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1974 YEAR CLASS REPORT
 FOR THE
 MULTIPLANT IMPACT STUDY
 OF THE
 HUDSON RIVER ESTUARY
 VOLUME III
 LOWER ESTUARY STUDY

MAY 1977

Prepared under contract with
**CONSOLIDATED EDISON COMPANY
 OF NEW YORK, INC.**

4 Irving Place
 New York, New York 10003

Jointly financed by

Consolidated Edison Company of New York, Inc.
 Orange and Rockland Utilities, Inc.
 Central Hudson Gas and Electric Corporation

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SECTION I
INTRODUCTION

The 1974-1975 Lower Estuary Study was designed to complement the sampling effort associated with the Multiplant Impact Study of the Hudson River estuary. Its primary purpose was to provide a recapturing effort in the extreme lower estuary (bays) below the Hudson River for striped bass, white perch, and Atlantic tomcod marked within the confines of the river. It was suspected that these species, being anadromous or semianadromous, may leave the river during the course of a mark/recapture program (August through June). Therefore, by sampling the lower estuary, a more representative survey for marked individuals in the Hudson River based populations would be achieved because emigrants from the main study area (George Washington Bridge to Troy Dam) could be collected. Marking striped bass and white perch and recapturing them within the areas sampled in the lower estuary additionally aided population estimation or analysis of movements. Also, an intensive and fairly extensive survey of the Marine District of New York near the mouth of the Hudson River allowed inferences concerning the timing and extent of possible movement of the three key species from the Hudson River. Consideration was given to the effect of these movements on the impact of Hudson River power plant operation on the river based populations.

While collecting data on the occurrence of the three key species, additional data were gathered on the total fish species composition in the major areas studied in the lower estuary. Many of the species found were anadromous, particularly the American shad and blueback herring (Clupeidae) which, like the striped bass, white perch, and Atlantic tomcod, may have originated in the Hudson River.



SECTION II

MAJOR STUDY AREAS

The Hudson River's extreme lower estuary encompasses a large area with a great diversity of aquatic habitats. Estuarine waters, at least indirectly influenced by the Hudson River, involve much of the New York Bight, particularly from northern New Jersey to the eastern tip of Long Island. Within this region are open coastlines with heavy surf and saline water; ocean inlets with strong tidal currents; bays varying in salinity and exposure to currents and wave action; and rivers, marshlands, and mud flats. Because of its proximity to metropolitan New York and other cities, the area is heavily populated and industrialized; consequently, man's activity, particularly water pollution, plays an important role in the habitability of much of the aquatic environment. The increased salinity, the productivity typical of estuarine systems, and the diversity of habitat contribute to make the lower Hudson River estuary an important nursery area for anadromous species such as the striped bass.

Areas for study were chosen on the basis of proximity to the mouth of the Hudson River, logistical suitability for sampling with fisheries gear, and location relative to tracing directional movements of fish possibly emigrating from the Hudson River. In the several major study areas (Figure II-1), habitat types include Long Island Sound and its adjoining harbors and bays, the open coastline of Staten Island, the brackish water of the Hackensack River, and the protected beaches and intricate channels of Jamaica Bay. A brief description of each major study area follows.

A. LITTLE NECK BAY

Little Neck Bay, which is at the western end of Long Island's north shore where the East River and Long Island Sound meet (Figure II-1), is a small, shallow body of water. Depths are rarely over 20 ft (6.1 m) at the mouth. There are tidal flats at the head of the bay, and the bottom type is mud. The shoreline is rocky at the mouth, and the head of the bay is marsh. There are



few sandy beaches. The opening to Long Island Sound is only about a mile wide, so the bay is well protected and the waters usually calm. Several freshwater streams and ponds empty into the bay.

Little Neck Bay is extensively developed. Boat moorings occupy much of the surface area, while houses and roads line the shore. The only open space is the marsh at the head of the bay and a beach area that is separated from houses by a steep cliff on the eastern shore.

Weekly mean water conductivities measured during July-December 1974 and March-July 1975 ranged widely from a high of 40 mmho/cm in November 1974 to a low of 27 mmho/cm in June 1975 (Figure II-2); equivalent salinity values (TI, 1975) are 26 ‰ and 17 ‰ respectively. Weekly mean water temperatures varied during the sampling period from 24.8°C in August 1974 to 2.8°C in March 1975. Appendix Table A-1 contains the conductivity and temperature data.

B. MANHASSET BAY

Manhasset Bay, which lies east of Little Neck Bay (Figure II-1) between Great Neck and Manhasset Neck, is very similar to Little Neck Bay: it is shallow and protected from wave action by a narrow mouth; the bottom is mud and sand; and the shoreline is rocky and sandy at the mouth, with mud flats and marshland as the bay narrows farther inland. Several streams and ponds supply an inflow of fresh water into Manhasset Bay. Also, the bay is extensively developed with many marinas, boat moorings, a seaplane base, oil-tank farms, housing, and roadways.

During the study intervals of July-December 1974 and March-July 1975, weekly mean water conductivities ranged from a high of 41 mmho/cm (27 ‰ salinity) in November 1974 to a low of 26 mmho/cm (16 ‰ salinity) in July 1974 (Figure II-3). The highest weekly mean water temperature was 24.9°C in August 1974; the lowest was 2.9°C in March 1975. Appendix Table A-2 contains the conductivity and temperature data.

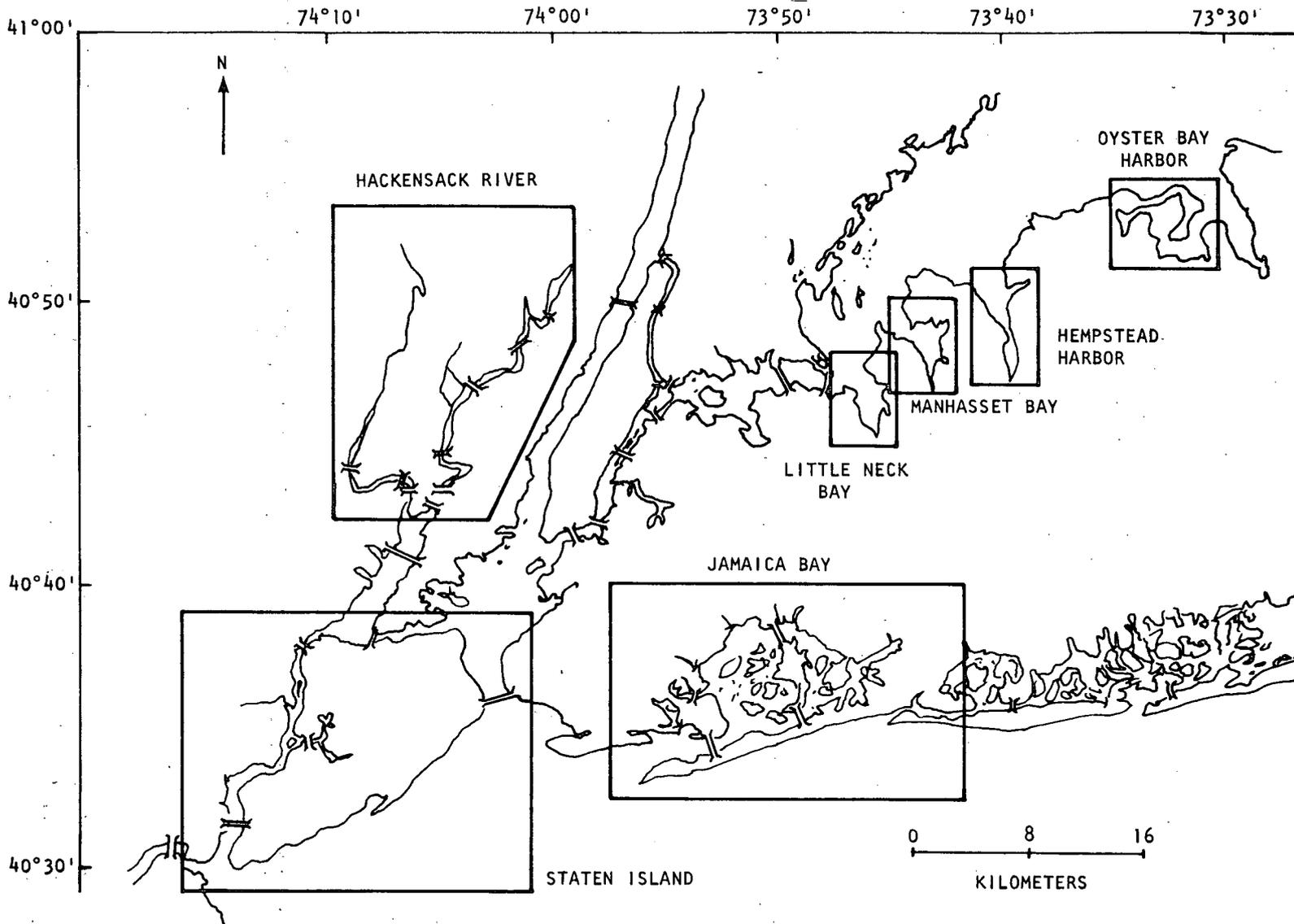


Figure II-1. Major Areas Surveyed in Lower Estuary Study

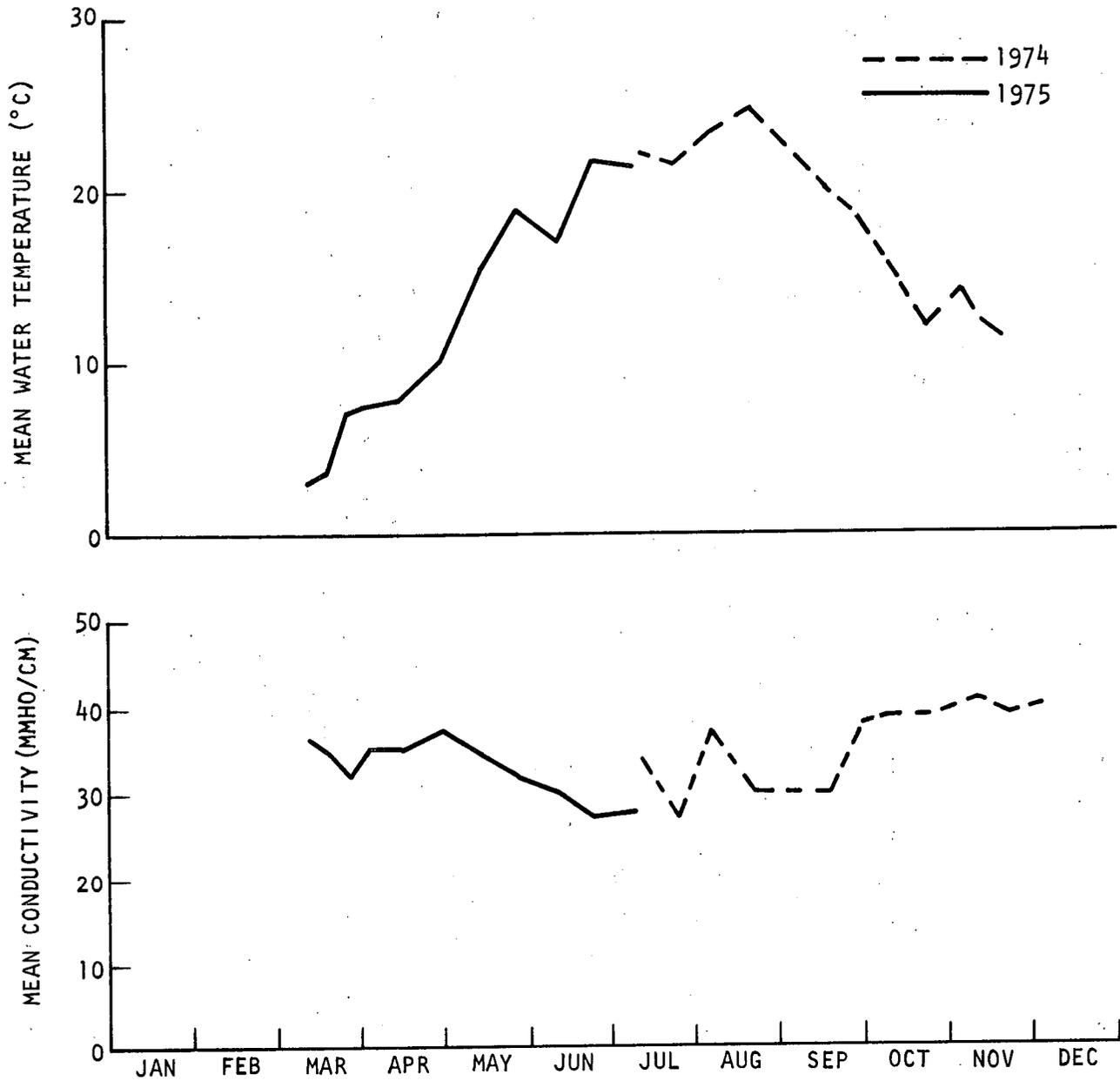


Figure II-2. Mean Water Temperature and Conductivity (Adjusted to 25°C) in Little Neck Bay, July-December 1974 and March-July 1975

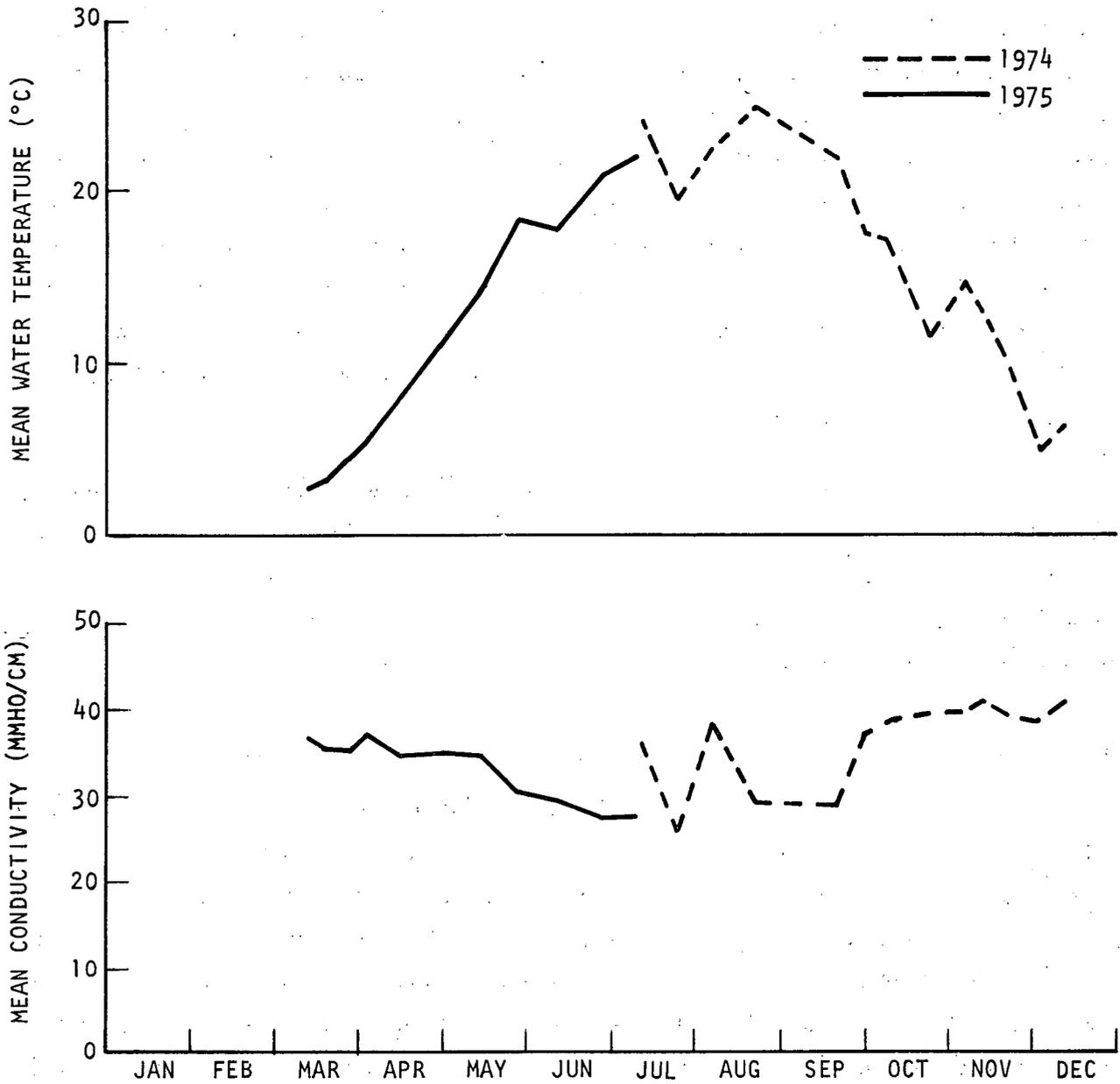


Figure II-3. Mean Water Temperature and Conductivity (Adjusted to 25°C) in Manhasset Bay, July-December 1974 and March-July 1975



C. HEMPSTEAD HARBOR

Directly east of Manhasset Bay is Hempstead Harbor, a larger funnel-shaped bay with a wide mouth. It is deeper at the mouth than Little Neck and Manhasset bays, but the head of the bay is shallow. The bottom is rocky toward the Sound, with mud flats farther in. The shoreline is rocky or sandy at the mouth, with a marsh area at the head. One large creek (Glen Cove Creek) and a few smaller streams flow into Hempstead Harbor. As with most of the other bays studied on Long Island's north shore, Hempstead Harbor is extensively developed: the shoreline has houses, swimming beaches, a power plant, a quarry, a marina, boat moorings, a tugboat dock, and an incinerator. However, much of the marsh at the head of the bay is undeveloped, and sheer cliffs sometimes separate the shoreline from the houses.

Weekly mean water conductivities during August-December 1974 and March-July 1975 ranged from 41 mmho/cm (26 ‰ salinity) in December 1974 to 27 mmho/cm (18 ‰ salinity) in June 1975 (Figure II-4). Weekly mean water temperatures went from a high of 24.1°C (August) to a low of 3.0°C (March). Conductivity and temperature data appear in Appendix Table A-3.

D. JAMAICA BAY

Jamaica Bay, which is on the southwestern end of Long Island (Figure II-1), is large but very shallow except where a channel has been dredged. The bottom is mud while the shoreline is mostly sand. The waters are sheltered by a barrier beach and connected to Lower New York Bay by a narrow inlet. The bay is circular in shape, with many hassocks and islands at its center, and there are few tributaries into it. Jamaica Bay is marked by isolated development: Kennedy International Airport borders it to the northeast, and a landfill and apartment housing border it to the northwest and south. However, much of the perimeter and most of the interior, except for the community of Broad Channel, remain undeveloped as part of Gateway National Park.

