellfish (see Table 37I).

Heavy metal analysis of the fish tissue measured at a sensitivity of <0.02 mg/kg for chromium, cadmium and <0.2 mg/kg for lead showed no traces.

Zinc was detected in all of the fish samples with values ranging up to 58.0 mg/kg. The highest concentration (58.0 mg/kg) was observed in meat of the blue crab collected near Brigantine Inlet. A comparison of mean levels of zinc by species showed the commercial and recreationally important weakfish and the forage species, spot, with the highest levels (see Figure 10). All other species were

FIGURE II. COMPARISON OF MEAN LEVELS OF FIVE HEAVY METALS DETECTED IN SHELLFISH TAKEN FROM THE BACK BAY SYSTEMS IN ATLANTIC COUNTY, 1977-78.

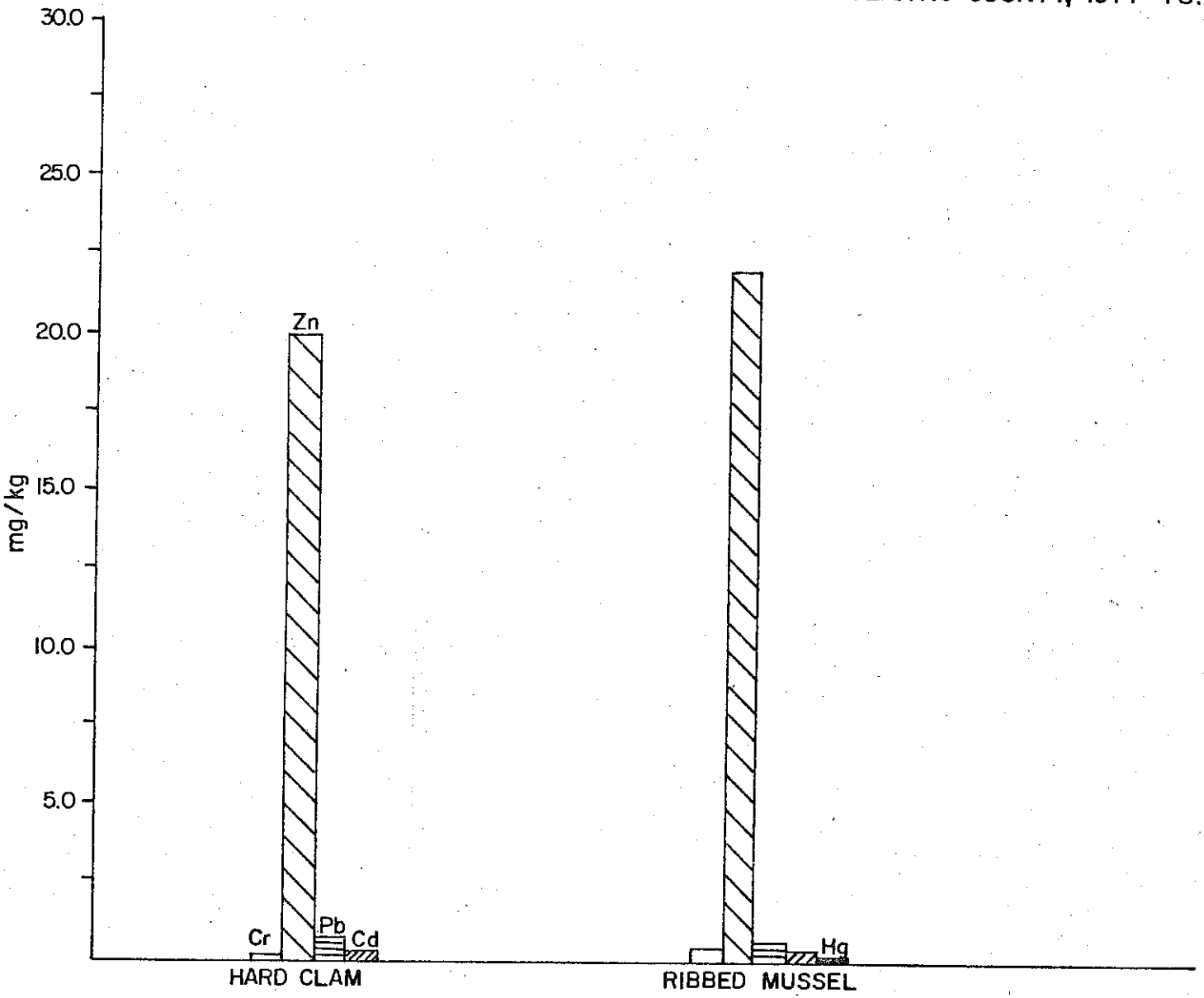
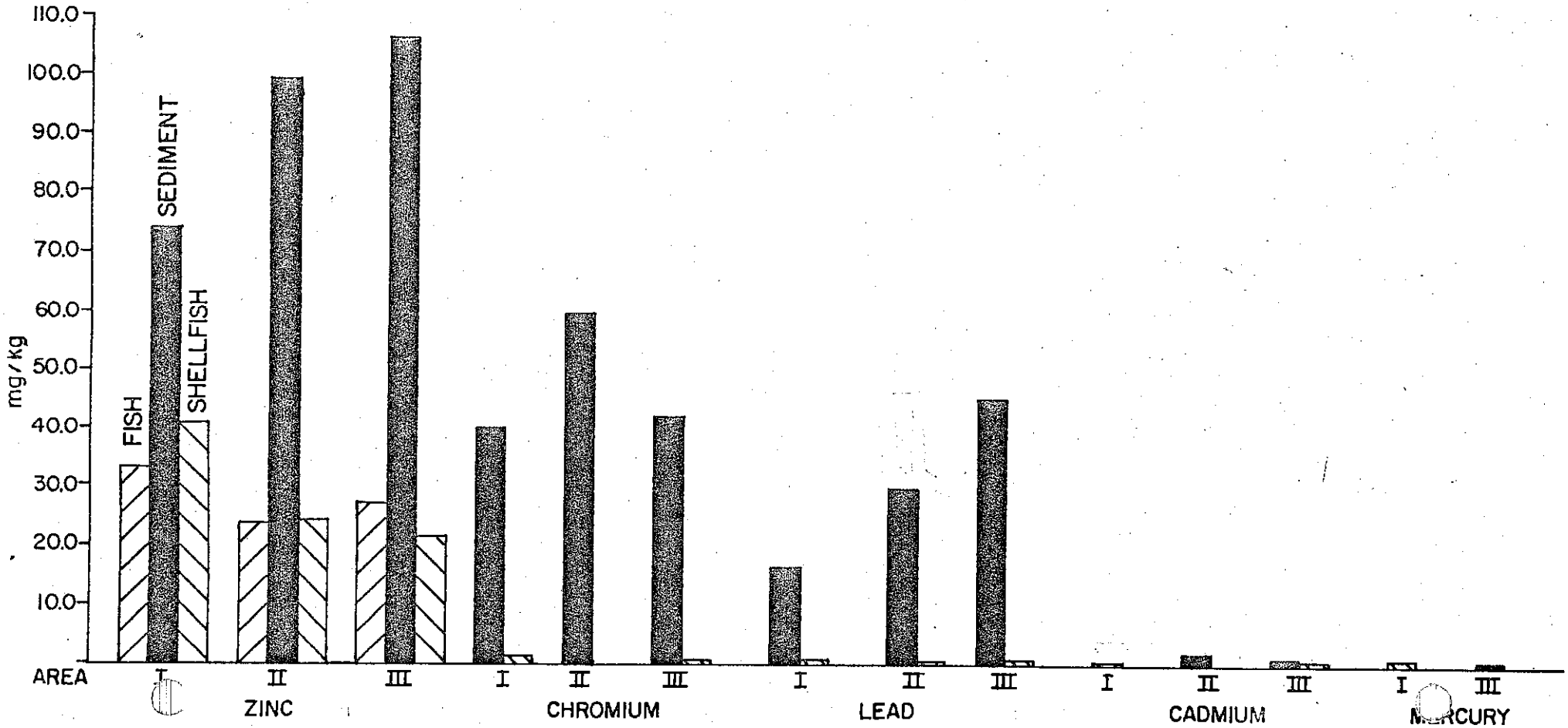


FIGURE 12. COMPARISON BY AREA, MEAN LEVELS OF FIVE HEAVY METALS DETECTED IN FISH, SEDIMENT AND SHELLFISH TAKEN FROM THE BACK BAY SYSTEMS IN ATLANTIC COUNTY, 1977-78.



found with similar concentrations. A closer examination of the data shows fish captured in Area I to contain slightly higher levels of zinc than Areas II and III (see Figure 12).

Mercury was detected in 98% of the fish samples with values ranging up to 1.27 mg/kg. The highest concentration was observed in yellow perch collected in Absecon Creek. It is interesting to point out that all four samples taken in this tributary were detected with levels near or above 0.5 ppm. Other species besides the yellow perch, found with levels near or above FDA's (Food and Drug Administration) acceptable level of 0.5 ppm for human consumption were the blue crab (0.70 mg/kg) and fluke (.53 and .65 mg/kg).

Analysis of composite samples of shellfish meat measured chromium to a sensitivity of <0.05 mg/kg showed 17% of the samples with values up to 4.0 mg/kg. The highest concentration was detected in the ribbed mussel collected in Risley Channel (Zone 26). Figure 11 shows slightly higher mean levels in the ribbed mussels as compared to the hard clam.

Zinc was detected in all shellfish samples with values ranging up to 214.0 mg/kg. The largest level was observed in the oysters taken from Hammock Cove, Main Marsh Thorofare, (Figure 5A). High zinc concentrations were detected (2,800 mg/kg) in the oyster during the Maurice River System Study (1978). Mean levels of zinc were similar for the hard clam and ribbed mussel (Figure 11).

Measuring to a sensitivity of <0.1 mg/kg, lead was detected in 41% of the samples with values ranging up to 7.0 mg/kg. The largest concentration was found in the ribbed mussel. This sample was taken at the station Black Point, Main Marsh Thorofare (Zone 06).

The element cadmium, measuring to a sensitivity of <0.05 mg/kg, was also found in 41% of the samples with values ranging up to 2.0 mg/kg. This concentration

FIGURE 13 SEASONAL COMPARISON OF MEAN LEVELS OF FIVE HEAVY METALS DETECTED IN FISH AND SHELLFISH TAKEN FROM THE BACK BAY SYSTEM IN ATLANTIC COUNTY, 1977-78.

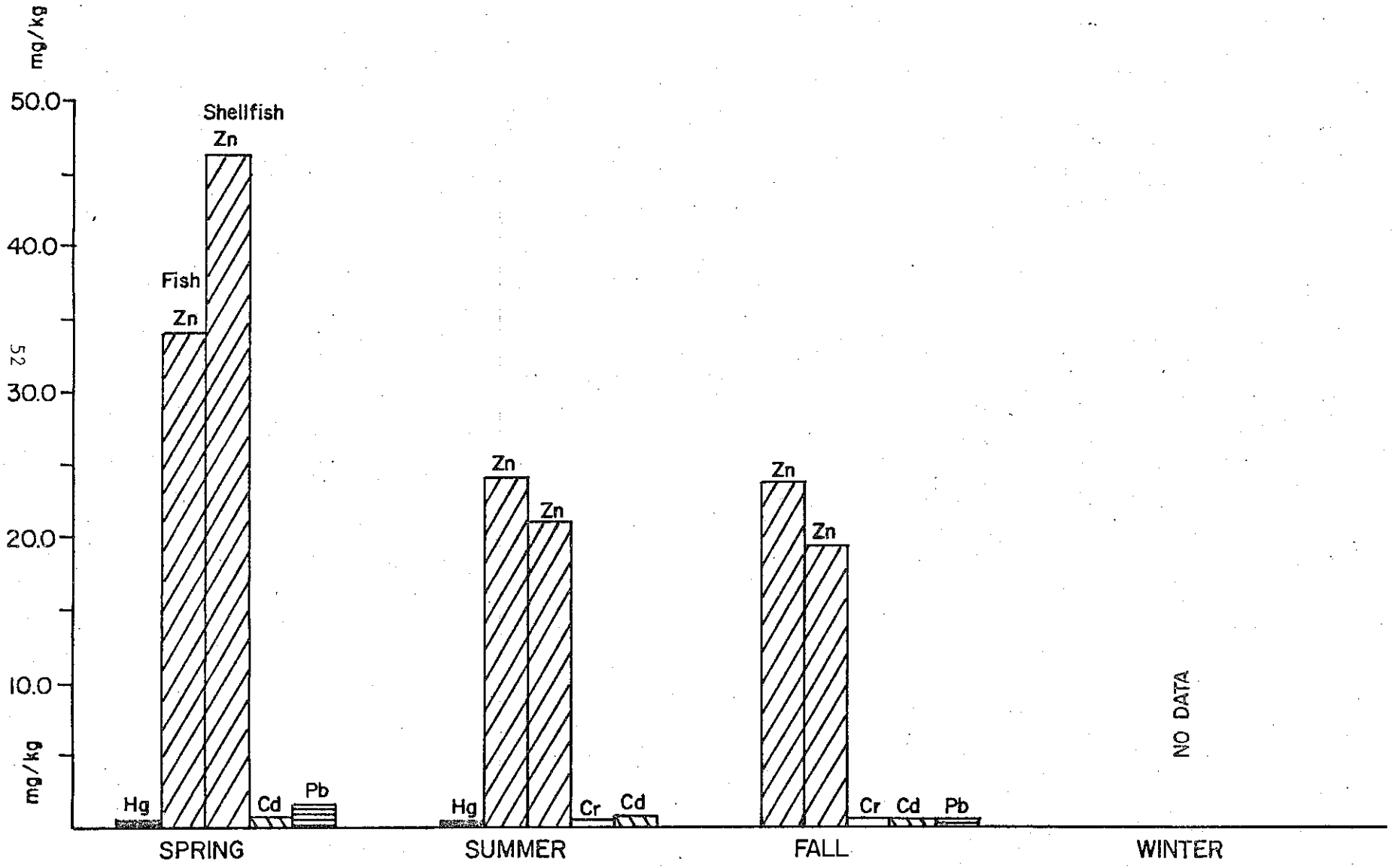
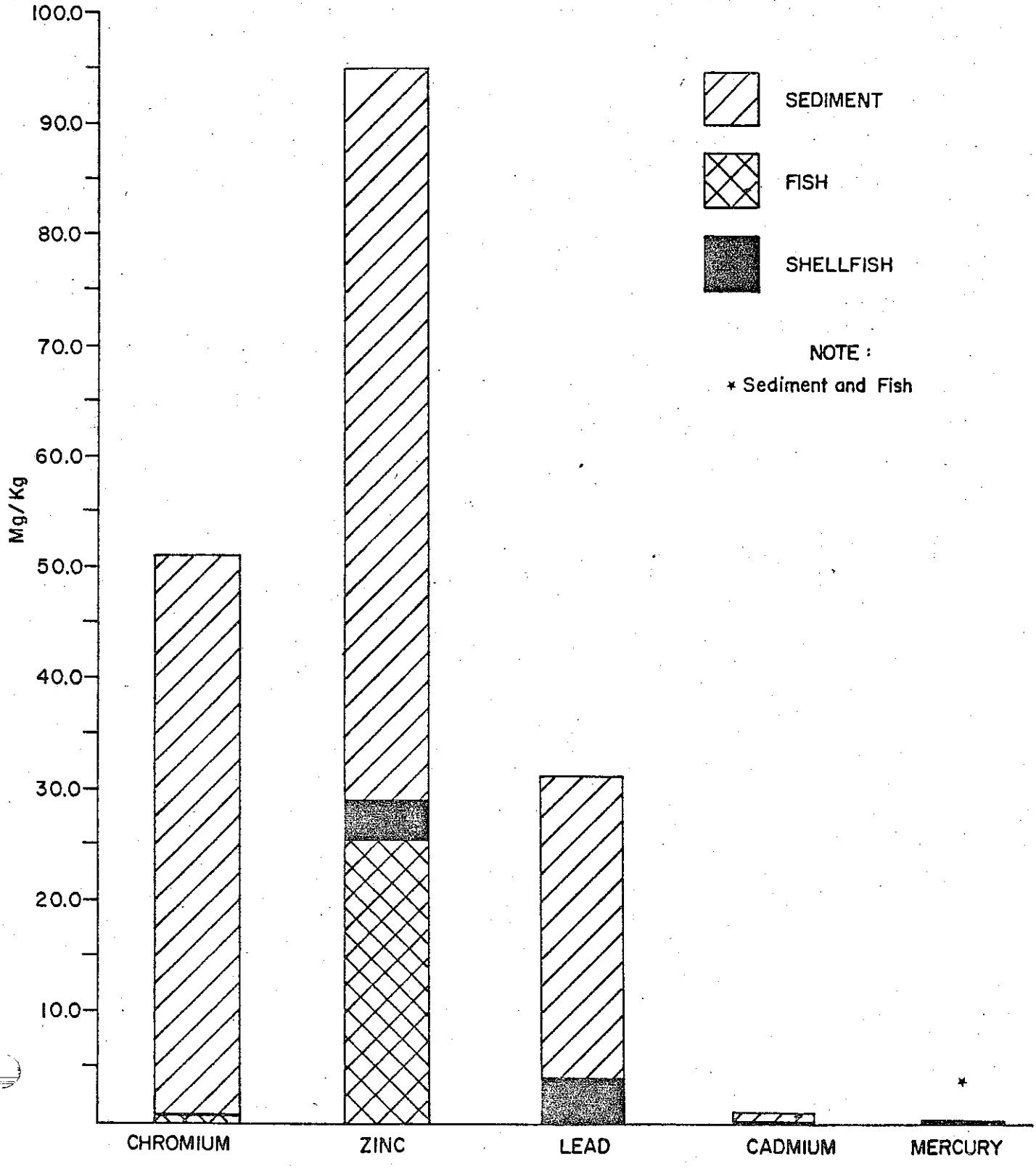


FIGURE 14.

COMPARISON OF MEAN LEVELS OF FIVE HEAVY METALS DETECTED IN FISH, SEDIMENT AND SHELLFISH TAKEN FROM THE BACK BAY SYSTEMS IN ATLANTIC COUNTY, 1977-78.



was detected in the ribbed mussel collected in Obes Thorofare. There were no significant differences in mean levels between the hard clam and ribbed mussel.

Traces of mercury were detected in 75% of the samples with values ranging up to .29 mg/kg. Concentration did not exceed the FDA's level of 0.5 ppm for human consumption.

As was previously mentioned no samples were collected during the winter. Figure 13 shows shellfish samples collected in the spring to have, when detected, slightly higher heavy metal concentrations than the other two periods.

In Figure 14, mean levels of the five elements were compared for fish, sediment and shellfish. Except for mercury, the rest of the metals were found to be in higher concentrations in the sediment then fish and shellfish.

Sediment analysis, measuring to a sensitivity of <0.05 mg/kg, revealed chromium present in 85% of the samples with values ranging up to 195.0 mg/kg. The highest concentration was observed in bottom grab taken from St. George's Thorofare, Area II. Figure 12 shows mean levels of chromium to be slightly higher in this region as compared to the other areas.

Lead was detected in all bottom samples with values ranging up to 88.6 mg/kg. The highest level was observed in a sample taken from Inside Thorofare (Zone 21), Area III. It should be pointed out that mean levels were higher in Area III as compared with Area I and II. Lead concentrations detected in the mud from this system were found in higher concentrations than were reported in the Maurice River study (.6 mg/kg).

Zinc, the highest levels of the five elements, was also detected in all samples with values ranging up to 212.0 mg/kg (Figure 14). Such a value was detected in the bottom of St. George's Thorofare (Zone 15).

Measuring to a sensitivity of <0.05 mg/kg, cadmium was detected in 37% of the samples, with values ranging up to 7.8 mg/kg. Concentrations greater than .5 mg/kg

were observed in 24% of the samples. The highest concentration again was detected in the bottom waters of St. George's Thorofare (Zone 15).

Mercury was also found in all of the bottom samples with values ranging up to .94 mg/kg. Mean levels tended to be slightly higher in the sediment as compared to the fish. The highest concentration of .94 mg/kg was observed in a sample collected near Route 30 Bridge, Beach Thorofare (Zone 16). It is interesting to note, levels above FDA's level of .5 mg/kg were observed in Beach Thorofare (Zones 18 and 19) and Inside Thorofare (Zone 21); all within the same vicinity. Other stations found with high mercury levels included Scull Bay, Absecon Creek (AC-0) and St. George's Thorofare. As was previously mentioned, high levels of mercury were also detected in yellow perch, taken in Absecon Creek.

It would appear from the results on the sediment analysis, there are specific areas which are generally found to contain higher levels of heavy metals. There appears to be a strong indication that point source discharges or upstream runoff are contributing. As previously mentioned, Sewerage Treatment Plants listed in Tables 1 and 2 use the back bay areas as the receiving waters for their effluent. One important area of concern is the high levels of mercury found in both the sediment and fish in Absecon Creek. A closer examination of this water system is needed to evaluate conditions.

The heavy metal concentration detected in fish during this study were found to be generally lower than reported during the 1976 estuarine survey of the Maurice River and Cove system. On the other hand, both zinc and mercury levels were slightly higher during this survey (58.0 and 1.27 mg/kg) than the previous report (52.5 and .87 mg/kg).

Analysis of the sediment and shellfish showed levels generally higher in this estuary as compared to the Maurice River report. An exception to this, cadmium

(sediment - 17.6 mg/kg and shellfish - 2.5 mg/kg) and zinc (sediment - 375.0 mg/kg and shellfish - 2800 mg/kg) concentrationsdetected during the previous estuarine study were higher than the cadmium (sediment - 7.8 mg/kg and shellfish - 2.0 mg/kg) and zinc (sediment - 212.0 mg/kg and shellfish - 214.0 mg/kg) levels reported for this study.

Metals reach the marine environment by many ways, including natural weathering as well as municipal and industrial discharges. Young (1973) reported that municipal wastewater contributed quanitites of copper, mercury, zinc, lead, cobalt, iron and maganese that were at least on the same order of magnitude as other sources (surface runoff, direct rainfall, vessel coating - including vessel antifowling paints, primers, etc). For silver, cadmium, chromium and nickel, however, municipal wastewater discharge dominated all other anthropogenic inputs.

Huggett (1971) reports heavy metals tend to be associated with the organic fraction of the estuarine bottom sediment and Weiss (1971) notes they seem to be concentrated to a greater degree in the surface layers than in the deeper sediments.

The biological effects of metals in the estuarine ecosystem are quite varied, depending on the particular metal, the organism, and such modifying factors as the presence of other toxicants, the environmental conditions and the age or condition of the organisms (Bryan, 1971). He also reports in order of generally decreasing lethality to aquatic organisms, mercury, silver and copper are at the top of the list, followed by cadmium, zinc, lead, chromium, nickel and cobalt.

The following is a summery from the literature and the effect of the five elements on marine resources:

ZINC

This metal is used in galvanizing, i.e. coating (hot dipping) or various iron

and steal surfaces with a thin layer of zinc to retard corrosion of the coated metal.

In seawater, zinc is found at a maximum concentrations of about 10 mg/kg.

Skidmore (1964) notes the toxicity of zinc compounds to aquatic animals is modified by several environmental factors, particularly hardness, dissolved oxygen and temperature. Both an increase in temperature and a reduction in dissolved oxygen increase the toxicity of zinc. Toxic concentrations of zinc compounds cause adverse changes in the morphology and physiology of fish. Acutely toxic concentrations induce cellular breaddown of the gills, and possibly in the clogging of the gill with mucus.

Huggett (1975) notes that oysters are especially vulnerable as they have the capacity to concentrate trace metals, such as copper and zinc to relatively high levels which may then effect their marketability. In 1971 a survey of metal levels in oysters from the Cheasapeake Bay indicated that a natural concentration gradient exist, which is a function of, or is measured by salinity (Huggett, Bender and Slone, 1973). Animals living in fresher waters consistently contained more copper and zinc than those from a more saline environment.

Although few data are available on the effects of zinc in the marine environment, it is accumulated by some species and marine animals contain zinc in the range of 6 to 1,5000 mg/kg (NTAC, 1968).

CADMIUM

This metal occurs in nature chiefly as a sulfide salt, frequently in association with zinc and lead ores. The salts of the metal also may occur in wastes from electroplating plants, pigment works, textile and chemical industries. Seepage of cadmium from electroplating plants has resulted in groundwater cadmium concentrations of 0.01 to 3.2 mg/kg (Lieber and Welsh, 1954). Most freshwater con-

tains less than 1 ug/l cadmium and most analyses of seawater indicate an average concentration of about 0.15 ug/l (Fleischer, 1974).

Zaroogian, as reported by Eisler (1974), states that adult oysters exposed to 10 mg/l cadmium between April and August 1973 accumulated 18,000 ug/kg of cadmium in wet whole meat, which exceeds the human emetic threshold of 13,000 to 15,000 ug/kg. Oysters retained virtually all of the accumulated cadmium for at least severaly months. Under natural conditions, significantly greater numbers of larvae from cadmium-streamed oysters failed to develop when compared to controls after 48 or 72 hours. A criterion of one-half of the level at which oysters accumulate cadmium in excess of the human emetic threshold, 5 ug/l is believed to provide protection for consumers of oysters.

CHROMIUM

This element is found in air, soil, some foods, and most biological systems; it is recognized as an essential trace element for humans (NAS, 1974). Fish appear to be relatively tolerant of chromium, but some aquatic invertebrates are quite sensitive. Toxicity varies with species, chromium oxidation state and pH. It is reported that significant effects were seen in fish at 0.2 mg/l of hexavalent chromium and a recommended criterion of 0.10 mg/l should provide adequate protection for both freshwater invertebrates and fish (QCFW, 1976).

LEAD

This metal not only occurs naturally but lead and its compound may enter the environment at any stage during mining, smelting, processing and use. The toxity of lead in water, like other heavy metals, is affected by pH, hardness organic materials, and the presence of other metals. Lead enters the aquatic

environment through precipitation, lead dust fallout, erosion and leaching of soil, municipal and industrial waste discharges, and land runoff.

Dow and Hurst (1972) report lead to be toxic to oyster gonads; also adversely affects hard and soft clam reproduction. Oyster larvae are killed by 3 ppm levels. It is also extremely toxic to soft clams above .02 ppm in water.

MERCURY

Historically, it was recognized to possess a high toxic potential and was used as a germicidal or fungicidal agent for medical and agricultural purposes (QCFW, 1976). It is noted that several forms of mercury, ranging from elemental to dissolved inorganic and organic species, are expected to occur in the environment. The recent discovery that certain microorganisms have the ability to convert inorganic and organic forms of mercury to the highly toxic methyl or dimethyl mercury has made any form of mercury potentially hazardous to the environment (Jenson and Jernelou, 1969). Jenne (1972) found that the majority of U.S. waters contained less than 0.1 ug/l of mercury. Robertson, (1972) reports marine waters have shown to contain concentrations of mercury from a low of 0.03 to a high of 0.2 ug/l, but most marine waters fall within the range of 0.05 to 0.19 ug/l mercury.

Eisler (1974) found that concentrations of 1.0 ug/l mercury represents a distinct threat to selected species of marine organisms and, based on a comparison with freshwater species, the accumulation of mercury is similar in fresh and marine water.

It would appear that some of the heavy metal concentrations recorded in this system are in sufficient quantities to have sub-lethal effects on estuarine organisms.

FIGURE 15 MEAN SURFACE ISOTHERMS RECORDED DURING WINTER, 1977 (°C)

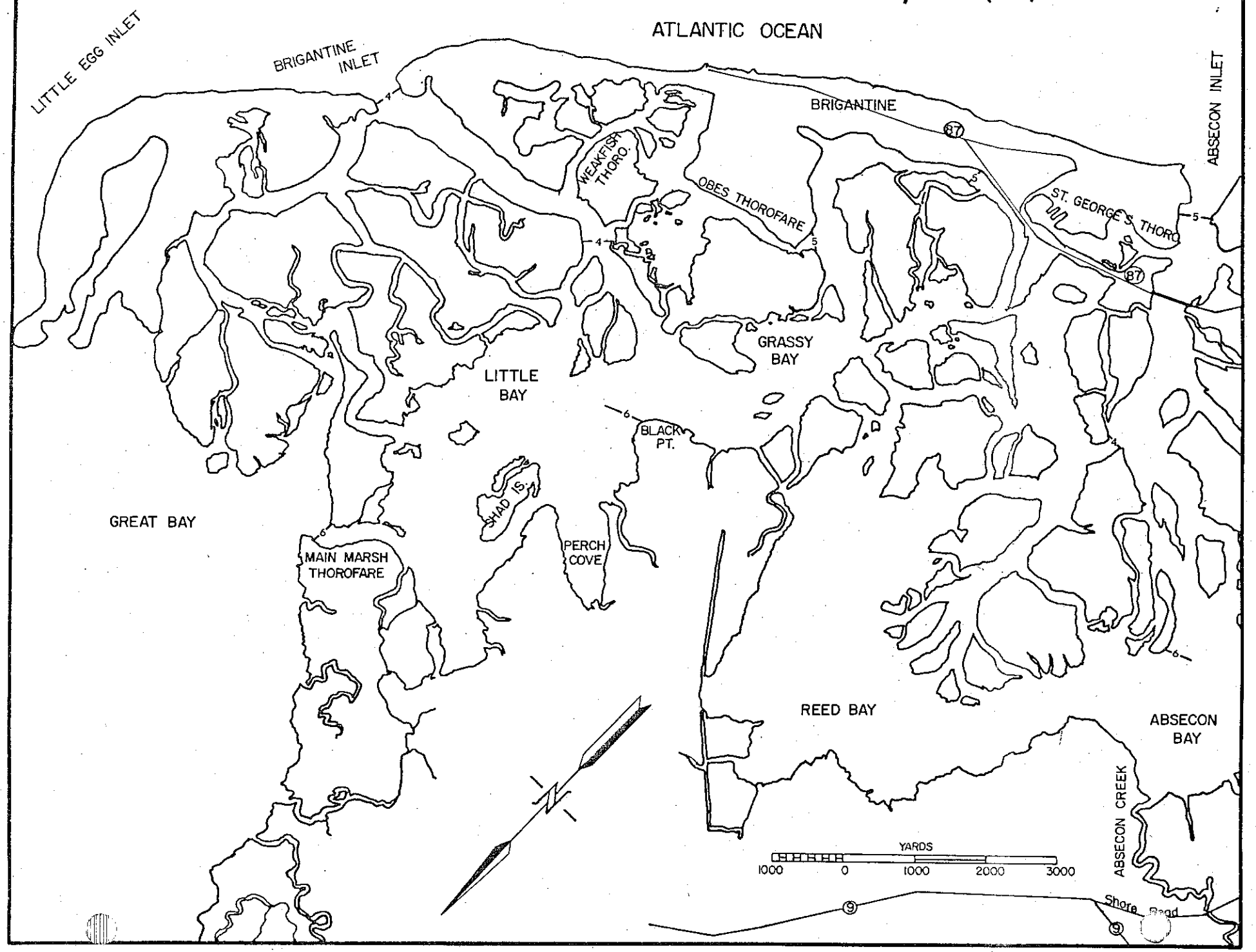


FIGURE 15 con't

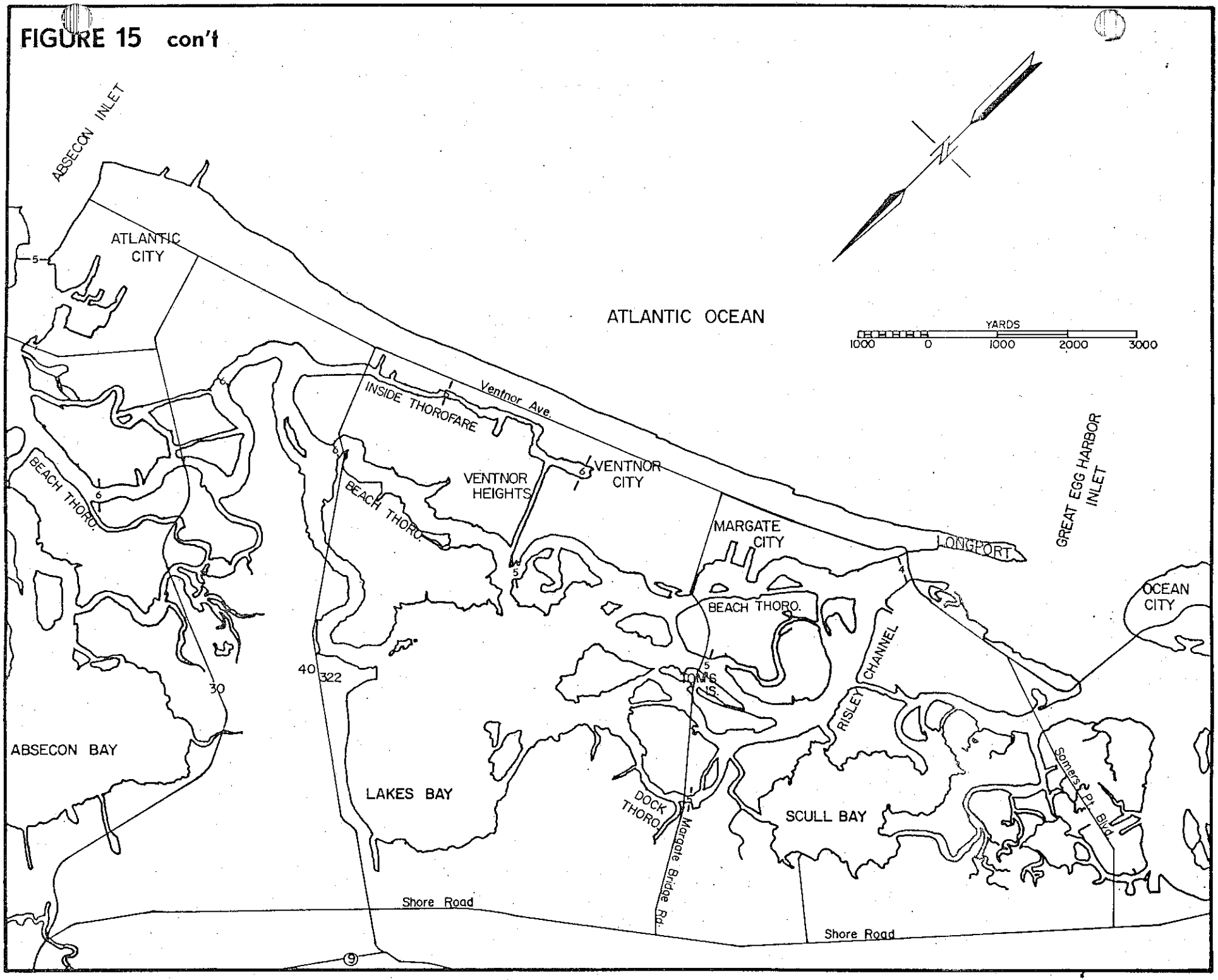


FIGURE 16 MEAN SURFACE ISOHALINES RECORDED DURING WINTER, 1977 (‰)

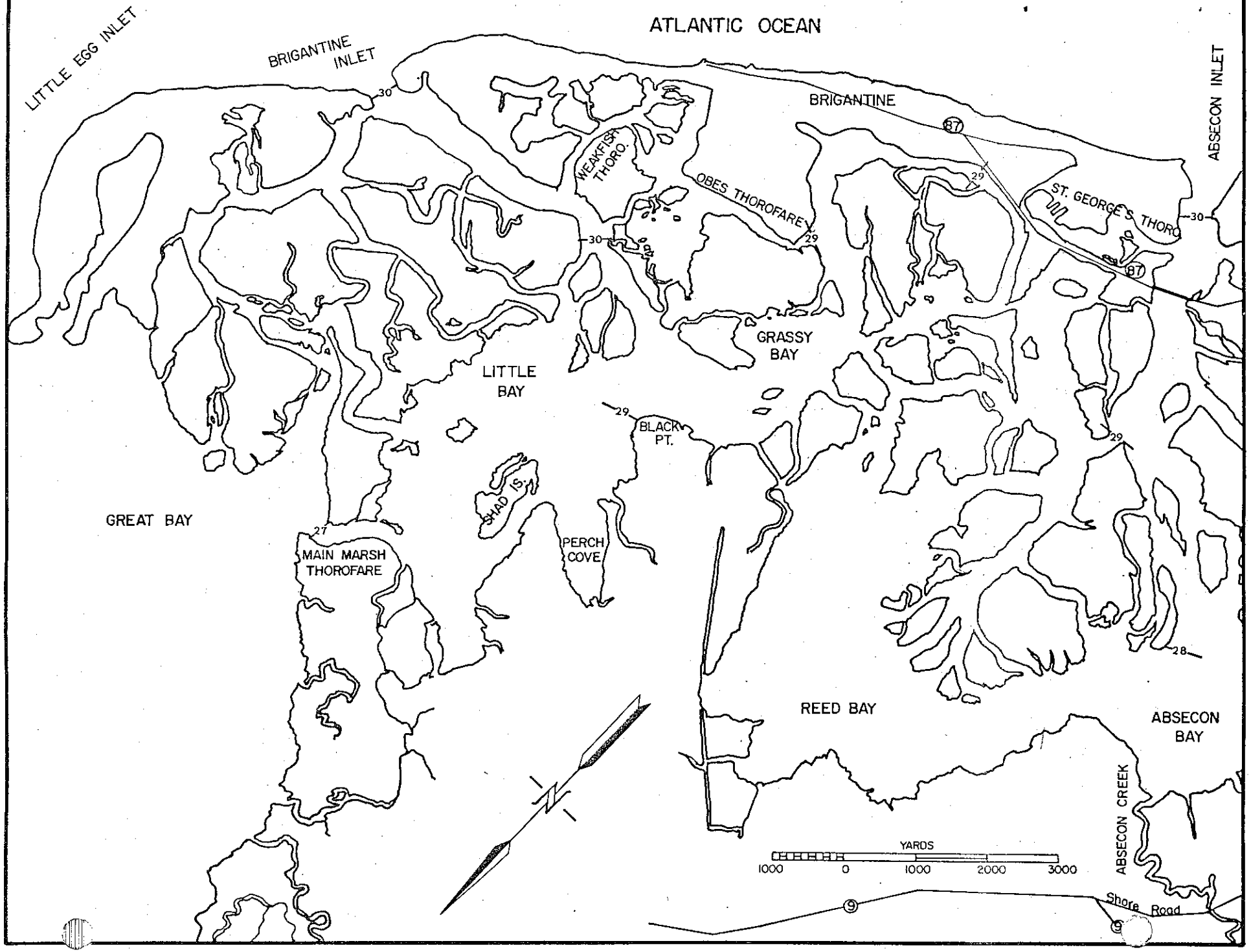


FIGURE 16 con't

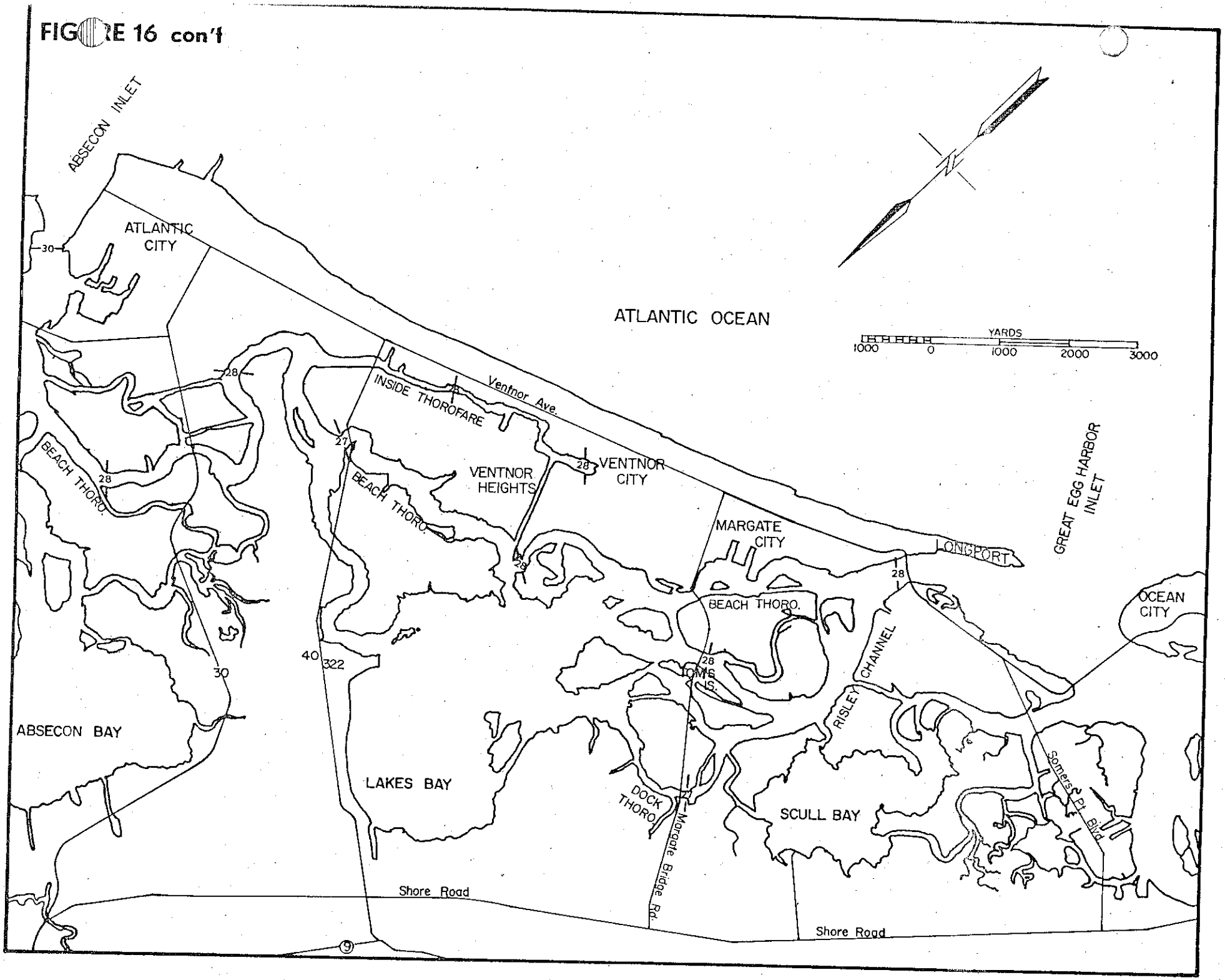


FIGURE 17 SPRING ISOTHERMS, 1977 (°C)

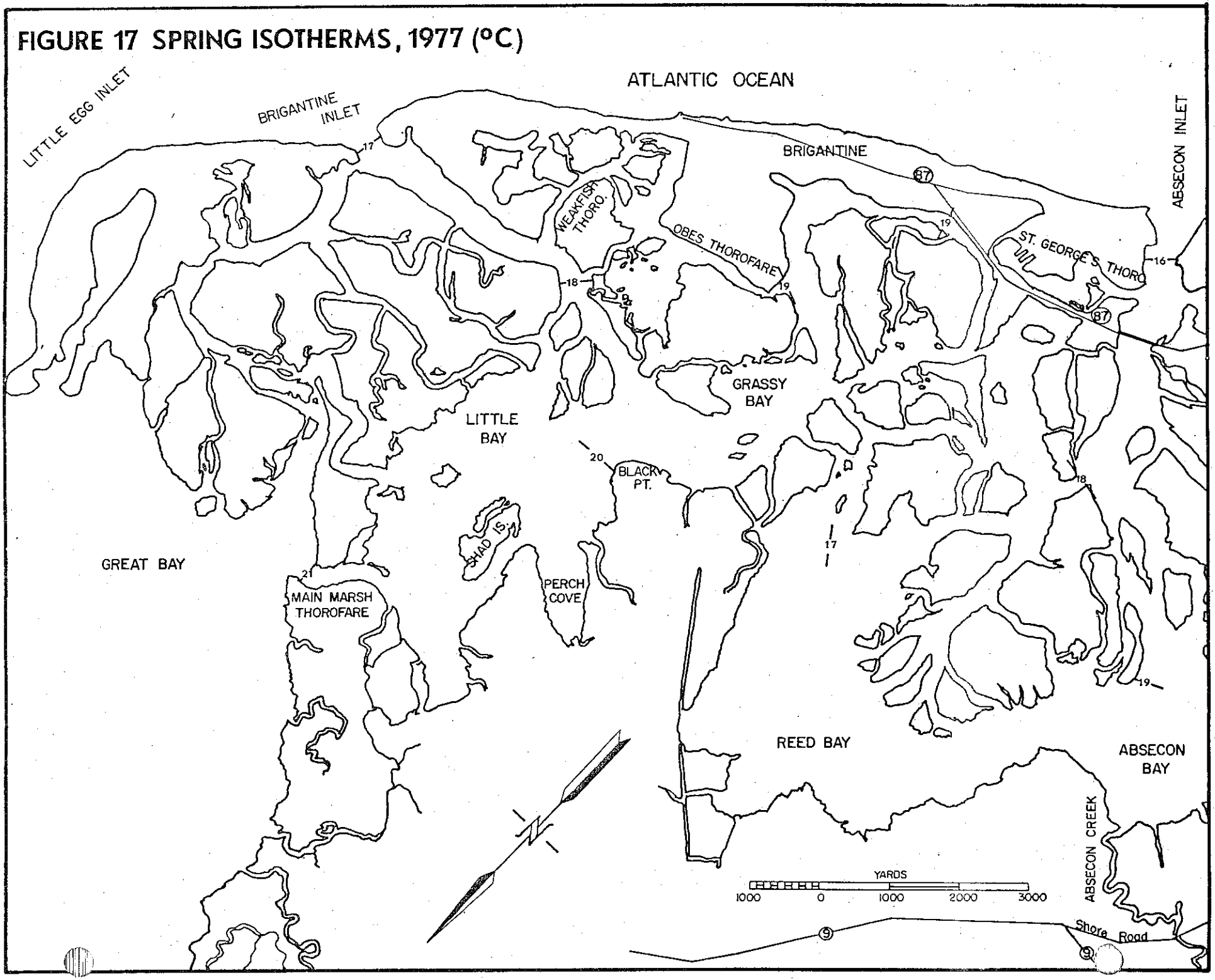


FIGURE 17 con't

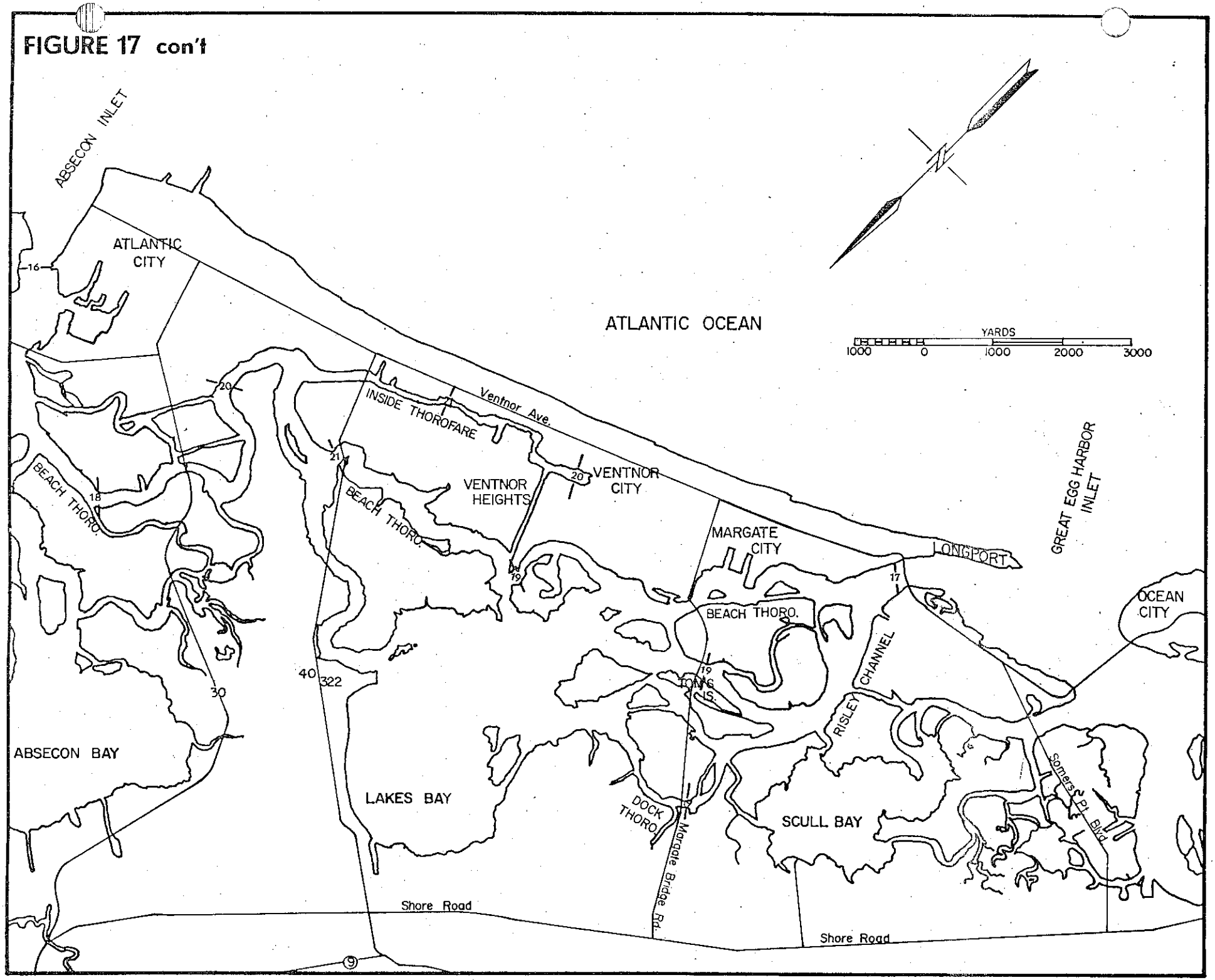


FIGURE 18 SPRING ISOHALINES, 1977 (‰)

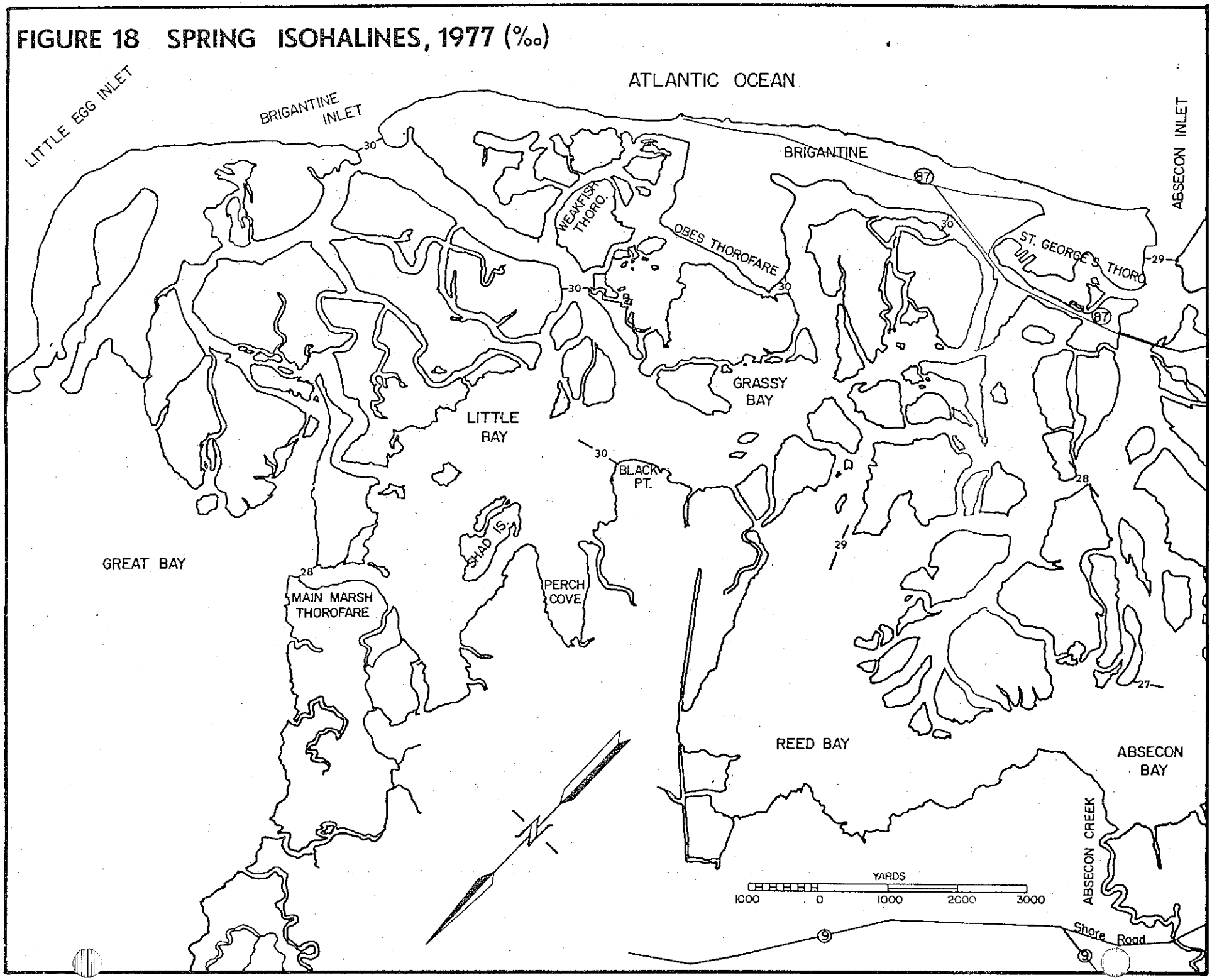


FIGURE 18 con't

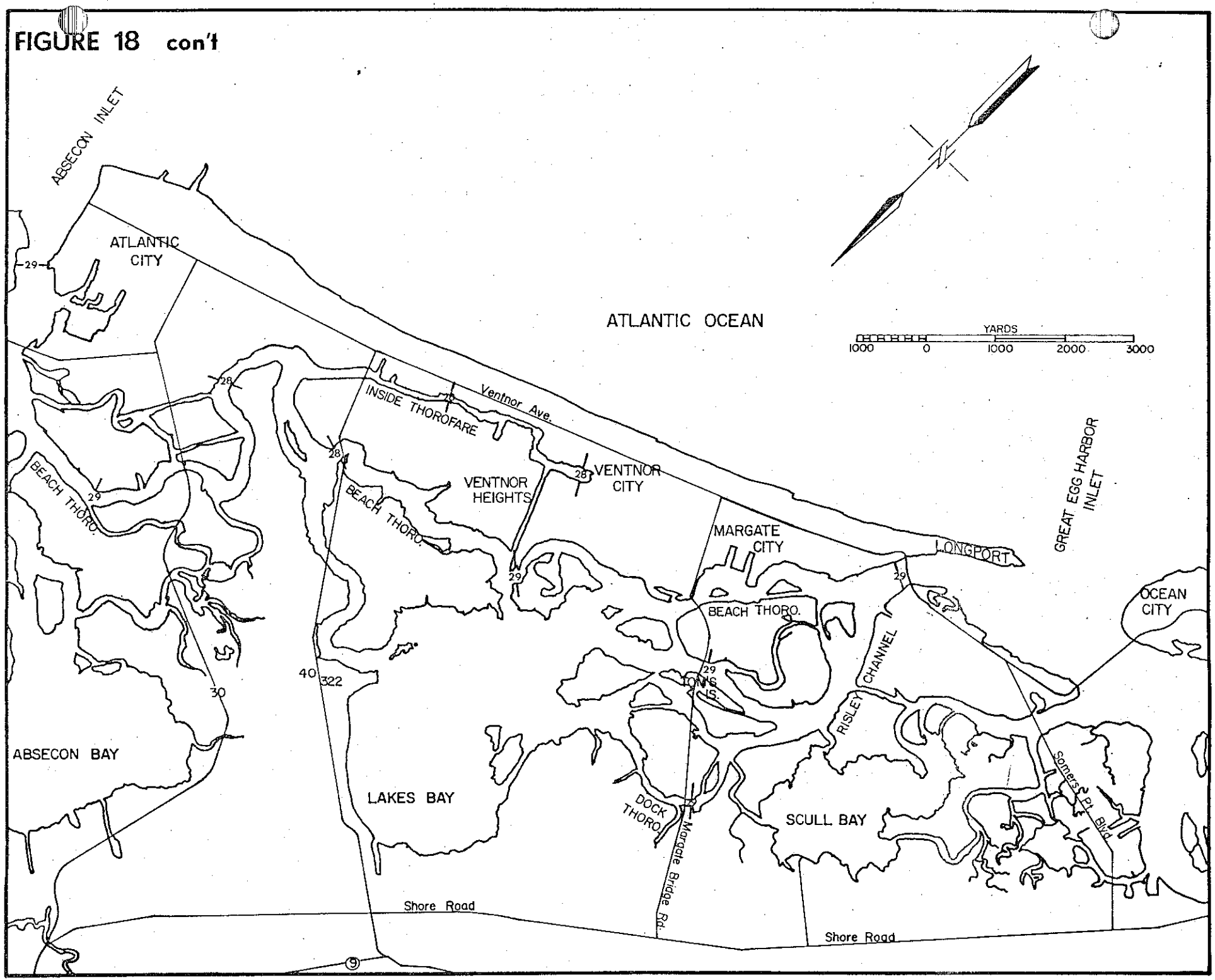


FIGURE 19 SUMMER ISOTHERMS, 1977 (°C)

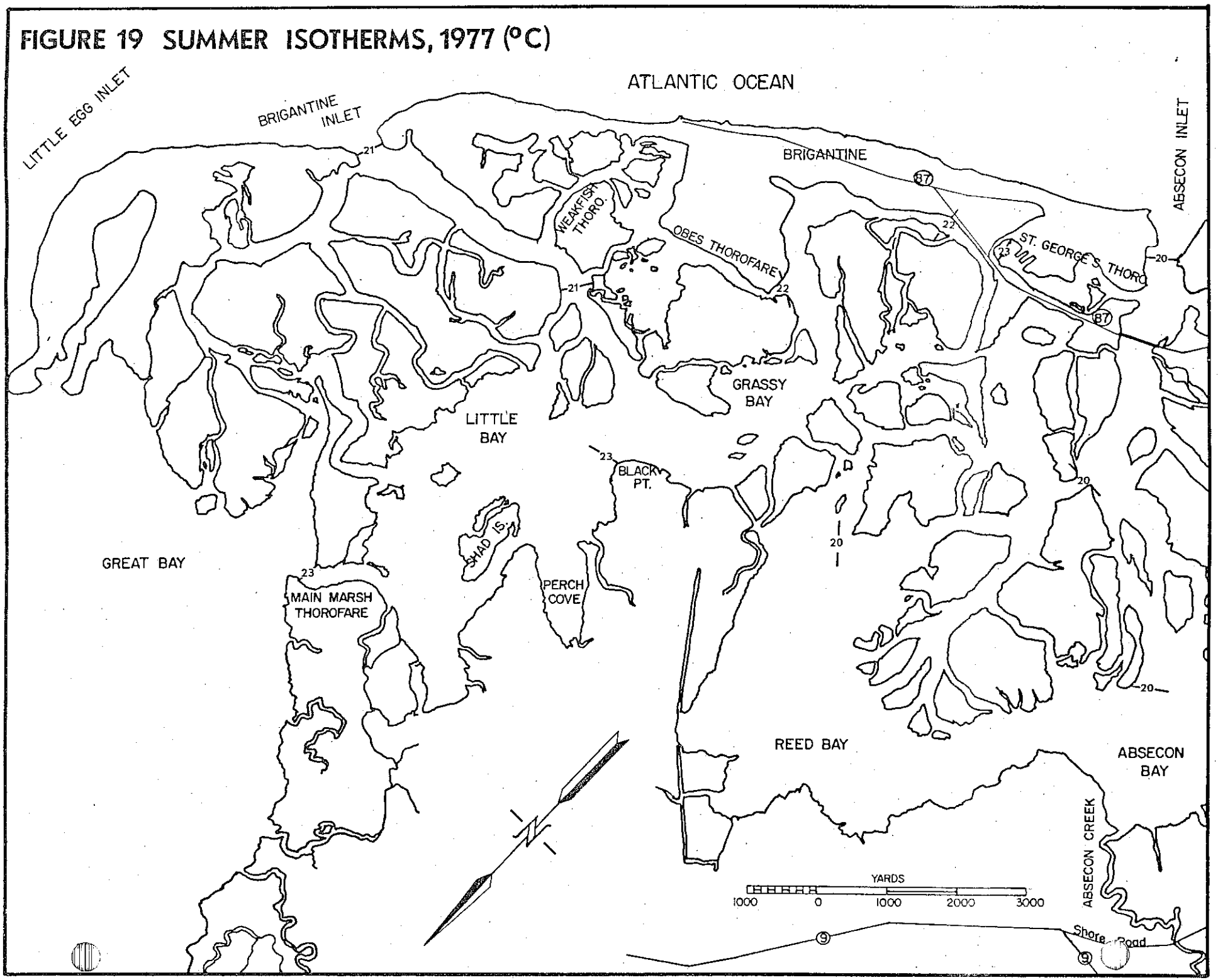


FIGURE 19 con't

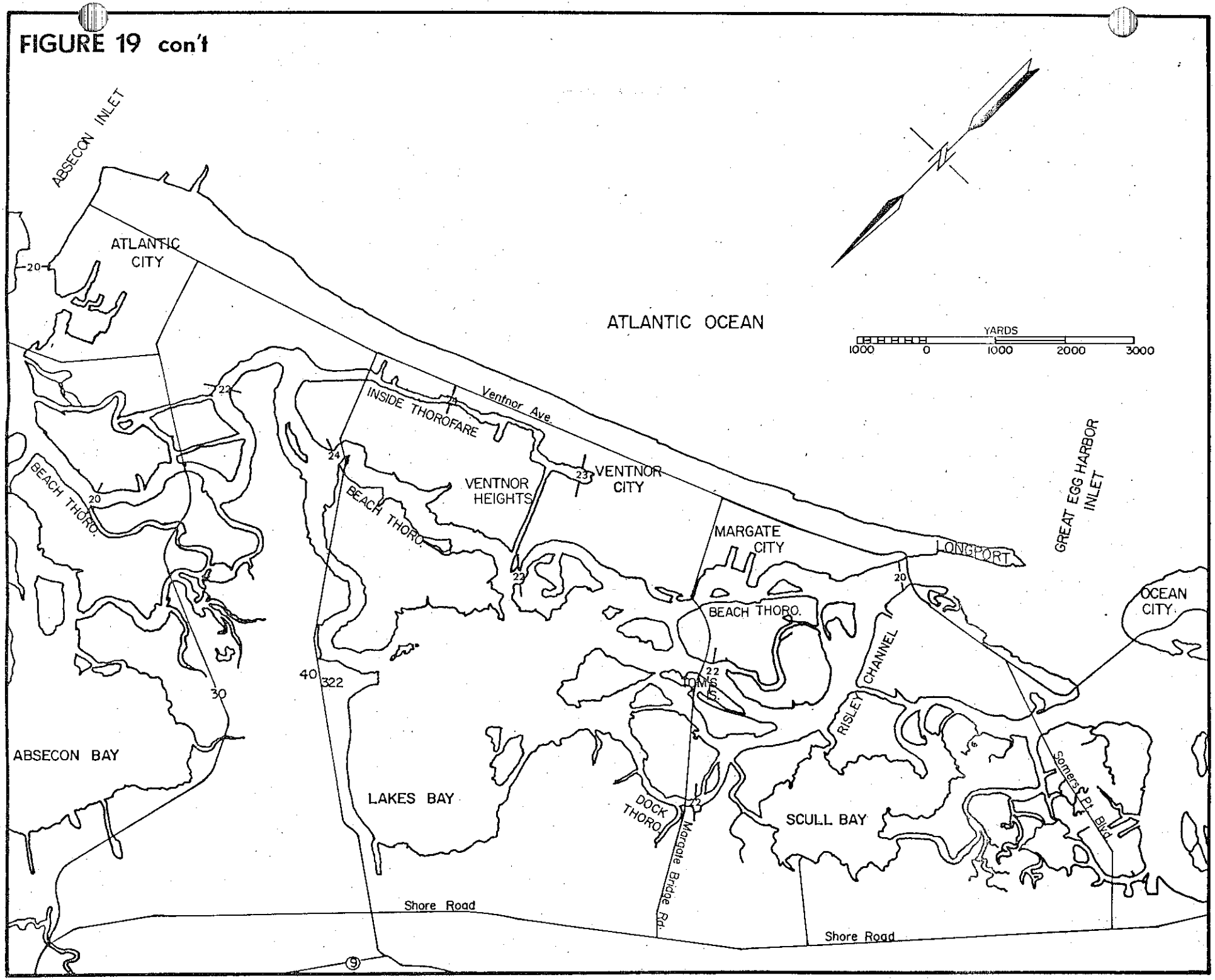


FIGURE 20 SUMMER ISOHALINES, 1977 (‰)

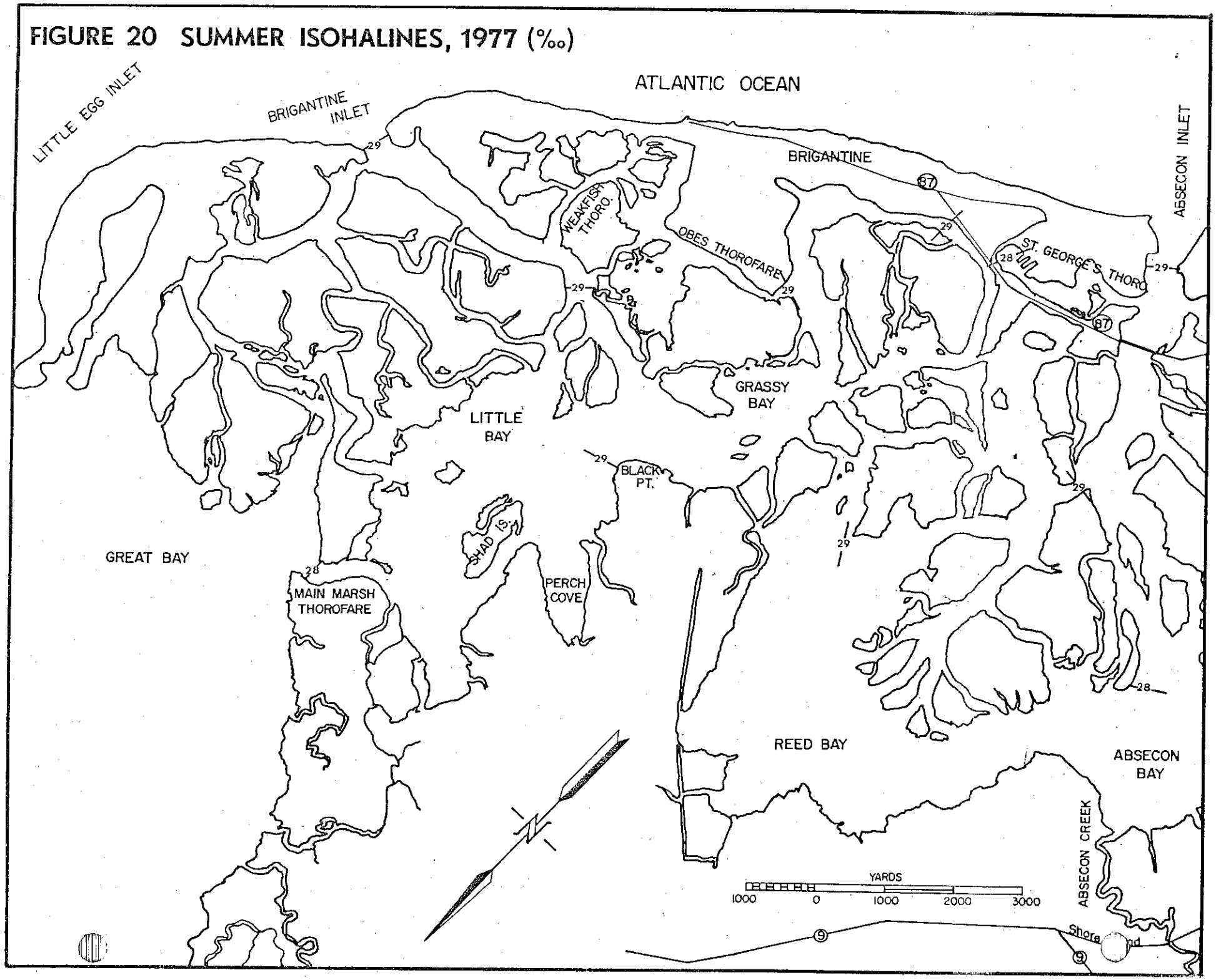


FIGURE 20 con't

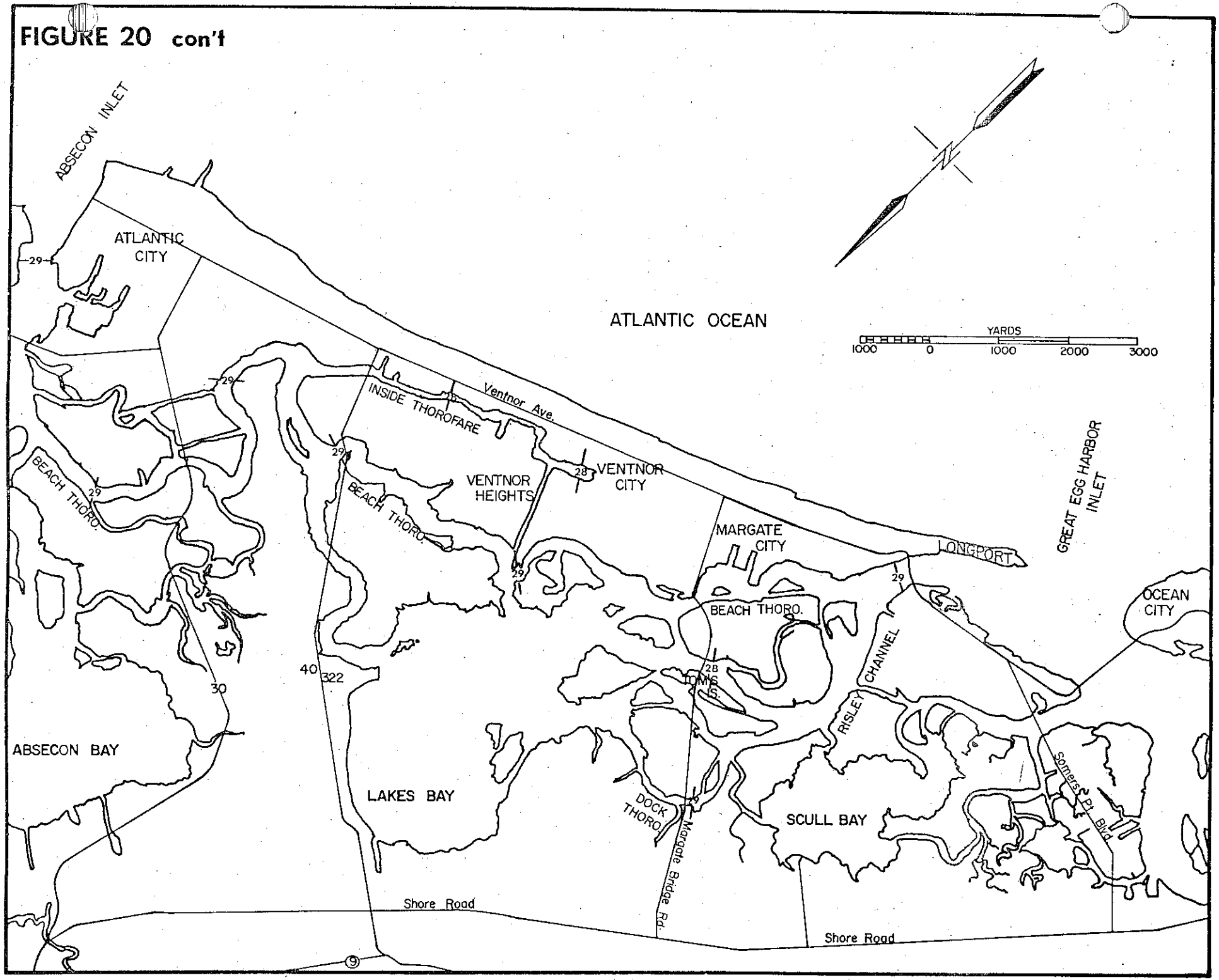


FIGURE 21 FALL ISOTHERMS, 1977 (°C)

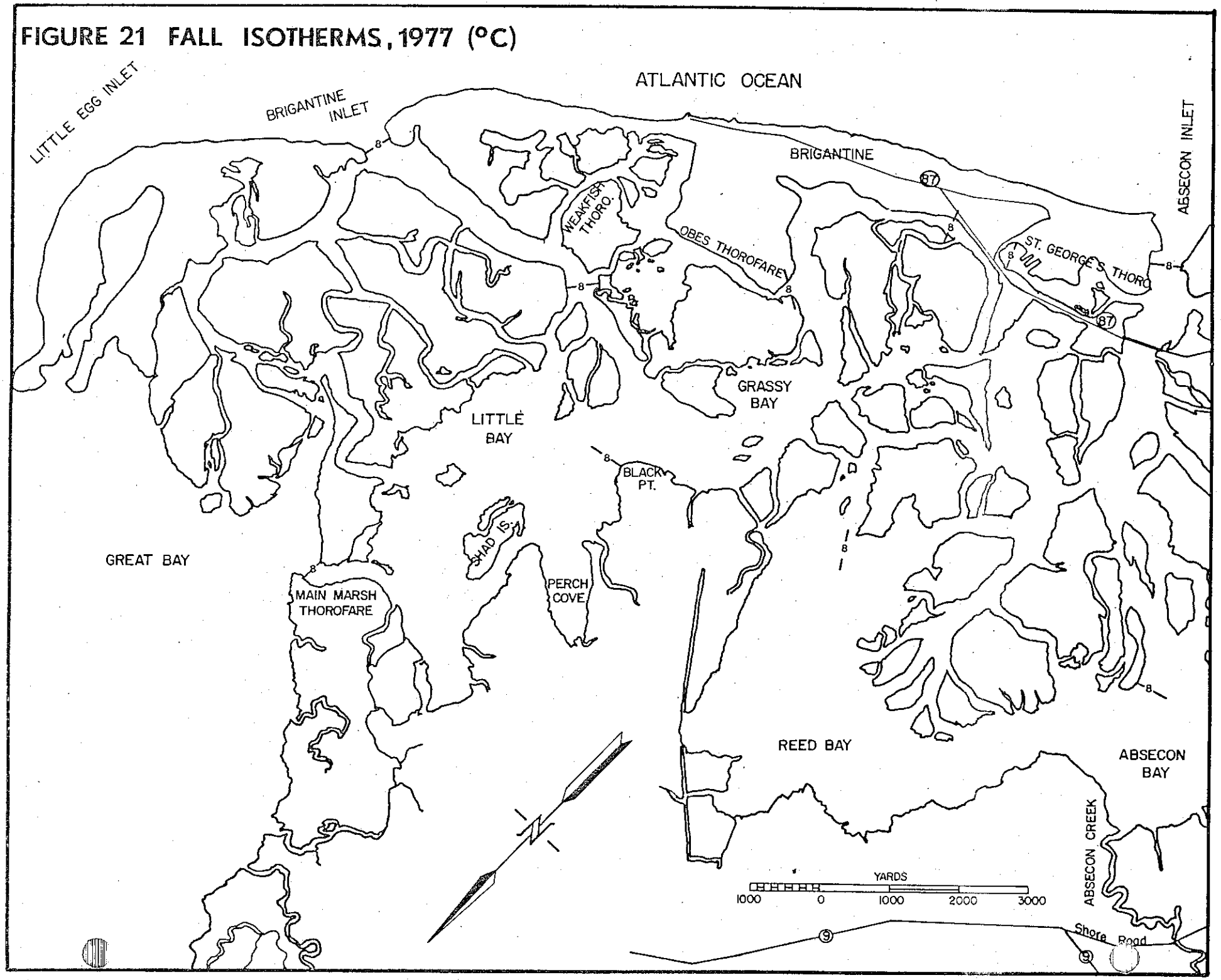


FIGURE 21 con't

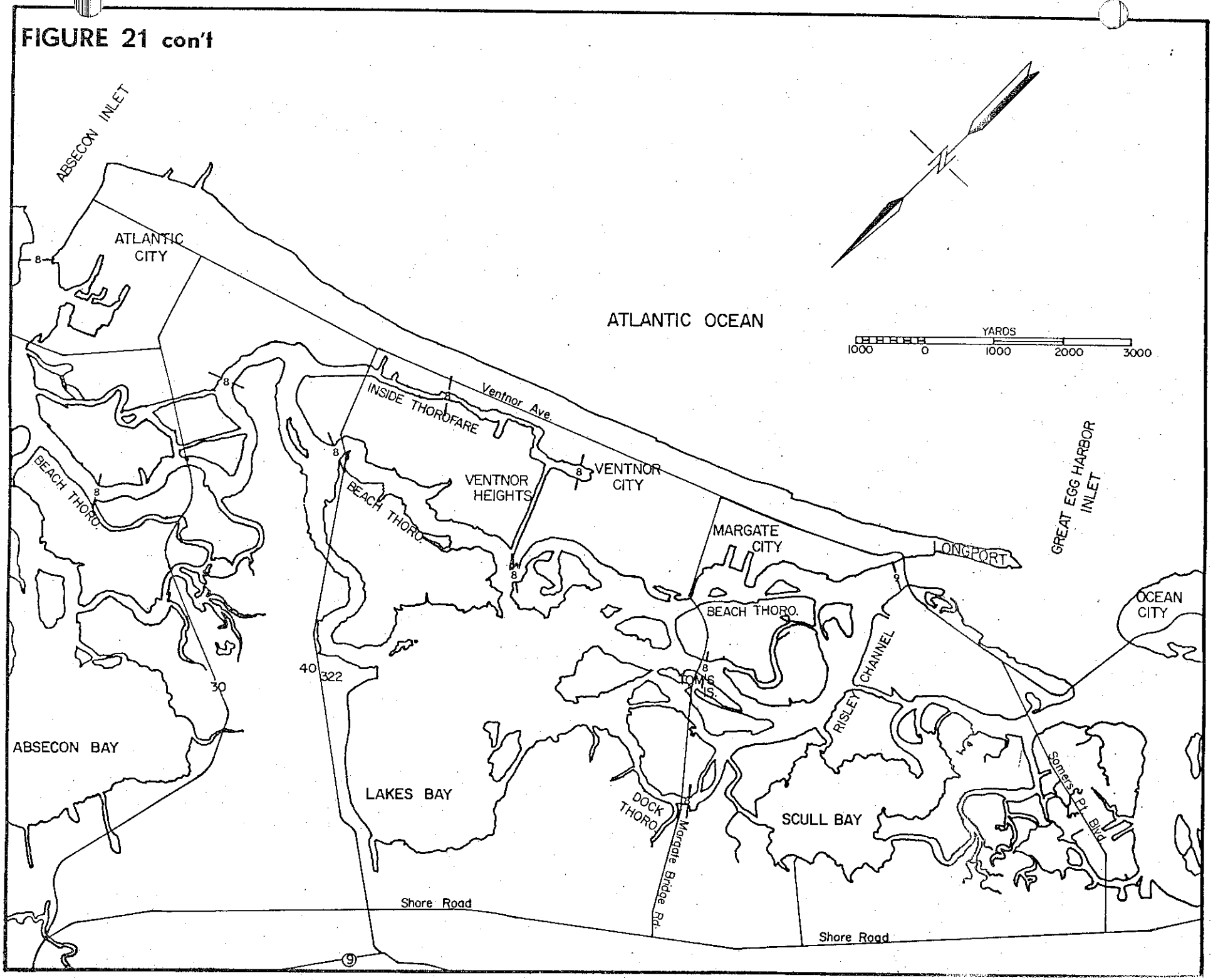


FIGURE 22 FALL ISOHALINES, 1977 (‰)

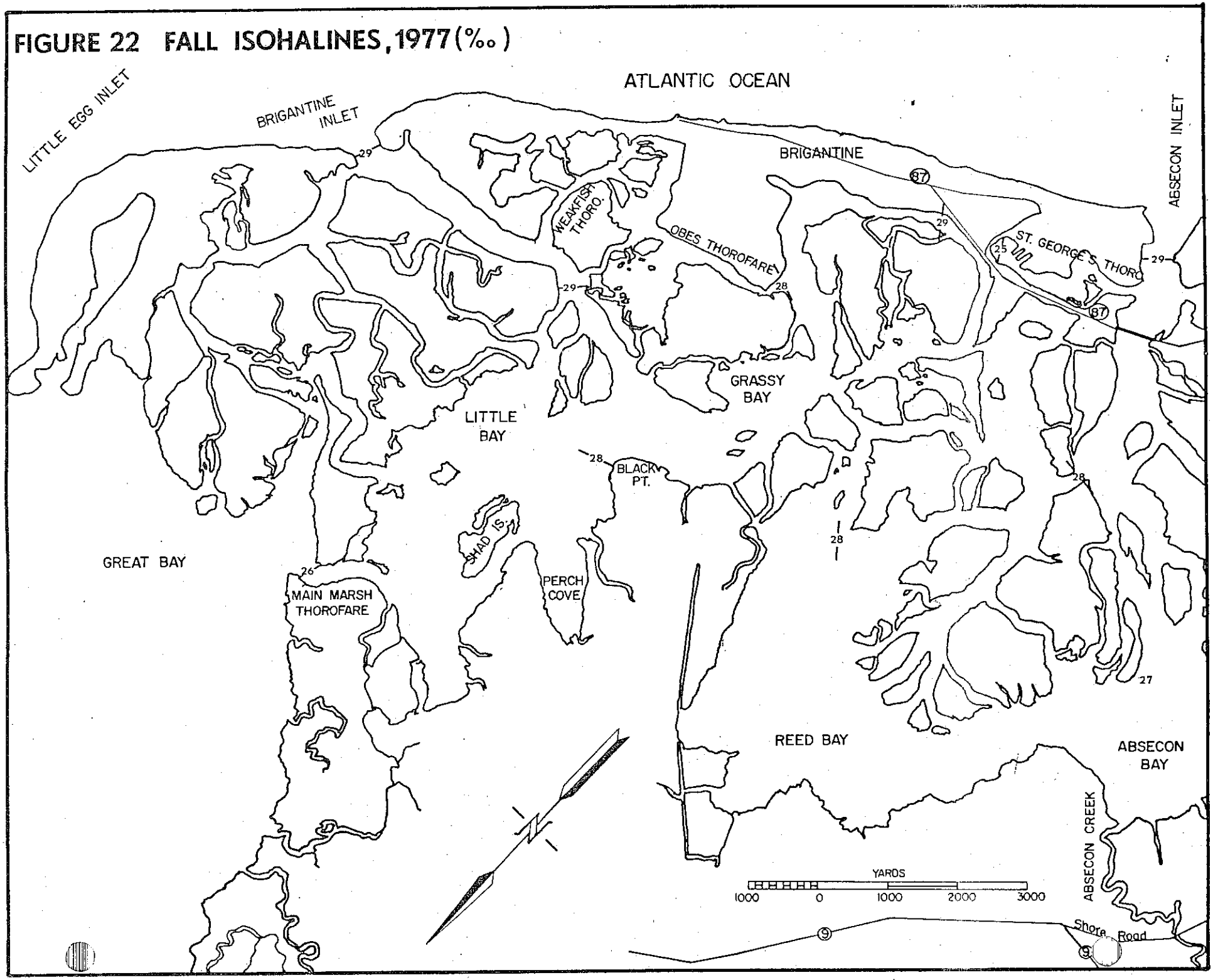
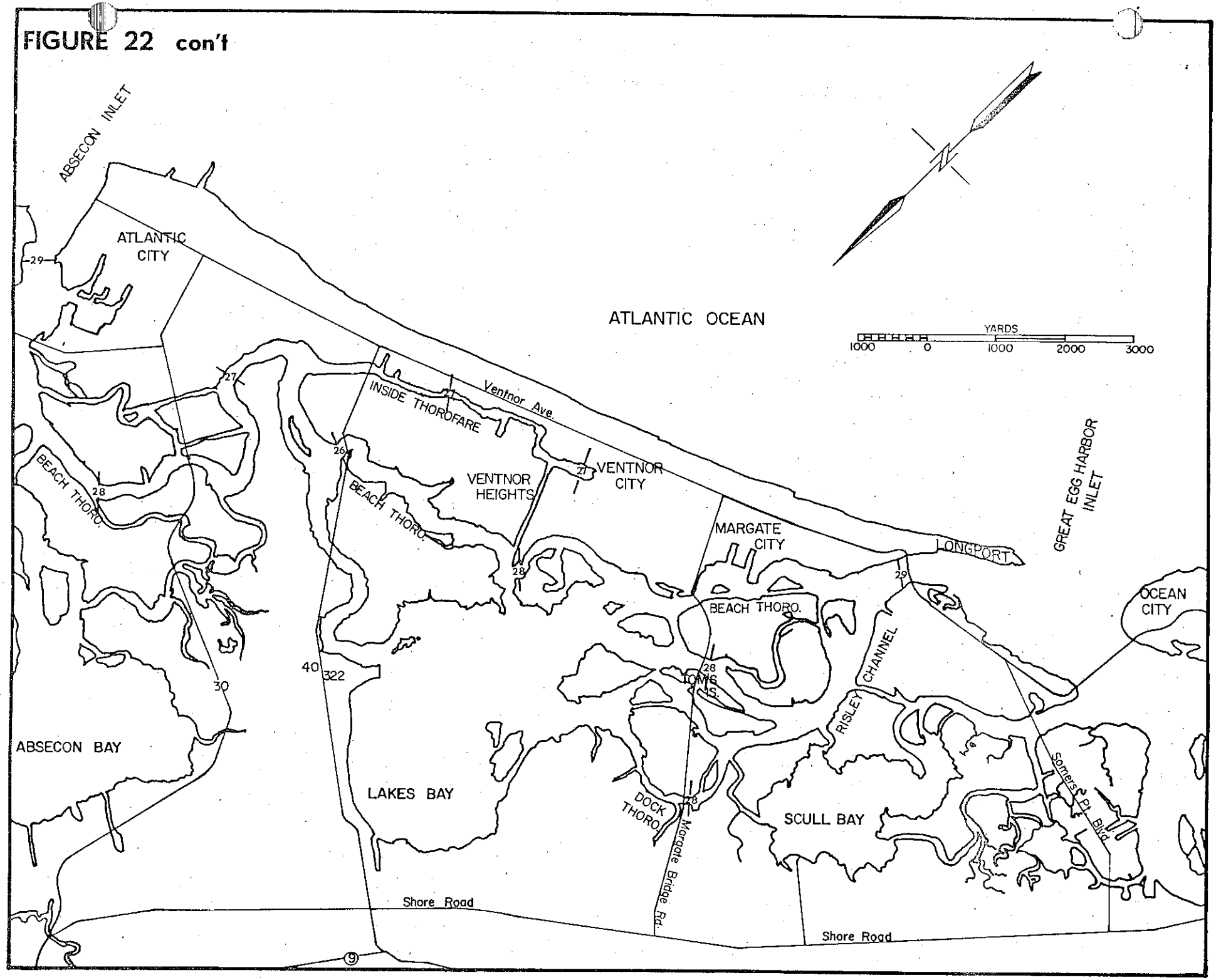


FIGURE 22 con't



ISOHALINE AND ISOTHERM DISTRIBUTION

Figures 15 to 22 present mean isohaline and isotherm distribution patterns mapped seasonally. The sampling days for each period are as follows:

Winter (March 3 and 9)

Spring (May 13 and 20)

Summer (July 13 and 20)

Fall (October 21 and December 16)

DISCUSSION

Water temperatures recorded during the survey period (January 1977 - December 1977) ranged from -1.5 to 31.0 °C. The data showed the lowest extremes were observed during the month of February. Heavy ice conditions prevented sampling during the month of January. Temperatures at or below 0°C were also recorded during December in St. George's Thorofare (-1.0 °C) and Reed Bay (-.2 °C). The highest temperature of 31.0 °C was measured in Reed Bay during the month of July. This bay is found to be very shallow with depths ranging from 0.5 to 5 feet at mean low water.

Temperatures monitored at Absecon Inlet (Old Brigantine Bridge) and the Longport Bridge (Great Egg Harbor Inlet) were considered representative of ocean temperatures. Generally, the inshore bay waters which are characteristically shallow, are greatly influenced by climatic conditions. The data shows as observed with other estuarine surveys, during the summer ocean water are found to be cooler than the inshore regions. In September there begins a transition period where the bay area begins to cool faster than the ocean. During January and February, severe cold weather caused abrupt changes in water temperatures. Usually in March or early April, temperatures begin to steadily increase going into the warmer months.

Figure 4 presents monthly means, standard deviation and range of water temperatures recorded within the study area. Comparison of the monthly means at these four thermograph stations show Reed Bay and Main Marsh Thorofare to be similar and warmer than the other stations (see Figure 5). The data also suggests that both Longport and Absecon Inlet had similar mean temperatures.

Thermal stratification was evident during most of the field sampling. The largest vertical temperature difference was 5.0 °C, observed in St. George's Thorofare during July. This system is the receiving waters for the Brigantine Sewerage Treatment Plant (see Table 2).

Saltwater intrusion into the study area is provided by several waterways: Little Egg Inlet via Great Bay-Main Marsh Thorofare, Brigantine Inlet, Absecon Inlet and Great Egg Harbor Inlet. Except for one reading of 19.5 o/oo (zone 04), salinity levels did not fall below below 23 o/oo. The highest levels were recorded in the inlets and in Absecon Bay (31.4 o/oo).

Figure 23 shows mean salinity levels recorded in the study area throughout the 12 month period ranged from 26 to 30 o/oo. Salinities were generally higher during the summer months. In Absecon Creek, water quality station AC-2 was found with the greatest salinity fluctuation (15.4 to 24.8 o/oo). Besides the dischargers listed in Tables 1 and 2, this tributary is the only source of freshwater (Atlantic City Reservoir) intrusion into the area.

Dissolved oxygen concentrations measured in the waters throughout the study area were found at times to be stratified. St. George's Thorofare (Zone 15) was found to be more stratified than the other areas.

The data showed seasonal trends to be consistent in this system as observed in other esutaries. Generally, levels were higher during the colder months and

FIGURE 23. MONTHLY MEAN, STANDARD DEVIATION AND RANGE OF DISSOLVED OXYGEN, CARBON DIOXIDE AND SALINITY LEVELS MEASURED IN THE BACK BAY SYSTEMS IN ATLANTIC COUNTY.

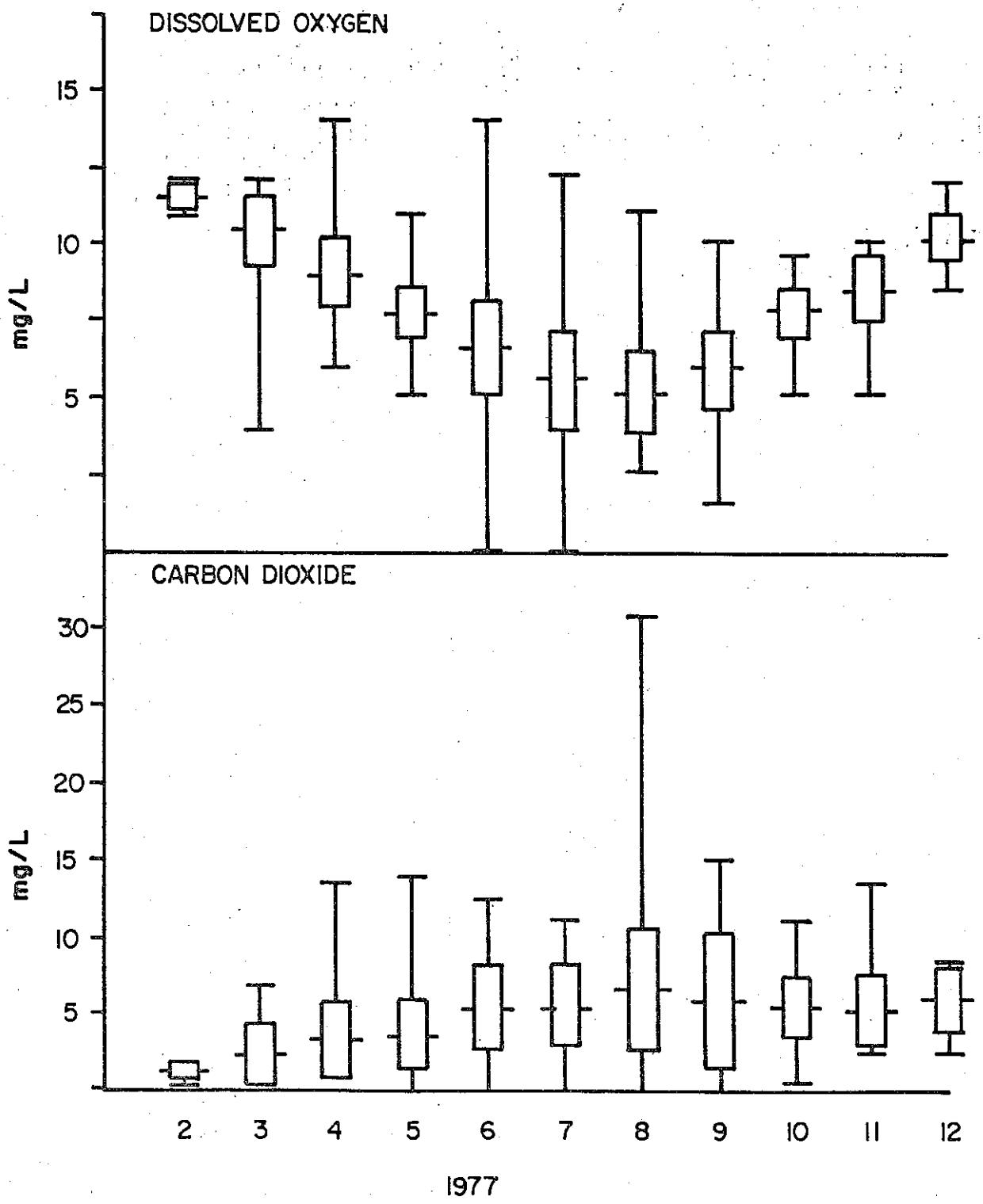
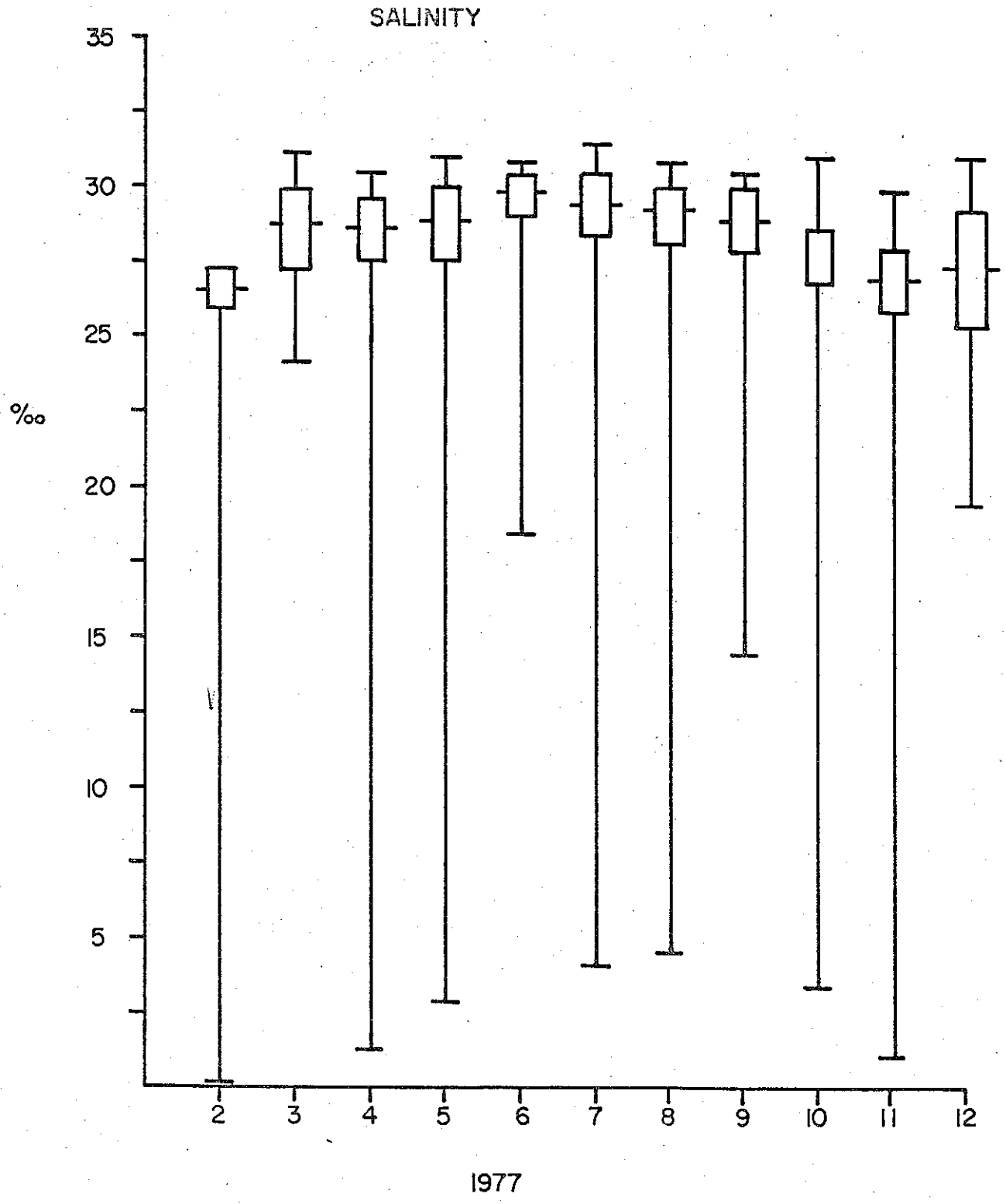


FIGURE 23.
CONTINUED



lowest in summer (Figure 23). Results also showed unusual high concentrations of dissolved oxygen were observed in St. George's Thorofare during April (13.9 mg O_2/l), June (14.1 mgO_2/l), July (12.3 mg O_2/l) and August (11.1 mg O_2/l).

Oxygen concentrations below 5.0 mg O_2/l were detected in the waters throughout the study area. The following stations were found to contain oxygen levels between 3.0 to 5.0 mg O_2/l: zones 1, 2, 12 (August); 3, 7, 9, 10, 14, 16, 19, 26 (July and August); 15, 18 (July, August and September); 17, 20, 21, 27 (June, July, August and September); 24, 25 (June, July and August); 22 (June and August); Scull Bay and Lakes Bay (June and August); and in Absecon Creek at stations AC-2 (May); -3 (May and June); -0 and -4 (June, July, August and September). Such levels are considered marginal to support any finfish populations.

There were also regions within the study area where concentrations were greatly reduced ($<$3.0 mg O_2/l) or void of oxygen ($\leq$1.0 mg O_2/l). Such conditions were found to exist at zones 21 (June); 15, 20 (July and September); 24 (August); and station AC-4 (July and August). It should be noted that this condition was not restricted to the bottom strata but was also evident in the surface waters (zone 24). It would appear from the data, that this system is stressed during the summer period. Water quality should improve once the sewage treatment plants connect to the Atlantic City ocean outfall pipe.

All pH levels measured during the survey period, excluding Absecon Creek, were found to be basic. Generally there was little difference between surface and bottom measurements. Most of the readings did not exceed 8.4 except in zones 22 (8.9, 9.3), 04 (8.8), Absecon Bay and St. George's Thorofare (8.6).

In Absecon Creek the pH ranged from 4.9 to 8.3. Except for the low readings of 4.9 (November) taken at the farthest upstream station (gill net station), measurements were above 6.6.

Carbon dioxide concentrations were found to range from 0.0 to 30.8 mg CO_2/l. The maximum reading of 30.8 mg CO_2/l was measured in Reed Bay during August; all other values were below 16.0 mg CO_2/l.

Figure 23 shows the seasonal trend for mean carbon dioxide levels to be inverse to dissolved oxygen. Carbon dioxide values were found to be low during the winter and high in the summer period.

Secchi disc measurements ranged from .2 to 3.7 m. Generally, turbidity levels did not go above 2.6 m; maximum readings of 3.7 and 3.0 meters were taken in Absecon Inlet and Middle Thorofare.

Light penetration was found to be greatest in the winter and lowest during the summer period. The shallow bays with soft mud bottoms were generally found to be more turbid than the deeper channels. Climatic conditions greatly limited transparency.

Biochemical Oxygen Demand (B.O.D.) values recorded were found to be generally good. Except for the readings of 10.4 mg O_2/l taken in St. George's Thorofare, 7.3 mg O_2/l (March) and 5.6 mg O_2/l (July) recorded in Scull Bay, concentrations did not exceed 4.6 mg O_2/l. Average B.O.D. levels were found to fluctuate throughout the 12-month period. Mean values tended to be higher during the months of February and March (see Figure 24). The data also shows B.O.D. levels to be low during the months of September through December.

It has been suggested that a clear stream or harbor should not have a B.O.D. of greater than 4.0 mg O_2/l (Lackey 1958).

Slight traces of nitrite nitrogen were detected during the survey period ($<$0.003 to 0.136 mg/l). Generally levels did not exceed 0.062 mg/l. The highest value was observed in Reed Bay during September. Mean levels were also found to be highest during that month (see Figure 24).

FIGURE 24 MONTHLY MEAN, STANDARD DEVIATION AND RANGE OF AMMONIA NITROGEN, NITRITE - NITRATE NITROGEN ORTHPHOSPHATE, DETERGENT AND B.O.D. RECORDED IN THE BACK BAY SYSTEMS IN ATLANTIC COUNTY.

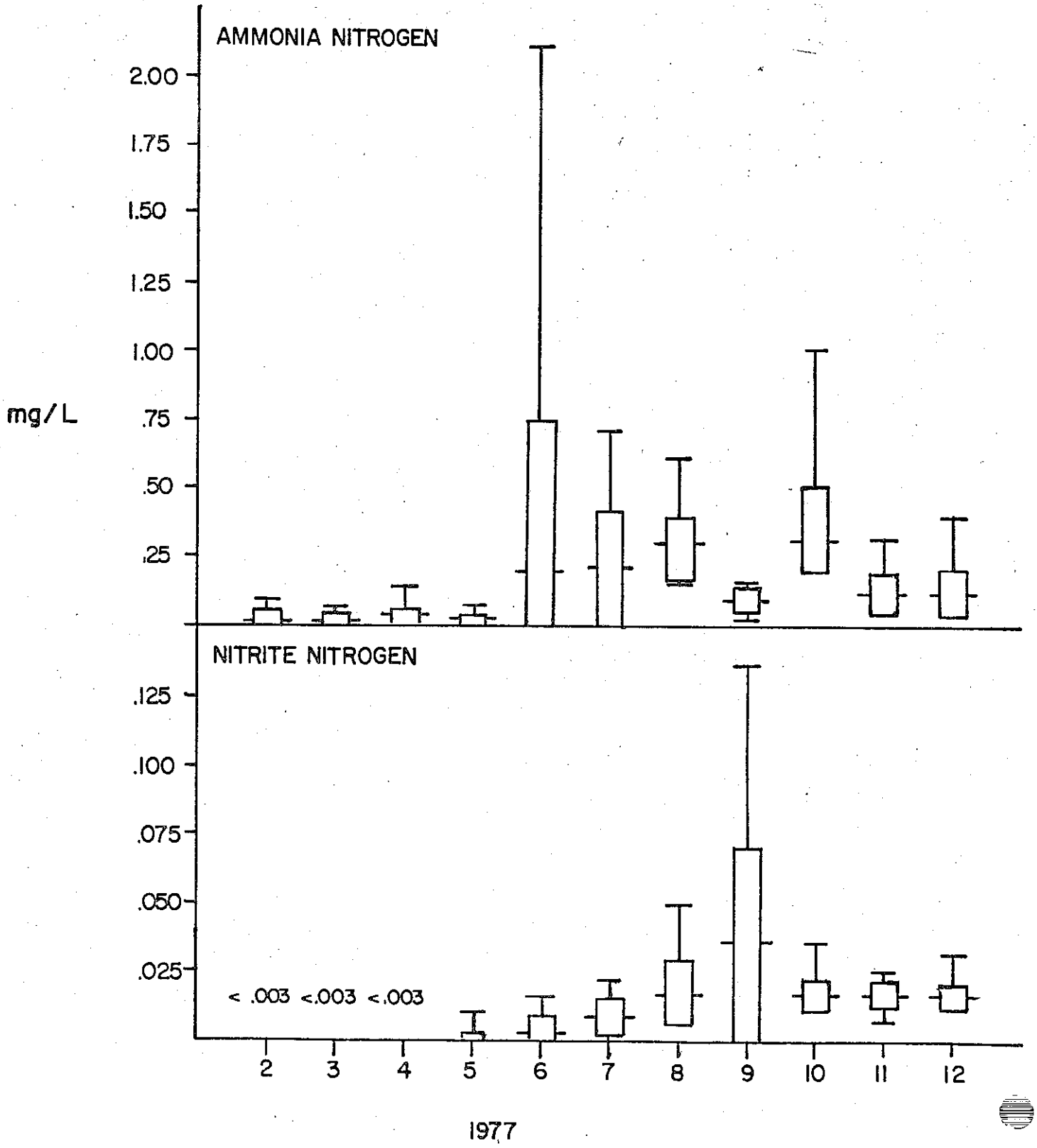


FIGURE 24 CONTINUED

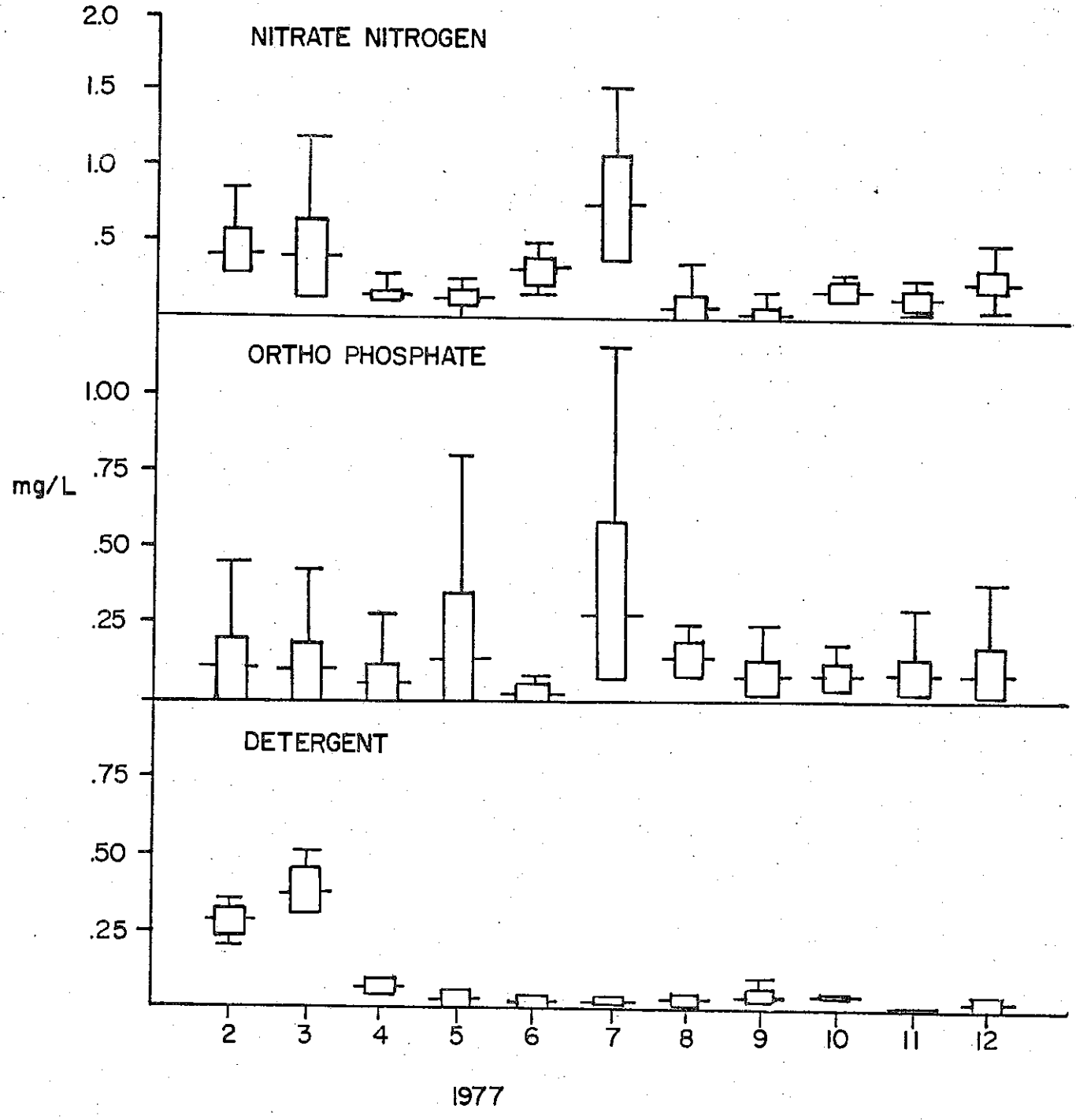
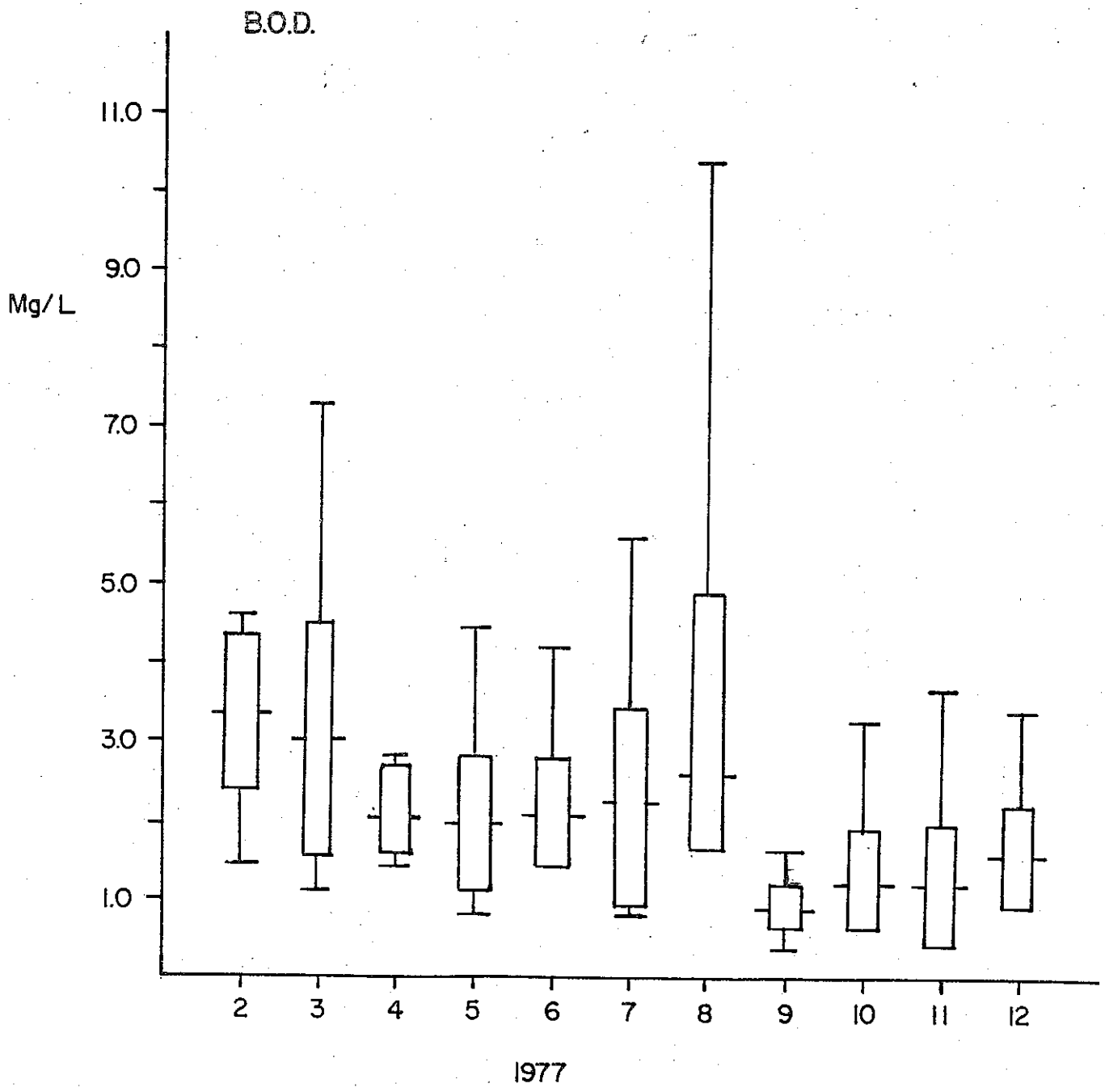


FIGURE 24 CONTINUED



Nitrate nitrogen levels ranged from $\leq$0.04 to 1.52 mg/1. The highest concentrations of 1.52 and 1.48 mg/1 were detected during July in Reed Bay and Longport, respectively. Values greater than 1.0 mg/1 were observed during March in Reed Bay (1.17 mg/1) and during July in zone 24 - Toms Island (1.05 mg/1). Comparison of monthly mean levels of nitrate nitrogen showed July to have the highest level (see Figure 24).

Ammonia nitrogen ranged from <0.01 to 2.1 mg/1. Except for readings of 2.1 mg/1 (June) and 1.0 mg/1 (July) observed in St. George's Thorofare, concentrations did not exceed 0.71 mg/1. Values were consistently higher in this zone as compared to the other regions.

Orthophosphate concentrations ranged from <0.01 to 1.17 mg/1. Except for the reading of 1.17 mg/1 recorded during July in Scull Bay, levels did not exceed .67 mg/1. Ortho levels were found to be generally higher in Scull Bay than the rest of the study area.

Detergent values detected were considered low, ranging from <0.01 to .44 mg/1. The highest level was measured during March at water quality station in Beach Thorofare (zone 22). Mean levels were found to be highest during the months of February and March.

SUMMARY

The study area, situated in Atlantic County, consisted of all water acreage extending from Little Egg Inlet south to the Great Egg Harbor Inlet. This included Little Bay, Grassy Bay, Reed Bay, Absecon Bay, Lakes Bay, Scull Bay, associated thorofares and drainage from the tributary, Absecon Creek. This made up a total of 16,548 acres surveyed; the bays comprising 50% of this total.

At mean low water, depths within the survey area ranged from 0.5 to 40 feet.

From the 16,548 acres, 86% are 6 feet or less in depth.

It is estimated that a total of 21,273 acres of wetlands remain in this region. Portions of this total acreage are part of the Absecon Wildlife Management Area (3,040 acres), managed by the Division of Fish, Game and Shellfisheries and North Brigantine (679 acres) managed by the Bureau of Parks and Forests. The federally owned Brigantine National Wildlife Refuge is located on the northern boundary of the study area. It includes 20,000 acres of beach, salt marsh, fresh water pools and upland habitat. Approximately 8,316 acres of the Refuge's wetlands are situated within the study area.

According to the Wetlants Inventory conducted by the New Jersey Department of Environmental Protection, 23 plant species have been identified on wetland maps for the study area: Spartina alterniflora (tall and short salt marsh cordgrass); Spartina patens (salt meadow cordgrass); Spartina cynosuroides (salt reed grass); Distichlis spicata (spike grass); Iva frutescens (high tide bush); Juncus gerardi (rush); Baccharis halimifolia (sea myrtle); Typha spp. (cattail); Zizania aquatia (wild rose); Nuphar advena (yellow water lily); Peltandra virginica (arrow arum); Phragmites communis (common reed); Polygonum punctatum (water smartweed); Hibiscus palustris (marsh mallow); Panicum virgatum (swith grass); Scirpus olneyi (olney's bulrush); Carex spp. (sedge); Eleocharis spp. (spike rush); Juncus spp. (rush); Rosa spp. (rose) and Pluchea spp. (marsh fleabane).

According to ecological studies conducted by Ichthylogical Associates, it was reported that the red algae, Gracilaria foliifera and Agarhiella temera were present in the Brigantine area. Polysiphonia fibrillosa, usually food at intertidal levels, was occasionally taken in their trawl collections. Porphyra umbilicalis, also a red alga resembling Ulva in its general morophology was reported on rocks and pilings in the Brigantine area.

Three other genera of algae not identified to the species levels, have been reported by Ichthyological Associates in the shore zones of Brigantine. This included Fucus sp. (common rockweed), Ulva sp. and Entermorpha sp.

Commercially important molluscan shellfish of the study area include the hard clam Mercenaria mercenaria; the eastern oyster, Crassostrea virginica; the soft clam, Mya arenaria; and the blue mussel, Mytilus edulis.

Over 380 acres of bottom in the study areas are leased to commercial shellfishermen for the culture of shellfish. Unfortunately, a large portion of the water is condemned for the direct harvest of shellfish due to bacterial contamination. To provide for the utilization of this resource a hard clam relay program was initiated in 1970. Clams harvested from specified condemned waters are transported to approved waters in Great Bay, where they are planted on "relay lots" for thiry days of purification. If clams are within acceptable bacterial limits, the relay lots are opened for harvest.

Water temperatures ranged from -1.5° to 31.0°C. Although heavy ice conditions prevented the collection of data during January, it is safe to assume that the lowest temperatures were during this month and February. The highest temperature was recorded during the month of July in Reed Bay. This water area has a water depth ranging from 0.5 to 5 feet at mean low water.

Thermal stratification was evident during most of the survey. The largest vertical temperature difference was 5.0 °C.

Salt water intrusion into the study is provided by four inlets: Little Egg Inlet via Great Bay - Main Marsh Thorofare, Brigantine Inlet, Absecon Inlet and Great Harbor Inlet. Salinity levels generally never fell below 23 o/oo except for one reading 19.5 0/00. This would exclude Absecon Creek, which is the receiving waters of Atlantic City Reservoir.

Station AC-2, located in Absecon Creek, was found with the greatest salinity

fluctuations (15.4 to 24.8 °/oo).

The data showed seasonal trends for dissolved oxygen were consistent in this system as compared to other estuaries. Generally, levels were higher during the colder months and lowest during the summer. Concentrations measured were found at times to be stratified. It would appear from the data that dissolved oxygen levels are greatly reduced (<0.5 mg/1) throughout the waters of the study area during the summer months.

All ph readings measured in the bay systems were found to be basic (7.5 to 9.3). In Absecon Creek pH values ranged from 4.9 to 8.3.

Carbon dioxide concentrations ranged from 0.0 to 30.8 mg O_2/1. The largest value was recorded in Reed Bay; all other readings were below 16 mg CO_2/1.

Secchi disc measurements ranged from .2 to 3.7 meters. Light penetration was found to be greatest in the winter and lowest in the summer. The shallow bays tended to be more turbid than the deeper channels.

Biochemical Oxygen Demand (B.O.D.) concentrations were found to be generally good. Except for readings of 10.4 mg O_2/1 (August) taken in St. George's Thorofare, 7.3 (March) and 5.6 (July) mg O_2/1 recorded in Scull Bay, levels did not exceed 4.6 mg O_2/1.

Slight traces of nitrite nitrogen were detected (<0.003 to 0.136 mg/1). Generally levels did not exceed 0.062 mg/1.

Nitrate nitrogen levels ranged from <0.04 to 1.52 mg/1. Mean levels were highest during the month of July.

Ammonia nitrogen ranged from <0.01 to 2.1 mg/1. Except for the readings of 2.1 (June) and 1.0 (July) detected in St. George's Thorofare, concentrations did not exceed 0.71 mg/1.

Orthophosphate concentrations measured ranged from <0.01 to 1.17 mg/1. Except for the reading of 1.17 mg/1 measured in Scull Bay, levels did not exceed

.67 mg/1.

Detergent levels recorded were considered low ranging from <0 .01 to .44 mg/1.

Results of residue analysis for the chlorinated hydrocarbons showed DDT and its metabolites were detected in 95% of the finfish samples with values ranging up to 246.6 ug/kg. DDT levels were also detected in 52% of the samples with values ranging up to 14.69 ug/kg. Except for one reading of 3.37 ug/kg detected in the hard clam, traces of DDT were only present in the ribbed mussel. Forty-one percent of the sediment samples analyzed were found with traces of DDT ranging up to 95.5 ug/kg.

The only other insecticides detected were as follows: dieldrin (5% of the fish) and chlordane (74% of the sediment).

Analysis of fish, shellfish and sediment samples showed all five elements (cadmium, chromium, lead, zinc and mercury) were present. In the fish, tissues analyzed at a sensitivity of <0.02 mg/kg for chromium, cadmium and <0.02 mg/kg for lead showed no traces. Zinc ranged from 15.0 to 58.0 mg/kg and mercury ranged from <0.01 to 1.27 mg/kg. Sediment analysis showed chromium ranging from <0.05 to 195.0 mg/kg, zinc from 17.0 to 212.0 mg/kg, lead from 0.1 to 88.6 mg/kg, cadmium from< 0.05 to 7.8 mg/kg and mercury from 0.04 to .94 mg/kg. Analysis of shellfish meat showed chromium ranging from <0.05 to 4.0 mg/kg, zinc from 10.0 to 214.0 mg/kg, lead from <0.1 to 7.0 mg/kg, cadmium from <0.05 to 2.0 mg/kg and mercury from 0.0 to 0.29 mg/kg.

LITERATURE CITED

American Fisheries Society, 1970. A list of common and scientifice names of fishes from the United States and Canada. Special publication No. 6

Bryan, G. W., 1971. The effects of heavy metals on marine and estuarine organisms. Proceedings of the Royal Society of London, Vol. 177, No. 1048, pp. 389-410.

Butler, P. A., et al. 1960. Effect of pesticides on oysters. Proceedings of the National Shell Fisheries Association, 51:23.

Butler, P. A. 1966. Pesticides in the marine environment. R. Appl. Ecol. 3:253-259.

Calabrese, A. 1972. How some pollutants affect embryos and larvae of American oysters and hard shell clams. Marine Fisheries Review, 34 (11-12): p. 66-77.

Charlesworth, J. L. (unpublished) 1968. Study of Bay Inlet and Nearshore Marine Sediment State. State of New Jersey Department of Conservation and Economic Development, Trenton, N.J. pp. 81-141.

Coastal Engineering Research Center, 1966. Shore Protection, Planning and Design: Tech. Report No. 4, Third Edition, U.S. Army Corps of Engineers, Washington, D.C.

Dow, R. L. and J. W. Hurst, 1972. Renewable resource problems of heavy metals mining in Coastal Marine Research Bulletin #35 Reprinted from National Fishermen.

Eisler, R. 1974. Testimony in the matter of proposed toxic pollutant effluent standard for Aldrin - Dieldrin, Federal Water Pollution Control Act Amendment (307) Docket No. 1.

Ferrigno, F. and L. Widjeskog, 1972. Ecology of salt marsh and coastal impoundments, Division of Fish, Game and Shellfisheries, Bureau of Wildlife Management, Progress Report, Project W-34-R-17 16 pp.

Ferrigno, F. L. Widjeskog and S. Toth, 1973. Marsh destruction. Division of Fish, Game and Shellfisheries, Bureau of Wildlife Management, Progress Report, Project W-53-R-1, Job 1-G, 20 pp.

Fleischer, M. 1974. Environmental impact of cadmium;a review by the panel on hazardous trace substances. Environmental health perspective. U.S. Government Printing Office, Washington, D.C. 7:253.

Hugget, R. J., M. E. Bender, and H. D. Slone, 1971. Mercury in sediments from three Virginia estuaries. Chesapeake Science, Vol. 12, No. 4, pp. 280-282.

Huggett, R. J., M. E. Bender, and H. D. Slone, 1973. Utilizing metal concentrations relationships in the Eastern Oyster (Crassostrea Virginica) to detect heavy metal pollution, Water Resources, 7:451-460.

Huggett, R. J., D. R. Colby and F. A. Cross, 1975. Variability of trace metals in oysters: Implication for sampling design. Annual Report to the Energy Research and Development Administration.

Ichthyological Associates, 1973. Ecological Studies in the Bays and Other Waterways near Little Egg Inlet and in the ocean in the vicinity of the proposed site for the Atlantic Generating Station, New Jersey. Ichthyological Associates, Edward C. Raney, Director, Ithaca, N.Y.

Jenne, E. A., 1972. Mercury in waters of the United States, 1970-71. Open file report, U.S. Geological Survey, Menlo Park, Calif.

Jenson, S., and A. Jernelon, 1969. Biological methylation of mercury in acquatic organisms, Nature 225.

Korn, S., and R. Carnest. 1974. Acute toxicity of 20 insecticides to striped bass, Morone saxatilis. Calif. Fish and Game, 60:128.

Lackey, J. B. 1958. Effects of fertilization on receiving waters. Engineering progress at the University of Florida. Leaflet No. 106, Vol. XIII, No. 3, Reprint, March.

Lieber, M. and W. E. Welsch, 1954. Contamination of ground waters by cadmium. Jour. Amer. Water Works Assn. 46:51.

Loveland, R. E. 1969. The qualitative and quantitative analysis of the benthic flora and fauna of Barnegat Bay before and after the onset of thermal addition; Fifth progress report. Rutger's University, New Brunswick, N.J. p. 70

Loveland, R. E., K. Mountford, E. T. Moul, D. A. Busch, P. H. Sandine, and M. Moskowitz. 1971. The qualitative and quantitative analysis of the benthic flora and fauna of Barnegat Bay before and after the onset of thermal addition. Seventh progress report Rutger's University, New Brunswick, N.J. p. 37.

Loveland, R. E., E. T. Moul, D. A. Busch, P. H. Sandine, S. A. Shaftr and J. McCarthy. 1972. The qualitative and quantitative analysis of the Benthic flora and fauna of Barnegat Bay before and after the onset of thermal addition; Eighth progress report, Rutger's University, New Brunswick, N.J. p. 86.

Makai, J. F. 1971. Studies of the Great Egg Harbor River and Bay. Project 3-137 R-1. Miscellaneous report No. 8 M, New Jersey Department of Environmental Protection, Division of Fish and Game, Bureau of Fisheries.

Makai, J. F. 1973. Studies of the Upper Barnegat System Project 3 - 137 R-2, Miscellaneous report No. 10 M. New Jersey Department of Environmental Protection, Division of Fish and Game, Bureau of Fisheries

Moeller, H. W. 1964. A standing crop estimate of some marine plants in Barnegat Bay. Bull. N. J. Acad. Sci 9 (1) :27-30.

National Academy of Science, National Academy of Engineering, 1974. Water quality criteria, 1972. U.S. Governmental Printing Office, Washington, D.C.

Nieswand, G. H., C. W. Stillman, and A. J. Esser. 1972. Inventory of estuarine site development lagoon systems: New Jersey shore. Department of Environmental Resources, Rutger's University, New Brunswick, New Jersey.

Quality Criteria For Water, 1976. U.S. Environmental Protection Agency, Washington, D.C. pp. 256.

Reid, George K. 1961. Ecology of Inland Waters and Estuaries. Van Nostrand Reinhold Co., New York, 357 pp.

Reinert, R. E. 1970. Pesticide concentrations in Great Lakes Fish. Pesticide Monit. Jour., 3:233.

Robertson, E. E., 1972. Baltelle Northwest contribution to the I D O E Baseline Study, Baltelle Northwest, 1972 I D O E Workshop, p. 231.

Schuster, C. N. Jr, 1959. A biological evaluation of the Delaware River Estuary. Information Series, Publication No. 3, University of Delaware Marine Laboratories, 77 pp.

Skidmore, J. F. 1964. Toxicity of zinc compound to aquatic animals, with special reference to fish, Quaterly Rev. of Biology. 39:227.

Status of permit development, 1978. Computer print out sheets prepared by E.P.A.. permit section, Region 2, 76 pp.

The determination of chlorinity by the Knudson method, 1962. G. M. Manufacturing Co., New York.

U.S. Army Corps of Engineers, 1950. Atlantic City Beach Erosion Control Study: 81st. Congress, 2nd Session, House Doc. 538.

U.S. Coast and Geodetic Survey, 1977. Tide Tables. East Coast of North and South America (Including Greenland), U.S. Department of Commerce, Washington, D.C.

Water quality inventory annual statewide assessment, 1975. Division of Water Resources prepared pursuant to Section 305 (b) of the 1972 Federal Water Pollution Control Act Amendments (Public Law 920500)

Water Resources data for New Jersey, 1975, Geological Survey Water Data Report N.J. - 75-1 470 pp.

Weiss, H. V., M. Koide, and E. D. Goldberg, 1971. Mercury in a Greenland ice sheet: Evidence of recent input by man. Science, Vol 174, No. 4010, pp. 692-694.

Welch, T. S., 1948. Limnological methods. Blakiston Co.

Young, D. R., C. S. Young, and G. E. Hlavka, 1973. Sources of trace metals from highly urbanized southern California to the adjacent marine ecosystems. In: Cycling and Control of metals, National Environmental Research Center, Cincinnati, pp. 21-40.

Fish Study

By: John F. McClain

ABSTRACT

An inventory of the fishes inhabitating the bays and thorofares of Atlantic County was conducted for one year.

Thirteen seine, 16 trawl and 8 gill net stations were sampled monthly, weather permitting. Sampling began in March and continued through December 1977. Seine and trawl sampling at an additional station was initiated in June.

Fifty-nine species of finfish, in varying stages of their life cycles, were collected. Thirty-nine species were captured by seine, 46 by trawl and 23 in gill nets. Fifteen species were taken by all gear types.

INTRODUCTION

This is the sixth in a series of studies designed to sample the fish populations of New Jersey's estuaries. We want to know the species which, at some stages of their life cycle, inhabit our estuaries, the time they spend there and where they spend it. This study covers the bays and thorofares behind Brigantine and Absecon Island from Brigantine Inlet to Great Egg Harbor Inlet. Field work was conducted from January through December 1977.

ACKNOWLEDGEMENTS

Barry Preim worked full time on the project, assisted by Hal Swindell and Ray Townsend. Other lab personnel lending assistance were: Mark Boriek, Jeff Carlson, Russ Cookingham and Russ Tilton.

METHODS AND MATERIALS

Three types of fishing gear were used to collect samples: gill net, seine and trawl.

A 150' x 8' gill net with three 50' panels of 1", 2" and 3" square mesh was used at all except two gill net stations. These were located in Absecon Creek and were sampled with a 125' x 6' net with five 25' panels of 1/2", 3/4", 1", 1 1/2" and 2" square mesh.

All seine stations were sampled with a 25' x 5' bag seine with a 5' x 5' x 5' bag. The entire net was 1/2" stretch mesh knotless nylon netting. In addition,

three stations were sampled with a 150'x 10' bag seine of the following specifications: 55' wings of 5/8" stretch mesh, 15' each side of bag--3/8" stretch mesh and a 10' x 10' x 10' bag of 3/8" stretch mesh. This net was set from a 17' Boston Whaler boat.

Trawling was conducted with a 16' semi-balloon trawl of the following dimensions: 16' headrope, 19' footrope, body 1 1/2" mesh of #9 thread, cod end 1 1/4" mesh of #15 thread, innerliner 1/2" stretch mesh of #63 thread knotless nylon netting; doors are mahagony, weigh 15 lbs. each and measure 2' x 1' x 1" with 100' of 3/8" nylon line attached. The trawl is towed by a 17' Boston Whaler boat for five minutes at 2,000 r.p.m. Two tows are made at each station under normal conditions.

Data was collected as follows: The catch was speciated, each species was measured and counted if numbers allowed. Aliquot samples were taken when individual numbers of any species were so great as to make processing the entire catch impractical. The sub-samples were counted and measured and the data adjusted accordingly.

SEINE (25') RESULTS

Sampling began at eight stations in March. Three more were added in April and two others in June. See Figure 1 for station location and Table 40 for description. Tables 41 through 53 show the number of fish taken and water quality recorded monthly for each station. Species diversity indices are given in Table 89.

Twenty-six species of finfish numbering 34,843+ specimens were collected. Overall catch per haul (c/h) was 161.3 specimens. Seven species made up 99% of the catch. The Atlantic silverside (c/h 137.1) was the most abundant

species, making up 85% of the catch. The other six species in decreasing numerical order were: mummichog (c/h 12.2), striped killifish (c/h 3.2), bay anchovy (c/h 3.2), white mullet (c/h 2.3), spot (c/h 1.5) and sheepshead minnow (c/h 0.6). See Table 54 for the number of each species and c/h by season.

WINTER (January, February, March)

Eight stations were sampled in March, none in January or February due to ice. Four hundred forty-eight specimens of five species were collected, 434 of which were Atlantic silversides. The other four species were: blueback herring (1), striped killifish (5), three spine stickleback (7), and white perch (1).

SPRING (April, May, June)

Fifteen species numbering 4,559+ specimens were taken. Overall c/h was 68.0 specimens. The Atlantic silverside was the most abundant species, accounting for 47% of the catch. C/h was 31.8 specimens. The next five species in descending order were; mummichog (c/h 14.1), white mullet (c/h 7.3), bay anchovy (c/h 6.80), striped killifish (c/h 3.7), and spot (c/h 3.4). The only fourspine stickleback collected during the survey occurred in Zone 21 in May.

SUMMER (July, August, September)

Twenty-one species numbering 18,202 specimens were taken. Overall c/h was 242.7 specimens. Four species made up 98% of the season catch. They were, in decreasing order; Atlantic silverside (c/h 222.1), mummichog (c/h 10.2), striped killifish (c/h 4.5), and bay anchovy (c/h 2.2).

FALL (October, November, December)

Ten species totalling 11,636 specimens were taken. Overall c/h was 200.6

specimens. The Atlantic silverside (c/h 179.2) made up 89% of the fall catch. Next in abundance was the mummichog (c/h 15.9) accounting for 8% of the catch. The sheepshead minnow (c/h 2.0) and striped killifish (c/h 2.0) ranked third and fourth each making up 1%.

SEINE (150') RESULTS

Three of the 25' seine stations (zones 01, 10, 24) were also sampled with the 150' seine from March through November. See Figure 1 for station location. Tables 55 through 57 show the number of fish taken and water quality recorded monthly for each station. Species diversity indices are given in Table 89.

Thirty-two species of finfish numbering 54,392+ specimens were collected. Overall c/h was 1,026.2 specimens. Eight species numbered more than 100 specimens and made up 99% of the catch. The bay anchovy (c/h 552.3) was the most abundant, making up 54% of the total catch. The Atlantic silverside (c/h 414.8) ranked second, accounting for 40% of the catch. These were followed by; spot (c/h 26.2) American sand lance (c/h 12.9), bluefish (c/h 4.7), mummichog (c/h 3.3), winter flounder (c/h 2.4) and windowpane (2.0). Table 58 gives the number of each species and c/h by season.

WINTER

Only six hauls were made, two at each station in March. Twenty-seven specimens of five species were collected. They were: the Atlantic silverside, American sand lance, blueback herring, threespine stickleback and northern pipefish.

SPRING

Seventeen species numbering 2,763+ specimens were taken. Overall c/h was 153.5 specimens. The bay anchovy was most abundant, accounting for 53% of the

catch. C/h was 80.9 specimens. The American sand lance (c/h 13.9) ranked second making up 24% of the catch. Next in abundance was the Atlantic silverside (c/h 19.2), followed by the windowpane (c/h 5.3), the blueback herring (c/h 4.4) and the spot. These six species made up 98% of the spring catch. Three of the six were taken primarily in the spring. They are: American sand lance--97%, blueback herring--89%, and windowpane--54%.

SUMMER

Twenty-five species totalling 45,871+ specimens were taken in the summer. The overall c/h was 2,548.4 specimens. Again the bay anchovy (c/h 1,474.4) was most abundant, followed by the Atlantic silverside (c/h 966.1) and the spot (c/h 73.1). These species accounted for 99% of the catch. Two other species numbered over 100 specimens, the bluefish (c/h 13.3) and the winter flounder (c/h 6.6).

FALL

Thirteen species numbering 5,731 specimens were collected. Overall c/h was 520.9 specimens. The Atlantic silverside (c/h 384.7) ranked first, accounting for 74% of the catch. The bay anchovy (c/h 115.9) was second with 22%, and the mummichog (c/h 15.5) third with 3%.

TRAWL RESULTS

Fifteen stations were trawled monthly, from March through December; a 16th was added in June. See Figure 1 for station location and Table 59 for description. Tables 60 thru 75 show the number of fish taken and water quality recorded at each station. Species diversity indices are given in Table 89.

Forty-six species of finfish totalling 9,613+ specimens were taken. C/h was 30.8 specimens. Four species made up 95% of the trawl catch. They were; bay anchovy--67%, spot--15%, Atlantic silverside--9%, and weakfish--4%. C/h figures for these species are: bay anchovy--20.7, spot--4.8, Atlantic silverside--2.7, and weakfish--1.2. Table 76 lists the number of each species and c/h by season.

WINTER

No trawling was done during January or February because of ice. Fifteen stations were sampled in March. Five specimens of four species were collected. They were: American eel, American sand lance, striped killifish and winter flounder.

SPRING

Nineteen species numbering 607 specimens were collected. Overall c/h was 6.6 specimens. The spot (c/h 3.0) and bay anchovy (c/h 1.8) made up 72% of the catch. The Atlantic silverside (c/h 0.5) ranked third and accounted for 1% of the catch.

The American shad, pollock and tautog appeared only in the spring. All specimens except one tautog were taken trawling.

SUMMER

Thirty-one species numbering 6,866+ specimens were collected. Overall c/h was 71.5 specimens. Three species made up 95% of the summer trawl catch. The bay anchovy (c/h 53.7) was the most abundant, accounting for 75% of the catch. The spot (c/h 10.6) ranked second and the weakfish (c/h 3.9) third.

Eleven of the 31 species taken by trawl appeared only in the summer.

FALL

Twenty-seven species numbering 2,135 specimens were taken. C/h was 22.7 specimens. Two species, the bay anchovy (c/h 12.3) and the Atlantic silverside (c/h 7.4) made up 87% of the fall catch. The spot (c/h 2.0) ranked third, comprising 9% of the catch.

Nine species appeared in the trawl only in the fall. Three of these were taken exclusively by trawl.

GILL NET RESULTS

Eight gill net staions were sampled during the year. See Figure 1 for station location. Tables 77 thru 84 show the number of fish taken and water quality recorded at each station.

Twenty-three species of finfish numbering 1,524 specimens were taken. Catch per hour (c/hr) was 6.7 specimens. Five species made up 92% of the catch. The most abundant was the spot (c/hr 3.2) which constituted 48% of the gill net catch. The other four species, in decreasing order, were; the bluefish (c/hr 1.3), smooth dogfish (c/hr 0.7), Atlantic menhaden (c/hr 0.5), and the white perch (c/hr 0.3). See Table 85 for the number of fish taken and c/hr by season.

SPRING

Fifteen species numbering 228 specimens were taken. C/hr was 3.4 specimens. The most abundant species was the dogfish (c/hr 1.6), making up 49% of the catch. The Atlantic menhaden (c/hr 0.7) ranked second and the white perch (c/hr 0.3) third.

SUMMER

Seventeen species totalling 1,238 specimens were taken. C/hr was 12.9

specimens. The spot (c/hr 7.4) ranked first in abundance, making up 57% of the summer catch. The bluefish (c/hr 3.0) was second accounting for 23% of the catch. The next three species in descending order were: Atlantic menhaden (c/hr 0.7), smooth dogfish (c/hr 0.6) and white perch (c/hr 0.5).

FALL

Only seven species numbering 58 specimens were taken. C/hr was 0.9 specimens. As in the summer, spot ranked first, however, the c/hr was only 0.4 specimens. The white perch was second with a c/hr of 0.2 and the bluefish third also with a c/hr of 0.2 speciemens.

DISCUSSION

Fifty-nine species of finfish were taken during the survey. See Table 86 for the number of each species taken by each gear type, their overall rank and the percent of total catch each species comprised. Thirteen plus species of invertebrates were also collected in the various gear types and their presence recorded. Table 39 lists the common and scientific names of invertebrates collected. Table 90 shows the seasonal occurrence of all species taken in the study area.

Sixteen species of finfish numbered more than 100 specimens. Table 91 shows the total number of each of these species, the percent of the total catch each comprised and the overall c/h for gear type. Table 92 shows the months these species occurred by gear type. Salinity and temperature ranges for most of these species are given in Tables 87 and 88. Ten of these species were forage fish: American sand lance, Atlantic menhaden, Atlantic silverside, bay anchovy, mummichog, northern pipefish, sheepshead minnow, striped killifish, striped mullet,

and white mullet. These ten accounted for 94% of the total catch. Four were important sport and commercial species: bluefish, spot, weakfish and winter flounder. This group made up 5% of the catch.

The Atlantic silverside was the most abundant species making up 52% of the catch. It was taken throughout the sampling year (March - December), being most abundant in the summer (65%). Ninety-eight percent were collected seining.

The bay anchovy ranked second comprising 36% of the total catch. It was taken April thru December, primarily with 150' seine (80%). They were also most abundant in the summer with 87% occurring then.

The spot ranked third with 3,927 specimens making up 4% of the total catch. It was the most abundant sport and/or commercial species. Most of those collected were young of the year. They were taken June thru November, 79% occurring in the summer. The spot was one of ten species taken in all four gear types and was the most evenly divided. Eight percent were taken in the 25' seine, 35% in the 150', 38% in the trawl and 19% in gill nets.

The mummichog was fourth in abundance accounting for 3% of the catch. This was the last species to comprise more than 1% of the catch. They were collected April thru December and were most abundant during the fall (39%). Mummichogs were also taken by all gear types. In contrast to the spot, 6% were taken in the 25' seine and 93% in the 150'. One specimen was taken in the trawl and nine in the gill nets.

Fifth in abundance was the striped killifish. They appeared throughout the sampling year with 49% being taken in the summer. The striped killifish followed the same pattern as the mummichog, 7% were taken in the 150' seine

and 92% in the 25'. Three specimens were collected with the trawl and four in the gill nets.

The American sand lance ranked sixth. They were taken in March, May, July, August, October and November in the 150' seine and in March and December in the trawl. The 150' seine accounted for over 99% of the catch, 94% were taken at Absecon Inlet (Zone 10) in June.

The bluefish was the second most abundant sport and commercial species collected and ranked seventh overall. They were taken May thru October. Over half (51%) were taken by gill nets followed by the 150' seine with 42%, the 25' seine with 4% and the trawl with 2%. Most of those collected were young of the year.

The white mullet was eighth in abundance. They appeared in the catch June thru October. The relatively high rank of this species is due to a catch of 470+ specimens, in one haul of the 25' seine in a tidepool off Absecon Inlet (Zone 10) in June. This was 83% of the total catch, altogether 88% were taken in the 25' seine and 12% in the 150'.

The weakfish, another important sport and commercial species, ranked ninth. They were taken May thru October, 78% in August. Most were young of the year. Ninety percent were collected with the trawl, 6% by gill net and 4% in the 25' seine.

The winter flounder was tenth in abundance and the last sport and commercial fish to number over 100 specimens. They were taken throughout the sampling year, mostly in the summer. Fifty-seven percent were collected in the 150' seine, 27% in the trawl and 15% in the 25' seine. Over 90% of the winter flounder collected were young of the year.

The smooth dogfish ranked eleventh. They were collected May thru September,

with 62% taken in the spring and 38% in the summer. Most (79%) were taken by gill net followed by the trawl--19% and the 150' seine--2%. Specimens measured ranged form 303 to 1,260 mm (total length). Spawning apparently takens place May thru July as specimens under 400 mm were collected during this time. Adults appear to leave the bays and thorofares after spawning. Only one specimen 452 mm was taken in July and the maximum lengths for August and September were 675 mm and 570 mm respectively.

Twelfth in abundance was the windowpane. They were collected April thru December and were most abundant in the spring, 68%. Most (57%) were taken in the 150' seine, followed by the trawl--27% and the 25' seine--15%.

The Atlantic menhaden ranked thirteenth. They were taken May thru October. Menhaden were one of three species taken primarily by gill net, the others being bluefish and smooth dogfish. Seventy-one percent were taken in the gill net, 4% in the trawl, 20% in the 150' seine and 5% in the 25'seine.

The sheepshead minnow was fourteenth in abundance. They were taken July thru November, primarily in the fall (89%). All were collected seining; 97% in the 25' seine and 3% in the 150'. While they occurred at eight seining locations, half were collected from the tide pool on the east side of Absecon Inlet.

The striped mullet ranked fifteenth. They occurred in April (3 specimens) and June thru November. Most (70%) were collected in the summer, followed by 27% in the spring and 2% in the fall. Eighty-eight percent were taken seining, 47% in the 25' seine and 41% in the 150', and 11% in the gill net.

The northern pipefish was the last species to number over 100 specimens. they were taken March thru November, being most abundant in the summer (64%). Thet were collected by all gear types, 22% in the 150' seine, 32% in the 25', 39% in the trawl and 8% in the gill net.

OTHER STUDIES

Ichthyological Associates, Inc. (IA) seined the area behind Brigantine in 1972 as part of their study of ocean sites for proposed nuclear generating stations. They collected almost twice as many species (46) as we did (26); 23 species occurred in both studies. The Atlantic silverside, mummichog and striped killifish were the most abundant species, ranking 1, 2 and 3 in our collections and 1, 3 and 2 in their's. IA also sampled the area with a 16 foot semi-ballon trawl of the same type we used. Each study collected 46 species, 42 of which were in common. The four most abundant species collected by IA were: bay anchovy, Atlantic silverside, winter flounder and silver perch. Our top four were: bay anchovy, spot, Atlantic silverside and weakfish. It is interesting to note that in their study, IA found silver perch to be fourth in abundance, while they collected only eight spot and 5 weakfish. In our study, five years later, spot ranked second in abundance and weakfish fourth and no silver perch were taken at all.

Studies were conducted in the Great Bay-Mullica River Estuary (McClain, 1970) to the north of this study area and the Great Egg Harbor River and Bay (McClain, 1971) to the south. Considering only the bay stations in these two areas where the salinities are similar to those in this study, 46 species were taken in Great Bay and 42 in Great Egg Harbor Bay.

SUMMARY

The finfish population of the back bay systems in Atlantic County was sampled from March thru December, 1977. No sampling was done in January or February because of ice. Three types of gear were used to collect fish,

a 150' x 10' bag seine, a 25' x 5' bag seine, a 16' semi-balloon trawl, a 150' x 8' gill net and a 125' x 6' gill net.

Fifty-three hauls were made at three stations with the 150' seine. Thirty-two species of finfish numbering 54,392+ specimens were collected. Overall c/h was 1,026.2 specimens. Eight species numbered over 100 specimens and made up 99% of the catch. In decreasing order they were; bay anchovy, Atlantic silverside, spot, American sand lance, bluefish, mummichog, winter flounder and windowpane.

A total of 216 hauls were made at 13 stations with the 25' seine. Twenty-six species numbering 34,843+ were taken. C/h was 161.3 specimens. The Atlantic silverside (86%) was the most abundant, followed by mummichog, striped killifish, bay anchovy, white mullet, spot and sheepshead minnow.

Three hundred and twelve hauls were made at 16 trawl stations. Forty-six species totalling 9,613+ speciemens were collected, overall c/h was 30.8 specimens. Four species constituted 95% of the catch; bay anchovy (67%), spot, Atlantic silverside and weakfish. All of the hakes taken in the study area were taken trawling, as were all the American shad. Several other species appeared only or primaily in the trawl catch.

Eight gill net stations were sampled, six with the 150' x 8' net and two in Absecon Creek with the 125' x 6' net. Twenty-three species numbering 1,524 specimens were collected at all stations. C/hr was 6.7 specimens. Five specimens made up 92% of the catch; spot (48%), bluefish, smooth dogfish, Atlantic menhaden and white perch.

Altogether, fifty-nine species of finfish numbering 100,372+ fish were taken. The five most abundant species and the percent of total catch they comprised were: Atlantic silverside--52%, bay anchovy--36%, spot--4%, mummichog--3%, and striped killifish--1%. Thirteen plus species of invertebrates were also collected during the study and their presence recorded.

LITERATURE CITED

American Fisheries Society, A list of common and scientific names of fishes from the United States and Canada. Special Publication No. 6, 1970.

McClain, J.F. 1970. Phase I. Fish Study. p. 1-51. In Studies of the Mullica River - Great Bay Estuary. N.J. Department of Environmental Protection, Division of Fish, Game and Shellfisheries, Bureau of Marine Fish, Misc. Report No. 6M-1, 141 p.

McClain, J.F. 1971. Phase I. Fish Study. p. 1-54. In Studies of the Great Egg Harbor River and Bay. N.J. Department of Environmental Protection, Division of Fish, Game and Shellfisheries, Bureau of Marine Fish, Misc. Report No. 8M, 156 p.

Pielou, E.C. 1966. The measurement of diversity in different types of biological collections, J. Theoret. Biol. 13:131-144.

Thomas, D.L. and C.B. Milstein. 1973. Part one. Ecological studies in the bays and other waterways near Little Egg Inlet and in the ocean in the vicinity of the proposed site for the Atlantic Generating Station, New Jersey. Ichthyological Associates Inc., Edward C. Raney, Director, Ithaca, New York. 666 p.

Ichthyoplankton Study

By: Peter Himchak

ABSTRACT

Over 10,000 young and larval fishes representing twenty species have been indentified in ichthyoplankton samples collected in the Back Bay Systems in Atlantic County from March to December 1977.

The total catch is largely composed of the Family Gobiidae (66.86%) and the Family Engraulidae (15.10%), both families consisting of individuals too small to speciate. The most commonly caught species were the naked goby (5.57%), the Northern pipefish (5.45%), the weakfish (3.15%) and the bay anchovy (1.24%). Fewer numbers of sandlance, Atlantic silverside, winter flounder and killifish were taken. Also collected but in relatively small numbers were larval or young American eels, seahorses, summer flounder, tidewater silversides, goosefish, grubbies, windowpanes, and inshore lizardfish. A single croaker, oyster toadfish, filefish, and searobin were also sampled.

Each of the major species is discussed separately, giving time of spawning from the literature and the occurrence of the larvae and young of those same fishes in the vicinity of Atlatic City.

Number of fish per cubic meter of water filtered (n/m^3) values are given for each sample, and summarized by station to show the relative abundance of each of the species sampled.

INTRODUCTION

The Ichthyoplankton Sampling Program is designed to survey and inventory the species of young and larval finfishes that utilize the estuaries as a nursery area. Larval fishes collected in the estuaries may have been spawned there, or nearshore, with subsequent migration through the inlets and into the back bays.

This study of the spatial and temporal distribution of larval finfishes complements the adult finfish population segment of this same report. Together, they qualify the dynamic utilization by marine fishes throughout their lives of the bays, inlets and creeks in the vicinity of Atlantic City, an area earmarked for extensive re-development in the near future.

The occurrence of at least twenty species of young and larval finfishes between Great Bay and the Great Egg Harbor Inlet points to the value of this study area is possessing natural resources capable of supporting these finfishes throughout the early stages of their development.

Attempts were made to quantify the data so that not only the species utilizing the area would be known but also an index of their relative abundances could be determined.

ACKNOWLEDGEMENTS

Russell Tilton and Mark Boriek performed the largest part of the field sampling. Their efforts and consistently good sampling techniques are greatly appreciated. Paul Hamer and Pat Festa contibuted to the selection of sampling sites and with their overall supervision throughout the study.

Michael Fahay and Peter Berrien of the National Marine Fisheries Lab at Sandy Hook were instrumental in identifying the more difficult larval species of

marine fishes. Dr. Kenneth Able verified the identification of larval specimens of the Family Cyprinodonitidae.

Joseph Vaughan, Debra Spenser and Hal Swindell also participated in the collection and sorting of specimens.

METHODS AND MATERIALS

Samples were collected from an anchored boat during the daytime utilizing a 0.5 mm mesh, 1/2 and 1 meter diameter plankton nets. A flowmeter was mounted in the mouth of each net to determine the volume of water filtered. Number of revolutions of the impeller blade of the flowmeter was converted to cubic meters of water filtered using the equation: Volume = $\alpha \cdot N \cdot A$, where α = a calibration factor for each instrument based on the velocity of the water current, N = number of revolutions, A = area of the mouth of the net (m^2). Estimates of the velocity of the water current were obtained using a hand-held current meter.

There was essentially no salinity gradient throughout the sampling area on which to base the selection of sampling stations. Station 1, within the Great Egg Harbor Inlet was selected to determine which species migrated up the Great Egg Harbor River, an area whose adult finfish species had already been surveyed, but no ichthyoplankton work done. Brigantine and Absecon Inlets were not chosen as sampling sites since data on ichthyoplankton have already been collected there by Ichthyological Associates. Station 2, Whirlpool Island, is located between Whirlpool and Winkle Islands within Lakes Channel which connects Lakes Bay with Shelter Island Waters as shown on Nautical Chart 12316, Intracoastal Waterway, Little Egg Harbor to Cape May New Jersey. The sampling station is surrounded by islands of undeveloped Spartina marsh. Broad Creek connects Reed Bay with the Intracoastal Waterway Channel at Fl R "70" and is also shown

on Nautical Chart 12316. Station 4, at the Mouth of Absecon Creek, is the only large creek entering the sampling area. A significant difference in salinity within the system exists at this station, being less saline. Station locations are depicted on Figure 1.

Sampling was conducted during the daytime at all four sites on both a flood and ebb tide each month. Night time samples were taken at the Mouth of Absecon Creek which was only sampled from May through August 1977. All other stations were sampled from March through November 1977. Both a surface and a bottom sample were taken each sampling event.

Upon return to the laboratory, specimens were picked, sorted and preserved in a 10% buffered formalin solution. In addition to many periodicals specific to a species, the following keys were used extensibly: Lippson and Moran (1974), Scotton et al. (1973) and the U.S. Fish and Wildlife Service (1978).

Specimens collected were keyed to the species level wherever possible and reported under the life stage headings: larva, young, and adult. A larva did not possess a full complement of adult fin characteristics. A young fish possessed a full complement of adult fin characteristics but was not sexually mature and generally lacking adult pigmentation. Adults were sexually mature. The distinction between young and adults was not determined on gonad morphology but rather, pigmentation and total length determinations as stated in the literature. A representative number of specimens of each species was measured to the nearest millimeter. Total length measurements are frequently the characteristic on which life stage determinations are made.

Physical-chemical data collected with each sample include: water temperature, salinity, dissolved oxygen, pH, air temperature, sample depth, and for daytime samples, secchi readings.

RESULTS

A. Total System Results

Over 10,000 young and larval fishes representing at least twenty species have been identified in the ichthyoplankton samples collected in the vicinity of Atlantic City from March through November 1977. Table 93 lists both the scientific and common names of the species identified.

The total catch is largely composed of members of the Family Gobiidae (71.98%) and the Family Engraulidae (15.71%). Most gobies were too small to speciate and the literature on these fish less than 10 mm total length is not clearly defined. Larger specimens were identified as naked gobies, Gobiosoma bosci. Similarly, members of the Family Engraulidae whose dorsal and anal fins were not sufficiently developed could not be speciated. They were probably bay anchovies, Anchoa mitchilli, since adult members are extremely abundant throughout the system. However, adult silver anchovies, Engraulis eurystole, were also taken in the adult finfish study and the taxon Anchoa spp. could not be used.

Among other species, those most commonly caught included: Northern pipefish, 5.49%; weakfish, 3.53; winter flounder, 0.82%; and sandlance, 0.37%. Also collected but in relatively small numbers were larval or young American eels, seahorses, Atlantic silversides, tidewater silversides, inshore lizardfish, and summer flounder. Table 94 lists all species of finfish collected both by life stage and percent of total catch.

B. Station Results

Station 1: Great Egg Harbor Inlet

Table 96 lists each of the thirty samples collected in the Great Egg Harbor Inlet showing catch by species, accompanying physical-chemical data, and the number of finfish collected per cubic meter of water filtered. Great Egg Harbor Inlet accounted for 1338 specimens, 13.02% of the total catch, 15,404 cubic meters filtered and 0.087 fish per cubic meter (Table 95).

Station 2: Whirlpool Island

Whirlpool Island sampling results representing thirty-two individual samples are shown in Table 97. Station totals listed in Table 95 show 8,005 specimens taken at Whirlpool Island representing 77.92% of the total catch. Sampling effort was 18,159 cubic meters of water filtered for a catch per effort of 0.441 specimens per cubic meter.

Station 3: Broad Creek

Station totals (Table 95) include 294 specimens taken in Broad Creek, representing 2.86% of the total catch. Catch per unit effort, 0.013 specimens per cubic meter, is based on 21,906 cubic meters of water filtered.

Table 98 shows each of the 34 samples taken in Broad Creek by species and life stage. The fewest number of specimens, 294, was taken at this station.

Station 4: Mouth of Absecon Creek

Forty samples were taken at the Mouth of Absecon Creek between May 19 and August 11, 1977. Table 99 gives a complete breakdown of each sample. Sampling catch per unit effort, 0.188 fish per cubic meter, was the second highest within the study area. The Mouth of Absecon Creek accounted for 637

specimens, 6.20% of the total catch with only 3,396 cubic meters of water filtered. Half meter diameter plankton nets were used at this station only.

C. Individual Species Results

1. Family Gobiidae/Gobiosoma bosci

Members of the Family Gobiidae accounted for 7395 specimens with an additional 44 G. bosci also having been taken. Together, they account for 72.41% of the total catch. Mean total length for Family Gobiidae was 6.7 mm and for G. bosci, 16.7 mm, see Tables 112 and 110, respectively. Larvae generally became young at approximately 10 mm total length.

Of the 72.41% taken, 62.14% were larvae and 0.27% could be identified as young naked gobies. Over four hundred (408) of these specimens were measured, 5.5% of the total catch.

2. Family Engraulidae/Anchoa mitchilli

Specimens under these headings accounted for 16.33% of the total catch, 1678 members having been taken. Mean length for the Family Engraulidae was 9.8 mm (Table 111) and for A. mitchilli, 14.2 mm (Table 110). A total of 461 specimens, 27.47% of the catch, was measured.

Specimens were no longer considered larvae when the entire fin complement was present and the intestine no longer bulged below the gas bladder, both generally occurring before 19 mm total length.

3. Northern pipefish, Syngnathus fuscus

Third in abundance, 436 Northern pipefish of the 564 taken were measured. The mean total length was 20.4 mm (Table 113).

Of all the pipefish taken, only 3 were considered adults, total length 140 mm or greater. All the rest were classified as young, the larvae having developed within the adult brood pouch.

4. Weakfish, Cynoscion regalis

Weakfish accounted for 3.53% of the total catch. All 363 specimens collected were larvae, mean length 5.8 mm (Table 114). Of those collected, 46.6% were measured, being taken at all four sampling stations.

5. Winter flounder, Pseudopleuronectes americanus

Mean total length of the 82 specimens collected was 7.0 mm (Table 114). The size range was 3 to 10 mm. The 82 specimens represent only 0.80% of the total catch, all fish being larvae.

6. Atlantic silversides, Menidia menidia

Only 65 Atlantic silversides were taken, representing 0.63% of the total catch. Of these, 59 were larvae and 6 were adults. Mean total length of the 63 measured was 14.0 mm (Table 109). M. mendia were collected at all four sampling stations.

7. Sand lance, Ammodytes sp.

The 38 sand lance larvae represent only 0.37% of the total catch. The

taxonomy of this genus is rather confusing during the early stages of their development and specimens could not be speciated with any degree of certainty. Mean total length of the 37 specimens measured was 8.0 mm (Table 109) with the size range from 5.5 to 12.0 mm.

The remaining species of finfish, present in much fewer numbers, are listed below.

Species	# Collected	Size Range (mm)
Fundulus heteroclitus	19	7-15
Anguilla rostrata	7	52-60
Hippocampus sp.	2	7
Lophius americanus	2	4,4
Menidia beryllina	2	7-8
Myoxycephalus aenaeus	2	8-11
Paralichtys dentatus	2	15,15
Scophthalmus aquosus	2	3.5-6
Synodus foetens	2	25-30
Micropogon undulatus	1	5.5
Family Monacanthidae	1	---
Opsanus tau	1	---
Prionotus sp.	1	26
Family Synodontidae	1	16

All species are treated in further detail in the discussion section.

DISCUSSION

A. Total System Discussion

The species list presented for the series of inlets and bays in the vicinity of Atlantic City cannot be taken as an all inclusive list for the occurrence of lavae in this system. This study, at best, is a survey of the most common species utilizing the area at some time during the year or throughout the year. Sampling was not conducted through the winter months when most shallow bays are ice covered. Some species may have been missed during this time. Also, a one year survey cannot produce a definitive list of those species and only those species utilizing the area.

However, this sampling program defines many of the forage and sportfishes that may be found there during the early stages of their development. Festa (1979), described the following taxa as important fish food organisms in the nearby Little Egg Harbor Estuary: Family Atherinidae, Anchoa spp., Ammodytes americanus, Genus Fundulus and Gobiosoma bosci, all of which were collected during this survey. Festa (1979), is the source for all the following food web relationships.

Members of the Family Atherinidae (silversides), are important diet components of Atlantic needlefish, bluefish, Northern sennet, striped bass and summer flounder.

Genus Anchoa (anchovies) represent over 15% of the total catch in the vicinity of Atlantic City. They are consumed by bluefish, summer flounder and weakfish, three popular sportfishes.

Sand lance were identified as food items of striped bass and windowpane.

Killifish of the Genus Fundulus are important in the food webs of bluefish and white perch. Larval killifish were found in the stomachs of Tidewater silversides.

Perhaps the most abundant forage species, Gobiosoma bosci, based on the ichthyoplankton sampling and represented largely as members of the Family Gobiidae, gobies are consumed at least by black seabass, bluefish, white perch and winter flounder.

Larvae of three important sportfishes, weakfish, summer flounder and winter flounder, were collected in the vicinity of Atlantic City. Adult members of these species are highly prized by angling enthusiasts.

Occasional catches of elvers, sea horses, goosefish, croakers, grubbies, oyster toadfish, sea robins, windowpane, pipefish and lizardfish are also worthy of note although their relative importance within the system may not be as clearly defined and their popularity with fishermen may not be very intense.

B. Individual Station Discussion

Station 1: Great Egg Harbor Inlet

Eleven species of larval and young finfishes were collected in the Great Egg Harbor Inlet, ten on flood tide and five on an ebbing tide. Both important forage and sportfishes migrated through the inlet. For comparable volumes of water filtered, flood samples greatly exceeded ebb samples 1326 to 12 specimens, respectively. This enormous difference points to this inlet as an entranceway for many species of fishes with little export of larvae out of the system.

Composite bottom samples greatly exceed surface samples, 1.680 n/m^3 total for the bottom to 0.480 n/m^3 total for the surface samples. This vertical

stratification of larvae is apparently explained by their diurnal vertical migration in response to light intensity.

The greatest number of weakfish larvae were collected in the inlet and the only catches of goosefish were also recorded in the inlet.

Station 2: Whirlpool Island

Catches of anchovies and gobies were substantially greater in this back bay area than at any of the other sampling sites. Winter flounder and weakfish were also more abundant here than at some of the other stations.

Both flood and ebb composite samples were also relatively high, 8.987 n/m^3 and 6.647 n/m^3, respectively. In absolute numbers, 5,504 fish were imported and 2,500 were exported. This back bay area appears to represent an authentic nursery area for larval fishes, anchovies and gobies in particular. Twelve species entered the area, whereas only three young or larval species were collected on an ebb tide.

Again, bottom catches far exceed surface catches, 6427 to 1578 fishes. This is attributed to sampling during daylight hours.

Station 3: Broad Creek

Only 294 specimens representing fourteen separate finfish species were collected in Broad Creek, 2.86% of the total catch. Catch per unit effort 0.013 n/m^3 was also the lowest at this sampling station.

Of note, the only croaker, filefish and summer flounder larvae collected were taken in Broad Creek, with more species here than at any other sampling site.

Broad Creek is in close proximity to Absecon Inlet. The net movement of

ichthyoplankton based on flood and ebb sampling results seems to indicate more of an export of young and larval fishes toward the inlet from the back bay area.

Station 4: Mouth of Absecon Creek

At this less saline station where there is substantial fresh water input, three species were collected exclusively, the mummichog, Tidewater silversides and an oyster toadfish. In all, ten species were taken. Since sampling was only conducted from May through August, this species list cannot be considered complete.

Average catch per effort, 0.188 n/m^3, was secondonly to Whirlpool Island with anchovies and gobies contributing heavily to the catch.

Species composition between flood and ebb samples were similar but catch per effort was nearly twice as great in favor of ebb tide samples.

Of the 637 specimens collected, 548 (86.18%) were taken at night. Gobies, anchovies, killifish and Atlantic silversides favored night samples, whereas, weakfish and pipefish were more common during the day.

C. Individual Species Discussion

1. Family Gobiidae/Gobiosoma bosci

Hildebrand and Shroeder (1928) report spawning for gobies taking place from June to October in the Chesapeake Bay with peak activity during the month of July. Larvae of both the Family Gobiidae and G. bosci were sampled in the vicinity of Atlantic City during the months of July and August.

Goby spawning appears to occur in the back bay areas of Whirlpool Island and Broad Creek.

2. Family Engraulidae/Anchoa mitchilli

The bay anchovy spawns from June through August in Delaware Bay, Kurtz (1914). Hildebrand and Schroeder (1928), report bay anchovies spawning in Chesapeake Bay from May through August. Young bay anchovies were taken in the survey area during the month of April, with larvae appearing in April, July and August. Those larvae too small to speciate were collected in July and August. It appears that these larvae were spawned within the system.

3. Northern pipefish, Syngnathus fuscus

Hildebrand and Schroeder (1928) report the spawning of pipefish from April to October with the peak season from April through July based on the large number of males having pouches filled with eggs.

Young pipefish were sampled from April through August. No adult males with filled egg pouches were sampled at any time.

4. Weakfish, Cynoscion regalis

Larval weakfish were collected during the months of July and August and were taken at all four sampling stations. The greatest number was taken within the Great Egg Harbor Inlet.

Welsh and Breder (1923) report weakfish spawning taking place in the larger bays and possibly in the ocean beginning in May and continuing through September. Peak spawning occurs between the middle of May and the middle of

June, spawning little effected by latitude, Hildebrand and Schroeder (1928).

Spawning activity in Delaware Bay, their principal spawning ground, has been studied in greater detail.

5. Winter flounder, Pseudopleuronectes americanus

Winter flounder spawning is known to occur during the winter and early spring, taking place along sandy shores, Hildebrand and Schroeder (1928), Metamorphosis, the migration of the eye from the left side to the right side is usually completed by 9 millimeters total length.

Specimens collected near Atlantic City, mean total length 7.0 mm, demonstrated many degrees of metamorphosis. Larvae were sampled in April and May.

6. Atlantic silversides, Menidia menidia

Larvae were collected at all four sampling sites, having been taken from May through July.

Spawning in Chesapeake Bay takes place from early spring to late summer with peak activity in April and May, Hildebrand and Shroeder (1928).

7. Sand lance, Ammodytes sp.

Spawning of the American sand eel has not been observed, Bigelow and Schroeder (1953). Ripe specimens have been taken throughout the year but the chief production of eggs takes place in autumn and early winter, Bigelow and Schroeder (1953).

Sand lance larvae were collected near Atlantic City in March and April. Since no sampling was conducted during the winter months, it is possible that they are present then also.

Other Species

Fundulus heteroclitus larvae were taken between June and August, their known spawning season extending from April to August, Hildebrand and Schroeder (1928).

Eels are known to spawn in the Sargassum Sea with subsequent migration through inlets into bays and ultimately freshwater. Elvers were taken near Atlantic City in March and May, size range 52-60 mm.

Goosefish are known to spawn in spring, summer and early autumn depending on latitude, Bigelow and Schroeder (1953), although the location is not well known. Both larvae collected near Atlantic City were taken in June in the Great Egg Harbor Inlet.

The monthly occurrence of other less frequent species is depicted in figure 25. The spawning habits of some, such as the sea horse and the inshore lizardfish, are not known.

Summary

Twenty species of larval and young finfishes utilize the back bays in the vicinity of Atlantic City as a nursery area during the early stages of their development. Over 10,000 specimens were collected from March to December 1977 at four ichthyoplankton sampling stations. Members of the Families Gobiidae and Engraulidae comprised over 80% of the total catch, most too small to speciate. Naked gobies, Northern pipefish, weakfish, and bay anchovies together accounted for approximately 15% of the total catch. Other species collected in relatively small numbers were: sand lance, Atlantic silversides, winter flounder, killifish,

American eels, seahorses, summer flounder, tidewater silversides, goosefish, grubbies, windowpanes and inshore lizardfish.

Stations were located in the Great Egg Harbor Inlet, the Mouth of Absecon Creek, and in two back bay areas, Whirlpool Island and Broad Creek.

The occurrence of these twenty species of young and larval fishes in the waters surrounding Atlantic City points to the capability of this marine environment in serving as a nursery area for the early development of finfishes.

REFERENCES

American Fisheries Society. 1970. A list of common and scientific names of fishes from the United States and Canada. Third Edition. Amer. Fish. Soc., Spec. Pub. No. 6, 150 pp.

Armstrong, P.B. and J.S. Child 1965. Stages in the Normal Development of Fundulus heteroclitus. Biol. Bull. 128 (2): 143-168.

Bigelow, H. B. and W. C. Schroeder. 1953. Fishes of the Gulf of Maine. Fish. Bull. US Fish & Wildlife Ser. 53 (74): 577 pp.

Clark, J., W. G. Smith, A. W. Kendall Jr. 1969. Studies of Estuarine Dependance of Atlantic Coastal Fisheries. Bur. Sport Fish and Wildlife, Tech. Paper No. 28: 3-132.

Croker, Robert A. 1965. Planktonic fish eggs and larvae of Sandy Hook Estuary. Chesapeake Science 6 (2): 92-95

Festa, P. J. 1974. A study of the distribution of young and larval summer flounder in NJ estuarine waters, Nacote Creek Misc. Report No. 11M NJ Dept. of Env. Protection, Trenton, NJ.

_____ 1979. Analysis of the Fish Forage Base in the Little Egg Harbor Estuary. NJ Dept. of Env. Protection, Technical Report No. 24 M, Trenton, NJ

Gibbs, R. H. 1959. A Synopsis of the Postlarvae of Western Atlantic Lizard-Fishes (Synodontidas). Copeia 1959 (3): 232-236

Gutherz, E. J. 1967. Field guide to the flatfishes of the family Bothidae in western North Atlantic. US Fish and Wildlife Serv., Bur. Comm. Fish. Circular 263, 47 pp.

Hildebrand, S. F. 1921. Notes on Habits and Development of Eggs and Larvae of the Silversides Menidia menidia and Menidia beryllina. Bull, U.S. Bur. Fish 38: 113-120

_____and L. E. Cable. 1930. Development and life history of fourteen teleostean fishes at Beaufort, NC. Bull, US Fish. 46 (doc. 1093): 383-488

_____and_____. 1938. Further notes on the development and life history of some teleosts at Beaufort, NC. Bull, US Bur. Fish. 48(24): 505-642

_____and W. C. Schroeder. 1928. Fishes of Cesapeake Bay, Bull, U.S. Bur. Fish. 43 (1927) Doc. 1024:366 pp.

Himchak, P. J. 1976. Occurrence, relative abundance and size of young and larval fishes in the Maurice River collected from Oct. 1975 through Sept. 1976. Nacote Creek Research Station, NJ DEP, Trenton, NJ Misc. Report No. 40M.

Hubbs. C. L. 1943. Terminology of Early Stages of Fishes. Copeia 1943 (4): 260.

Kuntz, A. 1914. The embryology and larval development of Bairdiella chrysura and Anchoa mitchilli. Bull. US Bur. Fish. 1913 33:1-19.

_____and L. Radcliffe. 1917. Notes on the embryology and larval development of twelve teleostean fishes. Bull. U. S. Bur. Fish. 35 (doc. 849): 87-134

Lippson, A. J. and R. L. Moran. 1974. Manual for identification of early developmental stages of fishes of the Potamac River estuary. Environmental Technology Center, Martin Marietta Corp., Baltimore Md. 282 pp.

Lund, W. A. and B. C. Marcy, Jr. 1975. Early Development of the Grubby, Myoxycephalus aenaeus (Mitchell). Biol. Bull. 149: 373-383

Manuseti, A. J. and J. D. Hardy, Jr. 1967. Development of fishes of the Chesapeake Bay region. An atlas of egg, larval and juvenile stages, Part 1. Port City Press, Baltimore, Md. 202 pp.

Massman, W. H., J. J. Norcross and E. B. Joseph. 1962. Atlantic menhaden larvae in Virginia coastal waters, Chesapeake, Sci. 3(1):42-45

Miller, and Jorgenson 1973. Meristic Characters of Some Marine Fishes of the Western Atlantic Ocean. Fish. Bull. 71 (1): 301-312

Mook, D. and J. R. Wilcox 1974. Clearing and Staining Larval fishes. Florida Sci. 37 (2): 71-72

Norcross, J. J., W. H. Massmann and E. B Joseph 1961. Investigation of Inner Continental Shelf Waters off Lower Chesapeake Bay. Part II. Sand lance Larvae, Ammodytes americanus, Chesa. Sci. 2: 49-59

Pearson, J. C. 1941. The young of some Marine Fishes taken in Lower Chesapeake Bay, Virginia, with Special Reference to the Gray Sea Trout, Cynoscion regalis U. S. Fish Wildl. Serv. Fish. Bull. 50:79-102

Richards, S. W. 1965. Description of the Postlarvae of the Sand Lance (Ammodytes) from the East Coast of North America. J. Fish. Res. Bd. Canada 22(5): 1313-1317

_____and A. M. McBean 1966. Comparison of Postlarvae and juveniles of Fundulus heteroclities and Fundulus majalis. Trans. Amer. Fish. Soc. 95(2):218-226

Scotton, L. N., R. E. Smith, N. S. Smith, K. S. Price and D. P. de Sylva. 1973. Pictorial guide to fish larvae of Delaware River with information and Bibliographies useful for the study of fish larvae. College Marine Studies, University of Delaware, Delaware Bay Report. Ser. 7, 206 pp.

Smith, W. G. & M. P. Fahay 1970. Description of eggs and larvae of the Summer flounder, Paralichthys dentatus, Fish and Wildl. Ser. Bur. of Sport Fish. and Wildl., Research Report 75

Tidal Current Tables. 1977. Atlantic Coast of North America. U. S. Dept. of Commerce, NOAA, National Ocean Survey, 215 pp.

Welsh, W. W. and C. M. Breder, Jr. 1923. Contributions to life histories of Scianenidae of the eastern United States Coast. Bull. U.S. Bur. Fish. 1923-1924 39. Doc. 945:141-201.

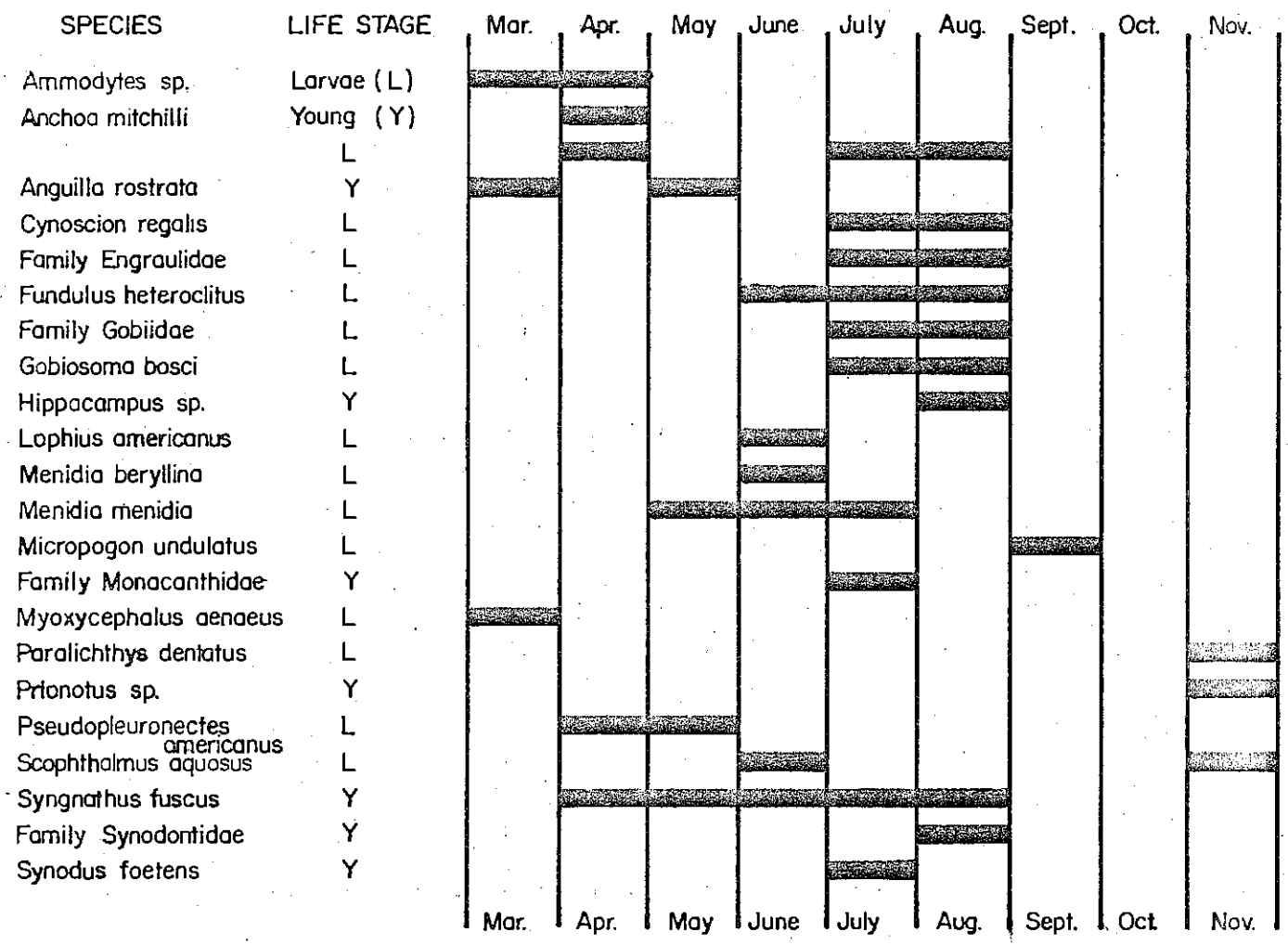


FIGURE 25. MONTHLY OCCURRENCE OF LARVAL AND YOUNG FISHES IN THE ATLANTIC CITY VICINITY, (MARCH 1977 TO NOVEMBER 1977).

Benthic Study

By: Peter Himchak

ABSTRACT

The survey and inventory of the benthos in the vicinity of Atlantic City was designed to learn the major forms of macroinvertebrates comprising the infauna and epifauna and their sediment requirements. These macroinvertebrates are important fish-food organisms in the estuarine environment.

Twenty-seven stations distributed equally from Great Bay to the Great Egg Harbor Inlet were sampled for both organism content and sediment analysis. Organism abundance is correlated with percent silt-clay in the sediment for the major types of organisms encountered. A complete breakdown of each sediment for particle size distribution is given. Organisms are grouped together based on feeding types and physical-chemical data are given for each station.

INTRODUCTION

In assessing the natural resources of an estuarine system, the condition of the bottom communities is often a reliable indication of the overall quality of that system for supporting life. The survey and inventory of benthic communities has unfortunately been overlooked in previous estuarine evaluations. The survey area from Great Bay to Great Egg Harbor Inlet represents the first attempt at surveying the benthos under the on-going Estuarine Evaluation Project.

This job includes: first, the identification of the various forms of life comprising the bottom communities; secondly, the analysis of the substrate in which they live; and, thirdly the detection of possible relationships between a species of organism and its sediment requirements.

It has been shown, Festa (1979), that these benthic invertebrates are important members of the estuarine food web. They contribute largely to the diet requirements of important forage, sport, and commercial species of finfishes. Some of the benthic macroinvertebrates, such as the hard clam, Mercenaria mercenaria, in this system represent important commercial fisheries themselves.

In this survey, an attempt was made to sample every type of bottom community. Stations were selected according to depth, mud content, tidal influence, and condition of the surrounding area, i.e. developed area versus natural marsh.

Organism-sediment relationships are given. It was the overall goal of this job to develop predictive capabilities of the quality of the benthic environment based on the numbers and types of macroinvertebrates contained therein.

ACKNOWLEDGEMENTS

Appreciation is extended to Pat Festa for helping design the project and

for overall guidance in the identification of benthic macroinvertebrates.

Russell Tilton and Mark Boriek largely contributed to the field sampling effort as well as Dan Vaughan and several other individuals.

Organism identification was greatly facilitated by assistance from Diane Newcomb, polychaetes; Dan Vaughan, amphipods; and Tom McCloy, molluscs.

Appreciation is extended to Dr. Harold Haskin, Rutgers University, for assistance in the analysis of sediments for particle size and composition.

Barry Preim is commended for his design and construction of specialized field sampling equipment, outfitting of boat with boom and davit and preparation of all figures in this report.

Debra Spencer performed the tedious task of picking the organisms from the samples returned to the laboratory.

METHODS AND MATERIALS

Field sampling utilized a 23 cm x 23 cm Ponar dredge and on occasion when soft sediment permitted, a 23 cm x 23 cm Ekman dredge. A boom was mounted in the boat and a manual winch was used for raising the dredge.

Station locations were determined by sextant readings and located on the intracoastal waterway map (figure 26) using a three arm protractor.

Samples were rinsed through a 1 mm stainless steel mesh screen. For predominately sandy sediments, the entire sample was rinsed through the field sampling sieve. The organisms were then picked from the screen and returned to the laboratory for identification. For finer sediments and especially those containing large amounts of organic matter, entire samples were returned to the laboratory for picking and sorting. All samples were preserved in a 10% formalin solution.

The number and location of stations were dictated by time and available resources. Stations were selected to represent as many different bottom types as possible, considering the variables of depth, sediment composition, tidal stage and salinity. Wherever possible, benthic sampling stations coincided with seine and trawl stations of the adult finfish population survey of this same report.

Three grabs per station were taken to represent the benthic fauna and one grab was taken for sediment analysis. A grab had to equal at least one liter in volume to be accepted. Each station was sampled once during the months June through September in the attempt to determine the benthic macroinvertebrates dominating the area.

Sediment analyses largely followed Folk (1968) and the American National Standards Institute (1972) modified for the laboratory by Dr. Harold Haskin, Rutgers University. The fines (silt and clay) fraction of the sediment was analyzed by the Buoyocous hydrometer method. The sand fraction of each sediment was shaken and passed through a set of Standard Brass Sieves, Numbers 5, 10, 18, 35, 60, 120 and 230. Nomenclature and categories of different particle sizes follow Folk (1968) and Shepard (1954). Refer to table 117 taken from Folk (1968) for particle size categories. A complete breakdown of sediments is given in the results section for each station and graphed separately as grain size accumulation curves in figures 27 through 54. Sodium metaphosphate was used as the dispersing agent.

In the keying of organisms, nomenclature follows Gosner (1971), except for amphipods which follows Bousfield (1973). Pettibone (1963) and Smith (1964) were keys used for polychaete identification, Abbott (1968) the key for identifying molluscs. All macroinvertebrates were keyed to the lowest taxon wherever possible.

In the results section, each of the three grabs is reported separately. Then, a composite sample is listed showing the total number of organisms of each taxon taken at that station. Number of organisms per square meter represents an average for the three individual grabs.

Physical-chemical parameters recorded for each station include: depth, secchi reading, dissolved oxygen, salinity, water temperature and sediment composition.

Species diversity indices were calculated for each station using the composit n/m^2 data in determining the Shannon Weaver Diversity Index.

Figures 55 through 64 represent the relationship between number of organisms and percent silt-clay of the sediment and follow the procedure of Sanders (1958).

In reporting the various populations and community structure of each location sampled, stations are grouped in terms of general similarity, i.e., A. Inlets: Channels and Adjacent Sand Beaches; B. Intertidal Stations; C. Open Bay, Undeveloped Areas; D. Developed Areas; E. Open Marsh, Undeveloped Areas; and, F. Absecon Creek Stations.

RESULTS

Table 115 lists all benthic stations sampled giving their sediment composition by percent-gravel, sand, and mud. Refer to table 117 for the complete breakdown of sediments by particle size and category dimensions.

Table 116 lists all benthic macroinvertebrates encountered within the study area.

Results by station, including sediment composition, organisms per grab,

composite grab, and physical-chemical data are given below. Following the results by station are results by organisms, grouped together in major feeding categories and showing their abundance in terms of percent silt-clay in their respective sediments.

A. RESULTS BY STATION

A. Inlets: Channels and Adjacent Sand Beaches

Station # 5, Brigantine Channel

Gravel	0.12%	Pebble	0.12%
Sand	99.88%	Very Coarse Sand	0.12
		Coarse Sand	2.11
		Medium Sand	51.55
		Fine Sand	45.35
		Very Fine Sand	0.74
Mud	0.0%		

Grab 1: Phylum Arthropoda — *Acanthohaustorius millsi* - 2

Grab 2: Phylum Arthropoda — *Acanthohaustorius millsi* - 2

Phylum Annelida — Polychaete fragements - 1

Grab 3: Phulum Arthropoda — *Acanthohaustorius millsi* - 29

Composite:			n	n/m²
	Phylum Arthropoda	*Acanthohaustorius millsi*	54	342
	Phylum Annelida	Polychaete fragments	1	6
		Total	55	348

Date - 6/14/77
Depth - 2.0 m.
Secchi - 1.25 m.
Species Diversity Index - 0.0909

Dissolved Oxygen	9.4 mg/l
Salinity	31.55 °/oo
Temperature	20.5 °C

Station #27, Great Egg Harbor Inlet

Sand	97.64%	Very Coarse Sand	0.20%
		Coarse Sand	0.78
		Medium Sand	12.18
		Fine Sand	81.53
		Very Fine Sand	2.95
Mud	2.36%	Silt	2.36

Grab 1: Phylum Mollusca — *Spisula solidissima* - 1

Phylum Arthropoda — *Parahaustorius longimerus* - 65

Grab 2: Phylum Mollusca — *Spisula solidissima* - 1

Phylum Arthropoda — *Parahaustorius longimerus* - 1

Grab 3: Phylum Arthropoda — *Parahaustorius longimerus* - 22

Composite:		n	n/m^2
Phylum Mollusca	*Spisula solidissima*	2	13
Phylum Arthropoda	*Parahaustorius longimerus*	88	557
	Total	90	570

Date - 9/19/77
Depth - 4.5 m.
Secchi - 1.5 m.
Species Diversity Index - 0.1066

Dissolved Oxygen	8.15 mg/l
Salinity	31.74 °/oo
Temperature	23.0 °C

Station #26 Risley Channel, Seine Beach Adjacent Channel

Sand	95.81%	Medium Sand	0.40%
		Fine Sand	67.86
		Very Fine Sand	27.54
Mud	4.19%	Silt	4.19

Grab 1: Phylum Mollusca — *Crepidula fornicata* - 2

Phylum Arthropoda — Family Haustoriidae - 1

Pagurus longicarpus - 3

Grab 2:	Phylum Annelida	Nephtys sp. - 1
		Unidentified polychaete - 1
	Phylum Arthropoda	Pagurus longicarpus - 4
Grab 3:	Phylum Mollusca	Tellina sp.- 1
	Phylum Annelida	Nephtys sp. - 1
	Phylum Arthropoda	Pagurus longicarpus - 3

			n	n/m^2
Composite:	Phylum Mollusca	Crepidula fornicata	2	13
		Tellina sp.	1	6
	Phylum Annelida	Nephtys sp.	2	13
		Unidentified polychaete	1	6
	Phylum Arthropoda	Family Haustoriidae	1	6
		Pagurus longicarpus	10	63
		Total	17	107

Date - 9/19/77
Depth - 4.5 m.
Secchi - 0.75 m.
Species Diversity Index - 1.3156

D. O. - 6.02 mg/l
Salinity - 32.10 °/oo
Temperature - 22 °C

Station #16 Absecon Inlet, Seine Beach Adjacent Channel

Sand	92.66%	Coarse Sand	0.19%
		Medium Sand	0.77
		Fine Sand	63.90
		Very Fine Sand	27.80
Mud	7.34%	Silt	7.34

Grab 1:	Phylum Mollusca	Crepidula fornicata - 1
	Phylum Arthropoda	Pagurus longicarpus - 1
Grab 2:	Phylum Mollusca	Tellina sp. - 1
		Unidentified gastropod - 1
	Phylum Annelida	Nephyts sp. - 4
		Spiophanes bombyx - 3
		Unidentified polychaetes - 2

Grab 3: Phylum Mollusca — Tellina sp. - 4

Phylum Annelida — Nephtys sp. - 2

Polychaete fragments - 6

Composite:		n	n/m²
Phylum Mollusca	Crepidula fornicata	1	6
	Unidentified gastropod	1	6
	Tellina sp.	5	32
Phylum Annelida	Nephtys sp.	6	38
	Spiophanes bombyx	3	19
	Unidentified polychaetes	2	13
Phylum Arthropoda	Pagurus longicarpus	1	6
	Total	19	120

Date - 8/18/77
Depth - 8.0 m.
Secchi - 0.75 m.
Species Diversity Index - 1.7086

D. O. - 3.68 mg/l
Salinity - 27.95 °/oo
Temperature - 18 °C

B. Intertidal Stations

Station #1 - Hammock Cove

Sand	38.31%	Coarse Sand	0.20%
		Medium Sand	0.39
		Fine Sand	8.84
		Very Fine Sand	28.88
Mud	61.69%	Silt	61.69

Grab 1: Phylum Annelida — Family Arabellidae - 2

Grab 2: Phylum Mollusca — Ilyanassa obsoleta - 3

Tellina sp. - 1

Mulinia lateralis - 1

Phylum Annelida — Myriochele heeri - 2

Clymenella torquata - 1

Family Arabellidae - 5

	Phylum Arthropoda	Unidentified amphipod - 1
Grab 3:	Phylum Mollusca	Ilyanassa obsoleta - 5
	Phylum Annelida	Clymenella torquata - 3
		Myriochele heeri - 1
		Nereis succinea - 3
		Unidentified polychaete - 1
		Polychaete fragments - 2
	Phylum Arthropoda	Gammarus mucronatus - 1

			n	n/m^2
Composite:	Phylum Mollusca	Ilyanassa obsoleta	8	51
		Tellina sp.	1	6
		Mulinia lateralis	1	6
	Phylum Annelida	Myriochele heeri	3	19
		Clymenella torquata	4	25
		Family Arabellidae	7	44
		Nereis succinea	3	19
		Unidentified polychaete	1	6
	Phylum Arthropoda	Gammarus mucronatus	1	6
		Unidentified amphipod	1	6
		Total	30	188

Date - 7/1/77
D. O. - 6.51 mg/l*
Salinity - 32.29 °/oo*
Temperature - 25 °C*
Species Diversity Index - 1.9881

* At high tide

Station #6, Opposite Black Point, Intertidal Sand Flat

Sand	90.96%	Medium Sand	0.20%
		Fine Sand	66.99
		Very Fine Sand	23.77
Mud	9.04%	Silt	9.04

Grab 1:	Phylum Mollusca	Ilyanassa obsoleta - 2
	Phylum Annelida	Nereis arenaceodonta - 1

		Polydora commensalis - 1
		Nereis succinea - 1
		Arabella iricolor - 1
		Polychaete fragments - 5
	Phylum Arthropoda	Ampelisca verrilli - 1
		Pagurus longicarpus - 1
Grab 2:	Phylum Nemertea	Tubulanus pellucidus - 1
	Phylum Annelida	Arabella iricolor - 1
		Polychaete fragments - 1
Grab 3:	Phylum Mollusca	Ilyanassa obsoleta - 3
	Phylum Arthropoda	Ampelisca verrilli - 1.

			n	n/m^2
Composite:	Phylum Mollusca	Ilyanassa obsoleta	5	32
	Phylum Nemertea	Tubulanus pellucidus	1	6
	Phylum Annelida	Nereis succinea	1	6
		Nereis arenaceodonta	1	6
		Polydora commensalis	1	6
		Arabella iricolor	2	13
	Phylum Arthropoda	Ampelisca verrilla	2	13
		Pagurus longicarpus	1	6
		Total	14	88

Date - 7/27/77
Species Diversity Index - 1.8662

C. Open Bay, Undeveloped Areas

Station #4, Little Bay

Sand	77.30%	Medium Sand	0.20%
		Fine Sand	35.03
		Very Fine Sand	42.07
Mud	22.70%	Silt	18.79
		Clay	3.91

Grab 1:	Phylum Mollusca	Tellina sp. - 1
	Phylum Annelida	Nereis succinea - 1
		Family Arabellidae - 9
	Phylum Arthropoda	Ampelisca verilli - 2
Grab 2:	Phylum Mollusca	Tellina sp. - 4
	Phylum Annelida	Family Arabellidae - 8
		Lumbrinereis sp. - 4
	Phylum Arthropoda	Ampelisca verrilli - 2
		Crangon septemspinosa - 1
Grab 3:	Phylum Mollusca	Ilyanassa obsoleta - 1
		Tellina sp. - 2
	Phylum Annelida	Family Arabellidae - 7
		Lumbrinereis sp. - 2
	Phylum Arthropoda	Gammarus sp. - 1

			n	n/m^2
Composite:	Phylum Mollusca	Ilyanassa obsoleta	1	6
		Tellina sp.	7	44
	Phylum Annelida	Family Arabellidae	24	152
		Nereis succinea	1	6
		Lumbrinereis sp.	6	38
	Phylum Arthropoda	Ampelisca verrilli	4	25
		Gammarus sp.	1	6
		Crangon septemspinosa	1	6
		Total	45	285

Date - 7/1/77
Depth - 1.75 m.
Secchi - 1.0 m.
Species Diversity Index - 1.4468

D. O. - 6.51 mg/l
Salinity - 31.92 °/oo
Temperature - 21.0 °C

Station# 21, Lakes Bay, Channel, Trawl Station

Sand	76.97%	Medium Sand	0.20%
		Fine Sand	10.83
		Very Fine Sand	65.94
Mud	23.03%	Silt	23.03

Grab 1: Phylum Mollusca

Crepidula fornicata - 1

Mercenaria mercenaria - 1

Phylum Annelida

Sabella microphthalma - 1

Drilonereis longa - 1

Clymenella torquata - 1

Scoloplos sp. - 2

Family Cirratulidae -14

Phylum Arthropoda

Ampelisca verrilli - 1

Corophium sp. - 18

Erichthonius brasiliensis - 1

Crangon septemspinosa - 1

Neomysis americana - 5

Grab 2: Phylum Arthropoda

Ampelisca verrilli - 1

Grab 3: No organisms

Composite:	Phylum Mollusca	*Crepidula fornicata*	1	6
		Mercenaria mercenaria	1	6
	Phylum Annelida	*Sabella microphthalma*	1	6
		Drilonereis longa	1	6
		Clymenella torquata	1	6
		Scoloplos sp.	2	13
		Family Cirratulidae	14	89

Phylum Arthropoda	Ampelisca verrilli	2	13
	Corophium sp.	18	114
	Erichthonius brasiliensis	1	6
	Crangon septemspinosa	1	6
	Neomysis americana	5	32
	Total	48	303

Date - 9/16/77
Depth - 1.8 m.
Secchi - 0.75 m.
Species Diversity Index - 1.7921

D. O. - 6.90 mg/l
Salinity - 31.56 °/oo
Temperature - 20.0 °C

Station #13, Absecon Bay, Spoil Site Adjacent Channel

Sand	48.60%	Very Coarse Sand	0.20%
		Coarse Sand	0.20
		Medium Sand	0.80
		Fine Sand	5.60
		Very Fine Sand	41.80
Mud	51.40%	Silt	45.40
		Clay	6.0

Grab 1: No organisms

Grab 2: Phylum Mollusca — Tellina sp. - 1

Phylum Arthropoda — Neomysis americana - 7

Grab 3: No organisms

			n	n/m^2
Composite:	Phylum Mollusca	Tellina sp.	1	6
	Phylum Arthropoda	Neomysis americana	7	44
		Total	8	50

Date - 8/4/77
Depth - 3.5 m.
Secchi 3.5 m.
Species Diversity Index - 0.3768

D.O. 5.56 mg/l
Salinity 31.02 °/oo
Temperature 23.5 °C

Station #12, Absecon Bay, Open Water

Sand	47.0%	Coarse Sand	0.20%
		Medium Sand	0.40
		Fine Sand	5.20
		Very Fine Sand	41.80
Mud	53.0%	Silt	44.00
		Clay	9.00

Grab 1:	Phylum Mollusca	Ilyanassa obsoleta - 3
	Phylum Annelida	Glycera capitata - 1
		Arabella iricolor - 11
Grab 2:	Phylum Mollusca	Ilyanassa obsoleta - 5
		Anadara ovalis - 1
	Phylum Annelida	Arabella iricolor - 18
	Phylum Arthropoda	Gammarus mucronatus - 3
		Ampelisca verrilli - 1
		Elasmopus laevis - 4
		Corophium volutator - 32
Grab 3:	Phylum Annelida	Family Capitellidae - 3
		Family Arabellidae - 1
		Polychaete fragments - 1
	Phylum Arthropoda	Eurypanopeus depressus - 1

			n	n/m^2
Composite:	Phylum Mollusca	Ilyanassa obsoleta	8	51
		Anadara ovalis	1	6
	Phylum Annelida	Glycera capitata	1	6
		Arabella iricolor	29	184
		Family Capitellidae	3	19
		Family Arabellidae	1	6

Phylum Arthropoda	Gammarus mucronatus	3	19
	Ampelisca verrilli	1	6
	Elasmopus laevis	4	25
	Corophium volutator	32	203
	Eurypanopeus depressus	1	6
	Total	86	531

Date - 8/4/77
Depth - 1.5 m.
Secchi - 1.2 m.
Species Diversity Index - 1.5911

D. O. - 5.75 mg/1
Salinity - 31.73 °/oo
Temperature - 24.0 °C

Station #22, Lakes Bay, Open Water

Sand 22.40%

Mud 77.60%

Medium Sand	1.00%
Fine Sand	3.40
Very Fine Sand	18.00
Silt	64.60
Clay	13.00

Grab 1: No organisms

Grab 2: Phylum Annelida

Drilonereis longa - 3

Drilonereis magna - 1

Scoloplos sp. - 2

Family Glyceridae - 1

Phylum Arthropoda

Ampelisca vadorum - 3

Ampelisca verrilli - 1

Grab 3: Phylum Mollusca

Crepidula fornicata - 1

Phylum Arthropoda

Neomysis americana - 1

Ampelisca sp. - 1

Composite:		n	n/m^2
Phylum Mollusca	Crepidual fornicata	1	6
Phylum Annelida	Drilonereis longa	3	19
	Drilonereis magna	1	6
	Scoloplos sp.	2	13
	Family Glyceridae	1	6

Phylum Arthropoda	*Ampelisca vadorum*	3	6
	Ampelisca verrilli	1	6
	Ampelisca sp.	1	6
	Neomysis americana	1	6
	Total	14	87

Date - 9/16/77
Depth - 1.5 m.
Secchi - 0.6 m.
Species Diversity Index - 2.0692

D. O. - 6.25 mg/1
Salinity - 31.22 °/oo
Temperature - 20.0 °C

Station #2, Marker 37, adjacent Shad Island Intracoastal Waterway Channel

Sand	17.4%	Coarse Sand	0.20%
		Medium Sand	1.20
		Fine Sand	4.00
		Very Fine Sand	12.00
Mud	82.6	Silt	77.60
		Clay	5.00

Grab 1:	Phylum Mollusca	*Tellina* sp. - 3
	Phylum Annelida	*Nereis succinea* - 1
		Lumbrinereis sp. - 15
	Phylum Arthropoda	*Crangon septemspinosa* - 1
		Neomysis americana - 1
		Microdeutopus gryllotalpa - 1
Grab 2:	Phylum Mollusca	*Tellina* sp. - 4
	Phylum Annelida	*Lumbrinereis* sp. - 15
		Family Terebellidae - 3
	Phylum Arthropoda	*Ampelisca abdita* - 1
		Crangon septemspinosa - 1
		Neomysis americana - 1

Grab 3: Phylum Mollusca — Ilyanassa obsoleta - 1

Tellina sp.- 2

Anadara ovalis - 1

Phylum Annelida — Lumbrinereis sp. - 1

Family Terebellidae - 5

Phylum Arthropoda — Ampelisca abdita - 1

Crangon septemspinosa - 1

Neomysis americana - 2

Composite:		n	n/m^2
Phylum Mollusa	Ilyanassa obsoleta	1	6
	Tellina sp.	9	57
	Anadara ovalis	1	6
Phylum Annelida	Nereis succinea	1	6
	Lumbrinereis sp.	31	196
	Family Terebellidae	8	51
Phylum Arthropoda	Ampelisca abdita	2	13
	Microdeutopus gryllotalpa	1	6
	Crangon septemspinosa	3	19
	Neomysis americana	4	25
	Eurypanopeus depressus	2	13
		63	398

Date - 6/8/77
Depth - 3.0 m.
Secchi - 0.6 m.
Species Diversity Index - 1.6911

D. O. - 5.90 mg/l
Salinity - 29.87 °/oo
Temperature - 17.5 °C

Station #9, Reed Bay, Open Water

Grabel	0.60%
Sand	12.50%
Mud	86.90

Pebble	0.20%
Granule	0.40
Very Coarse Sand	0.20
Coarse Sand	0.20
Medium Sand	0.20
Fine Sand	0.99
Very Fine Sand	10.91
Silt	77.97
Clay	8.93

Grab 1:	Phylum Mollusca	Ilyanassa obsoleta - 1
		Mercenaria mercenaria - 2
	Phylum Annelida	Capitella capitata - 1
	Phylum Arthropoda	Ampelisca verrilli - 1
Grab 2:	Phylum Mollusca	Ilyanassa obsoleta - 2
		Gemma gemma - 1
	Phylum Annelida	Capitella capitata - 6
		Arabella iricolor - 3
		Lumbrinereis sp. - 4
	Phylum Arthropoda	Ampelisca verrilli - 2
Grab 3:	Phylum Mollusca	Ilyanassa obsoleta - 2
		Mercenaria mercenaria - 1
	Phylum Annelida	Capitella capitata - 4
		Arabella iricolor - 1
		Lumbrinereis sp. - 5
	Phylum Arthropoda	Melita nitida - 2
		Eurypanopeus depressus - 2

Composite:		n	n/m^2
Phylum Mollusca	Ilyanassa obsoleta	5	32
	Gemma gemma	1	6
	Mercenaria mercenaria	3	19
Phylum Annelida	Capitella capitata	11	70
	Arabella iricolor	4	25
	Lumbrinereis sp.	9	57
Phylum Arthropoda	Ampelisca verrilli	3	19
	Melita nitida	2	13
	Eurypanopeus depressus	2	13
		40	254

Date - 9/21/77
Depth - 1.75 m.
Secchi - 0.5 m.
Species Diversity Index - 1.9611

D. O. - 6.76 mg/l
Salinity - 31.92 °/oo
Temperature - 20.0 °C

Station #8, Reed Bay, Turtle Cove

Gravel	0.20%	Granule	0.20%
Sand	11.41	Very Coarse Sand	0.98
		Coarse Sand	2.36
		Medium Sand	3.74
		Fine Sand	2.76
		Very Fine Sand	1.57
Mud	88.39%	Silt	75.59
		Clay	12.80

Grab 1: Phylum Mollusca
- Ilyanassa obsoleta - 4
- Gemma gemma - 3
- Macoma balthica - 1

Phylum Annelida
- Capitella capitata - 2
- Scoloplos sp. - 5
- Family Orbiniidae - 8

Grab 2: Phylum Mollusca
- Gemma gemma - 4

Phylum Annelida
- Family Orbiniidae - 30

Grab 3: Phylum Mollusca
- Ilyanassa obsoleta - 1
- Gemma gemma - 3

Phylum Annelida
- Family Orbiniidae - 30

Composite:

		n	n/m^2
Phylum Mollusca	Ilyanassa obsoleta	5	32
	Gemma gemma	10	63
	Macoma balthica	1	6
Phylum Annelida	Capitella capitata	2	13
	Scoloplos sp.	5	32
	Family Orbiniidae	68	431
	Total	91	577

Date - 9/21/77
Depth - 1.0 m.
Secchi - 0.5 m.
Species Diversity Index - 0.9127

D. O. - 6.20 mg/1
Salinity - 31.40 °/oo
Temperature - 20.0 °C

Station #25, Scull Bay, Open Water

Sand 7.0%

Mud 93.0%

Very Coarse Sand	0.20%
Coarse Sand	0.40
Medium Sand	1.00
Fine Sand	1.40
Very Fine Sand	4.00
Silt	79.0
Clay	14.0

Grab 1: Phylum Annelida — Family Capitellidae - 1

Grab 2: No organisms

Grab 3: Phylum Mollusca — Tellina sp. - 1

Composite: Phylum Mollusca
Phylum Annelida

	n	n/m^2
Tellina sp.	1	6
Family Capitellidae	1	6
Total	2	12

Date - 9/16/77
Depth - 1.8 m.
Secchi - 0.6 m.
Species Diversity Index - 0.6931

D. O. - 6.39 mg/1
Salinity - 32.83 °/oo
Temperature - 19.9 °C

Station #3, Perch Cove, Open Water

Sand 1.96%

Mud 98.04

Coarse Sand	0.46%
Medium Sand	0.20
Fine Sand	0.40
Very Fine Sand	0.80
Silt	93.11
Clay	4.93

Grab 1:	Phylum Mollusca	*Ilyanassa obsoleta* - 2
		Tellina sp. - 1
	Phylum Annelida	*Glycera* sp. - 1
		Family Arabellidae - 4
		Sabellaria vulgaris - 2
	Phylum Arthropoda	*Ampelisca abdita* - 8
Grab 2:	Phylum Annelida	*Nereis succinea* - 1
		Lumbrinereis sp. - 1
		Family Arabellidae - 14
		Family Onuphidae - 2
	Phylum Arthropoda	*Ampelisca abdita* - 3
		Pinnixa sp. - 2
Grab 3:	Phylum Mollusca	*Ilyanassa obsoleta* - 2
		Gemma gemma - 1
	Phylum Annelida	Family Arabellidae - 10
		Nereis sp. - 1
		Diopatra cuprea - 1
	Phylum Arthropoda	*Ampelisca abdita* - 14
		Crangon septemspinosa - 1
		Neomysis americana - 1

			n	n/m^2
Composite:	Phylum Mollusca	*Ilyanassa obsoleta*	4	25
		Tellina sp.	1	6
		Gemma gemma	1	6
	Phylum Annelida	*Glycer a* sp.	1	6
		Nereis succinea	1	6

		n	n/m^2
	Nereis sp.	1	6
	Lumbrinereis sp.	1	6
	Family Arabellidae	28	177
	Diopatra cuprea	1	6
	Sabellaria vulgaris	2	13
	Family Onuphidae	2	13
Phylum Arthropoda	Ampelisca abdita	25	158
	Pinnixa sp.	2	13
	Crangon septemspinosa	1	6
	Neomysis americana	1	6
	Total	72	453

Date - 6/14/77
Depth - 0.9 m.
Secchi - 0.5 m.
Species Diversity Index - 1.7283

D. O. - 7.55 mg/l
Salinity - 32.25 °/oo
Temperature - 22.0 °C

D. Developed Areas

Station #24, Margate City.