During July-November 1974 and April-June 1975, weekly mean water conductivity ranged from a high of 42 mmho/cm (26 ‰ salinity) in November 1974

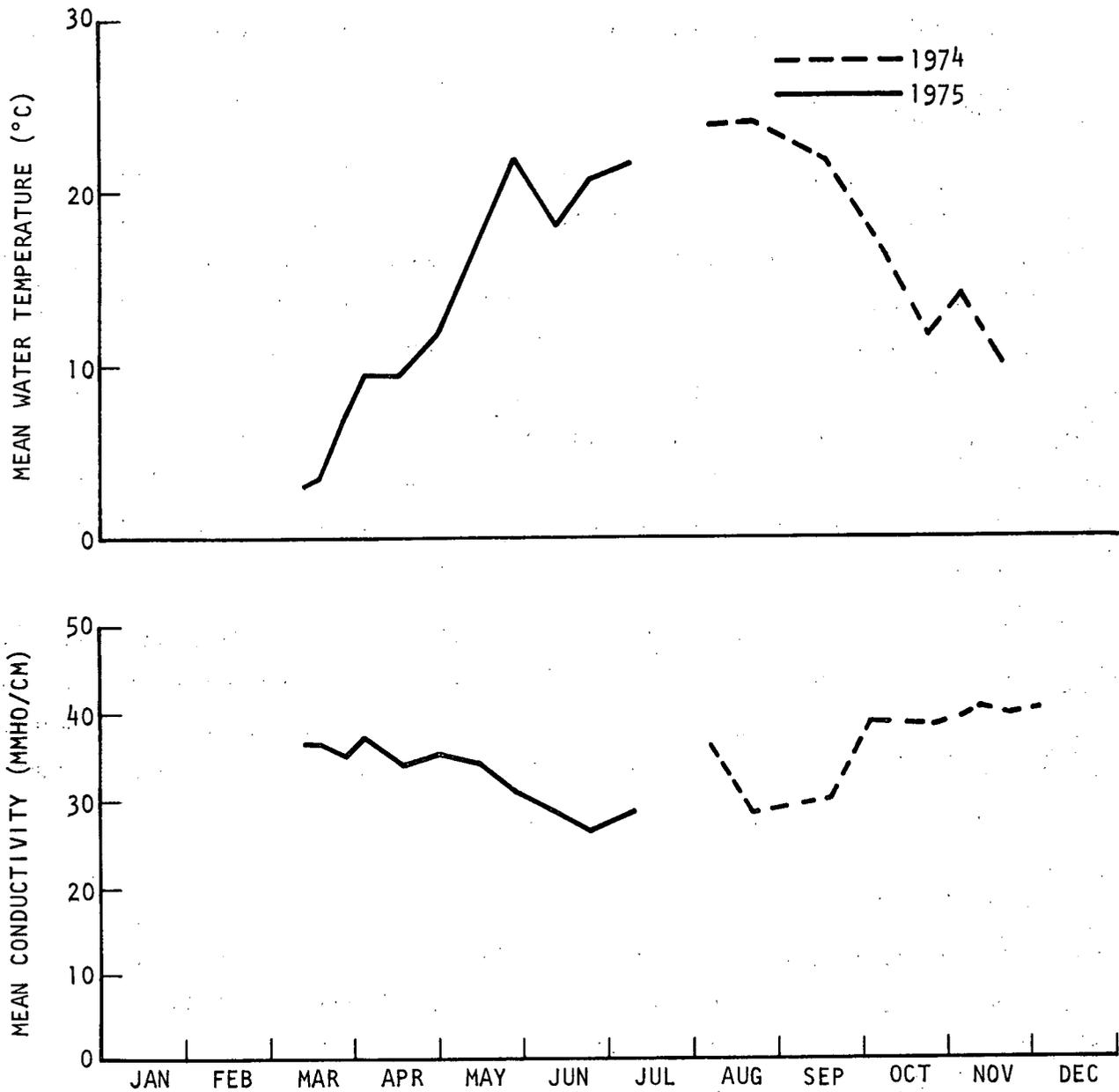


Figure II-4. Mean Water Temperature and Conductivity (Adjusted to 25°C) in Hempstead Harbor, August-December 1974 and March-July 1975



to a low of 28 mmho/cm (18 ‰ salinity) in June 1975 (Figure II-5). Weekly mean water temperatures ranged from 25.2°C in August to 3.8°C in April. Appendix Table A-4 contains the conductivity and temperature data.

E. STATEN ISLAND

Sampling included the eastern shoreline of Staten Island below the Verrazano Narrows Bridge, as well as adjacent waters (Figure II-1). The shoreline is exposed to the Atlantic Ocean from the Verrazano Narrows to Wards Point and consists almost entirely of sandy beaches except inside Great Kills Harbor where there are mud flats. Water depth is shallow along the shoreline and shoals but increases toward Raritan Bay to the south. The bottom is muddy. Only a few creeks empty into the waters off Staten Island. Development of the shoreline is scattered: a factory and several houses line the beach, but primarily the shoreline comprises swimming beaches. The only marinas are in Great Kills Harbor.

During July-November 1974 and April-June 1975, weekly mean water conductivities ranged from 40 mmho/cm (25 ‰ salinity) in October to 21 mmho/cm (12 ‰ salinity) in June (Figures II-6 and II-7). Weekly mean water temperatures ranged from 23.2°C in August to 6.7°C in April. Conductivity and temperature data are presented in Appendix Tables A-5 and A-6.

F. HACKENSACK RIVER

The Hackensack River is a narrow tidal estuary flowing into Newark Bay (Figure II-1). The sampling area is near the Hackensack Meadowlands in the vicinity of Secaucus, New Jersey. A deep channel has been dredged in the middle of the river, but the shoreline is shallow. The bottom is mud; the shoreline is mostly marsh with few beaches suitable for seining. Where sampling occurred, the river separates industrial and residential development on its eastern shore from the meadowlands to the west. The area is interlaced with railways and superhighways, including the New Jersey Turnpike. Solid waste disposal and landfill operations scar much of the landscape and have changed the topography considerably. Oil pollution is particularly noticeable

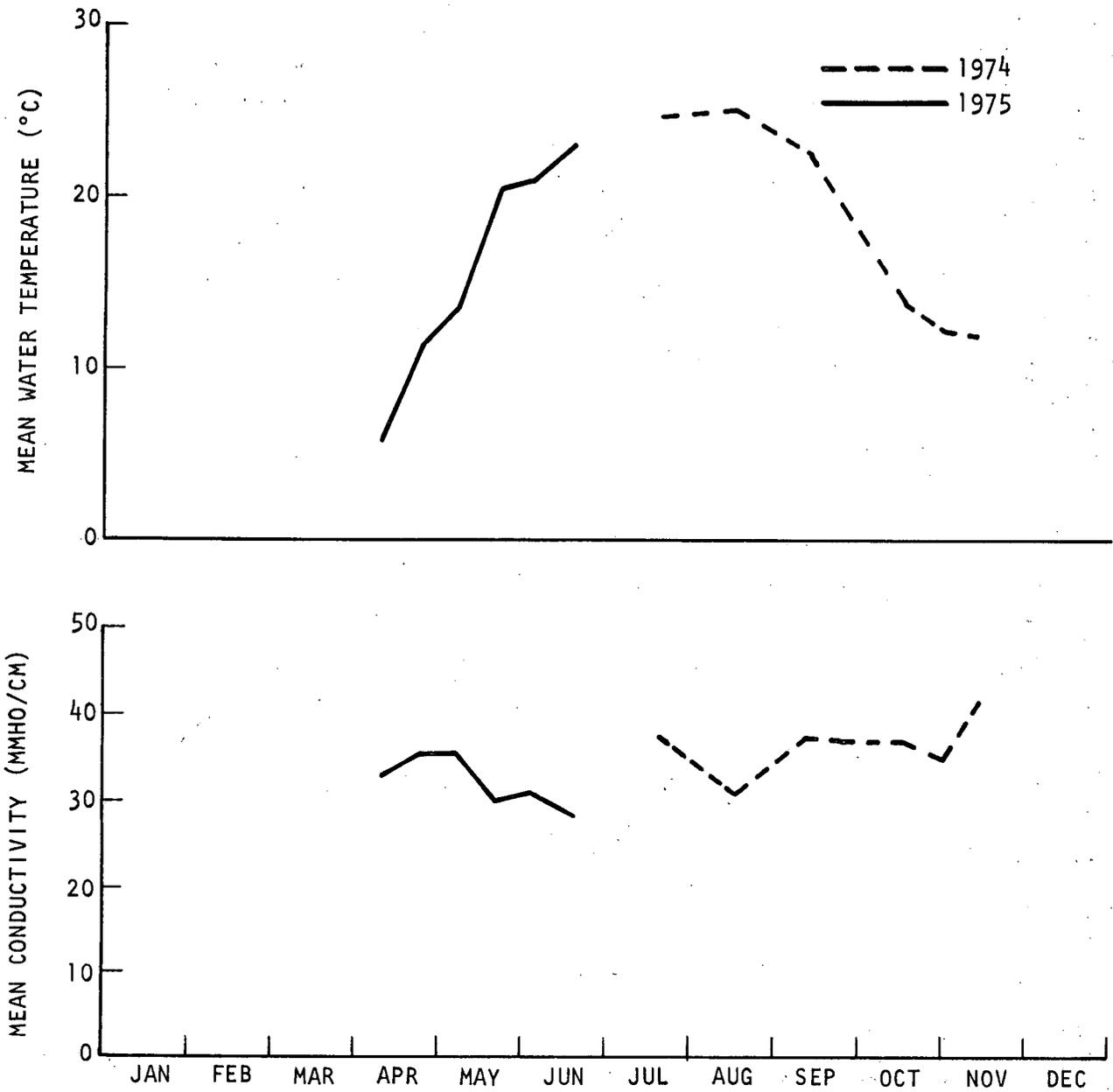


Figure II-5. Mean Water Temperature and Conductivity (Adjusted to 25°C) in Jamaica Bay, July-November 1974 and April-June 1975

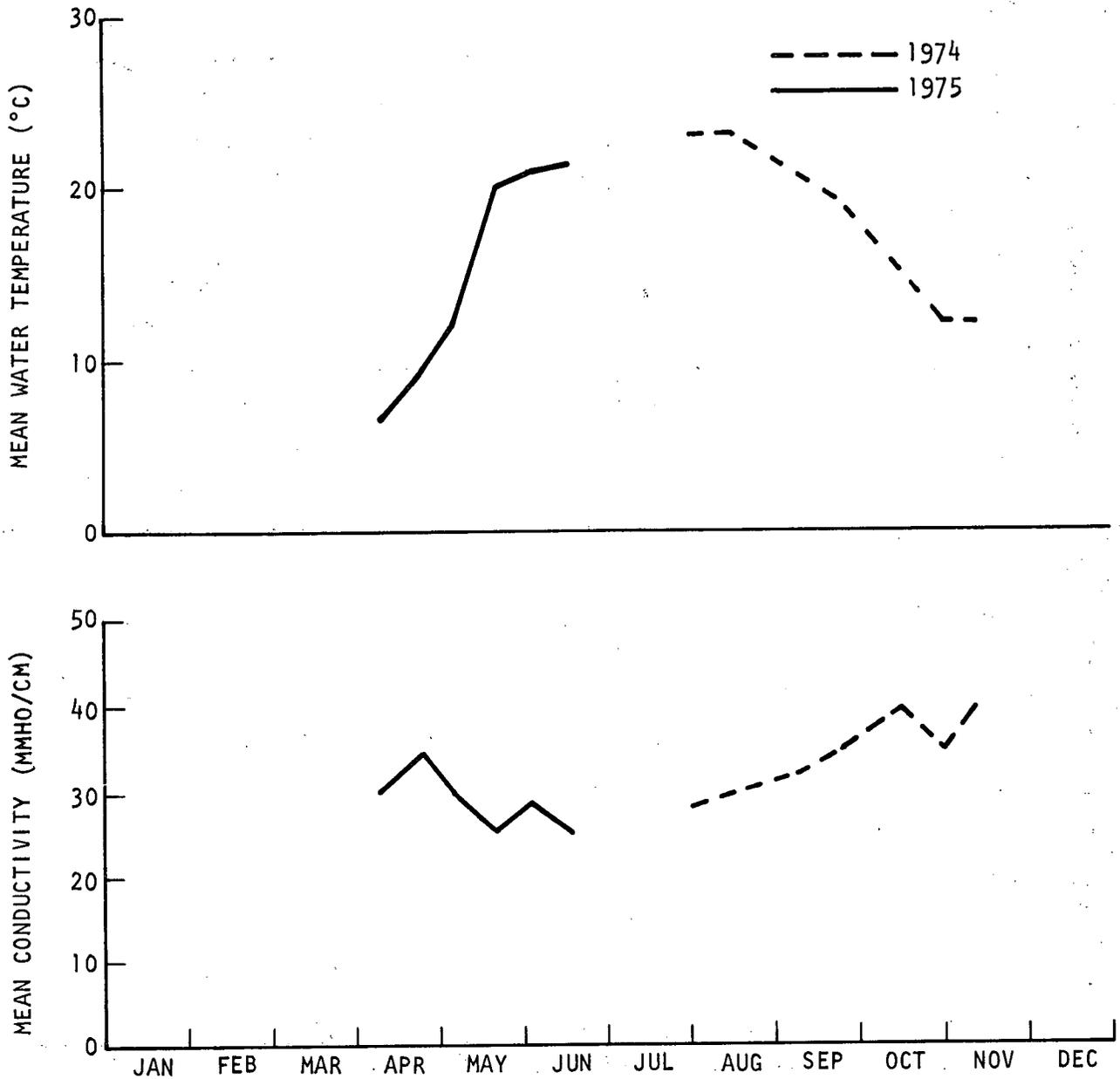


Figure II-6. Mean Water Temperature and Conductivity (Adjusted to 25°C) in Northeastern Staten Island, July-November 1974 and April-June 1975

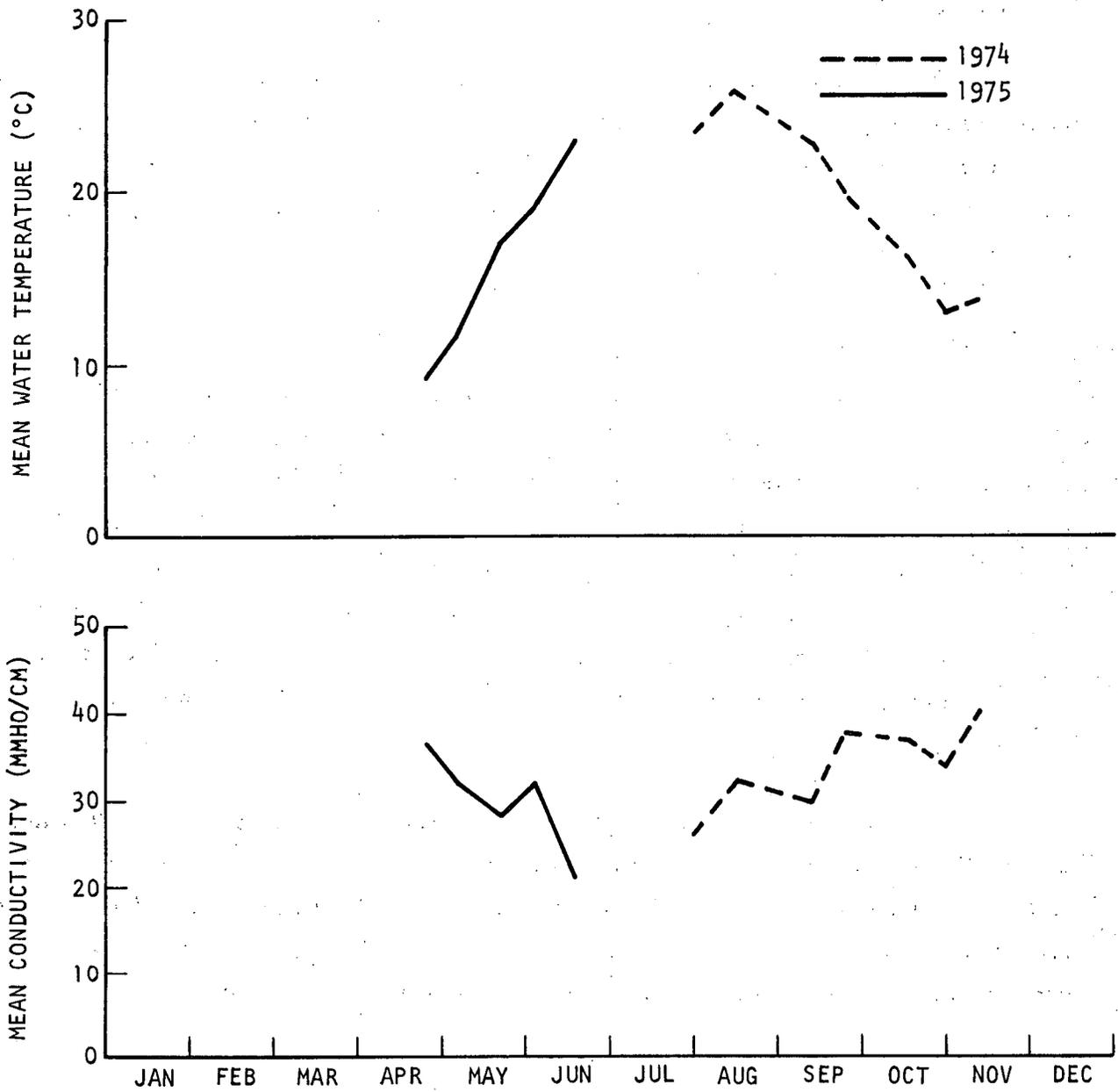


Figure II-7. Mean Water Temperature and Conductivity (Adjusted to 25°C) along Southeastern Staten Island, July-November 1974 and April-June 1975



in the water and sediments. Salinity fluctuations in the study area are moderated by the diversion of much of the freshwater discharge from the Oradell Dam to reservoirs.

During the sampling interval of May-June 1975, daily mean water conductivities ranged from a high of 11 mmho/cm (6 ‰ salinity) in May to a low of 6 mmho/cm (4 ‰ salinity) in June (Figure II-8). Mean water temperatures ranged from 23.0°C to 22.0°C. Appendix Table A-7 contains the conductivity and temperature data.

G. OYSTER BAY HARBOR

Oyster Bay Harbor, an S-shaped cove emptying into Long Island Sound on the north shore of Long Island to the east of Hempstead Harbor (Figure II-1), represents the easternmost area sampled on Long Island Sound. This relatively clean, undeveloped body of water serves as a wildlife refuge. Mill Neck Creek, where the most samples were taken, is the western arm of the harbor; its shoreline is primarily marsh with a mud bottom. The harbor's main body is lined with beaches and is of moderate depth. There is little residential development and no industrial development; however, some oyster dredging is done in the main body of the harbor.

Oyster Bay Harbor was sampled only twice, once in November 1974 and once in May 1975; during those samplings, mean water conductivities for November and May were 40 mmho/cm (25 ‰ salinity) and 37 mmho/cm (23 ‰ salinity) respectively, while mean water temperatures were 9.6°C and 17.9°C respectively. Conductivity and temperature data appear in Appendix Table A-8.

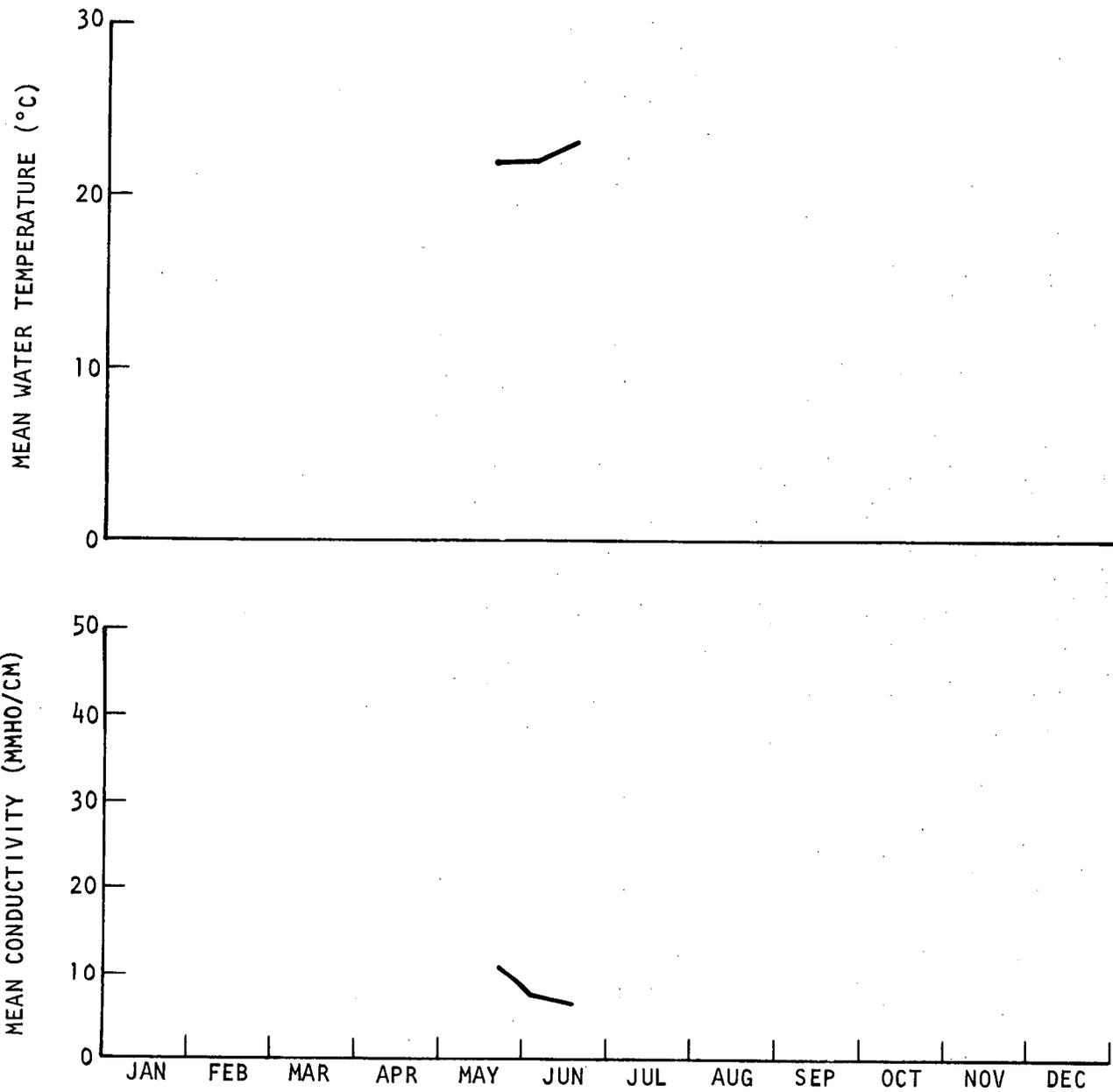


Figure II-8. Mean Water Temperature and Conductivity (Adjusted to 25°C) in Hackensack River during May-June 1975



SECTION III

METHODS

A. INTRODUCTION

Field sampling for the Lower Estuary Study began in July 1974, continued until December when weather conditions no longer permitted sampling, and was resumed in March 1975, with the final sampling occurring in mid-July 1975. By sampling for a complete year (July to July), the spatial and temporal distribution of each fish species could be monitored on an annual basis, with particular reference to the appearance of the 1973 and 1974 year classes.

Greatest emphasis was on sampling in the shore zone of the major study areas (Section II). Sites or stations for sampling with haul seines, bottom trawls, epibenthic sleds, or other gear were identified by number and used repeatedly for standardization of results. These sites were first picked largely because of their accessibility; through time, however, a few sites were dropped or added on the basis of the catch of striped bass, white perch, and Atlantic tomcod. Since the principal objective of the Lower Estuary Study was to recover the maximum number of individuals of those species, a deliberate bias was created in favor of their occurrence in the catch. However, data were collected on the occurrence of all fish species in each major study area.

The gear and procedures used in 1974 and in 1975 are described in the remainder of this section.

B. 1974 FIELD PROCEDURES

1. Haul Seining

The shore zone in the study areas was sampled with a 200-ft (61-m) haul seine composed of two 90-ft (27-m) wings 10 ft (3 m) deep with 0.375-in. (9.5-mm) mesh and 20-ft (6-m) bunt 12 ft (3.7 m) deep with 0.25-in. (6.4-mm) delta mesh. The seine was set from a dory in a semicircular pattern starting and ending approximately 50 ft (15 m) from the beach. Once set, the jack lines and net were hauled onto the beach by a 4-man crew.

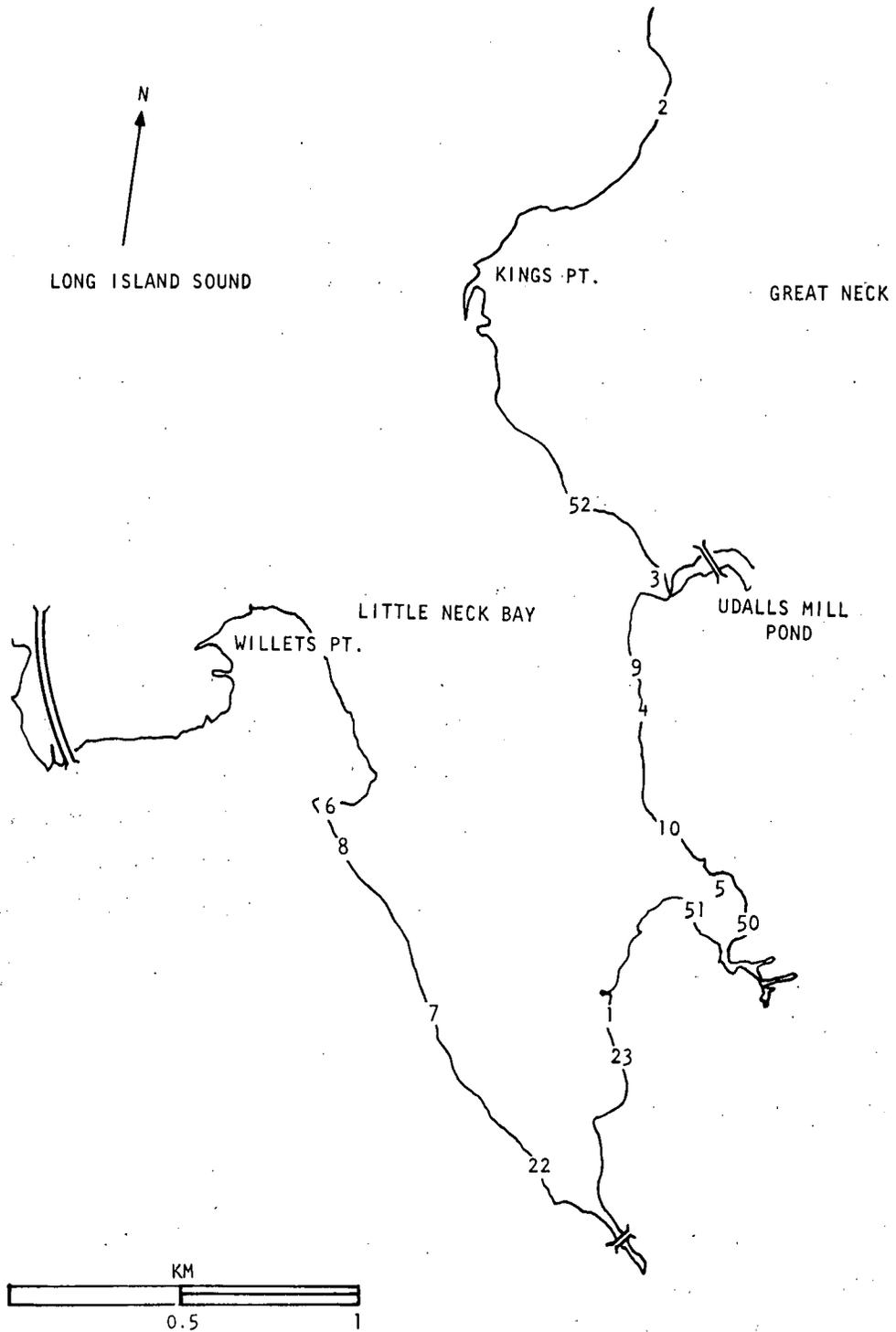


Figure III-1. Haul Seining Sites in Little Neck Bay, 1974 and 1975



All fish were sorted by species and life stage (if possible) and counted. Life-stage divisions included larval, juvenile (young-of-the-year), subadult, and adult. Fish were assigned to a life stage according to length divisions derived from a continuous monitoring of growth by age groups (TI, 1972) as part of the TI Hudson River fisheries program. Striped bass and white perch could be assigned to an additional life stage, yearlings. Species, primarily marine, not under study in the Hudson River (TI, 1975a) were assigned to life stages according to age/length relationships given in the literature. Life stage identification by the literature method was less exact; for some species, there was no differentiation between subadults (older than young-of-the-year but immature) and adults (sexually mature). Samples of each species were preserved in 10% formalin and kept in a reference collection for positive identification.

Sampling in Little Neck Bay, Manhasset Bay, and Jamaica Bay began in July 1974; thereafter, each of these regions was sampled approximately bi-weekly until the third week of November. In August 1974, Staten Island and Hempstead Harbor were added to the areas sampled biweekly. Three areas were sampled only once each: Eastchester Bay (Hutchinson River) in July, the East River (one site in Little Neck Bay) in October, and Oyster Bay Harbor in November. During 1974, 12 sites (1 through 10 and 22 and 23) were sampled in Little Neck Bay (Figure III-1), 13 (sites 1 through 13) in Manhasset Bay (Figure III-2), 12 (sites 1 through 8 and 29 through 32) in Hempstead Harbor (Figures III-3 and III-4), 26 (sites 1 through 26) in Jamaica Bay (Figure III-5), 13 (sites 1 through 13) on Staten Island (Figure III-6), and 9 (sites 1 through 9) in Oyster Bay Harbor (Figure III-7).

2. Trawling

The shoals and channels in four of the major study areas were sampled with an otter trawl or a 1-m² epibenthic sled fitted with a 3000- μ plankton net. These gear have been described in a previous report (TI, 1975a). A 40-ft (12-m) converted Maine lobster boat towed them in a stern-trawling manner against the current for 5 min (some experimental tows were longer) at