Sand	65.04%	Coarse Sand	0.20
		Medium Sand	0.78
		Fine Sand	19.14
		Very Fine Sand	44.92
Mud	34.96	Silt	34.96

Grab 1:	Phylum Mollusca	Tellina sp. - 6
	Phylum Annelida	Streblospio benedicti - 12
		Tharyx sp. - 30
Grab 2:	Phylum Mollusca	Tellina sp. - 14
	Phylum Annelida	Streblospio benedicti - 10
		Tharyx sp. - 20
Grab 3:	Phylum Mollusca	Tellina sp. - 9
		Mercenaria mercenaria - 1

Phylum Annelida

Glycera americana - 1

Streblospio benedicti - 3

Tharyx sp. - 20

Unknown polychaete - 1

Composite: Phylum Mollusca

Phylum Annelida

	n	n/m^2
Tellina sp.	29	184
Mercenaria mercenaria	1	6
Streblospio benedicti	25	158
Tharyx sp.	70	443
Glycera americana	1	6
Unknown polychaete	1	6
Total	127	803

Date - 9/20/77
Depth - 4.5 m.
Secchi - 1.0 m.
Species Diversity Index - 1.0999

D. O. - 5.93 mg/1
Salinity - 32.29 °/oo
Temperature - 21.0 °C

Station #7, City of Brigantine

Gravel	1.91%
Sand	40.84
Mud	57.25

Pebble	0.95%
Granule	0.95
Very Coarse Sand	0.95
Coarse Sand	1.14
Medium Sand	2.48
Fine Sand	22.52
Very Fine Sand	13.74
Silt	48.66
Clay	8.59

Grab 1: Phylum Annelida

Streblospio benedicti - 1

Phylum Arthropoda

Ampelisca sp. - 1

Grab 2: Phylum Annelida

Streblospio benedicti - 4

Nereis sp. - 1

Asabellides oculata - 4

Grab 3: Phylum Annelida — Streblospio benedicti - 6

Asabellides oculata - 1

Phylum Arthropoda — Ampelisca abdita - 1

Crangon septemspinosa - 1

Composite: Phylum Annelida, Phylum Arthropoda

	n	n/m^2
Streblospio benedicti	11	70
Nereis sp.	1	6
Asabellides oculata	5	32
Ampelisca sp.	1	6
Ampelisca abdita	1	6
Crangon septemspinosa	1	6
Total	20	126

Date - 6/14/77
Depth - 4.0 m.
Secchi - 1.7 m.
Species Diversity Index - 1.2745

D. O. - 6.60 mg/1
Salinity - 31.91 °/oo
Temperature - 18.5 °C

Station #17, Gardner's Basin, Atlantic City

Sand 15.75%

Mud 84.25%

Coarse Sand	0.39%
Medium Sand	1.97
Fine Sand	8.07
Very Fine Sand	5.31
Silt	80.31
Clay	3.94

Grab 1: Phylum Mollusca — Tellina sp. - 1

Phylum Annelida — Nereis succinea - 3

Phylum Arthropoda — Pagurus longicarpus - 2

Grab 2: Phylum Annelida — Nereis succinea - 3

Family Arabellidae - 1

Phylum Athropoda — Neomysis americana - 3

Grab 3: Phylum Annelida

Nereis succinea - 5

Family Arabellidae - 1

Phylum Arthropoda

Neomysis americana - 2

Composite: Phylum Mollusca
Phylum Annelida

Phylum Arthropoda

	n	n/m^2
Tellina sp.	1	6
Nereis succinea	11	70
Family Arabellidae	2	13
Neomysis americana	5	32
Pagurus longicarpus	2	13
Total	21	134

Date - 8/18/77
Depth - 4.0 m.
Secchi - 0.6 m.
Species Diversity Index - 1.2732

D. O. - 3.58 mg/l
Salinity - 30.79 °/oo

Station #18, Marker 18, Intracoastal Waterway Channel, behind Atlantic City

Sand 12.67%

Mud 87.33%

Coarse Sand	0.20%
Medium Sand	0.79
Fine Sand	4.75
Very Fine Sand	6.93
Silt	81.39
Clay	5.94

Grab 1: Phylum Mollusca

Tellina sp. - 1

Mercenaria mercenaria - 1

Phylum Annelida

Streblospio benedicti - 1

Glycera sp. - 2

Tharyx sp. - 33

Phylum Arthropoda

Cyanthura polita - 2

Corophium sp. - 12

Grab 2: Phylum Annelida — Streblospio benedicti - 7

Tharyx sp. - 74

Phylum Arthropoda — Corophium sp. - 1

Grab 3: Phylum Mollusca — Crepidula fornicata - 1

Tellina sp. - 1

Mercenaria mercenaria - 1

Phylum Annelida — Pectinaria gouldi - 1

Streblospio benedicti - 6

Tharyx sp. - 20

Composite:		n	n/m^2
Phylum Mollusca	Crepidula fornicata	1	6
	Tellina sp.	2	13
	Mercenaria mercenaria	2	13
Phylum Annelida	Streblospio benedicti	14	89
	Glycera sp.	2	13
	Pectinaria gouldi	1	6
	Tharyx sp.	127	804
	Total	149	944

Date - 9/30/77
Depth - 4.0 m.
Secchi - 1.0 m.
Species Diversity Index - 0.5991

D. O. - 5.84 mg/1
Temperature - 19.5 °C

Station #20, Inside Thorofare, Ventnor Heights

Sand	7.90%	Coarse Sand	0.20%
		Medium Sand	0.79
		Fine Sand	3.16
		Very Fine Sand	3.75
Mud	92.10%	Silt	87.16
		Clay	4.94

Grab 1: No organisms

Grab 2: Polychaete fragments - 2

Grab 3: No organisms

Composite: No organisms, 0 n/m^2

Date - 9/20/77
Depth - 7.0 m.
Secchi - 1.5 m.
Species Diversity Index - 0.00

D. O. - 3.33 mg/l
Salinity - 31.74 °/oo
Temperature - 22.5 °C

Station #15, St. George's Thorofare

Sand 1.15%

Mud 98.85%

Coarse Sand	0.19%
Medium Sand	0.19
Fine Sand	0.58
Very Fine Sand	0.19
Silt	92.12
Clay	6.73

Grab 1: No organisms

Grab 2: Phylum Annelida — Nereis succinea - 1

Phylum Arthropoda — Crangon septemspinosa - 1

Neomysis americana - 1

Grab 3: Phylum Annelida — Nereis succinea - 1

Composite: Phylum Annelida, Phylum Arthropoda

	n	n/m^2
Nereis succinea	2	13
Crangon septemspinosa	1	6
Neomysis americana	1	6
Total	4	26

Date - 6/30/77
Depth - 6.0 m.
Secchi - 1.2 m.
Species Diversity Index - 1.0397

D. O. - 4.80 mg/l
Salinity - 31.40 °/oo
Temperature - 21.0 °C

E. Open Marsh, Undeveloped Areas

Station #19, Beach Thorofare, Intracoastal Waterway Channel

Gravel	1.57%	Granule	1.57%
Sand	88.24	Very Coarse Sand	7.06
		Coarse Sand	14.51
		Medium Sand	31.57
		Fine Sand	22.74
		Very Fine Sand	12.35
Mud	10.20	Silt	10.20

Grab 1:	Phylum Mollusca	*Tellina* sp. - 8
		Mulinia lateralis - 1
		Mercenaria mercenaria - 11
	Phylum Annelida	*Nereis succinea* - 1
		Lumbrinereis sp. - 2
	Phylum Arthropoda	*Ampelisca abdita* - 47
		Cyathura polita - 1
		Neomysis americana - 1
Grab 2:	Phylum Mollusca	*Tellina* sp. - 8
		Mulinia lateralis - 2
		Mercenaria mercenaria - 7
	Phylum Annelida	*Prionospio* sp. - 1
	Phylum Arthropoda	*Ampelisca abdita* - 7
		Cyathura polita - 1
Grab 3:	Phylum Mollusca	*Tellina* sp. - 1
		Mulinia lateralis - 3

Mercenaria mercenaria - 6

Phylum Annelida — Nereis succinea - 3

Streblospio benedicti - 1

Phylum Arthropoda — Ampelisca abdita - 25

Melita nitida - 6

			n	n/m^2
Composite:	Phylum Mollusca	Tellina sp.	17	108
		Mulinia lateralis	6	38
		Mercenaria mercenaria	24	152
	Phylum Annelida	Nereis succinea	4	25
		Lumbrinereis sp.	1	6
		Prionospio sp.	1	6
		Streblospio benedicti	1	6
	Phylum Arthropoda	Ampelisca abdita	79	500
		Melita nitida	6	38
		Cyathura polita	2	13
		Neomysis americana	1	6
		Total	142	898

Date - 9/30/77
Depth - 5.5 m.
Secchi - 0.5 m.
Species Diversity Index - 1.4483

D. O. - 6.67 mg/l
Salinity - 30.14 °/oo
Temperature 21.0 °C

Station #23, Whirlpool Island

Sand 85.71%

Mud 14.29

Very Coarse Sand	0.20%
Coarse Sand	0.20
Medium Sand	0.99
Fine Sand	63.49
Very Fine Sand	20.88
Silt	14.29

Grab 1: Phylum Mollusca — Tellina sp. - 4

Phylum Annelida — Glycera sp. - 1

Tharyx sp. - 4

Streblospio benedicti - 1

	Phylum Arthropoda	Pontogeneia inermis - 1
		Melita nitida - 1
		Rhithropanopeus harrisii - 1
Grab 2:	Phylum Annelida	Glycera sp. - 1
		Streblospio Benedicti - 9
		Tharyx sp. - 5
	Phylum Arthropoda	Pontogeneia inermis - 1
		Lysianopsis alba
		Crangon septemspinosa - 1
		Pagurus longicarpus -1
Grab 3:	Phylum Mollusca	Tellina sp. - 3
	Phylum Annelida	Tharyx sp. - 1
		Streblospio benedicti - 10
	Phylum Arthropoda	Pagurus longicarpus - 1

			n	n/m^2
Composite:	Phylum Mollusca	Tellina sp.	7	44
	Phylum Annelida	Tharyx sp.	10	63
		Streblospio benedicti	20	127
		Glycera sp.	2	13
	Phylum Arthropoda	Pontogeneia inermis	2	13
		Melita nitida	1	6
		Lysianopsis alba	1	6
		Rhithropanopeus harrisii	1	6
		Pagurus longicarpus	2	13
		Crangon septemspinosa	1	6
		Total	47	297

Date - 9/19/77
Depth - 6.0 m:
Secchi - 1.5 m.
Species Diversity Index - 1.7071

D. O. - 7.13 mg/l
Salinity - 31.92 °/00
Temperature - 25.0 °C

Station #14, Broad Creek

Sand	72.64%	Coarse Sand	0.19%
		Medium Sand	20.00
		Fine Sand	52.45
Mud	27.36	Silt	27.36

Grab 1: Phylum Annelida — *Tharyx* sp. - 8

Streblospio benedicti - 1

Phylum Arthropoda — *Neomysis americana* - 18

Grab 2: Phylum Arthropoda — *Neomysis americana* - 18

Ovalipes ocellatus - 1

Grab 3: Phylum Annelida — *Streblospio benedicti* - 22

Tharyx sp. - 1

Phylum Arthropoda — *Ampelisca* sp. - 1

Neomysis americana - 63

Composite:		n	n/m^2
Phylum Annelida	*Streblospio benedicti*	23	182
	Tharyx sp.	9	57
Phylum Arthropoda	*Ampelisca* sp.	1	6
	Neomysis americana	108	684
	Ovalipes ocellatus	1	6
	Total	142	935

Date - 6/13/77
Depth - 2.7 m.
Secchi - 0.75 m.
Species Diversity Index - 0.7476

D. O. - 7.10 mg/l_o
Salinity - 30.48 /oo
Temperature - 19.8 °C

F. Absecon Creek

Station #11, Absecon Creek, Upstream

Gravel	0.20%	Granule	0.20%

Sand	92.35%	Very Coarse Sand	1.57%
		Coarse Sand	13.75
		Medium Sand	58.15
		Fine Sand	16.90
		Very Fine Sand	2.16
Mud	7.45	Silt	7.45

Grab 1:	Phylum Mollusca	Macoma balthica - 4
	Phylum Annelida	Glycera sp. - 2
		Ophelia bicornis - 2
		Family Arabellidae - 8
		Capitella capitata - 1
		Unidentified polychaetes - 2
	Phylum Arthropoda	Microdeutopus gryllotalpa - 3
Grab 2:	Phylum Annelida	Family Arabellidae - 4
	Phylum Arthropoda	Microdeutopus gryllotalpa - 2
Grab 3:	Phylum Mollusca	Macoma balthica - 4
	Phylum Annelida	Family Arabellidae - 12
	Phylum Arthropoda	Microdeutopus gryllotalpa - 3
		Cyathura polita - 1

Composite:		n	n/m^2
Phylum Mollusca	Macoma balthica	8	51
Phylum Annelida	Glycera sp.	2	13
	Ophelia bicornis	2	13
	Family Arabellidae	24	152
	Capitella capitata	1	6
	Unidentified Polychaetes	2	13
Phylum Arthopoda	Microdeutopus gryllotalpa	8	51
	Cyathura polita	1	6
	Total	48	305

Date - 8/18/77
Depth - 3.5 m.
Secchi - 0.5 m.
Species Diversity Index - 1.5023

D.O. - 3.11 mg/l
Salinity - 17.21 °/oo
Temperature - 25.0 °C

Station # 10, Mouth of Absecon Creek

Sand 18.04%

Mud 81.96

Very Coarse Sand	0.20%
Coarse Sand	0.59
Medium Sand	2.35
Fine Sand	9.02
Very Fine Sand	5.88
Silt	75.10
Clay	6.86

Grab 1: Phylum Mollusca

Ilyanassa obsoleta - 4

Gemma gemma - 65

Phylum Annelida

Arabella iricolor - 5

Capitella capitata - 1

Phylum Arthropoda

Crangon septemspinosa - 2

Grab 2: Phylum Mollusca

Ilyanassa obsoleta - 4

Gemma gemma - 19

Phylum Nemertea

Phylum Annelida

Arabella iricolor - 10

Amphitrite cirrata - 1

Potamilla neglecta - 1

Unidentified polychaete - 1

Phylum Arthropoda

Ampelisca vadorum - 1

Ampelisca abdita - 1

Melita nitida - 1

Elasmopus laevis - 1

Gammarus mucronatus - 2

Crangon septemspinosa - 3

Grab 3:	Phylum Mollusca	Ilyanassa obsoleta - 3	
		Gemma gemma - 50	
		Mulinia lateralis - 1	
	Phylum Annelida	Amphitrite cirrata - 1	
		Arabella iricolor - 8	
	Phylum Arthropoda	Ampelisca abdita - 2	

			n	n/m^2
Composite:	Phylum Mollusca	Ilyanassa obsoleta	11	70
		Gemma gemma	134	849
		Mulinia lateralis	1	6
	Phylum Nemertea		1	6
	Phylum Annelida	Arabella iricolor	23	146
		Capitella capitata	1	6
		Amphitrite cirrata	2	13
		Potamilla neglecta	1	6
		Unidentified polychaete	1	6
	Phylum Arthropoda	Ampelisca vadorum	1	6
		Ampelisca abdita	3	19
		Melita nitida	1	6
		Elasmopus laevis	1	6
		Gammarus mucronatus	2	13
		Crangon septempsinosa	5	32
		Total	188	1190

Date - 6/13/77
Depth - 1.7 m.
Secchi - 0.75 m.
Species Diversity Index - 1.1464

D. O. - 5.58 mg/l
Salinity - 22.65 °/oo
Temperature - 22.0 °C

RESULTS BY ORGANISM

Figures 55 through 63 present abundance and sediment relationships of the major invertebrates grouped together by feeding types.

Filter-feeding bivalves include: Tellina sp., Gemma gemma, Mercenaria mercenaria, Spisula solidissima, Mulinia lateralis, Macoma balthica, and Anadara ovalis, and are represented by Figure 54. Of course, true population densities

are not represented by sampling with a Ponar dredge and these estimates do not reflect the true abundance of these bivalves in the system.

Figure 55 gives abundance and sediment relationships for epifaunal deposit feeders, Ilyanassa obsoleta, Pagurus longicarpus, mud crabs of the Family Xanthidae, Pinnixa sp., and Ovalipes ocellatus. Only single specimens of Pinnixa sp. and Ovalipes ocellatus were taken.

Polychaetes of the Families Glyceridae and Nephtyidae are represented by Figure 56.

Predaceous polychaetes of the family Nereidae, including both Nereis succinea and Nereis arenaceodonta, are shown on Figure 57.

Deposite feeding polychaetes of the families Capitellidae, Orbiniidae and Opheliidae are represented as Figure 58; whereas, deposite feeders of the Family Spionidae are on Figure 59. The Family Spionidae includes the species: Streblospio benedicti, Polydora commensalis, Spionphanes bombyx, and Prionospio sp.

Figure 60 shows the relationship of numbers of organisms to sediment composition for the species: Lumbrinereis sp., Arabella iricolor and Drilonereis sp., all carnivorous polychaetes.

Miscellaneous families of polychaetes are represented by Figure 61, including: Tharyx sp., Amphitrite cirrata, Potamilla neglecta, Sabellaria vulgaris, Pectinaria gouldi, and Asabellides oculata, many of which were taken at only one station.

Amphipods of the Family Ampeliscidae are presented on Figure 62.

Epifaunal shrimp. Neomysis americana and Crangon septemspinosa, important fish-food organisms, are shown on Figure 63. Again, true population density estimates are more accurately dirived using an epifaunal sampling device, and not a Ponar dredge for these epibenthic shrimp.

DISCUSSION BY STATION

Stations containing the least amount of mud (silt and clay) were located in the inlets and in nearby sand beaches. Brigantine Inlet, sampled within the main channel, contained 0.0% mud and the community was composed of the subtidal Haustoriid amphipod, Acanthohaustorius millsi, 342 per square meter. Sediment composition was largely medium to fine sand. Great Egg Harbor Inlet containing only 2.36% mud was populated by a different Haustoriid amphipod, Parahaustorius longimerus, 557 per square meter. Species diversity indices for these two stations were low, 0.0909 and 0.1066, respectively. Surf clams, Spisula solidissima, were taken in Great Egg Harbor Inlet and nowhere else within the study area. These inlets are natural and not regularly dredged.

Station 26, the seine beach adjacent Risley Channel contained 4.19% mud and was largely populated by the long-armed hermit crab, Pagurus longicarpus, 63 per square meter. Also present were carnivorous polychaetes, Nephtys sp., tellins, Tellina sp., and an amphipod of the Family Haustoriidae. The seine beach adjecent the main channel in Absecon Inlet, Station 16, was similarly populated and likewise contained a small amount of mud, 7.34%. This was also the deepest station sampled, 8 meters.

Two intertidal stations were sampled. Hammock Cove contained large numbers of mud snail ($51/m^2$), Ilyanassa obsoleta, and several species of polychaetes, namely, Family Arabellidae ($44/m^2$), the bamboo worm Clymenella torquata, and Nereis succinea,. Opposite Black Point, Station 6, an intertidal hard sand flat contained mud snails, ampeliscid amphipods and several predaceous polychaetes. Mud comprised only 9.04% of the sediment of this sand flat.

Several shallow bays were sampled in undeveloped areas of marsh. Little

Bay contained mostly polychaetes and tellins, Family Arabellidae, Lumbrinereis sp. and Tellina sp. Lakes Bay sampled within a 1.8 meter deep channel contained mostly amphipods, Corophium sp., polychaetes of the Family Cirratulidae and the mysid shrimp, Neomysis americana. Station 13, Absecon Bay, is a spoil site for the adjacent channel running to the mouth of Absecon Creek. Mud content was 51.40% of the sediment and also contained 41.80% very fine sand. Very few organisms were taken at this spoil site. Total number of organisms sampled, ($50/m^2$), included Tellina sp. ($6/m^2$) and mysid shrimp, Neomysis americana, ($44/m^2$). Station 12, also in Absecon Bay, depth 1.5 meters, 53% mud, contained the polychaete Arabella iricolor ($184/m^2$), the amphipod Corophium volutator ($203/m^2$) and several other species of both polychaetes and amphipods. Lakes Bay, Open Water, Station 22 was 77.60% mud and contained predaceous polychaetes, Drilonereis longa and Drilonereis magna, and ampeliscid amphipods, at least two distinct species. Station 2, at Marker 37 within the intracoastal waterway channel consisted of 82.6% mud. Organisms dominating this habitat included polychaetes, Lumbrinereis sp. ($196/m^2$) and Family Terebellidae ($51/m^2$), the bivalve Tellina sp. ($57/m^2$), the mysid shrimp, Neomysis americana, and other crustaceans such as mud crabs, sand shrimp, and amphipods. Reed Bay, Open water, and Reed Bay, Turtle Cove, contained similar sediments, 86.90% and 88.39% mud, respectively. Reed Bay, Open water, contained both large and small hard clams, 1-2 mm and 9.8 cm, Mercenaria mercenaria, an important commercial mollusc. Polychaetes and amphipods dominated the catch. Reed Bay, Turtle Cove, was much less diverse, 0.9127 to 1.9611, but contained more than twice the number of organisms, $577/m^2$ to $254/m^2$ largely due to polychaetes of the Family Orbiniidae ($431/m^2$) and gem clams, Gemma gemma ($63/m^2$). Scull Bay, 93.0% mud contained few macroinvertebrates, $12/m^2$. Perch Cove, 98.04% mud, was very diverse, 1.7283 and contained abundant

organisms, 9453/m^2. Polychaetes, Family Arabellidae, and amphipods, Ampelisca abdita dominated the community with 177 and 158 organisms per square meter, respectively.

Developed area stations were in close proximity to residential communities along the ocean on one side and the bay on the other. Most stations were within channels, usually the intracoastal waterway channel. Margate City, Station 24, contained 44.92% very fine sand and 34.96% silt. Organism abundance, 803/m^2, can be attributed to polychaetes, Streblospio benedicti, and Tharyx sp. plus the bivalve Tellina sp. A single hard clam, Mercenaria mercenaria, 1 mm. was also taken. The City of Brigantine Station was 57.25% mud populated by Streblospio bendicti (70/m^2) and another polychaete Asabellides oculata (32/m^2). Gardner's Basin, a large commercial marina contained 84.25% mud heavily populated by the predaceous worm, Nereis succinea (70/m^2) and the mysid shrimp, Neomysis americana (32/m^2). Station 18, behind Atlantic City was 87.33% mud, again, Tharyx sp. (804/m^2) and Streblospio benedicti (89/m^2) dominated the catch. Species diversity was comparatively low, 0.5991. Station 20, the Inside Thorofare near Ventnor Heights contained no organisms in the three grabs made. Sediment within this channel was 92.10% mud, depth 7.0 meters. St. George's Thorofare contained the sediment with the highest mud content in the study area, 98.85%. It was also on of the deepest stations, 6.0 meters. Nereis succinea (13/m^2) and epibenthic shrimp comprised the total catch, 26/m^2.

Station 19, Beach Thorofare was located within the open marsh, undeveloped areas. It was also within the intracoastal waterway channel. Containing 10.20% mud in its sediment, this station accounted for the greatest hard clam catch, Mercenaria mercenaria. The composite grab included 24 hard clams (152/m^2) within the size range 2-6 mm. Even more abundant were amphipods, Ampelisca abdita (500/m^2), and other organisms present included Tellina sp. (108/m^2), and

Mulinia lateralis (38/m^2). Whirlpool Island, Station 23, contained 14.29% mud and was largely populated by polychaetes, Streblospio benedicti (127/m^2) and Tharyx sp. (63/m^2). Broad Creek, Station 14, contained the largest number of mysid shrimp within the study area, 684/m^2. Sediment content incuded 27.36% mud also containing large number of the polychaetes Streblospio benedicti (182/m^2) and Tharyx sp. (57/m^2).

Two sampling stations were located in Absecon Creek. Upstream, Station 11, represented the only station with significantly different salinity, 17.21°/oo. Mud content was small, 7.45%, and dominant organisms included polychaetes, Family Arabellidae (152/m^2), molluscs, Macoma balthica (57/m^2), and amphipods Microdeutopus gryllotalpa (51/m^2). At the mouth of Absecon Creek, Station 10, the mud content was appreciable, 81.96%. Organism abundance was highest for the entire sampling area, 1190/m^2. The bivalve, Gemma gemma accounted for most of the total, 849/m^2, followed by the polychaete, Arabella iricolor (146/m^2) and the sand shrimp, Crangon septemspinosa (32/m^2).

DISCUSSION BY SPECIES

Relationship of number of organisms to sediment composition follow Sanders (1958) and show the sediment requirements for the occurrence of any particular species. The importance of these benthic macroinvertebrates in the estuarine food web is documented by the empirical food web relationships worked out by Festa (1978) for the Little Egg Harbor Estuary, an adjacent estuarine system.

Filter-feeding bivalves were taken in every possible type of sediment composition ranging from 2 to 99% mud. Surf clams, Spisula solidissima. were taken only in clean sand in Great Egg Harbor Inlet. Conversely, Gemma gemma were taken only in sediments with a mud content greater than 80%. Refer to figure 54 for bivalve-sediment relationships. Tellina sp. was universally distributed throughout the system occurring at 13 stations and in much lower numbers were Mulinia lateralis and Macoma balthica. Occasional blood arks, Anadara ovalis were taken in sediments of greater than 50% mud, however, the sample size is very small. The hard clam, Mercenaria mercenaria, an important commercial bivalve, is found throughout the system although most of the study area is closed for the harvesting of shellfish due to pollution. The hard clam was distributed in a wide variety of sediments, with the greatest catch occurring at Station 19, Beach Thorofare with a mud content of only 10%. These clams were all within the size range 2 to 6 mm.

Five epifaunal deposit feeders were taken within the survey area, one mollusc and four crustaceans. The mud snail, Ilyanassa obsoleta, occurred at nine sampling stations of all types of mud content. The long-armed hermit crab, Pagurus longicarpus, generally favored cleaner sediments, mud content less

than 15%. Mud crabs of the Family Xanthidae generally occurred in sediments over 50% mud. These small crabs are an important component of the diets of American eels, black sea bass, oyster toadfish and both summer and winter flounder. Pinnixa sp., a commensal with tubicolous annelid worms, was taken in Perch Cove having a mud content of 98%. A single lady crab, Ovalipes ocellatus inhabited a sediment of 27% mud.

Glycerids, commonly called bloodworms, were present in various sediments usually in low numbers, never more than two specimens taken in any one grab. Winter flounder and white perch consume glycerids, popularly used as bait. Nephtys sp. are active predatory worms found in sediments less than 7% mud. Nephtys sp. are consumed by bluefish, spot, and winter flounder.

Nereis sp. are also active predators with strongly developed jaws and an eversible proboscis. They were consumed by 15 species of finfish in the Little Egg Harbor Estuary, including, bluefish, tautog, white perch, winter flounder, pumpkinseeds, and oyster toadfish. Nereis sp. were found in varying sediments.

Polychaetes of the Family Spionidae are sedentary worms characterized by a pair of elongate palpi that are used to sweep the surface of the substratum for microscopic food items, Gosner (1971). Streblospio benedicti was common in large numbers, greater than 70 per square meter. Polydora commensalis is a commensal with the long-armed hermit crab, Pagurus longicarpus. Spionids are important food items of winter flounder of all sizes and bay anchovies.

Polychaetes of the Family Capitellidae and the Genus Scoloplos commonly found throughout the study area are consumed by winter flounder of all sizes.

The lumbrinerids and arabellids are generally carnivorous, burrowing forms, Gosner (1971). They occurred in relatively large numbers in all types of sediments. Again, winter flounder consume these families of polychaetes.

Tharyx sp. are tentacle feeders found in a variety of sediments.

Amphipods of the Genus Ampelisca occurred in the diets of 21 species of finfish in the Little Egg Harbor Estuary. Consumers include important sportfish; weakfish, winter flounder, black seabass, summer flounder, spot, and important forage species: Atlantic silversides, bay anchovies, and naked gobies. Ampeliscids were not restricted to any particular sediment type.

Mysid shrimp, Neomysis americana, and sand shrimp, Crangon septemspinosa were widely distributed throughout the study area in all types of sediments. Both are major food items of sport and commercial finfish. Mysid shrimp occurred in 23 species of finfish in the Little Egg Harbor Estuary and the sand shrimp occurred in 26 species of sport and commercial finfish.

SUMMARY

The composition of benthic communities is often a reliable indication of the overall quality of any particular aquatic habitat for supporting life. Benthic macroinvertebrates are important fish-food organisms in the estuarine environment. Together with primary producers, they serve to support extensive food webs leading to important forage, sport, and commercial species of finfishes.

The series of bays and inlets from Great Bay to the Great Egg Harbor Inlet were surveyed to inventory the macroscopic epifauna and infauna and examine the composition of the sediments in which they live. Organism - sediment relationships were studied. Preference for a sediment type based on sand and mud content by the major species of organisms was shown.

In the survey of benthic macroinvertebrates in the vicinity of Atlantic City, an attempt was made to sample every type of bottom community. Stations were lo-

cated uniformly throughout the study area, selection was based on depth, mud content, tidal influence and general condition of the surrounding area, i.e. developed area versus natural marsh.

For each of the twenty-seven locations sampled, organism content is given for each of the three separate grabs of the Ponar dredge and a composite sample is listed for each station. Sediment particle size composition is given, recorded as percentages with their subdivisions.

LIST OF REFERENCES

Abbott, R.T. 1968. Seashells of North America. Golden Press, New York 280 pp.

American National Standards Institute, 1972. Standard method for particle-size analysis of soils. Annual Book of ASTM Standards Designation: 3 D442-63 (Reapproved 1972)

Bousfield, E.L. 1965. Haustoriidae of New England (Crustacea: Amphipoda). Proc. U.S. Nat. Museum 117(3512): 159-240.

_____. 1973. Shallow water Gammaridean Amphipoda of New England. Comstock Publishing Assoc. Cornell University Press, Ithaca, N.Y. 312 pp.

Coe, W.R. 1956. Fluctuation of estuarine benthic invertebrates. J. Mar. Res. 15: 212-232

Dean, D. 1975. Raritan Bay macrobenthos survey, 1957-1960. NMFS Data Report 99. U.S. Dept. of Commerce, Washington, D.C.

Durand, J.B. and R.J. Nadeau 1972. Biological evaluation of the Mullica River-Great Bay Estuary. N.J. Water Resources Institute, Rutgers University.

Festa, P.J. 1978. Draft. Analysis of the fish forage base in the Little Egg Harbor Estuary. N.J. Dept. of Env. Protection, Trenton, N.J. Technical Report No. 24M

Folk, R.L. 1968. Petrology of Sedimentary Rocks. Hemphill's, Austin, Texas 170 pp.

Gosner, K.L. 1971. Guide to identification of marine and estuarine invertebrates, Cape Hatteras to the Bay of Fundy, Wiley-Interscience, a Division of John Wiley & Sons, Inc. 693 pp.

Gunter, G. 1961. Some relations of estuarine organisms to salinity. Limnol. Oceanogr. 6: 182-190.

Jacobson, M.K. and W. K. Emerson, 1971. Shells from Cape Cod to Cape May, Dover Publications, Inc., New York, New York. 152 pp.

Kaplan, E.H., J.R. Welker, M. G. Kraus, and S. McCourt, 1975. Some factors affecting the colonization of a dredged channel. Mar. Biol. 32: 193-204.

Leathem, W., P. Kinner, D. Maurer, R. Biggs, and W. Treasure, 1973. Effect of spoil disposal on benthic invertebrates. Mar. Poll. Bull. 4:122-125.

Pettibone, M.H. 1963. Marine Polychaete worms of the New England region. 1. Aphroditidae through Trochochaetidae. Bull. U.S. Nat. Mus. 227 (1): 1-356.

Rees, C.B. 1939. A preliminary study of the ecology of a mud-flat. J. Mar. Biol. Assoc. U.K. XXIV: 185-199

Sanders, H.L. 1958. Benthic studies in Buzzards Bay. I. Animal-sediment relationships. Limnol. . . Oceanog. 3: 245-258.

Sanders, H.L., E.M. Goudsmit, E.L. Mills, and G.E. Hampson. 1962. A study of the intertidal fauna of Barnstable Harbor, Massachusetts. Limnol. Oceanogr. 7: 63-79.

Shepard, F.P. 1954. Nomenclature based on sand-silt-clay ratios. J. Sediment. Petrol. 24: 151-158.

Smith, R.I. (Ed.), 1964. Keys to marine invertebrates of the Woods Hole region. Contrib. No. 11, Systematics-Ecology Program. Marine Biological Laboratory, Woods Hole, Mass.

Tenore, K.R. 1971. Macrobenthos of the Pamlico River Estuary, North Carolina. Ecol. Monogr. 42: 51-69.

Watling, L. and D. Maurer, 1973. Guide to the macroscopic estuarine and marine invertebrates of the Delaware Bay Region, College of Marine Studies, University of Delaware, Newark, Delaware. 178 pp.

Wigley, R.L. 1961. Benthic fauna of Georges Bank. Trans. Twenty-Sixth North American Wildl. and Nat. Res. Conference, Wildlife Management Institute, Wash., D.C.

FIGURE 26 BENTHIC SAMPLING STATION LOCATIONS

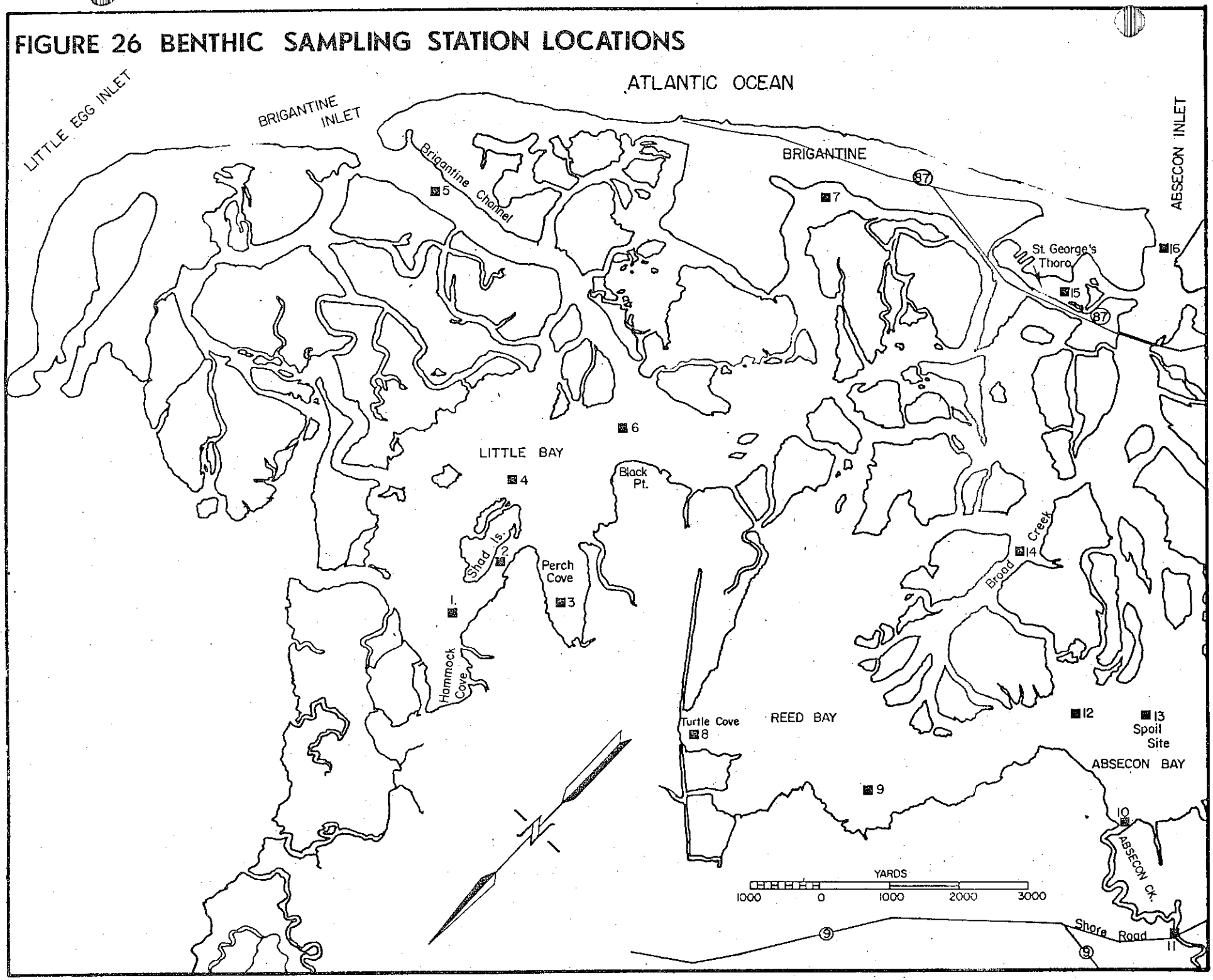


FIGURE 26 con't

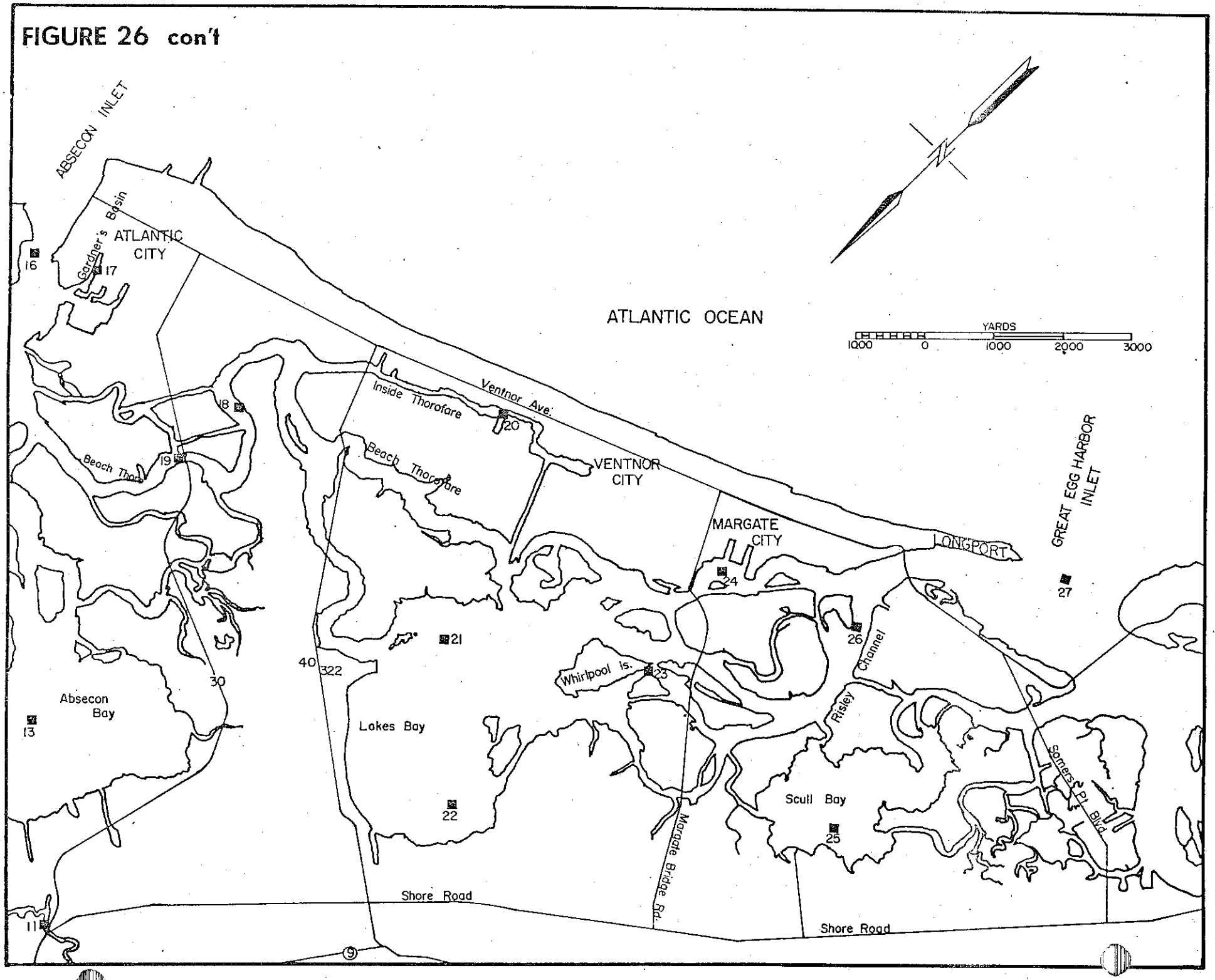


FIGURE 27. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 1 HAMMOCK COVE, INTERTIDAL MUD FLAT.

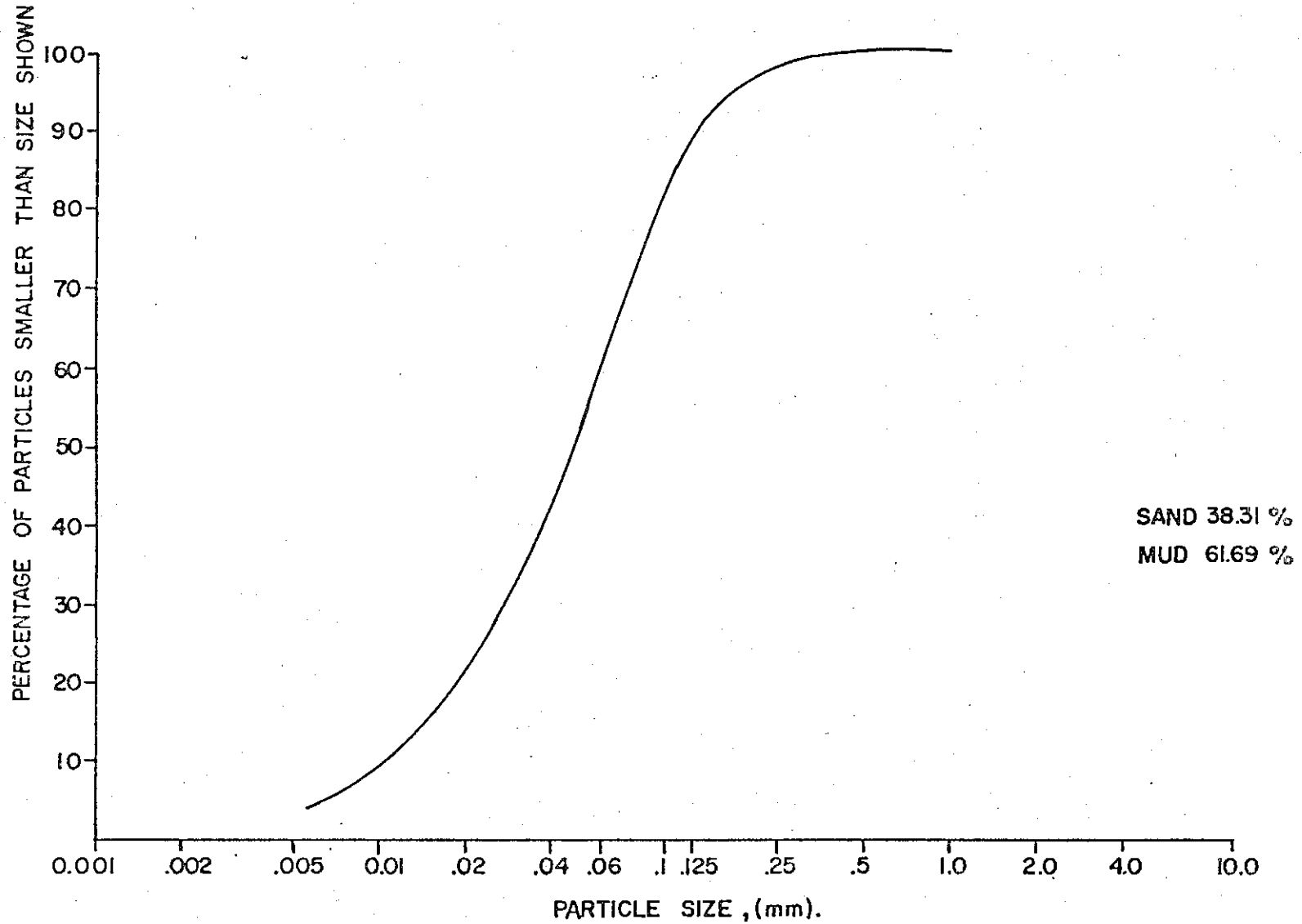


FIGURE 28. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 2
MARKER 37, ADJACENT SHAD ISLAND, INTRACOASTAL WATERWAY CHANNEL.

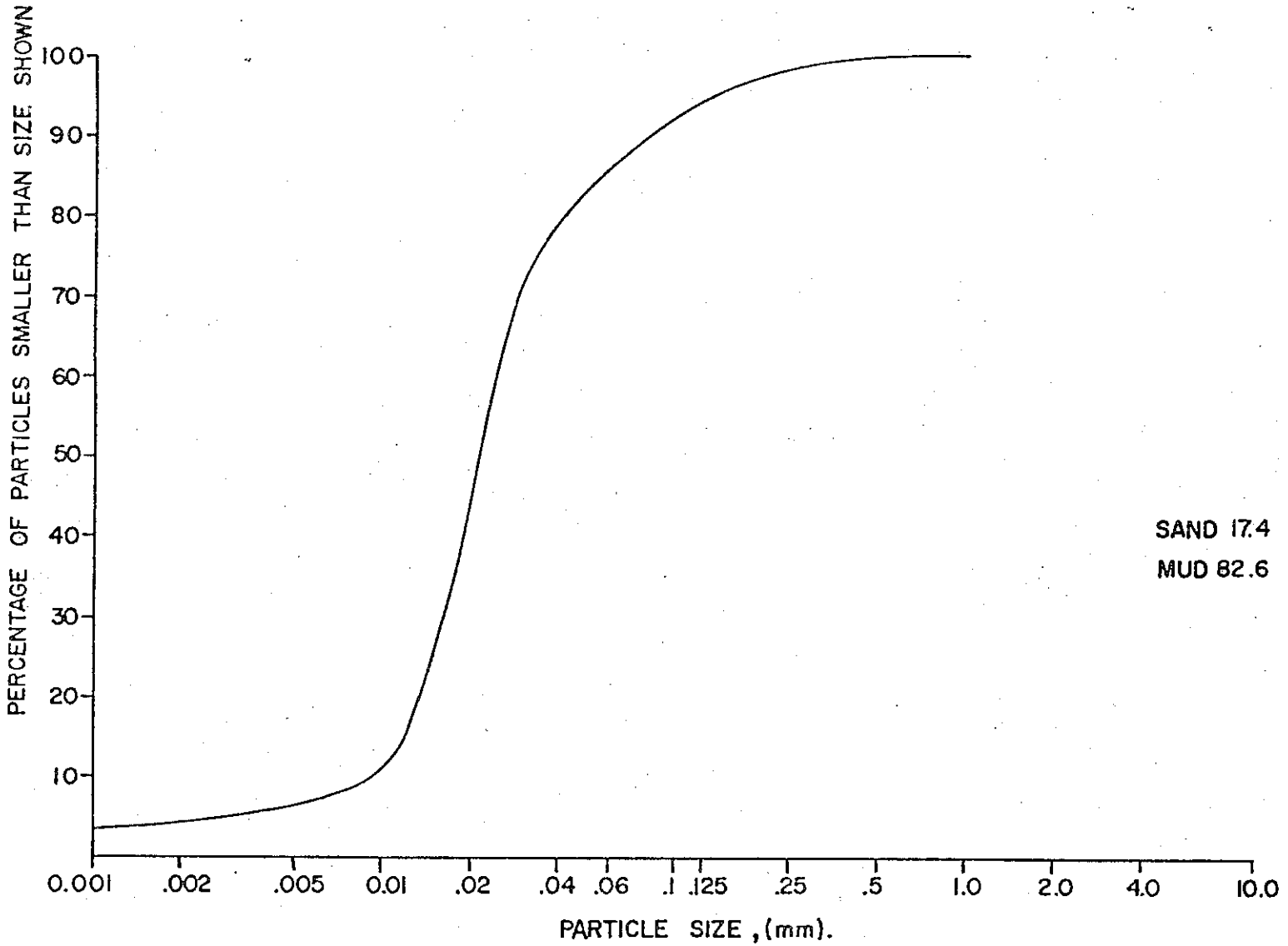


FIGURE 29. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 3 PERCH COVE, OPEN WATER.

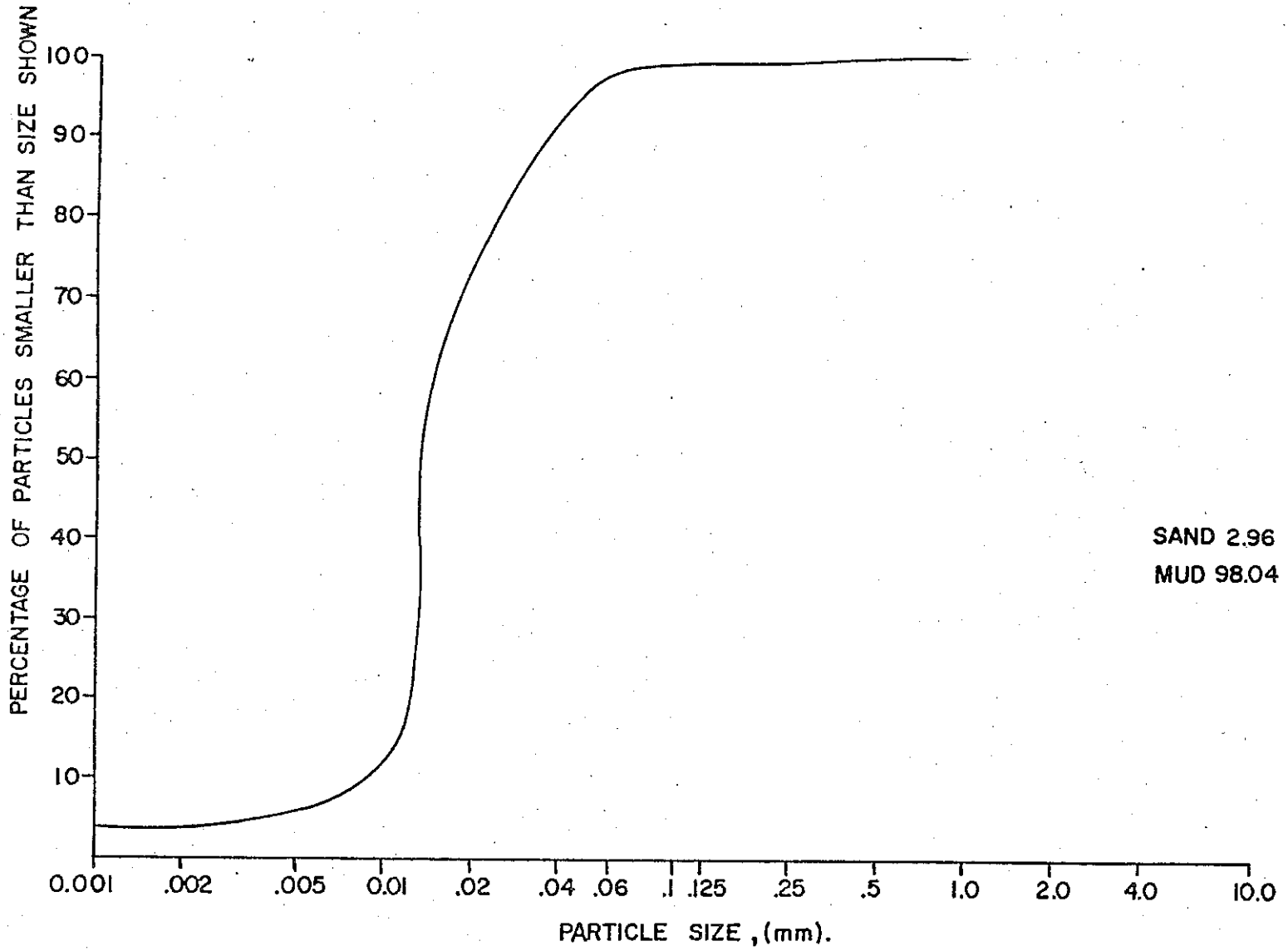


FIGURE 30. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 4 LITTLE BAY, OPEN WATER.

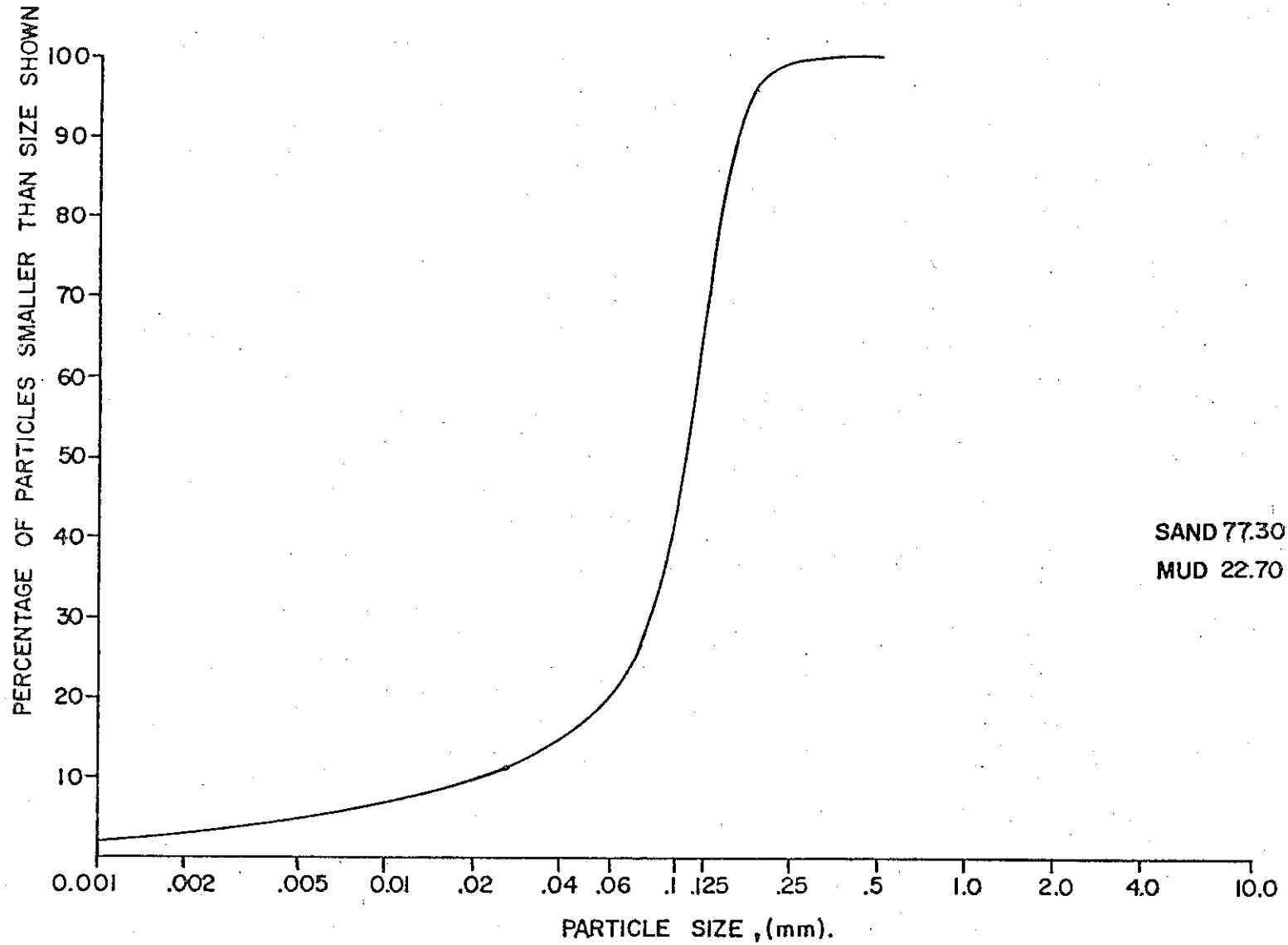


FIGURE 31. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 5 BRIGANTINE CHANNEL.

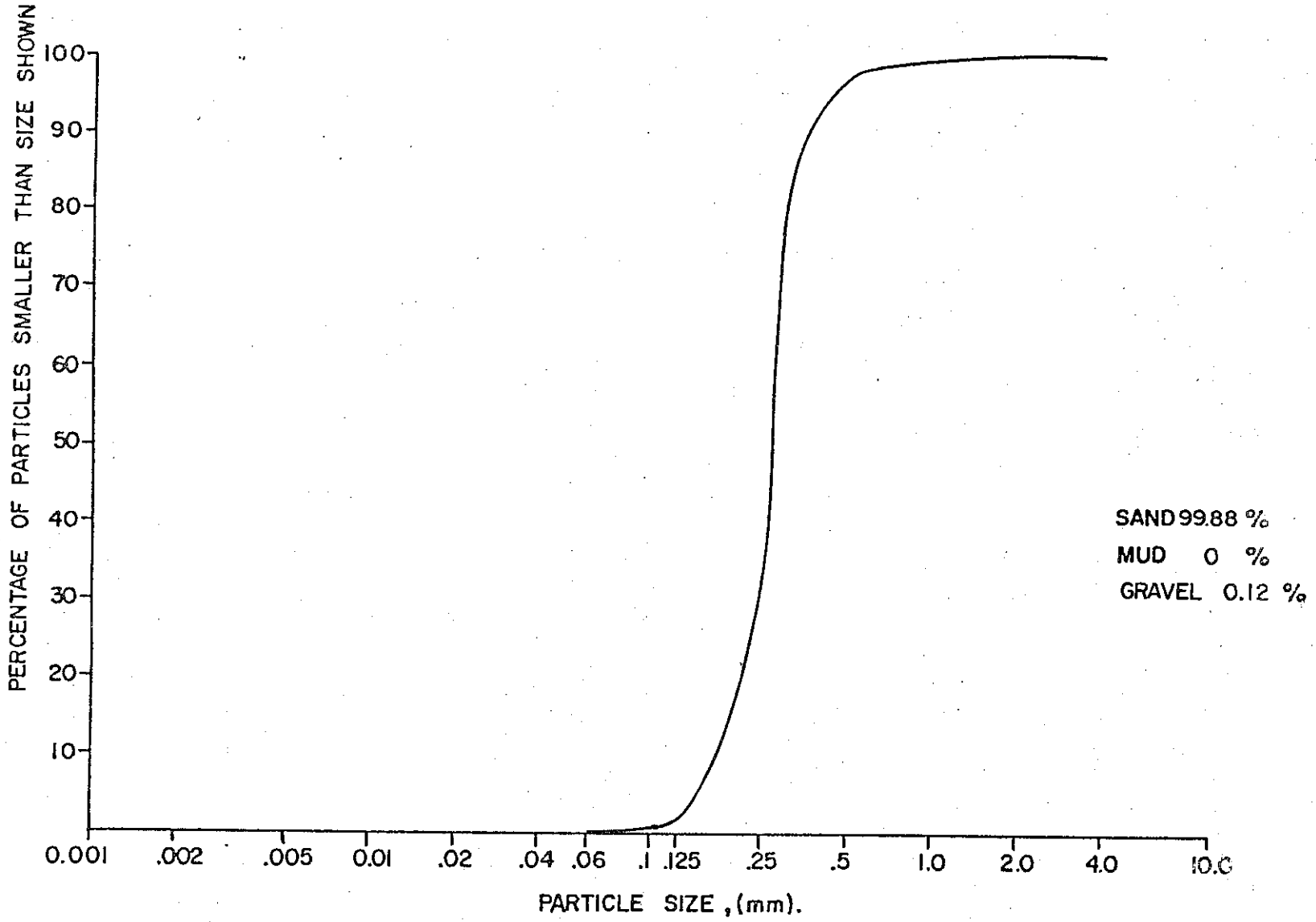


FIGURE 32. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 6 OPPOSITE BLACK POINT, INTERTIDAL SAND FLAT.

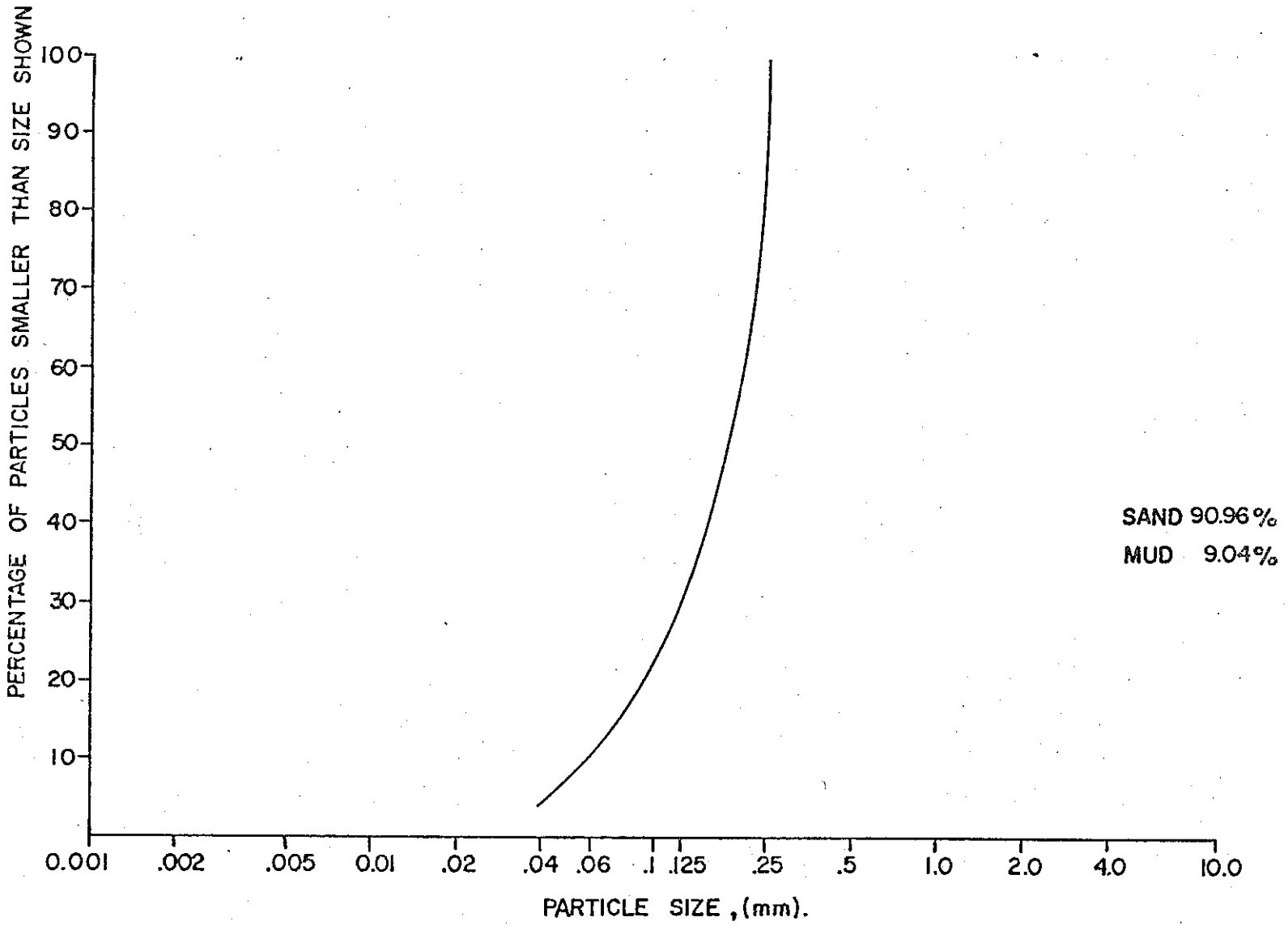


FIGURE 33. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 7 CITY OF BRIGANTINE, CHANNEL.

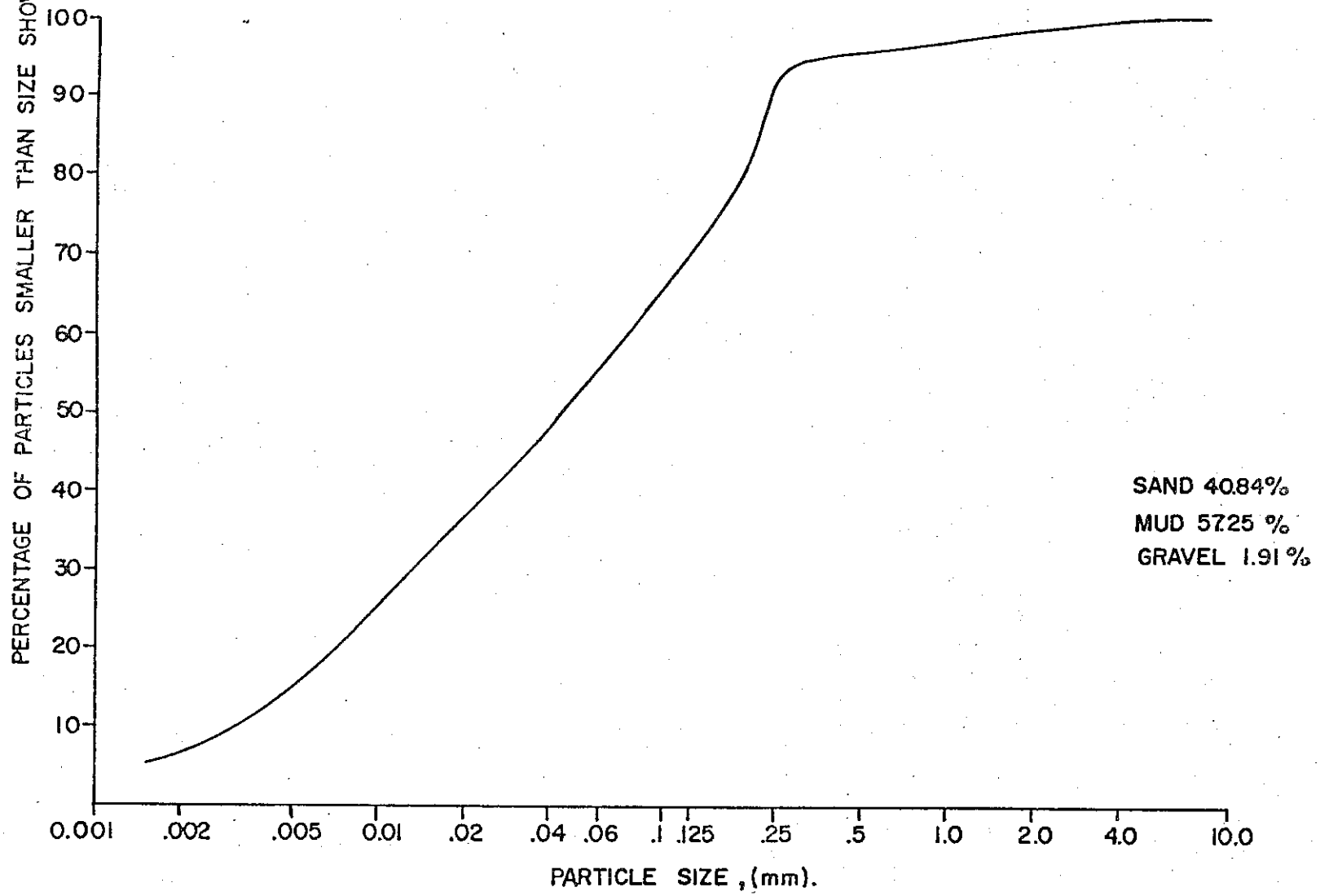


FIGURE 34. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 8 REED BAY, TURTLE COVE.

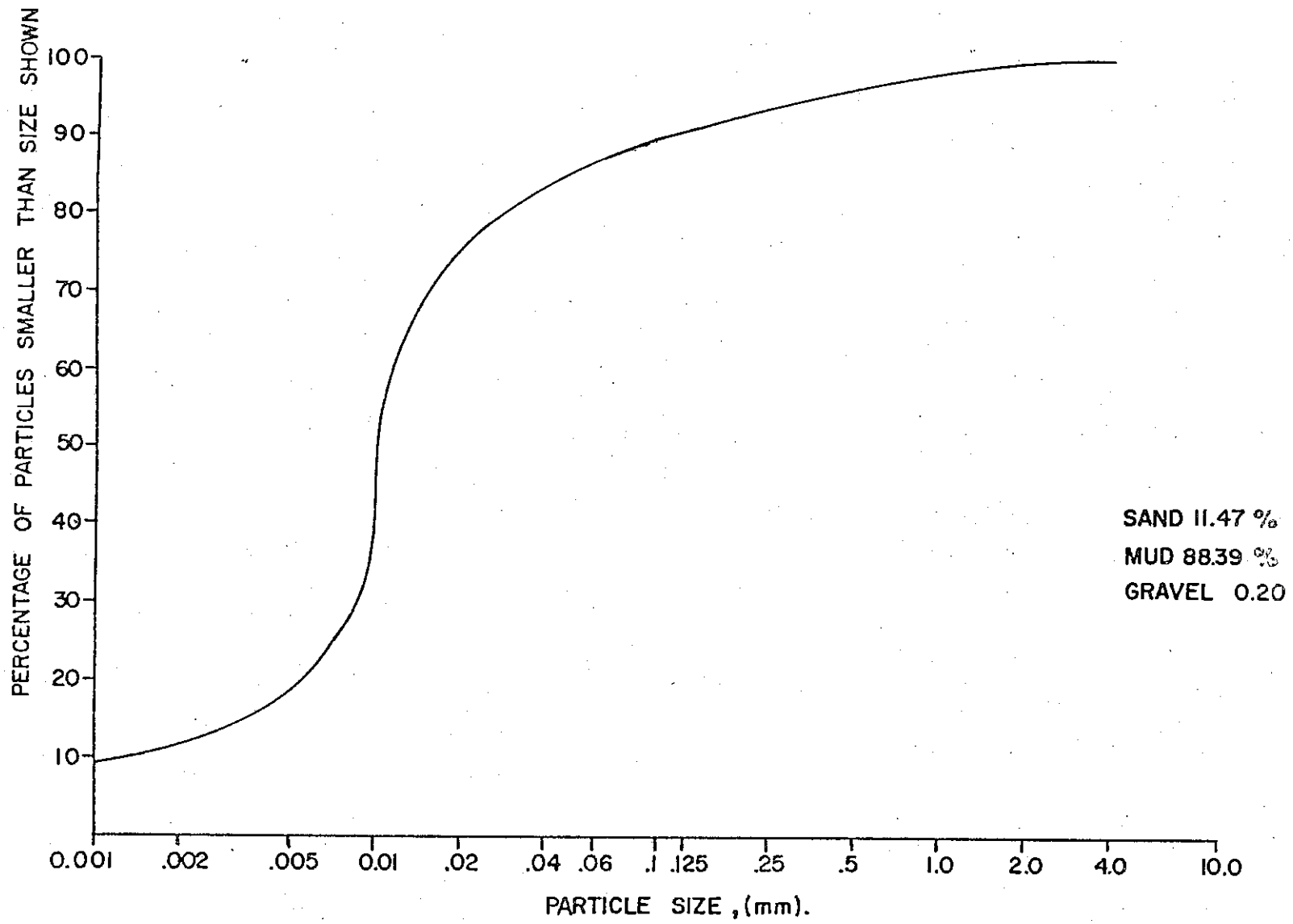


FIGURE 35. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 9 REED BAY, OPEN WATER.

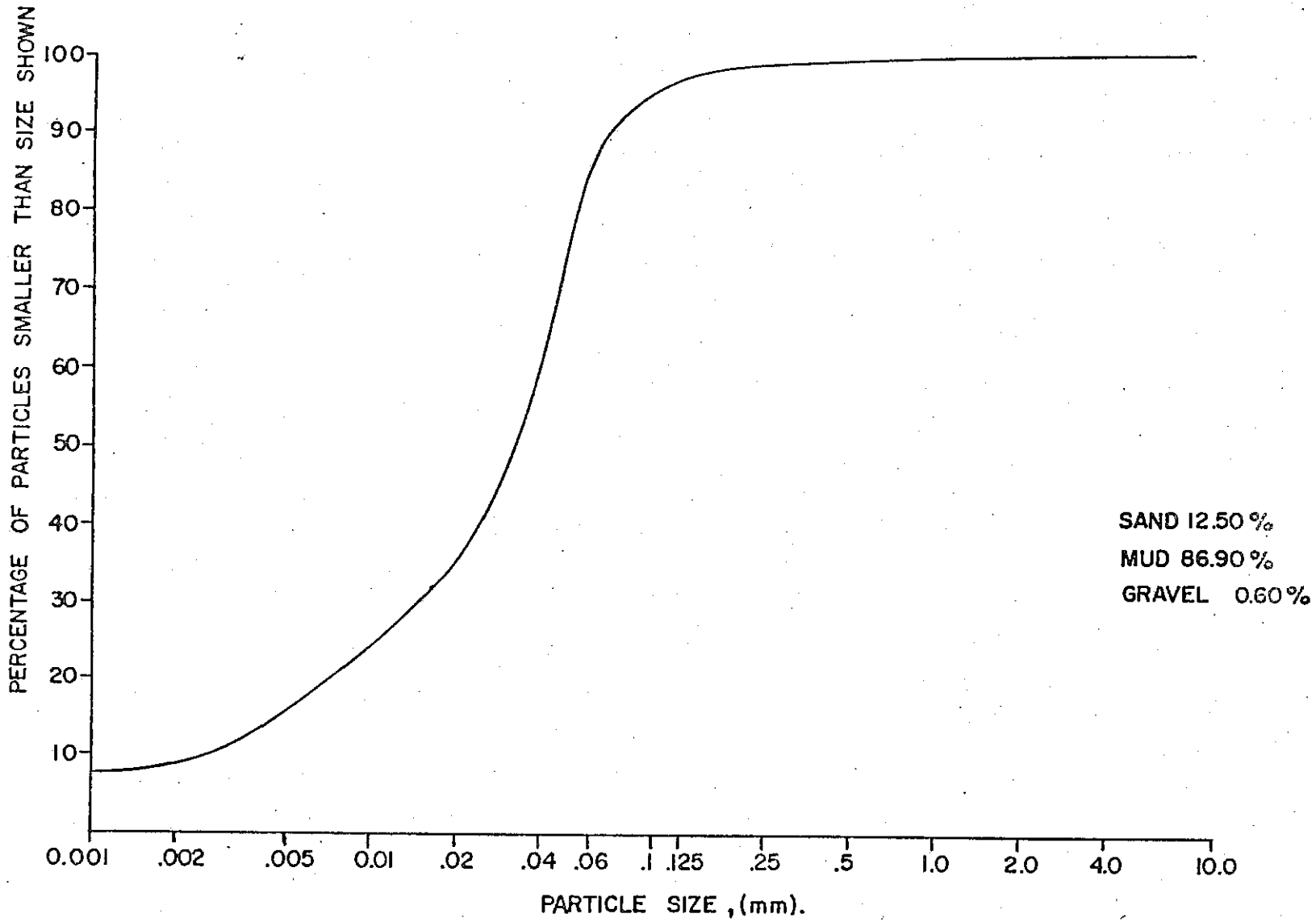


FIGURE 36. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 10 MOUTH OF ABSECON CREEK.

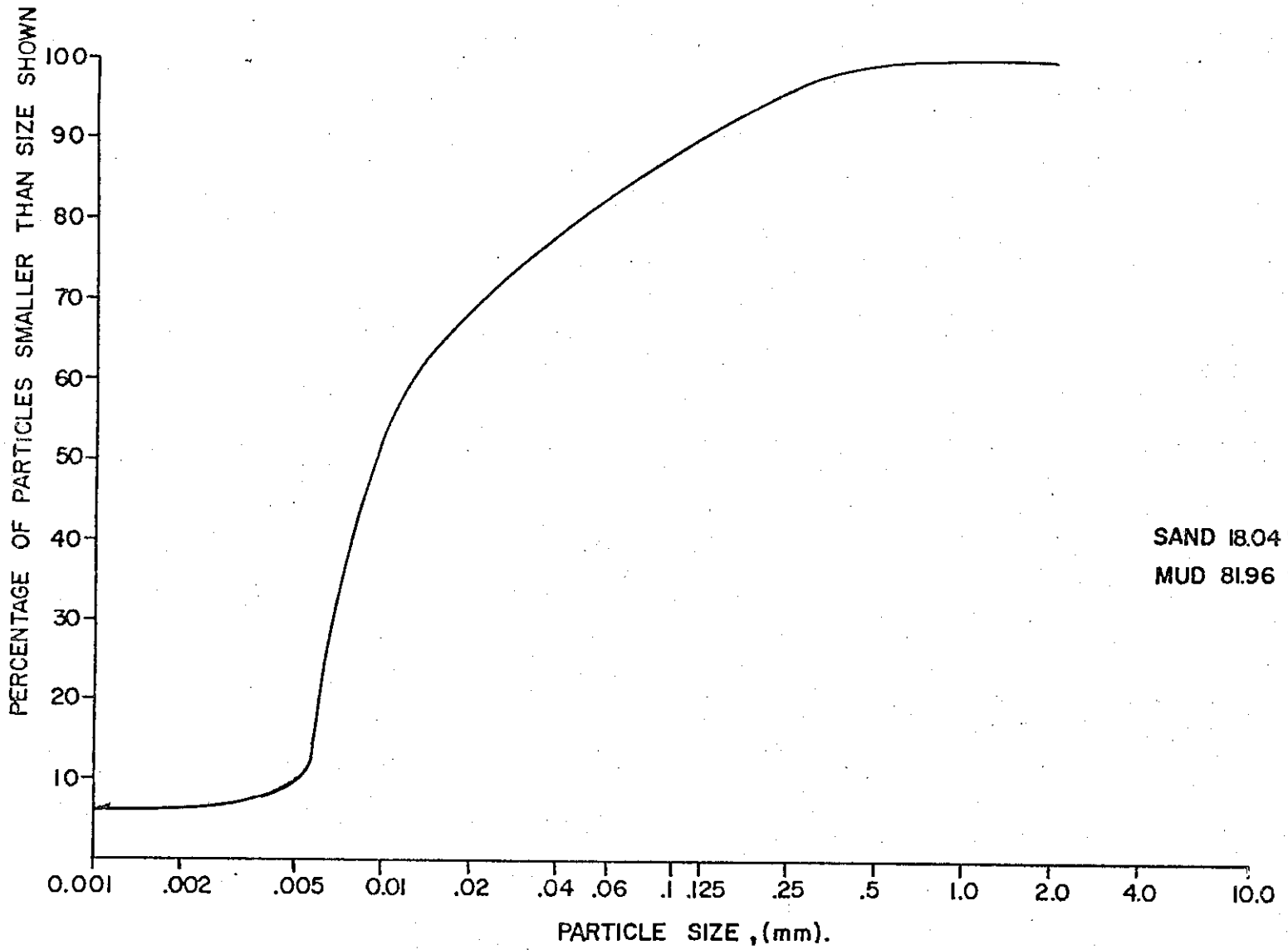


FIGURE 37. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 11 ABSECON CREEK, UPSTREAM.

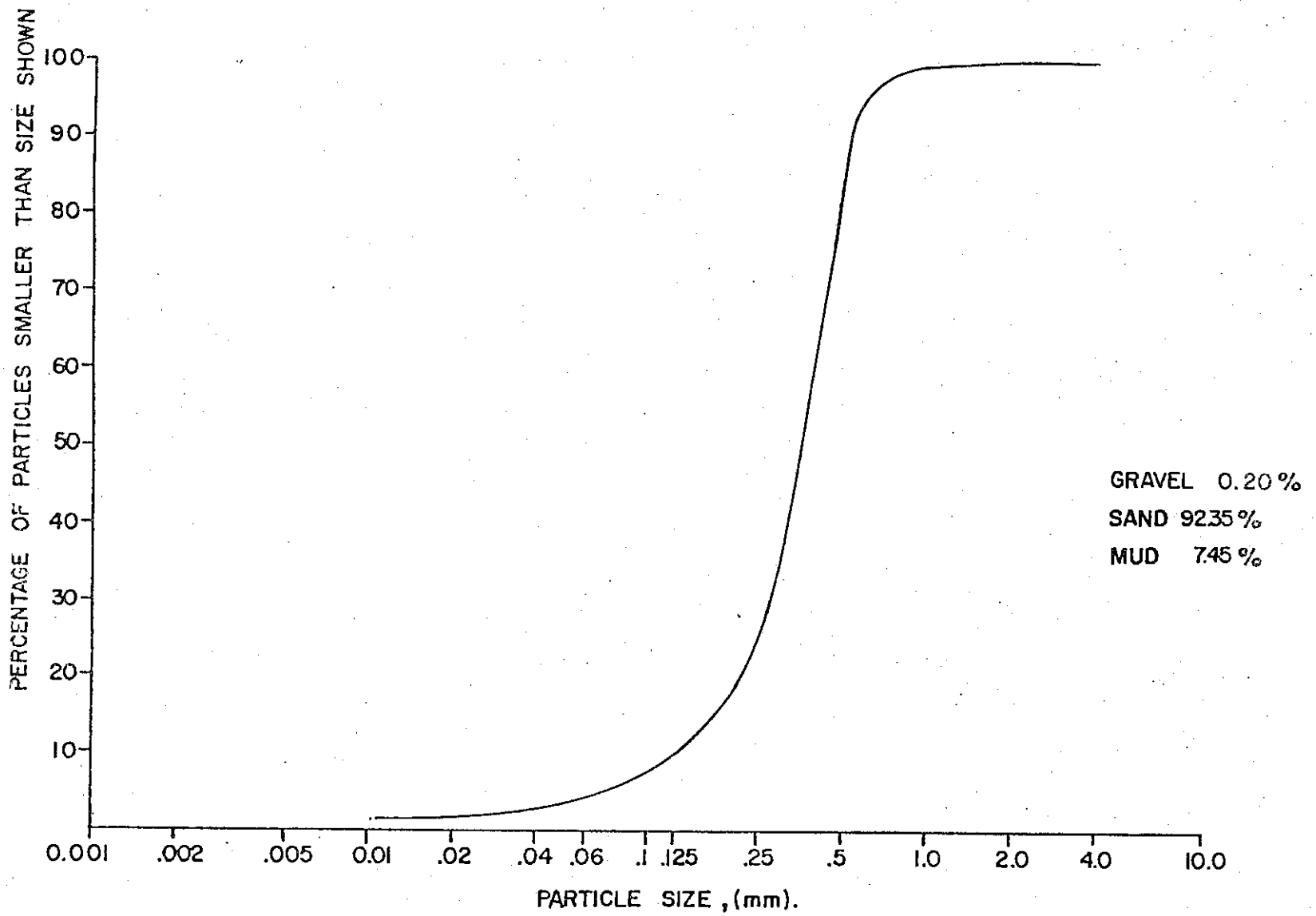


FIGURE 38. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 12 ABSECON BAY, OPEN WATER.

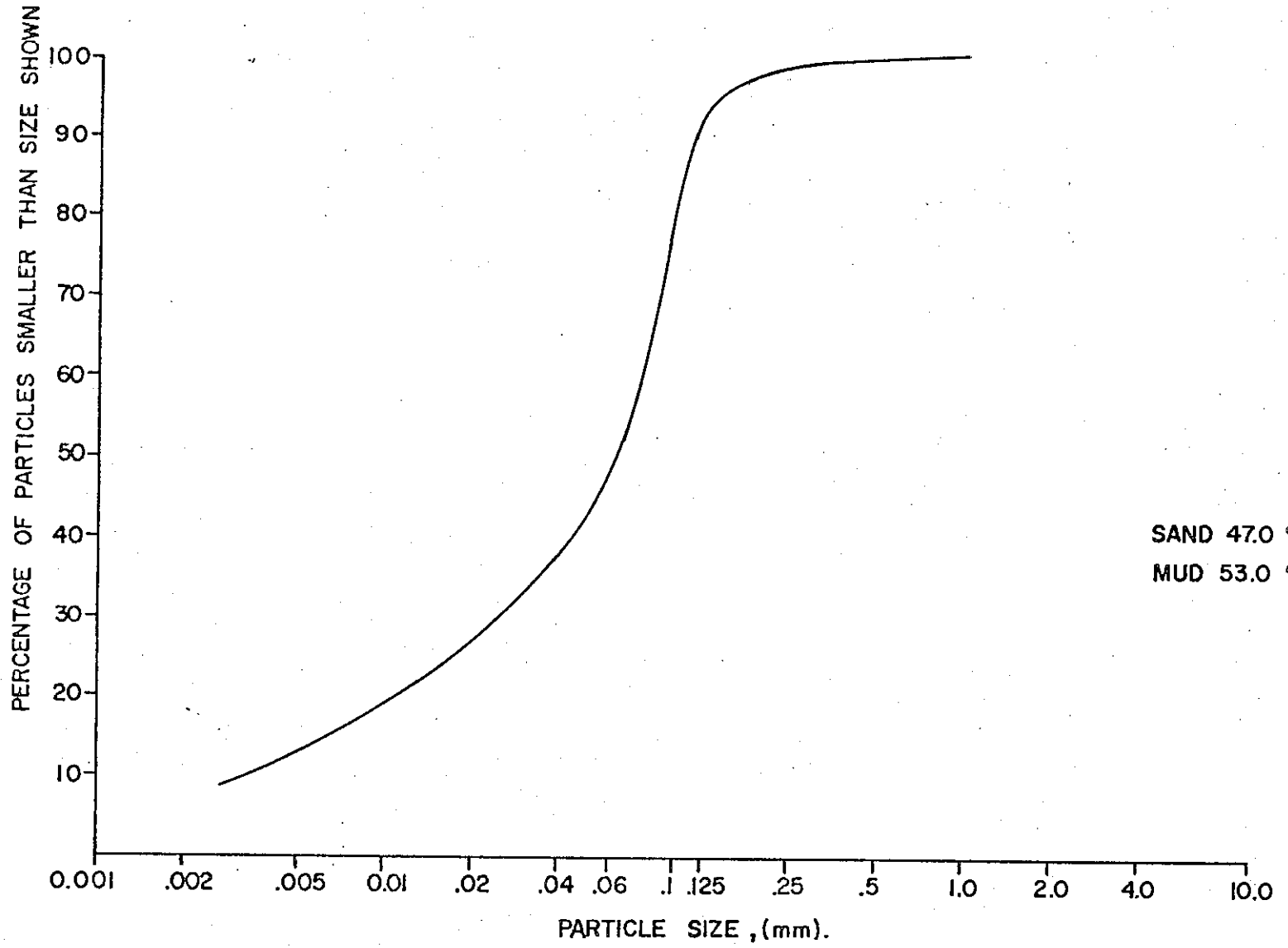


FIGURE 39. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 13 ABSECON BAY, SPOIL SITE ADJACENT CHANNEL.

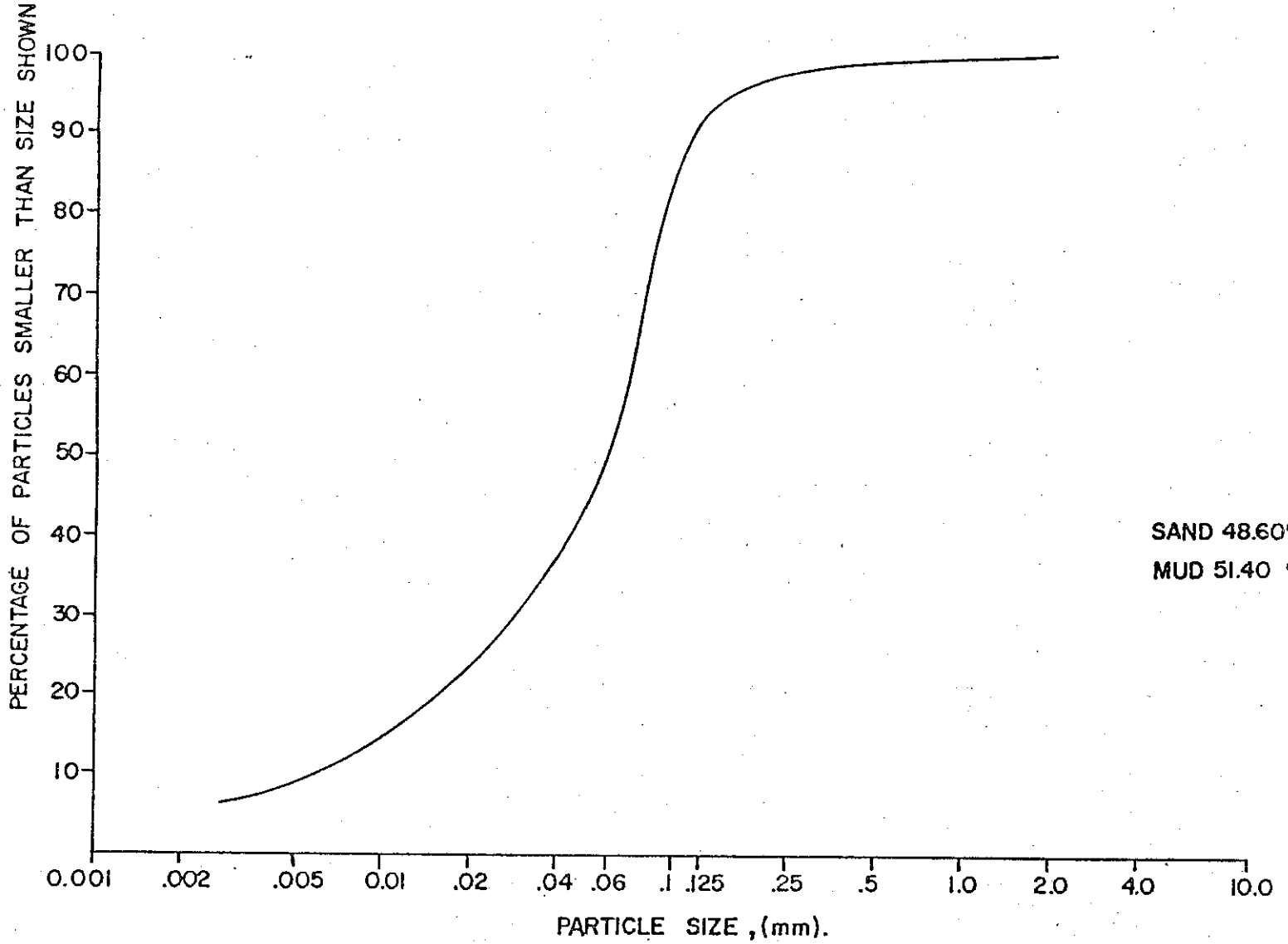


FIGURE 40. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 14
BROAD CREEK

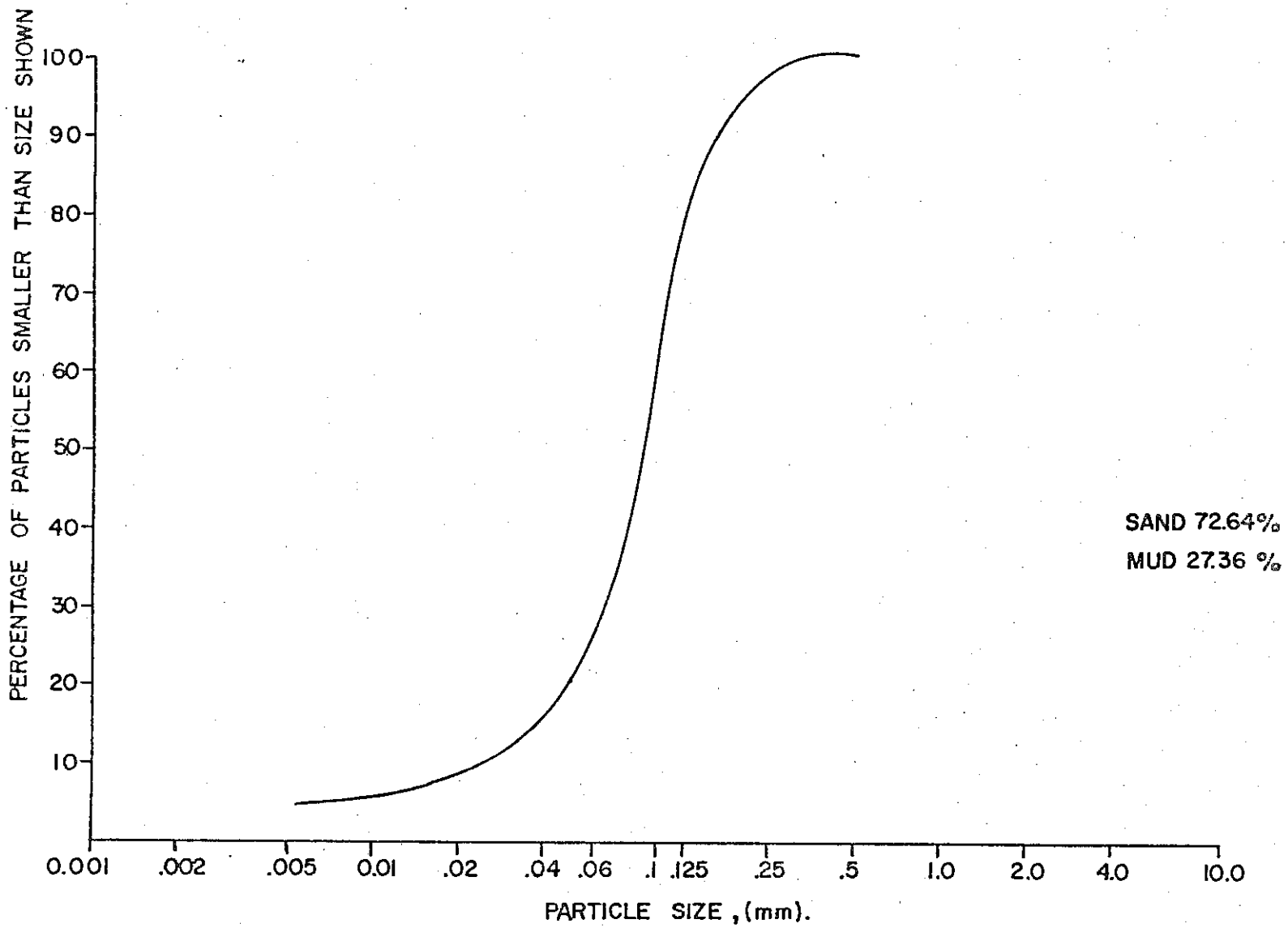


FIGURE 41. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 15 ST. GEORGE'S THOROFARE.

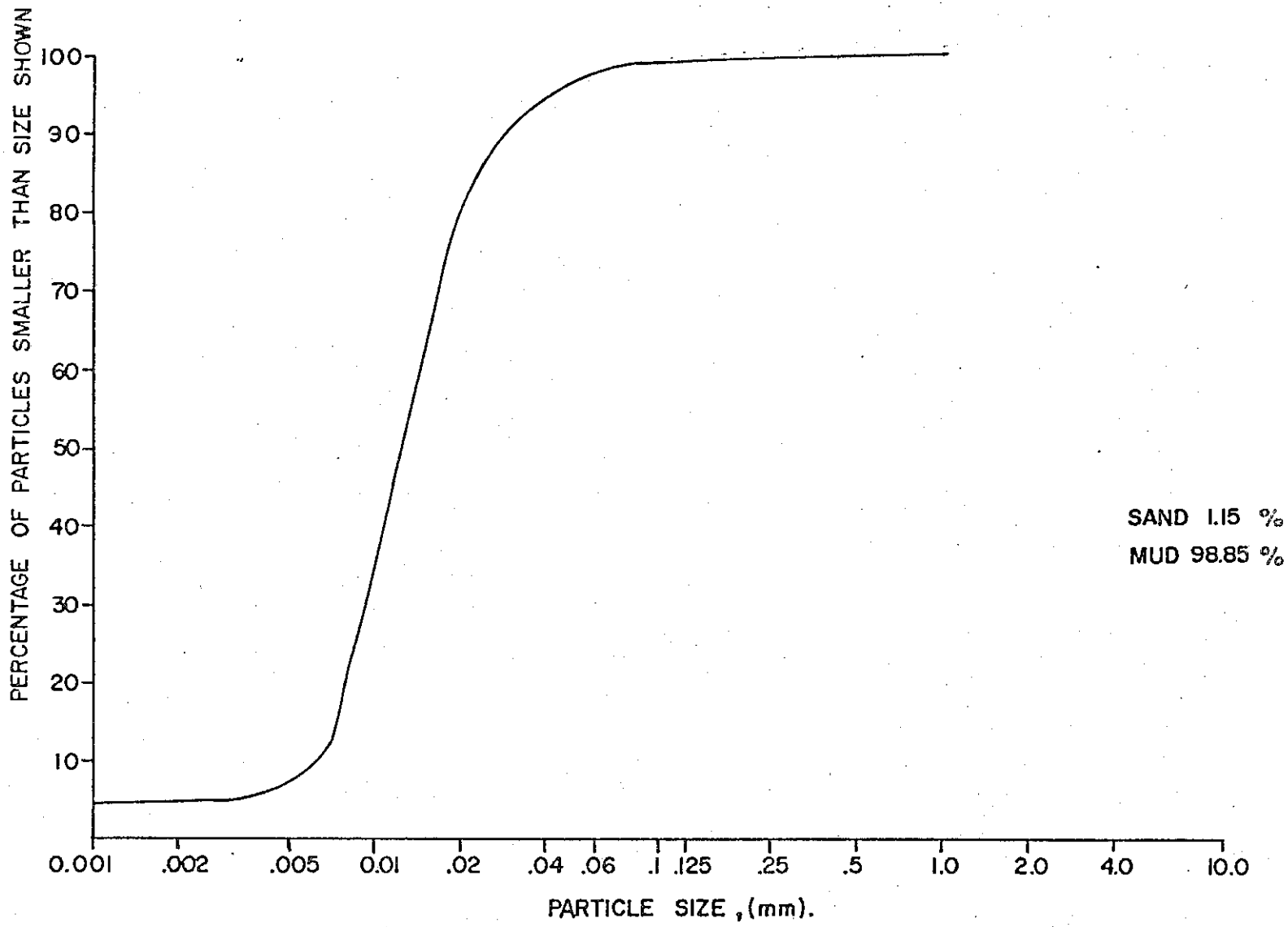


FIGURE 42. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 16
ABSECON INLET, SEINE BEACH ADJACENT CHANNEL

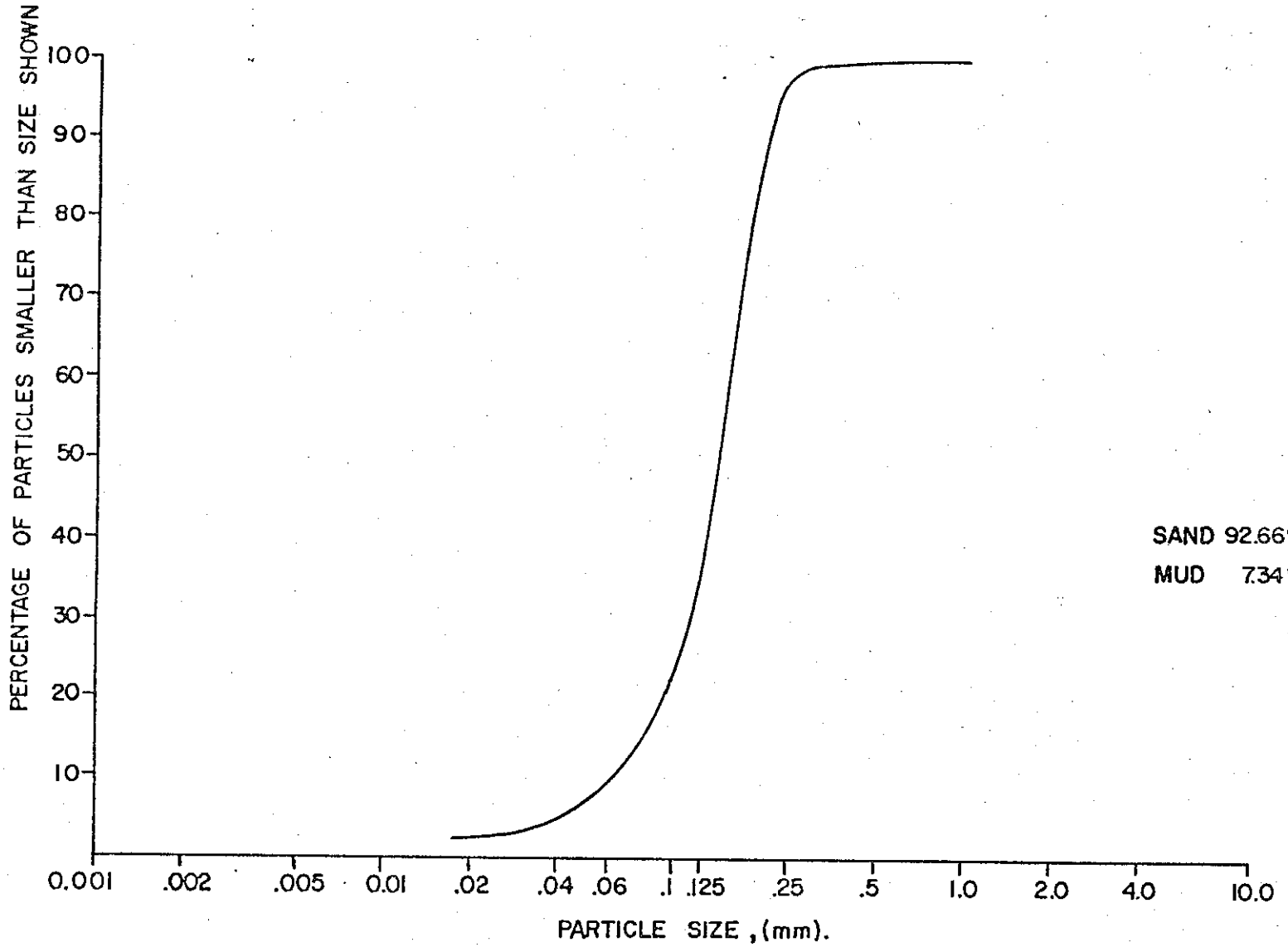


FIGURE 43. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 17 GARDNER'S BASIN, ATLANTIC CITY.