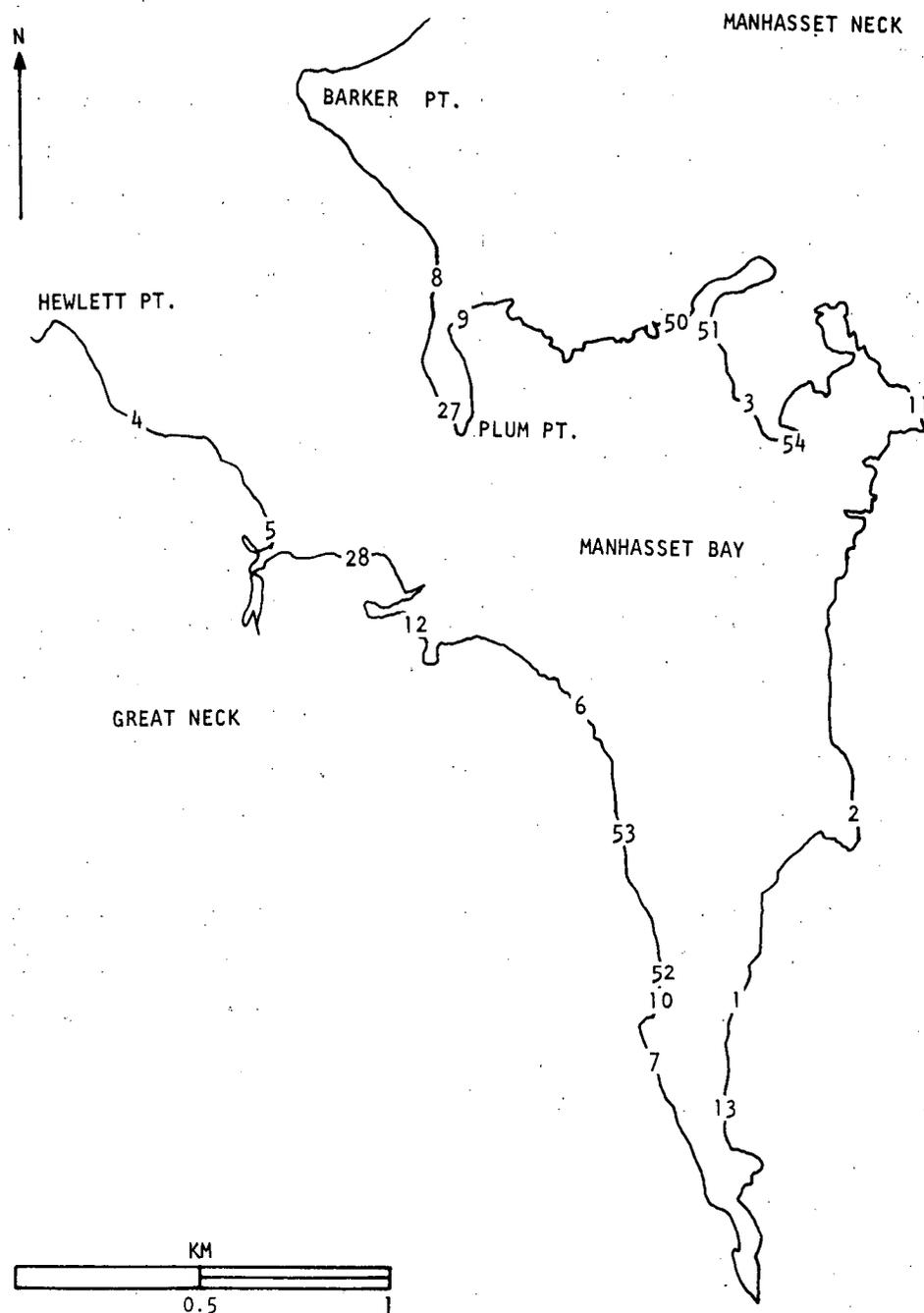


Figure III-2. Haul Seining Sites in Manhasset Bay, 1974 and 1975

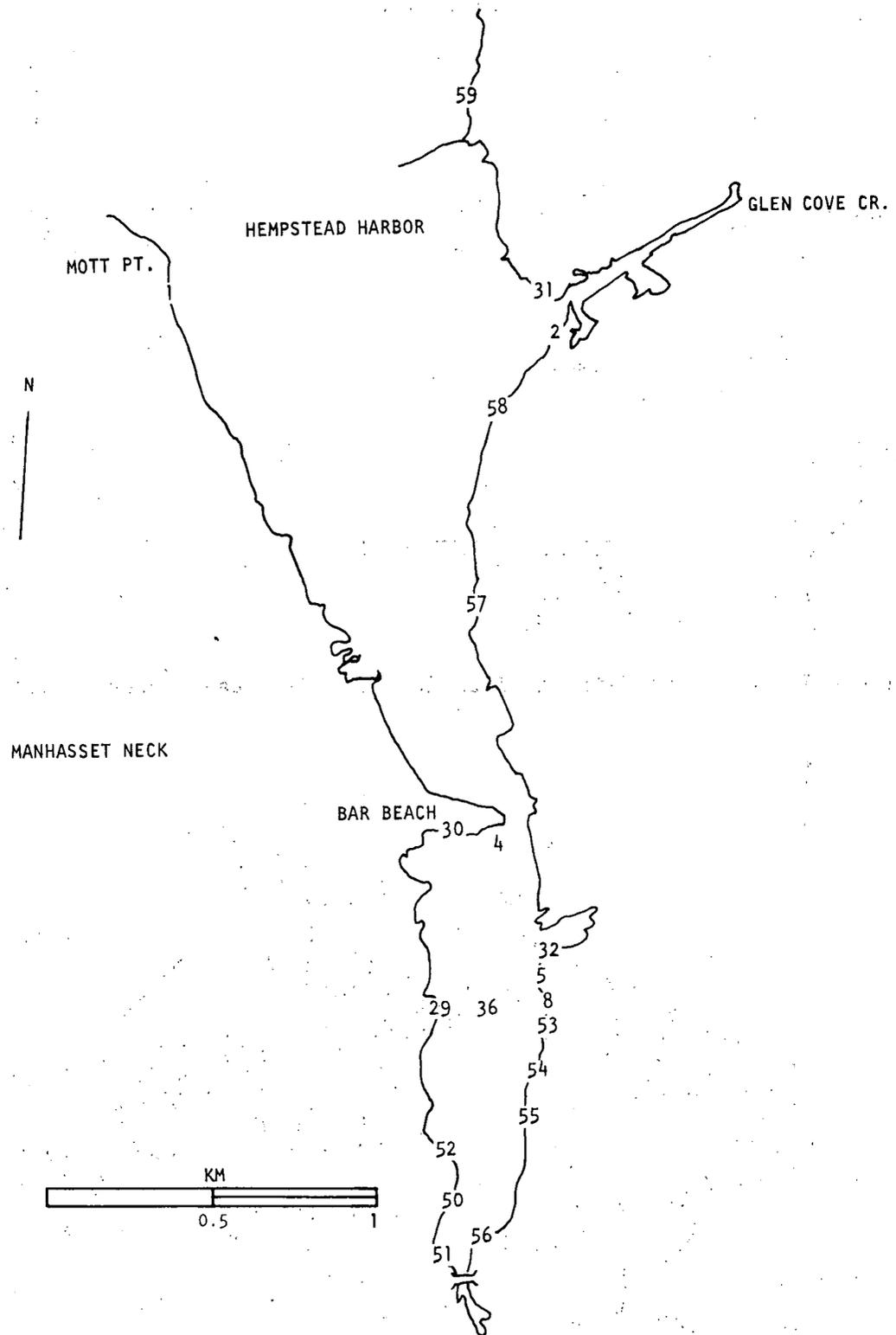


Figure III-3. Haul Seining Sites in Inner Hempstead Harbor, 1974 and 1975

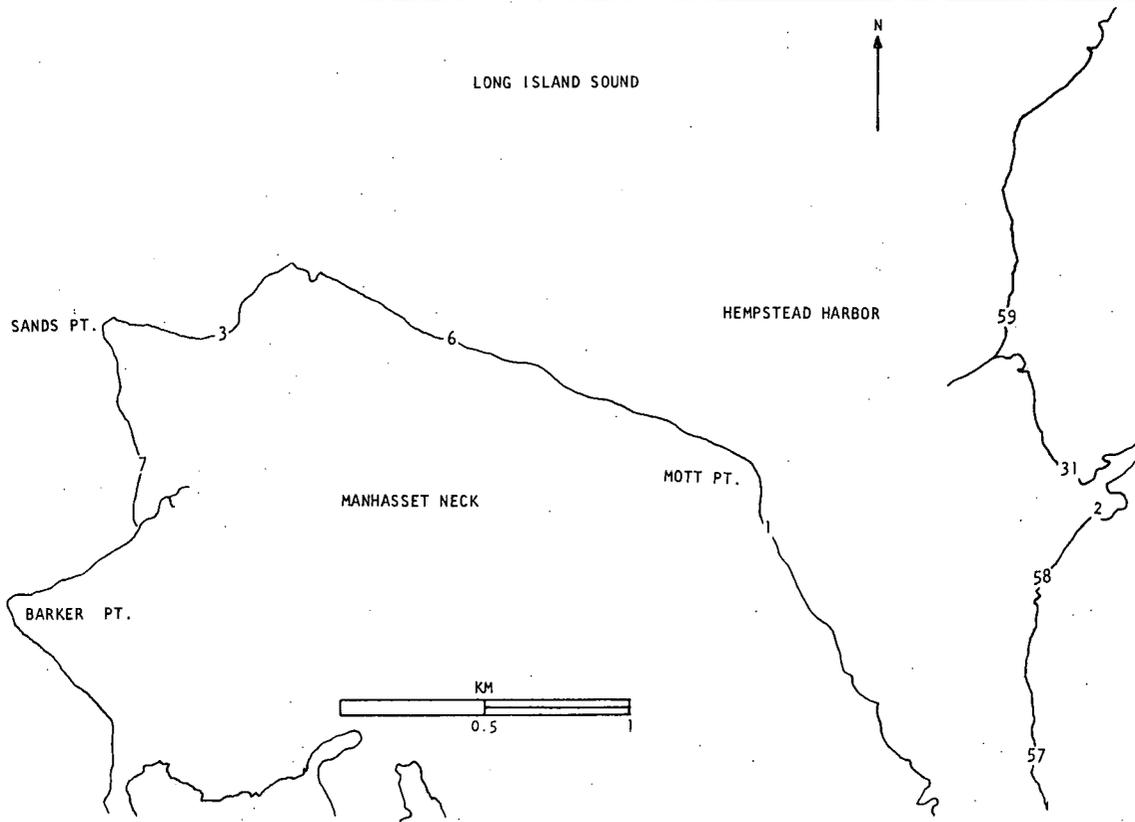


Figure III-4. Haul Seining Sites in Outer Hempstead Harbor, 1974 and 1975

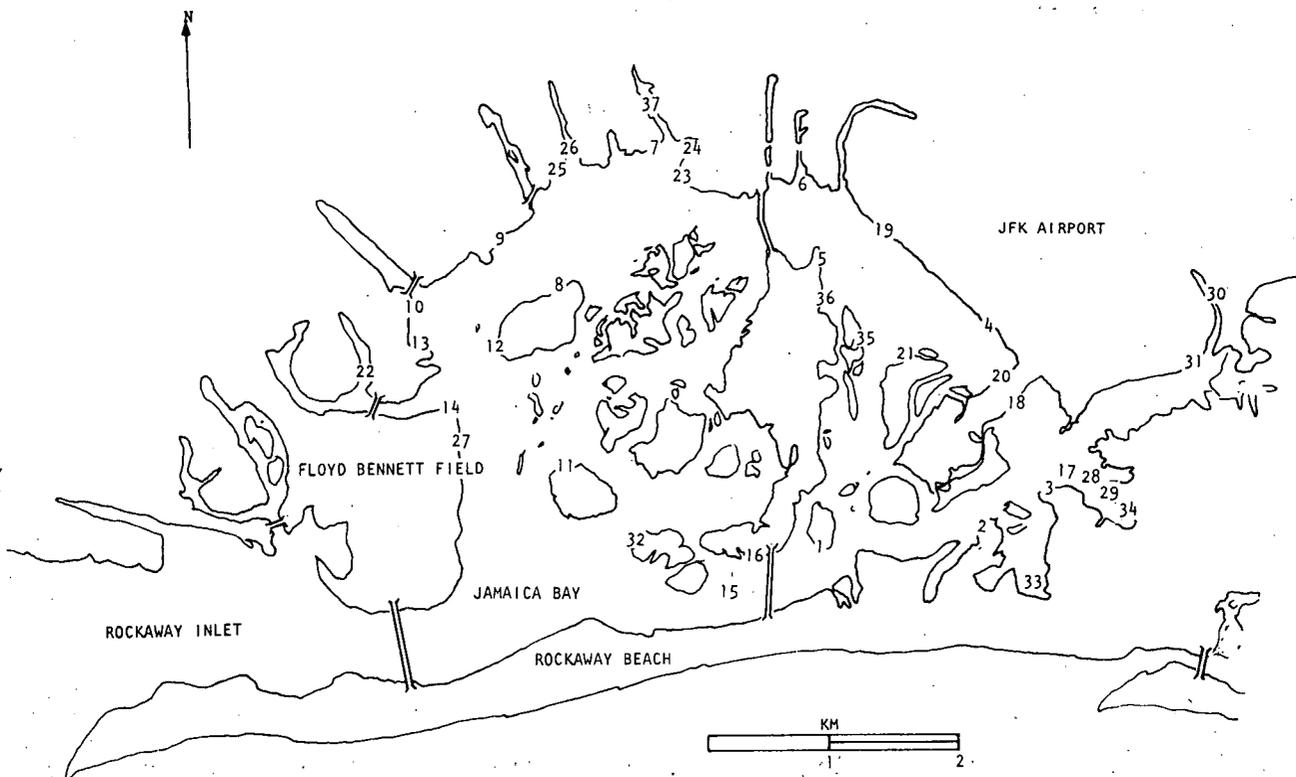


Figure III-5. Haul Seining Sites in Jamaica Bay, 1974 and 1975

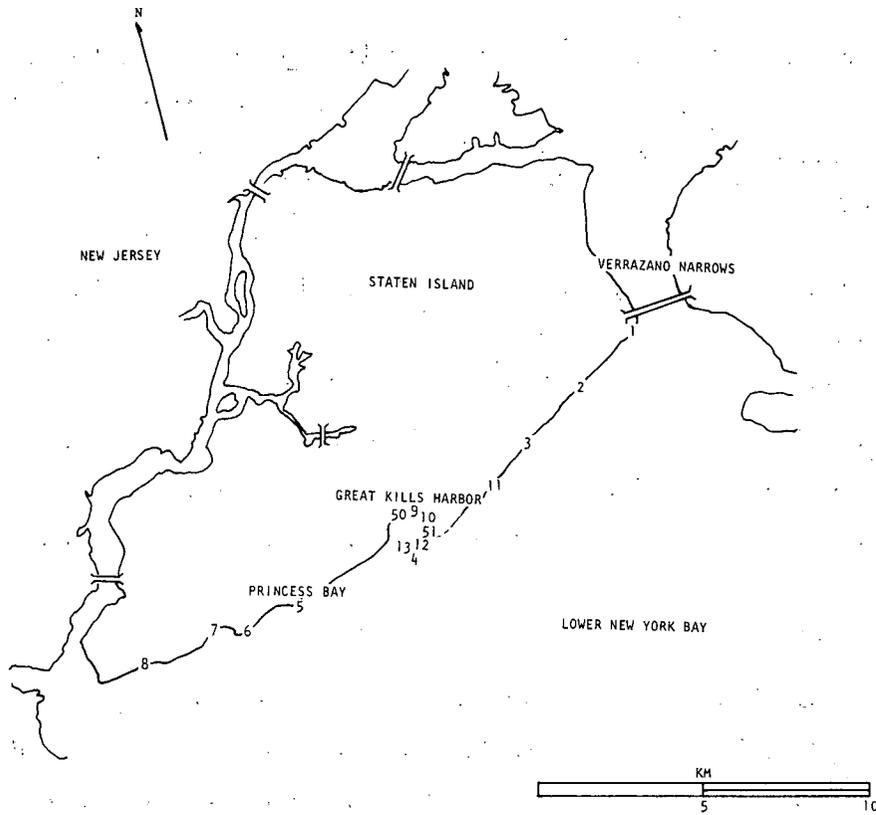


Figure III-6. Haul Seining Sites on Staten Island, 1974 and 1975

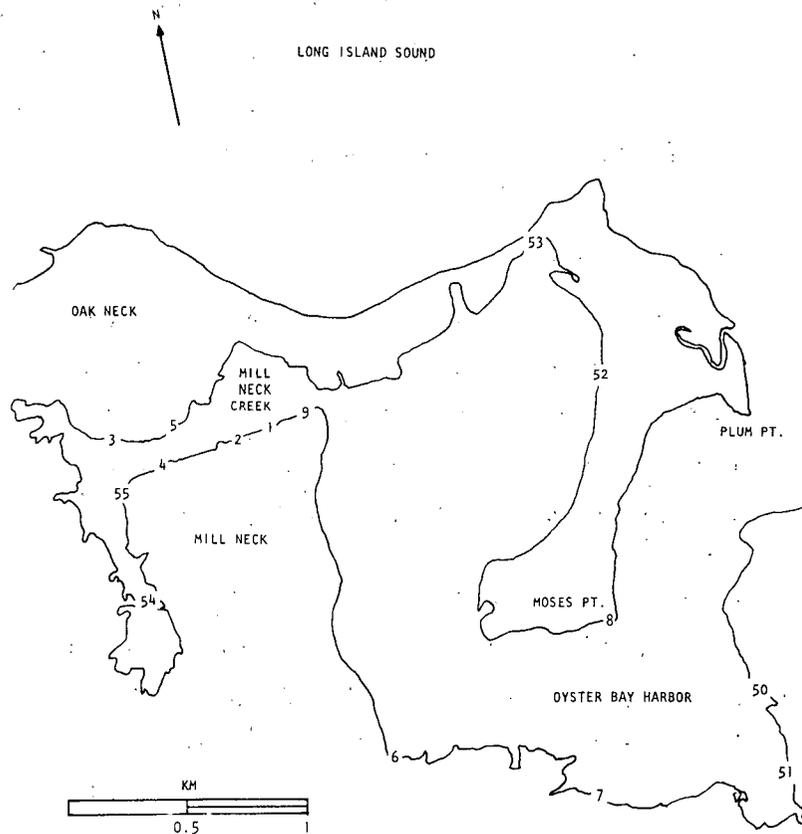


Figure III-7. Haul Seining Sites in Oyster Bay Harbor, 1974 and 1975



speeds ranging from 0.7 to 1.5 m/sec. A minimum cable length:depth ratio of 3:1 was maintained. All fish caught were sorted by species and life stage and counted. Methods for life stage determination were the same as for fish caught by haul seine.

Standard trawling stations included 12 in Little Neck Bay, Long Island Sound directly to the north, and Eastchester Bay (Figure III-8); 14 in or near Manhasset Bay (Figure III-9); 22 in Hempstead Harbor and Long Island Sound (Figure III-10); 12 off Staten Island (Figure III-11); and one near Coney Island (Figure III-11). These sites were sampled in September, October, November, and early December. The epibenthic sled was used in October 1974 only.

3. Supplemental Gear

Occasionally, a box trap and gill net were used: the former on Staten Island during September and October and in Manhasset Bay during October and November; the latter only in Manhasset Bay during September and October. The box trap was 3 ft x 3 ft x 6 ft (1 m x 1 m x 2 m) with two 25-ft (7.6-m) wings and a 50-ft (15.2-m) lead. The gill net was 200 ft (61 m) long with variable mesh of 0.25 in. (6.4 mm) and 0.375 in. (9.5 mm). Both gear were checked after a 24-hr period, and fish caught were identified and counted in the same manner used for the seine and trawl catches.

4. Mark/Recapture Operations

From the start of sampling, all striped bass and white perch were examined for marks (i.e., fin clips or tags) originating from the mark/recapture program on the Hudson River (TI, 1975, and Volumes I and II of this report). Possible fin-clip recaptures were returned to the main laboratory in Verplanck, New York, for verification [TI (1975a), Appendix A].

Beginning in September, all unmarked white perch and striped bass were measured and marked after capture. White perch <100 mm in total length (TL) and striped bass <150 mm (TL) were fin-clipped. Floy fingerling tags were applied to white perch 100-149 mm (TL) and striped bass 150-249 mm (TL).

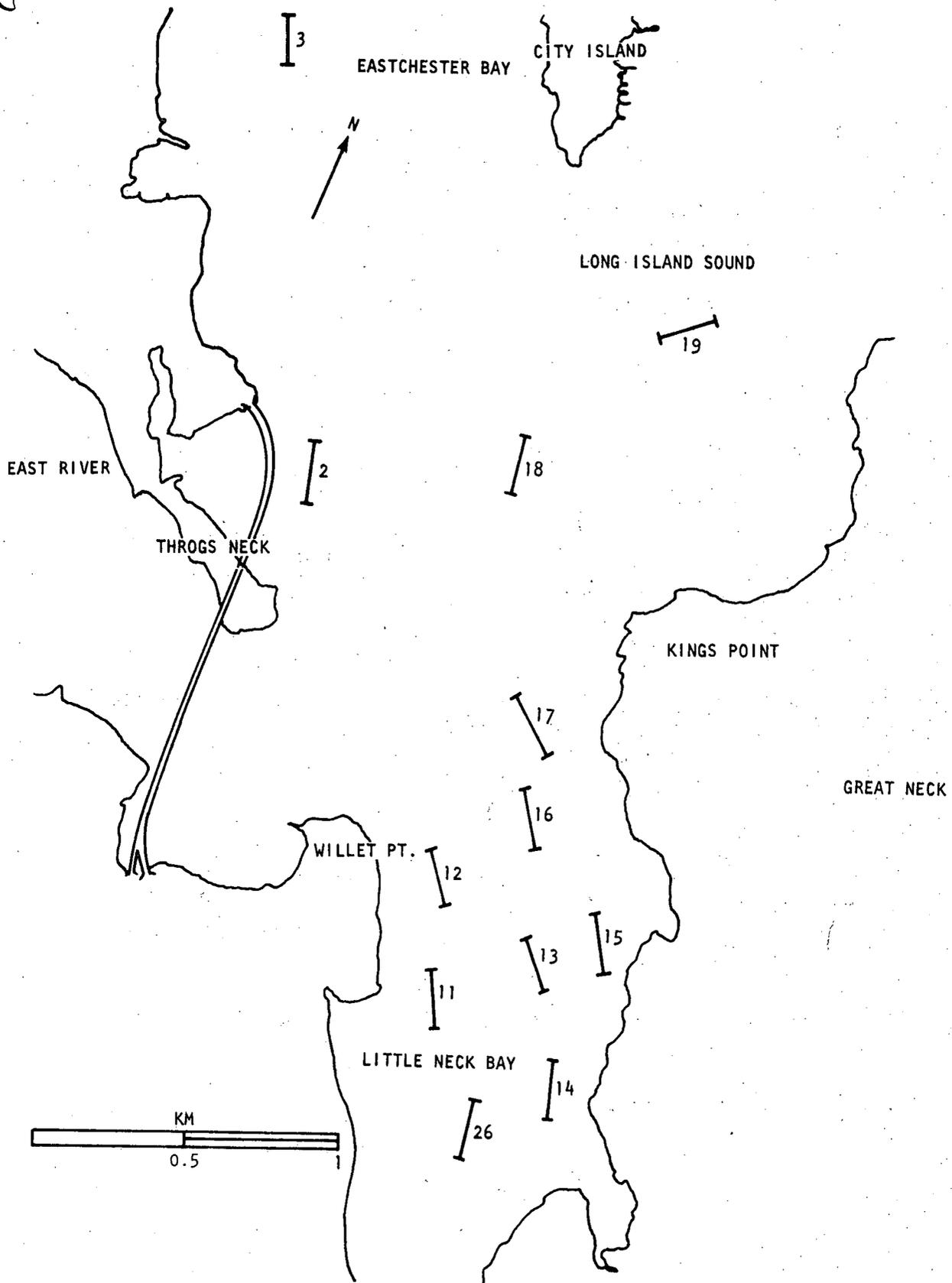


Figure III-8. Stations in Little Neck Bay and Eastchester Bay Sampled with Bottom Trawl, 1974 and 1975, and Epibenthic Sled, 1974

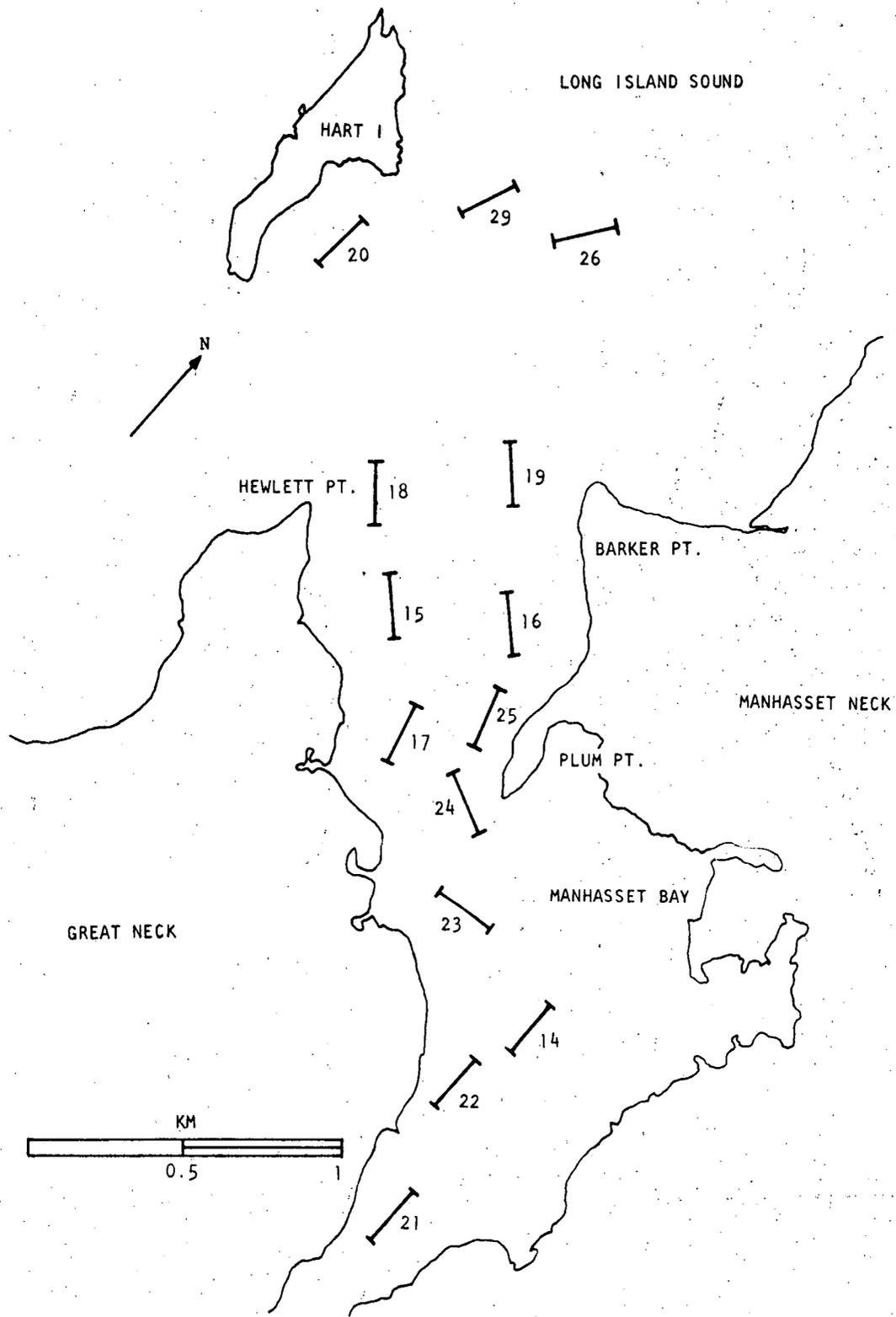


Figure III-9. Manhasset Bay Stations Sampled with Bottom Trawl, 1974 and 1975, and Epibenthic Sled, 1974

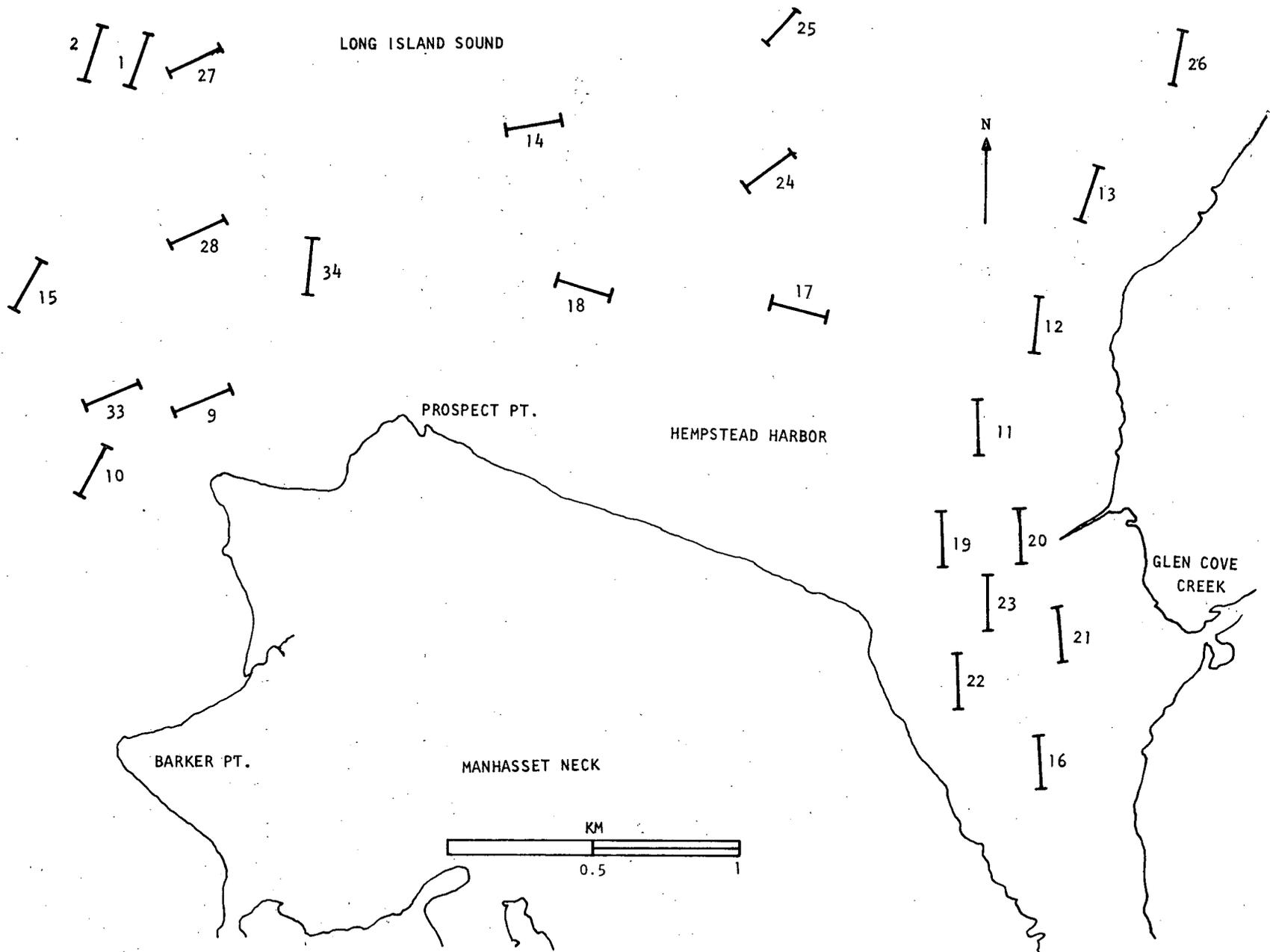


Figure III-10. Stations in Hempstead Harbor and Western Long Island Sound Sampled with Bottom Trawl, 1974 and 1975, and Epibenthic Sled, 1974

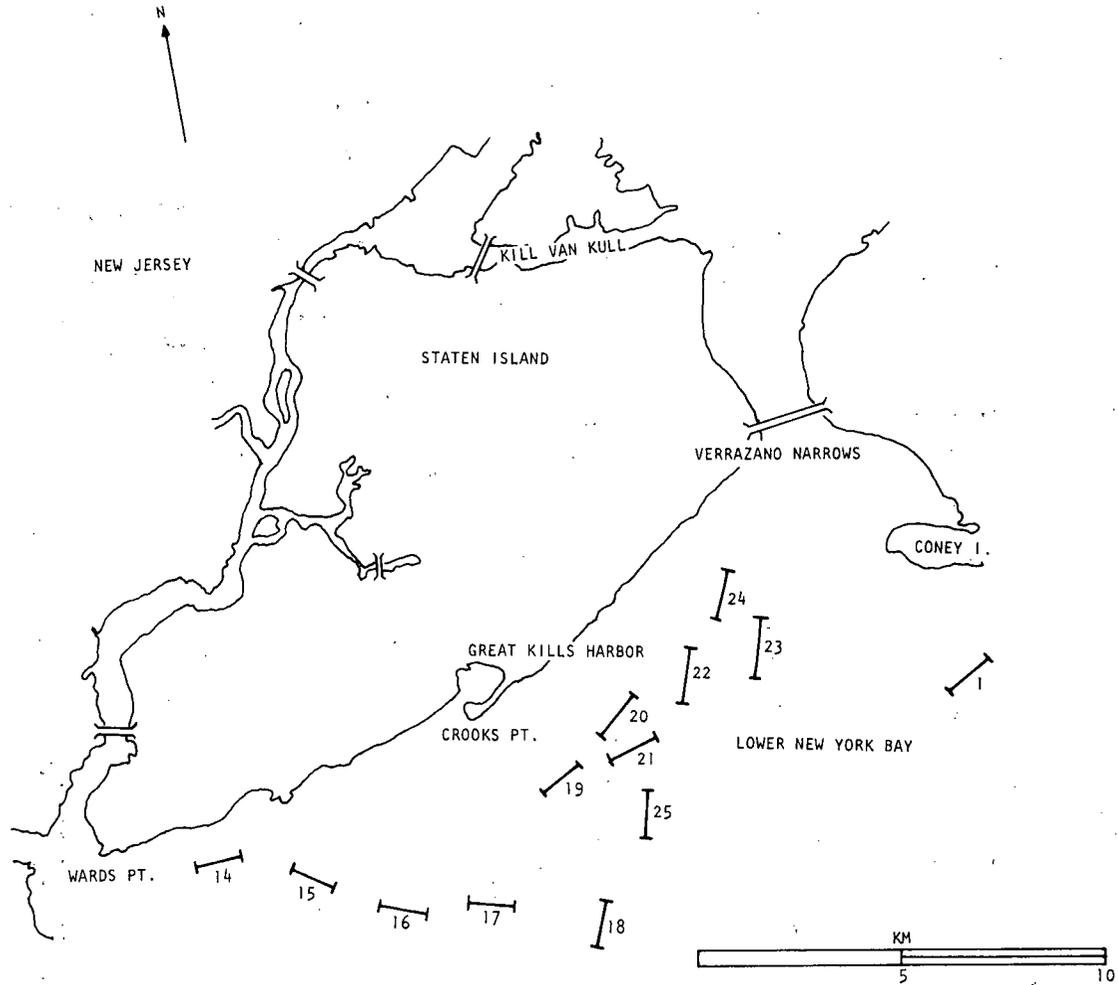


Figure III-11. Staten Island and Coney Island Stations Sampled with Bottom Trawl, 1974 and 1975, and Epibenthic Sled, 1974

White perch ≥ 150 mm (TL) and striped bass ≥ 250 mm (TL) received a Floy nylon internal anchor tag. Each tag bore instructions for its return and notice of a reward (\$1) to the person returning it.

Data obtained from the marking and recapture of marked fish were used for analyzing movements of white perch and striped bass.

Atlantic tomcod were examined for marks, but no marked adults (only adults were marked in the Hudson River) were recaptured.



5. Water Quality

Surface water samples were taken, and surface water temperature was recorded for every collection. Water samples were returned to the Verplanck laboratory for determination of specific conductivity with Yellow Springs Instruments Model 33 S-C-T meters.

C. 1975 FIELD PROCEDURES

1. Haul Seining

During 1975, new sampling sites were added in all regions: 3 (sites 50, 51, and 52) in Little Neck Bay (Figure III-1), 5 (sites 50 through 54) in Manhasset Bay (Figure III-2), 10 (sites 50 through 59) in Hempstead Harbor (Figure III-3), 11 (sites 27 through 37) in Jamaica Bay (Figure III-5), 2 (sites 50 and 51) on Staten Island (Figure III-6), and 6 (sites 50 through 55) in Oyster Bay Harbor (Figure III-7). Sampling began during the last week of March and continued until mid-July in these regions, except for Oyster Bay Harbor, which was sampled only once in May. None of the sites in Eastchester Bay or the East River was sampled during 1975 because of the failure to catch the key species during 1974 and because of logistics (few seunable sites and excessive time in transport); instead, during May and June, sampling was initiated in the Hackensack River at four sites (Figure III-12). Otherwise, methods were identical to those in 1974.

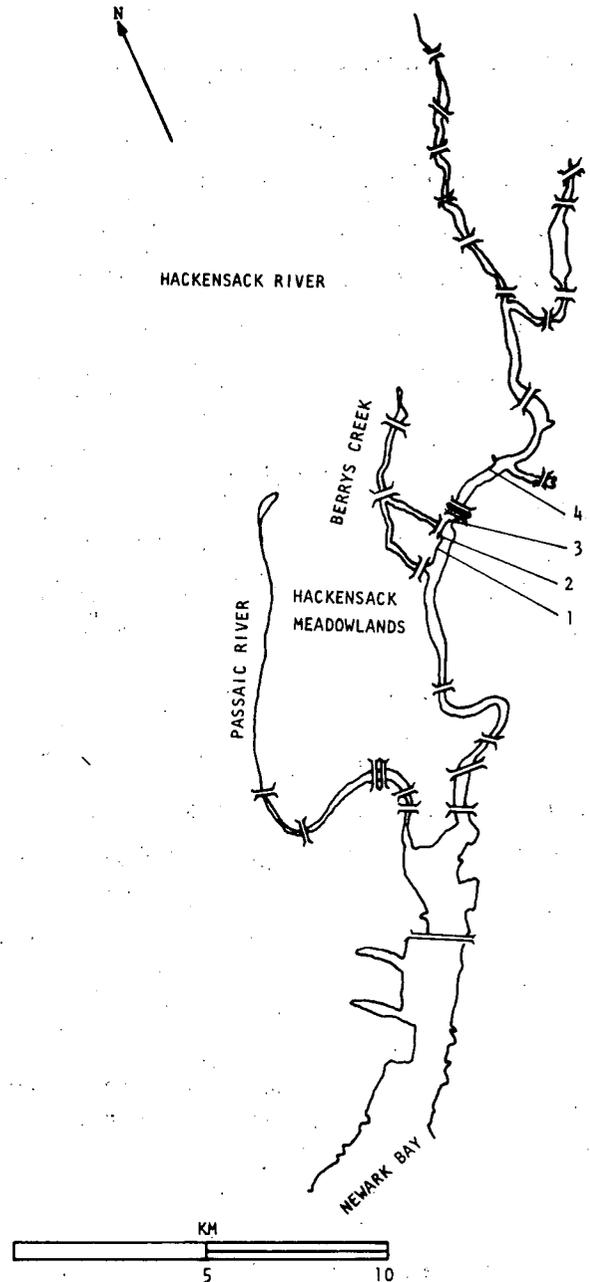


Figure III-12. Haul Seining Sites in Hackensack River, 1975



2. Trawling

In 1975 only during the first 3 weeks of March, the bottom trawl was used in Little Neck Bay, Manhasset Bay, and Hempstead Harbor. The stations sampled were those used in 1974 (Figure III-8 through III-10). Other methods were identical to those of 1974.

3. Mark/Recapture Operations

Marked striped bass and white perch recaptured during 1975 were handled in the same manner as those during 1974. Unmarked yearling striped bass and white perch were fin-clipped during April and May. Striped bass ≥ 150 mm and < 250 mm (TL) received Floy fingerling tags, as did white perch older than yearling but < 150 mm (TL). Striped bass ≥ 250 mm (TL) and white perch ≥ 150 mm (TL) received Floy internal anchor tags as in 1974.

4. Water Quality

Water quality measurements taken in 1975 were the same as those for 1974.

D. COMPUTATIONS

Haul seine catch-per-unit-effort (CPUE) values for each study area were computed for yearling striped bass and white perch, adult white perch, and young-of-the-year Atlantic tomcod as follows:

$$CPUE = \frac{\sum C_i}{n}$$

where

C_i = number of individuals caught in each tow taken during i^{th} time interval

n = total number of tows taken during i^{th} time interval

The variance of CPUE (S_{CPUE}^2) was calculated by the equation

$$S_{CPUE}^2 = \frac{\sum (C_i - CPUE)^2}{n(n-1)}$$



SECTION IV

RESULTS

A. INTRODUCTION

There have been few or no recent surveys of the fish populations in many of the areas sampled in the Lower Estuary Study, so the composition of fish species in the areas was largely unknown. It was particularly important to know the extent to which young striped bass, white perch, and Atlantic tomcod utilize the areas.

All three species were found as juveniles or adults in most of the study areas from July 1974 through mid-July 1975 but were rarely the dominant species present.

In this section are separate discussions of the three key species, as well as a composite discussion of other species found; however, since the primary objective of the Lower Estuary Study was to recover specimens of the key species under investigation by the Multiplant Impact Study, the presentation of the other species is brief. Table IV-1 lists common and scientific names of fish species caught in the lower Hudson River estuary. In the figures presented, the names of the study areas (identified in Figure II-1) are abbreviated as follows:

SI, NE	Staten Island, from Verrazano Narrows Bridge to Great Kills Harbor
SI, SE	Staten Island, from Great Kills Harbor to Wards Point (southern tip)
JB	Jamaica Bay
LNB	Little Neck Bay
MB	Manhasset Bay
HH	Hempstead Harbor
HR	Hackensack River



Table IV-1

Common and Scientific Names of Fish Species (Grouped by Family)
Found in Lower Hudson River Estuary during 1974 and 1975 (Page 1 of 3)

Family	Species	Common Name
Anguillidae	<i>Anguilla rostrata</i>	American eel
Clupeidae	<i>Alosa aestivalis</i>	Blueback herring
	<i>Alosa mediocris</i>	Hickory shad
	<i>Alosa pseudoharengus</i>	Alewife
	<i>Alosa sapidissima</i>	American shad
	<i>Brevoortia tyrannus</i>	Atlantic menhaden
	<i>Clupea harengus harengus</i>	Atlantic herring
	<i>Etrumeus teres</i>	Round herring
Engraulidae	<i>Anchoa mitchilli</i>	Bay anchovy
Osmeridae	<i>Osmerus mordax</i>	Rainbow smelt
Synodontidae	<i>Synodus foetens</i>	Inshore lizardfish
Cyprinidae	<i>Cyprinus carpio</i>	Carp
	<i>Notemigonus crysoleucas</i>	Golden shiner
Batrachoididae	<i>Opsanus tau</i>	Oyster toadfish
Gadidae	<i>Enchelyopus cimbrius</i>	Fourbeard rockling
	<i>Merluccius bilinearis</i>	Silver hake
	<i>Microgadus tomcod</i>	Atlantic tomcod
	<i>Pollachius virens</i>	Pollack
	<i>Urophycis chuss</i>	Red hake
	<i>Urophycis regius</i>	Spotted hake
	<i>Urophycis tenuis</i>	White hake
Belonidae	<i>Strongylura marina</i>	Atlantic needlefish
Cyprinodontidae	<i>Cyprinodon variegatus</i>	Sheepshead minnow
	<i>Fundulus diaphanus</i>	Banded killifish



Table IV-1 (Page 2 of 3)

Family	Species	Common Name
	<i>Fundulus heteroclitus</i>	Mummichog
	<i>Fundulus majalis</i>	Striped killifish
Atherinidae	<i>Membras martinica</i>	Rough silverside
	<i>Menidia beryllina</i>	Tidewater silverside
	<i>Menidia menidia</i>	Atlantic silverside
Gasterosteidae	<i>Apeltes quadracus</i>	Fourspine stickleback
	<i>Gasterosteus aculeatus</i>	Threespine stickleback
Fistulariidae	<i>Fistularia tabacaria</i>	Bluespotted cornetfish
Syngnathidae	<i>Hippocampus erectus</i>	Lined seahorse
	<i>Syngnathus fuscus</i>	Northern pipefish
Percichthyidae	<i>Morone americana</i>	White perch
	<i>Morone saxatilis</i>	Striped bass
Serranidae	<i>Centropristis striata</i>	Black sea bass
	<i>Mycteroperca microlepis</i>	Gag
Centrarchidae	<i>Lepomis macrochirus</i>	Bluegill
Pomatomidae	<i>Pomatomous saltatrix</i>	Bluefish
Carangidae	<i>Caranx hippos</i>	Crevalle jack
	<i>Selar crumenophthalmus</i>	Bigeye scad
	<i>Selene vomer</i>	Lookdown
	<i>Trachinotus falcatus</i>	Permit
Sparidae	<i>Lagodon rhomboides</i>	Pinfish
	<i>Stenotomus chrysops</i>	Scup
Sciaenidae	<i>Bairdiella chrysura</i>	Silver perch
	<i>Cynoscion regalis</i>	Weakfish
	<i>Leiostomus xanthurus</i>	Spot
	<i>Menticirrhus saxatilis</i>	Northern kingfish
Chaetodontidae	<i>Chaetodon ocellatus</i>	Spotfin butterflyfish
Labridae	<i>Tautoga onitis</i>	Tautog



Table IV-1 (Page 3 of 3)

Family	Species	Common Name
	<i>Tautogolabrus adspersus</i>	Cunner
Mugilidae	<i>Mugil cephalus</i>	Striped mullet
	<i>Mugil curema</i>	White mullet
Sphyraenidae	<i>Sphyraena borealis</i>	Northern sennet
Uranoscopidae	<i>Astroscopus guttatus</i>	Northern stargazer
Pholidae	<i>Pholis gunnellus</i>	Rock gunnel
Ammodytidae	<i>Ammodytes americanus</i>	American sand lance
Gobiidae	<i>Gobiosoma boscii</i>	Naked goby
	<i>Gobiosoma ginsburgi</i>	Seaboard goby
Stromateidae	<i>Peprilus triacanthus</i>	Butterfish
Triglidae	<i>Prionotus carolinus</i>	Northern searobin
	<i>Prionotus evolans</i>	Striped searobin
Cottidae	<i>Myoxocephalus aeneus</i>	Grubby
	<i>Myoxocephalus octodecemspinus</i>	Longhorn sculpin
Bothidae	<i>Etropus microstomus</i>	Smallmouth flounder
	<i>Paralichthys dentatus</i>	Summer flounder
	<i>Scophthalmus aquosus</i>	Windowpane
Pleuronectidae	<i>Pseudopleuronectes americanus</i>	Winter flounder
Soleidae	<i>Trinectes maculatus</i>	Hogchoker
Balistidae	<i>Monacanthus hispidus</i>	Planehead filefish
Ostraciidae	<i>Lactophrys triqueter</i>	Smooth trunkfish
Tetraodontidae	<i>Sphoeroides maculatus</i>	Northern puffer
Diodontidae	<i>Chilomycterus schoepfi</i>	Striped burrfish



B. STRIPED BASS

1. 1974 Haul Seining

Yearling striped bass (1973 year class) were caught in the shore zone by haul seines during initial sampling (early July) of 1974 and continued to be caught through mid-October (Figure IV-1). They first appeared in Little Neck Bay, Manhasset Bay, and Jamaica Bay, all of which are on the western end of Long Island; at this time, they were more abundant on the north shore of Long Island, in Little Neck Bay and Manhasset Bay, than on the south shore. Abundance peaked during 11-24 August in Little Neck Bay, the study area on Long Island that is nearest to the mouth of the Hudson River. By early September, yearling striped bass were also caught to the west on Staten Island, in Great Kills Harbor. During the first few weeks of October, yearlings were also caught in Hempstead Harbor. Thus, during August-October 1974, there appeared to be a progression eastward on the north shore of Long Island and possibly to the west to Staten Island. By the end of October, no yearling striped bass were caught in the shore zone of these areas.