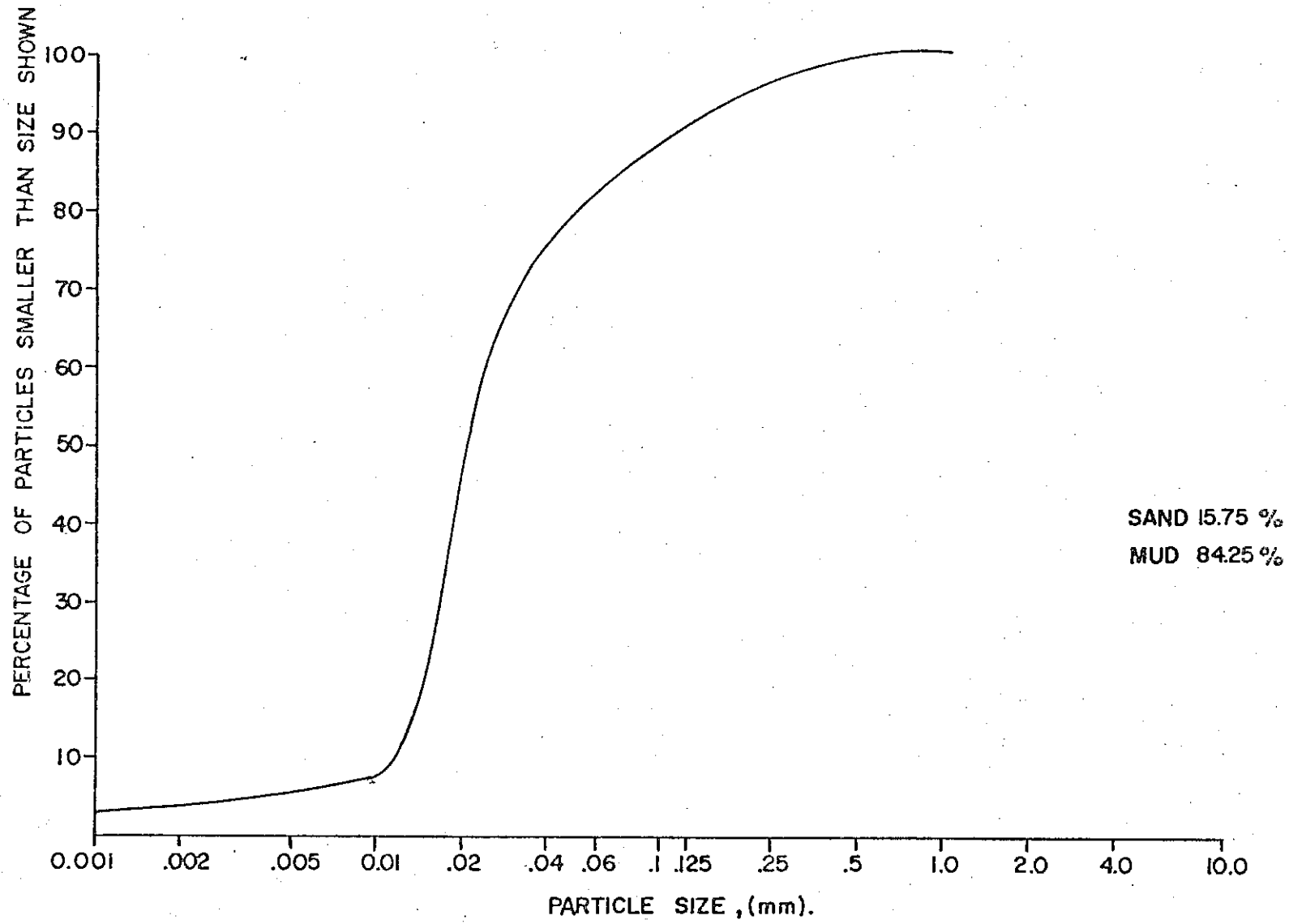


FIGURE 44. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 18, INTRACOASTAL WATERWAY CHANNEL, BEHIND, ATLANTIC CITY.

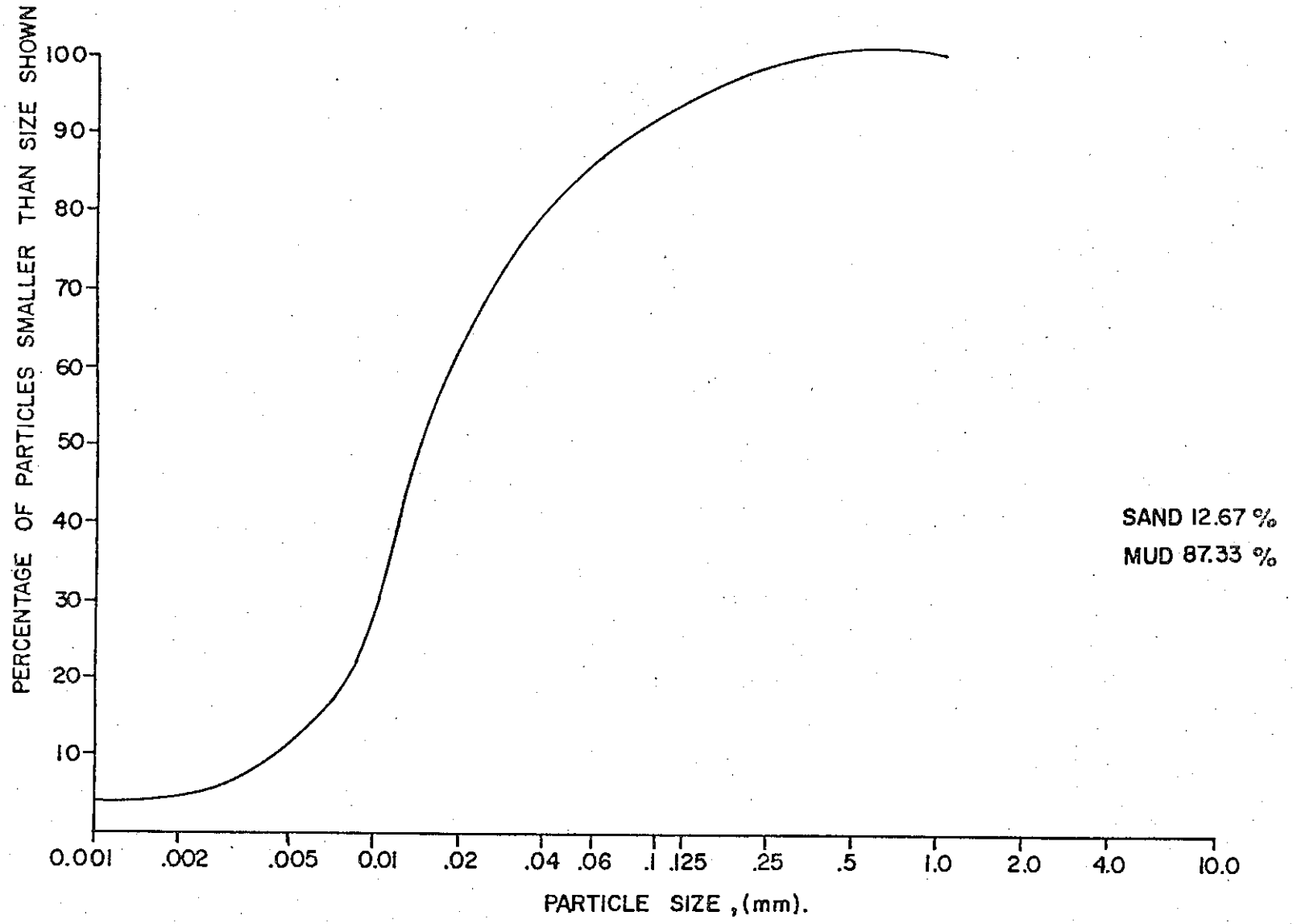


FIGURE 45. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 19 BEACH THOROFARE, INTRACOASTAL WATERWAY CHANNEL.

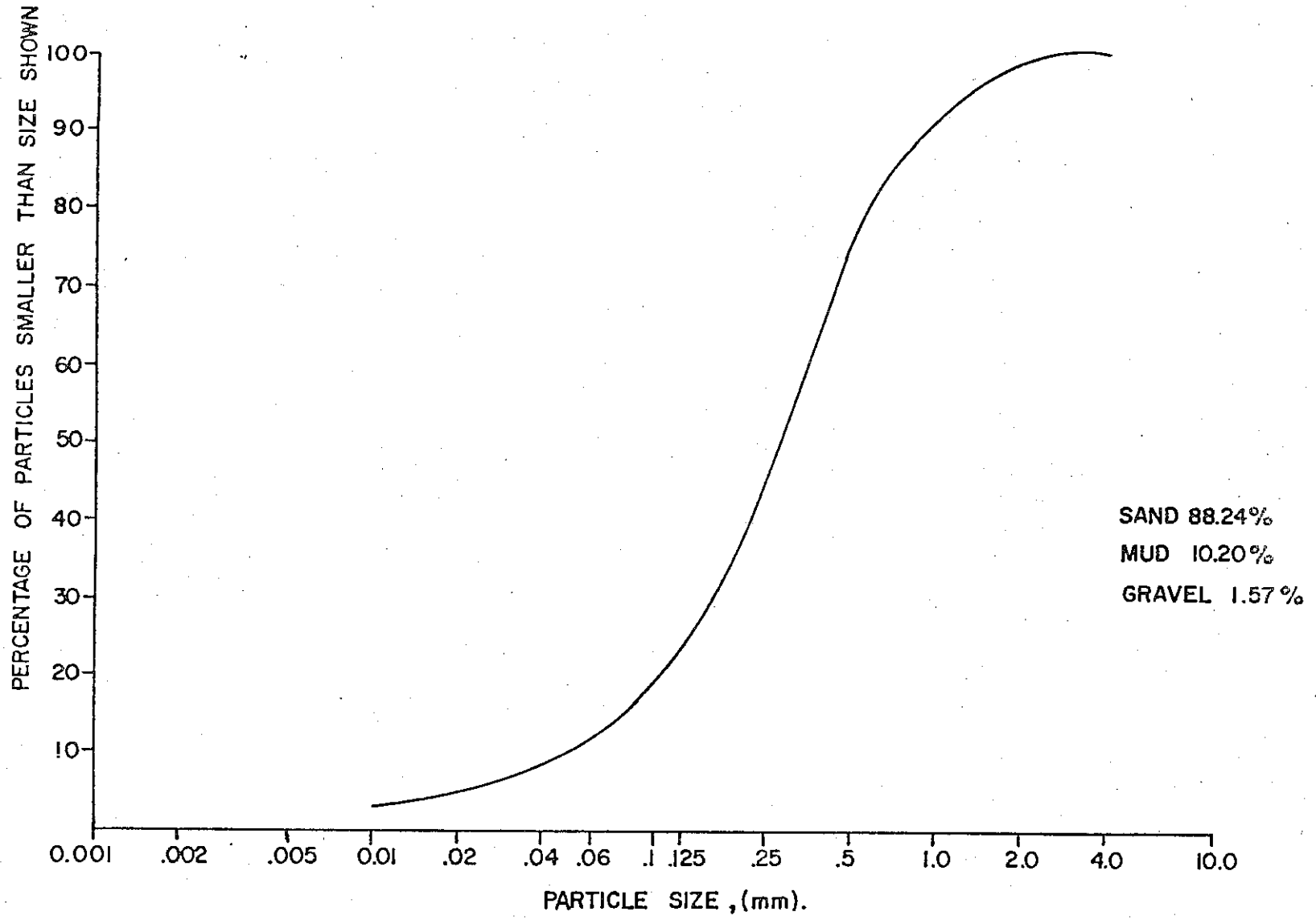


FIGURE 46. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 20 INSIDE THOROFARE, VENTNOR HEIGHTS.

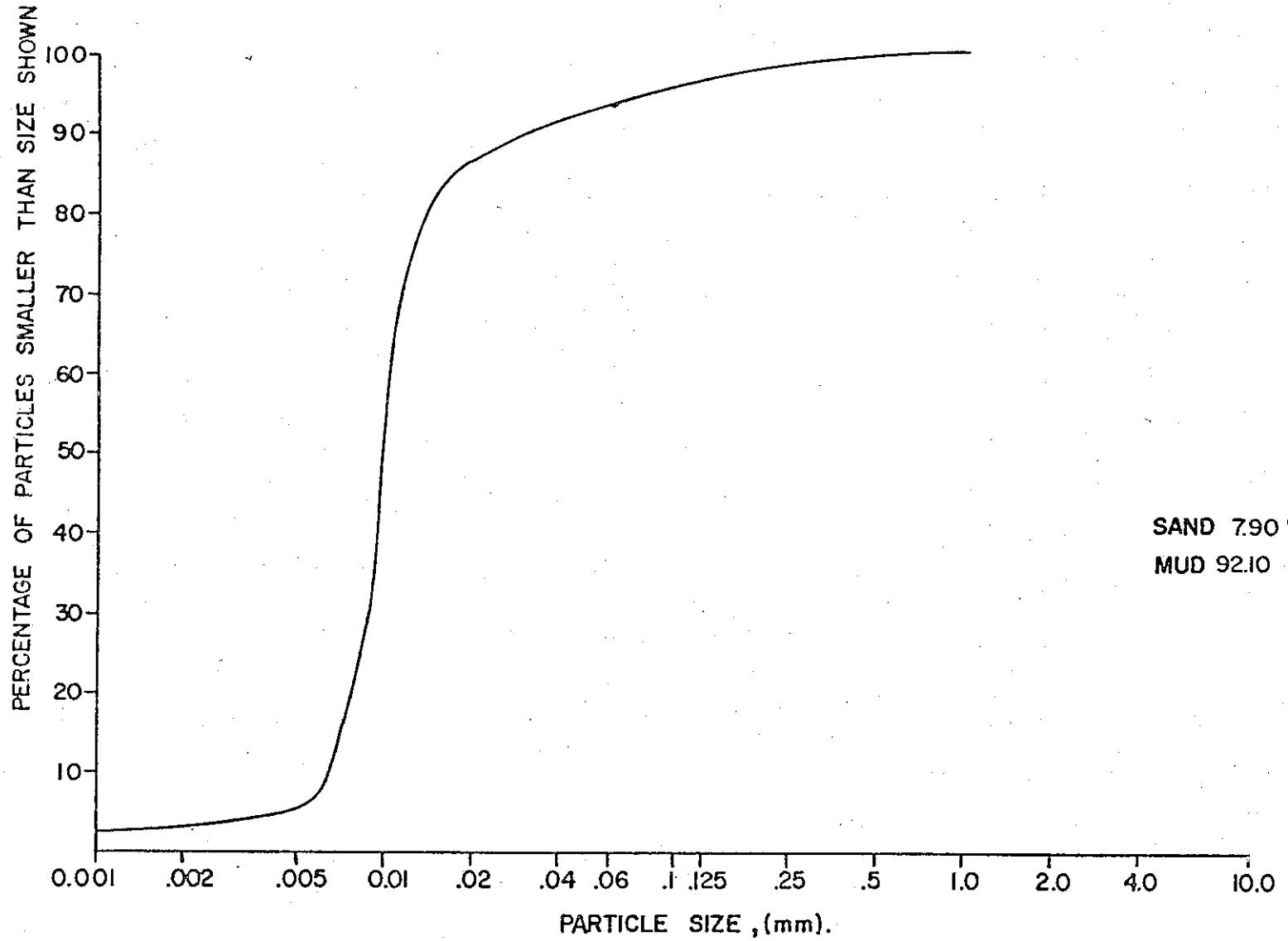


FIGURE 47. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 21 LAKES BAY, CHANNEL.

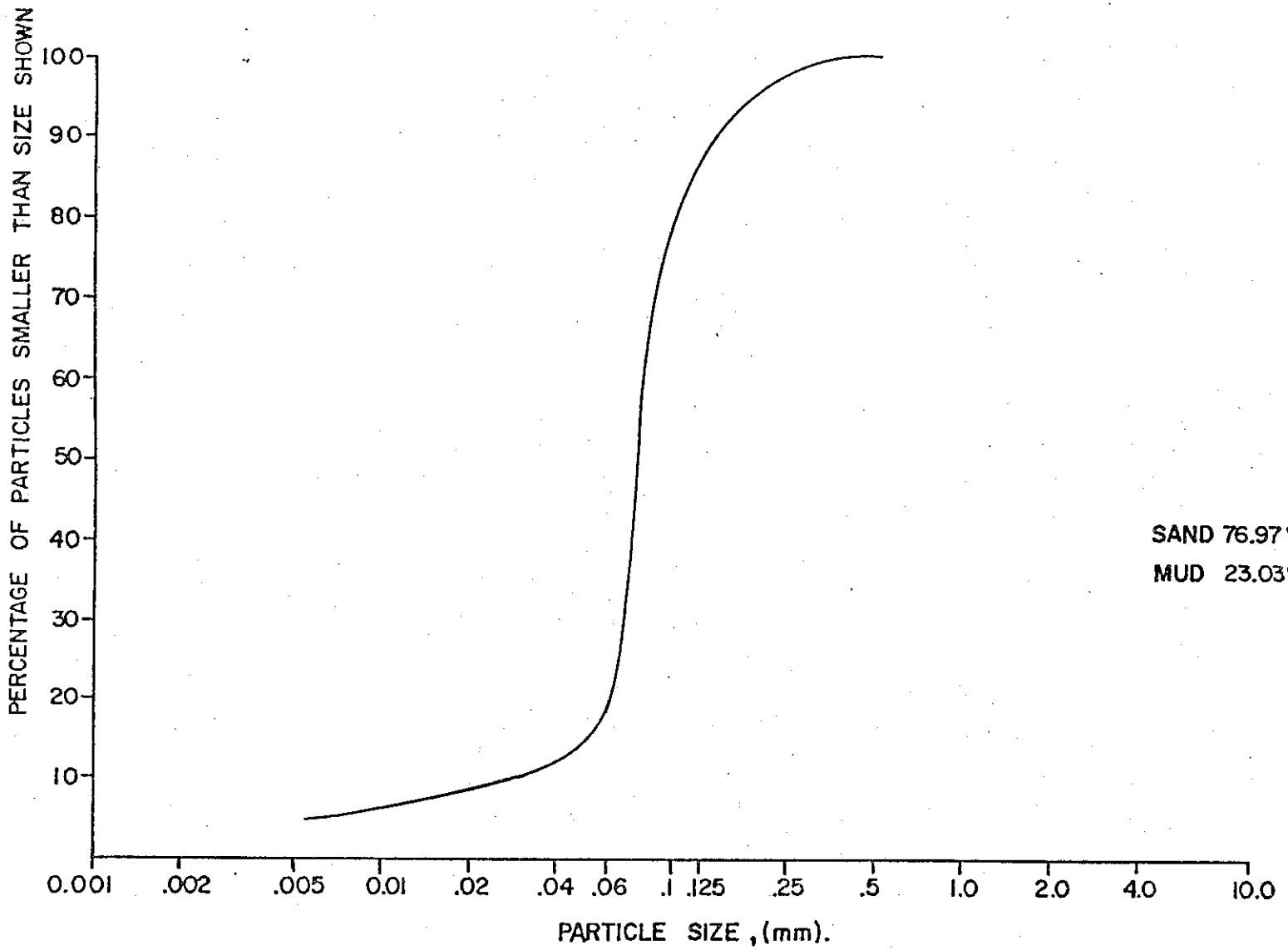


FIGURE 48. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 22 LAKES BAY, OPEN WATER.

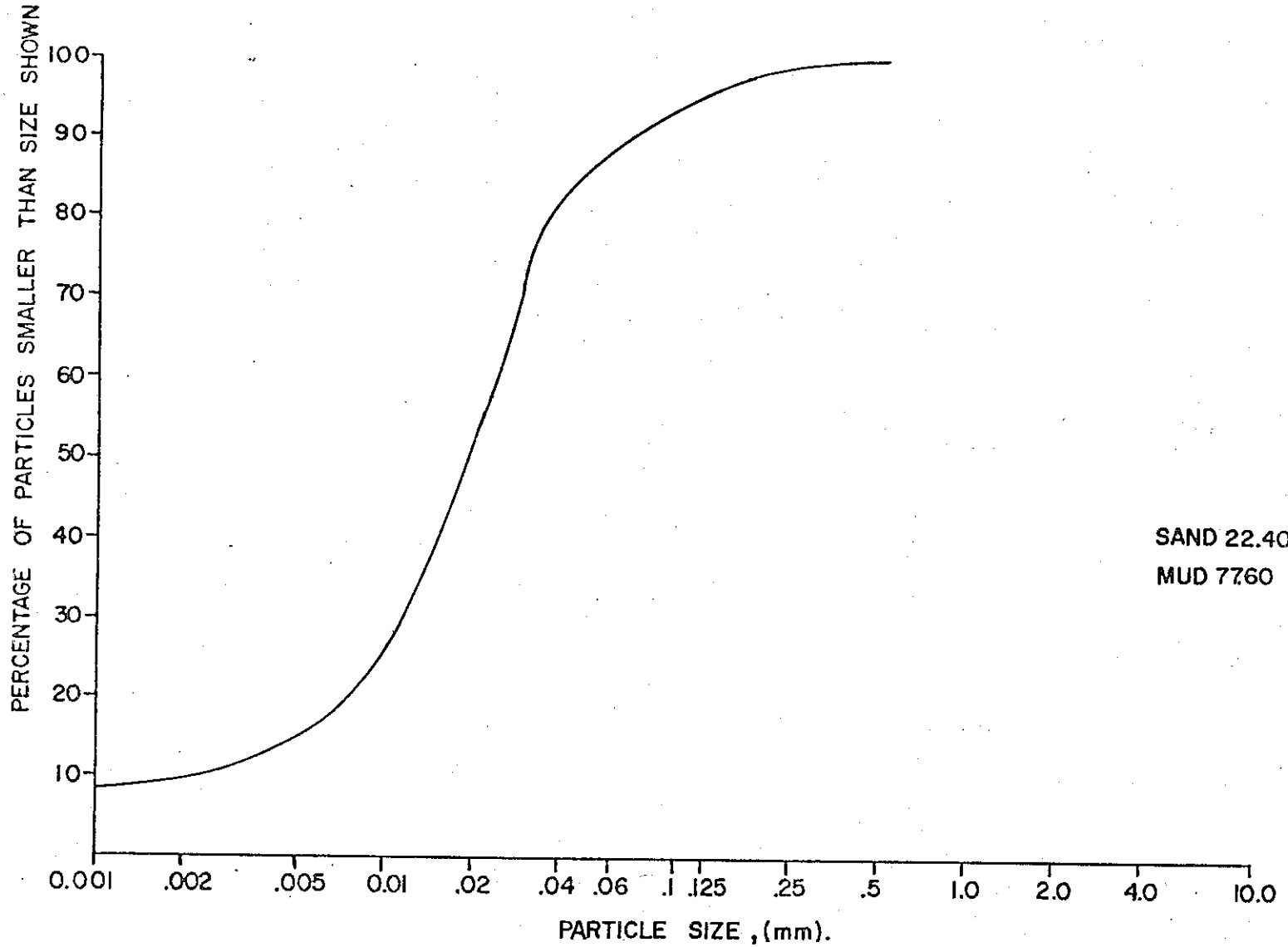


FIGURE 49. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 23 WHIRPOOL ISLAND – WINKLE ISLAND.

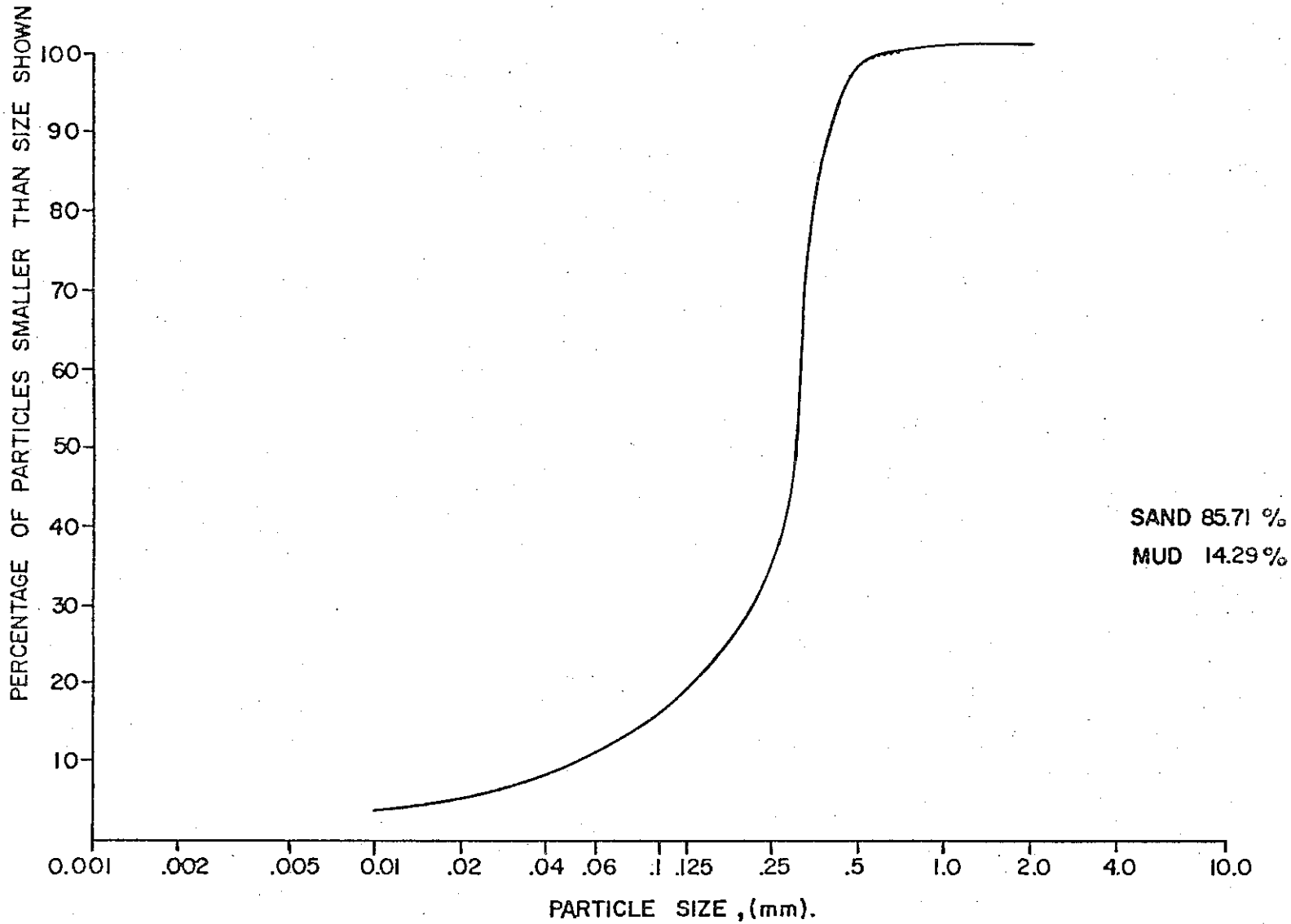


FIGURE 50. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 24
MARGATE CITY

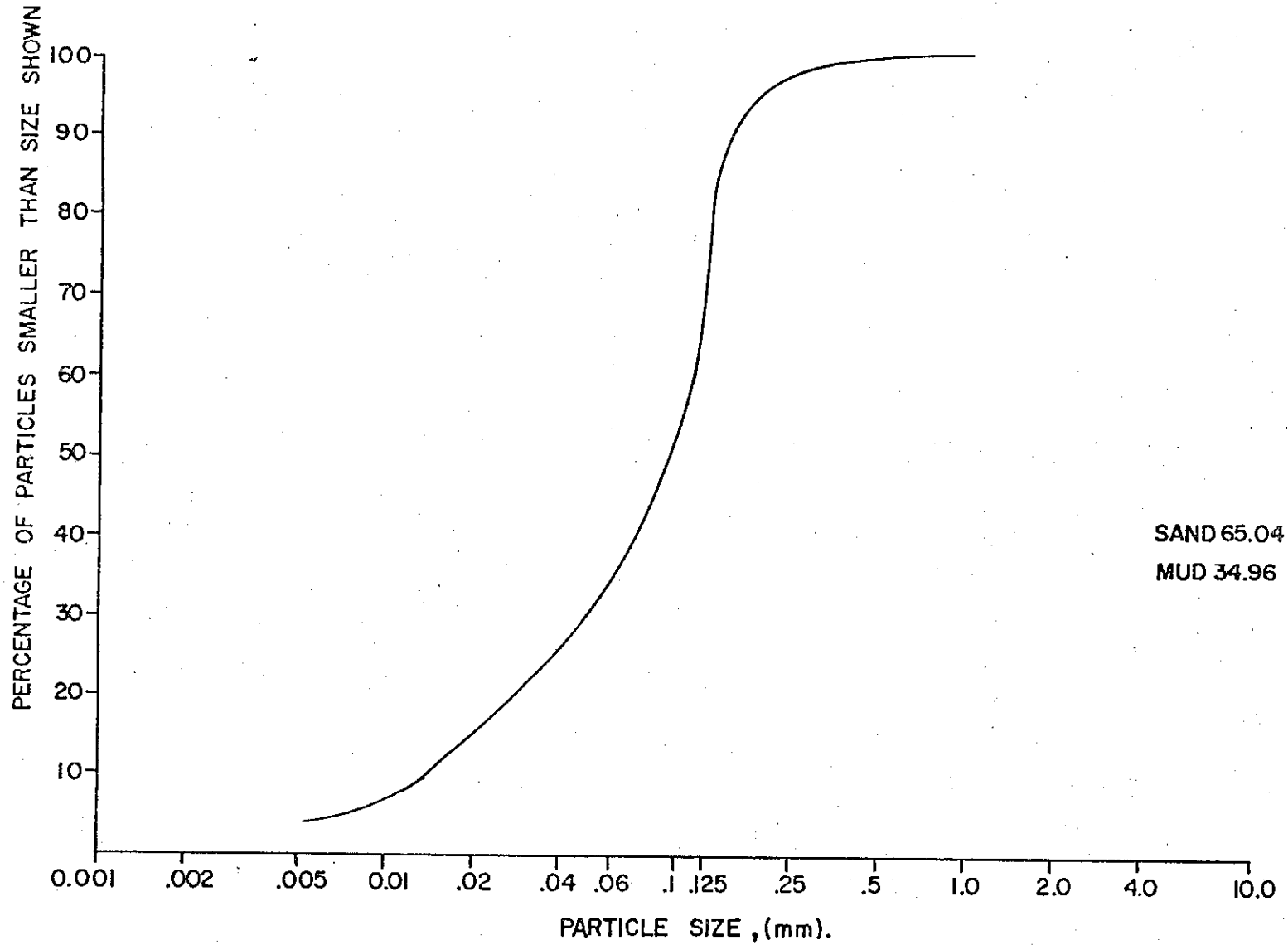


FIGURE 51. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 25 SCULL BAY, OPEN WATER.

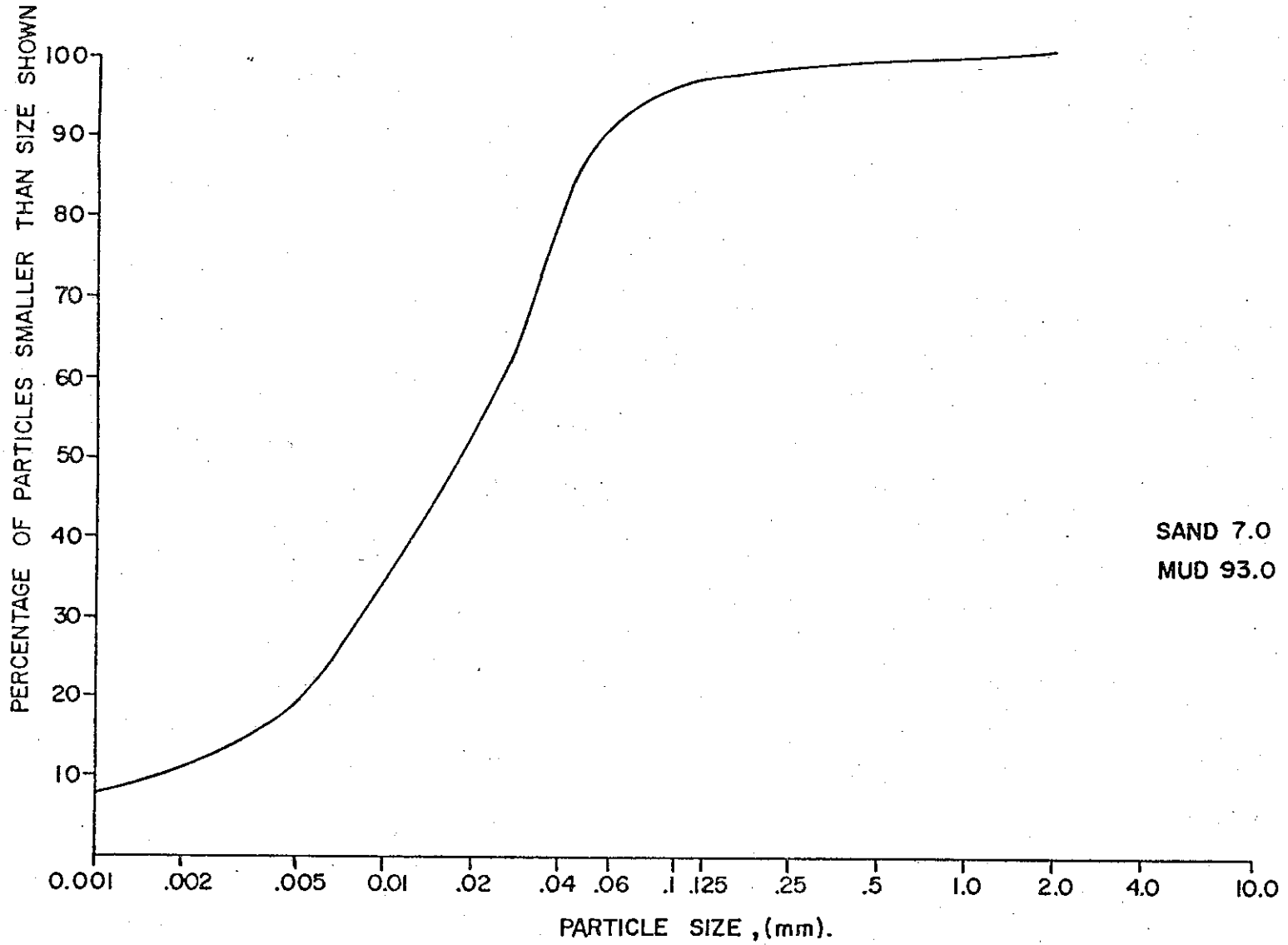


FIGURE 52. GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 26 RISLEY CHANNEL, SEINE BEACH ADJACENT CHANNEL.

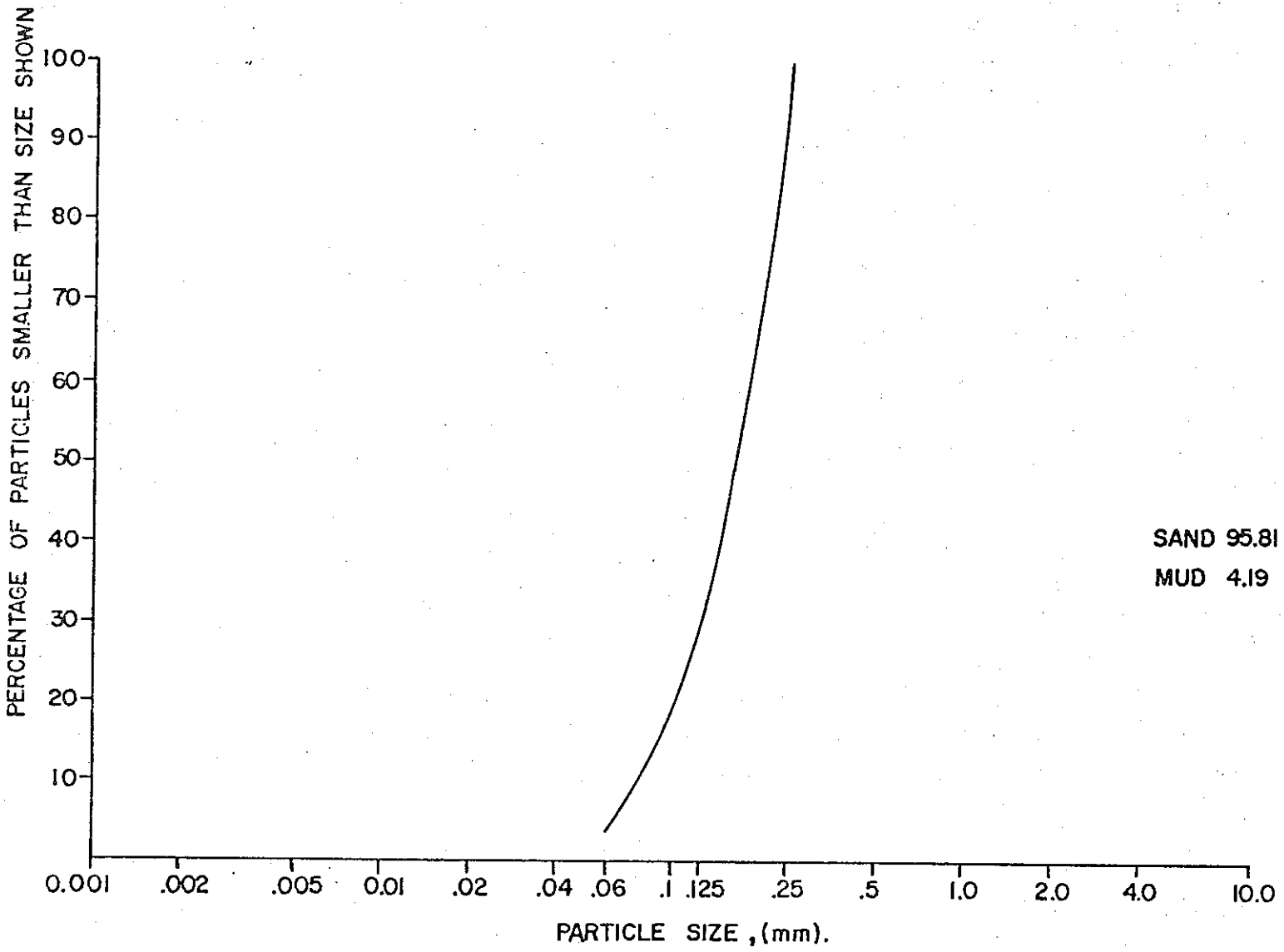


FIGURE 53 GRAIN SIZE ACCUMULATION CURVE, SEDIMENT SAMPLE NO. 27
GREAT EGG HARBOR INLET.

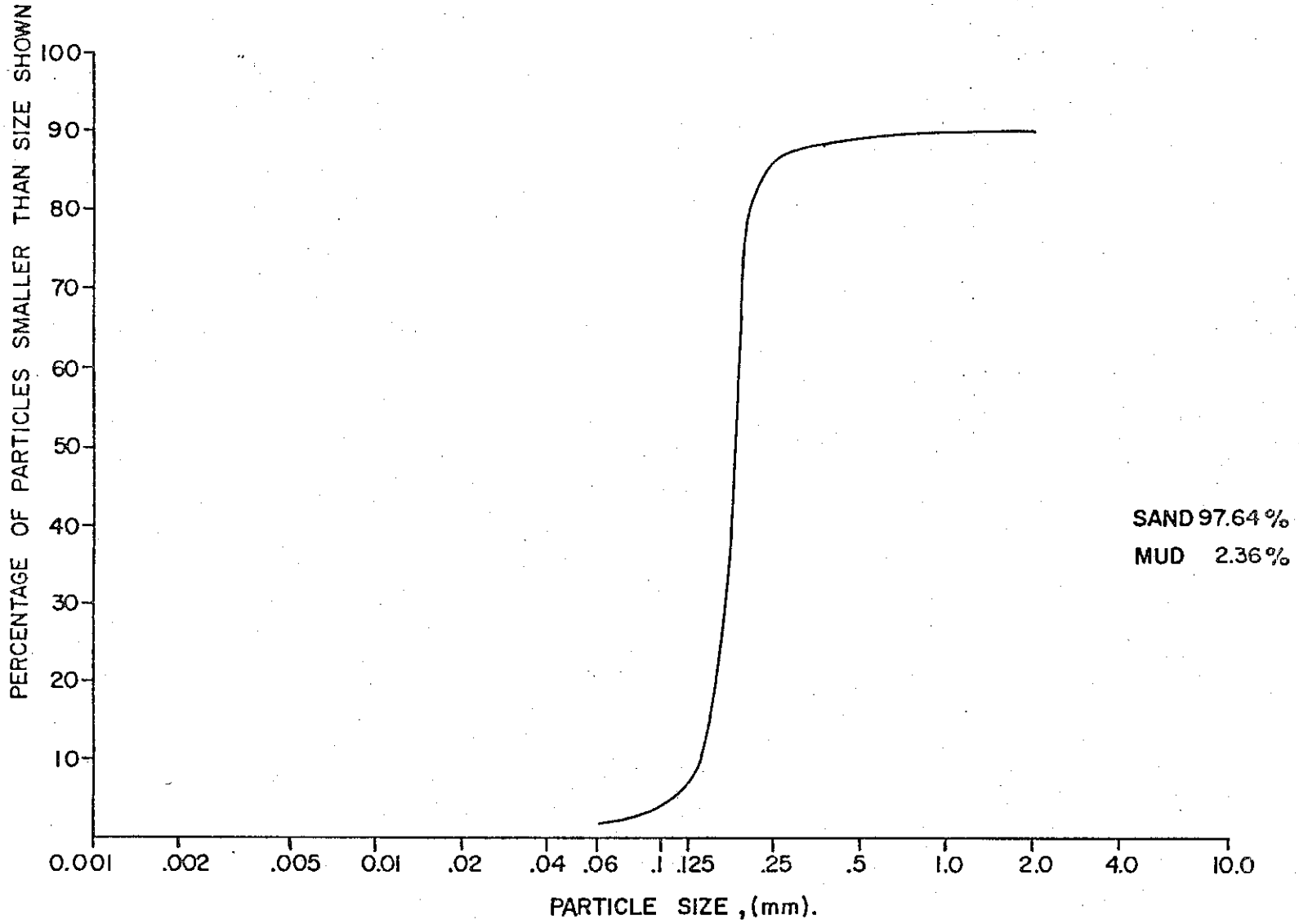


FIGURE 54. RELATIONSHIP OF NUMBER OF ORGANISMS TO SEDIMENT COMPOSITION FOR FILTER - FEEDING BIVALVES (AFTER SANDERS, 1958).

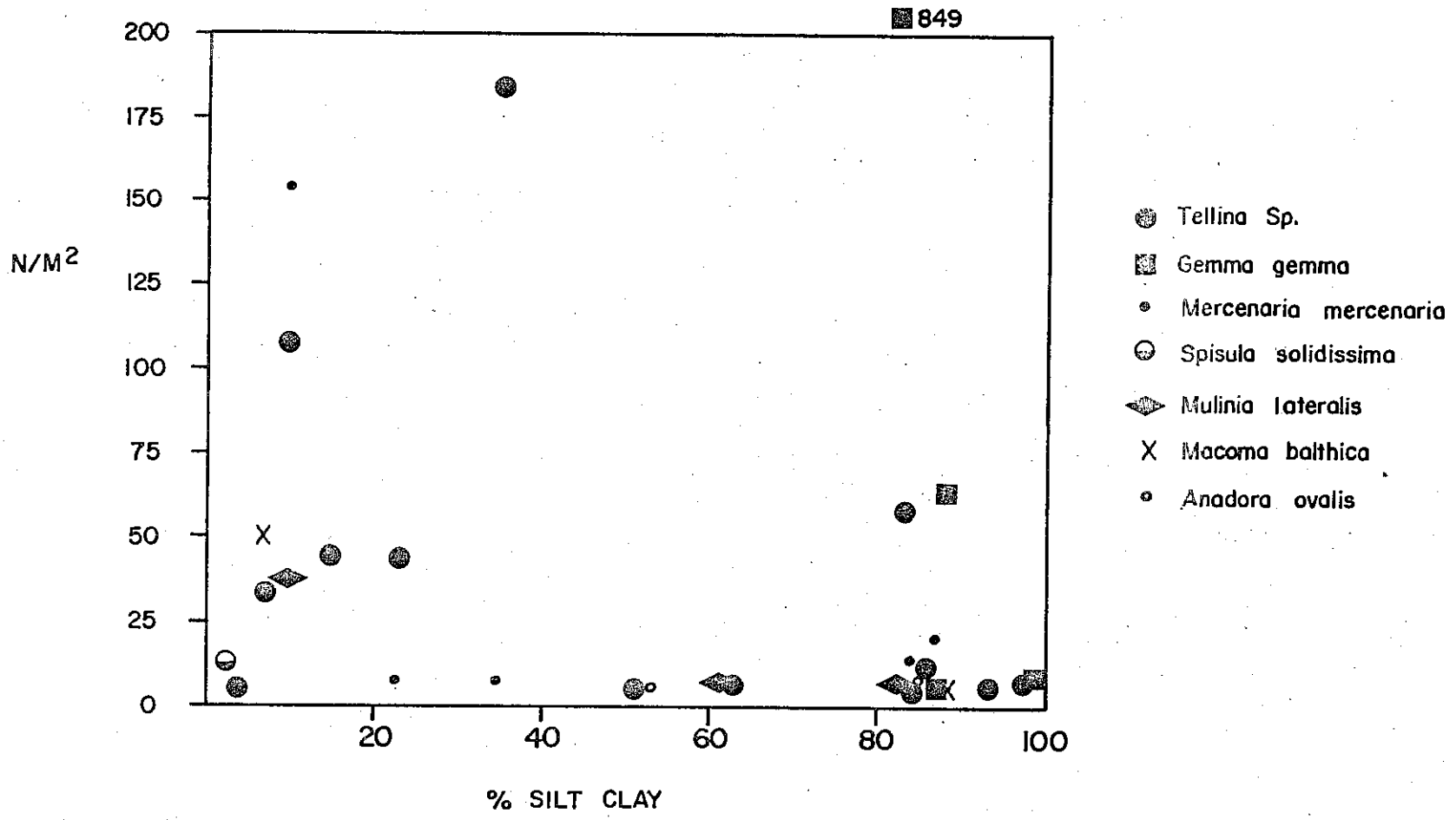


FIGURE 55. RELATIONSHIP OF NUMBER OF ORGANISMS TO SEDIMENT COMPOSITION FOR EPIFAUNAL DEPOSIT FEEDERS (AFTER SANDERS, 1958).

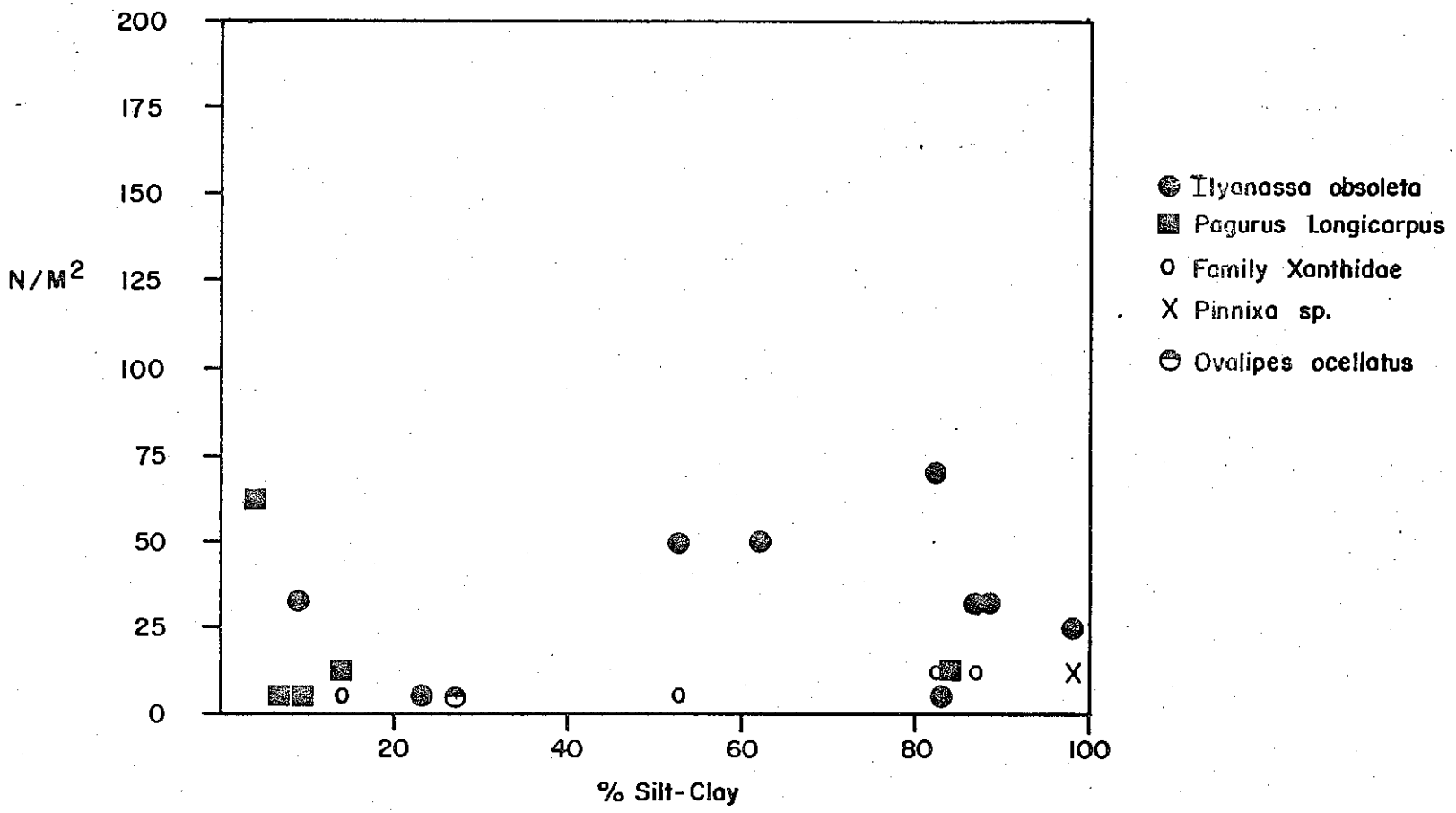


FIGURE 56. RELATIONSHIP OF NUMBER OF ORGANISMS TO SEDIMENT COMPOSITION FOR POLYCHAETES OF THE FAMILIES GLYCERIDAE AND NEPHTYIDAE (AFTER SANDERS,1958).

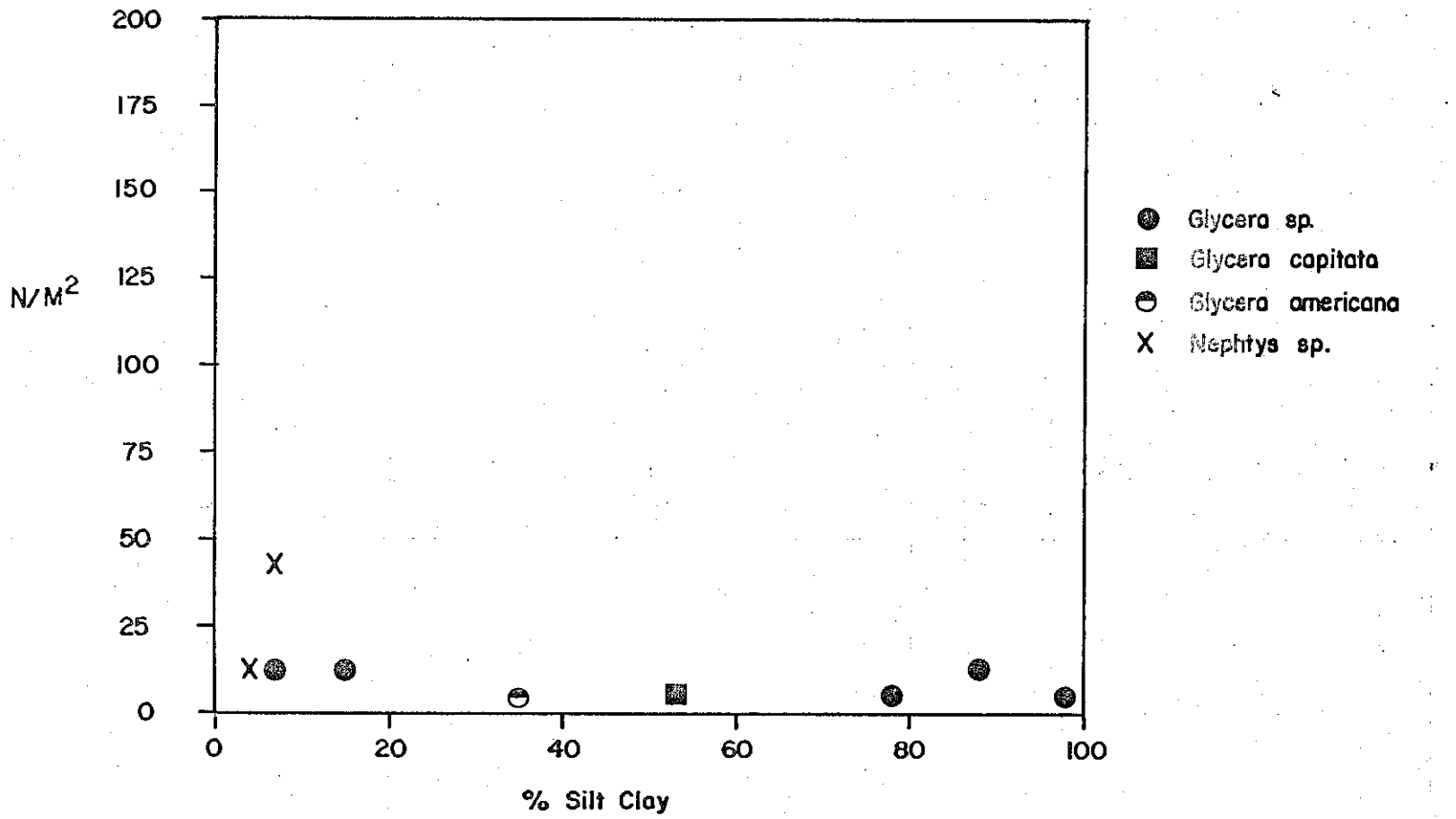


FIGURE 57. RELATIONSHIP OF NUMBER OF ORGANISMS TO SEDIMENT COMPOSITION FOR PREDACEOUS POLYCHAETES OF THE FAMILY NEREIDAE (AFTER SANDERS, 1958).

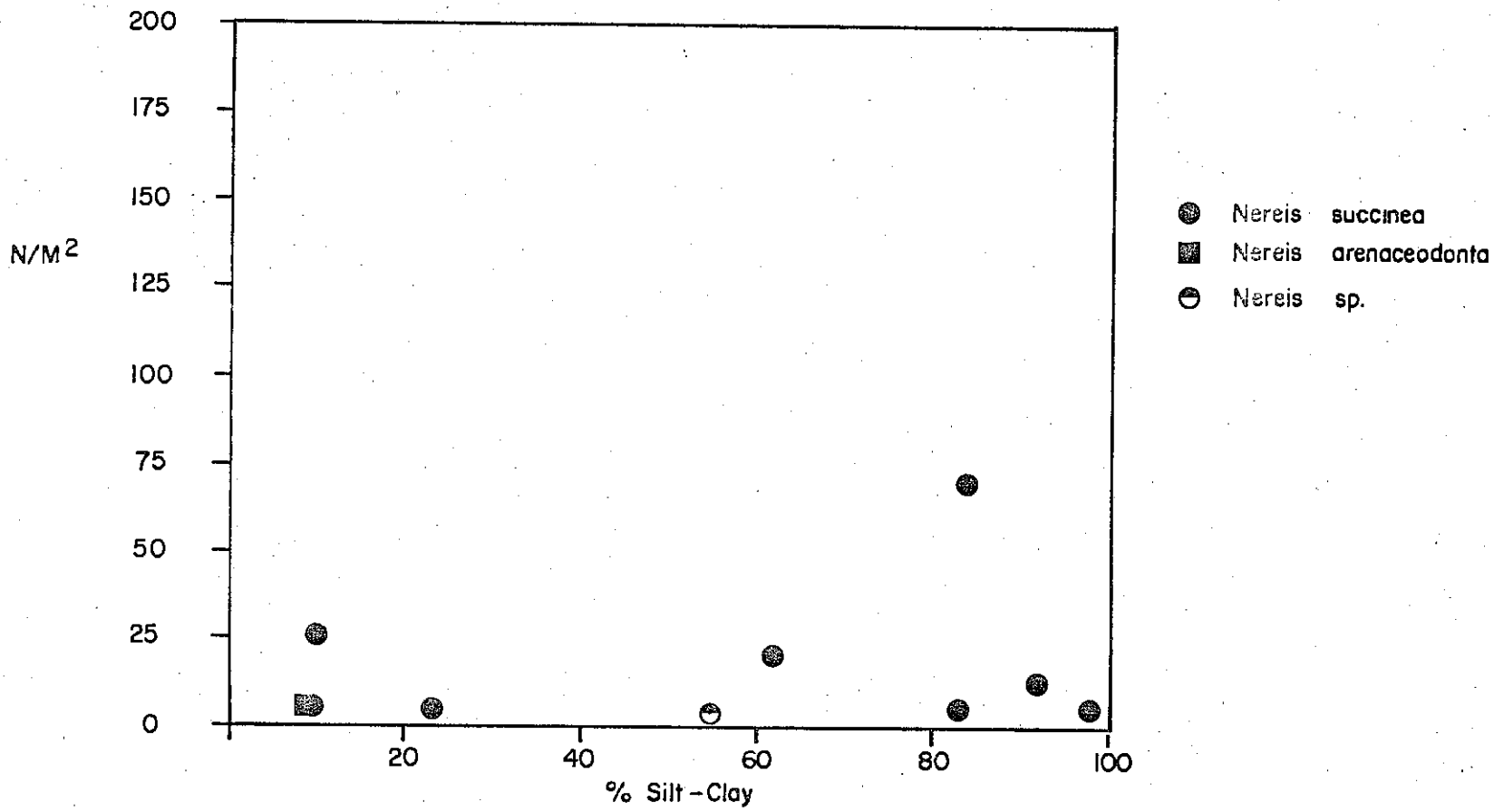


FIGURE 58. RELATIONSHIP OF NUMBER OF ORGANISMS TO SEDIMENT COMPOSITION FOR DEPOSIT FEEDING POLYCHAETES (AFTER SANDERS, 1958).

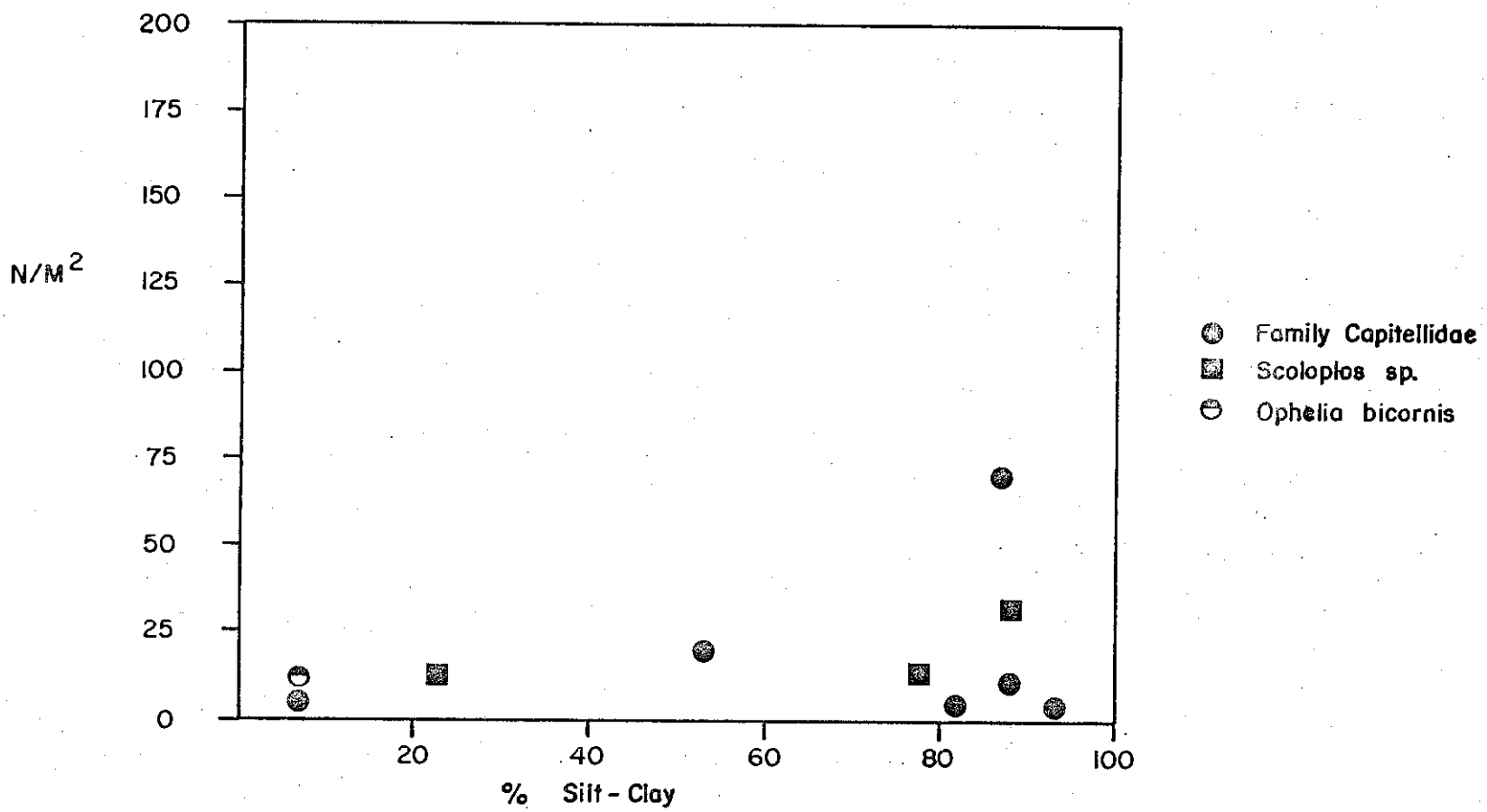


FIGURE 59. RELATIONSHIP OF NUMBER OF ORGANISMS TO SEDIMENT COMPOSITION FOR DEPOSIT FEEDING POLYCHAETES OF THE FAMILY SPIONIDAE (AFTER SANDERS, 1958).

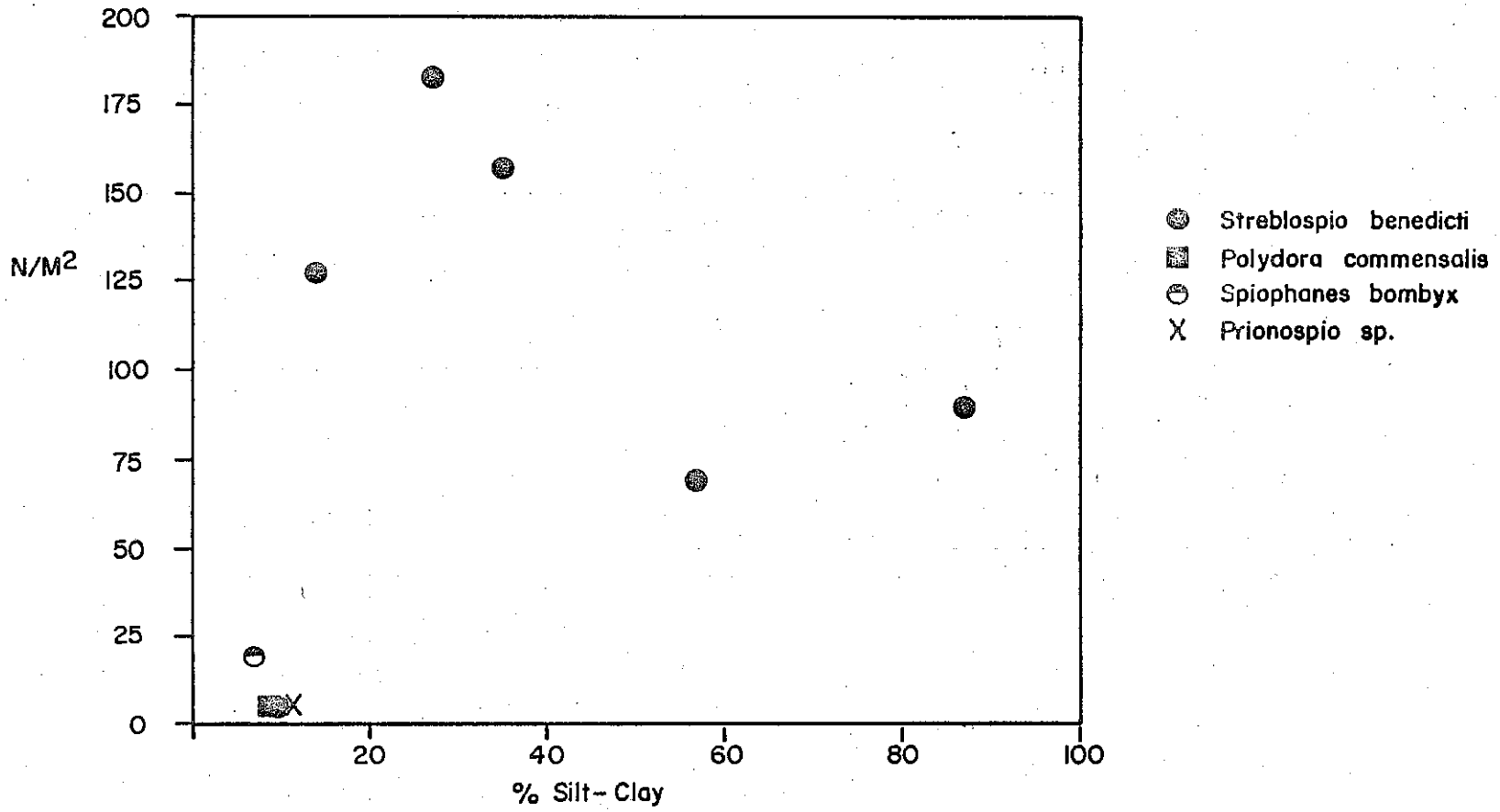


FIGURE 60. RELATIONSHIP OF NUMBER OF ORGANISMS TO SEDIMENT COMPOSITION FOR CARNIVOROUS POLYCHAETES OF THE FAMILIES LUMBRINEREIDAE AND ARABELLIDAE (AFTER SANDERS, 1958).

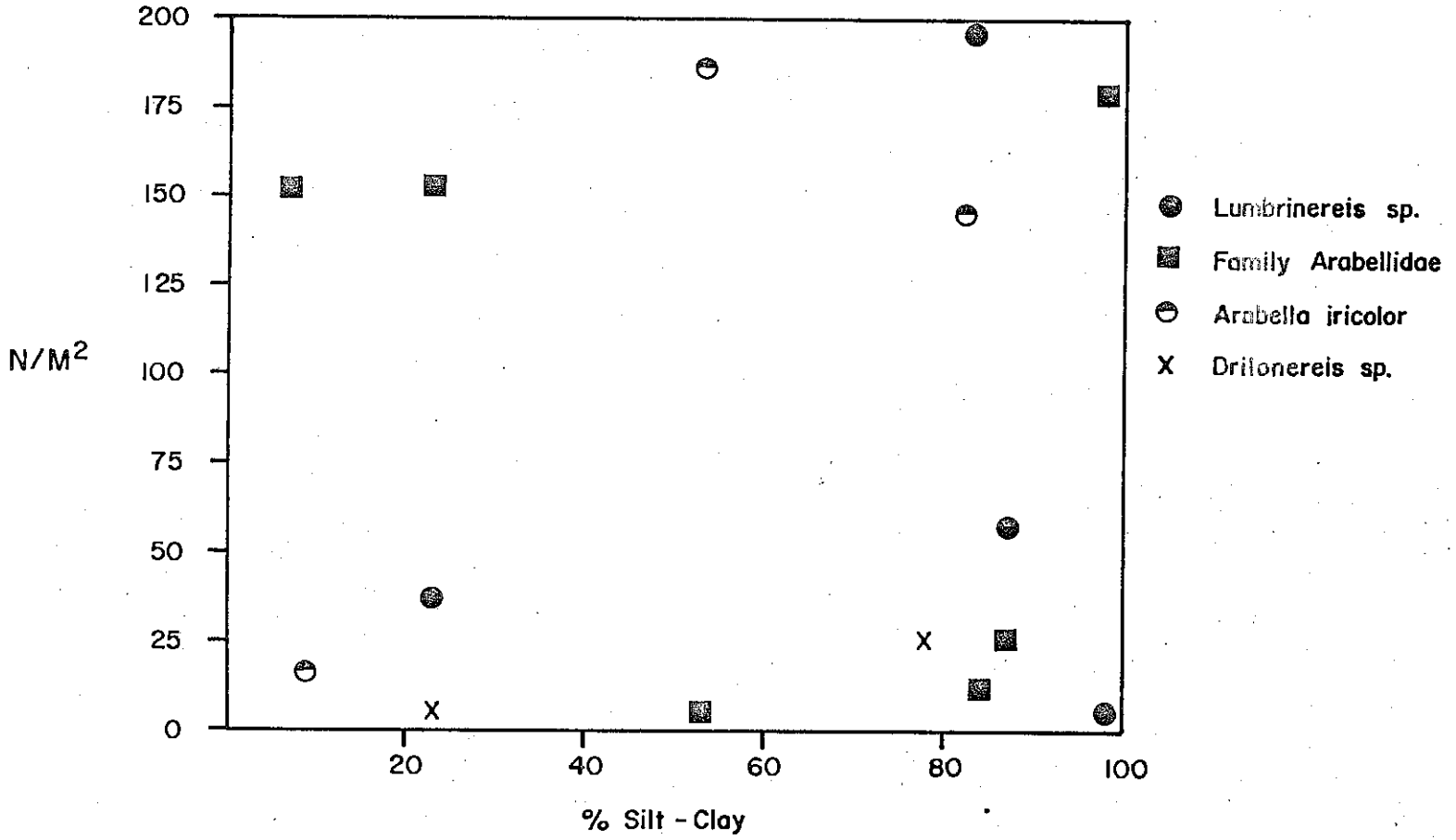


FIGURE 61. RELATIONSHIP OF NUMBER OF ORGANISMS TO SEDIMENT COMPOSITION FOR TENTACULAR FEEDING POLYCHAETES OF THE FAMILIES CIRRATULIDAE, TEREBELLIDAE, AMPHARETIDAE, PECTINARIIDAE, SABELLIDAE, AND SABELLARIDAE.

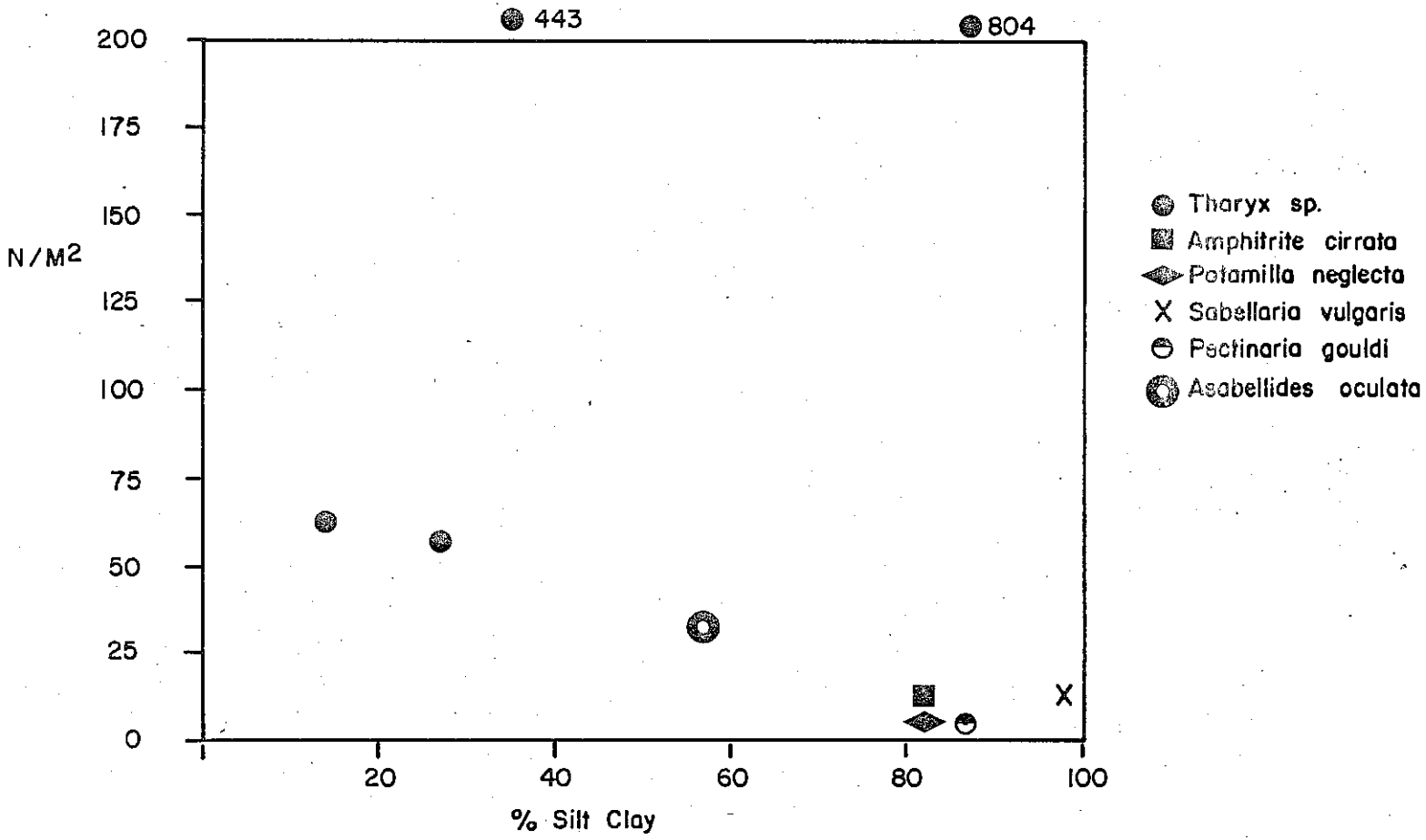


FIGURE 62. RELATIONSHIP OF NUMBER OF ORGANISMS TO SEDIMENT COMPOSITION FOR AMPHIPODS OF THE FAMILY AMPELISCIDAE (AFTER SANDERS, 1958).

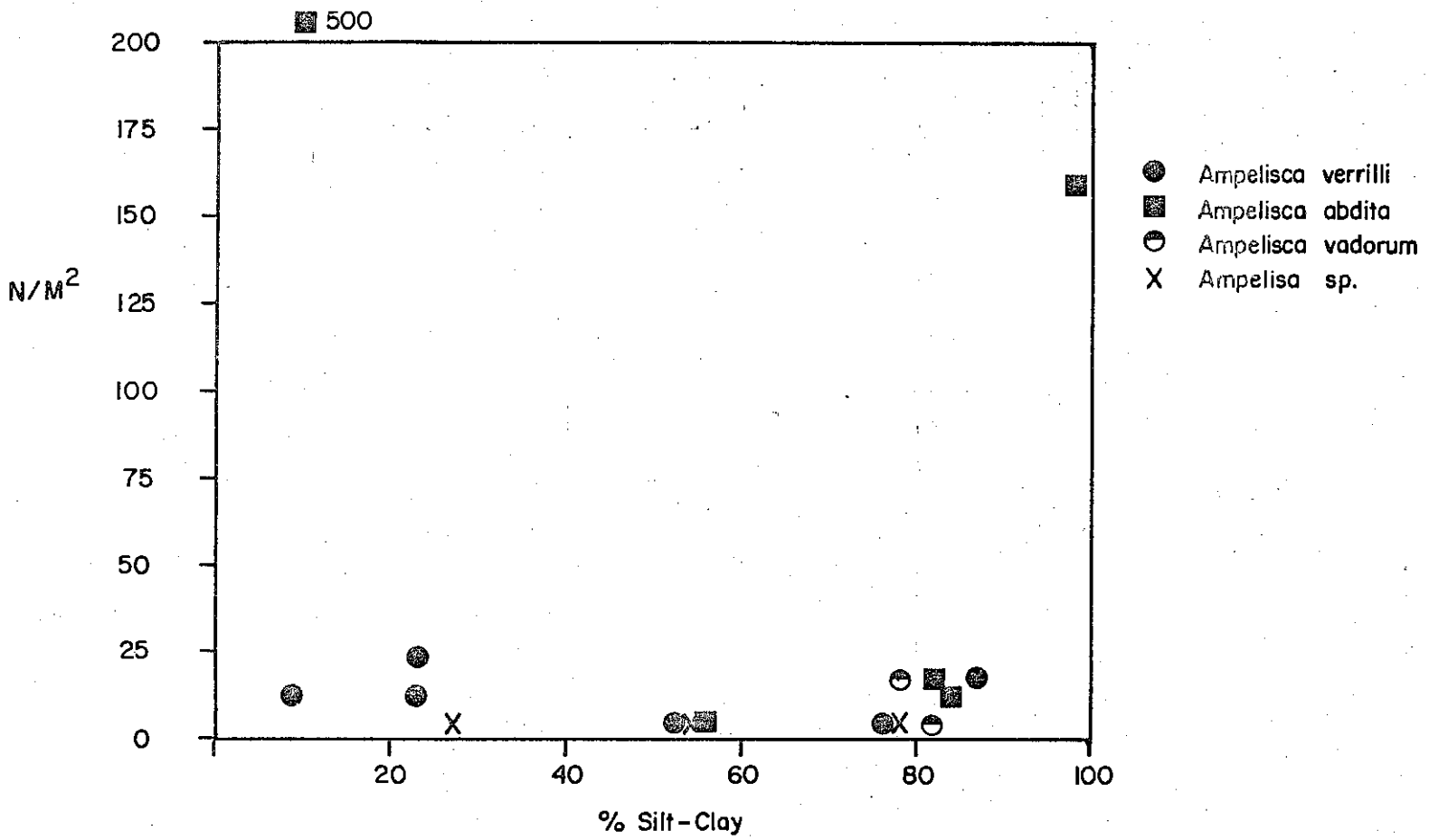
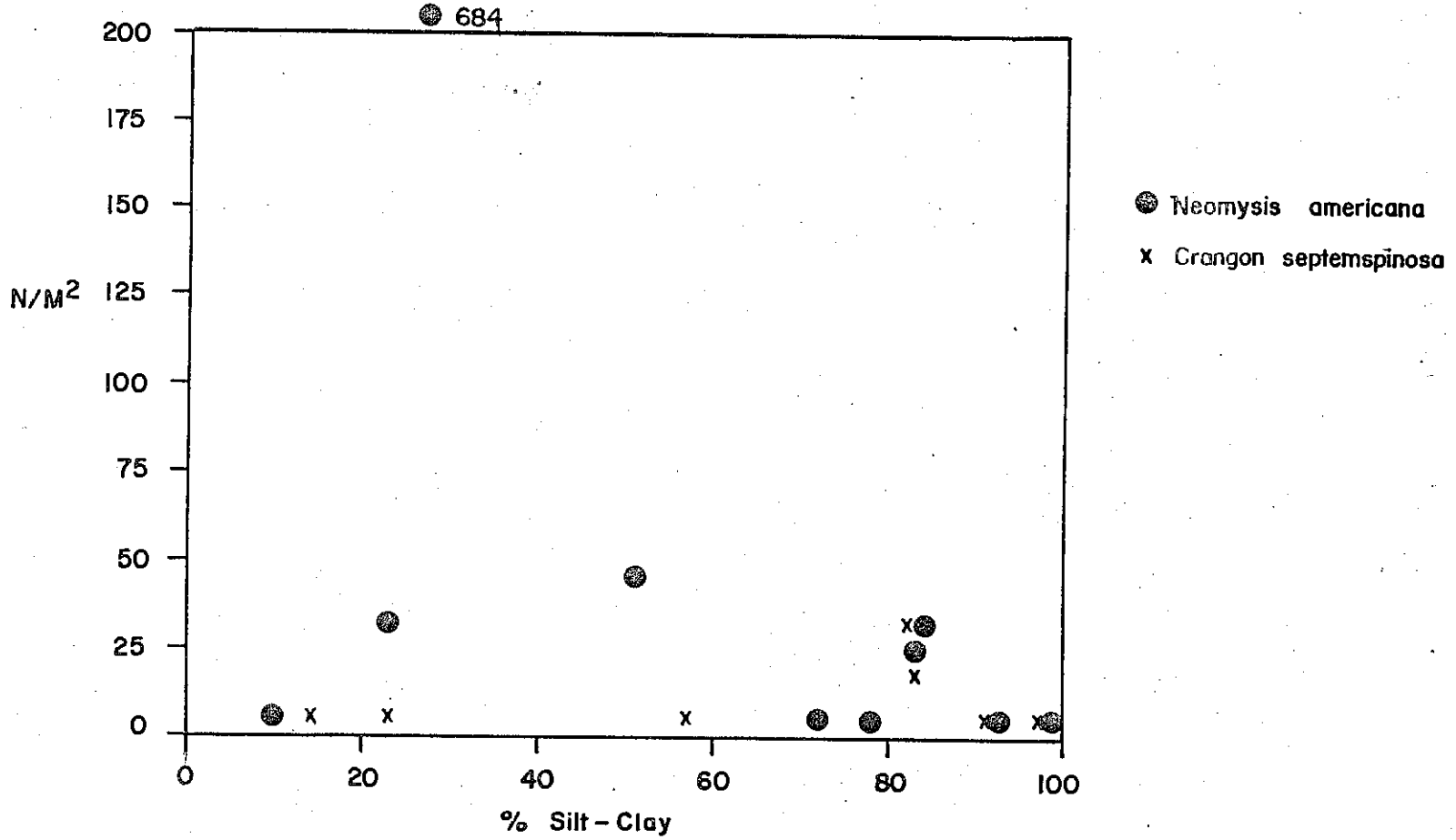


FIGURE 63. RELATIONSHIP OF NUMBER OF ORGANISMS TO SEDIMENT COMPOSITION FOR SHRIMP OF THE FAMILIES MYSIDACEA AND CRANGONIDAE (AFTER SANDERS, 1958).



USE SURVEY

By Paul G. Scarlett

ABSTRACT

A use survey of the back bay systems of Atlantic County was conducted between January 1977 and December 1977. During the 12-month period, 98,396 man-days were expended by recreational and commercial fishermen, boaters, clammers, bathers, hunters, trappers, bird watchers, and others. Recreational fishermen landed 150,634 fish and crabs, with summer flounder comprising 46% of the catch. Catch per effort for all species ranged from 1.21 in September to 0.03 in March. In Atlantic County, commercial fishermen landed 1,060,836 pounds of finfish valued at $680,623 and 6,054,982 pounds of shellfish valued at $2,907,854. Within the county, 138 trappers harvested 14,201 muskrats and 310 other furbearers valued at $58,211 as measured during the 1976 trapping season. Recreational anglers spent $988,022 on bait, food, gas, oil, equipment rental, and equipment costs.

INTRODUCTION

The Use Survey of the Back Bays of Atlantic County was the sixth such study in a continuing project designed to obtain a comprehensive measurement of recreational and commercial use of New Jersey's estuaries. The basic objectives of the Use Survey are to determine the ways in which estuarine systems are used, the relative importance of various uses, the monetary expenditures of various user groups, the man-days of recreation provided by the resource, and the harvest of biological resources.

The Use Survey was limited to the tidal waters and adjoining marshlands of Little Bay, Reed Bay, Absecon Bay, Lakes Bay, Absecon Channel, Scull Bay and the intra-coastal waterway and thorofares behind Brigantine, Atlantic City, Ventnor City, Margate City and Longport. Field work, which consisted primarily of aerial surveys and creel interviews, was conducted between January 1977 and December 1977.

ACKNOWLEDGEMENTS

The following people assisted in the collection of field data during the Use Survey: Assistant Fisheries Biologist Ken Hult, Foreman Jeffrey Carlson, Senior Fisheries Workers Barry Preim and Raymond Townsend, Fisheries Workers Joseph D. Vaughan and Russell Tilton, and Student Assistants Hal Swindell and Susan Hullings.

METHODS

Three integrated surveys were used to gather data for the Use Survey. Aerial counts were used to determine man-days of activity, creel checks for resource harvest, and expenditure surveys for recreational expenditures. Monthly sampling effort is listed in Table 118.

AERIAL SURVEYS

The aerial survey was composed of three randomly chosen flights each week. Flights were stratified into weekdays and weekend days due to differences in recreational activity, with two flights randomly scheduled for weekdays, and one flight randomly scheduled for a weekend day. Holidays were included with the weekend days due to similar recreational activity. All flights were randomly conducted between 1000 and 1600 hours, as this was shown to be the greatest activity period of the day (Hamer, 1970). Flights cancelled due to adverse weather were not rescheduled. Flight count summaries are listed in tables 119 through 131.

All survey flights followed a pre-determined path unless it was necessary to deviate from this path to obtain more accurate counts. This occured when one pass was insufficient to count large numbers of users or when closer observation was needed to determine activity type. Basically, the flight began at Bader Field in Atlantic City and followed the shoreline in a counter-clockwise direction back to the starting point, with side flights to cover major bays as they were encountered. (Figure 64).

The study area was divided into seven sectors and the people using the area were classified under ten categories. This was done to obtain a more accurate measure of the relative importance of various types of activities within different sectors of the study area. The area sectors were classified as Lakes Bay, Scull Bay, Absecon Bay, Reed Bay, Little Bay, Brigantine, and Absecon Channel. Activity categories included boat, bank and commercial fishing, boating, clamming, bathing, hunting, trapping, bird watching, and others. Definitions of area sectors and activity categories are presented in a following section.

During each flight a total count was made of each activity for each sector of the estuary. On a monthly basis, separate means were calculated for weekdays

and weekend/holidays. These stratified means were then expanded to include all of the days in that month, and then combined to estimate the total number of man-days for each activity type.

The estimated man-days of activity determined by the above method are certainly minimal ones, representing only the use during the peak activity period. There were individuals who entered and left the study area both before and after the peak use period. In an attempt to determine the percentage of users afield at any given time during the day, sixteen twelve hour surveys were conducted at several locations. An interviewer was stationed at an access site from 0700 to 1900. During this time, the interviewer logged the times when each fishermen began and ended his fishing trip.

BAG AND CREEL SURVEY

Bag and creel surveys were conducted on the same days as the aerial surveys. Fishermen were contacted by foot, car, and boat. An attempt was made to visit as many access sites as possible and to randomize the sampling effort in order to obtain harvest data which reflected that of the whole estuary rather than a few sectors.

Data collected during bag and creel interviews included the number of people in party, hours fished, remaining hours, and catch by species. On a monthly basis, mean catch per hour was calculated for bank and boat fishermen. Using the estimates of total man-days of fishing activity from the aerial surveys, the mean catch per hour data were expanded to encompass the sport fishing harvest over the entire area.

EXPENDITURE SURVEY

During bag and creel checks, about every third party was questioned re-

garding expenditures which they had made for that day's fishing trip. Data collected included number in party, expenditures for bait, boat gas and oil, food, equipment rental, original equipment costs, equipment age, round-trip mileage and number of trips annually during which the equipment in question was used in the survey area.

Average expenditures per man-day were computed by summing daily expenditures for bait, boat gas and oil, food, equipment rental, round-trip transportation and per-trip equipment costs. Round-trip transportation costs were determined by multiplying round-trip mileage by $0.17 per mile (Federal Government allowance). Per-trip equipment costs were computed by dividing the original equipment costs by the product of equipment age and number of trips annually during which the equipment was used in the study area.

Sportsmen expenditures over the entire survey area were calculated by expanding the average daily per man expenditures to encompass the total man-days of activity as determined from the use phase of the study.

DEFINITIONS

For clarity and understanding, the following list of terms in this report is given along with their definitions.

1. Bank Fisherman - Any individual fishing without a boat.
2. Boat Fisherman - Any individual fishing from a boat of any type, size or description.
3. Boating - Any boat, the occupants of which were not obviously engaged in fishing, shellfishing, or hunting.
4. Catch per effort - The average number of fish or shellfish caught per hour spent fishing, shellfishing: fish per man-hour.
5. Fish per angler - The average number of fish caught per fisherman trip; fish per man-day.

6. Hours per angler - The average number of hours spent per fisherman trip; hours per man day.

7. Man-day - An indeterminate length of time an individual spends on the study area during any day.

8. Others - Any activity that was either unknown or which did not fit in the list of categories of major user-groups. This would include, but is not limited to, sight seers, hikers, other naturalists, motor-cyclists, campers and picnickers.

RESULTS — USE ESTIMATES

Due to severe weather, no flight or bag and creel surveys were conducted during January 1977. The results are calculated for the eleven month period from February 1977 to December 1977.

During the 11-month period, an estimated 98,396 man-days of activity were spent on the survey area (Table 132). Boat fishing was the most heavily engaged in activity, accounting for 52.29 percent of all activity. Boating was second in importance, accounting for 28.00 percent of all activities. Following boat fishing and boating in popularity were bank fishing (14.72%), clamming (2.71%), others (1.02%), bathers (0.80%), commercial fishing (0.17%), bird watching (0.16%), hunting (0.14%) and trapping (0.01%). A comparison of boat and bank fishing activity and the relative importance of use activities are shown in figures 65 and 66 respectively.

Three factors contributed to the under-estimation of use figures; (1) the inability to spot everyone on the estuary and marsh; (2) the inability to cover 100 percent of the survey area during an aerial survey; (3) the inability to count people who used the area before or after an aerial survey took place.

The first two factors were probably of minor importance. The third factor, however, may have resulted in significant under-estimation of at least some user

groups. In an attempt to quantify the error, 16 twelve - hour surveys were conducted at fishermen access sites (Table 145). Although not extensive enough to compute correction factors for use estimates, the data collected do suggest the following:

1. Estimates of bank fishing activity may be less than 25 percent of the actual total during some times of the year. Trips during cold weather may be shorter than those in warmer weather, leading to reduced chance of being present during aerial surveys. Also, work or school might lead to early morning or late afternoon fishing for some anglers.
2. Boat fishermen who trailer or rent boats spend a long time on the water. Aerial surveys between 1000 and 1500 hours account for 70 to 90 percent of these fishermen.
3. The period between 1000 and 1500 hours does receive the greatest amount of bank and boat fishing use.
4. Future estuarine studies should include enough 12-hour surveys to permit the computation of correction factors for estimates.

Tables 134 through 144 give estimated man-days of activity figures by area and activity for each month of the survey, while tables 132 and 133 summarize the total estimated man-days of activity for the 11-month study period.

Scull Bay accounted for 26.75 percent of all activity on the study area. Following Scull Bay in importance were Absecon Channel (26.34%), Brigantine (22.58%), Lakes Bay (11.35%), Little Bay (5.92%), Absecon Bay (4.33%), and Reed Bay (2.73%).

The primary area used by boat fishermen was Scull Bay, accounting for 31.98 percent of the total boat fishing in the study area. Absecon Channel accounted for the highest percentage (42.22) of the total bank fishing activity in the study area.

Commercial fishermen, probably including crabbers, gill netters, and eel

potters, were seen in five of the seven sectors within the study area. These boats, however, were most likely in transit, and not actually using the study area. The primary area used by clammers was Lakes Bay, accounting for 39.90 percent of the total clamming in the study area.

Non-consumptive uses of the resource include boating, bird watching, others and bathing. The primary sectors and percentages of total use for these activities were Scull Bay (24.93%), Reed Bay (100.00%), Absecon Channel (35.36%), and Brigantine (35.99%), respectively.

HARVEST ESTIMATES

Sportfishing

Over 150,000 fish and crabs were caught by sport fishermen on the study area during the eleven-month period from February 1977 to December 1977. Catch by species of bank and boat fishermen is presented in Tables 146 through 148. Boat fishermen caught 129,054 fish and crabs, 86.7 percent of the total. Boat fishermen also had a higher average catch per effort (per hour) for the year than did bank fishermen, 0.64 and 0.60 respectively (Table 149).

As discussed earlier, the use estimates of fishing activity are low, especially in the case of bank fishermen. Since harvest estimates are derived from the use figures, harvest data are also under-estimated. If the estimates were increased through the use of correction factors, bank fishing catch estimates may have reached or surpassed that of the boat fishermen.

Summer flounder was by far the principal species in the catch of boat fishermen, comprising 51.06 percent of the catch. Following summer flounder in importance were searobin (15.45%), sharks (12.19%), bluefish (9.38%), seabass (5.23%), blue crab (2.55%), weakfish (1.56%), tautog (0.99%), croaker (0.75%), spot (0.385), porgy (0.26%), eel (0.10%), and other (0.10%).

Bluefish was the principal species in the catch of bank fishermen, com-

prising 61.14 percent of the catch. Following bluefish in importance were summer flounder (16.73%), searobin(5.57%), shark (4.58%), seabass (2.97%), blue crab (2.87%), tautog (1.90%), spot (1.06%), weakfish (0.98%), striped bass (0.16%), other (0.04%), northern puffer (0.04%), and kingfish (0.03%). Although bank fishing resulted in a lower catch per effort and total catch as compared to boat fishing; bank fishermen caught sixteen species as compared to thirteen for boat fishermen. Species absent from the boat fishing catch that were present in the bank fishing catch were cunner, kingfish, northern puffer, striped bass, and winter flounder. Species absent from the bank fishing catch that were present in the boat fishing catch were croaker and porgy.

Collectively, summer flounder topped all of the eighteen species in the combined bank and boat fishing catch, accounting for 46.15 percent. Summer flounder was followed in importance by bluefish (16.80%), searobin (14.04%), shark (11.10%), seabass (4.90%), blue crab (2.60%), weakfish (1.48%), tautog (1.12%), croaker (0.64%), spot (0.47%) porgy (0.22%), eel (0,19%), cunner (0.11%), other (0.09%), winter flounder (0.06%), striped bass (0.02%), northern puffer (0.01%), and kingfish (0.01%).

COMMERCIAL LANDINGS

The commercial landings for Atlantic County for the period of January 1977 to December 1977 are presented in Table 50. These landings are not restricted to the study area alone, but may also include Great Bay and parts of the Atlantic Ocean. Some of these landings, however, do come from the study area.

Finfish landings amounted to 1,060,836 pounds with a dockside value of $680,623. Fluke, or summer flounder, were the most abundant species in the catch, followed by swordfish, scup or porgy, grey sea trout or weakfish, and bluefish.

Shellfish landings far exceed those of finfish by weight and revenues, amounting to 6,054,982 pounds with a dockside value of $2,907,854. Surf clams, hard clams, and ocean quahog clams comprised almost the entire shellfish catch.

HUNTING AND TRAPPING

During the study period of January 1977 to December 1977, an estimated 140 man-days of hunting and 7 man-days of trapping activity occurred within the study area. These estimates are undoubtedly minimal since the height of hunting and trapping activity generally occurs early in the morning or late in the afternoon, both before and after the aerial surveys were conducted. No bag checks were undertaken and, consequently, harvest data were not obtained.

During the 1976-1977 hunting season, bag checks were conducted on the Absecon Bay and Reed Bay area by the Bureau of Game Management, (Table 151). The majority of hunting activity on tidal lands was for waterfowl. Hunters spent a total of 2,546 man-days on the Absecon-Reed Bay area to harvest 3,064 birds. The black duck accounted for the largest percentage of the harvest (48.6%), followed by snow goose (22.7%), bufflehead (6.7%), canada goose (3.6%), green-winged teal (3.6%), mallard (3.4%), pintail (3.1%), mergansers (3.1%), baldpate (2.6%) shoveller (2.1%), scaup (0.5%), gadwall (0.5%), redhead (0.3%), and blue-winged teal (0.3%), (Widjeskog, Toth, and Ferrigno, 1977).

Although information on trapping specifically within the study area is not available, trapping activity within Atlantic County has been surveyed by Pénkala (1977). Approximately 138 trappers spent 7,783 man-days of trapping activity in Atlantic County during the 1975-1976 trapping season. The harvest was 14,201 muskrats, 263 raccons, 10 red fox, 20 opossum and 17 beaver (Table 152).

In addition to providing recreation, considerable economic benefit is also

obtained through the sale of pelts. The total value of the Atlantic County fur harvest to the trapper was $98,511. The mean value to each trapper was $713.85.

Using average per man values for the state ($91.68), Atlantic County trappers spent a total of $12,651.84 on new equipment (traps, boots, boats, etc.) during the 1975-1976 season. Total money invested in trapping was $57,043.97.

EXPENDITURE ESTIMATES

During creel surveys, bank and boat fishermen were interviewed for fishing-related expenditures. The daily per man expenditure for boat fishermen was $17.09, and for bank fishermen was $7.51. (Tables 153 and 154)

Expanding the daily per man expenditures to cover total man-days of activity yields total expenditures of over $879,000 for boat fishermen and $108,000 for bank fishermen during the study period.

Boat fishermen, because of costs of boat and motor, launching fees, and boat rentals, alloted 38.36 percent of their total expenditures for daily equipment costs. Travel to and from the study area was the greatest expenditure for bank fishermen (66.90%) and second greatest for boat fishermen (22.99%).

The cost per fish or crab amounted to $6.81 for boat fishermen and $5.03 for bank fishermen.

SUMMARY

1. The Use Survey of the Back Bay Systems of Atlantic County was designed to determine the various ways in which the estuary is used by man, the expenditures of users and the harvest of various biological resources.
2. The sampling period was from January 1977 to December 1977. No field sampling was conducted during January due to severe weather.

3. During the study period, 98,396 man-days of activity were expended in the area. Boat fishing accounted for 52.29 percent of all activity, followed by boating (28.00%), bank fishing (14.72%), clamming (2.71%), others (1.02%), bathing (0.80%), commercial fishing (0.17%), bird watching (0.16%), hunting (0.14%), and trapping (0.01%).

4. Within the study area, Scull Bay accounted for 26.75 percent of all activity, followed by Absecon Channel, (26.34%), Brigantine (22.58%), Lakes Bay (11.35%), Little Bay (5.92%), Absecon Bay (4.33%), and Reed Bay (2.73%).

5. During the study period, sport fishermen caught 150,634 fish and crabs of the following species: summer flounder (46.15%), bluefish (16.80%), searobin (14.04%), shark (11.10%), seabass (4.90%), blue crab (2.60%), weakfish (1.48%), tautog (1.12%), and croaker, spot, porgy, eel, cunner, other, winter flounder, stripped bass, northern puffer, and kingfish (less than 1% each).

6. The commercial harvest for the study period included 1,060,836 pounds of finfish (valued at $680.623) and 6,054,982 pounds of shellfish (valued at $2,907,859).

7. Within Atlantic County, 138 trappers spent 7,783 man-days to harvest 14,201 muskrats and 310 other furbearers at a value of $98,511 to the trappers.