Only one young-of-the-year (1974 year class) striped bass was caught during 1974; it was caught by haul seining in Little Neck Bay (Table IV-2).

Haul seining frequently caught adult striped bass in all major study areas (Tables IV-2 through IV-8) except Oyster Bay Harbor. The catch of adult striped bass was not analyzed in detail since adults are not necessarily of Hudson River origin (Raney et al, 1954; Clark, 1968).

Two minor study areas, Eastchester Bay (Table IV-9) and the East River (Table IV-10), produced no striped bass at all.

2. 1975 Haul Seining

Yearling striped bass (1974 year class) were caught immediately upon resumption of haul seining in late March 1975 but were not abundant until early May (Figure IV-2). They were first caught in Little Neck Bay, as were striped bass of the 1973 year class (presented previously),

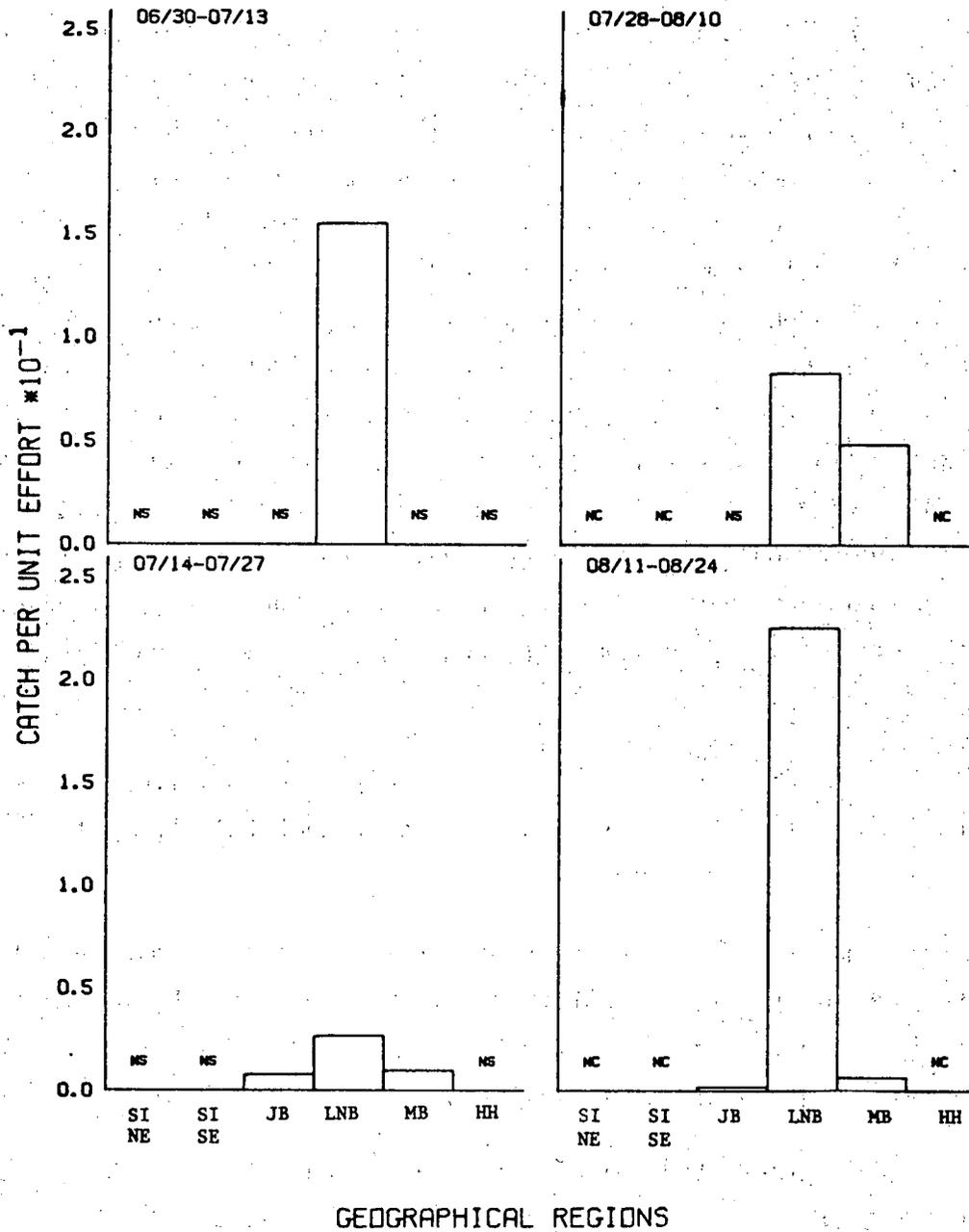
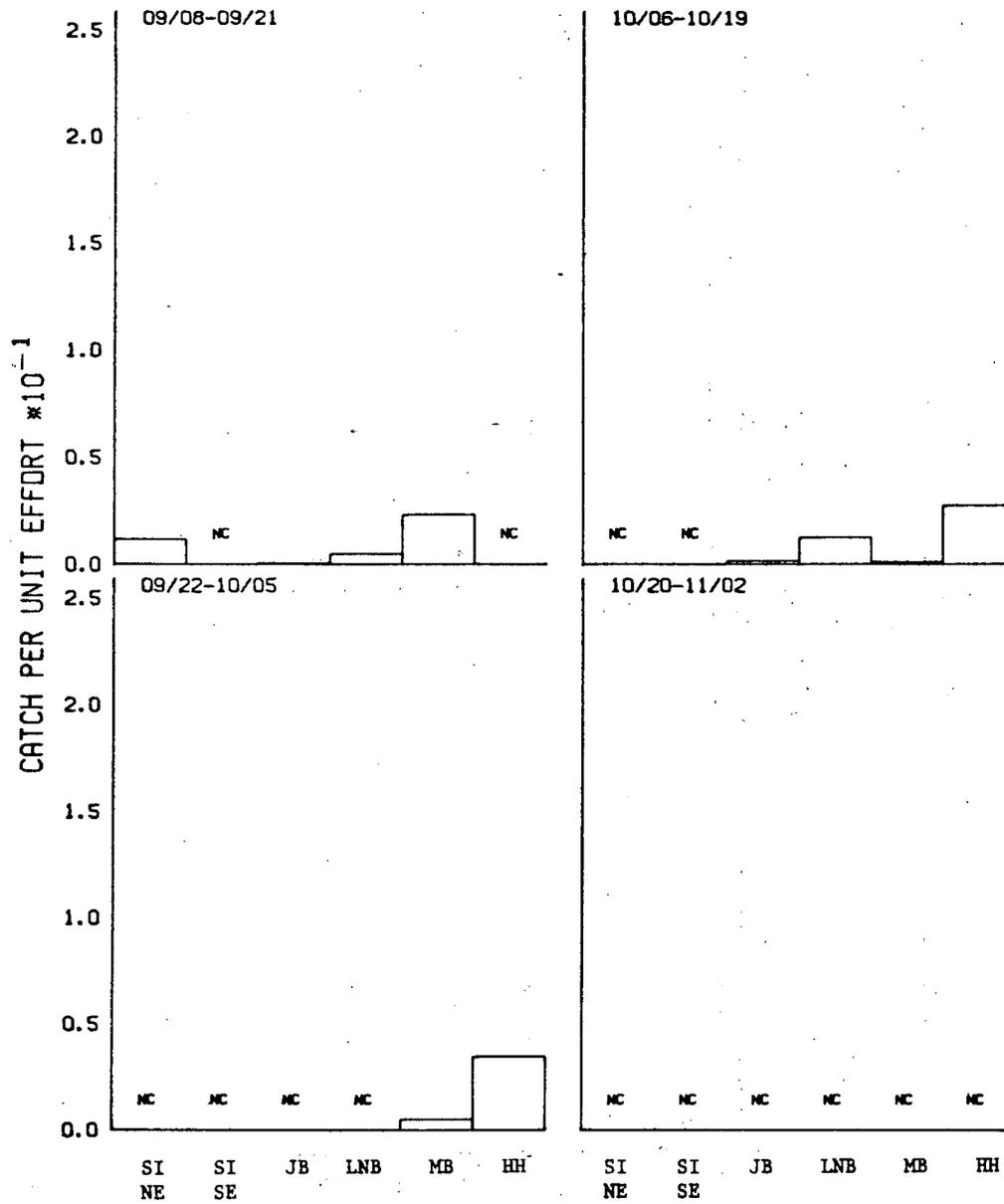


Figure IV-1. Yearling Striped Bass Catch per Unit Effort within Six Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1974 (Page 1 of 3) (Histograms based on data in Table A-9)



GEOGRAPHICAL REGIONS

Figure IV-1 (Page 2 of 3)

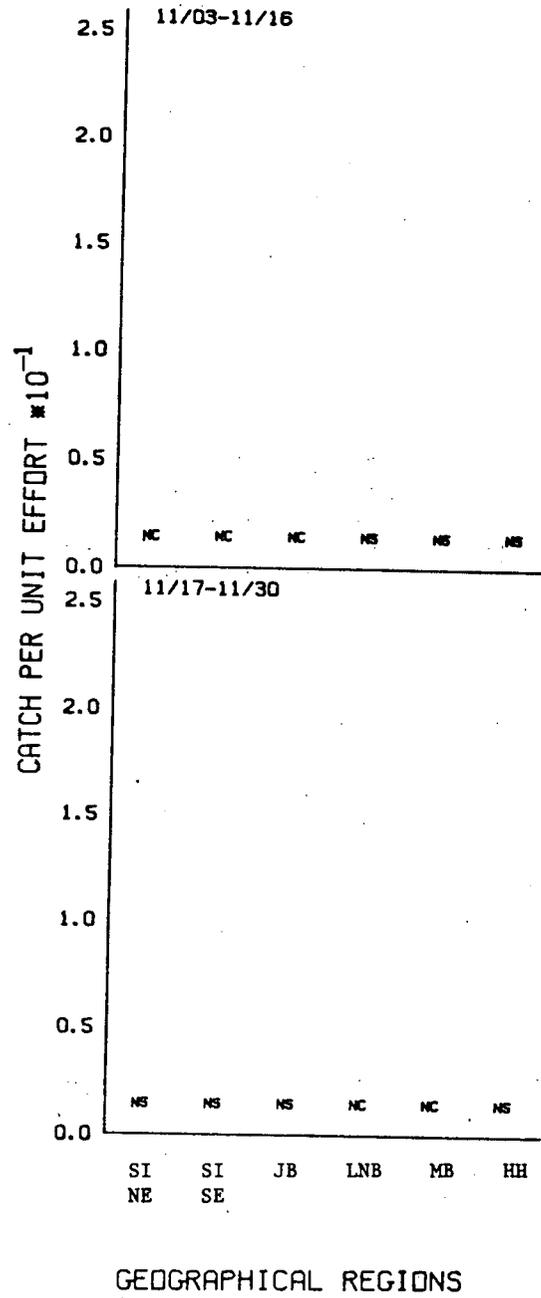


Figure IV-1 (Page 3 of 3)



but peak abundance occurred in Manhasset Bay during 18-31 May. When the Hackensack River was first sampled (18-31 May), yearling striped bass (Table IV-11) were found at all four sampling sites. They were also caught at some time in all of the 1975 study areas except southeastern Staten Island below Great Kills Harbor. Yearlings continued to be caught through the second week of July 1975 when sampling was terminated. There was no obvious progression of the catch either eastward or westward; instead, yearlings appeared almost simultaneously in most of the areas in mid-May.

3. 1974 and 1975 Trawling and Supplemental Gear

No striped bass were caught by 1974 and 1975 trawling (Tables IV-12 through IV-19). A yearling striped bass was caught in a box trap set in Manhasset Bay during October 1974 (Table IV-20). Gill netting in Manhasset Bay in September and October 1974 yielded no striped bass (Table IV-21).

4. 1974 Mark/Recapture Operations

Only one young-of-the-year striped bass was caught in the lower estuary. There were no confirmed recaptures of wild striped bass fin-clipped in the Hudson River. Two subadult striped bass tagged in the lower estuary were also recaptured there (Appendix Table A-17). One had left Manhasset Bay and was caught by a sport fisherman in the East River near the Throgs Neck Bridge. The other was both tagged and recaptured in Hempstead Harbor. There were no recaptures by the lower estuary sampling crews of striped bass tagged in the Hudson River.

5. 1975 Mark/Recapture Operations

Of 253 yearling striped bass fin-clipped during April and May 1975 in the lower estuary, eight were recaptured in the lower estuary study areas.



Table IV-2

Species Composition of Shore Zone of Little Neck Bay Based on
Daytime Sampling with 200-Ft (61-m) Haul Seine during 1974 and 1974 (Page 1 of 2)

Species	Life* Stage	1974					1975			
		6/30-7/27	7/28-8/24	9/8-10/5	10/6-11/2	11/3-11/30	3/24-4/20	4/21-5/17	5/18-6/14	6/15-7/12
Alewife	A	X	X						X	
	NA							X		
American eel	A	X	X					X	X	X
American sand lance	NA				X					
American shad	A								X	
Atlantic herring	YOY							X		
	A						X	X		
Atlantic menhaden	A	X					X	X	X	
Atlantic silverside	YOY	X								X
	A	X					X			X
	NA		X	X	X	X			X	
Atlantic tomcod	YOY	X	X		X			X	X	X
Bay anchovy	YOY			X	X					
	A	X			X					
	NA					X		X	X	X
Blueback herring	A	X	X	X	X	X			X	
Bluefish	YOY	X	X	X	X				X	X
	A	X								
Cunner	A							X		X
Fourspine stickleback	NA						X			
Grubby	YOY									X
	A	X								
Lined seahorse	YOY	X								
	A	X								
	NA		X					X	X	X
<i>Mugil</i> sp.	NA				X					
Mummichog	YOY	X	X	X	X					X
	A	X	X	X	X	X				
	NA						X	X	X	

*
YOY = young-of-the-year
A = adult = older than young-of-the-year; for *Morone* spp., older than yearling
NA = not aged

IV-10

services group

Table IV-2 (Page 2 of 2)

Species	Life* Stage	1974					1975				
		6/30-7/27	7/28-8/24	9/8-10/5	10/6-11/2	11/3-11/30	3/24-4/20	4/21-5/17	5/18-6/14	6/15-7/12	
Northern pipefish	YOY	X									
	A	X	X					X			
	NA			X					X	X	
Oyster toadfish	A	X	X							X	
Rainbow smelt	NA		X								
Red hake	NA					X					
Rough silverside	NA									X	
Seaboard goby	A		X								
Sheepshead minnow	NA			X						X	
Smallmouth flounder	A							X			
Spot	A	X									
Striped bass	YOY			X							
	YR	X	X	X	X		X	X	X	X	
	A	X	X	X	X		X	X	X	X	
Striped killifish	YOY	X	X	X	X	X					
	A	X	X	X	X	X					
	NA						X	X	X	X	
Striped mullet	NA			X	X					X	
Summer flounder	A					X				X	
Tautog	A	X							X		
	NA									X	
Threespine stickleback	A						X	X			
Tidewater silverside	NA									X	
White perch	A	X	X		X		X	X	X	X	
Windowpane	YOY		X								
	A	X	X	X	X		X	X	X	X	
Winter flounder	YOY	X	X	X	X	X				X	
	A	X	X		X	X	X	X	X	X	

*YOY = young-of-the-year

YR = yearling

A = adult = older than young-of-the-year; for *Morone* spp., older than yearling

NA = not aged





Table IV-3

Species Composition of Shore Zone of Manhasset Bay Based on
Daytime Sampling with 200-Ft (61-m) Haul Seine during 1974 and 1975 (Page 1 of 2)

Species	Life* Stage	1974					1975				
		6/30-7/27	7/28-8/24	9/8-10/5	10/6-11/2	11/2-11/20	2/24-4/20	4/21-5/17	5/18-6/14	6/15-7/12	
Alewife	A			X			X	X	X		
American eel	A	X	X	X	X		X	X	X	X	
American sand lance	YOY				X						
	A									X	
	NA					X					
American shad	A						X	X	X		
Atlantic herring	YOY							X			
	A						X	X			
Atlantic menhaden	A	X	X	X			X	X			
Atlantic needlefish	A			X							
Atlantic silverside	YOY	X								X	
	A	X			X		X	X		X	
	NA		X	X		X			X		
Atlantic tomcod	YOY	X	X					X	X	X	
Bay anchovy	YOY	X		X	X						
	A	X						X			
	NA		X						X	X	
Blueback herring	A		X		X	X	X	X	X		
	NA			X							
Bluefish	YOY	X	X	X	X				X	X	
Butterfish	YOY				X						
Cunner	YOY		X		X						
	A	X	X		X			X		X	
Fourspine stickleback	A							X			
	NA						X		X	X	
Grubby	A	X									
	NA		X					X			
Hickory shad	A								X		
Lined seahorse	A	X									
	NA						X				
Mummichog	YOY	X	X	X	X	X				X	
	A	X	X	X	X					X	
	NA						X	X	X		
Northern pipefish	YOY		X								
	A	X	X	X			X	X		X	
	NA				X				X		

YOY = young-of-the-year

A = adult - older than young-of-the-year; for Morone spp., older than yearling

NA = not aged

IV-12

services group

Table IV-3 (Page 2 of 2)