8. Recreational boat fishermen spent $879,358 and bank fishermen, $108,663 on bait, food, gas, oil, equipment rental, equipment costs, and travel. Trappers spent $12,651 on new equipment.

REFERENCES

Department of Commerce, New Jersey Landings, Annual Summary 1977, Current Fisheries Statistics No. 7511, May, 1978.

Figley, William, 1978, Use Survey, in Studies of Maurice River and Cove System, Final Report for Project 3-223-R-2. Commercial Fisheries Research and Development Act, New Jersey Division of Fish, Game and Shellfisheries, Miscellaneous Report No. 40 M.

Halgren, Bruce .A, 1973, Use Study, in Studies of the Upper Barnegat System, Final Report for Project 3-137-R-2, Commercial Fisheries Research and Development Act, New Jersey Division of Fish, Game and Shellfisheries. Miscellaneous Report No. 10 M.

Hamer, Paul .E, 1970, Use Studies, in Studies of the Mullica River - Great Bay Estuary, Final Report for Project 3-78-R-1, Commercial Fisheries Research and Development Act, New Jersey Division of Fish, Game and Shellfisheries. Miscellaneous Report No. 26 M.

Penkala, Joseph .M, 1975-1976 Trapper Harvest Recreational and Economic Survey P. R. Project W-52-R-5, Job III-B, New Jersey Division of Fish, Game and Shellfisheries.

Widjiskog, Lee, S. Toth, and F. Ferrigno, 1976-1977 Waterfowl Harvest, P. R. Project W-53-R-5. Job I-D, New Jersey Division of Fish, Game and Shell-Fisheries.

FIGURE 64. AERIAL SURVEY FLIGHT PATTERN

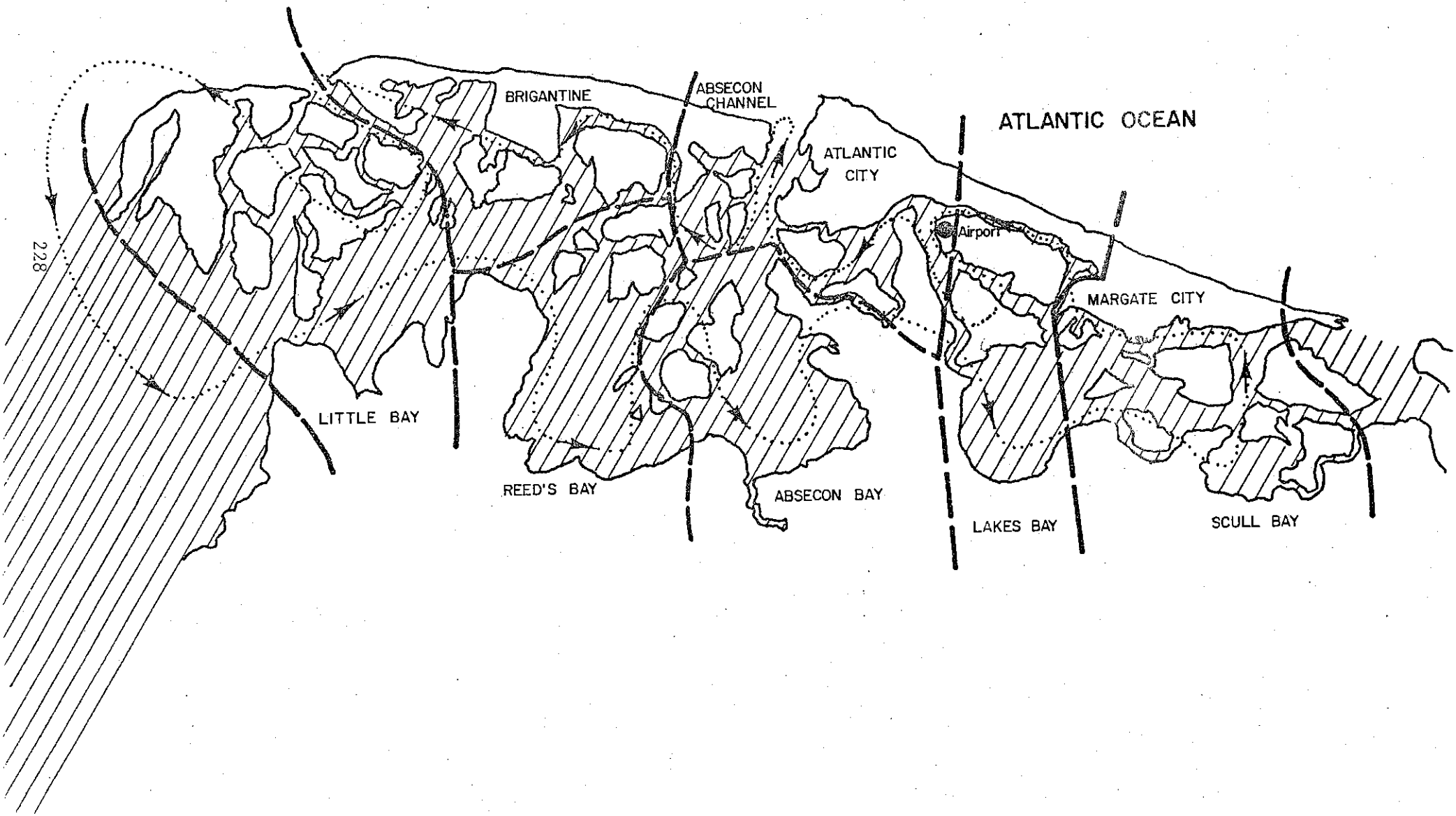


FIGURE 65.

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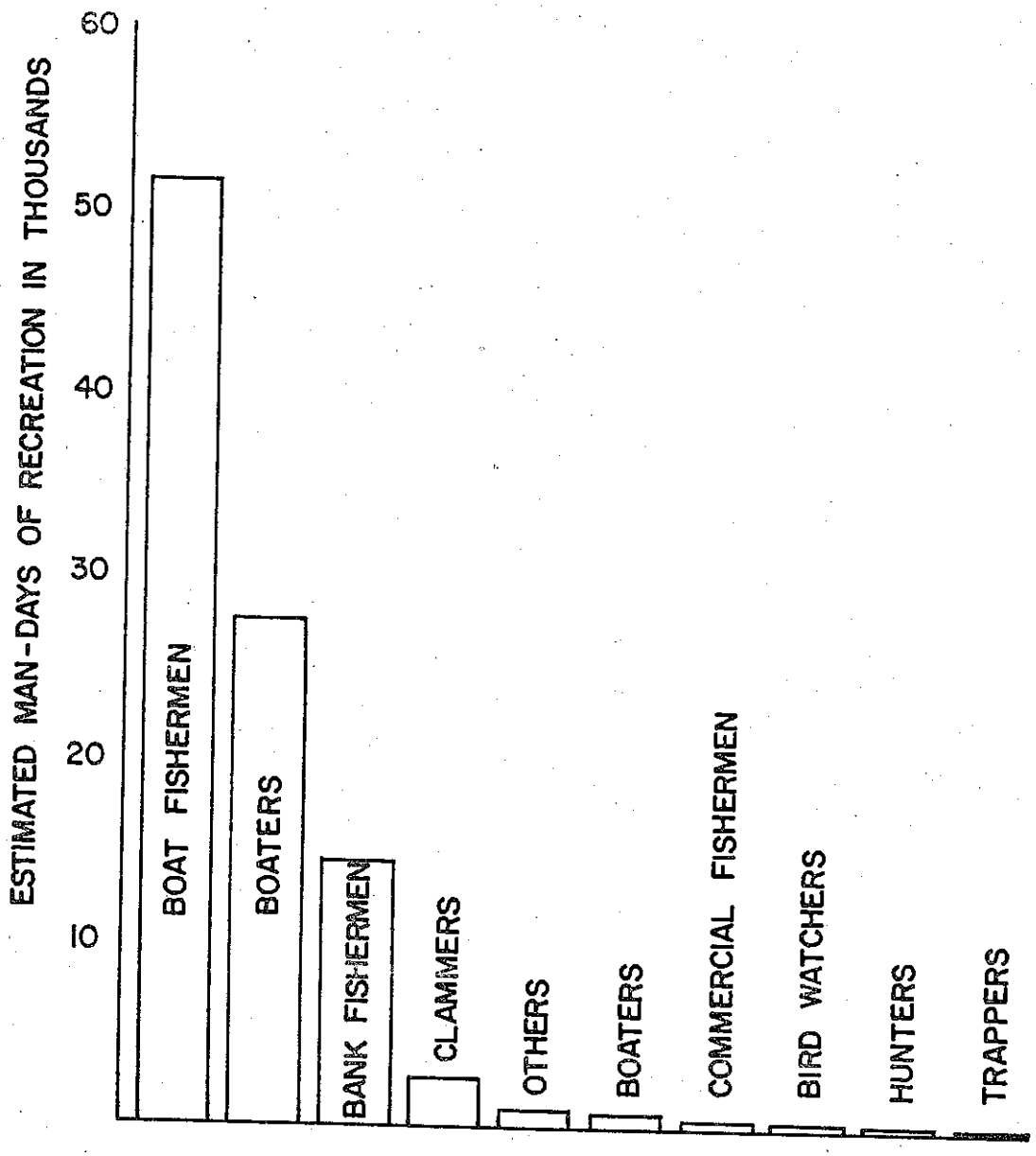

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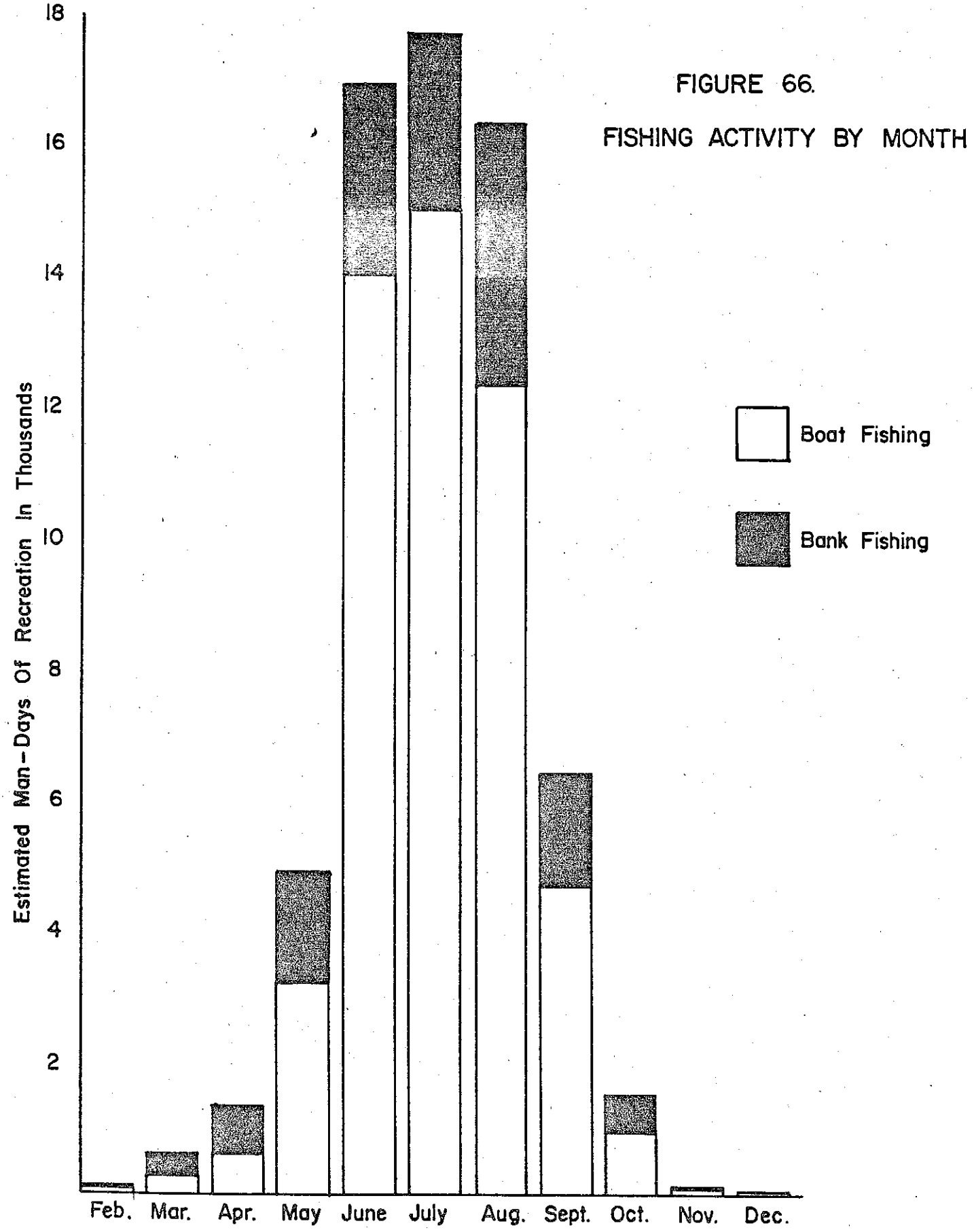

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New Jersey Department of Environmental Protection
Division of Fish, Game and Shellfish
Bureau of Fisheries
Nacote Creek Research Station

Studies of the Back Bay Systems in Atlantic County

Final Report For Project 3-223-R-3

Volume II

Appendix

This study was supported in part by funds from The Commercial Fisheries Research and Development Act.

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Table 1. Environmental Protection Agency's Listing of N.P.D.E.S. Permits Issued During 1978.*

DISCHARGER	MUNICIPALITY	RECEIVING WATERS
Atlantic City Electric Co.	Atlantic City	Beach Thorofare
Atlantic City Sewerage Co.	Atlantic City	Beach Thorofare
Atlantic County Sererage Authority	Atlantic City	Atlantic Ocean
U.S. Naval Reserve Training Center	Atlantic City	Absecon Inlet
Miles Petroleum Inc.	Atlantic City	Clam Creek
Exxon Company U.S.A.	Atlantic City	Clam Creek
City of Brigantine	Brigantine City	St. George's Thorofare
Brigantine Experimental Lab. Ichthyological Assoc.	Brigantine City	Bonita Tideway
Seaview County Club	Galloway Twp.	Tributary to Reeds Bay
Borough of Longport	Longport Boro.	Risley's Channel
City of Pleasantville	Pleasantbille City	Johnathon Thorofare
Ventnor Margate Joint Sewerage Commission	Ventnor City	Beach Thorofare

* Data taken from E.P.A., Region 2 Computer Print-out Sheets - Status of Permit Development, dated 3-2-78.

Table 2. Municipal, Institutional and Industrial Discharge Inventory for the Back Bay Systems in Atlantic County. *

MUNICIPALITY	DISCHARGER	RECEIVING STREAM	EXISTING TREATMENT PROCESS	FLOW (mgd) 1975. DES. CAP.	AVG.	MAX.
Atlantic City	Atlantic City	Beach Thorofare	Primary	18.2	10.7	13.8
Atlantic City	Atlantic City S. A. Coastal	Atlantic City	Active Sludge	40		
Brigantine City	Brigantine City	St. George's Thorofare	Contact Stabilizing	.6	1.13	1.52
Longport	Longport	Beach Thorofare	Primary	.5	.35	.39
Pleasantville	Pleasantville Water Poll. Control Fac.	Johnathan Thorofare	High Rate Trickling filter	2.05	2.37	2.8
Ventnor	Ventnor - Margate Joint Treatment Plant	Beach Thorofare	Primary	3.5	3.94	5.29
Atlantic City	Amoco Oil Co. Terminal	Clam Creek	Storm Runoff		.005	
Atlantic City	Exxon Corp.	Clam Creek	Storm Runoff		.001	.006

* Data taken from Water Quality Inventory Annual Statewide Assessment, 1975.

Table 3 Area of Submerged Contours

A_1 = surface to 3 feet contour depth; A_2 = 3 to 6 feet; A_3 = over 6 feet

(A) Area of Submerged Contours in Little Bay.

	Acres	Percent of Portion	Percent of Total
A_1	1066.1	91.7	6.4
A_2	96.4	8.3	.6
	1,162.5	100.0	7.0

(B) Area of Submerged Contours in Grassy Bay.

	Acres	Percent in Portion	Percent of Total
A_1	806.2	92.4	4.9
A_2	12.9	1.5	.1
A_3	53.3	6.1	.3
	872.4	100.0	5.3

(C) Area of Submerged Contours in Reed Bay.

	Acres	Percent of Portion	Percent of Total
A_1	2,377.4	99.8	14.4
A_2	3.7	0.2	0.0
	2,381.1	100.0	14.4

(D) Area of Submerged Contours in Absecon Bay.

	Acres	Percent of Portion	Percent of Total
A_1	1714.4	90.4	10.4
A_2	67.0	3.5	.4
A_3	115.7	6.1	.7
	1,897.1	100.0	11.5

(E) Area of Submerged Contours in Lakes Bay.

	Acres	Percent of Portion	Percent of Total
A_1	1,256.2	95.8	7.6
A_2	13.8	1.0	0.1
A_3	41.3	3.2	.2
	1,311.3	100.0	7.9

(F) Area of Submerged Contours in Scull Bay.

	Acres	Percent of Portion	Percent of Total
A_1	654.7	99.3	4.0
A_2	.9	.1	0.0
A_3	3.7	.6	0.0
	659.3	100.0	4.0

(G) Area of Submerged Contours in Brigantine Inlet, Channel and adjacent Thorofares.

	Acres	Percent of Portion	Percent of Total
A_1	1,574.8	66.7	9.5
A_2	209.4	8.9	1.2
A_3	576.7	24.4	3.4
	2,360.9	100.0	14.1

(H) Area of Submerged Contours in Absecon Inlet, Channel, and adjacent Thorofares

	Acres	Percent of Portion	Percent of Total
A_1	1,079.9	52.1	6.5
A_2	349.9	16.8	2.1
A_3	644.6	31.1	3.9
	2,074.4	100.0	12.5

(I) Area of Submerged Contours in Great Egg Harbor Inlet and adjacent Thorofares in the vicinity of Longport.

	Acres	Percent of Portion	Percent of Total
A_1	1,187.3	54.1	7.2
A_2	301.2	13.7	1.8
A_3	708.0	32.2	4.3
	2,196.5	100.0	13.3

(J) Area of Submerged Contours in the smaller bays found within the study area

1. Hammock Cove

	Acres	Percent of Portion	Percent of Total
A_1	349.9	96.0	2.1
A_2	14.7	4.0	.1
	364.6	100.0	2.2

2. Perch Cove

	Acres	Percent of Portion	Percent of Total
A_1	286.5	100.0	1.7

3. Widgeon Bay

	Acres	Percent of Portion	Percent of Total
A_1	97.3	100.0	.6

4. Steelman's Bay

	Acres	Percent of Portion	Percent of Total
A_1	24.8	56.2	.2
A_2	---	---	---
A_3	19.3	43.8	.1
	44.1	100.0	.3

5. Eagle Bay

	Acres	Percent of Portion	Percent of Total
A_1	68.0	84.0	.4
A_2	12.9	16.0	.1
	80.9	100.0	.5

6. Somers Bay

	Acres	Percent of Portion	Percent of Total
A_1	193.8	95.5	1.2
A_2	9.2	4.5	.1
	203.0	100.0	1.3

7. Shelter Island Bay

	Acres	Percent of Portion	Percent of Total
A_1	424.2	89.4	2.6
A_2	---	---	---
A_3	50.5	10.6	.3
	474.7	100.0	2.9

8. Steelman Bay (adjacent to Longport Blvd.)

	Acres	Percent of Portion	Percent of Total
A_1	66.1	100.0	0.4

(K) Length and Total Surface Area of Absecon Creek.

Acres	Percent of Total	Length (statute mile)
15.6	.1	4.5

Table 4. Water Analysis Data, Collected at Brigantine Inlet (Zone 01)

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C)			Sal (0/00)		p.h.		D.O.(mg/l)		CO_2 (mg/l)	Secchi	Depth
			Air	Sur.	Bot.	Sur.	Bot.	Sur.	Bot.	Sur.	Bot.	Sur.	(m)	(m)
3/3/77	11:30 A.M.	H+5 1/2	7.0	3.9	3.6	29.5	29.8	7.8	7.7	10.6	10.6	3.0	1.4	1.8
3/9/77	9:20 A.M.	L+5	6.0	3.6	3.6	29.9	31.1	7.7	7.7	10.1	9.8	4.7	1.7	4.3
5/13/77	9:15 A.M.	H+5	23.0	12.9	12.8	29.7	30.1	7.8	7.8	7.9	7.9	2.7	1.4	2.8
5/20/77	8:10 A.M.	L+5	18.2	14.2	14.5	29.4	29.8	8.0	8.0	7.6	7.6	2.8	1.7	3.7
6/22/77	10:30 A.M.	L+5	25.0	18.8	19.5	29.8	30.0	8.0	8.0	7.0	7.0	3.9	1.2	4.1
6/28/77	10:20 A.M.	H+5 1/2	24.8	22.0	22.2	30.0	30.3	7.9	8.0	6.7	6.6	4.4	1.1	4.0
7/13/77	10:56 A.M.	H+5 1/2	26.0	25.0	25.0	30.2	30.9	7.8	7.8	6.1	6.0	3.4	1.1	2.1
7.20/77	9:25 A.M.	L+5	25.0	21.0	20.7	29.1	29.2	7.9	7.9	5.5	5.5	4.7	1.3	3.0
8/30/77	8:00 A.M.	L+5 1/2	22.0	18.5	18.5	29.3	29.6	8.0	8.0	4.0	4.0	5.9	1.0	3.7
9/15/77	8:00 A.M.	L+5	17.5	20.0	20.5	29.7	30.0	8.0	8.0	7.3	7.4	2.1	.5	3.2
9/22/77	8:24 A.M.	H+5 1/2	17.0	18.9	18.9	28.6	29.7	7.8	7.9	6.4	6.4	10.9	.8	2.5
10/21/77	8:10 A.M.	H+5 1/2	12.0	11.0	11.5	28.3	28.7	7.8	7.8	8.3	8.3	4.9	.6	3.5
12/16/77	11:20 A.M.	L+5	9.0	6.0	5.8	28.9	29.4	8.1	8.1	10.4	10.1	6.0	.5	2.5

Table 5. Water Analysis Data, Collected at Brigantine Channel Station, Flashing Light "3" (Zone 02)

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C)			Sal (0/00)		p.h.		D.O.(mg/l)		CO_2 (mg/l)	Secchi	Depth
			Air	Sur.	Bot.	Sur.	Bot.	Sur.	Bot.	Sur.	Bot.	Sur.	(m)	(m)
3/3/77	11:45 A.M.	H+5	7.0	4.5	4.3	29.1	29.4	7.7	7.8	10.8	10.8	4.0	1.2	4.9
3/9/77	9:30 A.M.	L+4 1/2	5.8	3.5	3.5	29.9	30.7	7.7	7.9	10.4	10.8	3.0	1.5	11.0
5/13/77	9:30 A.M.	H+5 1/2	21.5	13.9	13.4	29.6	30.1	7.8	7.8	7.9	7.9	2.5	1.2	11.3
5/20/77	8.25 A.M.	L+4 1/2	19.0	15.2	15.2	29.6	29.8	8.0	8.0	7.5	7.5	2.7	1.4	12.3
6/22/77	10:42 A.M.	L+4 1/2	24.0	19.3	19.2	29.3	30.0	8.0	8.0	7.0	7.0	4.7	1.0	9.1
6/28/77	10:40 A.M.	H+5	24.0	22.7	22.7	30.0	30.3	8.0	7.9	7.0	6.9	5.4	.6	11.9
7/13/77	11:05 A.M.	H+4 1/2	26.0	25.0	25.0	29.7	30.0	7.8	7.8	6.1	5.8	3.9	1.0	7.6
7/20/77	9:36 A.M.	L+4 1/2	25.0	21.0	20.7	29.5	29.5	7.9	7.9	5.9	5.4	5.3	1.0	14.0
8/30/77	8:15 A.M.	L+5	22.0	18.5	18.5	29.6	30.7	8.1	8.1	4.0	4.0	5.4	.8	9.1
9/15/77	8:15 A.M.	L+4 1/2	18.0	20.5	20.5	29.7	30.0	8.0	8.0	7.6	7.1	3.0	.3	12.1
9/22/77	8:45 A.M.	H+5	17.0	18.9	19.0	28.6	29.7	7.8	7.8	6.2	6.2	6.7	.8	13.0
10/21/77	8:25 A.M.	H+4 1/2	12.0	11.2	11.5	28.3	28.7	8.0	7.9	8.5	8.2	5.4	.6	12.2
12/16/77	11:25 A.M.	L+4 1/2	9.0	5.0	5.8	28.9	29.1	8.1	8.1	10.1	9.7	7.4	.3	14.0

Table 6. Water Analysis Data, Collected at the Main Marsh Thorofare Station, Black Point (Zone 03).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/l) Sur.	D.O.(mg/l) Bot.	CO_2 (mg/l) Sur.	Secchi (m)	Depth (m)
3/3/77	1.05 P.M.	H+6	6.9	6.6	6.0	28.5	28.7	7.7	7.8	11.3	11.2	.5	.45	2.45
3/9/77	10.35 A.M.	L+5	7.5	5.2	5.0	29.2	29.7	7.8	7.8	10.1	10.1	5.4	.9	3.35
5/13/77	10.35 A.M.	H+5	23.0	16.6	16.0	29.0	29.4	7.9	7.9	7.6	7.5	2.5	.15	2.4
5/20/77	9.50 A.M.	L+5 1/2	21.0	18.1	16.9	29.8	30.1	8.0	8.0	6.8	6.5	4.0	.7	3.35
6/22/77	12:10 P.M.	L+5 1/2	26.0	21.2	21.0	29.6	29.6	8.0	8.0	6.8	6.6	5.6	.6	2.75
6/28/77	12:15 P.M.	L	27.0	24.8	24.6	30.0	30.6	8.0	8.1	7.2	7.0	5.6	.5	3.0
7/13/77	11:55 A.M.	H+5	28.2	27.0	26.5	30.6	30.9	8.0	7.9	7.6	7.1	3.5	.75	2.45
7/20/77	10:20 A.M.	L+5	27.0	25.3	25.0	29.2	30.3	8.0	8.0	5.4	4.5	3.8	1.0	4.25
8/30/77	9:00 A.M.	L+5 1/2	25.5	23.0	22.2	28.9	29.3	8.0	8.0	5.1	4.8	5.2	.5	4.5
9/15/77	9:30 A.M.	L+5 1/2	18.0	20.0	19.8	29.0	29.7	8.0	8.0	6.8	6.7	0	.25	7.6
9/22/77	10:10 A.M.	H+6	17.0	19.0	20.1	27.7	28.0	7.9	7.8	6.5	6.1	7.8	.25	3.0
10/21/77	9:07 A.M.	H+5	13.0	11.0	11.0	27.4	28.0	8.0	8.0	8.7	8.6	4.7	.5	1.85
12/16/77	12:00 P.M.	L+4 1/2	10.0	5.0	5.0	27.7	28.2	7.9	8.1	10.3	10.3	6.5	1.0	4.0

Table 7. Water Analysis Data, Collected at the Main Marsh Thorofare Station, Intercoastal Waterway Marker "27" (Zone 05).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/l) Sur.	D.O.(mg/l) Bot.	CO_2 (mg/l) Sur.	Secchi (m)	Depth (m)
3/3/77	1:23 P.M.	L	6.9	5.8	4.3	27.4	29.0	7.8	7.8	11.4	10.6	1.4	.75	4.5
3/9/77	10:50 A.M.	L+5	7.8	5.6	5.0	26.3	28.3	7.8	7.8	10.5	10.4	4.2	1.7	4.6
5/13/77	11:05 A.M.	H+6	21.5	16.0	15.3	27.5	28.5	7.9	7.9	8.1	7.8	3.4	1.3	6.4
5/20/77	10:10 A.M.	L+5 1/2	21.5	19.5	19.2	27.1	27.1	8.1	8.0	7.2	7.0	3.3	.7	4.6
6/22/77	12.20 P.M.	L+5 1/2	25.0	23.0	23.0	28.7	28.9	8.1	8.1	8.0	8.0	2.9	.75	4.1
6/28/77	12:35 P.M.	L	28.0	24.5	24.5	29.6	30.3	8.0	8.0	6.8	6.1	4.4	1.0	4.6
7/13/77	12:05 P.M.	H+5 1/2	28.0	26.0	25.5	29.5	30.6	8.0	8.0	6.9	6.4	4.4	.6	1.85
7/20/77	10:30 A.M.	L+4 1/2	28.0	26.7	26.7	29.5	----	7.9	8.0	5.4	5.0	4.4	1.0	5.2
8/30/77	9:20 A.M.	L+5 1/2	26.0	24.2	24.0	26.7	29.3	8.1	8.0	5.7	5.0	6.2	.6	7.0
9/15/77	9:45 A.M.	L+5 1/2	18.0	20.0	19.7	28.5	29.7	8.0	8.0	7.1	7.1	5.0	.5	7.0
9/22/77	10:40 A.M.	L	17.0	19.9	19.9	27.2	----	7.9	---	6.2	---	5.5	.5	6.0
10/21/77	9:20 A.M.	H+5 1/2	14.0	11.0	11.0	26.2	27.6	8.0	7.9	9.0	8.4	6.2	.6	7.6
12/16/77	12:15 P.M.	L+5	10.0	4.0	4.0	26.7	26.9	7.9	7.9	11.2	11.0	6.7	1.0	6.5

Table 8. Water Analysis Data, Collected at the Obes Thorofare Station, Flashing Red "6" (Zone 12).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/1) Sur.	D.O.(mg/1) Bot.	CO_2 (mg/1) Sur.	Secchi (m)	Depth (m)
3/3/77	12:05 P.M.	H+5	6.5	5.3	5.5	28.6	29.1	7.8	7.8	11.3	11.2	.5	1.5	5.8
3/9/77	9:45 A.M.	L+4	6.0	4.8	4.7	29.5	30.1	7.8	7.8	10.2	10.1	4.2	1.8	6.1
5/13/77	9:45 A.M.	H+4 1/2	22.5	14.4	14.0	29.6	30.3	7.9	7.9	7.7	7.9	5.1	1.2	4.1
5/20/77	8:45 A.M.	L+4 1/2	19.5	16.7	16.2	29.2	29.6	8.1	8.1	7.2	7.2	3.4	1.2	5.0
6/22/77	10:55 A.M.	L+4 1/2	24.5	21.0	21.2	29.3	30.0	8.1	8.0	6.7	6.3	4.9	1.0	4.6
6/28/77	10:55 A.M.	H+5	23.0	23.5	23.5	30.1	30.5	8.1	8.0	7.6	7.6	---	.6	5.2
7/13/77	11:20 A.M.	H+4 1/2	26.0	25.5	25.0	29.2	30.1	7.9	7.9	6.7	6.5	6.0	1.0	4.6
7/20/77	9:47 A.M.	L+4 1/2	25.0	23.8	23.5	29.2	30.6	8.0	8.0	5.4	5.0	3.0	1.0	7.3
8/30/77	8:28 A.M.	L+5	23.2	22.0	21.8	28.9	29.6	8.1	8.1	5.9	5.1	7.5	1.0	7.0
9/15/77	8:45 A.M.	L+5 1/2	18.5	19.5	20.5	29.7	30.4	8.0	8.0	6.9	6.8	5.3	.5	8.5
9/22/77	9:00 A.M.	H+5	17.0	18.9	18.9	28.6	29.4	7.9	7.9	6.0	5.5	4.8	.5	6.0
10/21/77	8:35 A.M.	H+4 1/2	13.0	11.0	11.0	28.0	28.5	8.0	8.0	8.5	8.4	3.9	.6	6.0
12/16/77	11:35 A.M.	L+4 1/2	10.0	5.0	5.0	28.5	28.9	8.1	8.1	10.5	9.8	7.0	.75	5.5

Table 9. Water Analysis Data, Collected at Bonita Tideway Station (Zone 14).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/1) Sur.	D.O.(mg/1) Bot.	CO_2 (mg/1) Sur.	Secchi (m)	Depth (m)
3/3/77	12:25 P.M.	H+5 1/2	6.8	5.0	4.0	29.1	29.3	7.8	7.8	11.3	10.4	.5	1.5	5.8
3/9/77	10:00 A.M.	L+4 1/2	7.0	5.0	4.8	29.7	30.4	7.8	7.8	10.2	10.1	2.3	1.8	3.0
5/13/77	10:05 A.M.	H+5	22.0	13.4	13.0	29.9	30.3	7.9	7.8	8.1	7.8	4.2	2.4	6.7
5/20/77	9:00 A.M.	L+5	19.5	18.2	16.8	28.7	29.8	8.1	8.0	7.5	6.5	3.4	1.7	5.5
6/22/77	11:15 A.M.	L+5	25.0	21.8	20.9	29.6	30.0	8.1	8.0	7.0	6.6	10.0	1.2	7.6
6/28/77	11:25 A.M.	H+5 1/2	22.5	22.6	22.6	30.1	30.3	8.0	7.8	5.7	5.3	4.4	1.2	5.5
7/13/77	11:32 A.M.	H+5	26.0	25.0	25.0	29.5	30.0	7.9	7.9	5.5	5.4	5.5	1.2	4.25
7/20/77	10:00 A.M.	L+5	26.0	23.5	23.2	29.2	30.9	8.0	7.9	5.4	4.8	4.8	1.4	7.6
8/30/77	8:45 A.M.	L+5 1/2	24.0	22.0	21.9	29.6	29.6	8.0	8.0	5.0	4.2	4.8	.8	6.1
9/15/77	9:10 A.M.	L+5 1/2	18.5	20.5	20.5	29.4	29.7	8.0	8.0	6.6	6.4	3.7	.75	8.5
9/22/77	9:15 A.M.	H+5	17.0	21.0	20.1	28.6	29.3	7.9	7.9	5.4	5.7	8.8	1.0	7.0
10/21/77	8:50 A.M.	H+5	13.0	12.0	11.8	28.3	28.7	8.0	7.9	8.2	8.0	4.7	1.2	6.0
12/16/77	11:45 A.M.	L+5	10.0	5.0	4.8	28.9	28.9	8.1	8.1	10.6	10.6	5.8	1.25	7.5

Table 10. Water Analysis Data, Collected at Absecon Inlet (Zone 10)

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/1) Sur.	D.O.(mg/1) Bot.	CO_2 (mg/1) Sur.	Secchi (m)	Depth (m)
3/3/77	11:45 A.M.	H+5 1/2	7.0	4.9	4.3	29.0	29.7	7.8	7.8	10.7	10.6	.7	1.5	6.5
3/9/77	9:30 A.M.	L+5	7.5	4.5	4.5	30.1	30.3	7.7	7.7	10.0	9.9	4.4	3.7	5.0
5/13/77	9:25 A.M.	H+5	21.0	14.0	14.0	29.3	29.6	7.9	7.9	8.0	7.7	3.2	1.8	7.0
5/20/77	8.08 A.M.	L+5	17.2	13.0	13.0	27.1	29.8	8.1	8.0	7.5	7.5	2.1	1.8	6.55
6/22/77	10:40 A.M.	L+5 1/2	20.5	17.7	18.0	29.8	30.3	8.0	7.9	7.6	7.1	2.9	2.4	7.0
6/28/77	10:10 A.M.	H+5	25.0	21.3	23.6	28.5	29.6	8.0	7.9	6.8	6.7	5.1	1.4	6.0
7/13/77	10:31 A.M.	H+5	26.0	24.0	24.0	27.1	29.5	7.9	7.9	6.0	6.0	8.0	1.5	5.2
7/20/77	9:25 A.M.	L+5	25.0	19.5	17.5	29.5	30.6	7.8	7.8	4.3	4.3	8.0	2.1	7.6
8/30/77	7:45 A.M.	L+5 1/2	25.0	18.5	17.5	30.4	30.8	7.9	7.9	4.0	3.8	4.3	1.5	7.6
9/15/77	8:04 A.M.	L+5 1/2	17.5	19.5	19.5	29.2	30.0	8.1	8.1	6.7	6.6	1.6	1.0	8.0
9/22/77	8:25 A.M.	H+5 1/2	16.0	19.0	18.5	29.4	29.5	7.9	7.9	6.2	6.0	4.3	.5	9.0
10/21/77	8:15 A.M.	H+5	11.0	11.0	11.0	28.4	28.9	8.0	8.0	8.0	7.9	5.4	1.0	8.0
12/16/77	11:19 A.M.	L+5	10.0	5.0	4.5	28.7	28.8	8.1	8.1	10.3	10.2	7.2	1.0	9.1

Table 11. Water Analysis Data, Collected at St. George's Thorofare Cove Station (Zone 15).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/1) Sur.	D.O.(mg/1) Bot.	CO_2 (mg/1) Sur.	Secchi (m)	Depth (m)
6/22/77	10:30 A.M.	L+5	23.8	22.0	21.5	-	30.0	-	7.9	-	-	-	.6	7.6
6/28/77	10:20 A.M.	H+5	24.0	23.0	22.5	29.6	30.1	7.9	7.9	6.9	6.7	5.4	1.2	2.7
7/13/77	10:45 A.M.	H+4 1/2	26.0	25.5	24.0	27.1	29.9	7.7	7.7	5.8	2.0	6.1	.45	3.0
7/20/77	9:51 A.M.	L+5	25.0	26.5	22.5	27.1	30.9	8.8	7.6	9.8	0	0	.45	5.5
8/30/77	7:55 A.M.	L+5	25.0	23.5	21.5	29.0	29.4	8.3	7.5	7.3	4.4	5.3	.6	7.3
9/15/77	8:15 A.M.	L+5	17.5	20.0	20.0	28.0	29.7	8.3	8.0	6.3	1.9	4.0	.75	8.5
9/22/77	8:35 A.M.	H+5	16.0	20.0	19.5	28.1	28.7	7.8	7.8	2.5	1.6	9.3	1.0	5.5
10/21/77	8:22 A.M.	H+5	11.0	10.5	12.0	23.9	27.1	7.9	7.9	6.4	6.2	11.1	1.0	6.0
12/16/77	11:29 A.M.	L+5	10.0	5.0	4.0	26.9	28.0	7.9	8.0	9.8	9.3	5.5	1.0	7.3

Table 12. Water Analysis Data, Collected at the Middle Thorofare Station, Pole 73 (Zone 09).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/1) Sur.	D.O.(mg/1) Bot.	CO_2 (mg/1) Sur.	Secchi (m)	Depth (m)
3/3/77	11:56 A.M.	H+5	8.0	4.0	4.2	28.4	28.8	7.8	7.8	10.8	10.7	1.9	1.0	8.5
3/9/77	9:50 A.M.	L+5	7.0	4.5	4.5	30.1	30.1	7.7	7.7	10.0	8.3	5.4	3.0	10.0
5/13/77	9:43 A.M.	H+4 1/2	21.5	15.0	14.5	28.5	29.0	7.9	7.9	10.0	7.9	0	1.4	13.0
5/20/77	8:20 A.M.	L+4 1/2	18.1	13.5	14.0	26.6	28.5	8.0	8.0	7.4	7.3	3.9	1.8	2.6
6/22/77	10:55 A.M.	L+5	20.5	17.7	18.5	29.3	30.0	8.0	8.0	7.6	7.1	4.4	2.0	11.0
6/28/77	10:34 A.M.	H+5	24.0	24.5	24.0	28.4	29.8	7.9	7.9	6.7	6.1	6.4	.3	2.9
7/13/77	11:02 A.M.	H+4 1/2	26.0	25.0	25.0	27.4	29.1	7.7	7.7	5.5	5.4	5.4	.75	2.4
7/20/77	10:07 A.M.	L+5 1/2	25.0	17.0	18.0	29.5	30.3	7.8	7.8	3.6	3.0	7.2	1.8	9.5
8/30/77	8:06 A.M.	L+5	25.0	18.0	17.5	29.7	29.7	7.9	7.9	3.8	3.7	5.5	1.0	12.2
9/15/77	8:35 A.M.	L+5 1/2	17.5	19.5	20.0	29.8	29.9	8.2	8.1	6.4	6.3	2.7	.5	10.0
9/22/77	8:50 A.M.	H+5	16.0	19.0	18.5	29.2	29.2	7.9	7.9	5.9	5.8	5.9	.75	11.5
10/21/77	8:34 A.M.	H+5	11.0	10.5	10.5	28.5	28.5	8.0	8.0	8.2	6.9	4.9	.5	8.0
12/16/77	11:40 A.M.	L+5	10.0	5.0	5.0	28.1	28.1	8.1	8.1	10.1	10.1	6.7	.75	14.6

Table 13. Water Analysis Data, Collected at the Absecon Bay Channel Station, Flashing Light 9.

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/1) Sur.	D.O.(mg/1) Bot.	CO_2 (mg/1) Sur.	Secchi (m)	Depth (m)
3/3/77	1:20 P.M.	L	9.0	6.9	6.5	27.1	27.9	7.8	7.9	11.3	11.3	.7	1.0	1.5
3/9/77	10:35 A.M.	L+5	7.0	5.0	5.0	29.8	29.9	7.8	7.7	4.3	3.9	4.2	2.15	3.0
5/13/77	9:55 A.M.	H+4 1/2	21.5	16.3	16.0	28.2	28.4	8.0	8.0	8.3	8.2	2.5	.45	3.65
5/20/77	8:35 A.M.	L+4	18.1	15.5	15.5	24.9	25.6	8.0	8.0	6.9	6.9	3.5	1.2	2.75
6/22/77	11:45 A.M.	L+5	23.5	20.0	20.3	28.5	30.0	7.9	8.0	7.5	7.2	8.6	1.1	2.25
6/28/77	10:59 A.M.	H+5	24.0	24.0	24.2	27.8	29.6	8.0	7.9	6.5	6.2	4.6	1.2	2.4
7/13/77	11:14 A.M.	H+4 1/2	26.0	26.0	25.0	24.9	29.1	7.9	8.1	6.8	6.7	1.0	.3	1.5
7/20/77	10:24 A.M.	L+5	26.0	18.0	18.5	28.8	29.5	7.7	7.9	4.0	3.3	6.7	1.2	2.75
8/30/77	8:18 A.M.	L+4 1/2	25.0	19.0	18.5	-	30.1	7.9	7.9	4.0	4.0	5.7	1.0	2.9
9/15/77	8:49 A.M.	L+5	17.5	20.0	19.0	29.7	29.9	8.1	8.1	6.5	6.5	3.0	.5	3.0
9/22/77	9:00 A.M.	H+5	16.0	18.5	20.0	28.8	29.3	7.9	7.9	6.0	6.0	-	.75	2.0
10/21/77	8:45 A.M.	H+5	11.0	10.5	10.5	26.7	27.1	8.0	8.0	8.4	8.3	6.4	.25	2.0
12/16/77	11:49 A.M.	L+4 1/2	10.0	5.0	5.0	28.1	28.1	8.1	8.1	10.2	10.2	6.5	.75	3.7

Table 14. Water Analysis Data, Collected at the Intercoastal Channel Flashing Light 58. (Zone 07).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C)			Sal (0/00)		p.h.		D.O.(mg/1)		CO_2 (mg/1)	Secchi	Depth
			Air	Sur.	Bot.	Sur.	Bot.	Sur.	Bot.	Sur.	Bot.	Sur.	(m)	(m)
5/13/77	10:40 A.M.	H+5 1/2	24.0	16.5	17.5	29.0	30.0	7.9	7.9	7.6	7.5	2.9	.75	3.0
5/20/77	9:28 A.M.	L+5	20.0	15.0	14.6	27.1	28.3	8.0	8.0	7.5	7.3	3.8	1.8	3.35
6/22/77	11:59 A.M.	L+5 1/2	23.5	18.5	19.0	29.6	30.0	8.0	8.0	-	7.3	4.4	1.1	4.25
7/13/77	12:00 P.M.	H+5 1/2	26.0	26.0	-	27.8	29.1	7.7	7.9	6.6	6.1	3.1	1.6	2.6
7/20/77	11:14 A.M.	L+5 1/2	26.5	19.0	19.0	29.5	30.9	7.8	8.0	5.7	4.2	7.1	1.7	3.3
8/30/77	8:59 A.M.	L+5 1/2	26.0	19.0	18.5	29.4	29.7	7.9	7.9	4.0	4.0	0.0	1.5	5.2
9/15/77	9:21 A.M.	L+5 1/2	18.0	20.5	20.0	28.7	29.8	8.1	8.1	6.6	6.0	1.9	1.0	4.0
9/22/77	9:54 A.M.	H+6	17.0	18.0	18.0	29.1	29.1	7.8	7.8	6.1	6.0	6.3	.5	3.0
10/21/77	9:22 A.M.	H+5 1/2	11.0	11.0	11.0	28.2	28.5	8.0	7.9	9.6	8.1	5.2	.5	4.0
12/16/77	12:28 P.M.	L+5	13.5	6.0	5.0	28.1	28.3	8.1	8.1	10.2	10.2	5.8	.75	6.4

Table 15. Water Analysis Data, Collected at the Beach Thorofare Station, Flashing Light 6 (Zone 16).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C)			Sal (0/00)		p.h.		D.O.(mg/1)		CO_2 (mg/1)	Secchi	Depth
			Air	Sur.	Bot.	Sur.	Bot.	Sur.	Bot.	Sur.	Bot.	Sur.	(m)	(m)
3/3/77	12:35 P.M.	H+5 1/2	8.0	5.9	5.6	27.0	27.4	7.9	7.9	12.0	12.1	0.0	1.0	2.0
3/9/77	10:00 A.M.	L+5	7.5	5.0	5.0	30.0	30.2	7.7	7.7	10.0	10.0	4.0	2.2	3.5
5/13/77	10:05 A.M.	H+5	22.0	16.0	16.0	28.2	28.5	8.1	8.1	9.7	9.7	0.0	1.2	3.0
5/20/77	8:52 A.M.	L+5	18.5	14.0	14.5	30.8	31.0	8.1	8.0	7.4	7.3	2.4	1.7	4.9
6/22/77	11:10 A.M.	L+5 1/2	23.5	20.0	19.5	28.9	30.0	7.8	8.0	7.0	6.7	5.9	1.1	4.0
6/28/77	10:48 A.M.	H+5	24.0	23.9	24.0	29.3	30.7	8.0	8.0	5.8	5.7	4.9	1.4	2.4
7/13/77	11:29 A.M.	H+5	26.5	25.5	25.0	27.4	29.1	7.6	7.5	4.2	3.9	8.6	.75	2.9
7/20/77	10:39 A.M.	L+5	26.0	18.5	18.0	28.8	28.8	7.7	7.8	3.4	3.1	8.2	1.5	4.6
8/30/77	8:31 A.M.	L+5 1/2	26.0	18.5	18.0	29.7	30.4	7.9	7.9	3.5	3.4	4.0	.75	5.2
9/15/77	8:59 A.M.	L+5 1/2	17.5	20.0	20.0	29.3	29.4	8.1	8.1	6.2	6.3	2.7	.5	5.0
9/22/77	9:22 A.M.	H+5 1/2	16.5	20.0	19.0	28.5	28.7	7.8	8.0	5.1	5.1	0.0	.75	2.5
10/21/77	8:55 A.M.	H+5	11.0	11.0	11.0	26.9	27.5	7.9	7.9	7.7	7.5	5.7	1.0	4.0
12/16/77	12:01 P.M.	L+5	11.5	5.0	5.0	28.5	28.5	8.1	8.1	10.1	10.0	5.3	.5	6.1

Table 16. Water Analysis Data, Collected at the Beach Thorofare Station, Railroad Bridge (Zone 17).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C)			Sal (0/00)		p.h.		D.O.(mg/l)		CO_2 (mg/l)	Secchi	Depth
			Air	Sur.	Bot.	Sur.	Bot.	Sur.	Bot.	Sur.	Bot.	Sur.	(m)	(m)
3/3/77	12:53 A.M.	H+6	9.0	6.5	6.5	27.0	27.2	7.9	7.8	12.2	12.1	0.0	1.2	3.0
3/9/77	10:15 A.M.	L+5	7.5	6.0	6.0	29.5	29.6	7.8	7.8	10.3	10.4	4.2	1.5	4.0
5/13/77	10:15 A.M.	H+5	24.0	16.0	16.0	28.2	29.0	8.1	8.0	10.2	10.0	0.0	1.4	4.0
5/20/77	9:05 A.M.	L+5	20.0	17.8	17.5	23.9	-	8.0	8.0	6.9	6.7	2.5	1.2	3.65
6/22/77	11:20 A.M.	L+5 1/2	24.0	22.5	21.7	28.5	30.0	8.2	8.1	8.0	7.3	3.7	1.1	3.5
6/28/77	11:17 A.M.	H+5 1/2	24.0	23.0	23.0	29.6	30.1	7.9	7.9	6.2	6.2	7.6	.4	1.8
7/13/77	11:30 A.M.	H+5	26.5	25.5	25.5	28.5	29.5	7.6	7.7	4.6	4.1	.74	.75	4.0
7/20/77	10:46 A.M.	L+6	26.5	25.0	24.5	28.8	30.2	8.0	8.2	5.5	4.5	8.3	1.0	5.8
8/30/77	8:38 A.M.	L+5 1/2	26.0	22.0	21.0	28.7	29.0	7.9	7.9	4.4	3.7	5.1	1.0	3.7
9/15/77	9:06 A.M.	L+4 1/2	18.0	20.0	20.0	29.1	29.2	8.1	8.0	6.2	6.2	2.9	.75	4.5
9/22/77	9:34 A.M.	H+5 1/2	17.0	20.0	20.0	28.9	29.5	7.9	8.0	4.7	4.6	7.5	1.0	2.5
10/21/77	9:05 A.M.	H+5 1/2	11.0	10.5	10.8	26.7	27.3	7.9	7.9	7.7	7.6	6.2	1.25	3.0
12/16/77	12:12 P.M.	L+5 1/2	11.5	5.0	5.0	26.5	28.5	8.1	8.1	10.6	10.3	6.5	1.0	8.5

Table 17. Water Analysis Data, Collected at the Beach Thorofare Station, Route 40 Bridge (Zone 18)

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C)			Sal (0/00)		p.h.		D.O.(mg/l)		CO_2 (mg/l)	Secchi	Depth
			Air	Sur.	Bot.	Sur.	Bot.	Sur.	Bot.	Sur.	Bot.	Sur.	(m)	(m)
3/3/77	2:10 P.M.	L+1	7.0	6.0	6.0	27.4	27.5	7.9	7.9	12.0	11.8	0.0	1.7	2.0
3/9/77	11:25 A.M.	H	9.0	6.2	6.2	27.3	27.5	7.9	8.0	11.4	11.2	.5	1.4	1.8
5/13/77	11:23 A.M.	L	26.5	16.3	17.0	25.9	28.9	7.9	8.0	9.0	9.0	1.5	.9	.9
5/20/77	9:35 A.M.	L+5 1/2	20.0	19.5	18.0	28.3	29.9	8.2	8.1	8.2	7.1	0.0	1.4	4.0
6/22/77	12:19 P.M.	H	25.0	23.0	23.0	28.9	-	8.2	8.2	8.8	8.4	3.8	1.0	2.1
6/28/77	12:10 P.M.	L+ 1/2	25.0	25.0	25.0	30.3	30.7	8.1	7.9	5.2	3.7	5.1	.6	1.2
7/20/77	11:00 A.M.	H	30.5	28.5	28.5	28.8	29.2	7.9	8.0	5.0	4.8	6.5	.5	1.7
8/30/77	9:14 A.M.	H	27.5	24.4	23.6	28.3	28.7	7.9	7.9	4.5	4.2	5.7	.75	2.1
9/15/77	9:39 A.M.	H	19.0	20.5	20.5	29.1	29.4	7.9	8.0	5.4	5.3	6.0	.75	3.0
9/22/77	9:48 A.M.	L	18.0	21.0	21.0	29.1	29.1	7.7	7.6	5.1	5.1	7.8	.75	1.0
10/21/77	9:45 A.M.	L	12:5	12.0	-	25.7	-	7.8	-	7.9	-	4.4	.75	.75
12/16/77	1:50 P.M.	L+1/2	5.5	4.0	3.7	26.9	27.7	7.9	8.1	11.0	10.6	7.9	1.5	2.0

Table 18. Water Analysis Data, Collected at the Inside Thorofare Station (Zone 20).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/l) Sur.	D.O.(mg/l) Bot.	CO_2 (mg/l) Sur.	Secchi (m)	Depth (m)
3/3/77	1:53 P.M.	L+1	9.0	6.0	5.5	27.5	27.7	7.8	7.9	11.7	11.6	0.0	1.4	5.5
3/9/77	11:10 A.M.	H	8.0	6.5	6.2	27.7	27.7	8.0	7.9	11.8	11.6	0.0	1.2	5.2
5/13/77	11:00 A.M.	H+6	26.0	15.8	16.3	27.6	27.6	7.8	7.8	7.7	7.6	4.9	2.4	3.4
5/20/77	9:15 A.M.	L+5	20.0	18.5	18.0	27.1	29.6	8.1	8.0	6.7	6.2	5.6	1.5	4.0
6/22/77	12:02 P.M.	L+6	25.0	23.5	23.5	-	29.3	8.0	7.9	7.1	5.9	5.9	1.4	5.8
6/28/77	11:50 A.M.	L	24.0	25.0	24.0	29.6	30.7	7.7	7.7	6.1	3.7	7.1	.9	2.9
7/20/77	10:45 A.M.	L+5 1/2	29.0	29.0	28.5	28.5	29.2	7.9	7.9	3.4	2.9	9.3	.75	3.7
8/30/77	9:00 A.M.	L+5 1/2	27.3	24.0	23.8	28.3	28.7	7.8	7.7	4.1	3.8	6.2	1.2	4.3
9/15/77	9:16 A.M.	L+5 1/2	18.0	20.5	20.5	28.3	29.4	7.9	7.9	5.9	5.2	5.5	1.0	5.5
9/22/77	9:32 A.M.	H+5 1/2	18.0	21.0	21.0	28.9	29.3	7.8	7.6	3.6	2.7	9.9	1.5	4.5
10/21/77	9:30 A.M.	H+6	12.5	12.0	11.8	26.4	27.5	7.7	7.7	7.5	7.2	7.1	2.25	5.0
12/16/77	12:45 P.M.	L+6	6.0	3.7	2.5	26.7	27.1	7.9	7.9	10.5	10.5	8.6	1.5	6.0

Table 19. Water Analysis Data, Collected at the Inside Thorofare Cove Station, Ventnor City (Zone 21).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/l) Sur.	D.O.(mg/l) Bot.	CO_2 (mg/l) Sur.	Secchi (m)	Depth (m)
3/3/77	1.25 P.M.	L+1/2	9.0	6.0	3.5	27.5	27.6	7.9	7.7	11.3	7.5	.5	1.5	4.9
3/9/77	10.45 A.M.	L+5 1/2	7.2	6.2	5.8	27.7	27.7	7.9	7.9	10.8	10.6	.7	1.7	3.0
5/13/77	10:40 A.M.	H+5 1/2	25.5	15.0	15.5	27.6	29.0	7.9	-	7.9	7.5	5.1	2.3	3.0
5/20/77	9:00 A.M.	L+5	20.0	18.5	18.0	27.8	28.5	8.0	8.0	6.8	6.4	4.4	1.8	4.3
6/22/77	11:40 A.M.	L+6	24.5	23.0	23.0	27.8	30.0	8.1	8.0	8.0	6.9	4.4	1.4	3.7
6/28/77	11:30 A.M.	L	22.5	24.5	23.5	30.3	30.3	7.9	7.8	5.4	4.4	4.4	.6	1.8
7/20/77	10:20 A.M.	L+5 1/2	29.0	27.5	27.0	28.5	30.2	8.0	8.0	4.0	3.6	6.9	.6	3.7
8/30/77	8:40 A.M.	L+5 1/2	27.0	23.5	23.4	28.3	28.7	7.9	7.9	4.8	4.3	5.7	1.5	3.4
9/15/77	8:49 A.M.	L+5 1/2	18.0	20.5	20.0	28.0	29.1	8.0	8.0	5.9	5.8	5.6	1.0	3.5
9/22/77	9:15 A.M.	H+5 1/2	18.0	21.0	21.0	28.9	29.1	7.9	7.9	6.1	6.3	5.8	1.5	3.0
10/21/77	9:15 A.M.	H+6	12.5	11.5	11.5	27.1	27.1	7.8	7.8	7.7	7.7	5.9	1.75	3.5
12/16/77	12:20 P.M.	L+5 1/2	6.5	3.6	3.0	26.6	27.8	8.0	8.1	10.9	10.4	-	1.8	4.0

Table 20. Water Analysis Data, Collected at the Beach Thorofare Station, Shelter Island Flashing Light 35 (Zone 19).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/l) Sur.	D.O.(mg/l) Bot.	CO_2 (mg/l) Sur.	Secchi (m)	Depth (m)
3/3/77	1:05 P.M.	L+ 1/2	9.0	5.3	5.0	27.0	27.1	7.9	7.8	11.3	10.8	0.0	.9	3.7
3/9/77	10:28 A.M.	L+5 1/2	7.5	5.0	5.0	28.1	28.7	7.8	7.8	10.7	10.6	3.0	1.7	5.5
5/13/77	10:25 A.M.	H+5 1/2	23.5	14.5	15.0	26.2	28.0	8.0	7.9	8.6	8.5	2.0	2.0	2.3
5/20/77	8:50 A.M.	L+5	17.0	16.5	16.0	28.7	30.1	8.0	8.0	7.0	6.8	4.7	1.2	5.2
6/22/77	11:26 A.M.	L+5 1/2	23.5	22.5	21.5	29.3	29.3	8.1	8.1	7.3	6.9	2.2	1.0	3.7
6/28/77	11:15 A.M.	H+6	22.5	24.0	23.5	30.0	30.1	8.0	8.0	6.9	5.5	2.2	.9	3.2
7/20/77	10:10 A.M.	L+5 1/2	26.0	26.0	25.0	27.8	28.5	8.0	8.0	4.6	4.6	5.5	.5	4.6
8/30/77	8:30 A.M.	L+5 1/2	25.0	22.0	21.4	28.7	28.8	-	7.9	4.6	4.5	4.7	.75	6.1
9/15/77	8:33 A.M.	L+5 1/2	16.5	20.0	20.0	29.3	29.4	8.0	8.1	6.4	6.2	5.3	.5	7.0
9/22/77	9:05 A.M.	H+5 1/2	18.0	21.0	21.0	29.1	29.1	7.8	7.9	5.5	5.1	13.7	1.0	5.0
10/21/77	9:05 A.M.	H+5 1/2	12.0	11.5	12.0	26.6	27.5	7.8	7.8	8.1	7.9	5.2	1.0	3.0
12/16/77	12:10 P.M.	L+5 1/2	6.5	4.6	4.7	28.4	28.7	8.1	8.1	10.9	10.6	6.7	1.2	7.0

Table 21. Water Analysis Data, Collected at the Margate Bridge Station, Toms Island (Zone 26).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/l) Sur.	D.O.(mg/l) Bot.	CO_2 (mg/l) Sur.	Secchi (m)	Depth (m)
3/3/77	12:50 P.M.	L	7.0	5.8	5.5	27.2	27.2	7.9	7.9	10.9	10.8	0.0	1.3	3.0
3/9/77	10:15 A.M.	L+5 1/2	7.5	5.0	4.5	28.0	28.4	7.8	7.8	11.6	9.7	3.0	1.7	4.0
5/13/77	9:57 A.M.	H+5	21.5	15.0	15.5	27.3	28.5	8.0	7.9	8.3	8.2	3.2	1.5	3.7
5/20/77	8:35 A.M.	L+5	16.5	15.0	15.0	29.2	30.7	8.0	8.0	6.8	6.7	4.5	.75	3.7
6/22/77	11:06 A.M.	L+5 1/2	25.0	20.0	20.0	29.1	29.3	8.1	8.1	7.4	7.3	3.4	.9	4.9
6/28/77	10:50 A.M.	H+5 1/2	23.5	24.5	24.5	30.7	30.7	8.0	8.0	6.5	6.0	5.4	.6	1.0
7/13/77	12:10 P.M.	L	26.0	25.5	25.0	27.8	28.5	7.9	7.8	7.1	5.5	4.8	.5	2.4
7/20/77	9:56 A.M.	L+5 1/2	25.5	23.5	23.0	28.0	28.1	8.0	8.0	5.1	4.7	6.5	.6	3.6
8/30/77	8:18 A.M.	L+5 1/2	25.0	20.0	19.1	28.3	29.1	7.9	7.9	4.6	4.1	6.2	1.2	4.0
9/15/77	8:21 A.M.	L+5	16.5	20.0	20.0	29.1	29.4	8.1	8.1	6.8	6.8	2.9	.75	4.0
9/22/77	8:54 A.M.	H+5	18.0	19.5	20.0	28.9	29.9	7.8	7.7	5.8	5.7	6.0	.5	4.0
10/21/77	8:40 A.M.	H+5 1/2	11.0	10.5	10.5	26.9	27.5	7.8	7.8	8.4	8.1	6.4	.75	3.0
12/16/77	11:54 A.M.	L+5	6.0	5.4	5.2	28.7	28.9	8.1	8.1	10.4	10.3	5.0	1.0	5.0

Table 22. Water Analysis Data, Collected at the Margate Bridge Station, Dock Thorofare (Zone 27).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/l) Sur.	D.O.(mg/l) Bot.	CO_2 (mg/l) Sur.	Secchi (m)	Depth (m)
3/3/77	12:32 P.M.	H+6	9.0	5.8	5.5	26.0	26.1	7.9	7.8	11.7	11.4	0.0	1.1	3.7
3/9/77	10:00 A.M.	L+5	9.0	4.5	4.5	28.5	28.7	7.8	7.8	10.8	10.6	2.6	1.2	4.9
5/13/77	9:40 A.M.	H+4 1/2	27.0	15.5	16.0	27.3	28.3	7.8	7.8	7.7	7.4	6.4	1.8	3.5
5/20/77	8:20 A.M.	L+4 1/2	16.0	16.0	15.5	28.9	29.9	8.0	8.0	6.6	6.5	4.6	.9	4.3
6/22/77	10:42 A.M.	L+5	24.5	20.5	20.5	30.0	-	8.1	8.0	7.1	7.1	6.9	.75	4.9
6/28/77	10:30 A.M.	H+5	23.5	24.0	24.5	30.0	30.7	7.5	7.5	3.6	3.2	2.0	.6	1.4
7/13/77	11:55 A.M.	L	28.5	26.0	26.0	28.5	28.8	7.8	7.7	4.2	3.9	8.7	.5	2.3
7/20/77	9:40 A.M.	L+5	25.5	24.0	23.5	28.8	29.2	8.0	8.0	5.4	4.5	6.6	.5	2.4
8/30/77	8:05 A.M.	L+5	25.4	20.5	20.3	28.7	29.0	7.9	7.9	4.3	4.2	6.7	.75	2.1
9/15/77	8:08 A.M.	L+5	16.5	20.0	19.5	29.2	29.7	8.0	8.0	6.5	6.3	5.1	.5	5.0
9/22/77	8:40 A.M.	H+5	18.0	19.5	19.5	28.5	29.9	7.7	7.6	3.9	3.3	10.1	.5	3.0
10/22/77	8:25 A.M.	H+5	11.0	11.0	10.8	26.9	27.5	7.8	7.8	7.3	7.2	9.7	.75	4.0
12/16/77	11:40 A.M.	L+5	6.0	5.2	5.0	28.4	28.7	8.1	8.3	10.4	10.2	7.0	1.0	5.0

Table 23. Water Analysis Data, Collected at the Longport Bridge Station, Great Egg Harbor Inlet (Zone 24).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/l) Sur.	D.O.(mg/l) Bot.	CO_2 (mg/l) Sur.	Secchi (m)	Depth (m)
3/3/77	12:00 P.M.	H+6	8.0	4.5	4.5	26.2	26.4	7.8	7.8	11.2	10.8	.2	1.3	4.3
3/9/77	9:35 A.M.	L+5 1/2	7.2	2.5	2.5	30.2	30.5	7.7	7.8	10.5	10.4	4.2	1.8	5.5
5/13/77	9:23 A.M.	H+5	22.5	13.0	13.5	27.3	29.7	7.9	7.9	8.1	7.8	4.4	1.5	4.7
5/20/77	8:07 A.M.	L+5	18.0	13.0	12.0	29.8	30.1	8.1	8.0	7.6	7.6	5.6	1.8	4.6
6/22/77	10:36 A.M.	L+5 1/2	24.5	18.5	18.0	30.1	-	8.0	8.0	6.9	6.8	4.4	1.7	6.4
6/28/77	10:08 A.M.	H+5	25.0	23.5	23.0	29.6	30.5	7.9	7.9	6.1	5.9	3.9	.9	5.2
7/13/77	11:35 A.M.	L	25.5	25.0	24.5	28.5	29.2	7.8	7.8	5.8	5.1	6.6	.6	4.6
7/20/77	9:25 A.M.	L+5	24.5	18.5	18.0	29.2	29.9	7.9	7.9	7.2	5.9	5.9	.9	3.7
8/30/77	7:50 A.M.	L+5 1/2	22.5	16.3	16.1	29.5	29.7	7.9	7.9	2.7	2.6	3.8	1.0	5.5
9/15/77	7:50 A.M.	L+5	16.5	20.0	20.0	29.3	29.5	8.1	8.1	6.5	6.4	2.9	.75	6.0
9/22/77	8:24 A.M.	H+5 1/2	18.0	20.0	20.0	29.1	29.1	7.9	7.8	5.5	5.4	6.2	.5	7.0
10/21/77	8:10 A.M.	H+5 1/2	11.0	11.5	11.5	27.5	28.4	7.8	7.8	8.2	7.8	5.4	.5	8.0
12/16/77	11:20 A.M.	L+5	8.2	6.2	6.0	30.3	30.9	8.3	8.3	9.8	9.8	4.6	.75	6.0

Table 23-A. Water Analysis Data, Collected at Absecon Creek Station: AC-0 (mouth)

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/1) Sur.	D.O.(mg/1) Bot.	CO_2 (mg/1) Sur.	Secchi (m)	Depth (m)
2/23/77	12:55 P.M.		12.0	4.5	3.5	27.7	28.1	8.3	8.2	11.9	11.6	5.8	.6	1.1
3/15/77	11:00 A.M.		13.0	11.5	-	20.6	-	7.1	-	8.5	-	5.8	.3	.3
5/26/77	8:30 A.M.		22.0	22.0	22.0	-	21.1	7.3	7.4	5.1	5.0	5.5	.46	.9
6/1/77	8:00 A.M.		20.0	18.0	18.0	28.8	29.0	7.6	7.5	6.1	6.0	9.6	.31	2.15

Station: AC-1

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/1) Sur.	D.O.(mg/1) Bot.	CO_2 (mg/1) Sur.	Secchi (m)	Depth (m)
2/23/77	12:35 P.M.		11.5	5.0	2.2	22.8	26.4	8.2	8.3	11.6	11.5	6.1	.76	2.3
3/15/77	11:20 A.M.		13.0	11.0	10.7	13.3	14.0	6.9	6.8	7.7	7.7	4.2	1.2	2.75
5/26/77	8:45 A.M.		24.0	21.0	22.0	14.8	-	7.0	7.4	5.2	4.2	3.8	.46	2.45
6/1/77	8:15 A.M.		20.0	18.0	18.0	25.6	29.0	7.6	7.6	5.9	5.7	9.9	.31	3.18

Station: AC-2

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/1) Sur.	D.O.(mg/1) Bot.	CO_2 (mg/1) Sur.	Secchi (m)	Depth (m)
2/23/77	12:20 P.M.		15.0	5.2	2.5	15.4	24.8	7.5	8.2	11.2	11.3	7.5	.76	1.8
3/15/77	11:35 A.M.		13.5	11.1	11.0	8.2	8.9	6.8	6.7	7.7	7.6	3.3	1.2	2.42
5/26/77	9:00 A.M.		23.0	22.0	22.0	-	8.9	7.0	7.0	5.4	5.3	5.3	.62	1.7
6/1/77	8:25 A.M.		18.0	18.0	18.0	19.8	27.6	7.4	7.4	5.8	5.7	9.8	.62	2.15

Station: AC-3(continued)

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/1) Sur.	D.O.(mg/1) Bot.	CO_2 (mg/1) Sur.	Secchi (m)	Depth (m)
2/23/76	12:07 A.M.		15.8	5.0	3.7	8.8	11.1	7.1	7.2	10.9	10.8	11.7	.76	1.7
3/15/77	11:48 A.M.		14.0	11.4	11.3	4.1	5.2	6.6	6.6	7.9	7.8	2.7	1.07	1.52
5/26/77	9:15 A.M.		24.0	21.0	21.0	3.8	3.9	7.0	6.8	4.6	3.4	2.9	.62	2.4
6/1/77	8:40 A.M.		18.0	19.0	19.0	18.8	20.2	7.2	7.1	4.5	4.3	5.6	.43	2.15

Station: AC-4

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur.	Temp.(°C) Bot.	Sal (0/00) Sur.	Sal (0/00) Bot.	p.h. Sur.	p.h. Bot.	D.O.(mg/1) Sur.	D.O.(mg/1) Bot.	CO_2 (mg/1) Sur.	Secchi (m)	Depth (m)
2/23/77	11:45 A.M.		15.2	8.5	6.2	.4	.6	6.7	6.8	11.0	10.6	6.8	1.1	1.1
6/1/77	8:55 A.M.		18.0	19.0	19.0	9.5	12.0	6.9	7.1	4.0	4.0	8.6	.91	1.1

Table 24. Nutrient Analysis Data Collected at the Brigantine Inlet Station (Zone 01).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur	NH_3 mg/1	NO_2-N mg/1	NO_3-N mg/1	Ortho-Phosphate mg/1	Detergent mg/1	B.O.D. mg/1
3/16/77	10:14 A.M.	H+5	9.5	7.6	<.01	.003	0.33	0.02	-	2.3
4/20/77	12:00 P.M.	H+3	18.6	-	<.01	<.003	0.24	0.02	-	2.1
5/19/77	11:15 A.M.	H+3	14.0	13.9	<.01	<.003	0.13	<.01	-	1.6
6/15/77	10:00 A.M.	H+3	19.0	19.0	<.01	<.003	0.22	<.01	-	1.6
7/28/77	10:30 A.M.	H+5	32.0	-	0.07	0.008	0.42	0.08	-	0.8
8/25/77	9:30 A.M.	H+5	24.0	21.0	0.17	0.006	<.04	0.09	-	1.6
9/27/77	11:30 A.M.	H+4	-	-	0.13	0.016	0.19	0.09	-	0.4
10/26/77	11:35 A.M.	H+4 1/2	22.0	14.0	0.18	0.013	0.14	0.07	-	0.8
11/18/77	9:50 A.M.	L+2	-	-	0.09	0.009	0.20	0.05	-	0.4
12/18/77	10:50 A.M.	L+2 1/2	3.0	5.5	0.10	0.014	0.24	0.03	-	1.3

Table 25. Nutrient Analysis Data Collected at the Main Marsh Thorofare Station (Zone 05).

Date	Time (E.S.T.)	Tidal Stage	Temp. (°C) Air	Temp. (°C) Sur	NH_3 mg/l	NO_2-N mg/l	NO_3-N mg/l	Ortho-Phosphate mg/l	Detergent mg/l	B.O.D. mg/l
3/16/77	9:50 A.M.	H+3 1/2	10.0	8.0	<.01	<.003	0.28	<.01	0.32	1.8
4/20/77	12:18 P.M.	H+2 1/2	18.7	-	<.01	<.003	0.14	0.02	0.07	2.6
5/19/77	11:40 A.M.	H+2	17.5	20.0	<.01	<.003	0.21	0.03	0.05	1.6
6/15/77	12:15 P.M.	H+4 1/2	21.0	22.0	0.01	<.003	0.32	<.01	0.02	2.0
7/28/77	10:45 A.M.	H+4	33.0	-	0.29	0.022	0.65	0.09	<.01	0.8
8/25/77	9:15 A.M.	H+4	24.5	22.5	0.28	0.021	.04	0.19	0.03	1.8
9/27/77	11:45 A.M.	H+3 1/2	-	-	0.07	0.028	.04	0.06	0.05	0.7
10/26/77	11:30 A.M.	H+3 1/2	22.0	14.0	0.23	0.016	0.14	0.06	0.04	1.0
11/18/77	10:02 A.M.	L+1	-	-	0.09	0.007	0.08	0.04	0.01	0.5
12/18/77	10:40 A.M.	L+ 1/2	3.0	5.0	0.05	0.014	0.16	0.03	0.05	3.4

Table 26. Nutrient Analysis Data Collected at the Ober Thorofare Station (Zone 13).

Date	Time (E.S.T.)	Tidal Stage	Temp. (°C) Air	Temp. (°C) Sur	NH_3 mg/l	NO_2-N mg/l	NO_3-N mg/l	Ortho-Phosphate mg/l	Detergent mg/l	B.O.D. mg/l
2/22/77	2:04 P.M.	H+3	5.0	2.0	0.01	<.003	0.28	0.02	0.28	2.8
3/16/77	10:35 A.M.	H+4 1/2	10.2	9.5	0.01	<.003	0.30	0.03	0.40	2.3
4/20/77	12:45 P.M.	H+3 1/2	17.0	15.0	0.01	<.003	0.21	0.02	0.05	1.5
5/19/77	12:03 P.M.	H+2 1/2	19.5	19.0	<.01	<.003	0.10	0.01	0.03	1.6
6/15/77	11:47 A.M.	H+4	31.5	22.0	0.01	<.003	0.33	<.01	0.03	1.5
7/28/77	10:47 A.M.	H+4	32.0	23.5	0.06	<.003	0.50	0.11	0.01	1.9
8/25/77	9:16 A.M.	H+4	23.0	22.0	0.20	0.007	<.04	0.11	0.03	1.6
9/27/77	12:17 P.M.	H+4	29.0	22.0	0.09	0.011	<.04	0.07	0.05	0.8
10/26/77	12:11 P.M.	H+4	22.5	14.3	0.22	0.011	0.14	0.07	0.05	0.8
11/18/77	9:57 A.M.	L+1	13.5	9.0	0.05	0.016	0.08	0.04	0.01	1.4
12/18/77	10:27 A.M.	L+1	6.0	6.0	0.06	0.015	0.34	0.10	0.03	0.8

Table 27. Nutrient Analysis Data Collected at the Absecon Inlet (Zone 09).

Date	Time (E.S.T.)	Tidal Stage	Temp. (°C) Air	Temp. (°C) Sur	NH_3 mg/l	NO_2-N mg/l	NO_3-N mg/l	Ortho-Phosphate mg/l	Detergent mg/l	B.O.D. mg/l
2/22/77	1:35 P.M.	H+3	5.0	2.0	0.04	<.003	0.33	<.01	0.30	2.4
3/16/77	10:15 A.M.	H+5	10.5	8.5	<.01	<.003	0.26	0.01	0.35	2.8
4/20/77	12:20 P.M.	H+3	18.6	13.3	0.03	<.003	0.14	0.02	0.05	2.0
5/19/77	11:37 A.M.	H+3	22.0	14.0	0.02	<.003	0.18	0.01	0.03	0.8
6/15/77	10:20 A.M.	H+3 1/2	30.5	20.0	0.07	0.004	0.33	0.01	0.01	1.6
7/28/77	10:22 A.M.	H+4 1/2	35.0	21.5	0.16	0.008	0.37	0.08	0.01	2.0
8/25/77	8:50 A.M.	H+4	23.8	18.3	0.16	0.010	<.04	0.06	0.05	1.7
9/27/77	11:47 A.M.	H+4	29.9	21.2	0.10	0.026	<.04	0.06	0.09	0.9
10/26/77	11:25 A.M.	H+4	22.0	14.5	0.18	0.011	0.16	0.07	0.04	0.6
11/18/77	9:34 A.M.	L+2	13.0	10.1	0.12	0.012	0.14	0.06	0.02	1.0
12/18/77	10:04 A.M.	L+2	4.0	6.0	0.11	0.014	0.27	0.06	0.04	2.0

Table 28. Nutrient Analysis Data Collected at Inside Thorofare Station (Zone 20).

Date	Time (E.S.T.)	Tidal Stage	Temp. (°C) Air	Temp. (°C) Sur	NH_3 mg/l	NO_2-N mg/l	NO_3-N mg/l	Ortho-Phosphate mg/l	Detergent mg/l	B.O.D. mg/l
2/22/77	2:40 P.M.	H+3 1/2	7.0	2.0	<0.01	<.003	0.33	<0.01	-	4.0
3/16/77	11:15 A.M.	H+5 1/2	11.5	10.0	<0.01	<.003	0.33	0.02	-	3.0
4/20/77	1:20 P.M.	H+3 1/2	16.8	15.8	0.01	<.003	0.17	0.05	-	2.8
5/19/77	12:04 P.M.	H+3	26.0	19.0	<.01	<.003	0.16	0.05	-	2.0
6/15/77	11:20 A.M.	H+4	29.0	22.0	0.08	0.005	0.21	0.05	-	1.6
7/28/77	11:17 A.M.	H+5	32.0	23.8	0.28	0.022	0.60	0.21	-	1.2
8/25/77	9:45 A.M.	H+4 1/2	23.2	23.8	0.34	0.028	0.12	0.16	-	2.2
9/27/77	12:47 P.M.	H+4 1/2	28.0	22.5	0.08	0.019	<.04	0.07	-	0.9
10/26/77	12:37 P.M.	H+5	23.5	14.3	0.28	0.018	0.28	0.11	-	1.2
11/18/77	10:23 A.M.	L+2	14.0	9.5	0.16	0.016	0.26	0.13	-	1.0
12/18/77	10:48 A.M.	L+1 1/2	6.0	5.0	0.03	0.011	0.22	0.03	-	1.0

Table 29. Nutrient Analysis Data Collected at Beach Thorofare Station, Ventor Heights (Zone 19).

Date	Time (E.S.T.)	Tidal Stage	Temp. (°C) Air	Sur	NH_3 mg/l	NO_2-N mg/l	NO_3-N mg/l	Ortho-Phosphate mg/l	Detergent mg/l	B.O.D. mg/l
2/22/77	2:57 P.M.	H+3 1/2	5.0	3.0	0.01	<.003	0.33	<.01	-	4.4
3/16/77	11:30 A.M.	H+5 1/2	8.5	10.2	<.01	<.003	0.30	0.02	-	3.9
4/20/77	1:33 P.M.	H+4	18.8	15.3	<.01	<.003	0.17	0.05	-	2.0
5/19/77	12:52 P.M.	H+3 1/2	22.0	19.8	<.01	<.003	0.16	0.07	-	2.0
6/15/77	11:33 A.M.	H+4	26.5	22.5	0.05	<.003	0.34	0.06	-	2.2
7/28/77	11:30 A.M.	H+5	31.0	23.8	0.16	0.006	0.45	0.24	-	2.4
8/25/77	9:58 A.M.	H+4 1/2	24.8	23.8	0.25	0.019	0.04	0.12	-	1.7
9/27/77	1:00 P.M.	H+5	25.0	21.5	0.16	0.027	0.08	0.07	-	0.7
10/26/77	12:50 P.M.	H+5	23.0	14.3	0.31	0.018	0.22	0.09	-	0.7
11/18/77	10:35 A.M.	L+2	14.0	9.2	0.13	0.016	0.18	0.05	-	0.8
12/18/77	11:06 A.M.	L+2	4.0	6.0	0.10	0.014	0.25	0.07	-	0.9

Table 30. Nutrient Analysis Data Collected at Beach Thorofare Station (Zone 22).

Date	Time (E.S.T.)	Tidal Stage	Temp. (°C) Air	Sur	NH_3 mg/l	NO_2-N mg/l	NO_3-N mg/l	Ortho-Phosphate mg/l	Detergent mg/l	B.O.D. mg/l
2/22/77	3:15 P.M.	H+4	5.0	2.0	0.03	<.003	0.30	<.01	0.36	3.2
3/16/77	11:53 A.M.	L+0	8.5	9.3	0.04	<.003	0.16	0.02	0.44	2.0
4/20/77	1:52 P.M.	H+4	23.0	14.8	<.01	<.003	0.14	0.03	0.07	1.4
5/19/77	1:10 P.M.	H+4	27.0	18.0	0.01	<.003	0.13	0.01	0.05	1.6
6/15/77	11:53 A.M.	H+4	27.5	21.0	0.05	0.004	0.33	0.03	0.04	1.6
7/28/77	11:47 A.M.	H+5 1/2	37.0	22.5	0.12	0.008	0.57	0.14	0.02	1.4
8/25/77	10:18 A.M.	H+5	23.8	22.0	0.33	0.030	0.08	0.11	0.07	1.7
9/27/77	1:18 P.M.	H+5	24.8	21.5	0.07	0.013	<.04	0.07	0.03	0.4
10/26/77	1:07 P.M.	H+5	20.0	14.3	0.27	0.017	0.20	0.09	0.04	0.7
11/18/77	10:50 A.M.	L+2 1/2	14.0	9.8	0.11	0.013	0.10	0.04	0.02	0.9
12/18/77	11:22 A.M.	L+3	4.8	6.0	0.10	0.014	0.27	0.09	0.02	1.0

Table 31. Nutrient Analysis Data Collected at Great Egg Inlet, Longport (Zone 24).

Date	Time (E.S.T.)	Tidal Stage	Temp. (°C) Air	Temp. (°C) Sur	NH_3 mg/l	NO_2-N mg/l	NO_3-N mg/l	Ortho-Phosphate mg/l	Detergent mg/l	B.O.D. mg/l
2/22/77	3:35 P.M.	H+5	5.0	3.0	0.03	<.003	0.47	0.08	0.25	4.6
3/16/77	12:10 P.M.	L+1	12.0	8.5	0.02	<.003	0.26	0.01	0.36	2.4
4/20/77	2:10 P.M.	H+5	16.0	15.0	<.01	<.003	0.20	0.03	0.09	1.4
5/19/77	1:34 P.M.	H+5	24.5	19.3	0.03	<.003	<.05	0.21	0.03	1.4
6/15/77	12:08 P.M.	H+5 1/2	24.0	21.5	0.01	<.003	0.36	0.04	0.03	1.8
7/28/77	12:03 P.M.	L+1/2	36.5	22.8	0.02	<.003	1.48	0.10	0.03	1.8
8/25/77	10:30 A.M.	L+0	27.0	21.5	0.21	0.008	<.04	0.14	0.05	1.8
9/27/77	1:34 P.M.	L+0	25.2	22.0	0.03	0.019	<.04	0.04	0.05	0.7
10/26/77	1:22 P.M.	L+0	21.0	14.5	0.21	0.013	0.18	0.07	0.05	0.7
11/18/77	11:04 A.M.	L+3 1/2	14.0	10.0	0.08	0.013	0.16	0.32	0.02	1.0
12/18/77	11:27 A.M.	L+3	6.7	5.3	0.02	0.011	0.20	0.05	0.06	1.5

Table 32. Nutrient Analysis Data Collected at Scull Bay Station.

Date	Time (E.S.T.)	Tidal Stage	Temp. (°C) Air	Temp. (°C) Sur	NH_3 mg/l	NO_2-N mg/l	NO_3-N mg/l	Ortho-Phosphate mg/l	Detergent mg/l	B.O.D. mg/l
2/22/77	3:57 P.M.	H+4 1/2	5.0	3.0	0.10	<.003	0.33	0.21	-	3.2
3/16/77	12:30 P.M.	L+ 1/2	10.0	9.0	0.06	0.003	0.52	0.15	-	7.3
4/20/77	2:27 P.M.	H+4 1/2	22.0	19.2	<.01	<.003	0.28	0.28	-	2.8
5/19/77	1:52 P.M.	H+4 1/2	23.0	22.0	0.07	<.003	0.24	0.82	-	2.1
6/15/77	12:28 P.M.	H+5	31.0	24.0	<.01	<.003	0.34	0.05	-	2.5
7/28/77	12:21 P.M.	L+0	29.0	28.5	0.60	0.012	0.92	1.17	-	5.6
8/25/77	10:55 A.M.	L+0	32.0	24.8	0.60	0.012	<.04	0.26	-	3.0
9/27/77	1:53 P.M.	H+5 1/2	27.0	23.0	0.03	0.019	<.04	0.12	-	0.9
10/26/77	2:02 P.M.	L+0	22.0	15.6	0.24	0.014	0.18	0.18	-	1.6
11/18/77	11:39 A.M.	L+3	13.5	9.2	0.12	0.022	0.20	0.14	-	1.4
12/18/77	11:48 A.M.	L+3	8.5	6.0	0.06	0.014	0.25	0.12	-	1.5

Table 33. Nutrient Analysis Data Collected at Margate City Bridge Station, Toms Island (Zone 26).

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur	NH_3 mg/l	NO_2-N mg/l	NO3-N mg/l	Ortho-Phosphate mg/l	Detergent mg/l	B.O.D. mg/l
2/22/77	4:15 P.M.	H+5	5.0	2.0	<.01	<.003	0.44	0.08	0.30	1.4
3/16/77	1:05 P.M.	L+1	11.5	10.5	0.04	<.003	0.37	0.27	-	4.0
4/20/77	2:42 P.M.	H+5	22.0	18.3	0.02	<.003	0.26	0.10	0.07	1.6
5/19/77	2:05 P.M.	H+5	22.0	21.0	0.07	0.008	0.27	0.25	0.03	1.6
6/15/77	12:43 P.M.	H+5	30.0	23.0	0.12	0.006	0.42	0.06	0.02	1.4
7/28/77	12:35 P.M.	L+ 1/2	28.0	24.8	0.24	0.012	1.05	0.33	0.04	3.0
8/25/77	11:08 A.M.	L+0	28.0	22.5	0.27	0.019	<.04	0.16	0.02	1.8
9/27/77	2:07 P.M.	L+0	27.0	23.0	0.08	0.003	<.04	0.12	0.05	1.0
10/26/77	1:42 P.M.	L+0	22.5	15.5	0.23	0.017	0.20	0.17	0.04	1.1
11/18/77	11:25 A.M.	L+3	14.5	9.3	0.10	0.016	0.12	0.07	0.02	1.0
12/18/77	12:07 P.M.	L+3	6.7	5.8	0.07	0.019	0.33	0.23	0.02	1.5

Table 34. Nutrient Analysis Data Collected at Lakes Bay Station.

Date	Time (E.S.T.)	Tidal Stage	Temp.(°C) Air	Temp.(°C) Sur	NH_3 mg/l	NO_2-N mg/l	NO_3-N mg/l	Ortho-Phosphate mg/l	Detergent mg/l	B.O.D. mg/l
2/22/77	4:35 P.M.	H+5	4.0	2.0	<.01	<.003	0.37	0.09	-	4.6
3/16/77	1:15 P.M.	L+1	12.0	13.5	0.02	<.003	0.33	0.05	-	3.2
4/20/77	2:59 P.M.	H+5	16.0	17.8	<.01	<.003	0.17	0.03	-	2.8
5/19/77	2:25 P.M.	H+5	20.5	21.0	0.01	<.003	0.09	0.04	-	1.8
6/15/77	12:57 P.M.	H+5	26.0	24.0	0.09	0.009	0.40	0.09	-	2.6
7/28/77	12:52 P.M.	L+ 1/2	35.0	25.5	0.04	<.003	0.67	0.67	-	2.2
8/25/77	11:26 A.M.	L+0	27.2	23.3	0.38	0.047	0.08	0.16	-	1.6
9/27/77	2:23 P.M.	L+1	26.0	23.0	0.16	0.030	0.11	0.17	-	1.0
10/26/77	2:23 P.M.	L+0	21.5	15.0	0.31	0.027	0.28	0.15	-	1.2
11/18/77	11:56 A.M.	L+3 1/2	14.5	9.5	0.10	0.022	0.18	0.06	-	1.2
12/18/77	12:22 P.M.	L+3	6.0	6.2	0.14	0.030	0.51	0.39	-	1.8

Table 35. Nutrient Analysis Data Collected at Absecon Bay Station.

Date	Time (E.S.T.)	Tidal Stage	Temp. (°C) Air	Temp. (°C) Sur	NH_3 mg/l	NO_2-N mg/l	NO_3-N mg/l	Ortho-Phosphate mg/l	Detergent mg/l	B.O.D. mg/l
2/22/77	1:14 P.M.	H+1 1/2	5.0	1.0	<.01	<.003	0.33	<.01	-	3.6
3/16/77	10:00 A.M.	H+3 1/2	10.5	9.5	0.02	<.003	0.26	0.03	-	1.1
4/20/77	12:00 P.M.	H+2	18.8	16.2	0.01	<.003	0.24	0.03	-	2.4
5/19/77	11:17 A.M.	H+2	24.0	22.0	<.01	<.003	0.21	0.12	-	2.6
6/15/77	10:02 A.M.	H+2	29.5	24.0	<.01	<.003	0.51	0.07	-	4.2
7/28/77	10:05 A.M.	H+3 1/2	25.0	22.0	0.14	0.006	1.52	0.21	-	2.4
8/25/77	8:33 A.M.	H+3	23.0	22.0	0.28	0.009	0.38	0.25	-	2.2
9/27/77	11:30 A.M.	H+3	32.0	21.5	0.13	0.070	<.04	0.09	-	1.6
10/26/77	11:05 A.M.	H+3	22.0	14.5	0.29	0.034	0.28	0.11	-	1.6
11/18/77	9:15 A.M.	L+0	13.0	8.5	0.13	0.024	0.12	0.05	-	1.0
12/18/77	9:50 A.M.	L+0	11.0	6.0	0.04	0.015	0.16	0.03	-	1.5

Table 36. Nutrient Analysis Data Collected at Reed Bay Station, Turtle Cove.

Date	Time (E.S.T.)	Tidal Stage	Temp. (°C) Air	Temp. (°C) Sur	NH_3 mg/l	NO_2-N mg/l	NO_3-N mg/l	Ortho-Phosphate mg/l	Detergent mg/l	B.O.D. mg/l
2/22/77	5:00 P.M.	H+5 1/2	4.0	1.0	0.06	<.003	0.85	0.45	0.22	3.0
3/16/77	2:00 P.M.	L+1	11.0	14.5	0.006	0.003	1.17	0.43	-	3.0
4/20/77	3:29 P.M.	H+5 1/2	21.0	20.5	0.14	<.003	0.17	0.12	0.09	2.0
5/19/77	2:47 P.M.	H+5	19.0	22.0	<.01	<.003	0.11	0.09	0.04	2.8
6/15/77	1:28 P.M.	H+5 1/2	23.5	24.0	<.01	<.003	0.29	0.04	0.04	2.2
7/28/77	10:30 A.M.	H+4	-	-	<.01	<.003	0.70	0.11	<.01	2.8
8/25/77	11:00 A.M.	H+5 1/2	-	-	0.25	0.008	0.08	0.11	0.03	2.6
9/27/77	12:15 P.M.	H+4	-	-	0.13	0.136	<.04	0.27	0.05	1.1
10/26/77	12:45 P.M.	H+4 1/2	20.0	14.5	0.28	0.017	0.18	0.09	0.04	1.8
11/18/77	10:53 A.M.	H+2	13.5	8.5	0.15	0.022	0.16	0.06	0.01	1.1
12/18/77	10:30 A.M.	L+1	3.0	5.5	0.10	0.020	0.30	0.18	0.04	1.8

Table 37. Nutrient Analysis Data Collected at St. George's Thorofare Station (Zone 15).

Date	Time (E.S.T.)	Tidal Stage	Temp. (°C) Air	Temp. (°C) Sur	NH_3 mg/l	NO_2-N mg/l	NO_3-N mg/l	Ortho-Phosphate mg/l	Detergent mg/l	B.O.D. mg/l
5/19/77	11:50 A.M.	H+2 1/2	24.0	18.0	0.01	<.003	0.13	0.07	-	4.4
6/15/77	10:33 A.M.	H+3	32.0	22.0	2.11	0.015	0.05	0.51		-
7/28/77	10:34 A.M.	H-4 1/2	31.5	23.0	0.71	0.003	0.62	0.19	-	-
8/25/77	9:00 A.M.	H+4	22.5	22.0	0.25	0.005	0.08	0.13	-	10.4
9/27/77	12:01 P.M.	H+4	28.5	22.5	0.12	0.062	<.04	0.09	-	1.3
10/26/77	11:52 A.M.	H+4	22.0	15.0	1.00	0.014	0.20	0.24	-	3.3
11/18/77	9:44 A.M.	L+1 1/2	13.0	9.5	0.61	0.023	0.22	0.23	-	3.7
12/18/77	10:09 A.M.	L+1	6.5	5.8	0.18	0.014	0.25	0.07	-	1.8

Table 37A. Chlorinated Hydrocarbona Detected in Tissue of Fish and Crabs Collected from the Back Bay Systems in Atlantic County, 1977-78.*

Location***	Species**	Date	O,P' DDE	P,P' DDE	O,P' DDT	P,P' DDD	P,P' DDT	DDT TOTAL
Brigantine Channel (Zone 01)	Blue crab	4/10/78	-	7.7	-	-	-	7.7
Brigantine Channel (Zone 01)	Fluke	8/18/77	-	246.6	-	-	-	246.6
Obes Thorofare (Zone 12)	Fluke	8/18/77	-	-	-	-	-	-
Weakfish Thorofare (Zone 11)	White perch	11/21/77	-	10.3	-	-	-	10.3
Weakfish Thorfare (Zone 11)	White perch	10/31/77	-	7.1	-	-	-	7.1
Main Marsh Thorofare (Zone 04)	Fluke	5/11/77	-	6.9	-	-	-	6.9
Meadow Cut (Zone 06)	Weakfish	5/11/77	-	41.3	-	-	-	41.3
Reed Bay	Spot	7/21/77	-	8.6	-	-	-	8.6
Reed Bay	Fluke	9/29/77	-	4.0	-	-	-	4.0
St. George's Thorofare (Zone 15)	Winter flounder	4/19/77	-	14.6	-	-	-	14.6
St. George's Thorofare (Zone 15)	Bluefish	9/16/77	-	12.9	-	-	-	12.9
Absecon Inlet (Zone 10)	Bluefish	7/21/77	-	33.0	-	-	-	33.0
Broad Creek (Zone 08)	Fluke	6/21/77	-	-	-	-	-	-
Beach Thorofare (Zone 17)	Fluke	6/17/77	-	20.3	-	-	-	20.3
Absecon Bay	Bluefish	7/28/77	-	5.6	-	-	-	5.6

Table 37A. Continued.

Location***	Species**	Date	O,P' DDE	P,P' DDE	O,P' DDT	P,P' DDD	P,P' DDT	DDT TOTAL
Dock Thorofare (Zone 27)	Fluke	7/22/77	-	10.3	-	-	-	10.3
Dock Thorofare (Zone 27)	Weakfish	7/22/77	-	8.6	-	-	-	8.6
Dock Thorofare (Zone 27)	Fluke	5/5/77	-	44.7	-	-	-	44.7
Beach Thorofare (Zone 22)	Fluke	8/19/77	-	7.5	-	-	-	7.5
Scull Bay	Bluefish	6/30/77	-	22.7	-	-	-	22.7
Scull Bay	Fluke	8/19/77	-	3.1	-	-	-	3.1
Scull Bay	Weakfish	9/31/77	-	32.0	-	-	-	32.0
Lakes Bay	Winter flounder	4/21/77	-	9.5	-	-	-	9.5
Lakes Bay	Window pane	4/21/77	-	10.3	-	-	-	10.3

Table 37A. Continued.

Location***	Species**	Date	∝BHC	Lindane	Aldrin	Heptachlor epoxide	Dieldrin	Chlordane
Brigantine Channel (Zone 01)	Blue crab	4/10/78	-	-	-	-	-	-
Brigantine Channel (Zone 01)	Fluke	8/18/77	-	-	-	-	-	-
Obes Thorofare (Zone 12)	Fluke	8/18/77	-	-	-	-	-	-
Weakfish Thorofare (Zone 11)	White perch	11/21/77	-	-	-	-	-	-
Weakfish Thorofare (Zone 11)	White perch	10/31/77	-	-	-	-	-	-
Main Marsh Thorofare (Zone 04)	Fluke	5/11/77	-	-	-	-	-	-
Meadow Cut (Zone 06)	Weakfish	5/11/77	-	-	-	-	3.6	-
Reed Bay	Spot	7/21/77	-	-	-	-	-	-
Reed Bay	Fluke	9/29/77	-	-	-	-	-	-
St. George's Thorofare (Zone 15)	Winter flounder	4/19/77	-	-	-	-	-	-
St. George's Thorofare (Zone 15)	Bluefish	9/16/77	-	-	-	-	-	-
Absecon Inlet (Zone 10)	Bluefish	7/21/77	-	-	-	-	-	-
Broad Creek (Zone 08)	Fluke	6/21/77	-	-	-	-	-	-
Beach Thorofare (Zone 17)	Fluke	6/17/77	-	-	-	-	2.9	-

Table 37A. Continued.

Location***	Species**	Date	∝BHC	Lindane	Aldrin	Heptachlor epoxide	Dieldrin	Chlordane
Absecon Bay	Bluefish	7/28/77	-	-	-	-	-	-
Dock Thorofare (Zone 27)	Fluke	7/22/77	-	-	-	-	-	-
Dock Thorofare (Zone 27)	Weakfish	7/22/77	-	-	-	-	-	-
Dock Thorofare (Zone 27)	Fluke	5/5/77	-	-	-	-	-	-
Beach Thorofare (Zone 22)	Fluke	8/19/77	-	-	-	-	-	-
Scull Bay	Bluefish	6/30/77	-	-	-	-	-	-
Scull Bay	Fluke	8/19/77	-	-	-	-	-	-
Scull Bay	Weakfish	9/31/77	-	-	-	-	-	-
Lakes Bay	Winter flounder	4/21/77	-	-	-	-	-	-
Lake Bay	Window pane	4/21/77	-	-	-	-	-	

* Results reported in ug/kg.
** Length reported in Table 37E
*** Fish collected at trawl, gill net and/or seine stations (see Figure 1).

Table 37B. Chlorinated Hydrocarbon Detected in Tissue of Fish Collected from Absecon Creek, Atlantic County, 1977.*

Location***	Species**	Date	O,P' DDE	P,P' DDE	O,P' DDT	P,P' DDD	P,P' DDT	DDT TOTAL
AC-1	White perch	4/28/77	-	7.5	-	-	-	7.5
Route 9 Bridge	Yellow perch	4/28/77	-	6.4	-	-	-	6.4
Route 9 Bridge	White perch	7/1/77	-	23.6	-	-	-	23.6
Route 9 Bridge	Yellow perch	8/24/77	-	12.4	-	-	-	12.4
Route 9 Bridge	Yellow perch	8/24/77	-	4.6	-	-	-	4.6
AC-1	Bluefish	8/24/77	-	9.4	-	-	-	9.4
Route 9 Bridge	White perch	8/24/77	-	5.5	-	-	-	5.5
AC-1	Spot	8/24/77	-	6.7	-	-	-	6.7
AC-1	Atlantic menhaden	8/24/77	-	12.2	-	-	-	12.2
AC-1	White perch	9/26/77	-	6.6	-	-	-	6.6
AC-1	Bluefish	9/26/77	-	8.9	-	-	-	8.9
AC-1	White perch	10/7/77	-	10.3	-	-	-	10.3
AC-1	Bluefish	10/7/77	-	20.9	-	-	-	20.9
Route 9 Bridge	Yellow perch	10/7/77	-	12.2	-	-	-	12.2
Route 9 Bridge	Bluefish	10/7/77	-	22.4	-	-	-	22.4
Route 9 Bridge	White perch	10/7/77	-	8.1	-	-	-	8.1

Table 37B Continued.

Location***	Species**	Date	∝BHC	Lindane	Aldrin	Heptachlor epoxide	Dieldrin	Chlordane
AC-1	White perch	4/28/77	-	-	-	-	-	-
Route 9 Bridge	Yellow perch	4/28/77	-	-	-	-	-	-
Route 9 Bridge	White perch	7/1/77	-	-	-	-	-	-
Route 9 Bridge	Yellow perch	8/24/77	-	-	-	-	-	-
Route 9 Bridge	Yellow perch	8/24/77	-	-	-	-	-	-
AC-1	Bluefish	8/24/77	-	-	-	-	-	-
Route 9 Bridge	White perch	8/24/77	-	-	-	-	-	-
AC-1	Spot	8/24/77	-	-	-	-	-	-
AC-1	Atlantic menhaden	8/24/77	-	-	-	-	-	-
AC-1	White perch	9/26/77	-	-	-	-	-	-
AC-1	Bluefish	9/26/77	-	-	-	-	-	-
AC-1	White perch	10/7/77	-	-	-	-	-	-
AC-1	Bluefish	10/7/77	-	-	-	-	-	-
Route 9 Bridge	Yellow perch	10/7/77	-	-	-	-	-	-
Route 9 Bridge	Bluefish	10/7/77	-	-	-	-	-	-
Route 9 Bridge	White Perch	10/7/77	-	-	-	-	-	-

* Results reported in ug/kg.
** Length reported in Table 7E
*** Fish collected at trawl, gill net and/or seine stations (see Figure 1)

Table 37C. Chlorinated Hydrocarbon Detected in Shellfish Meat Collected from the Bach Bay System in Atlantic County, 1977-78.*

Location**	Species**	Date	O,P' DDE	P,P' DDE	O,P' DDT	P,P' DDD	P,P' DDT	DDT TOTAL
Main Marsh Thorofare Black Point (Zone 06)	Ribbed mussels	5/23/78	-	3.81	-	-	-	3.81
Main Marsh Thorofare (Hammsock Cove)	Ribbed mussels	4/11/78	-	8.57	-	-	-	8.57
Main Marsh Thorofare (Hammsock Cove)	Oysters	4/11/78	-	12.24	-	-	-	12.24
Main Marsh Thorofare (Perch Cove)	Ribbed mussels	11/28/78	-	8.08	-	-	-	8.08
Main Marsh Thorofare (Perch Cove)	Hard clams	11/4/77	-	<2.5	-	-	-	<2.5
Little Bay	Hard clams	11/4/77	-	<2.5	-	-	-	<2.5
Little Bay	Ribbed mussels	11/4/77	-	<2.5	-	-	-	<2.5
Steelman's Bay (Zone 11)	Hard clams	7/11/77	-	<2.5	-	-	-	<2.5
Obes Thorofare (Zone 12)	Hard clams	11/4/77	-	<2.5	-	-	-	<2.5
Obes Thorofare (Zone 12)	Ribbed mussels	4/10/78	-	<2.5	-	-	-	<2.5
Grassey Bay	Hard clams	11/4/77	-	<2.5	-	-	-	<2.5
St. George's Thorofare (Zone 15)	Ribbed mussels	10/26/77	-	13.33	-	-	-	13.33
Beach Thorofare (Zone 16)	Hard clams	4/10/78	-	<2.5	-	-	-	<2.5
Stake Thorofare	Hard clams	4/10/78	-	<2.5	-	-	-	<2.5
Stake Thorofare	Ribbed mussels	5/22/78	-	9.87	-	-	-	9.87
Middle Thorofare (Zone 09)	Ribbed mussels	5/23/78	-	11.90	-	-	-	11.90

Table 37C. Continued

Location**	Species**	Date	O,P' DDE	P,P' DDE	O,P' DDT	P,P' DDD	P,P' DDT	DDT TOTAL
Reed Bay	Hard clam	11/4/77	-	<2.5	-	-	-	<2.5
Reed Bay	Ribbed mussels	9/26/78	-	10.14	-	-	-	10.14
Absecon Bay	Hard clam	7/15/77	-	<2.5	-	-	-	<2.5
Absecon Bay	Ribbed mussel	11/21/77	-	5.43	-	-	-	5.43
Lakes Bay	Ribbed mussel	9/26/78	-	4.43	-	-	-	4.43
Lakes Bay	Hard clams	9/26/78	-	<2.5	-	-	-	<2.5
Scull Bay	Ribbed mussel	10/26/78	-	9.56	-	-	-	9.56
Scull Bay	Hard clam	9/26/78	-	<2.5	-	-	-	<2.5
Beach Thorofare (Zone 18)	Ribbed mussels	5/22/78	-	14.69	-	-	-	14.69
Beach Thorofare (Zone 18)	Hard clams	5/26/78	-	3.37	-	-	-	3.37
Risley Channel (Zone 26)	Ribbed mussel	10/26/78	-	4.48	-	-	-	4.48
Risley Channel (Zone 25)	Hard clam	1/9/78	-	<2.5	-	-	-	<2.5
Beach Thorofare (Zone 24)	Smooth mussels	10/25/78	-	3.48	-	-	-	3.48

Table 37C. Continued.