Species	Life* Stage	1974					1975				
		6/30-7/27	7/28-8/24	9/8-10/5	10/6-11/2	11/3-11/30	3/24-4/20	4/21-5/17	5/18-6/14	6/15-7/12	
Northern searobin	A				X						
Oyster toadfish	A	X						X		X	
	NA			X							
Planehead filefish	NA	X									
Pinfish	NA			X							
Scup	A	X									
Seaboard goby	A									X	
	NA							X			
Sheepshead minnow	A				X						
	NA			X							
Striped bass	YR	X	X	X	X			X	X	X	
	A		X	X			X	X	X	X	
Striped killifish	YOY	X	X	X	X	X				X	
	A	X	X	X	X						
	NA						X	X	X		
Striped mullet	NA			X	X						
Summer flounder	A							X	X	X	
	NA	X									
Tautog	YOY		X	X	X						
	A	X	X		X			X	X	X	
	NA					X					
Threespine stickleback	A						X	X			
Tidewater silverside	NA		X							X	
Weakfish	A							X			
White mullet	NA				X						
White perch	YOY				X						
	YR				X			X	X		
	A	X		X	X		X	X	X	X	
Windowpane	YOY									X	
	A	X		X			X	X	X	X	
Winter flounder	YOY	X	X	X	X	X		X	X	X	
	A	X	X	X	X	X	X	X	X	X	

*YOY = young-of-the-year

YR = yearling

A = adult = older than young-of-the-year; for *Morone* spp., older than yearling

NA = not aged





Table IV-4

Species Composition of Shore Zone of Hempstead Harbor Based on
Daytime Sampling with 200-Ft (61-m) Haul Seine during 1974 and 1975 (Page 1 of 2)

Species	Life* Stage	1974				1975				
		** 6/30-7/27	7/28-8/24	9/8-10/5	10/6-11/2	** 11/3-11/30	3/24-4/20	4/21-5/17	5/18-6/14	6/15-7/12
Alewife	A		X		X		X	X	X	X
American eel	A		X		X			X	X	X
American sand lance	A				X					
American shad	A							X	X	
Atlantic herring	YOY A						X	X		
Atlantic menhaden	YOY A			X	X		X	X	X	X X
Atlantic needlefish	NA				X					
Atlantic silverside	YOY A NA		X	X	X		X	X		X X
Atlantic tomcod	YOY A				X			X	X	X
Bay anchovy	YOY A NA				X			X		X
Blueback herring	YOY A				X				X	X
Bluefish	YOY A		X	X	X		X	X	X	X
Butterfish	A				X				X	
Fourspine stickleback	NA								X	
<i>Mugil</i> sp.	NA				X					
Mummichog	YOY A NA		X	X	X					X
							X	X	X	

*

YOY = young-of-the-year

A = adult - older than young-of-the-year; for *Morone* spp., older than yearling

NA = not aged

**

No sampling

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services group

Table IV-4 (Page 2 of 2)

Species	Life* Stage	1974					1975				
		** 6/30-7/27	7/28-8/24	9/8-10/5	10/6-11/2	11/3-11/30	** 3/24-4/20	4/21-5/17	5/18-6/14	6/15-7/12	
Northern pipefish	YOY		X		X						
	A		X		X		X	X			
	NA								X	X	
Northern puffer	YOY				X						
Oyster toadfish	A		X								
Scup	A		X								
Sheepshead minnow	A							X			
	NA				X				X		
Striped bass	YR			X	X				X		
	A		X					X	X	X	
Striped killifish	YOY		X	X	X					X	
	A		X		X						
	NA						X	X	X	X	
Summer flounder	A							X	X		
Tautog	A		X		X			X			
Threespine stickleback	A						X				
Tidewater silverside	NA								X	X	
Weakfish	A							X			
White perch	YR									X	
	A							X	X		
Windowpane	YOY				X						
	A				X		X	X			
Winter flounder	YOY		X	X	X				X	X	
	A			X	X		X	X	X	X	

* YOY = young-of-the-year

YR = yearling

A = adult = older than young-of-the-year (for *Morone* spp., older than yearling)

NA = not aged

** No sampling





Table IV-5

Species Composition of Shore Zone of Jamaica Bay Based on Daytime Sampling with 200-Ft (61-m) Haul Seine during 1974 and 1975 (Page 1 of 2)

Species	Life* Stage	1974					1975			
		6/30- 7/27	7/28- 8/24	9/8- 10/5	10/6- 11/2	11/3- 11/30	3/24- 4/20	4/21- 5/17	5/18- 6/14	6/15- 7/12
Alewife	A				X			X	X	
American eel	A	X	X	X	X			X	X	X
American shad	A							X	X	
Atlantic herring	YOY A						X	X	X	
Atlantic menhaden	YOY A NA	X X		X	X X			X X	X X	X
Atlantic needlefish	NA		X							
Atlantic silverside	YOY A NA	X X					X	X	X	X
Atlantic tomcod	YOY	X	X	X	X	X			X	X
Bay anchovy	YOY A NA	X	X		X			X	X	X
Bigeye scad	NA				X					
Black sea bass	A	X								
Blueback herring	YOY A	X			X			X	X	
Bluefish	YOY	X	X	X					X	X
Cunner	YOY NA		X							
Fourspine stickleback	A NA		X			X	X	X		X
Gag	NA		X							
Grubby	YOY A NA	X X		X	X X			X		
Inshore lizardfish	NA		X	X						
Lined seahorse	A NA	X		X	X			X	X	
Mummichog	YOY A NA	X X	X X	X X	X X	X		X	X	X
Naked goby	NA		X	X						
Northern kingfish	YOY A NA		X		X X					
Northern pipefish	YOY A NA	X X	X X		X		X	X	X	X
Northern puffer	YOY NA	X	X		X				X	X
Northern searobin	A NA	X		X				X		

*YOY = young-of-the-year

YR = yearling

A = adult = older than young-of-the-year; for *Morone* spp., older than yearling

NA = not aged



Table IV-5 (Page 2 of 2)

Species	Life* Stage	1974					1975			
		6/30- 7/27	7/28- 8/24	9/8- 10/5	10/6- 11/2	11/3- 11/30	3/24- 4/20	4/21- 5/17	5/18- 6/14	6/15- 7/12
Northern stargazer	NA		X							
Oyster toadfish	YOY	X	X			X				
	A	X	X					X	X	
	NA			X				X		
Planehead filefish	NA	X								
Pollock	YOY						X			
Pinfish	NA	X								
Red hake	A						X	X		
Rough silverside	NA							X	X	
Seaboard goby	A				X					
	NA							X	X	
Silver hake	YOY				X	X				
Smallmouth flounder	YOY			X	X	X				
	A		X		X		X	X		
Smooth trunkfish	NA				X					
Spot	A	X								
	NA			X						
Spotfin butterflyfish	NA				X					
Spotted hake	YOY				X	X				
	A							X		
Striped bass	YR	X	X	X	X		X	X		
	A	X			X		X	X	X	
Striped killifish	YOY	X	X	X	X	X				
	A	X	X	X	X	X	X			
	NA						X	X	X	
Striped searobin	YOY				X	X				
	A	X			X					
	NA		X	X						
Summer flounder	YOY		X			X			X	
	A	X			X		X	X	X	
	NA			X						
Tautog	YOY				X	X				
	A	X			X		X			
	NA							X		
Tidewater silverside	NA						X	X		
White mullet	NA			X						
White perch	YOY	X								
	A	X			X		X	X	X	
Windowpane	YOY	X	X							
	A	X			X	X	X	X	X	
Winter flounder	YOY	X	X		X	X		X	X	
	A	X	X		X	X	X	X	X	
	NA			X						

*YOY = young-of-the-year

YR = yearling

A = adult = older than young-of-the-year; for *Morone* spp., older than yearling

NA = not aged



Table IV-6

Species Composition of Shore Zone of Northeast Staten Island Based on Daytime Sampling with 200-Ft (61-m) Haul Seine during 1974 and 1975 (Page 1 of 2)

Species	Life* Stage	1974					1975			
		** 6/30- 7/27	7/28- 8/24	9/8- 10/5	10/6- 11/2	11/3- 11/30	3/24- 4/20	4/21- 5/17	5/18- 6/14	6/15- 7/12
Alewife	A				X		X	X		
American eel	A			X				X	X	
American sand lance	A						X			
American shad	YOY		X							
	A						X	X		
Atlantic herring	YOY						X			
Atlantic menhaden	YOY								X	
	A		X		X	X	X	X	X	
Atlantic needlefish	A				X					
	NA		X	X						
Atlantic silverside	YOY								X	
	A		X				X		X	
	NA			X	X	X		X		
Atlantic tomcod	YOY		X					X	X	
Banded killifish	A							X		
Bay anchovy	A		X							
	NA			X	X		X	X	X	
Black sea bass	NA		X					X		
Blueback herring	YOY				X					
	A		X		X		X	X	X	
Bluefish	YOY		X	X	X			X	X	
	A		X							
Butterfish	YOY		X							
Crevalle jack	NA		X	X						
<i>Gobiosoma</i> sp.	NA			X						
Grubby	NA							X		
Hogchoker	NA								X	
Lined seahorse	A						X			
	NA		X				X	X	X	
Lookdown	NA				X					
Mummichog	YOY				X					
	NA						X	X	X	
Naked goby	A							X	X	
Northern kingfish	YOY		X		X					
	A				X					
	NA			X						

*YOY = young-of-the-year
 YR = yearling
 A = adult = older than young-of-the-year; for *Morone* spp., older than yearling
 NA = not aged
 **No sampling



Table IV-6 (Page 2 of 2)

Species	Life* Stage	**		1974			1975			
		6/30- 7/27	7/28- 8/24	9/8- 10/5	10/6- 11/2	11/3- 11/30	3/24- 4/20	4/21- 5/17	5/18- 6/14	6/15- 7/12
Northern pipefish	YOY									X
	A						X	X		X
	NA		X	X	X				X	
Northern puffer	YOY		X							
	A		X							
Northern searobin	A								X	
	NA		X					X		
Northern sennet	NA		X							
Northern stargazer	A				X					
	NA		X	X						
Oyster toadfish	YOY								X	X
	A				X				X	X
Permit	NA			X						
Pinfish	NA			X						
Pollock	YOY							X		
Red hake	A							X	X	
Rock gunnel	NA								X	
Rough silverside	NA								X	X
Seaboard goby	NA								X	X
Smallmouth flounder	A							X	X	X
Spot	YOY									X
	A				X					
	NA		X							
Striped bass	YR			X				X	X	X
	A		X	X	X		X	X	X	X
Striped burrfish	A				X					
Striped mullet	A				X					
	NA			X						
Striped searobin	NA			X						
Summer flounder	YOY		X							
	A		X					X	X	X
	NA			X						
Tautog	A				X				X	X
	NA			X						
Weakfish	YOY		X		X					
	NA			X						
White perch	A							X		
Windowpane	YOY		X		X					
	A				X			X		
Winter flounder	YOY		X		X				X	X
	A				X		X	X	X	X
	NA			X						

*YOY = young-of-the-year

YR = yearling

A = adult = older than young-of-the-year; for *Morone* spp., older than yearling

NA = not aged

**No sampling



Table IV-7

Species Composition of Shore Zone of Southeast Staten Island Based on
Daytime Sampling with 200-Ft (61-m) Haul Seine during 1974 and 1975 (Page 1 of 2)

Species	Life* Stage	1974					1975			
		** 6/30-7/27	7/28-8/24	9/8-10/5	10/6-11/2	11/3-11/30	** 3/24-4/20	4/21-5/17	5/18-6/14	6/15-7/12
Alewife	A							X		
American shad	YOY		X							
	A							X	X	
Atlantic herring	A							X		
Atlantic menhaden	A		X		X			X	X	
Atlantic needlefish	NA		X	X						
Atlantic silverside	YOY		X							
	A		X					X		
	NA			X	X	X				X
Atlantic tomcod	YOY		X							X
Bay anchovy	YOY		X				X			
	A		X				X			
	NA			X	X			X	X	X
Blueback herring	YOY						X			
	A				X			X	X	
Bluefish	YOY		X	X	X				X	X
	A		X							
Bluespotted cornetfish	A		X							
	NA			X						
Butterfish	YOY		X							
Crevalle jack	NA			X						
Cunner	NA			X						
Hickory shad	A								X	
Hogchoker	A								X	
Lined seahorse	A							X		
	NA								X	
Lookdown	NA		X							
Mummichog	YOY					X				
	A		X		X	X				
	NA								X	
Northern kingfish	NA		X	X						

*
YOY = young-of-the-year
A = adult - older than young-of-the-year; for Morone spp., older than yearling
NA = not aged

**
No sampling



Table IV-7 (Page 2 of 2)

Species	Life* Stage	1974					1975			
		** 6/30-7/27	7/28-8/24	9/8-10/5	10/6-11/2	11/3-11/30	** 3/24-4/20	4/21-5/17	5/18-6/14	6/15-7/12
Northern pipefish	A						X			
	NA		X	X				X	X	
Northern puffer	YOY		X							
	NA			X						
Northern sennet	NA		X	X						
Northern stargazer	YOY		X							
Pollock	YOY						X			
Red hake	A						X			
Rock gunnel	A						X			
Silver perch	A				X					
Smallmouth flounder	A						X	X		
	NA				X					
Spot	NA			X						
Spotfin butterfly fish	NA			X						
Striped bass	A							X		
Striped mullet	NA			X						
Striped searobin	NA			X						
Summer flounder	YOY		X							
	A		X				X	X	X	
	NA			X						
Tautog	YOY					X				
	A							X		
	NA		X	X						
Threespine stickleback	NA						X			
Weakfish	YOY		X							
	A		X							
	NA			X						
Windowpane	A						X			
	NA		X							
Winter flounder	A				X		X	X		
	NA		X	X						

* YOY = young-of-the-year
 A = adult = older than young-of-the-year; for *Morone* spp., older than yearling
 NA = not aged
 ** No sampling

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services group



Table IV-8

Species Composition of Shore Zone of Oyster Bay Harbor Based on Daytime Sampling with 200-Ft (61-m) Haul Seine during 1974 and 1975

Species	Life* Stage	1974					1975			
		** 6/30- 7/27	** 7/28- 8/24	** 9/8- 10/5	** 10/6- 11/2	11/3- 11/30	** 3/24- 4/20	4/21- 5/17	** 5/18- 6/14	** 6/15- 7/12
Alewife	A							X		
American eel	A							X		
American shad	A							X		
Atlantic herring	A							X		
Atlantic menhaden	A							X		
Atlantic silverside	NA					X		X		
Atlantic tomcod	YOY					X				
Bay anchovy	NA							X		
Blueback herring	A					X		X		
Fourspine stickleback	NA					X		X		
Golden shiner	NA							X		
Mummichog	YOY					X				
	A					X				
	NA							X		
Northern pipefish	NA							X		
Oyster toadfish	A							X		
Seaboard goby	NA					X				
Sheepshead minnow	NA							X		
Striped bass	A							X		
Striped killifish	YOY					X				
	A					X				
Tautog	YOY					X				
	A							X		
White perch	A							X		
Winter flounder	YOY					X				
	A					X		X		

*YOY = young-of-the-year

A = adult = older than young-of-the-year; for *Morone* spp., older than yearling

NA = not aged

**No sampling



Table IV-9

Species Composition of Shore Zone of Eastchester Bay Based on Daytime Sampling with 200-Ft (61-m) Haul Seine during 1975

Species	Life* Stage					
		6/30-7/27	** 7/28-8/24	** 9/8-10/5	** 10/6-11/2	** 11/3-11/30
Atlantic silverside	YOY	X				
Bay anchovy	A	X				
Bluefish	YOY	X				
Mummichog	A	X				

* YOY = young-of-the-year
A = adult = older than young-of-the-year

** No sampling

Table IV-10

Species Composition of Shore Zone of East River Based on Daytime Sampling with 200-Ft (61-m) Haul Seine during 1974

Species	Life* Stage					
		** 6/30-7/27	** 7/28-8/24	** 9/8-10/5	10/6-11/12	** 11/13-11/30
American eel	A				X	
Atlantic silverside	NA				X	
Bay anchovy	A				X	
Striped killifish	YOY				X	
	A				X	

* YOY = young-of-the-year
A = adult = older than young-of-the-year
NA = not aged

** No sampling



None were recaptured in the Hudson River, nor were any wild striped bass yearlings that had been marked in the Hudson River eventually caught in the lower estuary. Nevertheless, the yearling striped bass caught in the lower estuary were assumed to be part of the 1974 year class originating from the Hudson River. Since fin-clip types were shared by many study areas in the lower estuary, no data on the movement of marked yearlings between areas were available.

Twenty-five subadult and adult striped bass tagged in the lower estuary during 1974 and 1975 were recaptured there (Appendix Table A-17) during May and June 1975 (one July recapture is also presented). Of these 25 recaptures, only two were caught outside their area of release: both had moved eastward through Long Island Sound. Sport fishermen recaptured three tagged striped bass from the Hudson River during May and June 1975 (Appendix Table A-17) at Mamaroneck, Long Island; in lower New York Bay at the Verrazano Narrows Bridge; and on Coney Island. Two tagged striped bass (573 mm TL and 462 mm TL) released in Manhasset Bay during 1974 had moved a great distance by 1975: one was caught off Chincoteague, Virginia, in January; the other, at Monmouth Beach, New Jersey. A third (536 mm TL) was tagged in Little Neck Bay in May and recaptured in June at Falmouth, Maine (Table A-17). Also recaptured in the lower estuary from May through July 1975 were 22 fin-clipped hatchery-reared striped bass that had been stocked in the Hudson River (TI, 1975b) in September and October 1974. Of these, 13 were recaptured in Little Neck Bay; six in Manhasset Bay; and one each in the Hackensack River, Jamaica Bay, and northeastern Staten Island.

6. Length Distribution

A comparison of the mean total lengths of yearling striped bass caught in the lower estuary by haul seining and caught at standard stations (see Table IV-22 and Section II, Volume I, of this report) in the Hudson River by beach seining and trawling revealed that striped bass during May 1975 were usually larger in the lower estuary than in the river. This size differential continued through June in most of the areas and into July for Little Neck Bay. However, there is a potential bias because of different gear selectivity as to size of fish caught.