Location**	Species**	Date	∝BHC	Lindane	Aldrin	Heptachlor epoxide	Dieldrin	Chlordane
Main Marsh Thorofare Black Point (Zone 06)	Ribbed mussel	5/23/78	-	-	-	-	-	-
Main Marsh Thorofare Hammock Cove	Ribbed mussel	4/11/78	-	-	-	-	-	-
Main Marsh Thorofare Hammock Cover	Oyster	4/11/78	-	-	-	-	-	-
Main Marsh Thorofare Parch Cove	Ribbed mussel	11/28/78	-	-	-	-	-	-
Main Marsh Thorofare Perch Cove	Hard clam	11/4/77	-	-	-	-	-	-
Little Bay	Hard clam	11/4/77	-	-	-	-	-	-
Little Bay	Ribbed mussel	11/4/77	-	-	-	-	-	-
Steelman's Bay (Zone 11)	Hard clam	7/11/77	-	-	-	-	-	-
Obes Thorofare (Zone 11)	Hard clam	11/4/77	-	-	-	-	-	-
Obes Thorofare (Zone 12)	Ribbed mussel	4/10/78	-	-	-	-	-	-
Grassey Bay	Hard clam	11/4/77	-	-	-	-	-	-
St. George's Thorofare (Zone 15)	Ribbed mussel	10/26/77	-	-	-	-	-	-
Beach Thorofare (Zone 16)	Hard clam	4/10/78	-	-	-	-	-	-
Stake Thorofare	Hard clam	4/10/78	-	-	-	-	-	-
Stake Thorofare	Ribbed mussel	5/22/78	-	-	-	-	-	-
Middle Thorofare (Zone 09)	Ribbed mussel	5/23/78	-	-	-	-	-	-

Table 37C.Continued.

Location***	Species**	Date	∝BHC	Lindane	Aldrin	Heptachlor epoxide	Dieldrin	Chlordane
Reed Bay	Hard clam	11/4/77	-	-	-	-	-	-
Reed Bay	Ribbed mussel	9/26/78	-	-	-	-	-	-
Absecon Bay	Hard clam	7/15/77	-	-	-	-	-	-
Absecon Bay	Ribbed mussel	11/21/77	-	-	-	-	-	-
Lakes Bay	Ribbed mussel	9/26/78	-	-	-	-	-	-
Lakes Bay	Hard clam	9/26/78	-	-	-	-	-	-
Scull Bay	Ribbed mussel	5/22/78	-	-	-	-	-	-
Scull Bay	Hard clam	9/26/78	-	-	-	-	-	-
Beach Thorofare (Zone 18)	Ribbed mussel	5/22/78	-	-	-	-	-	-
Beach Thorofare (Zone 18)	Hard clam	5/26/78	-	-	-	-	-	-
Risley Channel (Zone 26)	Ribbed mussel	10/26/78	-	-	-	-	-	-
Risley Channel (Zone 25)	Hard clam	1/9/78	-	-	-	-	-	-
Beach Thorofare (Zone 24)	Smooth mussel	10/25/78	-	-	-	-	-	-

* Results reported in ug/kg.
** See Figure 5A

Table 37D. Chlorinated Hydrocarbon Detected in Sediment Collected from the Back Bay System in Atlantic County, 1977.*

Location**	O,P' DDE	P,P' DDE	O,P' DDT	P,P' DDD	P,P' DDT	DDT Total
Brigantine Inlet (Zone 01)	-	<2.5	-	-	-	<2.5
Brigantine Channel (Zone 02)	-	3.43	-	-	-	3.43
Main Marsh Thorofare (Zone 03)	-	<2.5	-	-	-	<2.5
Main Marsh Thorofare (Zone 05)	-	<2.5	-	-	-	<2.5
Obes Thorofare (Zone 12)	-	<2.5	-	-	-	<2.5
Bonita Tideway (Zone 14)	-	<2.5	-	-	-	<2.5
Absecon Inlet (Zone 10)	-	<2.5	-	-	-	<2.5
St. George's Thorofare Lagoon (Zone 15)	-	15.4	-	-	-	15.4
St. George's Thorofare (Zone 15)	-	95.5	-	-	-	95.5
Beach Thorofare (Zone 16)	-	<2.5	-	-	-	<2.5
Stake Thorofare (Zone 08)	-	<2.5	-	-	-	<2.5
Beach Thorofare (Zone 17)	-	<2.5	-	-	-	<2.5
Absecon Creek (AC-0)	-	<2.5	-	-	-	<2.5
Absecon Creek (Route 9 Bridge)	-	<2.5	-	-	-	<2.5
Inside Thorofare (Zone 20)	-	9.43	-	-	-	9.43

Table 37D. continued

Location**	O,P' DDE	P,P' DDE	O,P' DDT	P,P' DDD	P,P' DDT	DDT Total
Inside Thorofare (Zone 21)	-	16.5	-	-	-	16.5
Beach Thorofare Rt. 30 Bridge (Zone 16)	-	16.41	-	-	-	16.41
Beach Thorofare (Zone 18)	-	22.7	-	-	-	22.7
Beach Thorofare (Zone 19)	-	6.11	-	-	-	6.11
Beach Thorofare (Zone 22)	-	< 2.5	-	-	-	< 2.5
Longport (Zone 24)	-	< 2.5	-	-	-	< 2.5
Perch Cove	-	< 2.5	-	-	-	< 2.5
Little Bay	-	< 2.5	-	-	-	< 2.5
Reed Bay	-	3.84	-	-	-	3.84
Absecon Bay	-	8.95	-	-	-	8.95
Lakes Bay	-	< 2.5	-	-	-	< 2.5
Scull Bay	-	4.61	-	-	-	4.61

Table 37D. continued

Location**	∝BHC	LINDANE	ALDRIN	HEPTACHLOR EPOXIDE	DIELDRIN	CHLORDANE
Brigantine Inlet (Zone 01)	-	-	-	-	-	23.8
Brigantine Channel (Zone 02)	-	-	-	-	-	17.7
Main Marsh Thorofare (Zone 03)	-	-	-	-	-	12.6
Main Marsh Thorofare (Zone 05)	-	-	-	-	-	327.5
Obes Thorofare (Zone 12)	-	-	-	-	-	54.7
Bonita Tideway (Zone 14)	-	-	-	-	-	167.1
Absecon Inlet (Zone 10)	-	-	-	-	-	120.8
St. George's Thorofare Lagoon (Zone 15)	-	-	-	-	-	265.0
St. George's Thorofare (Zone 15)	-	-	-	-	-	6400.0
Beach Thorofare (Zone 16)	-	-	-	-	-	33.5
Stakes Thorofare (Zone 08)	-	-	-	-	-	40.0
Beach Thorofare (Zone 17)	-	-	-	-	-	12.5
Absecon Creek (AC-0)	-	-	-	-	-	792.2
Absecon Creek (Route 9 Bridge)	-	-	-	-	-	372.0
Inside Thorofare (Zone 20)	-	-	-	-	-	-

Table 37D. continued

Location**	∝BHC	LINDANE	ALDRIN	HEPTACHLOR EPOXIDE	DIELDRIN	CHLORDANE
Inside Thorofare (Zone 21)	-	-	-	-	-	1190.0
Beach Thorofare Rt. 30 Bridge (Zone 16)	-	-	-	-	-	266.1
Beach Thorofare (Zone 18)	-	-	-	-	-	-
Beach Thorofare (Zone 19)	-	-	-	-	-	-
Beach Thorofare (Zone 22)	-	-	-	-	-	35.0
Longport (Zone 24)	-	-	-	-	-	-
Perch Cove	-	-	-	-	-	273.4
Little Bay	-	-	-	-	-	188.6
Reed Bay	-	-	-	-	-	65.3
Absecon Bay	-	-	-	-	-	-
Lakes Bay	-	-	-	-	-	-
Scull Bay	-	-	-	-	-	-

* Results reported in mg/kg.
** Samples collected at water quality and/or finfish stations (see Figure 5A).

Table 37E. Heavy Metal Concentrations Detected in Tissue of Fish and Crabs Collected from the Back Bay System in Atlantic County, 1977-78.*

Location**	Species	Date	Length (cm)	Total Chromium	Zinc	Lead	Cadmium	Mercury
Brigantine Channel (Zone 01)	Blue crab	4/10/78	-	<0.02	58.0	<0.2	<0.02	0.70
Brigantine Channel (Zone 01)	Fluke	8/18/77	32.4	<0.02	19.5	<0.2	<0.02	0.19
Obes Thorofare (Zone 12)	Fluke	8/18/77	49.5	<0.02	27.5	<0.2	<0.02	0.06
Weakfish Thorofare (Zone 11)	White perch	11/21/77	-	<0.02	21.0	<0.2	<0.02	0.08
Weakfish Thorofare (Zone 11)	White perch	10/31/77	28.5	<0.02	19.0	<0.2	<0.02	0.04
Main Marsh Thorofare (Zone 04)	Fluke	5/11/77	42.0	<0.02	27.0	<0.2	<0.02	0.02
Meadow Cut (Zone 06)	Weakfish	5/11/77	66.0	<0.02	40.0	<0.2	<0.02	0.02
Reeds Bay	Spot	7/21/77	11- 12.2	<0.02	33.5	<0.2	<0.02	0.22
Reeds Bay	Fluke	9/29/77	44.0	<0.02	24.0	<0.2	<0.02	0.65
St. George's Thorofare (Zone 15)	Winter flounder	4/19/77	27.0	<0.02	15.0	<0.2	<0.02	0.02
St. George's Thorofare (Zone 15)	Bluefish	9/16/77	26.2-27.0	<0.02	26.0	<0.2	<0.02	0.05
Absecon Inlet (Zone 10)	Bluefish	7/21/77	11-13.0	<0.02	27.5	<0.2	<0.02	0.02
Broad Creek (Zone 08)	Fluke	6/21/77	44.4	<0.02	27.0	<0.2	<0.02	0.19
Beach Thorofare (Zone 17)	Fluke	6/17/77	41.8	<0.02	23.5	<0.2	<0.02	0.32
Absecon Bay	Bluefish	7/28/77	13.3	<0.02	23.5	<0.2	<0.02	0.02
Dock Thorofare (Zone 27)	Fluke	7/22/77	36.0	<0.02	23.5	<0.2	<0.02	0.02

Table 37E. continued

Location**	Species	Date	Length (cm)	Total Chromium	Zinc	Lead	Cadmium	Mercury
Dock Thorofare (Zone 27)	Weakfish	7/22/77	57.5	<0.02	20.5	<0.2	<0.02	0.34
Dock Thorofare (Zone 27)	Fluke	5/5/77	39.0	<0.02	23.0	<0.2	<0.02	0.02
Beach Thorofare (Zone 22)	Fluke	8/19/77	43.5	<0.02	20.5	<0.2	<0.02	0.53
Scull Bay	Bluefish	6/30/77	33.8	<0.02	25.0	<0.2	<0.02	<0.01
Scull Bay	Fluke	8/19/77	36.5	<0.02	22.5	<0.2	<0.02	0.20
Scull Bay	Weakfish	9/31/77	62.5	<0.02	33.5	<0.2	<0.02	0.03
Lakes Bay	Winter flounder	4/21/77	31.0	<0.02	34.0	<0.2	<0.02	0.32
Lakes Bay	Window pane	4/21/77	26.0	<0.02	29.0	<0.2	<0.02	0.02

* Results reported in mg/kg.
** Fish collected at trawl, gill net and/or seine stations (see Figure 1)

Table 37F. Heavy Metal Concentration Detected in Tissue of Fish Collected from Absecon Creek, 1977*

Location**	Species	Date	Length (cm)	Total Chromium	Zinc	Lead	Cadmium	Mercury
AC-1	White perch	4/28/77	24.0	<0.02	24.0	<0.2	<0.02	0.04
Route 9 Bridge	Yellow perch	4/28/77	30.0	<0.02	24.0	<0.2	<0.02	0.55
Route 9 Bridge	White perch	7/1/77	24.5	<0.02	28.5	<0.2	<0.02	0.03
Route 9 Bridge	Yellow perch	8/24/77	22.0	<0.02	20.0	<0.2	<0.02	0.65
Route 9 Bridge	Yellow perch	8/24/77	28.0	<0.02	24.5	<0.2	<0.02	0.49
AC-1	Bluefish	8/24/77	23,25	<0.02	22.5	<0.2	<0.02	0.05
Route 9 Bridge	White perch	8/24/77	15-17.0	<0.02	21.0	<0.2	<0.02	0.09
AC-1	Spot	8/24/77	13-16.0	<0.02	24.5	<0.2	<0.02	0.03
AC-1	Atlantic menhaden	8/24/77	12-14.0	<0.02	24.5	<0.2	<0.02	0.02
AC-1	White perch	9/26/77	22-26.0	<0.02	24.5	<0.2	<0.02	0.11
AC-1	Bluefish	9/26/77	25-26.0	<0.02	24.0	<0.2	<0.02	0.02
AC-1	White perch	10/7/77	15,18	<0.02	21.5	<0.2	<0.02	<0.01
AC-1	Bluefish	10/7/77	17-18.0	<0.02	21.5	<0.2	<0.02	0.02
Route 9 Bridge	Yellow perch	10/7/77	27.0	<0.02	22.0	<0.2	<0.02	1.27
Route 9 Bridge	Bluefish	10/7/77	23-25.0	<0.02	26.5	<0.2	<0.02	0.04
Route 9 Bridge	White perch	10/7/77	20.0	<0.02	23.5	<0.2	<0.02	0.06

* Results reported in mg/kg.
** See Figure 1.

Table 37G. Heavy Metal Concentrations Detected in Sediment Collected from the Back Bay System in Atlantic County, 1977.*

Location**	Total Chromium	Zinc	Lead	Cadmium	Mercury
Brigantine Inlet (Zone 01)	<0.05	17.0	2.90	< 0.05	0.13
Brigantine Channel (Zone 02)	<0.05	38.5	5.25	< 0.05	0.06
Main Marsh Thorofare (Zone 03)	<0.05	32.0	4.65	< 0.05	0.05
Main Marsh Thorofare (Zone 05)	67.5	110.0	28.60	0.60	0.10
Obes Thorofare (Zone 12)	58.5	93.0	14.40	< 0.05	0.24
Bonita Tideway (Zone 14)	23.0	62.5	10.80	< 0.05	0.05
Absecon Inlet (Zone 10)	20.5	31.0	4.30	< 0.05	0.10
St. George's Thorofare (Zone 15)	63.0	138.0	58.60	7.80	0.57
St. George's Thorofare (Zone 15)	195.0	212.0	78.60	5.40	0.60
Beach Thorofare (Zone 16)	23.0	66.0	6.65	<0.05	0.16
Stake Thorofare (Zone 08)	44.0	78.0	9.75	0.60	0.18
Beach Thorofare (Zone 17)	18.5	51.0	58.60	<0.05	0.04
Absecon Creek (AC-0)	77.0	122.0	78.60	1.60	0.57
Absecon Creek (Route 9 Bridge)	99.5	94.0	0.10	<0.05	0.21
Inside Thorofare (Zone 20)	40.0	100.5	38.60	0.40	0.29

Table 37G. continued

Location	Total Chromium	Zinc	Lead	Cadmium	Mercury
Inside Thorofare (Zone 21)	12.2	196.0	88.60	0.70	0.75
Beach Thorofare Rt. 30 Bridge (Zone 16)	85.5	134.0	58.60	<0.05	0.94
Beach Thorofare (Zone 18)	105.0	171.5	58.60	3.80	0.67
Beach Thorofare (Zone 19)	76.5	128.5	48.60	<0.05	0.50
Beach Thorofare (Zone 22)	24.0	71.5	6.65	<0.05	0.09
Longport (Zone 24)	<0.05	24.0	48.60	<0.05	0.06
Perch Cove	81.0	134.0	38.6	0.20	0.20
Little Bay	72.0	93.0	19.40	0.20	0.05
Reed Bay	53.5	113.5	12.40	<0.05	0.06
Absecon Bay	67.5	103.5	0.50	<0.05	0.40
Lakes Bay	13.5	44.5	4.40	<0.05	0.05
Scull Bay	66.5	114.5	1.95	<0.05	0.60

* Results reported in mg/kg.
** See Figure 5A .

Table 37H. Heavy Metal Concentration Detected in Shellfish Meat Collected from the Back Bays in Atlantic County, 1977-78.*

Location**	Species	Date	Total Chromium	Zinc	Lead	Cadmium	Mercury
Main Marsh Thorofare Black Point (Zone 06)	Ribbed mussels	5/23/78	<0.05	12.5	7.00	<0.05	0.03
Main Marsh Thorofare (Hammock Cove)	Ribbed	4/11/78	<0.05	13.0	<0.1	<0.05	0.0
Main Marsh Thorofare (Hammock Cove)	Oysters	4/11/78	<0.05	214.0	<0.1	<0.05	0.08
Main Marsh Thorofare (Perch Cove)	Ribbed mussels	11/28/77	2.50	17.5	<0.1	<0.05	0.07
Main Marsh Thorofare (Perch Cove)	Hard clams	11/4/77	0.50	13.0	<0.1	1.20	0.0
Little Bay	Hard clams	11/4/77	<0.05	30.0	2.35	0.20	0.06
Little Bay	Ribbed mussels	11/4/77	0.50	16.5	<0.1	0.20	0.02
Steelman's Bay (Zone 11)	Hard clams	7/11/77	0.50	17.0	<0.1	<0.05	0.9
Obes Thorofare (Zone 12)	Hard clams	11/4/77	<0.05	25.5	<0.1	<0.05	0.02
Obes Thorofare (Zone 12)	Ribbed mussels	4/10/78	<0.05	84.0	0.60	2.00	0.14
Grassey Bay	Hard clams	11/4/77	<0.05	13.0	0.30	<0.05	0.0
St. George's Thorofare (Zone 15)	Ribbed mussels	10/26/77	<0.05	12.5	<0.1	<0.05	0.09
Beach Thorofare (Zone 16)	Hard clams	4/10/78	<0.05	15.0	<0.1	<0.05	0.0
Stake Thorofare	Hard clams	4/10/78	<0.05	18.5	4.05	0.20	0.05
Stake Thorofare	Ribbed mussels	5/22/78	<0.05	18.0	<0.1	<0.05	0.29
Middle Thorofare (Zone 09)	Ribbed mussels	5/23/78	<0.05	52.5	0.15	<0.05	0.02

Table 37H continued.

Location**	Species	Date	Total Chromium	Zinc	Lead	Cadmium	Mercury
Reed Bay	Hard clams	11/4/77	<0.05	15.5	<0.1	<0.05	0.05
Reed Bay	Ribbed mussels	9/26/78	<0.05	10.0	<0.1	0.1	0.04
Absecon Bay	Hard clams	7/15/77	<0.05	25.0	<0.1	0.70	0.0
Absecon Bay	Ribbed mussels	11/21/77	<0.05	17.0	<0.1	<0.05	0.0
Lakes Bay	Ribbed mussels	9/26/78	<0.05	13.5	0.40	<0.05	0.03
Lakes Bay	Hard clams	9/26/78	<0.05	24.0	<0.1	0.60	0.04
Scull Bay	Ribbed mussels	10/26/78	<0.05	15.5	<0.1	0.70	0.0
Scull Bay	Hard clams	9/26/78	<0.05	26.5	<0.1	<0.05	0.03
Beach Thorofare (Zone 18)	Ribbed mussels	5/22/78	<0.05	15.5	0.15	<0.05	0.06
Beach Thorofare (Zone 18)	Hard clams	5/26/78	<0.05	19.5	0.65	<0.05	0.04
Risley Channel (Zone 26)	Ribbed mussels	10/26/78	4.00	17.5	0.15	1.00	0.02
Risley Channel (Zone 25)	Hard clams	1/9/78	<0.05	14.5	<0.1	0.60	0.07
Beach Thorofare (Zone 24)	Smooth mussels	10/25/78	<0.05	46.5	1.15	1.70	0.04

* Results reported in mg/kg.
** See Figure 5A.

Table 37I. Comparison of Heavy Metal Concentrations Detected in Fish, Sediment and Shellfish Samples Collected in the Back Bays in Atlantic County, 1977-78.*

	Fish			Sediment			Shellfish		
	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.
Chromium		< 0.02		< 0.05	51.36	195.0	< 0.05	0.28	4.00
Zinc	15.0	25.51	58.0	17.0	95.33	212.0	10.0	28.72	214.00
Lead		< 0.2		0.1	31.38	88.6	< 0.1	0.59	7.00
Cadmium		< 0.02		< 0.05	0.79	7.8	< 0.05	0.32	2.00
Mercury	< 0.01	0.19	1.27	0.04	0.29	.94	0.0	0.05	0.29

* Results reported in mg/kg.

Table 38. List of Common and Scientific Names of Fishes Taken in the Study Area.

Alewife	*Alosa pseudoharengus*
American eel	*Anguilla rostrata*
American sandlance	*Ammodytes americanus*
American shad	*Alosa sapidissima*
Atlantic croaker	*Micropogon undulatus*
Atlantic menhaden	*Brevoortia tyrannus*
Atlantic silverside	*Menidia menidia*
Bay anchovy	*Anchoa mitchilli*
Black sea bass	*Centropristis striata*
Blueback herring	*Alosa aestivalis*
Bluefish	*Pomatomus saltatrix*
Bluntnose stingray	*Dasyatis sayi*
Butterfish	*Peprilus triacanthus*
Crevalle jack	*Caranx hippos*
Cunner	*Tautogolabrus adspersus*
Fourspine stickleback	*Apeltes quadracus*
Grubby	*Myoxocephalus aenaeus*
Halfbeak	*Hyporhamphus unifasciatus*
Hardtail jack	*Caranx crysos*
Hogchoker	*Trinectes maculatus*
Lined seahorse	*Hippocampus erectus*
Lookdown	*Selene vomer*
Mummichog	*Fundulus heteroclitus*
Naked goby	*Gobiosoma bosci*
Northern kingfish	*Menticirrhus saxatilis*
Northern pipefish	*Syngnathus fuscus*
Northern puffer	*Sphoeroides maculatus*
Northern searobin	*Prionotus carolinus*
Orange filefish	*Aluterus schoepfi*
Oyster toadfish	*Opsanus tau*
Permit	*Trachinotus falcatus*
Pollock	*Pollachius viren*
Pumpkinseed	*Lepomis gibbosus*
Red hake	*Urophycis chuss*
Rough silverside	*Membras martinica*
Sandbar shark	*Carcharhinus milberti*
Scup	*Stenotomus chrysops*
Sheepshead minnow	*Cyprinodon variegatus*
Silver hake	*Merluccius bilinearis*
Smallmouth flounder	*Etropus microstomus*
Smooth dogfish	*Mustelus canis*
Spot	*Leiostomus xanthurus*
Spotted hake	*Urophycis regius*
Striped anchovy	*Anchoa hepsetus*
Striped burrfish	*Chilomycterus schoepfi*
Striped cusk-eel	*Rissola marginata*
Striped killifish	*Fundulus majalis*
Striped mullet	*Mugil cephalus*
Striped searobin	*Prionotus evolans*
Summer flounder	*Paralichthys dentatus*

Table 38. continued

Tautog	*Tautoga onitus*
Threespine stickleback	*Gasterosteus aculeatus*
Weakfish	*Cynoscion regalis*
White hake	*Urophycis tenuis*
White mullet	*Mugil curema*
White perch	*Morone americana*
Windowpane	*Scopthalmus aquosus*
Winter flounder	*Pseudopleuronectes americanus*
Yellow perch	*Perca flavescens*

Table 39. List of Common and Scientific Names of Invertebrates Collected in the Study Area.

Blue crab	*Callinectes sapidus*
Calico crab	*Ovalipes ocellatus*
Edible prawn	*Peneus sp.*
Glass shrimp	*Palaemonetes sp.*
Hermit crab	*Pagurus longicarpus*
Horseshoe crab	*Limulus polyphemus*
Mud crab	*Panopeus sp.*
Mud snail	*Illyanassa obsoleta*
Rock crab	*Cancer irroratus*
Sand shrimp	*Crangon septemspinosa*
Spider crab	*Libnia sp.*
Starfish	*Asterias forbesii*
Whelk	*Busycon sp.*

Table 40 Description of Seine Stations

Location	Bottom	Sampling depth (m)
*Zone 01 Brigantine Channel - sand beach at north end of Brigantine Island	sand	0.9 - 1.5
*Zone 10 Absecon Inlet - sand beach on south end of Brigantine Island	sand	0.9 - 1.8
Zone 10 Tidepool - just north of above	sand	0.6 - 1.0
Zone 12 Obes Thorofare - behind city of Brigantine, just north of Country Club	sand, mud and large bricks	0.6 - 1.2
Zone 16 Beach Thorofare - behind Atlantic City, just north of Route 30	sand and mud	0.5 - 1.0
Zone 19 Beach Thorofare - behind Ventnor Heights at end of Dorset Ave	sand, mud and rubble	0.6 - 1.0
Zone 21 Inside Thorofare - next to launching ramp in cove in Ventnor Heights very steep drop-off, small seine area	sand, mud, rocks and assorted trash	0.6 - 1.2
*Zone 24 Risley Channel - sand beach on Dune Island behind Margage City	sand	0.6 - 1.2
Little Bay - south end of Shad Island	sand and mud	0.5 - 1.4
Perch Cove - peat bank on south side of cove	mud and peat	0.8 - 1.1
Reed Bay - in Turtle Cove on north side of bay	mud and sand	0.6 - 1.5
Absecon Bay - west side of bay just off Route 30 near Paxson's Motel	mud and sand	0.2 - 0.8
Lakes Bay - north side of bay in West Atlantic City just off Route 40 near Sand Castle Restaurant	sand, mud and gravel	0.2 - 0.9

*Sampled with 150' seine also

Table 41. Number of Fish Taken and Water Quality Recorded at Seine Station in Brigatine Channel (Zone 01).

Water quality data	Jan.	Feb.	March	April	May	June
D,O. mg/l				9.01	8.39	7.65
Salinity °/oo				28.66	28.84	29.87
pH				7.7	7.8	7.9
H_2O temp. °C				13.5	12.4	16.0
CO_2				3.42	3.91	6.36
Tide				L+4	H+2	L+5 1/2
Depth m.				0.9	1.5	4.9
Secchi m.				0.9	1.5	0.9
Air temp. °C				25.0	12.4	---
Date				12	5	6

Species	#	L-R	#	L-R	#	L-R
Atlantic silverside	4	70-100			9	95-111
Bay anchovy						
Mummichog						
Northern pipefish						
Sheepshead minnow						
Spot						
Striped killifish	1	80			2	70-140
Threespine stickleback					2	25
Horseshoe crab						
Sand shrimp						
Total	5				13	

* # = number of fish collected
L-R = length range in mm
c/h = catch per haul

Table 41 cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D,O. mg/l	6.17	6.22	7.13	9.40	9.21	
Salinity °/oo	29.18	28.87	28.53	26.38	28.12	
pH	7.8	8.1	8.0	8.0	8.1	
H_2O temp. °C	20.0	27.0	20.0	13.5	9.0	
CO_2	4.64	7.14	33.50	2.64	4.46	
Tide	H+1	L+1 1/2	L+3	L+6	L+1	
Depth m.	5.5	1.5	0.9	1.5	1.0	
Secchi m.	1.2	0.9	0.9	0.5	1.0	
Air temp. °C	27.0	31.0	18.0	15.5	12.0	
Date	6	9	21	31	31	

Species	#		#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic silverside	18	38-123	175	35-110	2020	35-112	33	60-104	80	55-76			2339	146.2
Bay anchovy							2	46-56					2	0.1
Mummichog			3	32-52	1	58							4	0.2
Northern pipefish			1	110									1	0.1
Sheepshead minnow							1	40					1	0.1
Spot	1	63											1	0.1
Striped killifish			17	45-59	3	56-66			2	45-47			25	1.6
Threespine stickleback													2	0.1
Horseshoe crab					X									
Sand shrimp			X						X					
Total	19		196		2024		36		82				2375	148.4

* # = number of fish collected
L-R = length range in mm
c/h = catch per haul

Table 42. Number of Fish Taken and Water Quality Recorded at Seine Station in Absecon Inlet (Zone 10).

Water quality data	Jan.	Feb.	March	April	May	June
D.O. mg/l				9.03	7.83	7.90
Salinity °/oo				29.54	30.62	29.78
pH				7.8	7.8	8.0
H_2O temp. °C				10.5	13.5	19.0
CO_2				4.89	6.60	6.11
Tide				H+1/2	L+1	L+1
Depth m.				1.0	1.8	0.9
Secchi m.				1.0	1.8	0.7
Air temp. °C				14.0	20.0	22.0
Date				15	12	13

Species	#	L-R	#	L-R	#	L-R
Atlantic silverside						
Bluefish						
Mummichog						
Permit						
Sheepshead minnow						
Striped killifish						
Striped mullet					4	50-51
White mullet					16	31-37
Windowpane					1	105
Calico crab						X
Sand shrimp				X		X
Total					21	

Table 42 cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O mg/l	7.20	6.02	7.27	8.42	7.06	
Salinity °/oo	29.94	29.36	29.79	29.18	26.02	
pH	7.9	7.9	8.0	8.2	8.0	
H_2O temp. °C	23.0	21.0	20.5	12.5	16.0	
CO_2	.49	6.65	2.22	7.64	13.44	
Tide	L+5 1/2	H+1	H+0	L+6	H+0	
Depth m.	0.9	0.9	1.5	1.0	1.0	
Secchi m.	0.9	0.9	1.0	0.5	0.5	
Air temp. °C	28.0	22.0	20.0	11.5	17.0	
Date	21	24	16	18	10	

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic silverside	3300	30-121	33	33-120	3863	55-92	580	43-97	178	39-108			7954	497.1
Bluefish	6	90-118			1	174							7	0.4
Mummichog			1	52			175	37-65	6	40-55			182	11.4
Permit					1	101							1	0.1
Sheepshead minnow							7	37-46					7	0.4
Striped killifish							3	60-73					3	0.2
Striped mullet													4	0.2
White mullet													16	1.0
Windowpane	5	82-98											6	0.4
Calico crab			X											
Sand shrimp			X							X				
Total	3311		34		3865		765		184				8180	511.2

Table 43. Number of Fish Taken and Water Quality Recorded at Seine Station in Risley Channel (Zone 24).

Water quality data	Jan.	Feb.	March	April	May	June
D.O. mg/l			9.75	8.54	7.17	5.70
Salinity °/oo			28.80	29.18	29.51	30.14
pH			7.8	7.6	7.8	8.0
H_2O temp. °C			8.5	12.0	15.2	17.0
CO_2			0	3.42	4.65	4.65
Tide			L+4	L+6	H+4	H+1/2
Depth m.			0.6	1.2	0.8	0.9
Secchi m.			0.6	1.2	0.8	0.9
Air temp. °C			11.5	16.0	17.0	24.0
Date			29	27	31	20

Species	#	L-R	#	L-R	#	L-R	#	L-R
Atlantic silverside					11	23-100	2	30-110
Bluefish								
Mumichog								
Sheepshead minnow								
Spot								
Striped killifish								
Winter flounder								
Calico crab						X		
Glass prawn								X
Hermit crab				X		X		
Mud crab								X
Mud snail				X		X		X
Sand shrimp				X		X		X
Total					11		2	

Table 43. cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	4.90	6.02	6.20	8.12	9.60	
Salinity °/oo	30.05	29.36	30.14	28.53	28.19	
pH	7.8	7.8	7.6	8.1	8.2	
H_2O temp. °C	23.5	23.5	20.0	13.5	8.0	
CO_2	7.88	6.16	7.14	5.17		
Tide	H+1	L+2	L+1 1/2	H+4 1/2	H+2	
Depth m.	0.8	1.2	1.0	0.8	0.4	
Secchi m.	0.8	1.0	1.0	0.8	0.4	
Air temp. °C	30.5	23.0	19.0	16.5	10.0	
Date	18	23	23	24	28	

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic silverside	958	27-100	266	45-104	62	49-104	80	45-80					1379	76.6
Bluefish	1	102											1	0.1
Mummichog			236	35-57			409	33-64	3	29-31			648	36.0
Sheepshead minnow							2	32-39					2	0.1
Spot	5	52-61	2	85-96	17	84-120							24	1.3
Striped killifish			5	45-63	3	50	6	54-75	1	78			15	0.8
Winter flounder					2	91-122	1	110					3	0.2
Calico crab														
Glass prawn														
Hermit crab			X		X									
Mud crab														
Mud snail			X		X		X							
Sand shrimp					X		X							
Total	964		509		84		498		4				2072	129.5

Table 44. Number of Fish Taken and Water Quality Recorded at Seine Station in Little Bay.

Water quality data	Jan.	Feb.	March	April	May	June
D.O. mg/l			11.13	9.90	8.20	7.90
Salinity °/oo			26.47	30.32	29.81	28.19
pH			8.0	7.8	---	8.0
H_2O temp. °C			7.5	16.0	23.5	22.5
CO_2			0	2.20	0	4.65
Tide			L+4	H+1 1/2	L+4 1/2	L+2 1/2
Depth m.			1.0	1.4	1.0	0.8
Secchi m.			0.3	1.4	0.9	0.6
Air temp. °C			---	17.0	21.5	24.5
Date			28	25	24	23

Species	#	L-R	#	L-R	#	L-R	#	L-R
Atlantic silverside	12	70-100			211	80-129	512	20-133
Bay anchovy					3	55-66	43	62-79
Blueback herring	1	80						
Bluefish							2	72-85
Mummichog					9	63-75		
Spot							201	45-73
Striped killifish	4	50-140			1	85		
Threespine stickleback	7	60-70						
White perch	1	130						
Blue crab							X	
Calico crab							X	
Glass prawn						X	X	
Mud snail		X				X	X	
Sand shrimp							X	
Total	25				224		758	

Table 44. cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	7.50	6.69	8.71	8.08	9.60	
Salinity °/oo	28.12	29.02	27.65	27.11	28.19	
pH	7.6	7.8	8.0	7.9	8.1	
H_2O temp. °C	27.0	21.0	18.0	14.0	6.8	
CO_2	4.93	7.64	3.45	5.04	5.76	
Tide	L+5 1/2	L+6	H+2	H+2	H+1	
Depth m.	0.5	1.2	0.8	0.8	1.0	
Secchi m.	0.5	0.4	0.4	0.8	0.5	
Air temp. °C	35.0	22.5	15.0	17.8	9.0	
Date	19	19	29	26	28	

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic silverside			5	82-99	5	72-98	7	52-84					752	41.8
Bay anchovy													46	2.6
Blueback herring													1	0.1
Bluefish	1	101											3	0.2
Mummichog							1	46					10	0.6
Spot	19	67-91			1	1 25							2.21	12.3
Striped killifish							5	56-80					10	0.6
Threespine stickleback													7	0.4
White perch													1	0.1
Blue crab		X				X		X						
Calico crab														
Glass prawn														
Mud snail		X						X						
Sand shrimp								X						
Total	20		5		6		13						1051	58.4

Table 45. Number of Fish Taken and Water Quality Recorded at Seine Station in Obes Thorofare (Zone 12).

Water quality data	Jan.	Feb.	March	April	May	June
D.O. mg/l			10.05	8.59	7.69	7.90
Salinity °/oo			27.74	28.48	29.42	29.60
pH			7.8	7.8	7.7	8.0
H_2O temp °C			10.5	13.5	16.7	23.0
CO_2			0	3.67	2.69	0
Tide			L+0	H+3	H+2 1/2	H+3 1/2
Depth m.			0.6	---	---	0.6
Secchi m.			0.6	---	---	0.6
Air temp. °C			17.0	17.0	20.5	23.0
Date			29	18	17	15

Species	#	L-R	#	L-R	#	L-R	#	L-R
Atlantic silverside	22	90-110			7	82-114	7	20-84
Bay anchovy					11	56-70		
Mummichog								
Northern pipefish							5	150-195
Oyster toadfish								
Sheepshead minnow								
Spot							5	33-39
Striped killifish							5	62-73
Summer flounder								
Weakfish								
Winter flounder								
Blue crab					X			
Calico crab				X	X			
Glass prawn				X			X	
Hermit crab				X	X			
Mud crab					X			
Mud snail	X			X	X		X	
Rock crab							X	
Sand shrimp	X			X	X		X	
Total	22				18		22	

Table 45. cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	7.64	---	7.78	7.78	8.53	11.17
Salinity °/oo	28.12	30.30	28. 89	28.30	28.48	27.23
pH	7.8	7.8	8.3	8.1	8.1	8.1
H_2O temp. °C	26.0	25.0	20.5	14.5	12.8	1.0
CO_2	---	4.83	6.65	4.93	---	2.40
Tide	H+4 1/2	H+3	H+2 1/2	H+2 1/2	L+4	H+1 1/2
Depth m.	0.8	0.6	0.7	1.2	1.0	0.6
Secchi m.	0.8	0.3	0.6	1.2	1.0	0.6
Air temp. °C	25.0	26.0	20.0	12.5	15.0	0
Date	15	15	15	13	17	29

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic silverside	63	31-125	85	37-128	92	48-88	95	48-115	480	56-98			851	42.6
Bay anchovy							4	32-57					15	0.8
Mummichog	26	46-87	46	36-69					245	35-65			317	15.8
Northern pipefish	11	70-220	4	123-183									20	1.0
Oyster toadfish	1	130											1	
Sheepshead minnow			6	36-43					41	29-50			47	2.4
Spot	8	54-61	1	90									14	0.7
Striped killifish	5	45-140	24	34-130					11	39-62			45	2.2
Summer flounder	5	62-72											5	0.2
Weakfish			15	34-51									15	0.8
Winter flounder			19	53-84									19	1.0
Blue crab			X											
Calico crab														
Glass prawn		X		X		X		X		X				
Hermit crab		X												
Mud crab		X												
Mud snail		X												
Rock crab														
Sand shrimp		X		X				X		X				
Total	119		200		92		99		777				1349	67.4

Table 46. Number of Fish Taken and Water Quality Recorded at Seine Station in Reed Bay.

Water quality data	Jan.	Feb.	March	April	May	June
D.O. mg/l				8.54	6.79	7.65
Salinity °/oo				29.54	29.42	30.66
pH				7.9	7.6	8.3
H_2O temp °C				13.8	17.0	22.5
CO_2				2.69	5.38	3.42
Tide				H+1	H+1/2	H+0
Depth m.				0.9	0.6	0.6
Secchi m.				0.9	0.1	0.6
Air temp. °C				17.0	21.0	20.5
Date				18	17	17

Species	#	L-R	#	L-R	#	L-R
Atlantic silverside	1	80	35	70-110	182	73-113
Bay anchovy			1	50		
Mummichog						
Permit						
Sheepshead minnow						
Spot						
Striped killifish			2	60	76	55-130
Weakfish						
Blue crab				X		X
Calico crab				X		
Glass prawn	X			X		
Hermit crab						
Horseshoe crab				X		
Mud snail				X		
Rock crab						
Sand shrimp				X		
Total	1		38		258	

Table 46 cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	5.75	6.88	6.96	7.93	9.80	
Salinity °/oo	30.30	29.36	24.96	28.30	---	
pH	8.2	7.9	8.2	7.8	---	
H_2O temp °C	21.0	24.0	---	12.5	8.5	
CO_2	5.91	30.79	4.19	6.90	5.09	
Tide	H+0	L+3 1/2	H+2	H+1	H+5	
Depth m.	1.5	0.6	0.6	1.0	3.0	
Secchi m.	1.5	0.6	0.2	0.3	3.0	
Air temp. °C	19.0	24.0	---	11.0	11.0	
Date	28	19	13	13	21	

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic silverside	775	21-105	282	37-131	4	61-85	1272	58-106	127	52-90			2678	167.4
Bay anchovy					2	60							3	0.2
Mummichog	59	25-55	1	55			4	42-51	23	39-47			87	5.4
Permit	22	28-42	4	49-62	3	50-81							29	1.8
Sheepshead minnow									2	31			2	0.1
Spot							9	114-171					9	0.6
Striped killifish	82	29-61	1	26					2	51-65			163	10.2
Weakfish							1	80					1	0.1
Blue crab					X									
Calico crab					X									
Grass prawn								X		X				
Hermit crab										X				
Horseshoe crab														
Mud snail										X				
Rock crab										X				
Sand shrimp								X		X				
Total	938		288		9		1286		154				2972	185.8

Table 47. Number of Fish Taken and Water Quality Recorded at Seine Station in Absecon Bay.

Water quality data	Jan.	Feb.	March	April	May	June
D.O. mg/l			10.34	8.20	7.50	7.45
Salinity °/oo			30.05	29.18	30.12	30.32
pH			7.7	7.8	7.8	8.4
H_2O temp °C			12.0	15.0	18.0	24.0
CO_2			3.74	3.67	3.18	7.58
Tide			H+3 1/2	H+2	H+1 1/2	H+2
Depth m.			0.2	0.6	0.6	0.6
Secchi m.			0.2	0.6	0.4	0.5
Air temp. °C			15.0	19.0	18.0	22.0
Date			17	18	17	17

Species	March #	March L-R	April #	April L-R	May #	May L-R	June #	June L-R
Atlantic menhaden								
Atlantic silverside	3	70-80	95	70-120	5	73-90	17	22-42
Bay anchovy								
Bluefish							2	66-70
Crevalle jack								
Mummichog					4	57-78	12	53-80
Naked goby								
Sheepshead minnow								
Spot							5	52-56
Striped killifish	1	60			4	61-63	114	65-140
White mullet								
Blue crab						X		X
Glass prawn				X		X		X
Hermit crab		X						
Mud snails		X						X
Sand shrimp		X				X		
Total	4		95		13		150	

Table 47. cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	5.15	7.83	5.37	8.85	9.21	
Salinity °/oo	31.36	28.30	27.47	26.56	26.71	
pH	7.8	7.9	8.1	7.9	8.1	
H_2O temp °C	23.5	23.5	---	13.5	12.0	
CO_2	---	14.53	8.13	6.24	3.60	
Tide	H+1	L+6	H+1	L+6	L+4 1/2	
Depth m.	0.9	0.8	0.8	---	0.8	
Secchi m.	0.3	0.4	0.4	---	0.8	
Air temp. °C	24.5	25.0	---	16.0	15.0	
Date	29	19	13	31	17	

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic menhaden			7	102-133									7	0.4
Atlantic silverside	66	52-87	38	55-118	307	41-91	1	55	80	48-105			612	34.0
Bay anchovy			118	31-68									118	6.6
Bluefish	6	38-138											8	0.4
Crevalle jack					1	84							1	0.1
Mummichog					4	40-53	1	40	28	34-53			49	2.7
Naked goby					1	32							1	0.1
Sheepshead minnow									5	30-41			5	0.3
Spot													5	0.3
Striped killifish			1	140	7	35-117	1	28	2	46-60			130	7.2
White mullet			2	94-105	4	40-78							6	0.3
Blue crab						X								
Glass prawn		X								X				
Hermit crab														
Mud snails		X								X				
Sand shrimp										X				
Total	72		166		324		3		115				942	52.3

Table 48. Number of Fish Taken and Water Quality Recorded at Seine Station in Lakes Bay.

Water quality data	Jan.	Feb.	March	April	May	June
D.O. mg/1			9.36	8.74	8.20	7.70
Salinity $^{o}/_{oo}$			28.26	29.02	28.87	29.42
pH			7.8	8.0	7.8	7.9
H_2O temp. °C			12.5	---	---	22.7
CO_2			0.70	0	0.49	4.65
Tide			H+5	H+6	L+1/2	H+1/2
Depth m.			0.2	0.6	0.6	0.6
Secchi m.			0.2	0.6	0.4	0.5
Air temp. °C			15.0	19.0	18.0	22.0
Date			17	18	17	17

Species	#	L-R	#	L-R	#	L-R	#	L-R
Atlantic silverside	181	70-130	180	70-120	65	67-111	17	22-42
Bay anchovy					275	48-72		
Mummichog					1	45		
Northern pipefish			1	140				
Permit								
Spot							5	36-47
Striped killifish					1	115		
Striped mullet								
Blue crab					X			
Calico crab					X			
Glass prawn				X	X			
Hermit crab							X	
Mud snail		X			X		X	
Sand shrimp		X		X	X			
Total	181		181		342		22	

Table 48. cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	7.45	---	6.67	7.49	10.24	
Salinity °/oo	29.88	29.76	28.53	27.65	25.62	
pH	7.8	7.7	7.9	7.7	8.1	
H_2O temp. °C	28.0	27.0	21.0	16.5	9.4	
CO_2	0	5.42	8.13	4.80	6.67	
Tide	H+1/2	H+1/2	L+3 1/2	H+1 1/2	H+0	
Depth m.	0.9	0.8	0.8	----	0.8	
Secchi m.	0.3	0.4	0.4	----	0.8	
Air temp. °C	24.5	25.0	---	16.0	15.0	
Date	29	19	13	31	17	

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic silverside	140	27-85	206	38-124	278	48-94	14	54-78	42	61-86			1123	66.1
Bay anchovy													275	16.2
Mummichog	2	36-46			1	53			7	29-41			11	0.6
Northern pipefish													1	0.1
Permit			9	44-60									9	0.5
Spot	11	48-75	1	106									17	1.0
Striped killifish	3	15-45			42	43-90	2	77-84					48	2.8
Striped mullet	27	21-40											27	1.6
Blue crab				X		X								
Calico crab														
Glass prawn														
Hermit crab						X								
Mud snail		X												
Sand shrimp														
Total	183		216		321		16		49				1511	88.9

Table 49. Number of Fish Taken and Water Quality Recorded at Seine Station in Inside Thorofare (Zone 21).

Water quality data	Jan.	Feb.	March	April	May	June
D.O. mg/l			11.03	10.46	7.21	8.15
Salinity °/oo			25.95	26.17	27.97	28.53
pH			7.8	7.9	7.9	7.7
H_2O temp. °C			12.0	17.0	18.7	22.7
CO_2			0	0	5.87	5.38
Tide			L+1 1/2	H+4 1/2	H+2 1/2	H+2 1/2
Depth m.			0.8	---	---	0.6
Secchi m.			0.8	0.6	---	0.6
Air temp. °C			15.5	12.8	19.5	23.0
Date			29	18	17	15

Species	#	L-R	#	L-R	#	L-R	#	L-R
Atlantic silverside	215	70-120	200	60-90			29	20-41
Crevalle jack					1	38		
Fourspine stickleback								
Mummichog			750	20-70	25	45-68	23	45-72
Blue crab						X		X
Glass prawn		X				X		
Mud snail		X						X
Sand shrimp				X		X		X
Total	215		950		26		52	

Table 49. cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec
D.O. mg/l	6.57	---	6.57	6.71	9.60	11.56
Salinity °/oo	29.18	28.33	27.83	26.38	24.74	24.38
pH	7.8	7.7	7.9	7.6	8.0	8.1
H_2O	28.3	28.0	21.5	16.5	10.6	3.0
CO_2	6.90	9.46	6.16	6.72	5.33	3.36
Tide	H+3	H+1 1/2	L+5	H+1/2	L+6	H+1/2
Depth m.	0.8	1.0	1.2	1.2	1.0	0.9
Secchi m.	0.8	1.0	0.9	1.2	1.0	0.9
Air temp. °C	27.5	26.0	21.5	20.5	14.0	0
Date	15	15	15	28	16	29

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic silverside	14	28-65	75	25-81	182	38-90	4	51-60	64	50-81	2	45-62	785	41.3
Crevalle jack					1	83							1	0.1
Fourspine stickleback													1	0.1
Mummichog	83	15-75	2	85	3	37-40							886	46.6
Blue crab			X				X							
Glass prawn			X						X					
Mud snail	X		X				X		X					
Sand shrimp			X											
Total	97		77		186		4		64		2		1673	881

Table 50. Number of Fish Taken and Water Quality Recorded at Seine Station in Beach Thorofare (Zone 19).

Water quality data	Jan.	Feb.	March	April	May	June
D.O. mg/1			10.73	7.56	8.25	7.70
Salinity °/oo			28.44	27.95	28.69	29.60
pH			7.8	7.6	7.8	7.9
H_2O temp. °C			11.0	15.0	17.5	22.0
CO_2			0	3.18	2.93	4.89
Tide			L+2 1/2	L+4 1/2	H+3 1/2	H+2
Depth m.			0.6	1.0	---	0.6
Secchi m.			0.6	1.0	---	0.6
Air temp. °C			18.0	14.0	17.5	22.0
Date			29	27	17	15

Species	#	L-R	#	L-R	#	L-R	#	L-R
American eel					3	57-64		
Atlantic silverside	1	100			6	78-100	79	20-39
Bay anchovy								
Bluefish							4	45-48
Mummichog								
Northern pipefish					2	122-175		
Spot							1	40
Striped killifish							1	90
White mullet							2	32-35
Winter flounder					1	26		
Blue crab								
Calico crab			X					
Glass prawn	X				X			
Hermit crab								
Mud snail	X		X		X		X	
Sand shrimp	X		X		X			
Total	1				12		87	

Table 50. cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	6.66	---	6.95	7.49	9.31	10.88
Salinity o/oo	29.18	28.87	24.24	27.47	26.35	24.74
pH	7.8	7.7	8.1	7.6	8.1	8.1
H_2O temp. °C	28.0	26.0	21.0	16.5	10.0	1.5
CO_2	7.81	9.36	3.45	4.32	5.38	3.60
Tide	H+2	H+1	L+4 1/2	H+1	L+5	H+0
Depth m.	0.8	0.9	---	0.8	3.0	0.6
Secchi m.	0.8	0.9	---	0.8	3.0	0.6
Air temp. °C	28.0	26.0	21.5	18.0	16.5	0
Date	15	15	15	28	16	29

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
American eel													3	0.2
Atlantic silverside	209	32-123	98	72-124	428	48-115	155	45-98	332	48-105			1308	65.4
Bay anchovy							1	55					1	0.1
Bluefish													4	0.2
Mummichog			2	42-45									2	0.1
Northern pipefish													2	0.1
Spot													1	0.1
Striped killifish	1	90	11	48-63									13	0.6
White mullet					1	81							3	0.2
Winter flounder			2	65-68									3	0.2
Blue crab		X		X										
Calico crab														
Glass prawn														
Hermit crab		X		X										
Mud snail		X		X						X				
Sand shrimp														
Total	210		113		429		156		332				1340	67.0

Table 51. Number of Fish Taken and Water Quality Recorded at Seine Station in Perch Cove.

Water quality data	Jan.	Feb.	March	April	May	June
D.O. mg/l			9.85	9.11	8.39	8.70
Salinity °/oo			24.67	28.30	29.90	28.19
pH			7.8	7.8	8.0	8.0
H_2O temp. °C			8.0	16.0	25.0	21.7
CO_2			2.44	0.98	0	1.96
Tide			L+2 1/2	L+6	L+3 1/2	L+3 1/2
Depth m.			1.1	0.9	1.0	1.0
Secchi m.			---	0.9	0.5	0.6
Air temp. °C			11.0	17.5	28.0	26.0
Date			28	25	24	23

Species	#	L-R	#	L-R	#	L-R	#	L-R
American eel							1	58
Atlantic menhaden							2	40-70
Atlantic silverside			79	70-120	24	75-118	14	21-115
Bay anchovy					32	51-72	94	58-90
Bluefish					1	50		
Lookdown								
Mummichog								
Sheepshead minnow								
Spot							6	29-62
Striped killifish					5	40-68		
White perch								
Blue crab						X		X
Calico crab								X
Glass prawn						X		X
Mud snail		X				X		X
Sand shrimp		X				X		X
Total			79		62		117	

Table 51. cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	7.89	6.51	7.41	8.17	9.51	
Salinity °/oo	28.12	28.30	24.60	26.74	27.47	
pH	7.9	7.9	7.8	7.9	8.1	
H_2O temp. °C	---	22.0	21.9	14.0	6.8	
CO_2	3.94	6.16	6.40	4.32	---	
Tide	H+0	L+5	---	H+2 1/2	H+2	
Depth m.	0.8	0.9	1.0	0.8	1.0	
Secchi m.	0.3	0.4	0.3	0.8	1.0	
Air temp. °C	35.0	22.5	20.8	17.8	10.0	
Date	19	19	28	26	28	

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
American eel													1	0.1
Atlantic menhaden													2	0.1
Atlantic silverside	6	57-81	22	42-104	34	32-83	2	51-74	10	60-89			191	10.6
Bay anchovy			12	42-75	30	40-68	1	42					169	9.4
Bluefish													1	0.1
Lookdown			1	64									1	0.1
Mummichog									2	40-57			2	0.1
Sheepshead minnow					1	27							1	0.1
Spot					1	142							7	0.4
Striped killifish													5	0.3
White perch					4	61-252							4	0.2
Blue crab						X		X						
Calico crab														
Glass prawn						X		X		X				
Mud snail								X		X				
Sand shrimp						X		X		X				
Total	6		35		70		3		12				384	21.3

Table 52. Number of Fish Taken and Water Quality Recorded at Seine Station in Beach Thorofare (Zone 16).

Water quality data	Jan.	Feb.	March	April	May	June	
D.O. mg/l						7.40	
Salinity °/oo						29.25	
pH						7.8	
H_2O temp. °C						21.7	
CO_2						7.34	
Tide						L+1	
Depth m.						0.9	
Secchi m.						---	
Air temp. °C						25.0	
Date						14	
Species						**#**	**L-R**
Atlantic croaker							
Atlantic silverside						38	14-28
Bay anchovy							
Bluefish							
Mummichog						119	43-86
Northern pipefish						1	180
Spot							
Striped killifish							
White mullet							
Winter flounder							
Blue crab							
Calico crab							X
Glass prawn							X
Hermit crab							
Mud crab							X
Mud snail							
Sand shrimp							X
Total						158	

Table 52. cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	4.24	5.23	6.08	8.81	8.38	10.63
Salinity o/oo	27.79	27.95	---	26.02	27.59	27.95
pH	7.5	7.8	7.9	8.1	8.2	---
H_2O temp. °C	24.0	24.0	19.2	13.0	11.7	2.5
CO_2	12.07	5.91	6.40	1.92	3.36	5.04
Tide	L+1	---	H+0	L+5 1/2	L+3	H+2 1/2
Depth m.	0.5	0.6	1.0	1.0	1.0	0.9
Secchi m.	0.5	0.6	0.8	1.0	0.2	0.9
Air temp. °C	24.0	25.0	21.0	16.0	14.0	0
Date	27	29	30	31	17	29

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic croaker									7	32-49			7	0.6
Atlantic silverside	16	35-79	832	44-92	71	39-95	34	60-98	22	58-95			1013	84.4
Bay anchovy			2	39-40			7	53-66	48	41-69			57	4.8
Bluefish	1	119											1	0.1
Mummichog	110	28-111	160	35-95	6	34-59	17	34-48	2	34-43			414	34.5
Northern pipefish	5	80-170	3	100-175					1	164			10	0.8
Spot	2	88-99					1	134					3	0.2
Striped killifish	2	47-49			2	44-63							4	0.3
White mullet					1	137							1	0.1
Winter flounder	8	60-90							2	90-95			10	0.8
Blue crab		X								X				
Calico crab		X		X		X								
Glass prawn		X		X						X				
Hermit crab		X												
Mud crab														
Mud snail						X								
Sand shrimp		X				X				X				
Total	144		992		80		59		82				1520	126.7

Table 53. Number of Fish Taken and Water Quality Recorded at Seine Station in Tidepool on East Side of Absecon Inlet (Zone 10).

Water quality data	Jan.	Feb.	March	April	May	June
D.O. mg/l						11.05
Salinity °/oo						29.43
pH						8.3
H_2O temp °C						25.5
CO_2						0
Tide						L+1/2
Depth m.						0.6
Secchi m.						0.6
Air temp. °C						24.0
Date						14

Species	#	L-R
Atlantic silverside	300	18-34
Mummichog		
Sheepshead minnow		
Spot	7	41-46
Striped killifish	37	60-115
Striped mullet	29	50-62
White mullet	471	29-40
Sand shrimp		
Total	844	

Table 53. cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	6.86		8.98	9.73		
Salinity $^{o}/_{oo}$	30.30		29.79	27.95		
pH	7.9		8.1	8.2		
H_2O temp. °C	---		20.5	9.0		
CO_2	0.49		0	3.20		
Tide	L+5	H+I	L+6	L+6		
Depth m.	---		1.0	1.0		
Secchi m.	---		0.5	0.5		
Air temp. °C	26.0		22.5	11.5		
Date	21	24	16	18		

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic silverside	650	25-112	528	37-73	452	42-123	6700	54-88					8630	1078.8
Mummichog	2	40-44	19	30-50									21	2.6
Sheepshead minnow	6	32-38	1	38	1	44	60	26-49					68	8.5
Spot	3	48-58	3	83-94									13	1.6
Striped killifish	5	44-54	12	35-75	109	43-88	79	31-80					242	30.2
Striped mullet													29	3.6
White mullet			1	78	2	90-97							474	59.2
Sand shrimp					X		X							
Total	666		564		564		6839						9477	1184.6

Table 54. Number of Fish Taken in the 25' Seine and Catch Per Haul by Season.

Species	Winter #	Winter c/h	Spring #	Spring c/h	Summer #	Summer c/h	Fall #	Fall c/h	Total #	Total c/h
American eel			4	0.1					4	
Atlantic croaker							7	0.1	7	
Atlantic menhaden			2		7	0.1			9	
Atlantic silverside	434	27.1	2,129	31.8	16,658	222.1	10,394	179.2	29,615	137.1
Bay anchovy			459	6.8	164	2.2	63	1.1	686	3.2
Blueback herring	1	0.1							1	
Bluefish			9	0.1	16	0.2			25	0.1
Crevalle jack					2				2	
Fourspine stickleback			1						1	
Lookdown					1				1	
Mummichog			943	14.1	767	10.2	925	15.9	2,633	12.2
Naked goby					1				1	
Northern pipefish			9	0.1	24	0.3	1		34	0.2
Oyster toadfish					1				1	
Permit					39	0.5			39	0.2
Sheepshead minnow					15	0.2	118	2.0	133	0.6
Spot			230	3.4	75	1.0	10	0.2	315	1.5
Striped killifish	5	0.3	249	3.7	335	4.5	114	2.0	703	3.2
Striped mullet			33	0.5	27	0.4			60	0.3
Summer flounder					5	0.1			5	

Table 54 cont.

Species	Winter #	Winter c/h	Spring #	Spring c/h	Summer #	Summer c/h	Fall #	Fall c/h	Total #	Total c/h
Threespine stickleback	7	0.4	2						9	
Weakfish					15	0.2	1		16	
White mullet			487	7.3	11	0.2			498	2.3
White perch	1	0.1			4	0.1			5	
Windowpane			1		5				6	
Winter flounder			1		30	0.4	3	0.1	34	0.2

Table 55. Number of Fish Taken by 150' Bag Seine and Water Quality Recorded at Station in Brigatine Channel (Zone 1).

Water quality data		Jan.	Feb.	March	April	May	June
D.O. mg/l	surface			10.29	9.01	8.39	7.65
	bottom						7.25
Salinity °/oo	surface			30.56	28.66	28.48	29.87
	bottom						30.05
pH	surface			7.8	7.7	7.8	7.9
	bottom						7.9
H_2O temp. °C	surface			6.8	13.5	12.4	16.0
	bottom						15.0
CO_2 mg/l				6.07	3.42	3.91	6.36
Tide				L+6	L+4	H+2	H+0
Depth m.				2.3	1.8	1.6	4.9
Secchi m.				2.3	---	1.5	0.9
Air temp. °C				14.5	25.8	17.0	15.0
Date				11	12	5	6

Species	#	L-R	#	L-R	#	L-R	#	L-R
American sandlance					1	140	13	60-75
Atlantic menhaden								
Atlantic silverside	1	70	107	60-110	1	100	23	82-128
Bay anchovy							20	63-86
Blueback herring			7	80-85				
Bluefish							2	51-69
Bluntnose stingray								
Grubby								
Northern pipefish					1	150		
Northern puffer								
Northern searobin								
Smooth dogfish								
Spot								
Striped killifish			3	50-60				
Striped mullet								
Striped searobin							2	360-370
Threespine stickleback							1	20
White mullet								
Windowpane							2	84-90
Winter flounder								

Table 55. cont.

Species	Jan.	Feb.	March		April		May		June	
			#	L-R	#	L-R	#	L-R	#	L-R
Blue crab										
Calico crab					X					
Glass prawn										
Hermit crab										
Hôrseshoe crab										
Sand shrimp			X				X		X	
Total			I		117		3		63	

Table 55. cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	6.08	6.22	6.20	9.40	9.11	
	bottom	6.37	6.13	6.16			
Salinity °/oo	surface	28.82	28.87	29.54	26.38	27.59	
	bottom	29.18	30.84	28.84			
pH	surface	7.8	8.1	7.9	8.0	8.1	
	bottom	7.8	8.0	7.9			
H_2O temp. °C	surface	19.2	27.0	23.0	13.5	12.8	
	bottom	19.0	27.0	23.0			
CO_2 mg/l		4.79	7.14	8.13	0.55	6.38	
Tide		L+3	L+1	H+6	H+0	L+2 1/2	
Depth m.		4.0	2.4	4.5	1.5	2.0	
Secchi m.		1.7	0.9	0.5	0.5	2.0	
Air Temp. °C		27.0	31.0	23.0	15.5	12.8	
Date		6	9	8	31	21	

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
American sandlance	1	77							10	75-95			25	1.4
Atlantic menhaden	21	75-101											21	1.2
Atlantic silverside	126	27-120	1042	32-136	2808	40-125	71	56-111	85	31-98			4264	236.9
Bay anchovy	76	65-85			41	35-73	43	27-70					180	10.0
Blueback herring													7	0.4
Bluefish	28	75-111	26	131-194	27	162-200							83	4.6
Bluntnose stingray			1	1300									1	0.1
Grubby													4	0.2
Northern pipefish					3	105-175							5	0.3
Northern puffer			1	135	4	22-106							1	0.1
Northern searobin			1	205									1	0.1
Smooth dogfish			5	397-446									5	0.3
Spot	518	49-102	38	76-140	25	91-151							581	32.3
Striped killifish			16	32-56	18	43-66	1	80	1	65			39	2.2
Striped mullet					1	365							1	0.1
Striped searobin													2	0.1
Threespine stickleback													1	0.1
White mullet			2	72-80	21	152-172							23	1.3
Windowpane					1	255							3	0.2
Winter flounder	12	61-75	6	52-80	7	60-79							25	1.4

Table 55. cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L-R	Dec. #	Dec. L-R	Total #	Total c/h
Blue crab				X		X		X						
Calico crab		X		X		X		X						
Glass prawn														
Hermit crab								X		X				
Horseshoe crab		X												
Sand shrimp								X						
Total	782		1138		2956		116		96				5272	292.9

Table 56. Number of Fish Taken by 150' Bag Seine and Water Quality Recorded in Absecon Inlet (Zone 10).

Water quality data	Jan.	Feb.	March	April	May	June
D.O. mg/l			10.46	9.03	7.83	7.80
Salinity $^{o}/_{oo}$			30.61	29.54	30.62	29.07
pH			7.8	7.8	7.8	8.0
H_2O temp. °C			4.1	10.5	13.5	18.7
CO_2 mg/l			5.14	4.89	6.60	5.87
Tide			H+1	H+5	L+1 1/2	H+4 1/2
Depth m.			1.1	1.0	1.8	1.0
Secchi m.			1.1	1.0	1.8	---
Air temp. °C			9.0	14.0	20.0	20.5
Date			10	15	12	13

Species	#	L-R	#	L-R	#	L-R	#	L-R
American eel								
American sandlance							650	60-78
Atlantic menhaden							4	63-89
Atlantic silverside	9	80-100	160	70-120	6	80-110	5	30-100
Bay anchovy					14	60-80	1131	56-80
Blueback herring			7	190-220				
Bluefish							7	65-80
Crevalle jack								
Mummichog								
Northern kingfish								
Northern pipefish							1	140
Northern searobin								
Sheepshead minnow								
Spot							69	34-55
Striped anchovy								
Striped killifish								
Summer flounder							12	42-120
Threespine stickleback	2	60						
Weakfish								
White mullet								
Windowpane					2	70-80	91	70-130
Winter flounder								

Table 56. cont.

Species	Jan. #	Jan. L-R	Feb. #	Feb. L-R	March #	March L-R	April #	April L-R	May #	May L-R	June #	June L-R
Blue crab												
Calico crab									X		X	
Glass prawn											X	
Hermit crab									X			
Horseshoe crab											X	
Mud crab											X	
Mud snail												
Sand shrimp						X		X		X		X
Spider crab												X
Total					11		162		22		1970	

Table 56. cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	7.20	6.02	7.27	8.47	7.06	
Salinity °/oo	29.94	29.36	29.79	29.36	26.02	
pH	7.9	7.9	8.0	7.9	8.0	
H_2O temp. °C	23.0	21.0	20.5	13.8	16.0	
CO_2 mg/l	0.46	6.65	2.22	4.43	13.44	
Tide	L+6	L+1	H+1/2	H+1/2	H+6	
Depth m.	0.9	0.9	1.5	1.5	1.5	
Secchi m.	0.9	0.9	1.0	0.5	0.5	
Air temp. °C	28.0	22.0	20.0	14.5	18.0	
Date	21	24	16	18	10	

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
American eel									1	600			1	0.1
American sandlance							1	82					651	38.3
Atlantic menhaden													4	0.2
Atlantic silverside	2900+	30-107	320	48-111	3755	56-90	350	52-190	2440	54-101			9945	585.0
Bay anchovy			395	47-83	25,750	29-54	1120	40-72	112	48-95			28,522	1677.8
Blueback herring													7	0.4
Bluefish	86	95-156	9	74-200	17	165-392							119	7.0
Crevalle jack	1	45											1	0.1
Mummichog			2	52-94					160	34-64			162	9.5
Northern kingfish			1	51									1	0.1
Northern pipefish	3	122-205	2	95-145	1	200							7	0.4
Northern searobin			5	185-195									5	0.3
Sheepshead minnow							1	38	1	41			2	0.1
Spot	12	56-110	61	84-159	15	110-189	1	155	4	118-134			162	9.5
Striped anchovy			9	91-106	7	104-114							16	0.9
Striped killifish									1	80			1	0.1
Summer flounder			4	230-438									16	0.9
Threespine stickleback													2	0.1
Weakfish			1	65									1	0.1
White mullet					26	116-167	1	55					27	1.6
Windowpane	4	55-74	1	98	1	87							99	5.8
Winter flounder	30	50-83	8	47-95	2	95-116							40	2.4

Table 56. cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L-R	Dec. #	Dec. L-R	Total #	Total c/h
Blue crab			X											
Calico crab		X	X			X		X		X				
Glass prawn														
Hermit crab		X				X		X		X				
Horseshoe crab														
Mud crab														
Mud snail								X						
Sand shrimp										X				
Spider crab														
Total	3036+		818		29,574		1474		2719				39,791	2340.6

Table 57. Number of Fish Taken by 150' Bag Seine and Water Quality Recorded at Station in Risley Channel (Zone 24).

Water quality data	Jan.	Feb.	March	April	May	June
D.O. mg/l			10.24	8.98	8.30	5.70
Salinity °/oo			27.74	28.30	27.45	30.14
pH			7.9	7.8	8.0	8.0
H_2O temp. °C			7.5	15.0	17.5	---
CO_2 mg/l			5.48	1.96	2.05	4.65
Tide			L+5	H+1/2	H+0	H+1/2
Depth m.			2.4	2.0	1.8	0.9
Secchi m.			1.5	1.5	1.2	0.9
Air temp. °C			12.0	17.0	---	24.0
Date			29	22	23	20

Species	#	L-R	#	L-R	#	L-R	#	L-R
American eel								
American sandlance	4	110-150					1	63
Atlantic croaker								
Atlantic menhaden								
Atlantic silverside	6	70-120			8	82-110	35	24-130
Bay anchovy			4	50-60	287	45-80		
Blueback herring	4	70-110	56	105-122	10	62-72		
Bluefish								
Halfbeak					3	190-220		
Lined seahorse								
Mummichog							1	50
Northern pipefish	1	190	1	70	3	130-225		
Northern searobin								
Rough silverside					7	77-98	2	102-105
Sheepshead minnow								
Smallmouth flounder								
Spot								
Striped killifish								
Striped mullet			2	330-350				
Summer flounder								
White mullet								
Windowpane					1	70		
Winter flounder								

Table 57. cont.

	Jan.		Feb.		March		April		May		June	
Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R
Blue crab												
Calico crab								X		X		
Diamondback terrapin												
Glass prawn										X		X
Hermit crab								X				
Horseshoe crab												
Mud crab								X		X		X
Mud snail								X				
Sand shrimp						X		X		X		X
Spider crab								X		X		
Total					15		63		319		39	

Table 57. cont.

Water quality data	July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	5.56	6.02	6.11	7.88	9.60	
Salinity °/oo	29.76	29.36	30.14	28.19	28.19	
pH	7.8	7.8	7.55	8.1	8.2	
H_2O temp. °C	23.0	23.5	23.0	13.0	8.0	
CO_2 mg/l	7.39	6.16	7.39	4.93	6.96	
Tide	---	L+1/2	L+1/2	H+4	H+2	
Depth m.	1.5	1.2	1.0	1.8	1.5	
Secchi m.	0.6	1.0	0.5	1.0	1.5	
Air temp. °C	23.0	23.0	23.0	16.5	10.0	
Date	26	23	23	24	28	

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
American eel	2	640	3	523-748									5	0.3
American sandlance									2	86-92			7	0.4
Atlantic croaker							1	36	1	42			2	0.1
Atlantic menhaden	8	92-126											8	0.4
Atlantic silverside	5924+	32-115	110	40-126	405	45- 98	1110	46-116	176	60-142			7774	431.9
Bay anchovy	278	45-88											569	31.6
Bluebach herring													70	3.9
Bluefish	31	102-164	8	150-195	8	183-227							47	2.6
Halfbeak													3	0.2
Lined seahorse														
Mummichog	2	36-37	4	40-48			2	35-45	8	37-53			17	0.9
Northern pipefish	2	95-100	3	120-154	1	133	1	119					12	0.7
Northern searobin	1	156											1	0.1
Rough silverside													9	0.5
Sheepshead minnow									2	38-39			2	0.1
Smallmouth flounder	2	86-88					4	31-51					6	0.3
Spot	387	43-116	168	75-166	91	91-154							646	35.9
Striped killifish	4	35-40					1	70	11	65-87			16	0.9
Striped mullet			13	154-190	37	177-223							52	2.9
Summer flounder	3	286-415											3	0.2
White mullet			9	120-140	7	138-162							16	0.9
Windowpane	1	176											2	0.1
Winter flounder	30	44-92	18	51-115	6	75-107	3	90-115	5	110-174			62	3.4

Table 57 cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L-R	Dec. #	Dec. L-R	Total #	Total c/h
Blue crab						X								
Calico crab		X		X		X		X						
Diamondback terrapin		X												
Glass prawn														
Hermit crab				X		X		X						
Horseshoe crab														
Mud crab								X						
Mud snail								X						
Sand shrimp		X				X		X						
Spider crab														
Total	6678		336		555		1122		205				9329	5183

F. 0.0125% Sulfaquinoxaline Sodium added per ton to aid in prevention of Coccidiosis.

G. Product to be in ETT or crumble form only and must meet following standards:

Texture - 0% Held on #6 Tyler Screen
0 - 10% Held on #8 Tyler Screen
0 - 2% to pass #24 Tyler Screen

Moisture - Maximum 13.0%

Hardness - Pellet before broken must be minimum hardness of 16 pounds per square inch as measured by Pfizer Hardness Tester.

H. Pellet binder, if used, must be organic product such as Calcium Lignin Sulfonate. Inorganic binders not acceptable.

Table 58. Number of Fish Taken in the 150' Seine and Catch per Haul by Season.

Species	Winter #	Winter c/h	Spring #	Spring c/h	Summer #	Summer c/h	Fall #	Fall c/h	Total #	Total c/h
American eel					5	0.3	1	0.1	6	0.1
American sandlance	4	0.7	665	13.9	1	0.1	13	1.2	683	12.9
Atlantic croaker							2	0.2	2	
Atlantic menhaden			4	0.2	29	1.6			33	0.6
Atlantic silverside	16	2.7	345	19.2	17,390	966.1	4,232	384.7	21,983	414.8
Bay anchovy			1,456	80.9	26,540	1474.4	1,275	115.9	29,271	552.3
Blueback herring	4	0.7	80	4.4					84	1.6
Bluefish			9	0.5	240	13.3			249	4.7
Bluntnose stingray					1	0.1			1	
Crevalle jack					1	0.1			1	
Halfbeak			3	0.2					3	0.1
Lined seahorse					1	0.1			1	
Mummichog			1	0.1	8	0.4	170	15.5	179	3.3
Northern kingfish					1	0.1			1	
Northern pipefish	1	0.2	6	0.3	15	0.8	1	0.1	23	0.4
Northern puffer					5	0.3			5	0.1
Northern searobin					7	0.4			7	0.1
Rough silverside			9	0.5					9	0.2
Sheepshead minnow							4	0.4	4	0.1
Smallmouth flounder					2	0.1	4	0.4	6	0.1
Smooth dogfish					5	0.3			5	0.1

Table 58. cont.

Species	Winter #	Winter c/h	Spring #	Spring c/h	Summer #	Summer c/h	Fall #	Fall c/h	Total #	Total c/h
Spot			69	3.8	1,315	73.1	5	0.5	1,389	26.2
Striped anchovy					16	0.9			16	0.3
Striped killifish			3	0.2	38	2.1	15	1.4	56	1.1
Striped mullet			2	0.1	51	2.8			53	1.0
Striped searobin			2	0.1					2	
Summer flounder			12	0.7	7	0.4			19	0.4
Threespine stickleback	2	0.3	1	0.1					3	0.1
Weakfish					1	0.1			1	0.1
White mullet					65	3.6	1	0.1	66	1.2
Windowpane			96	5.3	8	0.4			104	2.0
Winter flounder					119	6.6	8	0.7	127	2.4

Table 59 Description of Trawl and Gill Net Stations

Location	Bottom	Sampling depth (m)
Zone 01 Brigantine Channel between mouth of Inlet and cable crossing.	sand	1.7 - 7.6
Zone 04 Main Marsh Thorofare-Intercoastal Waterway between Fl R 8 ft. "38" and Fl R 8 ft. "44"	mud and sand	1.4 - 6.1
Zone 06 Meadow Cut-Intercoastal Waterway between Fl R 8 ft. "53" and Fl R 8 ft. "54"	sand and mud	2.4 - 5.8
Zone 10 Absecon Inlet - between Brigantine Blvd. Bridge and Capt. Starns Restaurant	sand	3.0 - 12.8
Zone 12 Obes Thorofare - behind city of Brigantine, just north of Country Club	sand	4.3 - 7.0
*Zone 15 St. George's Thorofare - large cove off the north side of Absecon Inlet	mud	0.9 - 6.5
Zone 16 Beach Thorofare - Intercoastal Waterway behind Atlantic City, just north of Route 30	sand and shell pieces	3.7 - 4.9
Zone 17 Beach Thorofare - Intercoastal Waterway behind Atlantic City between G "17" and R "22"	mud and sand	1.8 - 6.1
Zone 21 Inside Thorofare - Intercoastal Waterway behind Ventnor City northeast of Dorset Ave. Bridge	mud	4.0 - 7.0
Zone 22 Beach Thorofare - Intercoastal Waterway behind Margate City between marker "43" and R "44"	sand and mud	2.0 - 6.0

Table 59 cont.

Location	Bottom	Sampling Depth (m)
Zone 24 Beach Thorofare - behind Longport City between N "2" and C "5" just north of Great Egg Harbor Inlet	sand	3.5 - 8.8
Zone 27 Dock Thorofare - south of Margate Bridge Road and north of Scull Bay	sand and mud	1.5 - 4.0
Broad Creek-off the Intercoastal Waterway west of Fl R 8 ft. "70" behind Brigantine	sand and mud	1.5 - 6.0
*Absecon Bay - north of Absecon Channel approximately 0.9 miles southeast of Fl "11" at the mouth of Absecon Creek	mud and sand	0.9 - 2.5
*Lakes Bay - south of West Atlantic City in the area of Fl R "8" and Fl G "7"	sand and mud	1.2 - 8.0
*Scull Bay - in the northern half of the bay off Linwood City	mud	0.8 - 3.5
Gill Nets Only		
Zone 11 Weakfish Thorofare off south side of Brigantine Channel north of Brigantine City	sand	0.4 - 3.7
Zone 25 Risley Channel-near Fl 11 ft.5M "1" behind Margate City	sand, mud and shellpieces	0.8 - 4.6
Absecon Creek - just above Fl "11" at mouth of creek	mud and sand	0.5 - 3.0
Absecon Creek-just above Route 9 in Absecon City	mud	0.4 - 3.0

* Trawl and Gill Net

Table 60. Number of Fish Taken and Water Quality Recorded at Trawl Station in Brigatine Channel (Zone 01).

Water quality data		Jan.	Feb.	March	April	May	June
D.O. mg/l	surface			10.25	9.95	8.44	8.20
	bottom			10.30	9.06	8.10	8.25
Salinity °/oo	surface			28.89	29.02	28.30	30.25
	bottom			29.07	29.18	28.66	29.88
pH	surface			8.2	7.9	7.8	7.9
	bottom			8.2	7.8	7.8	7.9
H_2O temp. °C	surface			5.5	7.0	13.5	15.5
	bottom			5.2	7.0	14.0	15.5
CO_2				0.65	2.10	3.65	3.57
Tide				L+1	H+1 1/2	H+1 1/2	H+3
Depth m.				6.1	6.1	6.4	7.6
Secchi m.				1.1	1.0	1.5	1.4
Air temp. °C				7.5	8.0	24.5	25.0
Date				1	7	4	2

Species	March #	March L-R	April #	April L-R	May #	May L-R	June #	June L-R
American sandlance	2	80-90						
Atlantic silverside								
Bay anchovy					1	90		
Black sea bass								
Cunner								
Grubby								
Northern pipefish								
Northern puffer								
Red hake								
Silver hake								
Smooth dogfish								
Spot								
Striped cusk-eel								
Striped searobin								
Summer flounder								
Weakfish								
Windowpane			1	320	1	70	1	95
Winter flounder								

Table 60 cont.

Species	Jan. #	Jan. L-R	Feb. #	Feb. L-R	March #	March L-R	April #	April L-R	May #	May L-R	June #	June L-R
Blue crab						X						
Calico crab						X				X		X
Glass prawn												
Hermit crab												X
Horseshoe crab												X
Mud snail								X				
Rock crab												
Sand shrimp										X		X
Spider crab												
Total					2		1		2		1	

Table 60. Number of Fish Taken and Water Quality Recorded at Trawl Station in Brigatine Channel (Zone 01).

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	5.80	7.26	6.53	8.03	8.90	9.07
	bottom	5.80	5.09	6.67	7.59	9.15	9.02
Salinity °/oo	surface	29.76	29.90	28.89	28.66	26.02	28.30
	bottom	29.76	30.08	27.29	27.95	26.02	28.12
pH	surface	8.1	7.8	8.2	7.9	8.1	8.1
	bottom	7.8	7.6	8.4	8.2	8.1	8.1
H_2O temp. °C	surface	21.0	18.5	22.5	12.5	14.5	9.0
	bottom	21.0	18.5	22.0	12.5	14.6	9.0
CO_2		0	6.65	2.46	4.43	2.40	4.80
Tide		L+4	H+0	L+3 1/2	L+5	H+1	H+0
Depth m.		1.7	3.7	4.0	4.0	5.0	6.0
Secchi m.		0.4	0.3	0.5	0.3	0.5	0.5
Air temp. °C		20.5	22.0	---	15.0	16.0	10.0
Date		26	18	19	18	2	2

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
American sandlance											1	97	3	0.2
Atlantic silverside					1	89							1	0.1
Bay Anchovy	9	75-84	40	42-90	258	36-85	7	54-94					315	15.8
Black sea bass			1	155									1	0.1
Cunner			3	33-36	1	52			1	80			5	0.2
Grubby			3	45-67									3	0.2
Northern pipefish	4	82-142	9	98-209					1	161			14	0.7
Northern puffer			3	84-97									3	0.2
Red hake									2	51-68			2	0.1
Silver hake									1	131			2	0.1
Smooth dogfish			6	413-494			1	82					6	0.3
Spot	3	72-100	40	103-245					1	116			44	2.2
Striped cusk-eel			2	238-264									2	0.1
Striped searobin			7	230-336									7	0.4
Summer flounder			6	324-385									6	0.3
Weakfish			51	22-72	3	70-109							54	2.7
Windowpane			12	101-205	1	155							16	0.8
Winter flounder			2	52-57									2	0.1

Table 60. cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L-R	Dec. #	Dec. L-R	Total #	Total c/h
Blue crab														
Calico crab		X		X		X		X		X				
Glass prawn								X						
Hermit crab		X		X		X		X		X				
Horseshoe crab														
Mud snail														
Rock crab				X						X		X		
Sand shrimp		X		X		X		X		X				
Spider crab		X								X				
Total	16		185		264		8		6		1		486	24.3

Table 61. Number of Fish Taken and Quality Recorded at Trawl Station in Absecon Inlet (Zone 10).

Water quality data		Jan.	Feb.	March	April	May	June
D.O. mg/1	surface			11.43	8.84	7.36	6.75
	bottom			11.23	8.54	7.26	6.70
Salinity °/oo	surface			28.44	28.66	28.69	30.32
	bottom			28.44	28.84	29.76	30.68
pH	surface			8.0	7.6	7.8	8.1
	bottom			8.0	7.6	7.9	8.1
H_2O temp. °C	surface			6.5	11.0	13.5	17.0
	bottom			6.0	11.0	14.0	17.0
CO_2				0	2.93	5.82	6.36
Tide				H+2 1/2	H+2 1/2	H+2	H+0
Depth m.				9.2	12.8	7.6	8.8
Secchi m.				1.4	2.6	2.4	2.4
Air temp. °C				16.0	14.0	28.0	24.0
Date				21	19	18	21

Species	#	L-R	#	L-R	#	L-R	#	L-R
Atlantic croaker								
Atlantic silverside								
Bay anchovy								
Butterfish								
Red hake								
Striped killifish								
Windowpane								
Calico crab						X		
Hermit crab								
Rock crab								
Sand shrimp						X		
Spider crab								
Total								

Table 61. cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	7.35	7.05	6.76	8.27	8.43	10.39
	bottom	7.35	6.41	6.76	8.22	8.38	10.00
Salinity °/oo	surface	30.30	30.43	28.19	28.19	28.30	27.23
	bottom	30.48	29.72	29.61	28.19	27.95	27.77
pH	surface	7.9	7.8	8.0	7.8	8.1	8.1
	bottom	8.0	7.9	8.2	7.8	8.1	7.9
H_2O temp. °C	surface	22.5	21.0	20.5	---	11.0	3.0
	bottom	21.0	20.5	20.0	---	10.6	3.0
CO_2		1.38	4.43	2.46	4.80	6.00	6.72
Tide		L+4	H+1 1/2	H+1	L+4 1/2	H+1/2	L+0
Depth m.		11.6	6.1	7.0	11.0	3.0	3.0
Secchi m.		2.3	1.0	1.0	0.5	1.0	1.0
Air temp. °C		25.0	24.0	19.5	17.0	12.0	1.0
Date		21	16	28	28	15	8

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic croaker											1	32	1	0.1
Atlantic silverside											6	63-90	6	0.3
Bay anchovy							28	24-93	1	68			29	1.4
Butterfish							1	78					1	0.1
Red hake											2	69-84	2	0.1
Striped killifish											1	89	1	0.1
Windowpane					5	146-239					1	317	6	0.3
Calico crab	X		X		X		X							
Hermit crab									X		X			
Rock crab											X			
Sand shrimp											X			
Spider crab											x			
Total					5		29		1		11		46	2.3

Table 62. Number of Fish Taken and Water Quality Recorded at Trawl Station Behind Longport (Zone 24).

Water quality data		Jan.	Feb.	March	April	May	June
D.O. mg/l	surface			10.46	9.65	8.02	4.51
	bottom			10.17	9.26	7.83	4.61
Salinity °/oo	surface			30.16	27.41	28.84	30.14
	bottom			30.50	28.84	28.12	29.97
pH	surface			7.8	7.8	7.6	7.8
	bottom			7.8	7.7	7.6	7.7
H_2O temp. °C	surface			4.3	11.5	14.0	15.5
	bottom			5.0	11.5	14.0	15.5
CO_2				6.07	2.93	5.13	7.34
Tide				L+5 1/2	L+2 1/2	H+3	H+0
Depth m.				4.2	3.7	4.6	7.2
Secchi m.				1.8	1.7	2.1	2.3
Air temp. °C				7.5	26.5	19.0	20.5
Date				10	12	5	30

Species	#	L-R	#	L-R	#	L-R	#	L-R
Atlantic silverside								
Bay anchovy								
Blueback herring								
Spot								
Windowpane							4	108-165
Calico crab				X				X
Hermit crab						X		
Mud snail				X				
Rock crab						X		
Sand shrimp				X		X		X
Starfish								
Total							4	

Table 62. cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	5.49	7.07	6.48	7.35	9.05	10.19
	bottom	5.29	6.79	6.25	7.25	8.95	10.29
Salinity °/oo	surface	29.94	30.07	27.29	28.48	26.74	27.59
	bottom	30.30	29.72	29.97	29.36	26.74	27.23
pH	surface	7.6	7.9	8.1	8.1	8.2	8.1
	bottom	7.8	7.8	8.1	8.2	8.2	8.1
H_2O temp. °C	surface	19.3	19.5	20.5	15.0	13.0	4.5
	bottom	20.0	20.0	20.5	15.5	13.5	4.5
CO_2		6.16	3.69	3.20	10.34	3.12	4.32
Tide		L+4 1/2	H+0	H+4	H+3	H+2 1/2	H+3
Depth m.		8.8	5.5	3.5	8.0	6.5	3.5
Secchi m.		2.4	1.5	1.0	.75	1.0	.25
Air temp. °C		25.0	24.0	22.0	11.5	16.0	5.0
Date		22	19	13	13	1	30

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
											4	80-110		
Atlantic silverside													4	0.2
Bay anchovy							10	38-54			1	78	10	0.5
Blueback herring													1	0.1
Spot			1	134							1	312	1	0.1
Windowpane			2	135-220									7	0.4
Calico crab					X		X							
Hermit crab														
Mud snail														
Rock crab														
Sand shrimp											X			
Starfish											X			
Total			3				10				6		23	1.2

Table 63. Number of Fish Taken and Water Quality Recorded at Trawl Station in Obe's Thorofare (Zone 12).

Water quality data		Jan.	Feb.	March	April	May	June
D.O. mg/l	surface			11.33	10.05	8.15	7.60
	bottom			10.93	9.95	8.44	7.45
Salinity $^{o}/_{\phi\phi}$	surface			27.74	26.36	28.30	29.87
	bottom			27.74	29.02	28.66	29.52
pH	surface			8.02	---	7.8	7.9
	bottom			8.0	7.8	7.8	---
H_2O temp. °C	surface			6.0	7.0	15.0	17.0
	bottom			6.0	7.0	14.5	17.0
CO_2				0	3.42	5.13	3.67
Tide				H+1/2	H+0	H+1	H+1 1/2
Depth m.				4.6	6.1	6.4	4.9
Secchi m.				1.1	0.9	1.0	1.0
Air temp. °C				11.0	---	21.0	19.5
Date				21	7	4	2

Species	#	L-R	#	L-R	#	L-R	#	L-R
American eel					5	60-90		
Atlantic silverside								
Bay anchovy								
Lookdown								
Northern pipefish								
Northern searobin								
Oyster toadfish								
Silver hake								
Smallmouth flounder								
Smooth dogfish							1	350
Spot								
Striped burrfish								
Striped searobin								
Summer flounder							2	375-435
Weakfish								
Windowpane							1	342
Winter flounder								

Table 63 cont.

Species	Jan.	Feb.	March #	March L-R	April #	April L-R	May #	May L-R	June #	June L-R
Blue crab										
Calico crab								X		X
Glass prawn										
Hermit crab					X			X		X
Mud crab					X					
Mud snail								X		
Rock crab										
Sand shrimp			X		X					X
Spider crab					X			X		
Starfish					X					
Total							5		4	

Table 63. cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	5.80	5.66	6.16	8.08	8.95	9.11
	bottom	5.80	4.72	6.25	7.49	8.95	9.02
Salinity °/oo	surface	29.76	29.36	30.50	28.30	26.92	26.53
	bottom	30.12	29.72	26.20	28.66	26.38	28.12
pH	surface	7.8	7.8	8.2	7.9	8.1	8.1
	bottom	8.0	7.7	8.2	8.3	8.2	8.1
H_2O temp. °C	surface	21.5	---	23.5	12.5	14.5	9.0
	bottom	21.5	19.5	23.5	12.5	14.5	9.0
CO_2		4.93	6.89	1.72	3.20	2.40	4.80
Tide		H+2 1/2	H+0	L+3	L+4	H+0	L+5 1/2
Depth m.		4.3	4.7	7.0	5.0	7.0	5.0
Secchi m.		0.6	0.6	0.7	0.3	1.0	1.0
Air temp. °C		---	20.0	28.5	15.0	16.0	9.0
Date		26	18	19	18	2	2

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
American eel	2	432-502	3	374-556			2	167-284					7	0.4
Atlantic silverside							1	81					1	0.1
Bay anchovy	71	64-94	57	72-83	7	61-82	4	61-87	6	38-48			150	7.5
Lookdown			1	52									1	0.1
Northern pipefish							2	117-139					2	0.1
Northern searobin	4	178-191											4	0.2
Oyster toadfish			1	184			2	52-72					3	0.2
Silver hake							1	85					1	0.1
Smallmouth flounder							11	37-57					11	0.6
Smooth dogfish													1	0.1
Spot	118	78-134	1	140			99	108-165					218	10.9
Striped burrfish	1	35											1	0.1
Striped searobin	4	131-250					2	35-70					6	0.3
Summer flounder	4	178-375	2	367-495									8	0.4
Weakfish			11	24-64									11	0.6
Window pane	11	171-196	2	85-185			1	127					15	0.8
Winter flounder	1	117					1	93					2	0.1

Table 63 cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L-R	Dec. #	Dec. L-R	Total #	Total c/h
Blue crab								X						
Calico crab		X				X		X				X		
Glass prawn		X												
Hermit crab		X		X		X		X						
Mud crab		X												
Mud snail														
Rock crab												X		
Sand shrimp								X		X		X		
Spider crab		X										X		
Starfish										X		X		
Total	216		78		7		126		6				442	22.1

Table 64. Number of Fish Taken and Water Quality Recorded at Trawl Station in Absecon Bay.

Water quality data		Jan.	Feb.	Mid-March	April	May	June
D.O. mg/l	surface			10.84	8.54	7.17	7.90
	bottom				8.64	7.50	6.80
Salinity °/oo	surface			27.01	28.66	29.94	30.68
	bottom				28.30	29.76	29.97
pH	surface			7.9	7.7	8.0	8.6
	bottom				7.6	7.8	8.1
H_2O temp. °C	surface			7.5	13.0	18.0	20.0
	bottom				13.0	16.5	19.5
CO_2				.49	1.96	3.91	5.62
Tide				L+4	H+ 1/2	H+0	H+0
Depth m.				1.5	1.2	1.7	1.7
Secchi m.				1.5	1.2	1.7	1.2
Air temp. °C				9.5	17.5	28.0	28.0
Date				28	19	18	21

Species	April #	April L-R	May #	May L-R	June #	June L-R
American sandlance						
Atlantic silverside						
Bay anchovy					9	67-94
Northern pipefish						
Spot						
Striped mullet						
Weakfish						
Windowpane						
Blue crab						
Calico crab			X		X	
Glass prawn						
Hermit crab	X		X			
Mud crab						
Mud snail	X		X		X	
Sand shrimp	X		X		X	
Spider crab	X					
Total					9	

Table 64. Number of Fish Taken and Water Quality Recorded at Trawl Station in Absecon Bay.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	6.27	5.21	6.67	7.98	8.48	10.88
	bottom	6.08	7.78	6.95	6.67	8.53	10.88
Salinity °/oo	surface	30.30	29.36	28.89	28.19	27.95	26.53
	bottom	27.45	27.95	27.11	27.03	27.23	26.17
pH	surface	7.9	7.9	8.2	7.8	7.9	8.3
	bottom	7.8	7.8	8.2	7.8	8.1	8.3
H_2O temp. °C	surface	22.5	24.5	19.7	16.0	10.0	1.0
	bottom	23.5	24.5	20.0	15.5	9.3	.5
CO_2		3.10	5.66	1.97	3.60	5.76	5.04
Tide		L+5	L+5 1/2	H+0	H+1/2	L+4 1/2	H+1
Depth m.		1.7	0.9	2.0	2.0	2.5	1.5
Secchi m.		1.2	0.8	0.8	1.0	1.2	1.0
Air temp. °C		27.0	25.0	18.5	19.5	10.0	1.0
Date		21	16	28	28	15	29

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
American sandlance											1	100	1	0.1
Atlantic silverside					1	87	33	64-107			12	60-106	46	2.3
Bay anchovy	2	75	242	11-67	32	35-88	154	38-86					439	22.0
Northern pipefish	1	160	3	146-195									4	0.2
Spot	4	83-122	2	105-141	27	135-175	2	125-139					35	1.8
Striped mullet									1	200			1	0.1
Weakfish			3	27-46	2	175-185	1	83					6	0.3
Windowpane					1	159							1	0.1
Blue crab							X		X					
Calico crab					X		X							
Glass prawn			X								X			
Hermit crab							X							
Mud crab	X													
Mud snail	X		X		X		X		X		X			
Sand shrimp							X		X		X			
Spider crab							X							
Total	7		250		63		190		1		13		533	26.6

Table 65. Number of Fish Taken and Water Quality Recorded at Trawl Station in Lakes Bay.

Water quality data		Jan.	Feb.	March	April	May	June
D.O. mg/l	surface			10.24	8.44	7.45	6.40
	bottom			10.34	8.74	7.59	6.60
Salinity °/oo	surface			28.19	27.95	28.87	27.65
	bottom			28.26	28.48	29.23	29.42
pH	surface			7.7	7.8	8.0	8.2
	bottom			7.9	7.9	8.0	8.3
H_2O temp. °C	surface			8.2	16.0	18.0	21.5
	bottom			8.5	15.0	18.0	21.5
CO_2				3.04	---	2.45	6.60
Tide				L+4 1/2	H+1/2	H+0	H+1
Depth m.				1.2	2.4	1.8	2.4
Secchi m.				1.2	1.8	1.4	1.4
Air temp. °C				13.0	19.0	20.0	21.5
Date				11	21	19	17

Species	March #	March L-R	April #	April L-R	May #	May L-R	June #	June L-R
American eel								
Atlantic croaker								
Atlantic silverside							5	28-38
Bay anchovy			5	60-70	5	44-65	22	64-72
Black sea bass								
Bluefish								
Lined seahorse								
Lookdown								
Northern pipefish								
Smooth dogfish					7	303-530		
Spot							36	38-67
Striped anchovy								
Summer flounder							2	308-343
Weakfish								
Winter flounder	1	300	1	390				

Table 65 cont.

	Jan.		Feb.		March		April		May		June	
Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R
Blue crab												
Calico crab										X		
Glass prawn												X
Hermit crab										X		X
Horseshoe crab												
Mud crab						X		X				X
Mud snail						X		X		X		X
Rock crab												
Sand shrimp								X		X		X
Total					1		6		12		65	

Table 65. Number of Fish Taken and Water Quality Recorded at Trawl Station in Lakes Bay.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	5.66	5.51	5.97	8.08	8.53	11.47
	bottom	5.33	5.00	6.07	8.17	9.02	11.17
Salinity °/oo	surface	30.12	29.02	27.83	27.05	26.17	25.28
	bottom	30.48	29.36	28.89	27.23	26.35	24.92
pH	surface	7.7	7.9	7.9	8.0	7.7	8.1
	bottom	7.8	7.8	7.9	8.0	7.9	8.2
H_2O temp. °C	surface	22.0	25.0	21.0	11.5	9.3	2.3
	bottom	22.0	24.5	20.5	11.0	9.3	2.3
CO_2		7.88	4.93	7.39	5.66	4.56	4.80
Tide		H+4	H+2 1/2	H+2	L+2	L+4 1/2	H+1/2
Depth m.		4.0	2.7	4.0	8.0	2.0	2.5
Secchi m.		0.9	1.0	0.7	0.8	1.0	1.0
Air temp. °C		21.0	28.0	25.0	16.0	8.0	5.0
Date		27	29	26	19	18	30

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total L-R
American eel	1	410											1	0.1
Atlantic croaker									1	38			1	0.1
Atlantic silverside									3	98			8	0.4
Bay anchovy	88	66-91	400	39-85	200	31-101	10	38-90	1	45			731	36.6
Black sea bass	1	165											1	0.1
Bluefish	2	105-143	1										3	0.2
Lined seahorse	1													
Lookdown					1	90							1	0.1
Northern pipefish	2	115-186					5	106-218					7	0.4
Smooth dogfish	1	380	1	495									9	0.4
Spot	23	70-126	5	58-113	2	125-146	8	101-126	3	107-123			77	3.8
Striped anchovy			5	110-116									5	0.2
Summer flounder			1	236									3	0.2
Weakfish	4	104-300	12	60-205	1	221							17	0.8
Winter flounder					1	335			1	287			4	0.2

Table 65. cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L-R	Dec. #	Dec. L-R	Total #	Total c/h
Blue crab				X		X		X		X				
Calico crab										X				
Glass prawn		X						X		X				
Hermit crab		X						X		X				
Horseshoe crab				X										
Mud crab		X		X				X		X				
Mud snail		X		X				X				X		
Rock crab										X				
Sand shrimp		X						X		X				
Total	122		425		205		23		9				868	43.4

Table 66. Number of Fish Taken and Water Quality Recorded at Trawl Station in Inside Thorofare (Zone 21).

Water quality data		Jan.	Feb.	March	April	May	June
D.O. mg/l	surface			11.13	8.40	6.79	5.10
	bottom			9.55	7.95	6.22	0.00
Salinity °/oo	surface			27.74	27.59	27.79	29.25
	bottom			28.19	27.95	29.23	29.96
pH	surface			8.0	7.9	7.9	8.2
	bottom			7.8	7.9	7.8	7.8
H_2O temp. °C	surface			8.0	17.0	19.2	21.0
	bottom			8.0	16.0	18.5	18.5
CO_2				2.57	---	5.13	8.31
Tide				L+5 1/2	H+2 1/2	H+2	H+2
Depth m.				6.7	4.9	4.9	4.0
Secchi m.				1.8	1.8	2.0	2.1
Air temp. °C				11.5	19.5	19.0	21.0
Date				11	21	19	17

Species	#	L-R	#	L-R	#	L-R	#	L-R
Alewife			1	230				
American eel	1	640						
Atlantic croaker								
Atlantic menhaden								
Atlantic silverside								
Bay anchovy								
Hardtail jack								
Oyster toadfish			1	210				
Spot								
Weakfish								
Winter flounder								
Blue crab			X					
Glass prawn			X					
Mud crab			X					
Mud snail			X		X			
Sand shrimp	X		X		X			
Total	1		2					

Table 66. cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	4.20	6.07	5.28	7.59	8.87	12.05
	bottom	3.02	4.12	3.24	7.30	8.62	11.37
Salinity °/oo	surface	29.23	28.30	28.89	27.23	27.77	22.23
	bottom	29.76	29.02	27.83	27.23	25.99	22.23
pH	surface	8.0	7.8	7.7	8.0	7.8	8.3
	bottom	7.6	7.7	7.7	7.8	7.8	8.1
H_2O temp. °C	surface	23.0	24.0	22.5	12.0	10.0	1.5
	bottom	23.0	24.0	22.5	11.5	10.0	1.5
CO_2		6.90	0	8.62	6.16	4.08	3.12
Tide		H+5 1/2	H+2 1/2	H+3	L+3 1/2	L+3 1/2	H+3
Depth m.		4.0	4.3	7.0	6.0	4.0	4.2
Secchi m.		1.0	1.4	2.0	2.5	1.5	1.5
Air temp. °C		24.5	28.0	25.0	16.5	8.0	2.5
Date		27	29	26	19	18	29

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Alewife													1	0.1
American eel													1	0.1
Atlantic croaker									1	37			1	0.1
Atlantic menhaden			1	123									1	0.1
Atlantic silverside							2	76-100			100	58-100	102	5.1
Bay anchovy	23	68-88	30	28-46			2	40-60	1	36			56	2.8
Hardtail jack							1	210					1	0.1
Oyster toadfish			2	37-185									3	0.2
Spot	13	83-105	1	132			1	110					15	0.8
Weakfish			1	178									1	0.1
Winter flounder											1	338	1	0.1
Blue crab														
Glass prawn														
Mud crab														
Mud snail		X												
Sand shrimp									X					
Total	36		35		6		2		101				183	9.2

Table 67 Number of Fish Taken and Water Quality Recorded at Trawl Station in Schull Bay.

Water quality data		Jan.	Feb.	March	April	May	June
D.O. mg/l	surface			10.37	8.54	7.07	6.85
	bottom			10.42		7.26	6.10
Salinity o/oo	surface			27.83	27.95	27.95	29.96
	bottom			27.29		28.12	29.25
pH	surface			8.0	7.8	7.6	8.0
	bottom			7.9		7.5	8.0
H_2O temp. °C	surface			7.0	17.5	14.5	20.5
	bottom			7.2		14.0	21.0
CO_2				3.74	2.44	6.85	4.40
Tide				L+6	H+1	H+0	H+1/2
Depth m				1.5	1.2	1.4	1.8
Secchi m				1.4	1.2	0.9	0.9
Air temp. °C				8.5	22.0	25.0	21.5
Date				10	22	5	16

Species	# L-R	# L-R	# L-R	# L-R
Atlantic silverside				2 29-32
Bay anchovy				11 61-77
Bluefish				
Smallmouth flounder				
Spot				
Spotted hake				22 32-59
Summer flounder				1 92
Weakfish			1 250	
Winter flounder				
Blue crab				1 54
Calico crab		X		X
Glass prawn				
Hermit crab	X	X	X	X
Horseshoe crab				
Mud crab			X	
Mud snail	X	X	X	X
Sand shrimp	X	X	X	X
Spider crab		X		
Starfish	X			
Total			1	37

Table 67 cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	6.76	5.47	6.16	7.39	9.15	
	bottom	6.37	5.28	6.25	7.25	8.90	
Salinity o/oo	surface	29.94	29.02	28.19	27.77	27.47	
	bottom	30.30	29.72	28.53	28.12	27.11	
pH	surface	7.8	7.8	7.9	7.8	8.1	
	bottom	7.8	8.0	7.9	8.1	8.1	
H_2O temp. °C	surface	26.0	21.5	21.0	13.0	13.5	
	bottom	24.0	21.0	21.0	14.0	13.0	
CO_2		6.31	7.88	4.93	5.17	3.12	
Tide		H+0	H+2	H+1	H+1	L+5 1/2	
Depth m		1.5	1.8	1.5	3.5	1.5	
Secchi m			0.9	1.0	0.5	1.0	
Air temp. °C		28.0	25.0	22.0	11.0	15.0	
Date		22	19	13	13	1	

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic silverside	1	70			3	78-88			7	80-157	13	0.6
Bay anchovy	55	65-83	350	57-89	175	27-88	75	39-90	13	45-95	679	34.0
Bluefish												
Smallmouth flounder							1	235			1	0.1
Spot	31	62-116	23	95-248	4	103-122	2	162-182	1	59	1	0.1
Spotted hake									1	113	83	4.2
Summer flounder			2	368-410	1	386					1	0.1
Weakfish			4	50-70							4	0.2
Winter flounder	1	70							3	96-380	4	0.2
											5	0.2
Blue crab			X									
Calico crab										X		
Glass prawn		X								X		
Hermit crab		X	X									
Horseshoe crab			X									
Mud crab			X							X		
Mud snail		X	X							X		
Sand shrimp										X		
Spider crab			X							X		
Starfish												
Total	88		379		183		78		25		791	39.6

Table 68 Number of Fish Taken and Water Quality Recorded at Trawl Station in Main Marsh Thorofare (Zone 04).

Water quality data		Jan.	Feb.	March	April	May	June
D.O. mg/l	surface			9.16	10.15	8.16	7.55
	bottom			9.16	10.05	7.87	6.80
Salinity o/oo	surface			29.51	29.54	28.33	28.80
	bottom			29.87	29.02	29.22	30.75
pH	surface			7.7	7.8	7.8	7.9
	bottom			7.7	7.8	7.8	7.8
H_2o temp. °C	surface			9.6	8.5	12.0	20.5
	bottom			8.7	9.0	11.0	18.7
CO_2				4.48	3.42	0.83	0
Tide				L+0	H+1	L+1	H+4
Depth m.				1.4	3.0	5.8	4.9
Secchi m.				1.4	0.9	0.6	1.0
Air temp. °C				17.0	12.0		25.0
Date				14	7	11	2

Species	#	L-R	#	L-R	#	L-R	#	L-R
Atlantic menhaden								
Atlantic silverside								
Bay anchovy								
Blueback herring					65	60-90	8	60-67
Bluntnose stingray								
Hogchoker								
Lookdown					1	150	2	93-130
Northern pipefish								
Oyster toadfish								
Smallmouth flounder								
Smooth dogfish								
Spot					1	330	2	305-1000
Striped searobin								
Summer flounder								
Weakfish					1	420		
White perch								
Winter flounder			1	120				
Blue crab								
Calico crab								
Edible prawn								

Table 68 cont.

	Jan.		Feb.		March		April		May		June	
Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R
Glass prawn												
Hermit crab												
Horseshoe crab					X		X		X			
Mud crab												
Mud snail											X	
Sand shrimp							X					
Spider crab					X		X		X		X	
							X					
Total					1		68		12			

Table 68 cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	6.27	5.75	6.53	8.42	8.66	9.75
	bottom	6.18	6.60	6.30	8.37	8.85	9.31
Salinity o/oo	surface	28.51	28.30	27.29	27.77	26.20	19.54
	bottom	28.15	30.25	30.14	27.41	26.56	22.95
pH	surface	7.9	7.8	8.2	8.2	8.1	7.9
	bottom	7.8	7.8	8.8	7.9	8.2	7.9
H_2o temp. °C	surface	22.0	24.0	24.0	10.5	15.0	7.5
	bottom	22.0	23.5	24.0	10.5	15.0	8.0
CO_2		5.66	5.66	4.68	6.16	2.88	4.80
Tide		H+5 1/2	H+1	L+4	L+5 1/2	L+4	L+3 1/2
Depth m		2.4	4.6		4.0	4.0	6.1
Secchi m		0.3	0.6	0.5	0.5	1.0	1.25
Air temp. °C		23.0	25.0		16.0	16.0	9.0
Date		26	18	19	18	2	2

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic menhaden							1	143					1	0.1
Atlantic silverside							40	65-128	3	75-90			43	2.2
Bay anchovy	744	30-104	250	49-100	110	37-89	3	39-86	29	35-81			1209	60.4
Blueback herring											1	70	1	0.1
Bluntnose stingray			1	475									1	0.1
Hogchoker	6	96-163	2	106-110									11	0.6
Lookdown	1	69											1	0.1
Northern pipefish													1	0.1
Oyster toadfish							1	123					1	0.1
Smallmouth flounder							1	79					1	0.1
Smooth dogfish			1	436					1	46			4	0.2
Spot	45	80-190	175	59-164	11	105-173			10	120-143			241	12.0
Striped searobin	1	195	2	52-163									3	0.2
Summer flounder	2	198-200	1	390									4	0.2
Weakfish	32	75-130	141	28-258	15	62-214							188	9.4
White perch													1	0.1
Winter flounder							2	76-128					2	0.1
Blue crab										X				
Calico crab		X						X		X				
Edible prawn		X		X				X						

Table 68 cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L-R	Dec. #	Dec. L-R	Total #	Total c/h
Glass prawn														
Hermit crab								X						
Horseshoe crab														
Mud crab								X						
Mud snail		X								X				
Sand shrimp		X		X				X		X				
Spider crab										X				
Total	831		573		136		48		43		1		1713	85.6

Table 69 Number of Fish Taken and Water Quality Recorded at Trawl Station in Meadow Cut (Zone 06).

Water quality data		Jan.	Feb.	March	April	May	June
D.O. mg/l	surface			8.67	9.70	8.44	7.20
	bottom			8.57	10.34	9.34	7.35
Salinity o/oo	surface			30.23	29.36	28.51	29.52
	bottom			29.51	29.72	28.69	29.52
pH	surface			7.7	7.8	7.8	7.8
	bottom			7.7	7.8	7.8	7.8
H_2O temp. °C	surface			10.0	8.5	12.5	18.5
	bottom			10.0	8.0	12.5	18.2
CO_2				6.77	4.40	2.65	5.87
Tide				H+6	H+0	L+1 1/2	H+2 1/2
Depth m.				4.6	4.3	5.8	3.7
Secchi m.				0.6	0.5	0.6	0.8
Air temp. °C				14.5	11.0		23.0
Date				14	7	11	2

Species	March #	March L-R	April #	April L-R	May #	May L-R	June #	June L-R
American eel								
American shad			13	80-180				
Bay anchovy					1	100		
Bluefish								
Lined seahorse								
Northern pipefish			1	170				
Northern searobin								
Red hake					1	130		
Smooth dogfish					4	930-980	2	330-335
Spot								
Striped cusk-eel								
Striped searobin								
Weakfish					2	300-660		
White perch			1	150				
Windowpane			1	260				
Blue crab								
Calico crab						X		
Glass prawn								
Hermit crab				X		X		X

Table 69 cont. Jan. Feb. March April May June

Species	#	L-R	#	L-R	#	L-R	#	L-R
Horseshoe crab								X
Mud crab		X						X
Rock crab								
Sand shrimp		X		X		X		X
Spider crab				X				X
Starfish				X				
Whelk								
Total			16		8		2	

Table 69 cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
	surface	5.61	5.37	6.16	7.30	8.56	9.21
D.O mg/l	bottom	5.56	7.13	5.56	7.39	8.80	9.02
	surface	30.12	27.95	30.14	28.48	26.92	26.53
Salinity o/oo	bottom	29.60	28.30	30.14	28.84	26.92	26.87
	surface	7.8	8.1	8.2	8.1	8.1	8.1
pH	bottom	7.8	8.3	8.4	8.0	8.2	8.0
	surface	21.0	23.0	25.0	13.0	14.2	9.0
H_2O temp. °C	bottom	21.0	22.5	24.0	12.5	14.0	9.0
CO_2		5.91	6.65	5.17	5.42	3.36	5.28
Tide		H+1 1/2	H+3 1/2	L+3	L+5 1/2	L+5	L+4 1/2
Depth m.		4.1	2.4	5.0	5.0	5.0	3.0
Secchi m.		0.6	0.5	0.5	0.5	0.8	1.2
Air temp. °C		16.0	27.0	28.5	16.0	16.0	10.0
Date		26	26	19	18	2	2

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total L-R
American eel									1	625			1	
American shad													13	0.6
Bay anchovy	49	68-94	80	30-99	75	30-95	1	71	3	40-50			209	10.4
Bluefish	1	29											1	
Lined seahorse			1										1	
Northern pipefish			1	209									2	0.1
Northern searobin			1	262									1	
Red hake													1	
Smooth dogfish			3	450-515									9	0.4
Spot	1	115	4	115-147	4	122-177	8	110-151					17	0.8
Striped cusk-eel	1	227											1	
Striped searobin					1	86							1	
Weakfish	1	108	25	35-66	3	104-169							31	1.6
White perch													1	
Windowpane							1	307			1	305	3	0.2
Blue crab								X		X				
Calico crab		X						X		X				
Glass prawn		X		X										
Hermit crab		X		X		X				X				

Table 69 cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L-R	Dec. #	Dec. L-R	Total #	Total c/h
Horseshoe crab														
Mud crab		X		X						X				
Rock crab												X		
Sand shrimp		X		X				X		X		X		
Spider crab		X												
Starfish														
Whelk		X												
Total	54		115		83		10		4		1		292	14.6

Table 70 Number of Fish Taken and Water Quality Recorded at Trawl Station in Broad Creek.

Water quality data		Jan.	Feb.	March	April	May	June
D.O mg/l	surface			10.14	8.64	7.78	8.10
	bottom			10.44	9.82	7.17	7.05
Salinity o/oo	surface			27.38	28.84	29.05	30.32
	bottom			27.38	28.66	29.42	29.79
pH	surface			7.8	7.6	8.0	8.2
	bottom			7.8	7.6	8.0	8.1
H_2O temp. °C	surface			7.5	12.0	19.5	20.5
	bottom			6.5	12.0	19.0	20.0
CO_2				3.67	1.71	3.72	15.65
Tide				L+3	H+1	H+3	H+1
Depth m.				3.6	2.6	5.5	3.7
Secchi m.				1.7	1.8	1.4	1.5
Air temp. °C				9.0	18.0	28.0	24.0
Date				28	19	18	21

Species	#	L-R	#	L-R	#	L-R	#	L-R
Atlantic menhaden								
Atlantic silverside								
Bay anchovy								
Blueback herring								
Bluefish								
Mummichog								
Northern pipefish					1	159		
Silver hake								
Smooth dogfish								
Spot								
Spotted hake								
Striped anchovy								
Striped killfish								
Summer flounder							1	444
Windowpane					1	85	7	109-150
Winter flounder								
Blue crab								
Calico crab					X			
Hermit crab	X		X		X			

Table 70 cont.

Species	Jan.	Feb.	March #	March L-R	April #	April L-R	May #	May L-R	June #	June L-R
Mud crab										X
Mud snail						X				X
Rock crab										
Sand shrimp				X		X		X		X
Starfish										
Total							2		8	

Table 70 cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
	surface	7.15	6.98	6.85	8.47	8.33	10.00
D.O. mg/l	bottom	7.15	6.84	6.71	8.36	8.23	8.82
	surface	30.30	30.79	27.83	28.53	29.02	27.59
Salinity o/oo	bottom	30.30	29.36	28.89	28.53	28.12	27.59
	surface	7.9	7.9	8.0	7.8	8.0	8.1
pH	bottom	7.9	8.0	8.2	7.8	7.9	8.1
	surface	22.0	22.0	21.0	15.0	11.0	2.0
H_2O temp. °C	bottom	21.5	23.0	21.0	14.5	11.0	2.0
CO_2		2.91	6.65	3.45	4.80	4.32	5.76
Tide		L+4 1/2	H+1 1/2	H+2 1/2	L+5	L+5	L+1
Depth m.		4.3	2.1	1.5	6.0	3.0	3.5
Secchi m.		2.0	0.8	0.2	0.5	1.0	0.5
Air temp. °C		27.5	28.0	22.5	18.0	11.0	0
		21	16	28	28	15	8

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	c/h
Atlantic menhaden							1	264					1	
Atlantic silverside			80	63-126			13	73-99	147	65-120	3	70-92	243	12.2
Bay anchovy	82	70-85	48	62-90	19	36-48	504	40-91	104	35-82			757	37.8
Blueback herring									2	122-125			2	0.1
Bluefish			2	132-191									2	0.1
Mummichog											1	70	1	
Northern pipefish			1	157									2	0.1
Silver hake											1	146	1	
Smooth dogfish					1	570							1	
Spot			3	125-141			1	135	6	112-155			10	0.5
Spotted hake							1	249					1	
Striped anchovy					2	80-111							2	0.1
Striped killfish											1	103	1	
Summer flounder													1	
Windowpane	1	170											9	0.4
Winter flounder			1	117			1	104	1	105			3	0.2
Blue crab					X				X					
Calico crab			X		X		X							
Hermit crab	X		X		X		X							

Table 70 cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L-R	Dec. #	Dec. L-R	Total #	Total c/h
Mud crab				X										
Mud snail		X		X				X		X				
Rock crab										X		X		
Sand shrimp								X		X		X		
Starfish		X												
Total	83		135		22		521		260		6		1037	51.8

Table 71 Number of Fish Taken and Water Quality Recorded at Trawl Station in St. George's Thorofare (Zone 15).

Water quality data		Jan.	Feb.	March	April	May	June
D.O. mg/l	surface			10.74	13.94	10.99	14.10
	bottom			10.64	10.61	7.54	5.50
Salinity o/oo	surface			28.80	28.30	28.51	29.07
	bottom			29.16	30.43	29.94	29.79
pH	surface			7.9	7.8	8.3	8.6
	bottom			7.9	7.7	8.0	8.1
H_2O temp. °C	surface			8.0	15.0	21.0	22.0
	bottom			8.0	13.5	18.0	20.5
CO_2				0.49	0	0	0
Tide				H+3	H+3	H+2 1/2	L+5
Depth m.				3.4	2.0	4.9	4.3
Secchi m.				1.7	1.4	1.5	0.6
Air temp. °C				10.0	18.5	28.0	27.0
Date				21	19	18	21

Species	March #	March L-R	April #	April L-R	May #	May L-R	June #	June L-R
American eel								
Atlantic silverside								
Bay anchovy					4	60-70	2	70-85
Bluefish								
Northern pipefish					1	175		
Pollock					1	95		
Smooth dogfish								
Spot							56	36-62
Striped killfish	1	40						
Weakfish								
Winter flounder			1	270			4	50-76
Calico crab			X				X	
Glass prawn					X		X	
Hermit crab	X		X		X			
Horseshoe crab			X		X			
Mud crab			X					
Mud snail	X		X					

Table 71 cont.

Species	Jan. #	Jan. L-R	Feb. #	Feb. L-R	March #	March L-R	April #	April L-R	May #	May L-R	June #	June L-R
Rock crab												
Sand shrimp						X		X		X		X
Spider crab										X		
Starfish						X		X		X		
Whelk												
Total					1		1		6		62	

Table 71 cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
	surface	9.11	11.11	5.74	7.49	7.64	10.29
D.O. mg/l	bottom	3.87	3.93	4.86	7.35	8.18	8.62
	surface	30.30	28.66	27.47	28.01	23.31	26.53
Salinity o/oo	bottom	29.94	30.07	27.47	28.71	27.23	26.87
	surface	8.1	8.0	7.8	7.8	7.7	7.9
pH	bottom	7.8	7.8	7.8	7.8	7.9	7.9
	surface	26.0	25.0	21.0	15.0	9.0	-1.0
H_2O	bottom	21.5	22.0	21.0	15.0	10.0	-1.0
CO_2		0	0	6.40	6.48	8.64	5.76
Tide		L+4 1/2	H+1 1/2	H+1 1/2	L+5 1/2	H+ 1/2	L+2
Depth m.		5.5	5.5	3.0	4.6	6.0	5.5
Secchi m.		0.4	0.9	1.0	1.3	1.0	1.0
Air temp. °C		27.5	27.5	21.5	17.0	12.0	1.0
Date		21	16	28	28	15	8

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
American eel			1	430					2	550-600			3	0.2
Atlantic silverside							3	68-90	133	57-79	3	68-72	139	7.0
Bay anchovy	2	70			324	30-58							332	16.6
Bluefish					1	200							1	
Northern pipefish							1	138					2	0.1
Pollock													1	
Smooth dogfish	1	415											1	
Spot	50	60-141	10	80-95	30	94-151	10	104-140					156	7.8
Striped killfish													1	
Weakfish	2	101-105											2	0.1
Winter flounder	4	42-95			1	109	2	104-110					12	0.6
Calico crab		X												
Glass prawn												X		
Hermit crab		X												
Horseshoe crab														
Mud crab		X												
Mud snail		X												

Table 71 cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L-R	Dec. #	Dec. L-R	Total #	Total c/h
Rock crab												X		
Sand shrimp								X				X		
Spider crab														
Starfish		X												
Whelk				X										
Total	59		11		356		16		135		3		650	32.5

Table 72 Number of Fish Taken and Water Quality Recorded at Trawl Station in Beach Thorofare (Zone 17).

Water quality data		Jan.	Feb.	March	April	May	June
D.O. m/l	surface			10.64	8.94	8.06	6.50
	bottom			10.34	9.13	6.88	4.30
Salinity o/oo	surface			29.51	28.12	28.51	28.89
	bottom			29.87	28.12	29.60	29.25
pH	surface			7.8	8.0	8.0	8.3
	bottom			7.8	7.9	8.0	8.2
H_2O temp. °C	surface			7.8	16.0	19.0	22.0
	bottom			7.5	16.0	18.0	22.0
CO_2				3.97	---	1.00	6.60
Tide				L+5	H+3 1/2	H+2	H+2 1/2
Depth m.				3.0	5.5	1.8	3.4
Secchi m.				2.0	1.5	1.0	1.2
Air temp. °C				12.0	16.0	19.0	21.0
Date				11	21	19	17

Species	#	L-R	#	L-R	#	L-R	#	L-R
American eel								
Atlantic menhaden								
Atlantic silverside								
Bay anchovy							5	57-74
Black sea bass								
Bluefish								
Northern pipefish			2	160-190			1	218
Northern searobin								
Orange filefish								
Oyster toadfish			1	230				
Smallmouth flounder								
Spot								
Striped anchovy								
Summer flounder							1	418
Weakfish								
Windowpane							2	164-166
Winter flounder								
Blue crab				X				
Glass prawn				X		X		X

Table 72 cont.

Species	Jan.	Feb.	March.		April		May		June	
			#	L-R	#	L-R	#	L-R	#	L-R
Hermit crab						X		X		X
Mud crab						X		X		X
Mud snail			X			X				
Rock crab										
Sand shrimp			X			X		X		X
Spider crab						X				X
Starfish						X				
Total					3		0		9	

Table 72 cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	4.76	4.58	6.90	7.69	8.53	11.56
	bottom	4.86	4.49	5.00	7.69	8.28	11.37
Salinity o/oo	surface	29.94	28.66	26.20	28.12	26.87	24.38
	bottom	30.12	29.72	29.61	28.30	25.81	24.38
pH	surface	7.6	7.7	7.7	8.0	7.9	8.3
	bottom	7.8	7.8	7.7	7.9	7.8	8.1
H_2O temp. °C	surface	21.0	24.0	22.5	13.0	9.7	.8
	bottom	20.5	24.5	22.0	13.0	10.0	.8
CO_2		8.62	6.70	7.64	5.66	3.84	5.76
Tide		H+3 1/2	H+3 1/2	H+3 1/2	L+4	L+3	H+2
Depth m.		6.1	4.3	4.0	4.5	5.0	3.5
Secchi m.		0.9	---	0.8	1.0	1.25	0.8
Air temp. °C		17.0	28.0	25.0	15.5	8.0	0
Date		27	29	27	19	18	29

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	c/h
American eel	1	440											1	
Atlantic menhaden	1	110											1	
Atlantic silverside									130	57-106	1	90	131	6.6
Bay anchovy	67	70-90	17	52-93	10	47-87	2	66-90					101	5.0
Black sea bass					1	199							1	
Bluefish	1	151											1	
Northern pipefish													3	0.2
Northern searobin			1	224									1	
Orange filefish			1	128									1	
Oyster toadfish			1	200									2	0.1
Smallmouth flounder									1	63			1	
Spot	66	83-144	9	86-157	3	112-177	10	104-158					88	4.4
Striped anchovy					3	112-115							3	0.2
Summer flounder	1	184											2	0.1
Weakfish			1	27	1	235							2	0.1
Windowpane													2	0.1
Winter flounder	7	46-85											7	0.4
Blue crab		X							X					
Glass prawn		X					X		X		X			

Table 72 cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L- R	Dec. #	Dec. L-R	Total #	Total c/h
Hermit crab		X								X				
Mud crab		X								X				
Mud snail												X		
Rock crab										X				
Sand shrimp		X						X		X		X		
Spider crab		X								X				
Starfish														
Total	144		30		18		12		131		1		348	17.4

Table 73 Number of Fish Taken and Water Quality Recorded at Trawl Station in Beach Thorofare (Zone 22).

Water quality data		Jan.	Feb.	March	April	May	June
D.O.	surface			10.46	9.85	7.73	4.80
	bottom			10.46	9.69	7.54	4.41
Salinity °/oo	surface			28.49	27.59	28.66	29.61
	bottom			28.98	25.43	28.12	29.97
pH	surface			7.9	7.8	7.6	7.7
	bottom			7.8	7.8	7.6	7.7
H_2O temp. °C	surface			6.0	13.0	15.0	19.0
	bottom			6.0	12.5	14.5	18.0
CO_2				---	2.69	5.62	8.80
Tide				H+0	L+3	H+1 1/2	H+0
Depth m.				4.6	2.4	4.6	2.6
Secchi m.				2.0	1.8	2.1	1.4
Air temp. °C				8.5	26.5	25.0	23.0
Date				10	12	5	30

Species	#	L-R	#	L-R	#	L-R	#	L-R
Atlantic silverside							38	26-48
Bay anchovy							2	55-76
Blueback herring								
Bluefish								
Northern pipefish							2	116-213
Smooth dogfish							6	335-395
Spot							57	50-85
Spotted hake							1	190
Striped searobin								
Summer flounder								
Tautog			2	70-90				
Weakfish								
Windowpane							2	188-190
Winter flounder							13	65-108
Blue crab								
Calico crab			X		X			
Glass shrimp								
Hermit crab	X				X		X	

Table 73 cont. Jan. Feb. March April May June

Species	#	L-R	#	L-R	#	L-R	#	L-R
Mud crab				X		X		
Mud snail				X				
Rock crab								
Sand shrimp		X		X		X		X
Spider crab				X				X
Starfish						X		
Total				2		0		121

Table 73 cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	5.39	4.81	6.06	7.25	8.95	10.88
	bottom	5.29	4.53	5.97	7.30	8.66	10.68
Salinity °/oo	surface	30.30	30.25	28.01	29.02	27.29	25.01
	bottom	29.94	30.25	21.89	30.95	26.74	25.64
pH	surface	7.8	8.9	8.1	9.3	8.1	8.2
	bottom	7.7	7.9	8.1	8.2	8.1	8.1
H_2O temp. °C	surface	22.5	18.5	20.5	13.5	13.0	3.0
	bottom	21.5	18.5	20.5	14.0	13.0	3.5
CO_2		3.79	6.40	4.43	5.17	2.88	3.84
Tide		L+5	L+5 1/2	H+2 1/2	H+2	H+1	H+1
Depth m.		2.7	4.6	2.0	3.5	3.5	6.0
Secchi m.		1.5	1.0	1.0	0.5	1.0	0.8
Air temp. °C		28.0	23.0	22.0	11.0	16.0	
Date		22	19	13	13	1	30

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Atlantic silverside									3	110-120	40	61-101	81	4.0
Bay anchovy	133	72-97	135	57-94	110	36-93	70	60-91	31	49-92			481	24.0
Blueback herring											1	79	1	
Bluefish	1	160											1	
Northern pipefish	1	175											3	0.2
Smooth dogfish	1	430											7	0.4
Spot	85	65-140	51	92-167	16	100-130	2	127-183	6	103-135			217	10.8
Spotted hake													1	
Striped searobin					1	271							1	
Summer flounder			1	436									1	
Tautog													2	0.1
Weakfish					3	75-229							3	0.2
Windowpane													2	0.1
Winter flounder	3	90-87	1	100							1	163	18	0.9
Blue crab				X						X				
Calico crab										X				
Glass shrimp		X								X				
Hermit crab		X		X						X		X		

Table 73 cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L-R	Dec. #	Dec. L-R	Total #	Total c/h
Mud crab				X								X		
Mud snail		X												
Rock crab												X		
Sand shrimp										X		X		
Spider crab														
Starfish														
Total	224		188		130		72		40		42		819	41.0

Table 74 Number of Fish Taken and Water Quality Recorded at Trawl Station in Dock Thorofare (Zone 27).

Water quality data		Jan.	Feb.	March	April	May	June
D.O. mg/l	surface			10.42	9.83	8.11	6.70
	bottom			10.42	9.56	7.36	6.55
Salinity °/oo	surface			28.17	26.87	27.77	29.78
	bottom			27.95	26.71	28.12	29.42
pH	surface			7.8	7.8	7.5	8.0
	bottom			7.9	7.8	7.5	8.0
H_2O temp. °C	surface			6.5	14.0	14.5	21.0
	bottom			6.5	14.0	14.5	21.0
CO_2				4.23	1.96	6.36	5.87
Tide				L+5 1/2	L+4 1/2	H+1 1/2	H+1 1/2
Depth m.				2.7	1.5	2.7	1.8
Secchi m.				1.2	1.0	1.5	1.2
Air temp. °C				7.5	26.0	25.0	22.5
Date				10	12	5	16

Species	#	L-R	#	L-R	#	L-R	#	L-R
Alewife			1	320				
Atlantic silverside								
Bay anchovy					1	90	10	62-77
Bluefish								
Bluntnose stingray							1	1473
Northern pipefish					1	210	1	190
Northern searobin								
Oyster toadfish					1	260		
Red hake								
Scup								
Smooth dogfish								
Spot							107	47-60
Summer flounder					2	270-390	1	288
Weakfish								
Windowpane					1	300		
Winter flounder								
Blue crab								
Calico crab			X			X		X
Glass shrimp								X

Table 74 cont.

	Jan.		Feb.		March		April		May		June	
Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R
Hermit crab						X		X		X		X
Mud crab						X		X		X		
Mud snail						X		X				X
Sand shrimp						X		X		X		X
Spider crab												X
Whelk								X				
Total					0		1		6		120	

Table 74 cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	6.17	5.19	5.97	7.39	8.66	
	bottom	5.78	5.09	5.83	7.35	8.71	
Salinity o/oo	surface	29.23	29.02	27.11	29.18	27.83	
	bottom	29.60	30.08	27.11	27.59	25.14	
pH	surface	7.8	7.8	7.9	8.3	8.1	
	bottom	7.8	8.1	7.9	8.1	8.1	
H_2O temp. °C	surface	23.0	21.0	20.0	14.0	13.0	
	bottom	22.0	21.5	20.5	14.5	13.0	
CO_2		1.38	6.65	2.96	3.45	3.36	
Tide		L+4 1/2	H+1 1/2	H+1 1/2	H+1 1/2	L+5 1/2	
Depth m.		2.1	4.0	3.5	3.5	1.75	
Secchi m.		0.9	0.9	0.5	0.8	1.0	
Air temp. °C		28.0	25.0	22.0	11.0	16.0	
Date		22	19	13	13	1	

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Alewife													1	0.1
Atlantic silverside	2	51-65							1	98			3	0.2
Bay anchovy	400	66-76	300	55-95	140	32-97	45	36-93	39	43-79			935	51.9
Bluefish			1	171			1	228					2	0.1
Bluntnose stingray													1	0.1
Northern pipefish													2	0.1
Northern searobin														
Oyster toadfish			1	145									2	0.1
Red hake					1	148			1	65			2	0.1
Scup			1	150									1	0.1
Smooth dogfish	2	370-393	2	442-675									4	0.2
Spot	101	67-133	46	93-165	4	115-122							258	14.3
Summer flounder	4	180-415											7	0.4
Weakfish	1	575	6	22-180	2	95-197							9	0.5
Windowpane													1	0.1
Winter flounder	2	64-65											2	0.1
Blue crab		X				X				X				
Calico crab						X				X				
Glass shrimp		X		X										

Table 74 cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L-R	Dec. #	Dec. L-R	Total #	Total c/h
Hermit crab		X		X										
Mud crab		X				X								
Mud snail		X		X						X				
Sand shrimp						X		X		X				
Spider crab				X										
Whelk														
Total	512		357		147		46		41				1230	68.3

Table 75 Number of Fish Taken and Water Quality Recorded at Trawl Station in Beach Thorofare (Zone 16).

Water quality data		Jan.	Feb.	March	April	May	June
D.O. mg/l	surface						6.75
	bottom						7.60
Salinity o/oo	surface						29.25
	bottom						29.07
pH	surface						8.3
	bottom						7.8
H_2O temp. °C	surface						20.5
	bottom						20.5
CO_2							5.38
Tide							H+3 1/2
Depth m.							3.7
Secchi m.							1.0
Air temp. °C							24.0
Date							14

Species	#	L-R
Alewife		
Atlantic croaker		
Atlantic menhaden		
Atlantic silverside		
Bay anchovy	5	69-80
Black sea bass		
Northern searobin		
Oyster toadfish		
Spot		
Striped searobin		
Weakfish		
White hake		
Windowpane		
Winter flounder		
Blue crab		
Calico crab		
Glass prawn		

Table 75 cont.	Jan.	Feb.	March	April	May	June

Species	#	L-R
Hermit crab	X	
Mud crab	X	
Rock crab		
Sand shrimp	X	
Spider crab		
Starfish		
Total	5	

Table 75 cont.

Water quality data		July	Aug.	Sept.	Oct.	Nov.	Dec.
D.O. mg/l	surface	4.38	4.68	5.57	7.88	8.38	10.09
	bottom	4.05	4.44	5.14	7.69	8.48	10.05
Salinity o/oo	surface	29.23	28.66	---	28.48	26.87	28.30
	bottom	29.94	29.02	27.83	28.66	26.17	27.95
pH	surface	7.6	7.7	---	8.0	7.8	8.1
	bottom	7.6	7.8	7.7	8.0	7.9	8.3
H_2O temp. °C	surface	22.5	24.5	21.5	---	9.8	2.5
	bottom	23.0	24.5	22.0	14.0	10.0	3.0
CO_2		10.10	9.21	6.90	4.93	4.32	3.84
Tide		L+1	H+4	H+4	L+4 1/2	L+2	H+1/2
Depth m.		4.9	4.9	4.5	4.5	4.0	4.5
Secchi m.		0.6	0.8	0.5	0.5	1.25	1.0
Air temp. °C		---	28.0	25.0	15.5	8.0	-.5
Date		27	29	27	19	18	29

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total #	Total c/h
Alewife									3	89-109			3	0.2
Atlantic croaker									1	35			1	0.1
Atlantic menhaden							2	144-155					2	0.1
Atlantic silverside									11	57-80			11	0.8
Bay anchovy	11	77-88	4	75-88	7	62-82	9	67-85	1	51			37	2.6
Black sea bass			1	150									1	0.1
Northern searobin			2	212-222									2	0.1
Oyster toadfish			4	134-220									4	0.3
Spot			6	125-235	1	143	18	110-148	1	110			26	1.9
Striped searobin			1	235									1	0.1
Weakfish			50	52-184			1	120					51	3.6
White hake									1	151			1	0.1
Windowpane	1	195	2	192-206									3	0.2
Winter flounder			1	85					2	99-108			3	0.2
Blue crab				X				X						
Calico crab				X				X						
Glass prawn								X		X		X		

Table 75 cont.

Species	July #	July L-R	Aug. #	Aug. L-R	Sept. #	Sept. L-R	Oct. #	Oct. L-R	Nov. #	Nov. L-R	Dec. #	Dec. L-R	Total #	Total c/h
Hermit crab								X						
Mud crab		X		X						X				
Rock crab										X				
Sand shrimp				X				X		X		X		
Spider crab		X		X						X				
Starfish		X												
Total	12		71		8		30		20				146	10.4

Table 76. Number of Fish Taken Trawling and Catch per Haul by Season.

Species	Winter #	Winter c/h	Spring #	Spring c/h	Summer #	Summer c/h	Fall #	Fall c/h	Total #	Total c/h
Alewife			2		5		3		10	
American eel	1				3		4		8	
American sandlance	2	0.1					3		5	
American shad			13	0.1					13	
Atlantic croaker							4		4	
Atlantic menhaden					2		4		6	
Atlantic silverside			50	0.5	88	0.9	699	7.4	837	2.7
Bay anchovy			161	1.8	5,156	53.7	1,153	12.3	6,470	20.7
Black sea bass					4				4	
Blueback herring							5		5	
Bluefish					10	0.1	2		12	
Bluntnose stingray			1		1				2	
Butterfish							1		1	
Cunner					4		1		5	
Grubby					3				3	
Hardtail jack							1		1	
Hogchoker			3		8	0.1			11	
Lined seahorse					1				1	
Lookdown					3				3	
Mummichog							1		1	
Northern pipefish			10	0.1	21	0.2	10	0.1	41	0.1
Northern puffer					3				3	
Northern searobin					8	0.1			8	

Table 76. cont.

Species	Winter #	Winter c/h	Spring #	Spring c/h	Summer #	Summer c/h	Fall #	Fall c/h	Total #	Total c/h
Orange filefish			1						1	
Oyster toadfish			3		9	0.1	3		15	
Pollock			1						1	
Red hake			1		1		5		7	
Scup					1				1	
Silver hake							4		4	
Smallmouth flounder							14	0.2	14	
Smooth dogfish			23	0.2	18	0.2			41	0.1
Spot			278	3.0	1,022	10.6	189	2.0	1,489	4.8
Spotted hake			2				1		3	
Striped anchovy					10	0.1			10	
Striped burrifish					1				1	
Striped cusk-eel					3				3	
Striped killifish	1						2		3	
Striped mullet							1		1	
Striped searobin					16	0.2	2		18	0.1
Summer flounder			11	0.1	25	0.3			36	0.1
Tautog			2						2	
Weakfish			2		375	3.9	2		379	1.2
White hake							1		1	
White perch			1		1				2	
Windowpane			23	0.2	38	0.4	5		66	0.2
Winter flounder	1		20	0.2	25	0.3	15	0.2	61	0.2

Table 77. Number of Fish Taken and Water Quality Recorded at Gill Net Station in Weakfish Thorofare (Zone 11).

Water quality data		January in	January out	February in	February out	March in	March out	April in	April out	May in	May out	June in	June out
D.O. mg/l	surface									8.11	8.49	7.70	8.20
	bottom									7.83	8.86	7.70	8.20
Salinity $^{o}/_{oo}$	surface												
	bottom									28.30	28.66	30.25	29.69
pH	surface									28.84	28.66	29.87	29.87
	bottom												
	surface									7.7	7.8	7.8	7.8
	bottom									7.7	7.8	7.7	7.8
H_2O temp. °C										12.5	15.5	14.8	16.5
										13.5	15.5	16.0	16.5
CO_2										4.16	5.87	5.38	3.91
Tide										H + 2		L + 4	
Depth m.										2.9	1.5	2.4	3.7
Secchi m.										1.4	1.0	0.9	1.2
Air temp. °C										16.8	10.8	14.2	19.0
Date										5		8	

Species	#	L-R	#	L-R
Atlantic menhaden			3	78
Bluefish				
Spot				
Striped mullet				
White perch				
Blue crab				
Calico crab			X	
Diamondback terrapin				
Doublecrested coromorant				
Horseshoe crab	X		X	
Total			3	

Table 78. Number of Fish Taken and Water Quality Recorded at Gill Net Station in St. Georges Thorofare (Zone 15).

Water quality data		January in	January out	February in	February out	March in	March out	April in	April out	May in	May out	June in	June out
D.O. mg/l	surface									8.58	10.00	7.85	9.07
	bottom									8.20	8.39	7.65	
Salinity °/oo	surface									29.92	30.28	29.42	29.07
	bottom									28.86	29.04	28.71	28.71
pH	surface									7.8	7.8	7.9	8.0
	bottom									7.8	7.8	8.0	8.0
H_2O temp. °C	surface									12.8	12.0	19.5	19.5
	bottom									11.6	11.2	18.5	19.0
CO_2										8.31	6.11	8.31	4.16
Tide										L + 2		L + 0	
Depth m.										3.0	4.9	3.7	4.0
Secchi m.										2.3	1.7	1.6	1.2
Air temp. °C										20.0	20.0	20.5	22.0
Date										12		13	

Species	#	L-R	#	L-R
Atlantic menhaden			10	217-282
Bluefish			1	300
Butterfish				
Smooth dogfish			4	1120-1260
Spot				
Calico crab		X		
Diamondback terrapin		X		
Horseshoe crab		X		
Total			15	

Table 78. cont.

Water quality data		July in	July out	August in	August out	September in	September out	October in	October out	November in	November out	December in	December out
D.O. mg/l	surface	9.56	12.25	8.06	7.96	7.13	10.09	8.03	7.98	9.26	9.11		
	bottom	3.92	4.51	7.59		6.67	6.57	7.88	8.03	9.21	9.11		
Salinity °/oo	surface	29.23	29.60	28.66	28.30	29.25	29.61	28.30	27.23	27.65	26.74		
	bottom	30.30	29.60		28.66	29.79	29.61	28.48	27.95	27.47	28.53		
pH	surface	8.0	8.2	8.0	7.9	8.0	8.1	8.0	7.9	8.0	7.9		
	bottom	7.8	7.8		7.9	7.9	8.0	7.9	7.9	8.0	8.0		
H_2O temp. °C	surface	24.0	26.0	21.9	22.0	20.0	21.0	11.3	11.9	8.0	8.0		
	bottom	21.5	21.0	20.0	23.0	20.5	20.5	11.5		7.5			
CO_2		0	0	5.66		2.96	0.49	5.91	4.93	7.20	4.32		
Tide		L + 6½/2		L + 1½/2		H + 1		L + 6½/2		H + 2			
Depth m.		2.4	4.4	0.9	1.8	6.5	5.5	4.5	4.0	5.0	4.0		
Secchi m.		0.9	0.8	0.4	0.9	1.0	1.0	0.8	1.25	1.5	2.0		
Air temp. °C		26.0	28.0	18.0	28.0	20.0	23.0	11.0		9.0	12.0		
Date		21		25		16		18		30			

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total
Atlantic menhaden	1	193			10	154-188	1	275					22
Bluefish	2	320-325	11	204-268	36	190-286	1	275					51
Butterfish					1	157	2	185-312					3
Smooth dogfish													4
Spot	3	195-229	62	146-202	39	149-184							104
Calico crab													
Diamondback terrapin													
Horseshoe crab													
Total	6		73		86		4						184

Table 79. Number of Fish Taken and Water Quality Recorded at Gill Net Station in Risley Channel (Zone 25).

Water quality data		January in	January out	February in	February out	March in	March out	April in	April out	May in	May out	June in	June out
D.O. mg/l	surface									7.87	8.63	5.90	4.90
	bottom									7.83	8.39	6.20	6.20
Salinity °/oo	surface									28.69	28.87	30.48	29.78
	bottom									26.00	28.87	29.78	30.14
pH	surface									8.0	8.0	8.1	8.0
	bottom									8.0	8.0	8.0	8.0
H_2O temp. °C	surface									19.0	20.2	16.9	21.0
	bottom									17.5	20.0	17.0	20.5
CO_2										2.64	2.30	6.60	3.91
Tide										H + 1		H + 2	
Depth m.										3.7	4.2	4.6	4.0
Secchi m.										1.4	0.9	1.2	1.2
Air temp. °C										21.5	20.0	23.5	
Date										23		20	

Species	#	L-R	#	L-R
Atlantic menhaden				
Black sea bass				
Bluefish				
Northern pipefish				
Northern searobin				
Smooth dogfish				
Spot				
Striped searobin	1	320		
Tautog			1	340
Blue crab			X	
Calico crab	X			
Hermit crab	X			
Horseshoe crab	X		X	
Rock crab	X			
Spider crab	X		X	
Total	1		1	

Table 79. Number of Fish Taken and Water Quality Recorded at Gill Net Station in Risley Channel (Zone 25).

Water quality data		July in	July out	August in	August out	September in	September out	October in	October out	November in	November out	December in	December out
D.O. mg/l	surface	4.51	6.86	5.37	3.70	5.19	5.79	8.12	6.47	8.97			
	bottom	3.43	5.98	5.37	3.75	5.09	5.65			9.02	9.95		
Salinity °/oo	surface	29.18	29.52	29.02	29.72	29.43	28.53	28.53	28.19	28.89			
	bottom	29.00	30.23	29.72	30.61	29.97	29.25			28.89	24.96		
pH	surface	7.8	7.9	7.8	7.8	7.8	7.8	8.1	8.1	8.2			
	bottom	7.8	7.9		7.8	7.8	7.9			8.2	7.9		
H_2O temp. °C	surface	21.0	27.0	23.0	18.5		20.00	13.5	14.5	7.9			
	bottom	19.0	26.5	23.0	19.2	21.0	20.00			8.2			
CO_2		3.94	5.90	11.33	9.36	6.16	0	5.17	4.19	6.72	6.00		
Tide		H + 2 1/2		L + 1 1/2		L + 2		H + 5 1/2		H + 3 1/2			
Depth m.		3.7	3.0	1.4	1.2	2.5	3.5	0.8	0.8	1.5	1.0		
Secchi m.		1.5	0.9	0.6	0.4	0.5	0.8	0.5	0.5	1.0	0.5		
Air temp. °C		30.5	29.5	23.0	23.0	21.0	18.5	16.0	17.0	10.0	8.0		
Date		18		23				24		28			

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total
Atlantic menhaden					4	154-163							4
Black sea bass					3	170-200							3
Bluefish					10	228-270							10
Northern pipefish			7	73-140									7
Northern searobin			3	205-221									3
Smooth dogfish	1	409											1
Spot			7	148-164	7	155-188							14
Striped searobin													1
Tautog													1
Blue crab													
Calico crab													
Hermit crab													
Horseshoe crab		X											
Rock crab										X			
Spider crab													
Total	1		17		24								44

Table 77. cont.

Water quality data		July in	July out	August in	August out	September in	September out	October in	October out	November in	November out	December in	December out
	surface	6.37	7.84	6.22	7.07	6.94	6.94	9.44		8.39			
D.O. mg/1	bottom	6.27	7.35		6.88	5.19	6.48	8.95	9.49	9.31	8.53		
	surface	28.48	29.18	30.30	30.48	29.36	29.02	26.02		27.59			
Salinity °/oo	bottom	28.48	29.18		28.15	29.18	29.54	26.02	26.56	28.30	27.59		
	surface	7.8	8.0	7.8	8.0	7.9	8.1	8.0	8.0	8.2			
pH	bottom	7.8	8.0		8.0	7.9	8.1		7.9	8.2	8.0		
	surface	21.0	23.5	27.0	27.0	22.5	23.0	13.0		9.8			
H_2O temp. °C	bottom	22.0	21.5		26.5	22.0	24.0	13.0	14.0	9.8	9.3		
CO_2		5.67	3.47	7.64	6.65	7.39	8.87	3.12	2.16	5.23	4.99		
Tide		L + 5		L + 1		L + 1/2		H + 1		L + 1			
Depth m.		1.4	2.4	0.4	1.2	2.0	2.5	1.3		2.0	1.0		
Secchi m.				0.4	0.6	0.5	0.8	0.5		1.0	1.0		
Air temp. °C		27.5	26.0	31.0		23.0	25.0	10.5	10.0	13.0	11.0		
Date		6		9		8		31		21			

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total
Atlantic menhaden	2	230-234									5
Bluefish	2	366-386			2	212-245					4
Spot					4	148-155	1	140			5
Striped mullet					10	198-216					10
White perch							1	285	2	285-290	3
Blue crab			X			X					
Calico crab		X									
Diamondback terrapin			X			X					
Doublecrested cormorant						X					
Horseshoe crab		X									
Total	4				16		2		2		27

Table 80. Number of Fish Taken and Water Quality Recorded at Gill Net Station in Absecon Bay.

Water quality data		January in	January out	February in	February out	March in	March out	April in	April out	May in	May out	June in	June out
D.O. mg/l	surface											5.88	6.27
	bottom												
Salinity °/oo	surface											29.97	30.14
	bottom												
pH	surface											7.8	7.9
	bottom												
H_2O temp. °C	surface												24.0
	bottom												
CO_2												6.60	6.27
Tide													H + 1/2
Depth m.												1.2	1.2
Secchi m.												1.0	0.8
Air temp. °C												22.0	26.0
Date												29	
Species												#	L-R
Atlantic menhaden													
Bluefish													
Sandbar shark													
Smooth dogfish												2	390-392
Spot													
Striped killifish													
Striped mullet													
Summer flounder													
Weakfish													
Blue crab													
Calico crab													
Horseshoe crab													X
Spider crab													X
Whelk													
Total												2	

Table 80. Number of Fish Taken and Water Quality Recorded at Gill Net Station in Absecon Bay.

Water quality data		July in	July out	August in	August out	September in	September out	October in	October out	November in	November out	December in	December out
D.O. mg/l	surface	5.47					6.81	7.59		9.80			
	bottom	5.47	6.32				6.32	7.64		9.21	9.85		
Salinity $^{o}/_{oo}$	surface	29.60					29.61	28.01		26.74			
	bottom	29.76	30.12				29.25	27.47		27.11	26.38		
pH	surface	8.1					8.0	7.8		8.0			
	bottom	8.0	8.3				8.1	7.8		8.0	8.0		
H_2O temp. °C	surface	19.5					19.0	16.0		6.3			
	bottom	19.5	22.0				18.0	16.0		6.3	7.0		
CO_2		7.88	7.39				6.65	1.10		4.32	5.04		
Tide		H + 1						L + 4 1/2		H + 1			
Depth m.		1.5	0.9				2.0	1.5		1.75	1.0		
Secchi m.		0.9	0.8				1.0			1.2	1.0		
Air temp. °C		15.5	20.0				18.5	17.5		9.0	12.0		
Date		28				29		28		30			

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total
Atlantic menhaden	8	200-306			6	182-315							14
Bluefish	1	339			42	183-428							43
Sandbar shark					3	710-754							3
Smooth dogfish	4	410-1070			18	418-1023							24
Spot					96	132-184	2	127-172					98
Striped killifish													
Striped mullet					1	215							1
Summer flounder					1	440							
Weakfish					1	411							1
Blue crab						X							
Calico crab		X				X		X					
Horseshoe crab						X							
Spider crab		X				X							
Whelk						X							
Total	13				168		2						185

Table 81. Number of Fish Taken and Water Quality Recorded at Gill Net Station in Lakes Bay.

Water quality data		July in	July out	Aug. in	Aug. out	September in	September out	October in	October out	November in	November out	December in	December out
D.O. mg/l	surface	6.08	6.55	4.91	5.69	6.18	6.62	7.59	7.78	9.16	9.41		
	bottom	5.80	6.41	4.26	5.19	6.03	6.62	7.59	7.59	9.20	9.56		
Salinity °/oo	surface	29.76	30.12	28.19	29.07	27.83	27.11	27.83	27.83	26.20	26.53		
	bottom	29.60	30.12	29.25	28.89	28.89	27.47		27.65	26.87	26.87		
pH	surface	7.6	7.9	7.9	7.9	7.8	7.9	7.8	7.9	7.2	8.1		
	bottom	7.9	7.7	7.8	7.9	7.7	7.8		7.9	8.0	8.0		
H_2O temp. °C	surface	21.5	23.0	25.0	26.5	18.5	19.0	15.0	15.0	8.75	9.0		
	bottom	21.0	23.5	24.5	26.0	18.0	19.0	15.0	15.0	9.0	9.5		
CO_2		4.93	5.17	5.71	6.40	5.91	5.91	6.24	6.24	3.84	3.84		
Tide		H + 1/2		H + 2		H + 1/2		H + 0		H + 0			
Depth m.		2.1	1.5	1.8	1.5	3.0	2.5	3.0	2.5	2.25	2.5		
Secchi m.		1.0	1.8	1.0	1.2	0.5	0.5	1.5	1.5	1.0	0.8		
Air temp. °C		19.0	24.0	28.0	27.0	14.5	18.0	16.0	16.0	13.0	14.0		
Date		29		31		29		27		16			

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R Total
Atlantic menhaden	2	176-272	2	190-233	1	222						12
Bluefish			8	200-275	28	215-285						36
Northern pipefish	1	105										1
Northern searobin												
Smooth dogfish	5	404-444	1	418	13	450-555						144
Spot	4	152-223	22	145-185	10	147-185						36
Striped mullet					1	195						1
Striped searobin												1
Summer flounder	1	190										2
Weakfish	1	601	1	215	2	229-231						5
Blue crab		X		X		X						
Horseshoe crab								X				
Spider crab												
Total	14		34		55							208

Table 81. Number of Fish Taken and Water Quality Recorded at Gill Net Station in Lakes Bay.

Water quality data		January in	January out	February in	February out	March in	March out	April in	April out	May in	May out	June in	June out
D.O. mg/l	surface									7.26	8.77	7.74	4.41
	bottom									7.50	8.11	6.96	6.13
Salinity °/oo	surface									28.62	28.62	29.25	28.71
	bottom									29.16	29.16	30.50	28.01
pH	surface									8.0	8.0	8.2	8.1
	bottom									7.9	8.0	8.1	8.0
H_2O temp. °C	surface									23.0	23.0	25.5	25.0
	bottom									23.5	23.0	25.0	24.5
CO_2										1.47	0.73	0	1.71
Tide										L + 2		L + 0	
Depth m.										1.5	2.4		1.5
Secchi m.										1.4	0.8	0.6	0.8
Air temp. °C										24.5	25.0	26.5	25.0
Date										27		28	

Species	May #	May L-R	June #	June L-R
Atlantic menhaden	3	250-325	4	261-283
Bluefish				
Northern pipefish				
Northern searobin				
Smooth dogfish	90	310-1230	5	340-415
Spot				
Striped mullet				
Striped searobin	1	324		
Summer flounder	1	290		
Weakfish	1	370		
Blue crab				
Horseshoe crab	X			
Spider crab	X			
Total	96		9	

Table 82. Number of Fish Taken and Water Quality Recorded at Gill Net Station in Scull Bay.

Water quality data		January in	January out	February in	February out	March in	March out	April in	April out	May in	May out	June in	June out
D.O. mg/l	surface									7.12	7.92	4.21	5.10
	bottom												4.61
Salinity °/oo	surface												
	bottom									29.23	29.60	29.61	29.97
pH	surface									7.9	7.9	7.6	7.7
	bottom												
H_2O temp. °C										21.0	22.0	22.0	22.5
													21.0
CO_2										2.69	2.45	10.27	7.34
Tide										L + 5 1/2		L + 6	
Depth m.										1.0	1.0	1.2	
Secchi m.										0.8	0.8	0.9	
Air temp. °C										22.0	22.0	20.0	
Date										24		30	

Species	May #	May L-R	June #	June L-R
Atlantic menhaden			4	239-340
Black sea bass				
Bluefish			1	338
Smooth dogfish	2	310-344	8	335-403
Spot			2	196-198
Striped searobin			2	160-197
Summer flounder				
Weakfish			3	335-440
Blue crab		X		
Calico crab				
Diamondback terrapin		X		
Hermit crab				
Horseshoe crab				
Spider crab		X		
Total	2		20	

Table 82. Number of Fish Taken and Water Quality Recorded at Gill Net Station in Scull Bay.

Water quality data		July in	July out	August in	August out	September in	September out	October in	October out	November in	November out	December in	December out
D.O. mg/l	surface	5.61	6.22	4.26	5.19	5.84	6.67	7.98	7.74	8.97	9.16		
	bottom	5.80		4.63	6.85	5.89	6.42	7.54	7.83	9.02	9.07		
Salinity °/oo	surface	28.87	30.66	28.53	28.89	25.30	28.89	27.83	27.47	25.99	25.28		
	bottom	29.23	30.12	29.97	29.61	28.35	28.35	26.38	27.65	25.28	24.92		
pH	surface	8.2	7.7	7.8	7.9	7.9	7.7	8.0	7.9	8.1	8.2		
	bottom	7.7	7.9	7.8	7.9	7.9	7.9	7.8	7.8	8.1	8.1		
H_2O temp. °C	surface	20.0	22.5	23.0	29.0	18.5	19.0	15.0	15.0	10.2	10.0		
	bottom	20.0		21.0	26.0	18.5	19.0	15.0	15.0	10.2	10.2		
CO_2			6.16	5.37	5.52	6.40	5.66	6.24	6.24	3.84	3.84		
Tide				H + 2		H + 0		L + 6		H + 0			
Depth m.		1.2	0.8	1.2	1.8	2.0	2.0	2.0	2.0	1.3	1.2		
Secchi m.		0.6	0.8	1.0	0.8	1.5	0.5	0.8	1.2	0.7	1.0		
Air temp. °C		19.5	25.5	26.0	26.0	14.5	16.5	17.0	16.0	14.0	14.5		
Date		29		31		29		27		16			

Species	July #	July L-R	August #	August L-R	September #	September L-R	October #	October L-R	November #	November L-R	December #	December L-R	Total
Atlantic menhaden	1	196			14	140-312							19
Black sea bass					1	186							1
Bluefish			1	210	27	210-275							29
Smooth dogfish	8	340-421	1	410	7	484-566							26
Spot	4	144-223	52	135-195	12	151-180	2	155-165					72
Striped searobin													2
Summer flounder			2	240-260	1	425							3
Weakfish			2	207-625	4	229-510							9
Blue crab		X		X		X		X					
Calico crab								X					
Diamondback terrapin		X				X							
Hermit crab								X					
Horseshoe crab		X											
Spider crab						X		X					
Total	13		58		66		2						161

Table 83. Number of Fish Taken and Water Quality Recorded at Gill Net Station in Absecon Creek, near the mouth.

Water quality data		January in	January out	February in	February out	March in	March out	April in	April out	May in	May out	June in	June out
	surface			11.70	11.95			7.66	9.48	7.36	8.96	5.68	4.26
D.O. mg/l	bottom			11.60	11.60			5.99	9.08		8.86	5.49	
	surface			25.39	27.11			14.49	21.62	25.46	22.23	29.25	21.35
Salinity °/oo	bottom			27.29	26.65			14.49	22.59		22.41	29.61	
	surface			8.2	8.1			7.0	7.6	7.8	7.9	7.5	7.3
pH	bottom			8.3	8.2			7.1	7.6		7.9	7.6	
	surface			3.5	4.5			16.0	19.0	23.0	24.5	24.0	25.0
H_2O temp. °C	bottom			3.0	4.5			15.5	19.0		25.0	24.0	
CO_2				1.75	1.15			7.82	3.91	2.67	4.89	7.82	12.47
Tide				L + 5				L + 2 1/2		L + 5		H + 2 1/2	
Depth m.				4.5	5.5			1.4	1.5	1.5	1.2	2.3	0.5
Secchi m.				1.5	1.5			1.0	0.8	0.6	0.6	0.3	0.3
Air temp. °C				12.0	12.0			23.0	24.0	25.0	25.0	32.0	31.0
Date				23				28		24		7-1	

Species	#	L-R	#	L-R	#	L-R
Alewife	1	200				
Atlantic menhaden			18	125-275	8	76-170
Atlantic silverside	8	110-130				
Bluefish					3	112-123
Oyster toadfish					1	322
Sandbar shark						
Smooth dogfish					1	350
Spot					1	82
Striped mullet						
Weakfish						
White perch	5	130-240	1	185	1	245
White mullet						
Blue crab						X
Horseshoe crab		X				X
Total	14		19		15	

Table 83. Number of Fish Taken and Water Quality Recorded at Gill Net Station in Absecon Creek, Near the Mouth.

Water quality data		July in	July out	August in	August out	September in	September out	October in	October out	November in	November out	December in	December out
D.O. mg/l	surface	5.39	5.98	4.12	6.30	3.24	3.24	7.64	8.95	5.68	5.64		
	bottom	5.00	6.27	3.80	6.07	3.24	3.24		7.88	5.49	5.44		
Salinity °/oo	surface	18.78	29.94	14.67	24.74	26.74	21.35	20.63	25.14	19.34	10.23		
	bottom	18.24	30.12	19.90		27.29	22.43		27.65	20.26	11.13		
pH	surface	8.1	7.5	7.2	7.6	7.1	6.9	7.6	8.0	7.4	6.8		
	bottom	7.1	7.4	7.2		7.2	6.9		7.9	7.4	6.8		
H_2O temp. °C	surface	24.5	24.0	23.8	25.5	21.0	22.0	16.5	18.0	16.0	16.5		
	bottom	25.0	24.0	23.8	25.0	21.0	22.0		17.5	16.0			
CO_2		9.61	7.39	9.11	5.17	8.87	14.04	8.62	6.65	5.52	5.52		
Tide		L + 2		L + 1		H + 4 1/2		H + 1		H + 6			
Depth m.		2.1	1.8	2.7		3.0	1.75	2.0	2.0	3.0	2.0		
Secchi m.		1.4	1.0	0.9	0.3	0.5	0.5	2.0	1.0	0.5	0.5		
Air temp. °C		26.0	23.5	24.0	23.5	22.0	24.5	18.0		17.0	15.0		
Date		25		24		26		7		9			

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	Total
Alewife													1
Atlantic menhaden	5	100-188	20	126-287	2	139-141							53
Atlantic silverside													8
Bluefish	29	112-194	35	167-262	5	220-267	2	233-229					74
Oyster toadfish			1	165									2
Sandbar shark	1	880											1
Smooth dogfish													1
Spot	68	112-152	29	124-166	3	150-160	11	122-232	1	152			113
Striped mullet							2						2
Weakfish	6	99-126	6	167-184									12
White perch					3	225-280	5	194-220	1	187			16
White mullet	1	99											1
Blue crab								X					
Horseshoe crab													
Total	110		91		13		20		2				284

Table 84. Number of Fish Taken and Water Quality Recorded at Gill Net Station in Upper Absecon Creek.

Water quality data		January in	January out	February in	February out	March in	March out	April in	April out	May in	May out	June* in	June* out
	surface			11.25	12.05			7.46	7.46	5.66	9.15	4.41	4.51
D.O. mg/l	bottom			10.85				6.92	7.27	5.28	8.20	4.36	
	surface			0.41	0.21			1.33	1.78	2.83	3.57	23.15	18.87
Salinity °/oo	bottom			0.59				1.60	1.69	3.01	3.01	22.97	
	surface			6.7	6.7			7.0	6.7	6.8	7.2	7.4	7.3
pH	bottom			6.8				7.0	6.7	6.8	7.2	7.3	
	surface			8.5	9.5			16.5	18.0	22.5	23.5	24.5	28.5
H_2O temp. °C	bottom			6.5				16.5	17.5	22.5	23.5	24.5	
CO_2				1.45	0.50			13.45	3.67	13.94	5.87	12.23	10.76
Tide													
Depth				3.0	3.5			2.0	2.1	1.8	1.5	1.2	0.4
Secchi m.				3.0	3.5			1.0	1.0	0.8	0.8	0.5	0.4
Air temp. °C				15.2	15.2			23.5	24.0	25.0	25.0	32.0	31.0
Date				23				28		24		7-1	

Species	#	L-R	#	L-R	#	L-R
Atlantic menhaden						
Bluefish					2	102-115
Mummichog					9	72-97
Pumpkinseed						
Spot						
Striped killifish	3	90			1	145
White perch	1	170	13	140-187		
Yellow perch	2	300				
Blue crab						
Total	6		13		12	

* downstream from normal location

Table 84. Number of Fish Taken and Water Quality Recorded at Gill Net Station in Upper Absecon Creek.

Water quality data		July in	July out	August in	August out	September* in	September* out	October in	October out	November in	November out	December in	December out
D.O. mg/l	surface	3.53	3.72	3.89	5.51	3.24	3.70	5.16	5.64	5.19	5.88		
	bottom	1.96	3.43	2.78	5.60	3.24	3.70		5.45	5.29	5.59		
Salinity ‰	surface	4.13	6.89	4.45	7.03	21.71	15.16	3.39	12.97	2.45	1.73		
	bottom	5.79	7.27	4.83	7.76	23.15	14.43		14.98	2.45	1.15		
pH	surface	7.7	7.6	6.8	7.7	7.0	6.8	6.7	7.1	6.8	6.3		
	bottom	8.0	7.4	6.8	7.6	7.0	6.8		7.1	6.7	4.9		
H_2O temp. °C	surface	23.5	24.0	23.3	23.5	21.0	21.0	16.0	15.7	16.2	16.5		
	bottom	23.2	24.0	23.3	23.0	21.0	21.5		15.7	16.2	16.5		
CO_2		11.08	10.34	13.69	10.34	12.56	15.02	6.90	7.88	6.72	5.04		
Tide													
Depth m.		1.5	2.1	1.8		2.5	0.8	2.0	3.0	2.0	2.0		
Secchi m.		0.6	0.4	0.6	0.4	1.0	0.8	2.0	0.8	0.5	0.8		
Air temp. °C		25.5		25.0	22.5	24.0	23.0	18.0		17.0	17.0		
Date		25				26		7					

Species	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R	#	L-R Total
Atlantic menhaden	5	165-175										5
Bluefish	14	116-190	13	157-228	2	239-240	10	207-257				41
Mummichog												9
Pumpkinseed	1	151										1
Spot	270	115-142	16	127-153			6	123-147				292
Striped killifish												4
White perch	35	128-189	7	150-175			5	130-214				61
Yellow perch	11	145-217	2	230-285			3	154-284				18
Blue crab								X				
Total	336		38		2		24					431

* downstream from normal location

Table 85. Number of Fish Taken by Gill Net and the Catch Per Hour by season.

Species	Winter #	Winter c/h	Spring #	Spring c/h	Summer #	Summer c/h	Fall #	Fall c/h	Total #	Total c/h
Alewife			1						1	
Atlantic menhaden			50	0.7	68	0.7	1		119	0.5
Atlantic silverside			8	0.1					8	
Black sea bass					4				4	
Bluefish			7	0.1	283	3.0	11	0.2	301	1.3
Butterfish					1		4	0.1	5	
Mummichog			9	0.1					9	
No. pipefish					8	0.1			8	0.4
No. searobin					3				3	
Oyster toadfish			1		1				2	
Pumpkinseed					1				1	
Sandbar shark					4				4	
Smooth dogfish			112	1.6	58	0.6			170	0.7
Spot			3		708	7.4	23	0.4	734	3.2
Striped killifish			4	0.1					4	
Striped mullet					12	0.1	2		14	0.1
Striped searobin			4	0.1					4	
Summer flounder			1		5				6	
Tautog			1						1	
Weakfish			4	0.1	23	0.2			27	0.2
White mullet					1				1	
White perch			21	0.3	45	0.5	14	0.2	80	0.3
Yellow perch			2		13	0.1	3		18	0.1

Table 86. Number of Each Species Taken by Each Gear, Overall Rank and Per Cent of Total Catch.

Species	Seine 150'	Seine 25'	Trawl	Gillnet	Total	Rank	%
Alewife			10	1	11	31	
American eel	6	4	8		18	24	
American sandlance	683		5		688	6	1
American shad			13		13	28	
Atlantic croaker	2	7	4		13	28	
Atlantic menhaden	33	9	6	119	167	13	
Atlantic silverside	21,983	29,615	837	8	52,443	1	52
Bay anchovy	29,271	686	6,470		36,427	2	36
Black sea bass			4	4	8	34	
Blueback herring	84	1	5		90	17	
Bluefish	249	25	12	301	587	7	1
Bluntnose stingray	1		2		3	42	
Butterfish			1	5	6	37	
Crevalle jack	1	2			3	42	
Cunner			5		5	38	
Fourspine stickleback		1			1	50	
Grubby			3		3	42	
Halfbeak	3				3	42	
Hardtail jack			1		1	50	
Hogchoker			11		11	31	
Lined seahorse	1		1		2	49	
Lookdown		1	3		4	39	
Mummichog	179	2,633	1	9	2,822	4	3
Naked goby		1			1	50	
Northern kingfish	1				1	50	
Northern pipefish	23	34	41	8	106	16	
Northern puffer	5		3		8	34	
Northern searobin	7		8	3	18	24	
Orange filefish			1		1	50	
Oyster toadfish		1	15	2	18	24	
Permit		39			39	20	
Pollock			1		1	50	
Pumpkinseed				1	1	50	
Red hake			7		7	36	
Rough silverside	9				9	33	
Sandbar shark				4	4	39	
Scup			1		1	50	
Sheepshead minnow	4	133			137	14	
Silver hake			4		4	39	
Smallmouth flounder	6		14		20	23	
Smooth dogfish	5		41	170	216	11	
Spot	1,389	315	1,489	734	3,927	3	4
Spotted hake			3		3	42	
Striped anchovy	16		10		26	21	
Striped burrfish			1		1	50	
Striped cusk-eel			3		3	42	
Striped killifish	56	703	3	4	766	5	

Table 86. cont.

Species	Seine 150'	Seine 25'	Trawl	Gillnet	Total	Rank	%
Striped mullet	53	60	1	14	128	15	
Striped searobin	2		18	4	24	22	
Summer flounder	19	5	36	6	66	19	
Tautog			2	1	3	42	
Threespine stickleback	3	9			12	30	
Weakfish	1	16	379	27	423	9	
White hake			1		1	50	
White mullet	66	498		1	565	8	
White perch		5	2	80	87	18	
Windowpane	104	6	66		176	12	
Winter flounder	127	34	61		222	10	
Yellow perch				18	18	24	

Table 87

SALINITY RANGE FOR SELECTED SPECIES TAKEN IN THE STUDY AREA

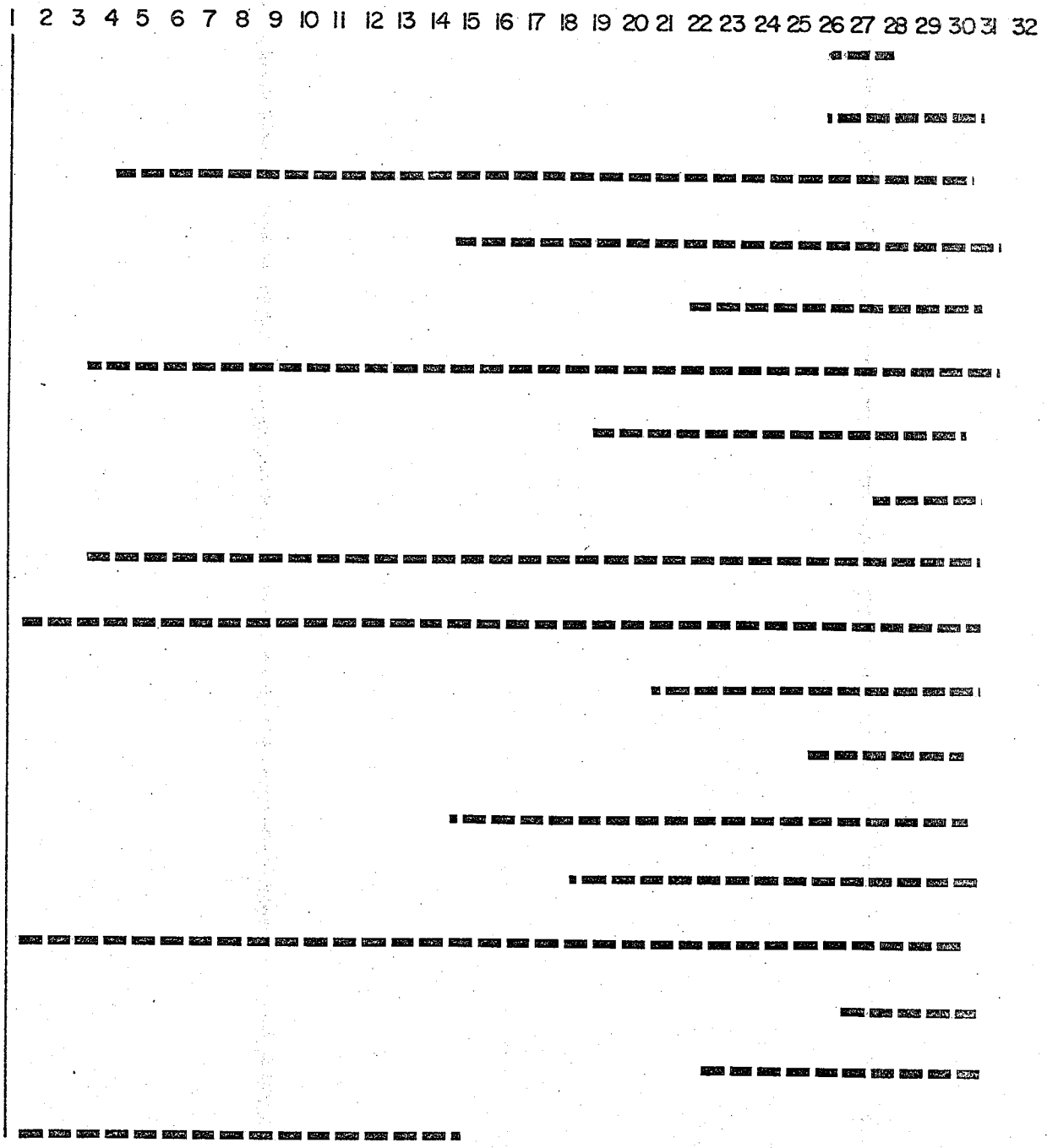

Table 88

TEMPERATURE RANGE (°C) FOR SELECTED SPECIES TAKEN IN THE STUDY AREA

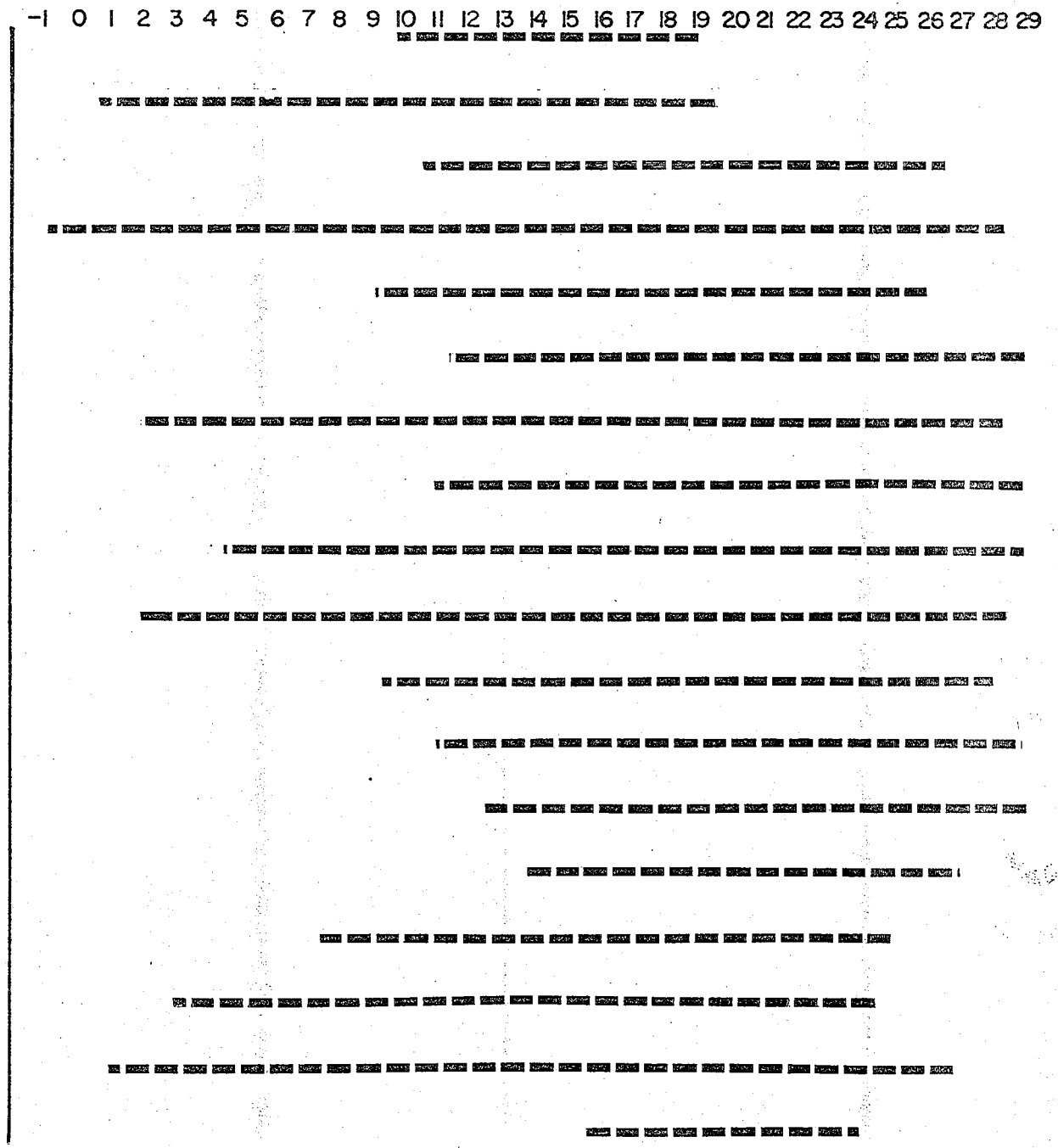

Table 89. Yearly Species Diversity Indices for Each Station.

	Zn 01	Zn 04	Zn 06	Zn 10	Zn 12	Zn 15	Zn 16	Zn 17	Zn 19	Zn 21	Zn 22	Zn 24
Seine - 25'	0.10			0.15	1.16		0.88		0.16	0.70		0.74
Seine - 150'	0.77			0.76								0.71
Trawl	1.39	0.97	1.12	1.21	1.40	1.19	1.81	1.47		1.16	1.13	1.30

	Zn 27	Ltl. Bay	Perch Cove	Reed Bay	Absecon Bay	Lakes Bay	Scull Bay	Broad Creek	Tide Pool Zn 10
Seine - 25'		0.86	1.00	0.43	1.15	0.90			0.40
Seine - 150'									
Trawl	0.71			0.67		0.69	0.55	0.77	

TABLE 90 Seasonal occurrence of all species taken by all gear types in the study area.

Species	Winter*	Spring	Summer	Fall
FINFISH				
Alewife		X	X	X
American eel	X	X	X	X
American sandlance	X	X	X	X
American shad		X		
Atlantic croaker				X
Atlantic menhaden		X	X	X
Atlantic silverside	X	X	X	X
Bay anchovy		X	X	X
Black sea bass			X	
Blueback herring	X	X		X
Bluefish		X	X	X
Bluntnose stingray		X	X	
Butterfish			X	X
Crevalle jack			X	
Cunner			X	X
Fourspine stickleback		X		
Grubby			X	
Halfbeak		X		
Hardtail jack				X
Hogchoker		X	X	
Lined seahorse			X	
Lookdown			X	
Mummichog		X	X	X
Naked goby			X	
Northern kingfish			X	
Northern pipefish	X	X	X	X
Northern puffer			X	
Northern searobin			X	
Orange filefish			X	
Oyster toadfish		X	X	
Permit			X	
Pollock		X		
Pumpkinseed			X	
Red hake		X	X	X
Rough silverside		X		

TABLE 90 (continued)

Species	Winter*	Spring	Summer	Fall
Sandbar shark			X	
Scup			X	
Silver hake				X
Smallmouth flounder		X	X	X
Smooth dogfish		X	X	
Spot		X	X	X
Spotted hake		X		
Striped anchovy			X	
Striped burrfish			X	
Striped cusk-eel			X	
Striped killifish	X	X	X	X
Striped mullet		X	X	X
Striped searobin		X	X	X
Summer flounder		X	X	
Tautog		X		
Threespine stickleback	X	X		
Weakfish		X	X	X
White hake				X
White mullet		X	X	X
White perch	X	X	X	X
Windowpane		X	X	X
Winter flounder	X	X	X	X
Yellow perch		X		X
INVERTEBRATES				
Blue crab	X	X	X	X
Calico crab	X	X	X	X
Edible prawn			X	X
Glass shrimp	X	X	X	X
Hermit crab	X	X	X	X
Horseshoe crab	X	X	X	X
Mud crab	X	X	X	X
Mud snail	X	X	X	X
Rock crab		X	X	X
Sand shrimp	X	X	X	X
Spider crab	X	X	X	X
Starfish	X	X	X	X
Whelk			X	

*March only

TABLE 91. Total number, percent of total catch and overall c/h by gear type for each species numbering more than 100 specimens.

Species	Number	Percent	25' Seine	150' Seine	Trawl	Gill Net *
Atlantic silverside	52,443+	52	137.1	414.8	3.8	0.1
Bay anchovy	36,427+	36	3.2	552.3	23.6	0
Spot	3,927+	4	1.5	26.2	5.4	3.2
Mummichog	2,822	3	12.2	3.4	0.1	0.1
Striped killifish	776	0.7	3.2	1.1	0.1	0.1
American sand lance	688	0.7	0	12.9	0.1	0
Bluefish	587	0.6	0.1	4.7	0.1	1.3
White mullet	565	0.6	2.3	1.2	0	0.1
Weakfish	423	0.4	0.1	0.1	1.4	0.1
Winter flounder	222	0.2	0.2	2.4	0.2	0
Smooth dogfish	216	0.2	0	0.1	0.2	0.7
Windowpane	176	0.2	0.1	2.0	0.2	0
Atlantic menhaden	167	0.2	0.1	0.6	0.1	0.5
Sheepshead minnow	137	0.1	0.6	0.1	0	0
Striped mullet	128	0.1	0.3	1.0	0.1	0.1
Northern pipefish	106	0.1	0.2	0.4	0.2	0.1

*c/hr

Table 92 - Species Numbering Over 100 Specimens and the Months in Which They Were Collected.

	MARCH				APRIL				MAY				JUNE				JULY			
	25'	150'	T	G	25'	150'	T	G	25'	150'	T	G	25'	150'	T	G	25'	150'	T	G
Atlantic silverside	X	X	X		X	X		X	X	X	X		X	X	X		X	X	X	
Bay anchovy						X	X		X	X	X		X	X	X			X	X	
Spot													X	X	X	X	X	X	X	X
Mummichog					X				X				X	X			X	X		X
Striped killifish	X				X	X		X	X				X				X	X		X
American sandlance		X	X							X								X		
Bluefish									X				X	X		X	X	X	X	X
White mullet													X							X
Weakfish											X	X				X			X	X
Winter flounder			X				X		X						X		X	X	X	
Smooth dogfish											X	X			X	X			X	X
Windowpane							X			X	X		X	X	X			X	X	
Atlantic menhaden											X		X	X		X		X	X	X
Sheepshead minnow																	X			
Striped mullet					X	X							X				X			
Northern pipefish		X			X	X	X		X	X	X		X	X	X		X	X	X	X

25' = seine
150' = seine
T = trawl
G = gill net

Table 92 - Species Numbering Over 100 Specimens and the Months in Which They Were Collected. (continued)

	AUGUST				SEPTEMBER				OCTOBER				NOVEMBER				DECEMBER			
	25'	150'	T	G	25'	150'	T	G	25'	150'	T	G	25'	150'	T	G	25'	150'	T	G
Atlantic silverside	X	X	X		X	X	X		X	X	X		X	X	X		X		X	
Bay anchovy		X	X		X	X	X		X	X	X		X	X	X		X		X	
Spot	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X				
Mummichog	X	X			X				X	X			X	X					X	
Striped killifish	X	X			X	X			X	X			X	X					X	
American sandlance		X								X				X					X	
Bluefish		X	X	X		X	X				X	X								
White mullet	X	X			X	X				X										
Weakfish	X	X	X	X	X		X	X			X									
Winter flounder	X	X	X		X	X	X		X	X	X		X	X	X				X	
Smooth dogfish		X	X	X			X	X												
Windowpane	X	X	X			X	X			X	X			X					X	
Atlantic menhaden			X	X				X			X	X								
Sheepshead minnow	X				X				X	X			X	X						
Striped mullet		X				X		X				X			X					
Northern pipefish	X	X	X	X		X				X	X		X		X					

25' = seine
150' = seine
T = trawl
G = gill net

Table 93. A List of Common and Scientific Names of Fishes Taken During the Ichthyoplankton Survey in the Back Bay Systems in Atlantic County from March 1977 to November 1977.

Scientific Name	Common Name
Ammodytes sp.	Sand lance
Anchoa mitchilli	Bay anchovy
Anguilla rostrata	American eel
Cynoscion regalis	Weakfish
Family Engraulidae	Anchovies
Fundulus heteroclitus	Mummichog
Family Gobiidae	Gobies
Gobiosoma bosci	Naked goby
Hippocampus sp.	Seahorse
Lophius americanus	Goosefish
Menidia beryllina	Tidewater silverside
Menidia menidia	Atlantic silverside
Micropogon undulatus	Atlantic croaker
Family Monacanthidae	Filefish
Myoxycephalus aenaeus	Grubby
Opsanus tau	Oyster toadfish
Paralichthys dentatus	Summer flounder
Prionotus sp.	Searobin
Pseudopleuronectes americanus	Winter flounder
Scophthalmus aquosus	Windowpane
Syngnathus fuscus	Northern pipefish
Family Synodontidae	Lizardfishes
Synodus foetens	Inshore lizardfish

Table 94. Species of Finfish Collected During the Ichthyoplankton Sampling Program in the Atlantic City Vicinity from March 1977 to November 1977 by Life Stage and Percent of Total Catch.

Species	Life Stage and Number of Specimens				% of Total Catch			
	Larvae	Young	Adult	Total	Larvae	Young	Adult	Total
Ammodytes sp.	38	-	-	38	0.37	-	-	0.37
Anchoa mitchilli	59	5	-	64	0.57	0.05	-	0.62
Anguilla rostrata	-	7	-	7	-	0.07	-	0.07
Cynoscion regalis	363	-	-	363	3.53	-	-	3.53
Family Engraulidae	1614	-	-	1614	15.71	-	-	15.71
Fundulus heteroclitus	19	-	-	19	0.18	-	-	0.18
Family Gobiidae	7395	-	-	7395	71.98	-	-	71.98
Gobiosoma bosci	16	28	-	44	0.16	0.27	-	0.43
Hippocampus sp.	-	2	-	2	-	0.02	-	0.02
Lophius americanus	2	-	-	2	0.02	-	-	0.02
Menidia beryllina	2	-	-	2	0.02	-	-	0.02
Menidia menidia	59	-	6	65	0.57	-	0.06	0.63
Micropogon undulatus	1	-	-	1	0.01	-	-	0.01
Family Monacanthidae	-	1	-	1	-	0.01	-	0.01
Myoxycephalus aenaeus	2	-	-	2	0.02	-	-	0.02
Opsanus tau	-	-	1	1	-	-	0.01	0.01
Paralichthys dentatus	2	-	-	2	0.02	-	-	0.02
Prionotus sp.	-	1	1	1	-	0.01	-	0.01
Pseudopleuronectes americanus	82	-	-	82	0.80	-	-	0.82
Scophthalmus aquosus	2	-	-	2	0.02	-	-	0.02
Syngnathus fuscus	-	561	3	564	-	5.46	0.03	5.49
Family Synodontidae	1	-	-	1	0.01	-	-	0.01
Synodus foetens	-	2	-	2	-	0.02	-	0.02
Total	9657	607	10	10,274	93.99	5.91	0.10	100.02

Table 95. Occurrence of Ichthyoplankton in the Atlantic City Vicinity by Species, Life Stage, and Station.

Species	Great Egg Harbor Inlet			Whirlpool Island			Broad Creek			Mouth of Absecon Creek			Total
	Larvae	Young	Adult	Larvae	Young	Adult	Larvae	Young	Adult	Larvae	Young	Adult	
Ammodytes sp.	16	–	–	6	–	–	16	–	–	–	–	–	38
Anchoa mitchilli	1	–	–	54	–	–	2	5	–	2	–	–	64
Anguilla rostrata	–	2	–	–	1	–	–	3	–	–	1	–	7
Cynoscion regalis	218	–	–	89	–	–	25	–	–	31	–	–	363
Family Engraulidae	463	–	–	908	–	–	20	–	–	223	–	–	1614
Fundulus heteroclitus	1	–	–	–	–	–	–	–	–	18	–	–	19
Family Gobiidae	527	–	–	6567	–	–	20	–	–	281	–	–	7395
Gobiosoma bosci	6	–	–	6	–	–	4	–	–	28	–	–	44
Hippocampus sp.	–	1	–	–	–	–	–	1	–	–	–	–	2
Lophius americanus	2	–	–	–	–	–	–	–	–	–	–	–	2
Menidia beryllina	–	–	–	–	–	–	–	–	–	2	–	–	2
Menidia menidia	3	–	5	16	–	–	9	–	–	31	–	1	65
Micropogon undulatus	–	–	–	–	–	–	1	–	–	–	–	–	1
Family Monacanthidae	–	–	–	–	–	–	–	1	–	–	–	–	1
Myoxycephalus aenaeus	–	–	–	2	–	–	–	–	–	–	–	–	2
Opsanus tau	–	–	–	–	–	–	–	–	–	–	–	1	1
Paralichthys dentatus	–	–	–	–	–	–	2	–	–	–	–	–	2
Prionotus sp.	–	–	–	–	1	–	–	–	–	–	–	–	1
Pseudopleuronectes americanus	31	–	–	42	–	–	9	–	–	–	–	–	82
Scophthalmus aquosus	–	–	–	1	–	–	1	–	–	–	–	–	2
Syngnathus fuscus	–	61	1	–	310	1	–	173	1	–	17	–	564
Family Synodontidae	–	–	–	–	–	–	1	–	–	–	–	–	1
Synodus foetens	–	–	–	–	1	–	–	–	–	–	1	–	2
Total	1268	64	6	7691	313	1	110	183	1	616	19	2	10,274
Percent of Total Catch	12.34	0.62	0.06	74.86	3.05	0.01	1.07	1.78	0.01	6.00	0.18	0.02	
Station Total	1338 specimens			8005 specimens			294 specimens			637 specimens			
	13.02%			77.92%			2.86%			6.20%			
Sampling Effort (m^3)	15,404			18,159			21,906			3,396			
n/m^3	0.087			0.441			0.013			0.188			

Table 96. Great Egg Harbor Inlet - Catch by Species, Physical-Chemical Data, and Number of Finfish per Cubic Meter by Sample.

Date	3/29/77		3/29/77		3/21/77		3/21/77		4/13/77		4/13/77	
Tide	Flood		Flood		Ebb		Ebb		Flood		Flood	
Type of Set	Surface		Bottom		Surface		Bottom		Surface		Bottom	
Volume (m^3)	-		1,644		580		448		585		657	
Temp. (°C)	8.0		8.5		5.5		5.9		13.0		13.0	
D.O. (mg/1)	10.55		10.26		10.71		10.88		9.33		9.33	
Salinity (ppt)	29.13		30.23		31.11		31.02		29.45		28.40	
pH	7.9		7.86		7.87		7.88		7.79		7.80	
Air temp.(°C)	14.0		14.0		9.5		9.5		17.0		17.0	
Secchi (cm)	121.9		121.9		165.0		165.0		121.6		121.6	
Depth (cm)	182.9		182.9		290.0		290.0		182.4		182.4	
Time	1100		1100		1010		1010		1110		1110	
Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Ammodytes sp. Larvae	No Sample		11	.007	No Finfish		5	.011	No Finfish			
Anchoa mitchilli Larva											1	.002
Anguilla rostrata Young			1	.001								
Pseudopleuronectes americancus Larva											1	.002
Syngnathus fuscus Adult			1	.001								
Total	-	-	13	.008	0	0	5	.011			2	.003

Table 96. continued.

Date	4/20/77	4/20/77	5/11/77	5/11/77	5/18/77	5/18/77
Tide	Ebb	Ebb	Flood	Flood	Ebb	Ebb
Type of Set	Surface	Bottom	Surface	Bottom	Surface	Bottom
Volume (m^3)	577	601	545	432	524	783
Temp. (°C)	11.0	12.0	12.0	12.0	14.0	14.0
D.O. (mg/l)	8.74	8.74	8.25	8.02	7.26	7.5
Salinity (ppt)	30.52	30.46	31.46	31.16	31.60	31.69
pH	8.10	8.10	7.80	7.76	7.92	7.85
Air temp (°C)	15.0	15.0	11.5	11.5	24.0	24.0
Secchi (cm)	244.0	244.0	152.4	152.4	198.12	198.12
Depth (cm)	305.0	305.0	304.8	304.8	335.28	335.28
Time	1010	1010	1124	1125	1030	1030

Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Anguilla rostrata Young	No Finfish						1	.002			No Finfish	
Menidia menidia Larvae					1	.002						
Pseudopleuronectes americanus Larvae			1	.002			28	.065	1	.002		
Total	0	0	1	.002	1	.002	29	.067	1	.002	0	0

Table 96. continued

Date	6/23/77	6/23/77	6/2/77	6/2/77	7/19/77	7/19/77
Tide	Flood	Flood	Ebb	Ebb	Ebb	Ebb
Type of Set	Surface	Bottom	Surface	Bottom	Surface	Bottom
Volume (m^3)	815	186	646	394	224	107
Temp. (°C)	19.5	19.75	15.0	15.5	19.0	19.0
D.O. (mg/1)	7.55	7.55	6.8	7.4	6.08	5.78
Salinity (ppt)	31.04	31.40	30.59	31.29	30.93	31.82
pH	8.0	7.95	7.88	7.52	8.25	8.1
Air temp (°C)	26.5	26.5	21.0	21.0	31.0	31.0
Secchi (cm)	121.92	121.92	106.68	106.68	243.84	243.84
Depth (cm)	289.56	289.56	350.52	350.52	365.76	365.76
Time	0830	0830	1055	1055	1030	1030

Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Fundulus heteroclitus Larva	1	.001					No Finfish		No Finfish			
Lophius americanus Larvae					2	.003						
Menidia menidia Larvae					2	.003						
Syngnathus fuscus Young	10	.012	27	.145							1	.009
Total	11	.013	27	.145	4	.006	0	0	0	0	1	.009

Table 96. continued

Date	7/26/77	7/26/77	8/23/77	8/23/77	8/16/77	8/16/77
Tide	Flood	Flood	Flood	Flood	Ebb	Ebb
Type of Set	Surface	Bottom	Surface	Bottom	Surface	Bottom
Volume (m^3)	748	624	616	858	412	371
Temp. (°C)	19.0	17.0	20.0	22.0	21.0	21.0
D.O. (mg/l)	4.34	3.68	6.20	6.11	5.28	5.19
Salinity (ppt)	32.09	31.36	31.13	31.13	30.79	30.43
pH	7.7	7.65	7.85	7.9	7.75	7.8
Air temp (°C)	23.0	23.0	21.0	21.0	25.0	25.0
Secchi (cm)	91.44	91.44	121.92	121.92	121.92	121.92
Depth (cm)	365.76	365.76	457.20	457.20	457.20	457.20
Time	1315	1315	1300	1300	1100	1100

Species	n	n/m3	n	n/m3	n	n/m3	n	n/m3	n	n/m3	n	n/m3
Cynoscion regalis Larvae	5	.007	213	.341					No Finfish		No Finfish	
Fam. Engraulidae Larvae	305	.408	139	.223			19	.022				
Fam. Gobiidae Larvae	24	.032	499	.800			4	.005				
Gobiosoma bosci Larvae							6	.007				
Hippocampus sp. Young					1	.002						
Menidia menidia Adult	5	.007										
Syngnathus fuscus Young	1	.001	21	.034			1	.001				
Total	340	.454	872	1.397	1	.002	30	.035	0	0	0	0

Table 96. continued.

Date	9/19/77	9/19/77	10/25/77	10/25/77	10/26/77	10/26/77
Tide	Ebb	Ebb	Flood	Flood	Ebb	Ebb
Type of Set	Surface	Bottom	Surface	Bottom	Surface	Bottom
Volume (m^3)	571	246	190	47	563	410
Temp. (°C)	23.0	23.0	-	-	14.5	14.5
D.O. (mg/l)	8.15	8.15	7.88	7.88	8.17	8.08
Salinity (ppt)	32.10	31.74	28.89	29.25	30.68	29.97
pH	-	-	-	-	8.0	8.0
Air temp (°C)	26.0	26.0	-	-	15.5	15.5
Secchi (cm)	150.0	150.0	100.0	100.0	125.0	125.0
Depth (cm)	450.0	450.0	250.0	250.0	400.0	400.0
Time	1420	1420	1340	1340	0830	0830
Species	n n/m^3	n n/m^3	n n/m^3	n n/m^3	n n/m^3	n n/m^3
	No Finfish	No Finfish	No Finfish	No Finfish	No Finfish	No Finfish

Table 97. Whirlpool Island - Catch by Species, Physical-Chemical Data, and Number of Finfish per Cubic Meter by Sample.

Date	3/29/77	3/29/77	3/21/77	3/21/77	4/13/77	4/13/77
Tide	Flood	Flood	Ebb	Ebb	Flood	Flood
Type of Set	Surface	Bottom	Surface	Bottom	Surface	Bottom
Volume (m^3)	399	346	939	715	485	560
Temp. (°C)	11.0	9.5	6.5	6.0	16.0	16.0
D.O. (mg/1)	10.39	10.35	10.39	10.24	9.25	9.19
Salinity (ppt)	28.84	29.01	30.3	30.73	28.15	29.26
pH	7.92	7.91	7.76	7.79	7.84	7.85
Air temp (°C)	14.0	14.0	9.5	9.5	17.0	17.0
Secchi (cm)	121.9	121.9	150.0	150.0	152.0	152.0
Depth (cm)	426.7	426.7	670.0	670.0	410.40	410.40
Time	1220	1200	1115	1115	1215	1215

Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Ammodytes sp. Larvae	3	.008			2	.002	No Finfish				No Finfish	
Anguilla rostrata Young			1	.003								
Myoxycephalus aenaeus Larvae			2	.006								
Syngnathus fuscus Young									1	.002		
Total	3	.008	3	.009	2	.002	0	0	1	.002	0	0

Table 97. continued

Date	4/20/77		4/20/77		5/11/77		5/11/77		5/18/77		5/18/77	
Tide	Ebb		Ebb		Flood		Flood		Ebb		Ebb	
Type of Set	Surface		Bottom		Surface		Bottom		Surface		Bottom	
Volume (m^3)	602		399		810		932		690		661	
Temp. (°C)	13.0		14.0		12.0		12.0		21.0		21.0	
D.O. (mg/l)	8.57		8.25		8.95		8.81		7.26		7.54	
Salinity (ppt)	29.88		29.7		31.32		32.03		30.01		30.28	
pH	8.0		8.1		7.79		7.81		8.0		7.95	
Air temp (°C)	15.0		15.0		11.5		11.5		26.0		26.0	
Secchi (cm)	152.0		152.0		121.92		121.92		121.92		121.92	
Depth (cm)	549.0		549.0		335.28		335.28		457.20		457.20	
Time	1115		1115		1235		1235		1130		1130	
Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Ammodytes sp. Larvae	No Finfish		1	.002								
Menidia menidia Larvae					9	.011	3	.003				
Pseudopleuronectes Americanus Larvae					10	.012	32	.034				
Syngnathus fuscus Young									2	.003	1	.002
Total	0	0	1	.002	19	.023	35	.038	2	.003	1	.002

Table 97. continued

Date	6/23/77		6/23/77		6/2/77		6/2/77		7/19/77		7/19/77	
Tide	Flood		Flood		Ebb		Ebb		Ebb		Ebb	
Type of Set	Surface		Bottom		Surface		Bottom		Surface		Bottom	
Volume (m^3)	379		128		726		417		132		146	
Temp. (°C)	21.5		21.0		18.5		18.5		29.0		25.0	
D.O. (mg/l)	7.45		7.35		6.5		5.4		7.45		4.31	
Salinity (ppt)	32.29		31.92		30.75		31.29		30.23		31.46	
pH	7.98		7.9		7.6		7.8		8.2		8.15	
Air temp (°C)	22.5		22.5		24.5		24.5		32.0		32.0	
Secchi (cm)	91.44		91.44		91.44		91.44		76.2		76.2	
Depth (cm)	518.16		518.16		518.16		518.16		579.12		579.12	
Time	0950		0950		1205		1205		1200		1200	
Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Fam. Gobiidae Larvae									No Finfish		476	3.260
Scophthalmus aquosus Larva	1	.003										
Syngnathus fuscus	20	.053	7	.055	84	.116	1	.002			7	.048
Young												
Adult					1	.001						
Total	21	.055	7	.055	85	.117	1	.002	0	0	483	3.308

Table 97. continued

Date	7/26/77		7/26/77		8/23/77		8/23/77		8/16/77		8/16/77	
Tide	Flood		Flood		Flood		Flood		Ebb		Ebb	
Type of Set	Surface		Bottom		Surface		Bottom		Surface		Bottom	
Volume (m^3)	796		595		775		691		713		537	
Temp. (°C)	24.0		24.0		25.0		24.0		25.0		26.0	
D.O. (mg/1)	6.13		6.04		6.3		4.07		5.09		4.81	
Salinity (ppt)	31.73		31.73		30.43		31.13		31.49		32.20	
pH	7.8		7.8		7.85		7.7		7.75		7.7	
Air temp (°C)	26.0		26.0		27.5		27.5		25.5		25.5	
Secchi (cm)	60.96		60.96		76.2		76.2		60.96		60.96	
Depth (cm)	457.20		457.20		487.68		487.68		584.64		584.64	
Time	1415		1415		1200		1200		1200		1200	
Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Anchoa mitchilli Larvae	11	.014									43	.080
Cynoscion regalis Larvae	10	.013	79	.133								
Fam. Engraulidae Larvae	277	.348	18	.030	32	.041	130	.188	366	.513	85	.158
Fam. Gobiidae Larvae	217	.273	4474	7.519	3	.004	20	.029	394	.552	983	1.830
Gobiosoma bosci Larvae			6	.010								
Menidia menidia Larvae	3	.004	1	.002								
Syngnathus fuscus Young	67	.084	34	.057	15	.019	17	.025	49	.069	5	.009
Syndodus foetens Young	1	.001										
Total	586	.736	4612	7.751	50	.064	167	.242	809	1.135	1116	2.078

Table 97. continued

Date	9/19/77	9/19/77	10/25/77	10/25/77	10/26/77	10/26/77
Tide	Ebb	Ebb	Flood	Flood	Ebb	Ebb
Type of Set	Surface	Bottom	Surface	Bottom	Surface	Bottom
Volume (m^3)	898	1017	297	293	611	617
Temp. (°C)	25.5	25.0	14.5	15.0	15.0	15.0
D.O. (mg/l)	8.8	7.13	8.56	8.56	7.98	7.83
Salinity (ppt)	31.4	31.92	29.61	29.25	30.32	30.32
pH	-	-	-	-	7.8	7.9
Air temp (°C)	29.0	29.0	15.0	15.0	15.0	15.0
Secchi (cm)	50.0	50.0	100.0	100.0	125.0	125.0
Depth (cm)	600.0	600.0	600.0	600.0	600.0	600.0
Time	1520	1520	1440	1440	0930	0930
Species	n n/m^3	n n/m^3	n n/m^3	n n/m^3	n n/m^3	n n/m^3
	No Finfish	No Finfish	No Finfish	No Finfish	No Finfish	No Finfish

Date	11/18/77	11/18/77
Tide	Flood	Flood
Type of Set	Surface	Bottom
Volume (m^3)	518	335
Temp. (°C)	9.5	10.0
D.O. (mg/l)	8.72	8.33
Salinity (ppt)	27.66	28.19
pH	-	-
Air temp (°C)	11.0	11.0
Secchi (cm)	50.0	50.0
Depth (cm)	400.0	400.0
Time	0945	0945
Species	n n/m^3	n n/m^3
Prionotus sp. Young	No Finfish	1 .003
Total	0 0	1 .003

Table 98. Broad Creek - Catch by Species, Physical-Chemical Data, and Number of Finfish per Cubic Meter by Sample.

Date	3/15/77	3/15/77	3/28/77	3/28/77	4/15/77	4/15/77
Tide	Flood	Flood	Ebb	Ebb	Flood	Flood
Type of Set	Surface	Bottom	Surface	Bottom	Surface	Bottom
Volume (m^3)	1090	1136	551	395	425	571
Temp. (°C)	11.2	11.0	7.0	7.0	14.0	14.0
D.O. (mg/1)	9.35	9.25	10.61	10.76	9.4	9.15
Salinity (ppt)	31.65	31.29	29.67	29.78	32.38	28.04
pH	7.81	7.82	8.15	8.15	7.85	7.9
Air temp (°C)	13.0	13.0	10.5	10.5	14.0	14.0
Secchi (cm)	114.0	114.0	137.2	137.2	106.0	106.0
Depth (cm)	440.0	440.0	518.2	518.2	396.0	396.0
Time	1210	1210	1640	1640	1300	1300

Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Ammodytes sp. Larvae	3	.003			No Finfish						No Finfish	
Anguilla rostrata Young			1	.001			2	.005				
Syngnathus fuscus Adult									1	.002		
Total	3	.003	1	.001	0	0	2	.005	1	.002	0	0

Table 98. continued.

Date	4/18/77	4/18/77	5/26/77	5/26/77	5/17/77	5/17/77
Tide	Ebb	Ebb	Flood	Flood	Ebb	Ebb
Type of Set	Surface	Bottom	Surface	Bottom	Surface	Bottom
Volume (m^3)	757	918	496	313	345	72
Temp. (°C)	13.0	14.0	19.0	19.0	15.5	14.5
D.O. (mg/l)	9.26	9.17	6.51	6.7	8.11	7.76
Salinity (ppt)	30.5	30.51	32.0	31.29	30.77	30.53
pH	7.84	7.89	7.85	7.75	8.0	8.0
Air temp (°C)	18.0	18.0	21.5	21.5	18.5	18.5
Secchi (cm)	244.0	244.0	106.68	106.68	335.28	335.28
Depth (cm)	336.0	336.0	335.28	335.28	487.68	487.68
Time	1120	1120	1045	1045	1015	1015

Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Ammodytes sp. Larvae	5	.007	8	.009			No Finfish		No Finfish		No Finfish	
Anchoa mitchilli Young	5	.007										
Menidia menidia Larva					1	.002						
Pseudopleuronectes americanus Larvae	3	.004	4	.004	2	.004						
Syngnathus fuscus Young					1	.002						
Total	13	.017	12	.013	4	.008	0	0	0	0	0	0

Table 98. continued

Date	6/7/77		6/7/77		6/15/77		6/15/77		7/7/77		7/7/77	
Tide	Flood		Flood		Ebb		Ebb		Flood		Flood	
Type of Set	Surface		Bottom		Surface		Bottom		Surface		Bottom	
Volume (m^3)	796		723		670		583		818		674	
Temp. (°C)	15.5		16.0		19.0		20.0		21.0		21.5	
D.O. (mg/l)	6.6		6.49		5.55		8.7		6.08		6.03	
Salinity (ppt)	31.47		31.65		30.50		30.50		31.63		30.23	
pH	7.6		7.63		8.1		8.05		7.9		7.9	
Air temp (°C)	17.0		17.0		23.5		23.5		24.0		24.0	
Secchi (cm)	121.92		121.92		152.4		152.40		121.92		121.92	
Depth (cm)	518.16		518.16		426.72		426.72		548.64		548.64	
Time	1005		1005		1005		1005		0930		0930	
Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Fam. Monocanthidae Young											1	.001
Menidia menidia Larvae	8	.010										
Syngnathus fuscus Young	25	.031	1	.001	14	.021	3	.005	29	.035		
Total	33	.041	1	.001	14	.021	3	.005	29	.035	1	.001

Table 98. continued

Date	7/14/77	7/14/77	8/5/77	8/5/77	8/11/77	8/11/77
Tide	Ebb	Ebb	Flood	Flood	Ebb	Ebb
Type of Set	Surface	Bottom	Bottom	Surface	Surface	Bottom
Volume (m^3)	810	591	522	661	508	61
Temp. (°C)	24.0	23.0	20.0	20.5	28.0	28.0
D.O. (mg/l)	4.9	4.9	4.24	4.43	5.94	3.96
Salinity (ppt)	29.52	30.23	32.79	32.09	32.43	31.73
pH	7.7	7.65	7.8	7.9	7.73	7.72
Air temp (°C)	29.0	29.0	28.5	28.5	28.5	28.5
Secchi (cm)	91.44	91.44	152.4	152.4	-	-
Depth (cm)	213.36	213.36	335.28	335.28	-	-
Time	1000	1000	0830	0830	0800	0800

Species	n	n/m3	n	n/m3	n	n/m3	n	n/m3	n	n/m3	n	n/m3
Anchoa mitchilli Larvae					No Finfish		2	.003				
Cynoscion regalis Larvae							19	.029	1	.002	5	.082
Fam. Engraulidae Larvae											20	.328
Fam. Gobiidae Larvae							12	.018			8	.131
Gobiosoma bosci Larvae											4	.066
Hippocampus sp. Young									1	.002		
Syngnathus fuscus Young	29	.036	40	.068			1	.002	15	.030	11	.180
Fam. Synodontidae Young									1	.002		
Total	29	.036	40	.068	0	0	34	.051	18	.035	48	.787

Table 98. Continued

Date	9/21/77		9/21/77		9/27/77		9/27/77		10/27/77		10/27/77	
Tide	Flood		Flood		Ebb		Ebb		Ebb		Ebb	
Type of Set	Surface		Bottom		Surface		Bottom		Surface		Bottom	
Volume (m^3)	465		1090		1160		1136		428		464	
Temp. (°C)	19.5		20.0		21.0		20.0		14.5		14.5	
D.O. (mg/l)	6.11		5.88		6.67		6.67		8.08		8.08	
Salinity (ppt)	32.47		32.47		31.92		31.04		29.61		28.89	
pH	-		-		-		-		7.9		7.9	
Air temp (°C)	15.5		15.5		26.0		26.0		17.0		17.0	
Secchi (cm)	75.0		75.0		100.0		100.0		75.0		75.0	
Depth (cm)	400.0		400.0		600.0		600.0		-		-	
Time	1050		1050		1000		1000		1000		1000	
Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Micropogon undulatus Larva	No Finfish				1	.001			No Finfish		No Finfish	
Syngnathus fuscus Young			1	.001			1	.001				
Total	0	0	1	.001	1	.001	1	.001	0	0	0	0

Table 98. continued.

Date	11/17/77		11/17/77		11/21/77		11/21/77	
Tide	Flood		Flood		Ebb		Ebb	
Type of Set	Surface		Bottom		Surface		Bottom	
Volume (m^3)	929		644		641		463	
Temp. (°C)	12.0		12.0		9.0		9.0	
D.O. (mg/l)	8.53		8.53		8.72		8.62	
Salinity (ppt)	30.66		29.96		29.97		29.97	
pH	-		-		-		-	
Air temp (°C)	15.0		15.0		12.0		12.0	
Secchi (cm)	75.0		75.0		200.0		200.0	
Depth (cm)	-		-		300.0		300.0	
Time	0830		0830		1220		1220	
Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Paralichthys dentatus Larvae			2	.003	No Finfish		No Finfish	
Scophthalmus aquosus Larva			1	.002				
Syngnathus fuscus Young	2	.002						
Total	2	.002	3	.005	0	0	0	0

Table 99. Mouth of Absecon Creek - Catch by Species, Physical-Chemical Data, and Number of Finfish per Cubic Meter by Sample.

Date	5/19/77	5/19/77	5/17/77	5/17/77	5/24/77	5/24/77
Tide	Flood	Flood	Ebb	Ebb	Flood	Flood
Type of Set	Surface	Bottom	Surface	Bottom	Surface	Bottom
Volume (m^3)	283	33	103	16	70	30
Temp. (°C)	19.5	19.5	17.5	17.0	22.0	22.0
D.O. (mg/1)	7.83	7.36	7.24	5.96	4.81	6.04
Salinity (ppt)	26.18	30.48	23.46	28.86	25.28	30.30
Day/Night	Day 1	Day 1	Day 1	Day 1	Night	Night
Air temp (°C)	18.0	18.0	20.0	20.0	20.25	20.25
Depth (cm)	121.92	121.92	396.24	396.24	-	-
Time	1745	1745	1215	1215	1015	1015

Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m
Anguilla rostrata Young					No Finfish		No Finfish		1	.014		
Menidia menidia Larvae	1	.004	3	.091					5	.071	2	.067
Opsanus tau Adult			1	.030								
Syngnathus fuscus Young									2	.028		
Total	1	.004	4	.121	0	0	0	0	8	.114	2	.067

Table 99. continued

Date	5/24/77		5/24/77		5/26/77		5/26/77		5/26/77		5/26/77	
Tide	Ebb		Ebb		Flood		Flood		Ebb		Ebb	
Type of Set	Surface		Bottom		Surface		Bottom		Surface		Bottom	
Volume (m^3)	116		160		101		34		112		287	
Temp. (°C)	22.0		21.5		22.0		22.0		23.0		23.0	
D.O. (mg/l)	5.28		5.0		7.65		7.26		7.45		7.26	
Salinity (ppt)	26.73		25.64		30.23		30.59		16.02		15.3	
Day/Night	Night		Night		Day 2		Day 2		Day 2		Day 2	
Air temp (°C)	19.0		19.0		21.0		21.0		22.0		22.0	
Depth (cm)	-		-		182.88		182.88		243.84		243.84	
Time	0353		0353		1250		1250		1715		1715	
Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Anchoa mitchilli Larva			No Finfish				No Finfish				1	.003
Menidia menidia Larvae	3	.026										
Syngnathus fuscus Young					3	.030			1	.009		
Total	3	.026	0	0	3	.030	0	0	1	.009	1	.003

Table 99. continued

Date	6/16/77	6/16/77	6/15/77	6/15/77	6/30/77	6/30/77
Tide	Flood	Flood	Ebb	Ebb	Flood	Flood
Type of Set	Surface	Bottom	Surface	Bottom	Surface	Bottom
Volume (m^3)	5	20	68	24	88	50
Temp. (°C)	21.0	20.0	22.25	23.25	23.25	28.0
D.O. (mg/l)	5.6	5.2	7.4	7.3	5.68	5.78
Salinity (ppt)	28.01	29.78	30.14	31.02	23.15	28.89
Day/Night	Night	Night	Night	Night	Day 1	Day 1
Air temp (°C)	-	-	-	-	28	28
Depth (cm)	-	-	-	-	167.64	167.64
Time	0510	0510	2235	2235	1600	1600

Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Fundulus heteroclitus Larva							No Finfish		1	.011		
Fam. Gobiidae Larvae									11	.125		
Menidia beryllina Larvae					2	.029						
Menidia menidia Larvae	1	.200							2	.023		
Syngnathus fuscus Young			2	.100					4	.045	1	.020
Total	1	.200	2	.100	2	.029	0	0	18	.204	1	.020

Table 99. continued

Date	6/30/77	6/30/77	7/7/77	7/7/77	7/7/77	7/7/77
Tide	Ebb	Ebb	Flood	Flood	Ebb	Ebb
Type of Set	Surface	Bottom	Surface	Bottom	Surface	Bottom
Volume (m^3)	110	1	87	43	27	4
Temp. (°C)	24.0	24.0	25.0	24.0	24.75	24.5
D.O. (mg/l)	5.39	4.21	7.4	6.52	7.64	7.01
Salinity (ppt)	30.34	30.52	29.52	31.27	29.88	30.59
Day/Night	Day 1	Day 1	Day 1	Day 1	Day 1	Day 1
Air temp (°C)	27.0	27.0	-	-	-	-
Depth (cm)	228.6	228.6	304.8	304.8	259.08	259.08
Time	0945	0945	1030	1030	1530	1530

Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m
Fam. Gobiidae Larvae	No Finfish		3	.333	No Finfish		5	.116	No Finfish		No Finfish	
Total	0	0	3	.333	0	0	5	.116	0	0	0	0

Table 99. continued

Date	7/25/77		7/25/77		7/25/77		7/25/77		7/14/77		7/14/77	
Tide	Flood		Flood		Ebb		Ebb		Flood		Flood	
Type of Set	Surface		Bottom		Surface		Bottom		Surface		Bottom	
Volume (m^3)	64		81		77		85		68		36	
Temp. (°C)	23.0		22.0		22.0		22.0		30.5		30.0	
D.O. (mg/1)	5.98		6.17		4.95		5.24		8.28		8.13	
Salinity (ppt)	-		-		31.73		31.36		24.58		26.71	
Day/Night	Night		Night		Night		Night		Day 2		Day 2	
Air temp (°C)	-		-		-		-		29.5		29.5	
Depth (cm)	182.88		182.88		-		-		244		244	
Time	1200		1200		1800		1800		1500		1500	
Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Fam. Engraulidae Larvae	152	2.375	64	.790	4	.052	2	.024				
Fundulus heteroclitus Larvae	3	.047	9	.111			1	.012	2	.029	1	.028
Fam. Gobiidae Larvae	209	3.266	41	.506	2	.026	1	.012				
Gobiosoma bosci Young	8	.016	17	.210							3	.083
Menidia menidia Larvae	11	.188	1	.012	1	.013						
Adult	1	.016										
Syngnathus fuscus Young					2	.026	1	.012				
Synodus foetens Young	1	.016										
Total	386	6.031	132	1.630	9	.117	5	.059	2	.029	4	.111

Table 99. continued

Date	7/14/77	7/14/77	8/5/77	8/5/77	8/5/77	8/5/77
Tide	Ebb	Ebb	Flood	Flood	Ebb	Ebb
Type of Set	Surface	Bottom	Surface	Bottom	Surface	Bottom
Volume (m^3)	140	6	47	5	127	15
Temp. (°C)	28.0	27.5	27.5	28.0	28.0	28.0
D.O. (mg/l)	3.82	3.92	8.58	8.68	9.52	9.05
Salinity (ppt)	18.17	29.52	29.60	29.23	28.51	32.09
Day/Night	Day 2	Day 2	Day 1	Day 1	Day 1	Day 1
Air temp (°C)	30.0	30.0	31.5	31.5	28.5	28.5
Depth (cm)	152.4	152.4	244	244	244	244
Time	0920	0920	0930	0930	1500	1500

Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Cynoscion regalis Larva			No Finfish						No Finfish		1	.067
Fundulus heteroclitus Larvae					1	.021						
Fam. Gobiidae Larvae							3	.600				
Menidia menidia Larvae	1	.007										
Syngnathus fuscus Young											1	.067
Total	1	.007	0	0	1	.021	3	.600	0	0	2	.133

Table 99. continued

Date	8/11/77		8/11/77		8/11/77		8/11/77	
Tide	Flood		Flood		Ebb		Ebb	
Type of Set	Surface		Bottom		Surface		Bottom	
Volume (m^3)	31		735		5		2	
Temp. (°C)	31.0		30.0		26.5		27.0	
D.O. (mg/l)	8.96		7.45		3.3		2.92	
Salinity (ppt)	27.27		27.27		22.77		27.27	
Day/Night	Day 2		Day 2		Day 2		Day 2	
Air temp (°C)	31.5		-		27		27	
Depth (cm)	183		183		198		198	
Time	1400		1400		0900		0900	
Species	n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Anchoa mitchilli Larva	1	.032	No Finfish					
Cynoscion regalis Larvae							30	15.000
Fam. Engraulidae Larvae	1	.032						
Fam. Gobiidae Larvae					1	.200	5	2.500
Total	2	.064	0	0	1	.200	35	17.500

Table 100. Great Egg Harbor Inlet Surface versus Bottom Catches.

Species	Life Stage	Surface		Bottom		Total Catch	
		n	n/m^3	n	n/m^3	n	n/m^3
Ammodytes sp.	Larvae	-	-	16		16	.018
Anchoa mitchilli	Larvae	-	-	1		1	.002
Anguilla rostrata	Young	-	-	2		2	.003
Cynoscion regalis	Larvae	5	.007	213	.341	218	.348
Fam. Engraulidae	Larvae	305	.408	158	.245	463	.653
Fundulus heteroclitus	Larvae	1	.001	-	-	1	.001
Fam. Gobiidae	Larvae	24	.032	503	.805	527	.837
Gobiosoma bosci	Larvae	-	-	6	.007	6	.007
Hippocampus sp.	Young	1	.002	-	-	1	.002
Lophius americanus	Larvae	2	.003	-	-	2	.003
Menidia menidia	Larvae	3	.005	-	-	3	.005
	Adult	5	.007	-	-	5	.007
Pseudopleuronectes americanus	Larvae	1	.002	30	.069	31	.071
Syngnathus fuscus	Young	11	.013	50	.189	61	.202
	Adult	1	-	1	.001	1	.001
Total		358	.480	980	1.680	1338	2.160

Table 101. Great Egg Harbor Inlet Flood versus Ebb Catches.

Species	Life State	Flood n	Flood n/m^3	Ebb n	Ebb n/m^3	Total Catch n	Total Catch n/m^3
Ammodytes sp.	Larvae	11	.007	5	.011	16	.018
Anchoa mitchilli	Larvae	1	.002	-	-	1	.002
Anguilla rostrata	Young	2	.003	-	-	2	.003
Cynoscion regalis	Larvae	218	.348	-	-	218	.348
Fam. Engraulidae	Larvae	463	.653	-	-	463	.653
Fundulus heteroclitus	Larvae	1	.001	-	-	1	.001
Fam. Gobiidae	Larvae	527	.837	-	-	527	.837
Gobiosoma bosci	Larvae	6	.007	-	-	6	.007
Hippocampus sp.	Young	1	.002	-	-	1	.002
Lophius americanus	Larvae	-	-	2	.003	2	.003
Menidia menidia	Larvae	1	.002	2	.003	3	.005
	Adult	5	.007	-	-	5	.007
Pseudopleuronectes americanus	Larvae	29	.067	2	.004	31	.071
Syngnathus fuscus	Young	60	.193	1	.009	61	.202
	Adult	1	.001	-	-	1	.001
Total		1326	2.130	12	.030	1338	2.160

Table 102. Whirlpool Island Surface versus Bottom Catches

Species	Life Stage	Surface		Bottom		Total Catch	
		n	n/m^3	n	n/m^3	n	n/m^3
Ammodytes sp.	Larvae	5	.010	1	.002	6	.012
Anchoa mitchilli	Larvae	11	.014	43	.080	54	.094
Anguilla rostrata	Young	-	-	1	.003	1	.003
Cynoscion regalis	Larvae	10	.013	79	.133	89	.146
Fam. Engraulidae	Larvae	675	.902	233	.376	908	1.278
Fam. Gobiidae	Larvae	614	.829	5953	12.638	6567	13.467
Gobiosoma bosci	Larvae	-	-	6	.010	6	.010
Menidia menidia	Larvae	12	.015	4	.005	16	.020
Myoxycephalus aenaeus	Larvae	-	-	2	.006	2	.006
Prionotus sp.	Young	-	-	1	.003	1	.003
Pseudopleuronectes americanus	Larvae	10	.012	32	.034	42	.046
Scophthalmus aquosus	Larvae	1	.003	-	-	1	.003
Syngnathus fuscus	Young	238	.346	72	.198	310	.544
	Adult	1	.001	-	-	1	.001
Synodus foetens	Young	1	.001	-	-	1	.001
		1578	2.146	6427	13.488	8005	15.634

Table 103. Whirlpool Island Flood versus Ebb Catches.

Species	Life Stage	Flood		Ebb		Total Catch	
		n	n/m^3	n	n/m^3	n	n/m^3
Ammodytes sp.	Larvae	3	.008	3	.004	6	.012
Anchoa mitchilli	Larvae	11	.014	43	.080	54	.094
Anguilla rostrata	Young	1	.003	-	-	1	.003
Cynoscion regalis	Larvae	89	.146	-	-	89	.146
Fam. Engraulidae	Larvae	457	.607	451	.671	908	1.278
Fam. Gobiidae	Larvae	4714	7.825	1853	5.642	6567	13.467
Gobiosoma bosci	Larvae	6	.010	-	-	6	.010
Menidia menidia	Larvae	16	.020	-	-	16	.020
Myoxycephalus aenaeus	Larvae	2	.006	-	-	2	.006
Prionotus sp.	Young	1	.003	-	-	1	.003
Pseudopleuronectes americanus	Larvae	42	.046	-	-	42	.046
Scophthalmus aquosus	Larvae	1	.003	-	-	1	.003
Syngnathus fuscus	Young	161	.295	149	.249	310	.544
	Adult	-	-	1	-	1	.001
Synodus foetens	Young	1	.001	-	-	1	.001
		5505	8.987	2500	6.647	8005	15.634

Table 104. Broad Creek Surface versus Bottom Catches.

Species	Life Stage	Surface n	Surface n/m3	Bottom n	Bottom n/m3	Total Catch n	Total Catch n/m3
Ammodytes sp.	Larvae	8	.010	8	.009	16	.019
Anchoa mitchilli	Larvae	2	.003	-	-	2	.003
	Young	5	.007	-	-	5	.007
Anguilla rostrata	Young	-	-	3	.006	3	.006
Cynoscion regalis	Larvae	20	.031	5	.082	25	.113
Fam. Engraulidae	Larvae	-	-	20	.328	20	.328
Fam. Gobiidae	Larvae	12	.018	8	.131	20	.149
Gobiosoma bosci	Larvae	-	-	4	.066	4	.066
Hippocampus sp.	Young	1	.002	-	-	1	.002
Menidia menidia	Larvae	9	.012	-	-	9	.012
Micropogon undulatus	Larvae	1	.001	-	-	1	.001
Fam. Monacanthidae	Young	-	-	1	.001	1	.001
Paralichthys dentatus	Larvae	-	-	2	.003	2	.003
Pseudopleuronectes americanus	Larvae	5	.008	4	.004	9	.012
Scophthalmus aquosus	Larvae	-	-	1	.002	1	.002
Syngnathus fuscus	Young	116	.159	57	.256	173	.415
	Adult	1	.002	-	-	1	.002
Fam. Synodontidae	Young	1	.002	-	-	1	.002
		181	.255	113	.888	294	1.143

Table 105. Broad Creek Flood versus Ebb Catches.

Species	Life Stage	Flood		Ebb		Total Catch	
			n/m^3		n/m^3	n	n/m^3
Ammodytes sp.	Larvae	3	.003	13	.016	16	.019
Anchoa mitchilli	Larvae	2	.003	-	-	2	.003
	Young	-	-	5	.007	5	.007
Anguilla rostrata	Young	1	.001	2	.005	3	.006
Cynoscion regalis	Larvae	19	.029	6	.084	25	.113
Fam. Engraulidae	Larvae	-	-	20	.328	20	.328
Fam. Gobiidae	Larvae	12	.018	8	.131	20	.149
Gobiosoma bosci	Larvae	-	-	4	.066	4	.066
Hippocampus sp.	Young	-	-	1	.002	1	.002
Menidia menidia	Larvae	9	.012	-	-	9	.012
Micropogon undulatus	Larvae	-	-	1	.001	1	.001
Fam. Monacanthidae	Young	1	.001	-	-	1	.001
Paralichthys dentatus	Larvae	2	.003	-	-	2	.003
Pseudopleuronectes americanus	Larvae	2	.004	7	.008	9	.012
Scophthalmus aquosus	Larvae	1	.002	-	-	1	.002
Syngnathus fuscus	Young	60	.074	113	.341	173	.415
	Adult	1	.002	-	-	1	.002
Fam. Synodontidae	Young	-	-	1	.002	1	.002
		113	.152	181	.991	294	1.143

Table 106. Mouth of Absecon Creek Surface versus Bottom Catches.

Species	Life Stage	Surface n	Surface n/m3	Bottom n	Bottom n/m3	Total Catch n	Total Catch n/m3
Anchoa mitchilli	Larvae	1	.032	1	.003	2	.035
Anguilla rostrata	Young	1	.014	-	-	1	.014
Cynoscion regalis	Larvae	-	-	31	15.067	31	15.067
Fam. Engraulidae	Larvae	157	2.459	66	.814	223	3.273
Fundulus heteroclitus	Larvae	7	.108	11	.151	18	.259
Fam. Gobiidae	Larvae	223	3.617	58	4.067	281	7.684
Gobiosoma bosci	Young	8	.016	20	.293	28	.309
Menidia beryllina	Larvae	2	.029	-	-	2	.029
Menidia menidia	Larvae	25	.532	6	.170	31	.702
	Adult	1	.016	-	-	1	.016
Opsanus tau	Adult	-	-	1	.030	1	.030
Syngnathus fuscus	Young	12	.138	5	.199	17	.337
Synodus foetens	Young	1	.016	-	-	1	.016
		438	6.977	199	20.794	637	27.771

Table 107. Mouth of Absecon Creek Flood versus Ebb Catches.

Species	Life Stage	Flood n	Flood n/m3	Ebb n	Ebb n/m3	Total Catch n	Total Catch n/m3
Anchoa mitchilli	Larvae	1	.032	1	.003	2	.035
Anguilla rostrata	Young	1	.014	-	-	1	.014
Cynoscion regalis	Larvae	-	-	31	15.067	31	15.067
Fam. Engraulidae	Larvae	217	3.197	6	.076	223	3.273
Fundulus heteroclitus	Larvae	17	.247	1	.012	18	.259
Fam. Gobiidae	Larvae	269	4.613	12	3.071	281	7.684
Gobiosoma bosci	Young	28	.309	-	-	28	.309
Menidia beryllina	Larvae	-	-	2	.029	2	.029
Menidia menidia	Larvae	26	.656	5	.046	31	.702
	Adult	1	.016	-	-	1	.016
Opsanus tau	Adult	1	.030	-	-	1	.030
Syngnathus fuscus	Young	12	.223	5	.114	17	.337
Synodus foetens	Young	1	.016	-	-	1	.016
		574	9.353	63	18.418	637	27.771

Table 108. Mouth of Absecon Creek Day versus Night Catches.

Species	Life Stage	Day 1		Day 2		Night		Total Catch	
		n	n/m^3	n	n/m^3	n	n/m^3	n	n/m^3
Anchoa mitchilli	Larvae	-	-	2	.035	-	-	2	.035
Anguilla rostrata	Young	-	-	-	-	1	.014	1	.014
Cynoscion regalis	Larvae	1	.067	30	15.000	-	-	31	15.061
Fam. Engraulidae	Larvae	-	-	-	.032	222	3.241	223	3.273
Fundulus heteroclitus	Larvae	2	.032	3	.057	13	.170	18	.259
Fam. Gobiidae	Larvae	22	1.174	6	2.700	253	3.810	281	7.684
Gobiosoma bosci	Young	-	-	3	.083	25	.226	28	.309
Menidia beryllina	Larvae	-	-	-	-	2	.029	2	.029
Minidia menidia	Larvae	6	.118	1	.007	24	.577	31	.702
	Adult	-	-	-	-	1	.016	1	.016
Opsanus tau	Adult	1	.030	-	-	-	-	1	.030
Syngnathus fuscus	Young	6	.132	4	.039	7	.166	17	.337
Synodus foetens	Young	-	-	-	-	1	.016	1	.016
		38	1.553	50	17.953	549	8.265	637	27.771

Table 109. Length Frequency Distributions for the Atlantic Silversides, Menidia menidia, and the Sand Lance, Ammodytes sp., Taken in the Atlantic City Vicinity.

Menidia menidia				Ammodytes sp.			
Total Length (mm)	No.	%	Cumulative %	Total Length (mm)	No.	%	Cumulative %
3.5	2	3.17	3.17	5.5	1	2.70	2.70
4	3	4.76	7.93	6	5	13.51	16.21
4.5	3	4.76	12.69	6.5	1	2.70	18.91
5	4	6.35	19.04	7	7	18.92	37.83
5.5	1	1.59	20.63	8	11	29.73	67.56
6	6	9.52	30.15	8.5	1	2.70	70.26
7	10	15.87	46.02	9	5	13.51	83.77
7.5	2	3.17	49.19	10	3	8.11	91.88
8	6	9.52	58.71	11	2	5.40	97.28
9	4	6.35	65.06	12	1	2.70	99.98
10	1	1.59	66.65		37	99.98	
11	5	7.94	74.59				
12	4	6.35	80.94				
13	3	4.76	85.70				
14	1	1.59	87.29				
15	1	1.59	88.88				
38	1	1.59	90.47				
49	1	1.59	92.06				
61	1	1.59	93.65				
70	1	1.59	95.24				
71	1	1.59	96.83				
73	1	1.59	98.42				
75	1	1.59	100.01				
	63	100.01					

Table 110. Length Frequency Distributions of the Naked Goby, Gobiosoma bosci, and the Bay Anchovy, Anchoa mitchilli, Taken in the Atlantic City Vicinity.

Gobiosoma bosci				Anchoa mitchilli			
Total Length (mm)	No.	%	Cumulative %	Total Length (mm)	No.	%	Cumulative %
10	1	2.56	2.56	5	1	0.73	0.73
11	7	17.95	20.51	6	1	0.73	1.46
12	4	10.26	30.77	7.5	2	1.46	2.92
13	6	15.38	46.15	9	2	1.46	4.38
14	1	2.56	48.71	10	4	2.92	7.30
15	2	5.13	53.84	11	21	15.33	22.63
16	1	2.56	56.40	12	21	15.33	37.96
18	2	5.13	61.53	13	17	12.41	50.37
19	1	2.56	64.09	14	12	8.76	59.13
20	3	7.69	71.78	15	12	8.76	67.89
21	3	7.69	79.47	16	6	4.38	72.27
22	3	7.69	87.16	17	5	3.65	75.92
24	1	2.56	89.72	18	19	13.87	89.79
26	2	5.13	94.85	19	2	1.46	91.25
29	1	2.56	97.41	20	6	4.38	95.63
30	1	2.56	99.97	21	4	2.92	98.55
	39	99.97		22	1	0.73	99.28
				26	1	0.73	100.01
					137	100.01	

Table 111. Length Frequency Distribution of the Anchovies, Family Engraulidae, Taken in the Atlantic City Vicinity.

Total Length (mm)	Number	%	Cumulative %
4	10	3.09	3.09
5	21	6.48	9.57
5.5	2	0.62	10.19
6	49	15.12	25.31
6.5	8	2.47	27.78
7	37	11.42	39.20
7.5	6	1.85	41.05
8	22	6.79	47.84
9	11	3.40	51.24
10	28	8.64	59.88
11	28	8.64	68.52
12	24	7.41	75.93
13	23	7.10	83.03
14	15	4.63	87.66
15	11	3.40	91.06
16	10	3.09	94.15
17	4	1.23	95.38
18	5	1.54	96.92
19	3	0.92	97.84
20	3	0.92	98.76
21	2	0.62	99.38
22	2	0.62	100.00
	324	100.00	

Table 112. Length Frequency Distribution of the Gobies, Family Gobiidae, Taken in the Atlantic City Vicinity.

Total Length (mm)	No.	%	Cumulative %
3	24	6.50	6.50
3.5	15	4.06	10.56
4	51	13.82	24.38
4.5	14	3.79	28.17
5	44	11.92	40.09
5.5	3	0.81	40.90
6	52	14.09	54.99
7	26	7.05	62.04
7.5	1	0.27	62.31
8	40	10.84	73.15
9	25	6.78	79.93
10	38	10.30	90.23
11	16	4.34	94.57
12	15	4.06	98.63
13	3	0.81	99.44
15	2	0.54	99.98
	369	99.98	

Table 113. Length Frequency Distribution of the Northern Pipefish, Syngnathus fuscus, Taken in the Atlantic City Vicinity.

Total Length (mm)	No.	%	Cumulative %	Total Length (mm)	No.	%	Cumulative %
7	2	0.46	0.46	28	9	2.06	81.17
8	39	8.94	9.40	29	4	0.92	82.09
9	42	9.63	19.03	30	11	2.52	84.61
10	47	10.78	29.81	31	4	0.92	85.53
11	38	8.72	38.53	32	6	1.38	86.91
12	26	5.96	44.49	33	1	0.23	87.14
13	4	0.92	45.41	34	5	1.15	88.29
14	14	3.21	48.62	35	7	1.60	89.89
15	20	4.59	53.21	36	5	1.15	91.04
16	13	2.98	56.19	37	2	0.46	91.50
17	6	1.38	57.57	38	5	1.15	92.65
18	10	2.29	59.86	40	4	0.92	93.57
19	2	0.46	60.32	41	1	0.23	93.80
20	25	5.73	66.05	42	6	1.38	95.18
21	14	3.21	69.26	43	1	0.23	95.41
22	11	2.52	71.78	44	2	0.46	95.87
23	6	1.38	73.16	45	4	0.92	96.79
24	5	1.15	74.31	46	1	0.23	97.02
25	7	1.60	75.91	48	2	0.46	97.48
26	7	1.60	77.51	50	1	0.23	97.71
27	7	1.60	79.11	90	1	0.23	97.94
				95	1	0.23	98.17
				100	1	0.23	98.40
				113	1	0.23	98.63
				122	1	0.23	98.86
				125	1	0.23	99.09
				127	1	0.23	99.32
				140	1	0.23	99.55
				146	1	0.23	99.78
				155	1	0.23	100.01
					436	100.01	

Table 114. Length Frequency Distributions of the Winter Flounder, Pseudopleuronectes americanus, and the Weakfish, Cynoscion regalis, Taken in the Atlantic City Vicinity.

Pseudopleuronectes americanus				Cynoscion regalis			
Total Length (mm)	No.	%	Cumulative %	Length (mm)	No.	%	Cumulative %
3	2	2.44	2.44	2.5	5	2.96	
3.5	2	2.44	4.88	3	17	10.06	13.02
4	3	3.66	8.54	3.5	12	7.10	20.12
5	2	2.44	10.98	4	46	27.22	47.34
6	5	6.10	17.08	4.5	14	8.28	55.62
7	41	50.02	67.10	5	25	14.79	70.41
7.5	10	12.20	79.30	5.5	1	0.59	71.00
8	9	10.98	90.28	6	8	4.73	75.73
8.5	4	4.88	95.16	7	6	3.55	79.28
9	2	2.44	97.60	8	1	0.59	79.87
10	2	2.44	100.04	9	2	1.18	81.05
	82	100.04		10	5	2.96	84.01
				11	9	5.32	89.33
				12	8	4.73	94.06
				13	4	2.37	96.43
				14	4	2.37	98.80
				15	2	1.18	99.98
					169	99.98	

Table 115 List of Benthic Stations Sampled Within the Vicinity of Atlantic City and Their Sediment Composition by Percentage

Station No.	Name	Gravel	Sand	Mud
1	Hammock Cove, Intertidal Mud Flat	0.00	38.31	61.69
2	Marker 37, adjacent Shad Island, Intracoastal Waterway Channel	0.00	17.40	82.60
3	Perch Cove, Open Water	0.00	1.96	98.04
4	Little Bay, Open Water	0.00	77.30	22.70
5	Brigantine Channel	0.12	99.88	0.00
6	Opposite Black Point, Intertidal Sand Flat	0.00	90.96	9.04
7	City Of Brigantine	1.19	40.84	57.25
8	Reed Bay, Turtle Cove	0.20	11.41	88.39
9	Reed Bay, Open Water	0.60	12.50	86.90
10	Mouth of Absecon Creek	0.00	18.04	81.96
11	Absecon Creek, Upstream	0.20	92.35	7.45
12	Absecon Bay, Open Water	0.00	47.00	53.00
13	Absecon Bay, Spoil Site Adjacent Channel	0.00	48.60	51.40
14	Broad Creek	0.00	72.64	27.36
15	St. George's Thorofare	0.00	1.15	98.85
16	Absecon Inlet, Seine Beach Adjacent Channel	0.00	92.66	7.34
17	Gardner's Basin, Atlantic City	0.00	15.75	84.25

Table 115 cont.

Station No.	Name	Gravel	Sand	Mud
18	Marker 18, Intracoastal Waterway Channel, Behind Atlantic City	0.00	12.67	87.33
19	Beach Thorofare, Intracoastal Waterway Channel	1.57	88.24	10.20
20	Inside Thorofare, Ventnor Heights	0.00	7.90	92.10
21	Lakes Bay, Channel	0.00	76.97	23.03
22	Lakes Bay, Open Water	0.00	22.40	77.60
23	Whirlpool Island	0.00	85.71	14.29
24	Margate City	0.00	65.04	34.96
25	Scull Bay, Open Water	0.00	7.00	93.00
26	Risley Channel, Seine Beach Adjacent Channel	0.00	95.81	4.19
27	Great Egg Harbor Inlet	0.00	97.64	2.36

Table 116 Macroinvertebrates Sampled in the Vicinity of Atlantic City from June 1977 through September 1977

Phylum Nemertea

Order Paleonemertea

Tubulanus pellucidus

Phylum Mollusca

Class Gastropoda

Family Calytraeidae

Crepidula fornicata

Family Nassariidae

Ilyanassa obsoleta

Family Arcidae

Anadara ovalis

Family Veneridae

Mercenaria mercenaria

Gemma gemma

Family Mactridae

Spisula solidissima

Mulinia lateralis

Family Tellinidae

Tellina sp.

Macoma balthica

Phylum Annelida

Class Polychaeta

Family Glyceridae

Table 116 (continued)

Glycera capitata

Glycera americana

Family Nephtyidae

Nephtys sp.

Family Nereidae

Nereis arenaceodonta

Nereis succinea

Family Capitellidae

Capitella capitata

Family Maldanidae

Olymenella torquata

Family Opheliidae

Ophelia bicornis

Family Spionidae

Streblospio benedicti

Prionospio sp.

Polydora commensalis

Spiophanes bombyx

Family Sabellariidae

Sabellaria vulgaris

Family Onuphidae

Diapatra cuprea

Family Lumbrineriidae

Lumbrinereis sp.

Table 116 (continued)

Family Arabellidae

Arabella iricolor

Drilonereis longa

Drilonereis magna

Family Oweniidae

Myriochele heeri

Family Orbiniidae

Scoloplos sp.

Family Cirratulidae

Tharyx sp.

Family Pectinaridae

Pectinaria gouldii

Family Ampharetidae

Asabellides oculata

Family Terebellidae

Amphitrite cirrata

Family Sabellidae

Sabella microphthalma

Potamilla neglecta

Phylum Arthropoda

Subclass Malacostraca

Order Isopoda

Family Anthuridae

Cyathura polita

Order Amphipoda

Table 116 (continued)

Family Ampeliscidae

Ampelisca abdita

Ampelisca vadorum

Ampelisca verrilli

Ampelisca sp.

Family Aoridae

Microdeutopus gryllotalpa

Family Corophiidae

Corophium volutator

Corophium sp.

Erichthonius brasiliensis

Family Gammaridae

Gammarus mucronatus

Gammarus sp.

Family Haustoriidae

Acanthohaustorius millsi

Parahaustorius longimerus

Family Lysianassidae

Lysianopsis alba

Family Melitide

Elasmopus levis

Melita nitida

Family Pontogeneiidae

Pontogeneia inermis

Order Mysidacea

Neomysis americana

Table 116 (continued)

Order Decapoda

Family Crangonidae

Crangon septemspinosa

Family Paguridae

Pagurus lonicarpus

Family Portunidae

Ovalipes ocellatus

Family Xanthidae

Eurypanopeus depressus

Rhithropanopeus harrisii

Family Pinnotheridae

Pinnixa sp.

Table 117 Grain Size Distribution for Sediments

(after Folk, 1968)

U.S. Std. Sieve Mesh Number	Millimeters	Size Class	
5	4	Pebble	GRAVEL
10	2	Granule	
18	1	Very Coarse Sand	
35	0.50	Coarse Sand	
60	0.25	Medium Sand	SAND
120	0.125	Fine Sand	
230	0.0625	Very Fine Sand	
Analyzed by Hydrometer	0.031	Silt	MUD
	0.0039	Clay	

TABLE 118 - Completed Aerial Surveys and Fishermen Interviews by Month

	Aerial Surveys	Bank Fishermen	Boat Fishermen
Feb.	5	-	-
March	8	21	-
April	11	98	-
May	13	189	3
June	11	295	176
July	10	502	30
August	12	177	106
Sept.	9	239	84
Oct.	6	3	-
Nov.	4	4	-
Dec.	6	-	-
Totals:	95	1,528	399

TABLE 119 - Total Flight Counts of Activity by Month and Type

	Bank Fisherman	Boat Fisherman	Comm. Fisherman	Boat-ing	Clam-ming	Bath-ing	Hunt-ing	Trap-ping	Bird Watching	Other	Total
Feb.	1	12	1	11	18	0	0	0	0	17	60
March	64	74	4	102	33	0	0	0	39	55	371
April	317	280	8	248	123	0	0	0	0	0	976
May	787	1,481	1	839	76	0	0	0	0	73	3,257
June	1,079	5,343	0	2,363	53	61	0	0	0	0	8,899
July	885	4,955	13	2,108	66	125	0	0	0	95	8,247
August	1,615	5,002	2	3,239	209	33	0	0	0	16	10,116
Sept.	481	1,371	8	737	68	4	0	0	0	3	2,672
Oct.	142	263	13	282	26	0	3	0	0	5	734
Nov.	8	8	0	36	31	0	2	0	0	2	87
Dec.	0	4	0	13	6	0	29	1	0	4	57
Totals:	5,379	18,793	50	9,978	709	223	34	1	39	270	35,476
Percent:	15.16	52.97	0.14	28.13	2.00	0.63	0.10	0.01	0.11	0.76	100.01

TABLE 120 - Total Flight Count Summary - February 1977 to December 1977 by Area and Type

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boating		Clamming		Bathing	
Lakes Bay	92	2.22 1.71	2105	50.83 11.20	-		1614	38.98 16.18	221	5.34 31.17	50	1.21 22.43
Scull Bay	967	10.41 17.98	5807	62.54 30.90	3	0.03 6.00	2398	25.82 24.03	13	0.14 1.83	53	0.57 23.77
Absecon Bay	45	2.91 0.84	674	43.65 3.59	-		752	48.70 7.54	8	0.52 1.13	-	
Reed Bay	1	0.11 0.02	419	47.40 2.23	2	0.23 4.00	260	29.41 2.61	154	17.42 21.72	-	
Little Bay		-	1483	71.75 7.89	8	0.39 16.00	397	19.21 3.98	166	8.03 23.41	-	
Brigantine	1969	24.68 36.61	3569	44.73 18.99	12	0.15 24.00	2177	27.28 21.82	142	1.78 20.03	74	0.93 33.18
Absecon Channel	2305	24.07 42.85	4736	49.46 25.20	25	0.26 50.00	2380	24.86 23.85	5	0.05 0.71	46	0.48 20.63
Totals:	5379	15.16 100.01	18793	52.97 100.00	50	0.14 100.00	9978	28.13 100.01	709	2.00 100.00	223	0.63 100.01

Key: No. Counted Percent % → Percent % ↓

TABLE 120 - (Continued)

	Hunting	Trapping	Bird Watching	Other	Totals
Lakes Bay	4 0.10 11.76	-	-	55 1.33 20.37	4141 100.0 11.6
Scull Bay	7 0.08 20.59	1 0.01 100.00	-	37 0.40 13.70	9286 100.0 26.1
Absecon Bay	2 0.13 5.88	-	-	63 4.08 23.33	1544 99.9 4.3
Reed Bay	8 0.91 23.53	-	39 4.41 100.00	1 0.11 0.37	884 100.0 2.4
Little Bay	11 0.53 32.35	-	-	2 0.10 0.74	2067 100.0 5.8
Brigantine	2 0.03 5.88	-	-	34 0.43 12.59	7979 100.0 22.4
Absecon Channel	-	-	-	78 0.81 28.89	9575 99.9 26.9
Totals:	34 0.10 99.99	1 0.003 100.00	39 0.11 100.00	270 0.76 99.99	35476 100.0 100.0

Key: No. Counted Percent % →
Percent % ↓

TABLE 121 - Monthly Flight Count Summary - December 1977

	Bank Fishermen	Boat Fishermen	Comm. Fishermen	Boating	Clamming
Lakes Bay	-	-	-	2 28.57 15.38	-
Scull Bay	-	2 25.00 50.00	-	-	-
Absecon Bay	-	-	-	2 66.67 15.38	-
Reed Bay	-	-	-	-	-
Little Bay	-	-	-	5 33.33 38.46	-
Brigantine	-	2 13.33 50.00	-	2 13.33 15.38	6 40.00 100.00
Absecon Channel	-	-	-	2 100.00 15.38	-
Totals:	0	4 7.02 100.00	0	13 22.81 99.99	6 10.53 100.00

Key: No. Counted Percent % →
Percent % ↓

TABLE 121 - (Continued)

	Bathing	Hunting	Trapping	Bird Watching	Other	Totals
Lakes Bay	-	4 57.14 13.79	-	-	1 14.29 25.00	7 100.00 12.28
Scull Bay	-	5 62.50 17.24	1 12.50 100.00	-	-	8 100.00 14.04
Absecon Bay	-	1 33.33 3.45	-	-	-	3 100.00 5.26
Reed Bay	-	7 100.00 24.14	-	-	-	7 100.00 12.28
Little Bay	-	10 66.67 34.48	-	-	-	15 100.00 26.32
Brigantine	-	2 13.33 6.90	-	-	3 20.00 75.00	15 99.99 26.32
Absecon Channel	-	-	-	-	-	2 100.00 3.51
Totals:	0	29 50.88 100.00	1 1.75 100.00	0	4 7.02 100.00	57 100.01 100.01

Key: No. Counted Percent % →
Percent % ↓

TABLE 122 - Monthly Flight Count Summary - February 1977

	Bank Fishermen	Boat Fishermen	Comm. Fishermen	Boating	Clamming
Lakes Bay	-	-	-	-	2 100.00 11.11
Scull Bay	-	-	-	-	-
Absecon Bay	-	-	-	3 100.00 27.27	-
Reed Bay	-	-	-	-	5 100.00 27.78
Little Bay	-	7 36.84 58.33	-	3 15.79 27.27	9 47.37 50.00
Brigantine	0	5 35.71 41.67	-	5 35.71 45.45	2 14.29 11.11
Absecon Channel	1 6.25 100.00	-	1 6.25 100.00	-	-
Totals:	1 1.67 100.00	12 20.00 100.00	1 1.67 100.00	11 18.33 99.99	18 30.00 100.00

Key: No. Counted Percent % →
Percent % ↓

TABLE 122 - (Continued)

	Bathing	Hunting	Trapping	Bird Watching	Other	Totals
Lakes Bay	-	-	-	-	-	2 100.00 3.33
Scull Bay	-	-	-	-	1 100.00 5.88	1 100.00 1.67
Absecon Bay	-	-	-	-	-	3 100.00 5.00
Reed Bay	-	-	-	-	-	5 100.00 8.33
Little Bay	-	-	-	-	-	19 100.00 31.67
Brigantine	-	-	-	-	2 14.29 11.76	14 100.00 23.33
Absecon Channel	-	-	-	-	14 87.50 82.35	16 100.00 26.67
Totals:	0	0	0	0	17 28.33 99.99	60 100.00 100.00

Key: No. Counted Percent % →
Percent % ↓

TABLE 123 - Monthly Flight Count Summary - March 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boating		Clamming		Bathing
Lakes Bay	7	14.00 10.94	12	24.00 16.22	-		15	30.00 14.71	5	10.00 15.15	-
Scull Bay	9	18.37 14.06	30	61.22 40.54	1	2.04 25.00	-		-		-
Absecon Bay	7	22.58 10.94	10	32.26 13.51	-		10	32.26 9.80	2	6.45 6.06	-
Reed Bay		-		-	1	1.89 25.00	10	18.87 9.80	3	5.66 9.09	-
Little Bay		-		-	-		-		-		-
Brigantine	13	28.89 20.31	5	11.11 6.76	-		-		23	51.11 69.70	-
Absecon Channel	28	19.58 43.75	17	11.89 22.97	2	1.40 50.00	67	46.85 65.69	-		-
Totals:	64	17.25 100.00	74	19.95 100.00	4	1.08 100.00	102	27.49 100.00	33	8.89 100.00	0

Key: No. Counted Percent % →
Percent % ↓

TABLE 123 - (Continued)

	Hunting	Trapping	Bird Watching	Other	Totals
Lakes Bay	-	-	-	11 22.00 20.00	50 100.00 13.48
Scull Bay	-	-	-	9 18.37 16.36	49 100.00 13.21
Absecon Bay	-	-	-	2 6.45 3.64	31 100.00 8.36
Reed Bay	-	-	39 73.58 100.00	-	53. 100.00 14.29
Little Bay	-	-	-	-	0
Brigantine	-	-	-	4 8.89 7.27	45 100.00 12.13
Absecon Channel	-	-	-	29 20.28 52.73	143 100.00 38.54
Totals:	0	0	39 10.51 100.00	55 14.82 100.00	371 99.99 100.01

Key: No. Counted
Percent % →
Percent % ↓

TABLE 124 - Monthly Flight Count Summary - April 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boating		Clamming		Bathing
Lakes Bay	9	5.73 2.84	62	39.49 22.14	-		84	53.50 33.87	2	1.27 1.63	-
Scull Bay	41	51.90 12.93	24	30.38 8.57	-		14	17.72 5.65	-		-
Absecon Bay		-		-	-		10	100.00 4.03	-		-
Reed Bay		-		-	-		4	10.00 1.61	36	90.00 29.27	-
Little Bay		-	58	61.70 20.71	1	1.06 12.50	12	12.77 4.84	23	24.47 18.70	-
Briganitne	62	21.38 19.56	112	38.62 40.00	1	0.34 12.50	56	19.31 22.58	59	20.34 47.97	-
Absecon Channel	205	66.99 64.67	24	7.84 8.57	6	1.96 75.00	68	22.22 27.42	3	0.98 2.44	-
Totals:	317	32.48 100.00	280	28.69 99.99	8	0.82 100.00	248	25.41 100.00	123	12.60 100.01	0

Key: No. Counted Percent % →
Percent % ↓

TABLE 124 - (Continued)

	Hunting	Trapping	Bird Watching	Other	Totals	
Lakes Bay	-	-	-	-	157	99.99 16.09
Scull Bay	-	-	-	-	79	100.00 8.09
Absecon Bay	-	-	-	-	10	100.00 1.02
Reed Bay	-	-	-	-	40	100.00 4.10
Little Bay	-	-	-	-	94	100.00 9.63
Brigantine	-	-	-	-	290	99.99 29.71
Absecon Channel	-	-	-	-	306	99.99 31.35
Totals:	0	0	0	0	976	100.00 99.99

Key: No. Counted
Percent % →
Percent % ↓

TABLE 125 - Monthly Flight Count Summary - May 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boating		Clamming		Bathing
Lakes Bay	28	8.67 3.57	96	29.72 6.48	-		162	50.15 19.31	-		-
Scull Bay	93	17.00 11.82	349	63.80 23.57	-		94	17.18 11.20	-		-
Absecon Bay	1	1.79 0.13	25	44.64 1.69	-		27	48.21 3.22	2	3.57 2.63	-
Reed Bay		-	78	55.32 5.27	1	0.71 100.00	39	27.66 4.65	23	16.31 30.26	-
Little Bay		-	215	64.76 14.52	-		84	25.30 10.01	33	9.94 43.42	-
Brigantine	53	8.59 6.73	406	65.80 27.41	-		133	21.56 15.85	18	2.92 23.68	-
Absecon Channel	612	49.32 77.76	312	25.14 21.07	-		300	24.17 35.76	-		-
Totals:	787	24.16 100.01	1481	45.47 100.01	1	0.03 100.00	839	25.76 100.00	76	2.33 99.99	0

Key: No. Counted Percent % → Percent % ↓

TABLE 125 - (Continued)

	Hunting	Trapping	Bird Watching	Others		Totals	
Lakes Bay	-	-	-	37	11.46 50.68	323	100.00 9.92
Scull Bay	-	-	-	11	2.01 15.07	547	99.99 16.79
Absecon Bay	-	-	-	1	1.79 1.37	56	100.00 1.72
Reed Bay	-	-	-	-		141	100.00 4.33
Little Bay	-	-	-	-		332	100.00 10.19
Brigantine	-	-	-	7	1.13 9.59	617	100.00 18.94
Absecon Channel	-	-	-	17	1.37 23.29	1241	100.00 38.10
Totals:	0	0	0	73	2.24 100.00	3257	99.99 99.99

Key: No. Counted Percent % → Percent % ↓

TABLE 126 - Monthly Flight Count Summary - June 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen	Boating		Clamming		Bathing	
Lakes Bay	9	0.60 0.83	1084	72.85 20.29	-	382	25.67 16.17	-		13	0. 21.
Scull Bay	197	8.49 18.26	1503	64.78 28.13	-	572	24.66 24.21	-		48	2. 78.
Absecon Bay		-	146	61.09 2.73	-	93	38.91 3.94	-			-
Reed Bay	1	0.80 0.09	61	58.80 1.14	-	42	33.60 1.78	21	16.80 39.62		-
Little Bay		-	246	68.33 4.60	-	82	22.78 3.47	32	8.89 60.38		-
Brigantine	95	7.44 8.80	790	61.86 14.79	-	392	30.70 16.59	-			-
Absecon Channel	777	25.15 72.01	1513	48.96 28.32	-	800	25.89 33.86	-			-
Totals:	1079	12.12 99.99	5343	60.04 100.00	0	2363	26.55 100.02	53	0.60 100.00	61	0. 100.

Key: No. Counted Percent % →
Percent % ↓

TABLE 126 - (Continued)

	Hunting	Trapping	Bird Watching	Other	Totals	
Lakes Bay	-	-	-	-	1488	99.99 16.72
Scull Bay	-	-	-	-	2320	100.00 26.07
Absecon Bay	-	-	-	-	239	100.00 2.68
Reed Bay	-	-	-	-	125	100.00 1.41
Little Bay	-	-	-	-	360	100.00 4.05
Brigantine	-	-	-	-	1277	100.00 14.35
Absecon Channel	-	-	-	-	3090	100.00 34.72
Totals:	0	0	0	0	8899	100.00 100.00

Key: No. Counted Percent % → Percent % ↓

TABLE 127 - Monthly Flight Count Summary - July 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boating		Clamming		Bathing	
Lakes Bay	17	2.35 1.92	306	42.32 6.18		-	369	51.04 17.50		-	31	4.2 24.8
Scull Bay	97	4.44 10.96	1501	68.76 30.29	2	0.09 15.38	557	25.52 26.42	8	0.37 12.12	2	0.0 1.6
Absecon Bay	12	3.58 1.36	151	45.07 3.05		-	109	32.54 5.17	4	1.19 6.06		-
Reed Bay		-	172	64.66 3.47		-	63	23.68 2.99	30	11.28 45.45		-
Little Bay		-	619	80.81 12.49	7	0.91 53.85	116	15.14 5.50	22	2.87 33.33		-
Brigantine	376	22.69 42.49	812	49.00 16.39	2	0.12 15.38	411	24.80 19.50	2	0.12 3.03	46	2.7 36.8
Absecon Channel	383	16.53 43.28	1394	60.16 28.13	2	0.09 15.38	483	20.85 22.91		-	46	1.9 36.8
Totals:	885	10.73 100.01	4955	60.08 100.00	13	0.16 99.99	2108	25.56 99.99	66	0.80 99.99	125	1.5 100.0

Key: No. Counted
Percent % →
Percent % ↓

TABLE 127 - (Continued)

	Hunting	Trapping	Bird Watching	Other		Totals	
Lakes Bay	-	-	-	-		723	100.00 8.77
Scull Bay	-	-	-	16	0.73 16.84	2183	100.00 26.47
Absecon Bay	-	-	-	59	17.61 62.11	335	99.99 4.06
Reed Bay	-	-	-	1	0.38 1.05	266	100.00 3.23
Little Bay	-	-	-	2	0.26 2.11	766	99.99 9.29
Brigantine	-	-	-	8	0.48 8.42	1657	99.99 20.09
Absecon Channel	-	-	-	9	0.39 9.47	2317	100.01 28.10
Totals:	0	0	0	95	1.15 100.00	8247	100.00 100.01

Key: No. Counted Percent % → Percent % ↓

TABLE 128 - Monthly Flight Count Summary - August 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boating		Clamming		Bathin	
Lakes Bay	10	0.92 0.62	415	38.32 8.30	-		483	44.60 14.91	168	15.51 80.38	6	0. 18.
Scull Bay	398	12.54 24.64	1930	60.81 38.58	-		838	26.40 25.87	5	0.16 2.39	3	0. 9.
Absecon Bay	21	2.94 1.30	295	41.26 5.90	-		398	55.66 12.29		-		-
Reed Bay		-	43	33.33 0.86	- -		65	50.39 2.01	21	16.28 10.05		-
Little Bay		-	223	78.25 4.46	-		50	17.54 1.54	12	4.21 5.74		-
Brigantine	1066	35.18 66.01	998	32.94 19.95	2	0.07 100.00	930	30.69 28.71	3	0.10 1.44	24	0. 72.
Absecon Channel	120	7.06 7.43	1098	64.59 21.95	-		475	27.94 14.67		-		-
Totals:	1615	15.96 100.00	5002	49.45 100.00	2	0.02 100.00	3239	32.02 100.00	209	2.07 100.00	33	0.3 100.0

Key: No. Counted
Percent % →
Percent % ↓

TABLE 128 - (Continued)

	Hunting	Trapping	Bird Watching	Other		Totals	
Lakes Bay	-	-	-	1	0.09 6.25	1083	99.99 10.71
Scull Bay	-	-	-		-	3174	100.00 31.38
Absecon Bay	-	-	-	1	0.14 6.25	715	100.00 7.07
Reed Bay	-	-	-		-	129	100.00 1.28
Little Bay	-	-	-		-	285	100.00 2.82
Brigantine	-	-	-	7	0.23 43.75	3030	100.00 29.95
Absecon Channel	-	-	-	7	0.41 43.75	1700	100.00 16.81
Totals:	0	0	0	16	0.16 100.00	10116	100.01 100.02

Key: No. Counted Percent % → Percent % ↓

TABLE 129 - Monthly Flight Count Summary - September 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boating		Clamming		Bathing	
Lakes Bay	8	3.16 1.66	113	44.66 8.24	-		97	38.34 13.16	32	12.65 47.06	-	
Scull Bay	105	13.96 21.83	408	54.26 29.76	-		239	31.78 32.43	-		-	
Absecon Bay	4	5.26 0.83	27	35.53 1.97	-		45	59.21 6.11	-		-	
Reed Bay	-		50	72.46 3.65	-		17	24.64 2.31	2	2.90 2.94	-	
Little Bay	-		110	67.48 8.02	-		30	18.40 4.07	23	14.11 33.82	-	
Brigantine	219	29.20 45.53	359	47.87 26.19	7	0.93 87.50	152	20.27 20.62	9	1.20 13.24	4	0.53 100.00
Absecon Channel	145	23.81 30.15	304	49.92 22.17	1	0.16 12.50	157	25.78 21.30	2	0.33 2.94	-	
Totals:	481	18.00 100.00	1371	51.31 100.00	8	0.30 100.00	737	27.58 100.00	68	2.54 100.00	4	0.15 100.00

Key: No. Counted Percent % → Percent % ↓

TABLE 129 - (Continued)

	Hunting	Trapping	Bird Watching	Other	Totals
Lakes Bay	-	-	-	3 1.19 100.00	253 100.00 9.47
Scull Bay	-	-	-	-	752 100.00 28.14
Absecon Bay	-	-	-	-	76 100.00 2.84
Reed Bay	-	-	-	-	69 100.00 2.58
Little Bay	-	-	-	-	163 99.99 6.10
Brigantine	-	-	-	-	750 100.00 28.07
Absecon Channel	-	-	-	-	609 100.00 22.79
Totals:	0	0	0	3 0.11 100.00	2672 99.99 99.99

Key: No. Counted Percent % → Percent % ↓

TABLE 130 - Monthly Flight Count Summary - October, 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boating		Clamming		Bathing
Lakes Bay	4	8.70 2.82	12	26.09 4.56	-		17	36.96 6.03	12	26.09 46.15	-
Scull Bay	27	17.31 19.01	60	38.46 22.81	-		69	44.23 24.47	-		-
Absecon Bay	-		20	27.40 7.61	-		52	71.23 18.44	-		-
Reed Bay	-		15	35.71 5.70	-		20	47.62 7.09	6	14.29 23.08	-
Little Bay	-		5	19.23 1.90	-		15	57.69 5.32	5	19.23 19.23	-
Brigantine	85	33.86 59.86	77	30.68 29.28	-		84	33.47 29.79	3	1.20 11.54	-
Absecon Channel	26	18.57 18.31	74	52.86 28.14	13	9.29 100.00	25	17.86 8.87	-		-
Totals:	142	19.35 100.00	263	35.83 100.00	13	1.77 100.00	282	38.42 100.01	26	3.54 100.00	0

Key: No. Counted Percent % →
Percent % ↓

TABLE 130 - (Continued)

	Hunting	Trapping	Bird Watching	Other	Totals
Lakes Bay	-	-	-	1 2.17 20.00	46 100.01 6.27
Scull Bay	-	-	-	-	156 100.00 21.25
Absecon Bay	1 1.37 33.33	-	-	-	73 100.00 9.95
Reed Bay	1 2.38 33.33	-	-	-	42 100.00 5.72
Little Bay	1 3.85 33.33	-	-	-	26 100.00 3.54
Brigantine	-	-	-	2 0.80 40.00	251 100.01 34.20
Absecon Channel	-	-	-	2 1.43 40.00	140 100.01 19.07
Totals:	3 0.41 99.99	0	0	5 0.68 80.00	734 100.00 100.00

Key: No. Counted Percent % →
Percent %

TABLE 131 - Monthly Flight Count Summary - November 1977

	Bank Fishermen	Boat Fishermen	Comm. Fishermen	Boating	Clamming	Bathing
Lakes Bay	-	5 55.56 62.50	-	3 33.33 8.33	-	-
Scull Bay	-	-	-	15 88.24 41.67	-	-
Absecon Bay	-	-	-	3 100.00 8.33	-	-
Reed Bay	-	-	-	-	7 100.00 22.58	-
Little Bay	-	-	-	-	7 100.00 22.58	-
Brigantine	-	3 9.09 37.50	-	12 36.36 33.33	17 51.52 54.84	-
Absecon Channel	8 72.73 100.00	-	-	3 27.27 8.33	-	-
Totals:	8 9.20 100.00	8 9.20 100.00	0	36 41.38 99.99	31 35.63 100.00	0

Key: No. Counted Percent % →
Percent % ↓

TABLE 131 - (Continued)

	Hunting	Trapping	Bird Watching	Other	Totals
Lakes Bay	-	-	-	1 11.11 50.00	9 100.00 10.34
Scull Bay	2 11.76 100.00	-	-	-	17 100.00 19.54
Absecon Bay	-	-	-	-	3 100.00 3.45
Reed Bay	-	-	-	-	7 100.00 8.05
Little Bay	-	-	-	-	7 100.00 8.05
Brigantine	-	-	-	1 3.03 50.00	33 100.00 37.93
Absecon Channel	-	-	-	-	11 100.00 12.64
Totals:	2 2.30 100.00	0	0	2 2.30 100.00	87 100.01 100.00

Key: No. Counted
Percent % →
Percent % ↓

TABLE 132 - Total Estimated Man-days of Activity by Month and Type

	Bank Fisherman	Boat Fisherman	Comm. Fishing	Boating	Clamming	Bathing
Feb.	5	62	5	65	101	0
March	247	295	16	398	120	0
April	751	661	20	569	308	0
May	1676	3230	3	1845	182	0
June	2926	14101	0	6504	142	226
July	2663	14979	44	6370	226	375
August	4062	12340	16	7667	995	176
Sept.	1599	4728	25	2557	208	12
Oct.	542	970	36	1222	190	0
Nov.	8	57	0	266	150	0
Dec.	0	24	0	83	45	0
Total:	14479	51447	165	27546	2667	789
Percent:	14.72	52.29	0.17	28.00	2.71	0.80

TABLE 132 - (Continued)

	Hunting	Trapping	Bird Watching	Other	Total
Feb.	0	0	0	127	365
March	0	0	155	213	1444
April	0	0	0	0	2309
May	0	0	0	178	7114
June	0	0	0	0	23899
July	0	0	0	309	24966
August	0	0	0	110	25366
Sept.	0	0	0	12	9141
Oct.	30	0	0	15	3005
Nov.	14	0	0	16	511
Dec.	96	7	0	21	276
Total:	140	7	155	1001	98396
Percent:	0.14	0.01	0.16	1.02	100.02

TABLE 133 - Total Estimated Man-days of Activity by Activity and Area - February 1977 to December 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boaters		Clammers	
Lakes Bay	263	2.35 1.82	5376	48.13 10.45		-	4118	36.87 14.95	1064	9.53 39.90
Scull Bay	2579	9.80 17.81	16454	62.52 31.98	11	0.04 6.67	6867	26.09 24.93	48	0.18 1.80
Absecon Bay	122	2.87 0.84	1821	42.78 3.54		-	2060	48.39 7.48	25	0.59 0.94
Reeds Bay	4	0.15 0.03	1267	47.15 2.46	7	0.26 4.24	750	27.91 2.72	469	17.45 17.59
Little Bay		-	4072	69.86 7.91	27	0.46 16.36	1133	19.44 4.11	555	9.52 20.81
Brigantine	5398	24.30 37.28	9782	44.04 19.01	47	0.21 28.48	6057	27.27 21.99	496	2.23 18.60
Absecon Channel	6113	23.58 42.22	12675	48.90 24.64	73	0.28 44.24	6561	25.31 23.82	10	0.04 0.37
Totals:	14479	14.72 100.00	51447	52.29 99.99	165	0.17 99.99	27546	28.00 100.00	2667	2.71 100.01

Key: No. Estimated Percent % →
Percent % ↓

TABLE 133 - (Continued)

	Bathers		Hunters		Bird Watchers		Trappers		Others		Totals	
Lakes Bay	170	1.52 21.55	15	0.13 10.71	-		-		164	1.47 16.38	11170	100.00 11.35
Scull Bay	200	0.76 25.35	36	0.14 25.71	7	0.03 100.00	-		117	0.44 11.69	26319	100.00 26.75
Absecon Bay	-		17	0.40 12.14	-		-		212	4.98 21.18	4257	100.01 4.33
Reed Bay	-		32	1.19 22.86	-		155	5.77 100.00	3	0.11 0.30	2687	99.99 2.73
Little Bay	-		35	0.60 25.00	-		-		7	0.12 0.70	5829	100.00 5.92
Brigantine	284	1.28 35.99	5	0.02 3.57	-		-		144	0.65 14.39	22213	100.00 22.58
Absecon Channel	135	0.52 17.11		-	-		-		354	1.37 35.36	25921	100.00 26.34
Totals:	789	0.80 100.00	140	0.14 99.99	7	0.01 100.00	155	0.16 100.00	100	1.02 100.00	98396	100.02 100.00

Key: No. Estimated Percent % →
Percent % ↓

TABLE 134 - Estimated Man-days of Activity by Activity and Area - February 1977

	Bank Fishermen	Boat Fishermen	Comm. Fishermen	Boaters	Clammers	Bather
Lakes Bay	-	-	-	-	12 100.00 11.88	-
Scull Bay	-	-	-	-	-	-
Absecon Bay	-	-	-	20 100.00 30.77	-	-
Reed Bay	-	-	-	-	23 100.00 22.77	-
Little Bay	-	37 33.33 59.68	-	20 18.02 30.77	54 48.65 53.47	-
Brigantine	-	25 34.72 40.32	-	25 34.72 38.46	12 16.67 11.88	-
Absecon Channel	5 4.10 100.00	-	5 4.10 100.00	-	-	-
Totals:	5 1.37 100.00	62 16.99 100.00	5 1.37 100.00	65 17.81 100.00	101 27.67 100.00	0

Key: No. Estimated Percent % →
Percent % ↓

TABLE 134 - (Continued)

	Hunters	Trappers	Bird Watchers	Others	Totals
Lakes Bay	-	-	-	-	12 100.00 3.29
Scull Bay	-	-	-	5 100.00 3.94	5 100.00 1.37
Absecon Bay	-	-	-	-	20 100.00 5.48
Reed Bay	-	-	-	-	23 100.00 6.30
Little Bay	-	-	-	-	111 100.00 30.41
Brigantine	-	-	-	10 13.89 7.87	72 100.00 19.73
Absecon Channel	-	-	-	112 91.80 88.19	122 100.00 33.43
Totals:	0	0	0	127 34.79 100.00	365 100.00 100.01

Key: No. Estimated Percent % →
Percent % ↓

TABLE 135 - Estimated Man-days of Activity by Activity and Area - March 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boaters		Clammers		Bathe
Lakes Bay	27	13.99 10.93	48	24.87 16.27	-		59	30.57 14.82	17	8.81 14.17	
Scull Bay	34	17.80 13.77	118	61.78 40.00	4	2.09 25.00	-		-		
Absecon Bay	27	22.31 10.93	40	33.06 13.56	-		40	33.06 10.05	6	4.96 5.00	
Reed Bay	-		-		4	1.93 25.00	38	18.27 9.55	11	5.29 9.17	
Little Bay	-		-		-		-		-		
Brigantine	50	29.41 20.24	19	11.18 6.44	-		-		86	50.59 71.67	
Absecon Channel	109	19.43 44.13	70	12.48 23.73	8	1.43 50.00	261	46.52 65.58	-		
Totals:	247	17.11 100.00	295	20.43 100.00	16	1.11 100.00	398	27.56 100.00	120	8.31 100.01	

Key: No. Estimated Percent % →
Percent % ↓

TABLE 135 - (Continued)

	Hunters	Trappers	Bird Watchers		Others		Totals	
Lakes Bay	-	-	-		42	21.76 19.72	193	100.00 13.37
Scull Bay	-	-	-		35	18.33 16.43	191	100.00 13.23
Absecon Bay	-	-	-		8	6.61 3.76	121	100.00 8.38
Reed Bay	-	-	155	74.52 100.00		-	208	100.01 14.40
Little Bay	-	-	-			-	0	
Brigantine	-	-	-		15	8.82 7.04	170	100.00 11.77
Absecon Channel	-	-	-		113	20.14 53.05	561	100.00 38.85
Totals:	0	0	155	10.73 100.00	213	14.75 100.00	1444	100.00 100.00

Key: No. Estimated Percent % →
Percent % ↓

TABLE 136 - Estimated Man-days of Activity by Activity and Area - April 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boaters		Clammers		Bathe
Lakes Bay	28	7.57 3.73	152	41.08 23.00	-		185	50.00 32.51	5	1.35 1.62	-
Scull Bay	86	52.12 11.45	47	28.49 7.11	-		32	19.39 5.62		-	-
Absecon Bay	-		-		-		18	100.00 3.16		-	-
Reed Bay	-		-		-		11	12.36 1.93	78	87.64 25.33	-
Little Bay	-		159	58.67 24.05	4	1.48 20.00	39	14.39 6.85	69	25.46 22.40	-
Brigantine	173	24.37 23.04	246	34.65 37.22	2	0.28 10.00	138	19.44 24.25	151	21.27 49.03	-
Absecon Channel	464	67.64 61.78	57	8.31 8.63	14	2.04 70.00	146	21.28 25.66	5	0.73 1.62	-
Totals	751	32.52 100.00	661	28.63 100.01	20	0.87 100.00	569	24.64 99.98	308	13.34 100.00	0

Key: No. Estimated Percent % →
Percent % ↓

TABLE 136 - (Continued)

	Hunters	Trappers	Bird Watchers	Others	Totals	
Lakes Bay	-	-	-	-	370	100.00 16.02
Scull Bay	-	-	-	-	165	100.00 7.15
Absecon Bay	-	-	-	-	18	100.00 0.78
Reed Bay	-	-	-	-	89	100.00 3.85
Little Bay	-	-	-	-	271	100.00 11.74
Brigantine	-	-	-	-	710	100.01 30.75
Absecon Channel	-	-	-	-	686	100.00 29.71
Totals:	0	0	0	0	2309	100.00 100.00

Key: No. Estimated Percent % →
Percent % ↓

TABLE 137 - Estimated Man-days of Activity by Activity and Area - May 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boaters		Clammers		Bather
Lakes Bay	61	9.17 3.64	203	30.53 6.28	-		314	47.22 17.02	-		-
Scull Bay	204	16.61 12.17	780	63.52 24.15	-		215	17.51 11.65	-		-
Absecon Bay	3	1.96 0.18	59	38.56 1.83	-		84	54.90 4.55	5	3.27 2.75	-
Reed Bay		-	172	54.95 5.33	3	0.96 100.00	88	28.12 4.77	50	15.97 27.47	-
Little Bay		-	468	62.23 14.49	-		201	26.73 10.89	83	11.04 45.60	-
Brigantine	108	8.03 6.44	881	65.50 27.28	-		296	22.01 16.04	44	3.27 24.18	-
Absecon Channel	1300	48.91 77.57	667	25.09 20.65	-		647	24.34 35.07	-		-
Totals:	1676	23.56 100.00	3230	45.40 100.01	3	0.04 100.00	1845	25.93 99.99	182	2.56 100.00	0

Key: No. Estimated Percent % →
Percent % ↓

TABLE 137 - (Continued)

	Hunters	Trappers	Bird Watchers	Others		Totals	
Lakes Bay	-	-	-	87	13.08 48.88	665	100.00 9.35
Scull Bay	-	-	-	29	2.36 16.29	1228	100.00 17.26
Absecon Bay	-	-	-	2	1.31 1.12	153	100.00 2.15
Reed Bay	-	-	-		-	313	100.00 4.40
Little Bay	-	-	-		-	752	100.00 10.57
Brigantine	-	-	-	16	1.19 8.99	1345	100.00 18.91
Absecon Channel	-	-	-	44	1.66 24.72	2658	100.00 37.36
Totals:	0	0	0	178	2.50 100.00	7114	99.99 100.00

Key: No. Estimated
Percent % →
Percent % ↓

TABLE 138 - Estimated Man-days of Activity by Activity and Area - June 1977

	Bank Fishermen		Boat Fishermen		Comm. Fisheries	Boaters		Clammers		Bathe
Lakes Bay	14	0.40 0.48	2531	72.44 17.95	-	901	25.79 13.85	-	48	1 21
Scull Bay	496	7.15 16.95	4552	65.66 32.28	-	1707	24.62 26.25	-	178	2 78
Absecon Bay	-		435	55.77 3.08	-	345	44.23 5.30	-	-	
Reed Bay	4	1.00 0.14	199	49.75 1.41	-	135	33.75 2.08	62 15.50 43.66	-	
Little Bay	-		689	70.81 4.89	-	204	20.97 3.14	80 8.22 56.34	-	
Brigantine	230	6.62 7.86	2139	61.57 15.17	-	1105	31.81 16.99	-	-	
Absecon Channel	2182	27.81 74.57	3556	45.33 25.22	-	2107	26.86 32.40	-	-	
Totals:	2926	12.24 100.00	14101	59.00 100.00	0	6504	27.21 100.01	142 0.59 100.00	226	0. 100.

Key: No. Estimated Percent % →
Percent % ↓

TABLE 138 - (Continued)

	Hunters	Trappers	Bird Watchers	Others	Totals	
Lakes Bay	-	-	-	-	3494	100.00 14.62
Scull Bay	-	-	-	-	6933	100.00 29.01
Absecon Bay	-	-	-	-	780	100.00 3.26
Reed Bay	-	-	-	-	400	100.00 1.67
Little Bay	-	-	-	-	973	100.00 4.07
Brigantine	-	-	-	-	3474	100.00 14.54
Absecon Channel	-	-	-	-	7845	100.00 32.83
Totals:	0	0	0	0	23899	99.99 100.00

Key: No. Estimated Percent % → Percent % ↓

TABLE 139 - Estimated Man-days of Activity by Activity and Area - July 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boaters		Clammers	
Lakes Bay	48	2.20 1.80	933	42.84 6.23		-	1107	50.83 17.38		-
Scull Bay	300	4.51 11.27	4573	68.77 30.53	7	0.11 15.91	1689	25.40 26.51	26	0.39 11.50
Absecon Bay	34	3.30 1.28	450	43.73 3.00		-	336	32.65 5.27	14	1.36 6.19
Reed Bay		-	545	65.04 3.64		-	190	22.67 2.98	100	11.93 44.25
Little Bay		-	1817	80.40 12.13	23	1.02 52.27	341	15.09 5.35	72	3.19 31.86
Brigantine	1138	22.23 42.73	2513	49.09 16.78	7	0.14 15.91	1278	24.97 20.06	14	0.27 6.19
Absecon Channel	1143	16.58 42.92	4148	60.19 27.69	7	0.10 15.91	1429	20.73 22.43		-
Totals:	2663	10.67 100.00	14979	60.00 100.00	44	0.18 100.00	6370	25.51 99.98	226	0.91 99.99

Key: No. Estimated Percent % →
Percent % ↓

TABLE 139 - (Continued)

	Bathers		Hunters	Trappers	Bird Watchers	Others		Totals	
Lakes Bay	90	4.13 24.00	-	-	-	-		2178	100.00 8.72
Scull Bay	7	0.11 1.88	-	-	-	48	0.72 15.53	6650	100.01 26.64
Absecon Bay		-	-	-	-	195	18.95 63.11	1029	99.99 4.12
Reed Bay		-	-	-	-	3	0.36 0.97	838	100.00 3.36
Little Bay		-	-	-	-	7	0.31 2.27	2260	100.01 9.05
Brigantine	143	2.80 38.13	-	-	-	26	0.51 8.41	5119	100.01 20.50
Absecon Channel	135	1.96 36.00	-	-	-	30	0.44 9.71	6892	100.00 27.61
Totals:	375	1.50 100.01	0	0	0	309	1.24 100.00	24966	100.01 100.00

Key: No. Estimated Percent % →
Percent % ↓

TABLE 140 - Estimated Man-days of Activity by Activity and Area - August 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boaters		Clammers	
Lakes Bay	20	0.67 0.49	1039	34.75 8.42	-		1082	36.19 14.11	812	27.16 81.61
Scull Bay	1017	12.90 25.04	4789	60.74 38.81	-		2042	25.90 26.63	22	0.28 2.21
Absecon Bay	42	2.62 1.03	685	42.65 5.55	-		872	54.30 11.37	-	-
Reed Bay	-		114	31.75 0.92	-		157	43.73 2.05	88	24.51 8.84
Little Bay	-		499	73.38 4.04	-		123	18.09 1.60	58	8.53 5.83
Brigantine	2674	35.51 65.83	2452	32.56 19.87	16	0.21 100.00	2195	29.15 28.63	15	0.20 1.51
Absecon Channel	309	7.16 7.61	2762	63.99 22.38	-		1196	27.71 15.60	-	-
Totals:	4062	16.01 100.00	12340	48.65 99.99	16	0.06 100.00	7667	30.23 99.99	995	3.92 100.00

Key: No. Estimated Percent % →
Percent % ↓

TABLE 140 - (Continued)

	Bathers		Hunters	Trappers	Bird Watchers	Others		Totals	
Lakes Bay	32	1.07 18.18	-	-	-	5	0.17 4.55	2990	100.0 11.7
Scull Bay	15	0.19 8.52	-	-	-	-		7885	100.0 31.0
Absecon Bay	-		-	-	-	7	0.44 6.36	1606	100.0 6.3
Reed Bay	-		-	-	-	-		359	99.9 1.4
Little Bay	-		-	-	-	-		680	100.0 2.6
Brigantine	129	1.71 73.30	-	-	-	49	0.65 44.55	7530	99.9 29.6
Absecon Channel	-		-	-	-	49	1.14 44.55	4316	100.0 17.0
Totals:	176	0.69 100.00	0	0	0	110	0.43 100.01	25366	99.9 100.0

Key: No. Estimated Percent % →
Percent % ↓

TABLE 141 - Estimated Man-days of Activity by Activity and Area - September 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boaters		Clammers	
Lakes Bay	25	2.89 1.56	398	45.80 8.42	-		336	38.67 13.14	98	11.28 47.12
Scull Bay	359	13.82 22.45	1417	54.54 29.97	-		822	31.64 32.15	-	
Absecon Bay	16	5.71 1.00	97	34.64 2.05	-		167	59.64 6.53	-	
Reed Bay		-	177	74.06 3.74	-		57	23.85 2.23	5	2.09 2.40
Little Bay		-	388	67.60 8.21	-		115	20.03 4.50	71	12.37 34.13
Brigantine	787	30.21 49.22	1225	47.02 25.91	22	0.84 88.00	530	20.35 20.73	29	1.11 13.94
Absecon Channel	412	20.85 25.76	1026	51.92 21.70	3	0.15 12.00	530	26.82 20.73	5	0.25 2.40
Totals:	1599	17.49 99.99	4728	51.72 100.00	25	0.27 100.00	2557	27.97 100.01	208	2.28 99.99

Key: No. Estimated Percent % →
Percent % ↓

TABLE 141 - (Continued)

	Bathers	Hunters	Trappers	Bird Watchers	Others	Totals
Lakes Bay	-	-	-	-	12 1.38 100.00	869 100.02 9.51
Scull Bay	-	-	-	-	-	2598 100.00 28.42
Absecon Bay	-	-	-	-	-	280 99.99 3.06
Reed Bay	-	-	-	-	-	239 100.00 2.61
Little Bay	-	-	-	-	-	574 100.00 6.28
Brigantine	12 0.46 100.00	-	-	-	-	2605 99.99 28.50
Absecon Channel	-	-	-	-	-	1976 99.99 21.62
Totals:	12 0.13 100.00	0	0	0	12 0.13 100.00	9141 99.99 100.00

Key: No. Estimated Percent % →
Percent % ↓

TABLE 142 - Estimated Man-days of Activity by Activity and Area - October 1977

	Bank Fishermen		Boat Fishermen		Comm. Fishermen		Boaters		Clammers		Bather
Lakes Bay	40	13.33 7.38	35	11.67 3.61	-		102	34.00 8.35	120	40.00 36.16	-
Scull Bay	83	16.70 15.31	166	33.40 17.11	-		248	49.90 20.29	-		-
Absecon Bay		-	55	26.07 5.67	-		146	69.19 11.95	-		-
Reed Bay		-	60	37.27 6.19	-		74	45.96 6.06	17	10.56 8.95	-
Little Bay		-	15	12.71 1.55	-		60	50.85 4.91	33	27.97 17.37	-
Brigantine	238	26.65 43.91	250	28.00 25.77	-		379	42.44 31.01	20	2.24 10.53	-
Absecon Channel	181	21.94 33.39	389	47.15 40.10	36	4.36 100.00	213	25.82 17.43	-		-
Totals:	542	18.04 99.99	970	32.28 100.00	36	1.20 100.00	1222	40.67 100.00	190	6.32 100.01	0

Key: No. Estimated
Percent % →
Percent % ↓

TABLE 142 - (Continued)

	Hunters		Trappers	Bird Watchers	Others		Totals	
Lakes Bay	-		-	-	3	1.00 20.00	300	100.00 9.98
Scull Bay	-		-	-	-		497	100.00 16.54
Absecon Bay	10	4.74 33.33	-	-	-		211	100.00 7.02
Reed Bay	10	6.21 33.33	-	-	-		161	100.00 5.36
Little Bay	10	8.47 33.33	-	-	-		118	100.00 3.93
Brigantine	-		-	-	6	0.67 40.00	893	100.00 29.72
Absecon Channel	-		-	-	6	0.73 40.00	825	100.00 27.45
Totals:	30	1.00 99.99	0	0	15	0.50 100.00	3005	100.01 100.00

Key: No. Estimated Percent % →
Percent % ↓

TABLE 143 - Estimated Man-days of Activity by Activity and Area - November 1977

	Bank Fishermen	Boat Fishermen	Comm. Fishermen	Boaters	Clammers	Bathers
Lakes Bay	-	37 56.92 64.91	-	20 30.77 7.52	-	-
Scull Bay	-	-	-	112 88.89 42.11	-	-
Absecon Bay	-	-	-	20 100.00 7.52	-	-
Reed Bay	-	-	-	-	35 100.00 23.33	-
Little Bay	-	-	-	-	35 100.00 23.33	-
Brigantine	-	20 9.90 35.09	-	94 46.53 35.34	80 39.60 53.33	-
Absecon Channel	8 28.57 100.00	-	-	20 71.43 7.52	-	-
Totals:	8 1.57 100.00	57 11.15 100.00	0	266 52.05 100.01	150 29.25 99.99	0

Key: No. Estimated Percent % →
Percent % ↓

TABLE 143 - (Continued)

	Hunters	Trappers	Bird Watchers	Others	Totals
Lakes Bay	-	-	-	8 12.31 50.00	65 100.00 12.72
Scull Bay	14 11.11 100.00	-	-	-	126 100.00 24.66
Absecon Bay	-	-	-	-	20 100.00 3.91
Reed Bay	-	-	-	-	35 100.00 6.85
Little Bay	-	-	-	-	35 100.00 6.85
Brigantine	-	-	-	8 3.96 50.00	202 99.99 39.53
Absecon Channel	-	-	-	-	28 100.00 5.48
Totals:	14 2.74 100.00	0	0	16 3.13 100.00	511 99.99 100.00

Key: No. Estimated Percent % →
Percent % ↓

TABLE 144 - Estimated Man-days of Activity by Activity and Area - December 1977

	Bank Fishermen	Boat Fishermen	Comm. Fishermen	Boaters	Clammers	Bathers
Lakes Bay	-	-	-	12 35.29 14.46	-	-
Scull Bay	-	12 29.27 100.00	-	-	-	-
Absecon Bay	-	-	-	12 63.16 14.46	-	-
Reed Bay	-	-	-	-	-	-
Little Bay	-	-	-	30 54.55 36.14	-	-
Brigantine	-	12 12.90 100.00	-	17 18.28 20.48	45 48.39 100.00	-
Absecon Channel	-	-	-	12 100.00 14.46	-	-
Totals:	0	24 8.70 100.00	0	83 30.07 100.00	45 16.30 100.00	0

Key: No. Estimated
Percent % →
Percent % ↓

TABLE 144 - (Continued)

	Hunters		Trappers		Bird Watchers	Others		Totals	
Lakes Bay	15	44.12 15.63	-		-	7	20.59 33.33	34	100.00 12.32
Scull Bay	22	53.66 22.92	7	17.07 100.01	-	-		41	100.00 14.86
Absecon Bay	7	36.84 7.29	-		-	-		19	100.00 6.89
Reed Bay	22	100.00 22.92	-		-	-		22	100.00 7.97
Little Bay	25	45.45 26.04	-		-	-		55	100.00 19.93
Brigantine	5	5.38 5.21	-		-	14	15.05 66.67	93	100.00 33.70
Absecon Channel	-		-		-	-		12	100.00 4.35
Totals:	96	34.78 100.01	7	2.54 100.01	0	21	7.61 100.00	276	100.00 100.02

Key: No. Estimated
Percent % →
Percent % ↓

TABLE 145 - Hourly Variations in the Percentage of Fishermen Involved in Fishing

Date	4-14	4-20	5-6	5-12	5-17	5-22	6-17	6-18	6-27	7-11	7-19
Date											
Fishermen Type	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Total Fishermen	18	13	9	20	7	34	42	19	28	27	36
Time	PERCENT OF TOTAL FISHERMEN										
0700	0.0	46.1	0.0	0.0	0.0	0.0	4.7	26.3	14.2	7.4	16.6
0800	11.1	46.1	0.0	0.0	0.0	5.8	7.1	31.5	21.4	14.8	30.5
0900	33.3	53.8	0.0	5.0	0.0	8.8	33.3	47.3	35.7	29.6	22.2
1000	22.5	53.8	0.0	10.0	0.0	23.5	42.8	47.3	46.4	37.0	36.1
1100	16.6	69.2	22.2	20.0	57.1	20.5	50.0	21.0	50.0	74.1	47.2
1200	22.2	53.8	66.6	50.0	85.7	55.8	30.9	63.1	39.2	62.9	66.6
1300	11.1	69.2	66.6	70.0	85.7	50.0	30.9	31.5	42.8	44.4	55.5
1400	5.5	7.6	55.5	85.0	28.5	29.4	30.9	21.0	28.5	59.2	30.5
1500	27.7	0.0	22.2	55.0	28.5	20.5	16.6	21.0	46.4	51.8	16.6
1600	33.3	0.0	0.0	15.0	28.5	8.8	14.2	0.0	42.8	29.6	5.5
1700	5.5	0.0	0.0	5.0	0.0	0.0	7.1	0.0	14.2	22.2	0.0
1800	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	11.1	0.0
1900	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE 145 - (Continued)

Date	7-24	7-27	Total	8-5	8-9	8-11	Total
Day							
Fishermen Type	Bank	Bank	Bank	Boat	Boat	Boat	Boat
Total Fishermen	31	49	333	7	12	7	26
Time	PERCENT OF TOTAL FISHERMEN						
0700	12.9	2.0	9.3	14.3	8.3	0.0	3.85
0800	25.8	2.0	14.7	14.3	33.3	28.6	15.38
0900	41.9	16.3	26.1	57.1	75.0	42.9	42.31
1000	51.6	30.6	34.5	71.4	75.0	71.4	73.08
1100	41.9	34.6	40.5	85.7	83.3	71.4	76.92
1200	61.2	48.9	50.5	85.7	83.3	100.0	88.46
1300	51.6	34.6	45.0	85.7	83.3	100.0	88.46
1400	45.1	34.6	36.0	100.0	83.3	100.0	92.31
1500	38.7	34.6	30.0	71.4	50.0	100.0	88.46
1600	25.8	32.7	19.8	14.3	0.0	71.4	46.15
1700	9.6	18.3	8.1	14.3	0.0	42.9	15.38
1800	0.0	8.1	2.4	0.0	0.0	0.0	0.00
1900	0.0	4.0	0.6	0.0	0.0	0.0	0.00

TABLE 146 - Total Estimated Combined Bank and Boat Fishing Catch Composition by Month

	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	To-tals	Per-cent
American Eel	-	14	41	18	19	7	182	-	-	-	-	281	0.1
Blue Crab	-	-	-	-	264	51	3161	376	55	-	-	3907	2.6
Bluefish	-	-	-	-	74	3119	5689	13658	2760	-	-	25300	16.8
Croaker	-	-	-	-	-	-	-	878	90	-	-	968	0.6
Cunner	-	18	55	96	-	-	-	-	-	-	-	169	0.1
Kingfish	-	-	-	-	-	7	-	-	-	-	-	7	0.0
Northern Puffer	-	-	-	-	-	-	-	7	2	-	-	9	0.0
Porgy	-	-	-	-	-	-	-	307	31	-	-	338	0.2
Sea Bass	-	-	-	26	226	51	518	5912	654	-	-	7387	4.9
Sea Robin	-	-	-	-	-	96	7320	12425	1303	-	-	21144	14.04
Shark	-	-	-	35	2008	2502	7066	4596	520	-	-	16727	11.1
Spot	-	-	-	-	-	16	26	578	92	-	-	712	0.47
Striped Bass	-	-	-	-	-	-	-	26	9	-	-	35	0.02
Summer Flounder	-	-	-	78	20058	9882	26545	11687	1261	-	-	69511	46.15
Tautog	-	-	-	9	1343	-	333	-	-	-	-	1685	1.12
Weakfish	-	-	-	-	1276	-	713	183	52	-	-	2224	1.48
Winter Flounder	-	23	69	-	-	-	-	-	-	-	-	92	0.06
Other	-	-	-	9	-	-	129	-		-	-	138	0.09
Totals	-	55	165	271	25268	15731	51682	50633	6829	-	-	150634	100.01
Percent	-	.04	.11	0.18	16.77	10.44	34.31	33.61	4.53			99.99	

TABLE 147 - Total Estimated Boat Fishing Catch Composition by Month

	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Percent
American Eel	-	-	-	-	-	-	129	-	-	-	-	129	.10
Blue Crab	-	-	-	-	245	-	2705	307	31	-	-	3288	2.55
Bluefish	-	-	-	-	74	2251	1074	7898	808	-	-	12105	9.38
Croaker	-	-	-	-	-	-	-	878	90	-	-	968	0.75
Porgy	-	-	-	-	-	-	-	307	31	-	-	338	0.26
Sea Bass	-	-	-	-	74	-	386	5704	583	-	-	6747	5.23
Sea Robin	-	-	-	-	-	-	6399	12286	1256	-	-	19941	15.45
Shark	-	-	-	-	1865	2251	6785	4388	449	-	-	15738	12.19
Spot	-	-	-	-	-	-	-	439	45	-	-	484	0.38
Summer Flounder	-	-	-	-	19725	8992	24606	11409	1167	-	-	65899	51.06
Tautog	-	-	-	-	1276	-	-	-	-	-	-	1276	.99
Weakfish	-	-	-	-	1276	-	687	44	5	-	-	2012	1.56
Other	-	-	-	-	-	-	129	-	-	-	-	129	.10
Totals	-	-	-	-	24535	13494	42900	43660	4465	-	-	129054	100.00
Percent	-	-	-	-	19.01	10.46	33.24	33.83	3.46	-	-	100.00	

TABLE 148 - Total Estimated Bank Fishing Catch Composition by Month

	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Percer
American Eel	-	14	41	18	19	7	53	-	-	-	-	152	.70
Blue Crabs	-	-	-	-	19	51	456	69	24	-	-	619	2.87
Bluefish	-	-	-	-	-	868	4615	5760	1952	-	-	13195	61.14
Cunner	-	18	55	96	-	-	-	-	-	-	-	169	.78
Kingfish	-	-	-	-	-	7	-	-	-	-	-	7	0.03
Northern Puffer	-	-	-	-	-	-	-	7	2	-	-	9	.04
Sea Bass	-	-	-	26	152	51	132	208	71	-	-	640	2.97
Sea Robin	-	-	-	-	-	96	921	139	47	-	-	1203	5.57
Shark	-	-	-	35	143	251	281	208	71	-	-	989	4.58
Spot	-	-	-	-	-	16	26	139	47	-	-	228	1.06
Striped Bass	-	-	-	-	-	-	-	26	9	-	-	35	0.16
Summer Flounder	-	-	-	78	333	890	1939	278	94	-	-	3612	16.73
Tautog	-	-	-	9	67	-	333	-	-	-	-	409	1.90
Weakfish	-	-	-	-	-	-	26	139	47	-	-	212	0.98
Winter Flounder	-	23	69	-	-	-	-	-	-	-	-	92	0.43
Other	-	-	-	9	-	-	-	-	-	-	-	9	0.04
Total	-	55	165	271	733	2237	8782	6973	2364	-	-	21580	99.98
Percent		0.25	.76	1.26	3.40	10.37	40.70	32.31	10.95			100.00	

TABLE 149 - Estimated Total Catch and Catch Per Effort for Bank, Boat and Combined Fishing.

Month	Bank		Boat		Combined	
	Catch	C/E	Catch	C/E	Catch	C/E
Feb.	0	0	0	0	0	0
March	55	0.03	No Interviews		55	0.03
April	165	0.16	No Interviews		165	0.16
May	271	0.07	No Interviews		271	0.07
June	733	0.11	24,535	0.60	25268	0.52
July	2237	0.30	13,494	0.20	15731	0.21
August	8782	0.79	42,900	0.58	51682	0.67
Sept.	6973	1.40	43,660	0.82	50633	1.21
Oct.	2364	1.28	No Interviews		6829	1.10
Nov.	0	0	0	0	0	0
Dec.	0	0	0	0	0	0
Feb. to Dec.	21548	0.60	129,054	0.64	150634	0.60

TABLE 150 - 1977 Commercial Landings for Atlantic County

Species	Harvest	
Fish	Pounds	Dollars
Alewives	4,500	265
Anglerfish	1,042	105
Bluefish	75,899	9,665
Bonito	30	6
Butterfish, Unclassified	7,454	1,950
Carp	-	-
Catfish	-	-
Cod	264	47
Croaker, Unclassified	6,878	1,337
Drum, Black	203	20
Eels, Common	8,060	3,002
Eels, Conger	930	174
Flounders, Blackback	10,735	1,900
Flounders, Fluke	374,008	185,000
Flounders, Gray Sole, Unclassified	3,758	944
Flounders, Sand	540	93
Flounders, Yellowtail, Unclassified	4,143	2,230
Haddock, Unclassified	-	-
Hake, Red	1,876	148
Hake, White, Unclassified	50	5
Herring, Sea	100	5
King Mackerel	-	-
King Whiting or "Kingfish"	-	-
Mackerel, Atlantic	3,073	352
Menhaden	445	18
Ocean Perch, Atlantic	-	-
Pollock	600	84
Scup or Porgy, Unclassified	133,693	35,461
Sea Bass, Unclassified	30,709	11,692
Sea Robin	765	38
Sea Trout, Grey	82,677	19,003
Shad	46,131	14,990
Sharks, Unclassified	569	66
Spot	461	48
Striped Bass	4,135	2,687
Sturgeon	12	2
Swordfish	189,252	358,890
Tautog	2,031	218
Tilefish	46,300	25,438
Tuna, Bluefin	-	-
Tuna, Little	125	9
Tuna, Skipjack	-	-
Tuna, Yellowfin	-	-
White Perch	13,110	3,358
Whiting	4,507	681
Unclassified for Food	1,771	692
Total Fish	1,060,836	680,623

TABLE 150 - (Continued)

Species	Harvest	
Shellfish	Pounds	Dollars
Crabs, Blue, Hard	20,680	8,022
Crabs, Blue, Soft and Peeler	-	-
Crabs, Rock	1,696	134
Lobsters, American, Unclassified	19,599	38,604
Clams, Hard (Meats)	431,900	591,992
Clams, Ocean Quahog (Meats)	875,970	264,708
Clams, Surf (Meats)	4,657,609	1,954,901
Conchs (Meats)	350	60
Oysters (Meats)	336	682
Scallops, Sea (Meats)	27,271	40,676
Squid	19,571	8,075
Turtles, Snapper	-	-
Total Shellfish	6,054,982	2,907,854
Grand Total	7,115,818	3,588,477

TABLE 151 - Estimated Total Harvest of Waterfowl on the Absecon-Reeds Bay Study Area, 1976-1977

Species	Estimated Harvest	Percent
Canada Goose	169	5.5
Snow Goose	570	18.6
Black Duck	1,535	50.1
Bufflehead	212	6.9
Shoveller	65	2.1
Mergansers	98	3.2
Green-winged teal	81	2.6
Mallard	107	3.5
Blue-winged teal	9	0.3
Baldpate	81	2.6
Pintail	98	3.2
Scaup	16	0.5
Gadwall	16	0.5
Redhead	9	0.3
Total:	3,064	99.9

Estimated Man-days Hunting - 2,546
Harvest Birds/Hunter Day:

Ducks - 0.84
Canada Geese - 0.04
Snow Geese - 0.45

TABLE 152 - Trapper Harvest, 1975-1976

County	Man-days
Atlantic	7,783

Harvest - Atlantic County

Muskrat - 14,201	Avg. Value/Pelt - 3.75	Tot. Value -	$53,254
Raccoon - 263	Avg. Value/Pelt - 17.00	Tot. Value -	4,471
Red Fox - 10	Avg. Value/Pelt - 45.00	Tot. Value -	450
Opposum - 20	Avg. Value/Pelt - 1.50	Tot. Value	30
Beaver - 17	Avg. Value/Pelt - 18.00	Tot. Value	306
		Total:	$98,511

TABLE 153 - Estimated Expenditures of Bank Fishermen by Month and Major Expenditure Category

Month	No. Fishermen	Bait	Food	Daily Equipment Cost	Travel Miles at $0.17/mile	Total Expenditures
Feb.	5	5.10	3.65	3.70	19.75	32.20
March	247	299.52	180.31	179.93	974.61	1634.37
April	751	700.60	548.23	285.38	3856.98	5391.19
May	1676	2098.23	1223.48	1508.40	9991.51	14821.62
June	2926	4043.81	2129.29	1606.55	10027.70	17807.35
July	2663	2209.58	1943.99	2788.66	16379.56	23321.79
August	4062	3611.89	2965.26	3743.15	22097.28	32417.58
Sept.	1599	1286.50	1167.27	397.78	9071.07	11922.62
Oct.	542	496.79	395.66	135.50	214.99	1242.94
Nov.	8	3.80	5.84	.61	61.88	72.13
Dec.	0	-	-	-	-	-
Total:	14479	14755.82	10562.98	10649.66	72695.33	108663.79
Percent:		13.58	9.72	9.80	66.90	100.00
Average Daily Per Man Expenditure		1.02	.73	.74	5.02	7.51

TABLE 154 - Estimated Expenditures of Boat Fishermen by Month and Major Expenditure Category

Month	No. Fishermen	Bait	Food	Gas & Oil for Boat	Daily Equip-ment Rental	Daily Equip. Cost	Travel-Miles at $0.17/mile	Total Exp.
Feb.	62	47.74	143.22	98.58	119.66	406.72	243.66	1059.58
March	295	227.15	681.45	469.05	569.35	1935.20	1159.35	5041.55
April	661	858.44	1526.91	1050.99	1275.73	4335.16	2597.73	11644.96
May	3230	2487.10	7461.30	5135.70	62333.90	21188.80	12693.90	55200.70
June	14101	10152.72	32432.30	40610.88	19917.66	88836.30	44074.28	236024.14
July	14979	13106.63	34601.49	23816.61	28909.47	145146.51	47363.60	292944.31
August	12340	9008.20	28382.00	6663.60	31467.00	38871.00	88107.60	202499.40
Sept.	4728	3167.76	11110.80	2506.54	8621.65	29739.12	1836.28	56982.15
Oct.	970	746.90	2240.70	1542.30	1872.10	6363.20	3812.10	16577.30
Nov.	57	43.89	131.67	90.63	110.01	373.92	224.01	974.13
Dec.	24	18.48	55.44	38.16	46.32	157.44	94.32	410.16
Total:	51447	39865.01	118767.28	82023.04	99142.85	337353.37	202206.83	879358.38
Percent:		4.53	13.51	9.33	11.27	38.36	22.99	99.99
Daily Per Man Expenditure		.77	2.31	1.59	1.93	6.56	3.93	17.09