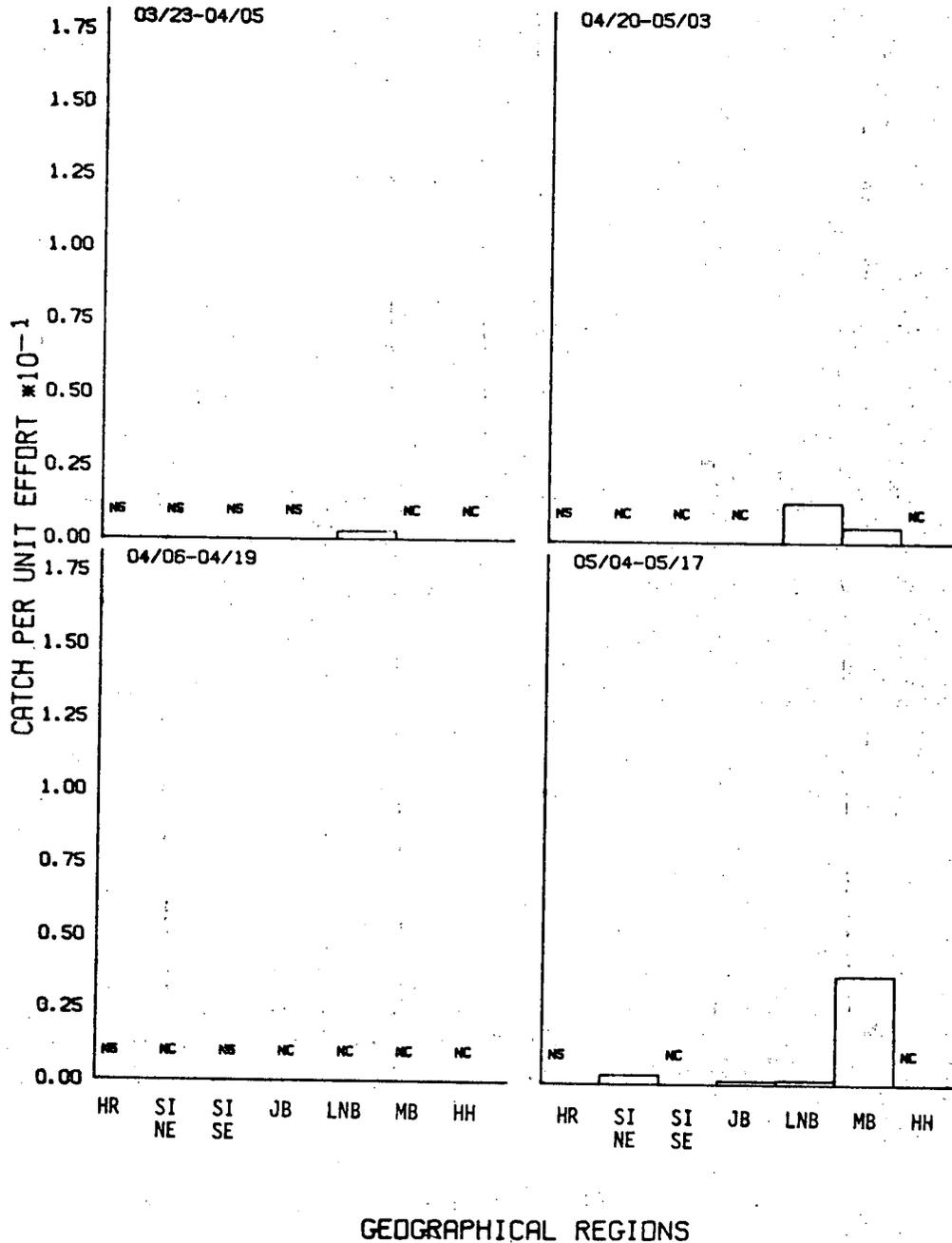
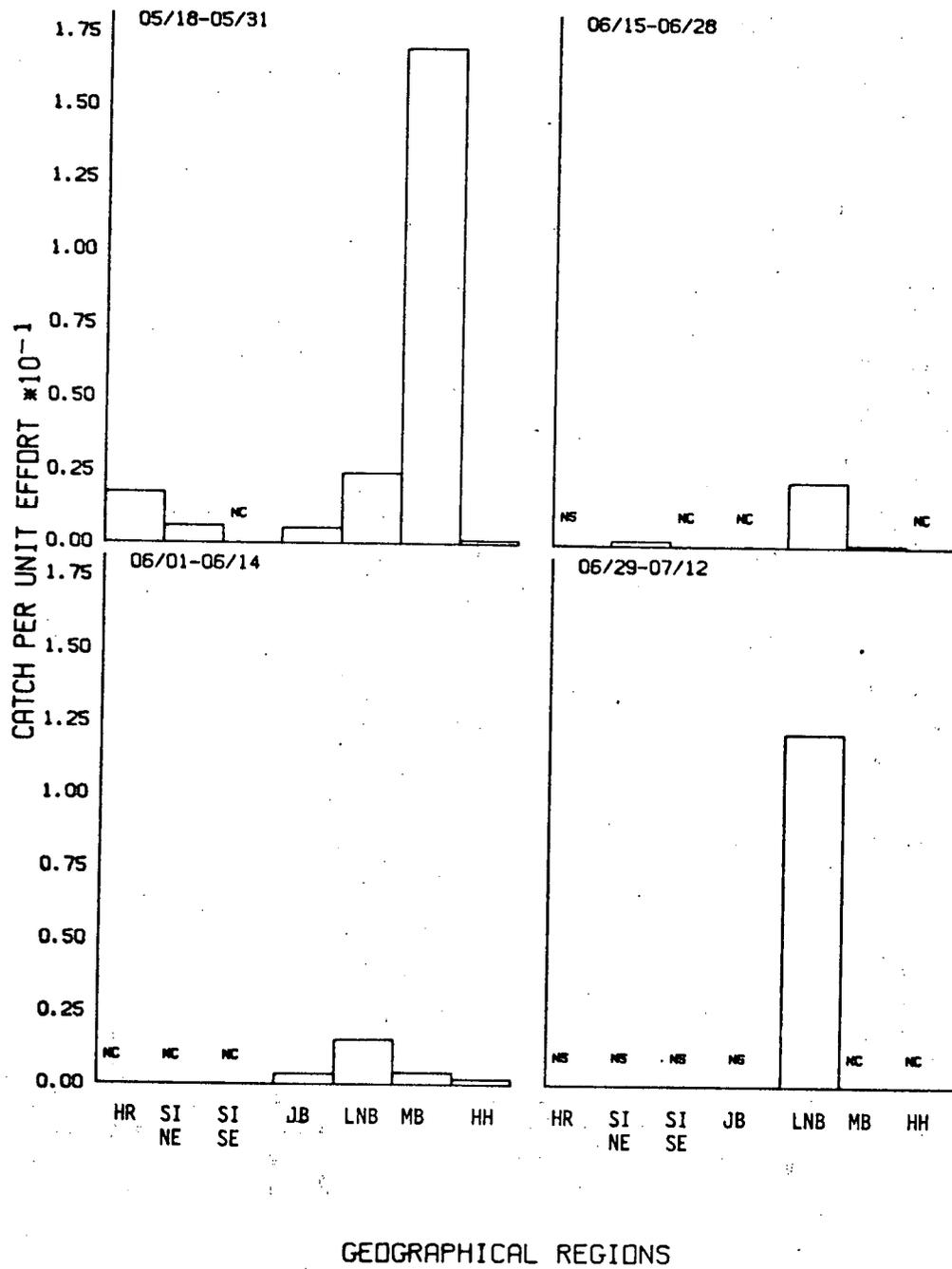


Figure IV-2. Yearling Striped Bass Catch per Unit Effort within Seven Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1975 (Page 1 of 2) (Histograms based on data in Table A-10)



GEOGRAPHICAL REGIONS

Figure IV-2 (Page 2 of 2)



Table IV-11

Species Composition of Shore Zone of Hackensack River Based on Daytime Sampling with 200-Ft (61-m) Haul Seine during 1975

Species	Life* Stage	**			
		3/24-4/20	4/21-5/17	5/18-6/14	6/15-7/12
Alewife	A			X	
Blueback herring	A			X	
Bluegill	NA				X
Carp	NA				X
Mummichog	NA			X	X
Striped bass	YR			X	X
White perch	A			X	X

* YR = yearling
 A = adult = older than young-of-the-year
 NA = not aged

** No sampling

Table IV-12

Total Catch of Fish by Bottom Trawling in Little Neck Bay during 1974 and 1975

Date	No. of Tows	Species	Life Stage*	No. Caught
9/74	7	Bay anchovy	YOY	1000**
10/74	18	Atlantic menhaden	YOY	43
		Bay anchovy	L	1050**
			A	9
		Blueback herring	YR	1
		Butterfish	YOY	7
			YR	5
		Windowpane	NA	1
		Winter flounder	YOY	1
11/74	24	Alewife	YOY	2
		Atlantic menhaden	YOY	2
			NA	1
		Bay anchovy	L	49
			YOY	300**
			A	5
		Blueback herring	YOY	101
		Cunner	NA	1
		Windowpane	SA	1
			A	2
			NA	1
	YOY	8		
	YR	1		
	A	1		
12/74	1	Round herring	A	1
		Windowpane	NA	1
		Winter flounder	YOY	2
3/75	16	Atlantic herring	A	2
		Windowpane	SA	1
			A	1
		Winter flounder	A	1

* L = larval
 YOY = young-of-the-year
 YR = yearling
 SA = subadult
 A = adult
 NA = not aged
 ** Estimated



Table IV-13

Total Catch of Fish by Bottom Trawling in Manhasset Bay during 1974 and 1975

Date	No. of Tows	Species	Life Stage*	No. Caught	Date	No. of Tows	Species	Life Stage*	No. Caught				
9/74	18	Bay anchovy	L	5550**	11/74	27	Tautog	NA	1				
			YOY	3000**			Weakfish	NA	9				
			A	280			Windowpane	YR	1				
		YOY	2				SA	3					
		Butterfish	YOY	10				A	8				
			YOY					NA	22				
10/74	16	Bay anchovy	L	50	12/74	13	Winter flounder	YOY	5				
			YOY	10				YR	7				
			A	30				SA	1				
				Butterfish			A	10				A	1
				Cunner			A	1				NA	2
				Windowpane			YR	1					
				Winter flounder			YOY	2				NA	2
			YR	2				NA	1				
			NA	1				NA	1				
11/74	27	Alewife	YOY	30	3/75	22	Alewife	NA	2				
			YR	5				Atlantic menhaden	NA	1			
		American shad	NA	18							NA	1	
		Atlantic menhaden	YOY	12							L	1	
		Bay anchovy	L	165							Blueback herring	YOY	2
			YOY	99								NA	27
			A	80							Cunner	A	5
			NA	2							Grubby	A	3
		Black seabass	NA	2							Windowpane	YR	5
		Blueback herring	YOY	179								A	6
			YR	3							Winter flounder	YOY	7
		Bluefish	YOY	2								YR	5
		Butterfish	YR	22								SA	1
			A	4								A	52
			NA	9									
		Cunner	YR	1							Atlantic herring	-A	1
			SA	1							Atlantic silverside	NA	1
			A	1							Blueback herring	YR	1
			NA	3							Cunner	SA	1
			NA	1							Grubby	YR	5
		Northern pipefish	NA	1								SA	3
		Round herring	SA	1							Threespine stickleback	A	4
	A	4					White hake	YR	6				
	NA	11					Windowpane	YR	2				
								SA	36				
								A	13				
							Winter flounder	YR	26				
								SA	5				
								A	2				

* L = larval
 YOY = young-of-the-year
 YR = yearling
 SA = subadult
 A = adult
 NA = not aged
 ** Estimated number

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services group



Table IV-14

Total Catch of Fish by Bottom Trawling in Hempstead Harbor during 1974 and 1975

Date	No. of Tows	Species	Life Stage*	No. Caught	Date	No. of Tows	Species	Life Stage*	No. Caught		
9/74	7	Bay anchovy	L	1600**	1/74	28	Atlantic menhaden	YOY	3		
		Butterfish	YOY	1				YR	1		
10/74	28	American eel	NA	2			Atlantic silver side	A	1		
		Bay anchovy	L	355**			Atlantic tomcod	YOY	1		
			YOY	40			Bay anchovy	L	1		
			A	12				YOY	6		
		Bluefish	YOY	1				A	2		
		Butterfish	YR	1			Black seabass	NA	1		
			NA	19			Blueback herring	NA	2		
		Gunner	NA	1			Gunner	YOY	1		
11/74	29	Alewife	YR	1			Grubby	NA	3		
			NA	1				A	2		
		American Shad	YOY	1				NA	2		
		Atlantic herring	A	1			Longhorn sculpin	A	1		
		Atlantic menhaden	YOY	3			Northern pipefish	A	1		
			NA	16			Round herring	A	1		
		Bay anchovy	L	130**			Striped searobin	NA	3		
			YOY	1175**			Tautog	YOY	1		
			A	88			Urophycis sp. (hake)	SA	1		
		Black seabass	NA	1			Windowpane	YOY	1		
		Blueback herring	YOY	23				YR	12		
			YR	1				A	17		
			A	1				NA	37		
		Bluefish	YOY	1			Winter flounder	YOY	18		
		Butterfish	A	1				YR	5		
			NA	27				SA	2		
		Gunner	NA	2				A	12		
		Northern pipefish	NA	2				NA	6		
		Seaboard goby	NA	1			3/75	19	Alewife	YR	1
		Round herring	SA	1					Atlantic herring	A	2
	A	2			Atlantic silverside	NA	6				
Weakfish	YOY	4			Blueback herring	YR	1				
Windowpane	YR	2				A	7				
	A	8			Fourbearded rockling	A	3				
	NA	10			Grubby	YR	2				
Winter flounder	YOY	38				NA	1				
	YR	4			Silver hake	YR	1				
	A	7				SA	1				
12/74	28	Alewife	NA	8			White hake	SA	2		
		American eel	NA	1			Windowpane	YR	1		
		American shad	YOY	4				SA	22		
		Atlantic herring	YR	2				A	7		
			A	7			Winter flounder	YR	22		
								SA	9		
								A	4		

* L = larval
 YOY = young-of-the-year
 YR = yearling
 SA = subadult
 A = adult
 NA = not aged
 ** Estimated number



Table IV-15

Total Catch of Fish by Bottom Trawling off
Northeastern Staten Island during 1974

Date	No. of Tows	Species	Life Stage*	No. Caught
9/74	8	Bay anchovy	NA	652
10/74	6	Bay anchovy	L	20
			A	23

* L = larval
A = adult
NA = not aged

Table IV-16

Total Catch of Fish by Bottom Trawling off
Southeastern Staten Island during 1974

Date	No. of Tows	Species	Life Stage*	No. Caught
9/74	10	Atlantic menhaden	NA	1
		Bay anchovy	A	2
			NA	2411
		Bluefish	YOY	4
			NA	29
		Butterfish	NA	18
		Lookdown	NA	3
		Weakfish	YOY	1014
		A	1	
10/74	6	Bay anchovy	L	20
			A	394
			NA	107

* L = larval
YOY = young-of-the-year
A = adult
NA = not aged



Table IV-17

Total Catch of Fish by Bottom Trawling in
Eastchester Bay during November 1974

No. of Tows	Species	Life Stage*	No. Caught
2	Bay anchovy	A	4
	Northern pipefish	NA	1
	Winter flounder	YOY	1

*
YOY = young-of-the-year
A = adult
NA = not aged

Table IV-18

Total Catch of Fish by Bottom Trawling in
Western Long Island Sound during December 1974

No. of Tows	Species	Life Stage*	No. Caught
2	Atlantic menhaden	YOY	1
	Windowpane	A	2

*
YOY = young-of-the-year
A = adult



Table IV-19

Total Catch of Fish in Six Regions of Lower Hudson River Estuary
by Sampling with Epibenthic Sled during October 1974

Region	No. of Tows	Species	Life Stage*	No. Caught
Northeastern Staten Island	5	Bay anchovy	L	3
			YOY	3
		Northern pipefish	A	12
			YOY	1
Southeastern Staten Island	6	Bay anchovy	L	1
			A	36
Gravesend Bay- Coney Island	1	Bay anchovy	L	1
Little Neck Bay	9	Bay anchovy	L	200**
			A	100**
			NA	4360**
		Windowpane	YR	1
Manhasset Bay	10	Bay anchovy	YOY	1
			A	10
			NA	559
		Butterfish	YOY	1
		Windowpane	A	1
			NA	1
Hempstead Harbor	18	Bay anchovy	A	1250**
			NA	30
		Windowpane	A	3
		Winter flounder	YOY	1
			A	2

* L = larval
 YOY = young-of-the-year
 YR = yearling
 A = adult
 NA = not aged
 ** Estimated



Table IV-20

Total Mean Catch per 24 Hours (CPUE) of Fish in Two Regions of Lower Hudson River Estuary by Sampling with Box Traps during September-November 1974

Region	Month	Species	Life Stage*	CPUE	Hours of sampling
Southeastern	September	Silver perch	YOY	10.0	24.0
Staten Island	October	Cunner	YOY	1.08	22.2
Manhasset Bay	October	Mummichog	YOY	2.54	155.6
		White perch	A	1.66	
		Mummichog	A	1.08	
		Striped killifish	YOY	0.74	
		Striped mullet	NA	0.74	
		Atlantic silverside	NA	0.31	
		American eel	A	0.27	
		American sand lance	A	0.24	
		Striped bass	YR	0.18	
		Winter flounder	A	0.15	
	Winter flounder	YR	0.14		
	November	Atlantic silverside	A	5.44	68.5
		Striped killifish	A	2.87	
		Mummichog	A	0.82	
		White perch	YOY	0.41	
		White perch	A	0.18	
Blueback herring		YR	0.18		
Alewife	YR	0.18			
Striped killifish	YOY	0.18			

*YOY = young-of-the-year
 YR = yearling
 A = not aged
 NA = adult

Table IV-21

Total Mean Catch per 24 Hours (CPUE) of Fish in Gill Nets Set in Manhasset Bay during October and November 1974

Month	Species	Life Stage*	CPUE	Hours of sampling		
October	Atlantic menhaden	A	1.57	147.6		
	Mummichog	A	0.93			
	Winter flounder	YOY	0.49			
	Winter flounder	YR	0.45			
	Winter flounder	A	0.33			
	Atlantic menhaden	YOY	0.29			
	Atlantic menhaden	YR	0.21			
	Striped killifish	YOY	0.21			
	Striped killifish	A	0.21			
	Bluefish	A	0.16			
	Blueback herring	YR	0.08			
	November	Mummichog	NA		8.21	68.5
		Striped killifish	NA		5.75	
Winter flounder		YOY	1.64			
Mummichog		A	0.53			
Winter flounder		A	0.41			
Atlantic silverside		A	0.18			
Blueback herring	YOY	0.18				

*YOY = young-of-the year
 YR = yearling
 A = not aged
 NA = adult



Table IV-22

Comparison of Mean Total Lengths of Yearling Striped Bass* during May-June 1975 from Hudson River[†] and Five Areas in Lower Hudson River Estuary**

	Date	Hudson River [†]	Little Neck Bay	Manhasset Bay	Jamaica Bay	Staten Island	Hackensack River
Mean TL (mm)	May 1975	89.14	118.06	124.16	117.40	105.92	109.0
Standard error		2.82	3.22	6.38	2.51	7.87	2.80
Number measured		42	17	207	10	12	6
Mean TL (mm)	Jun 1975	104.60	124.72	127.0	123.80	100.0	122.33
Standard error		3.67	3.13	8.09	7.11	2.0	2.60
Number measured		30	29	6	5	2	3
Mean TL (mm)	Jul 1975	114.40	134.11	-	-	-	-
Standard error		4.74	1.50	-	-	-	-
Number Measured		5	103	-	-	-	-

* Does not include hatchery-reared fish.

** From haul seining

† From beach seine and trawling standard station sampling.

C. WHITE PERCH

1. 1974 Haul Seining

Yearling white perch (1973 year class) were not caught in the shore zone by haul seining until October, when they appeared briefly in Manhasset Bay (Figure IV-3). One young-of-the-year white perch (1974 year class) was caught in Jamaica Bay during 14-21 July, and two were caught in Manhasset Bay during 21-25 October.

Adult white perch were caught in July 1974 when sampling began in Little Neck Bay, Manhasset Bay, and Jamaica Bay (Figure IV-4) but were most abundant in Manhasset Bay during 6-19 October. They apparently had left the shore zone of these three areas by early November. Adult white perch were never caught in 1974 in Hempstead Harbor, Eastchester Bay, the East River, or Staten Island.

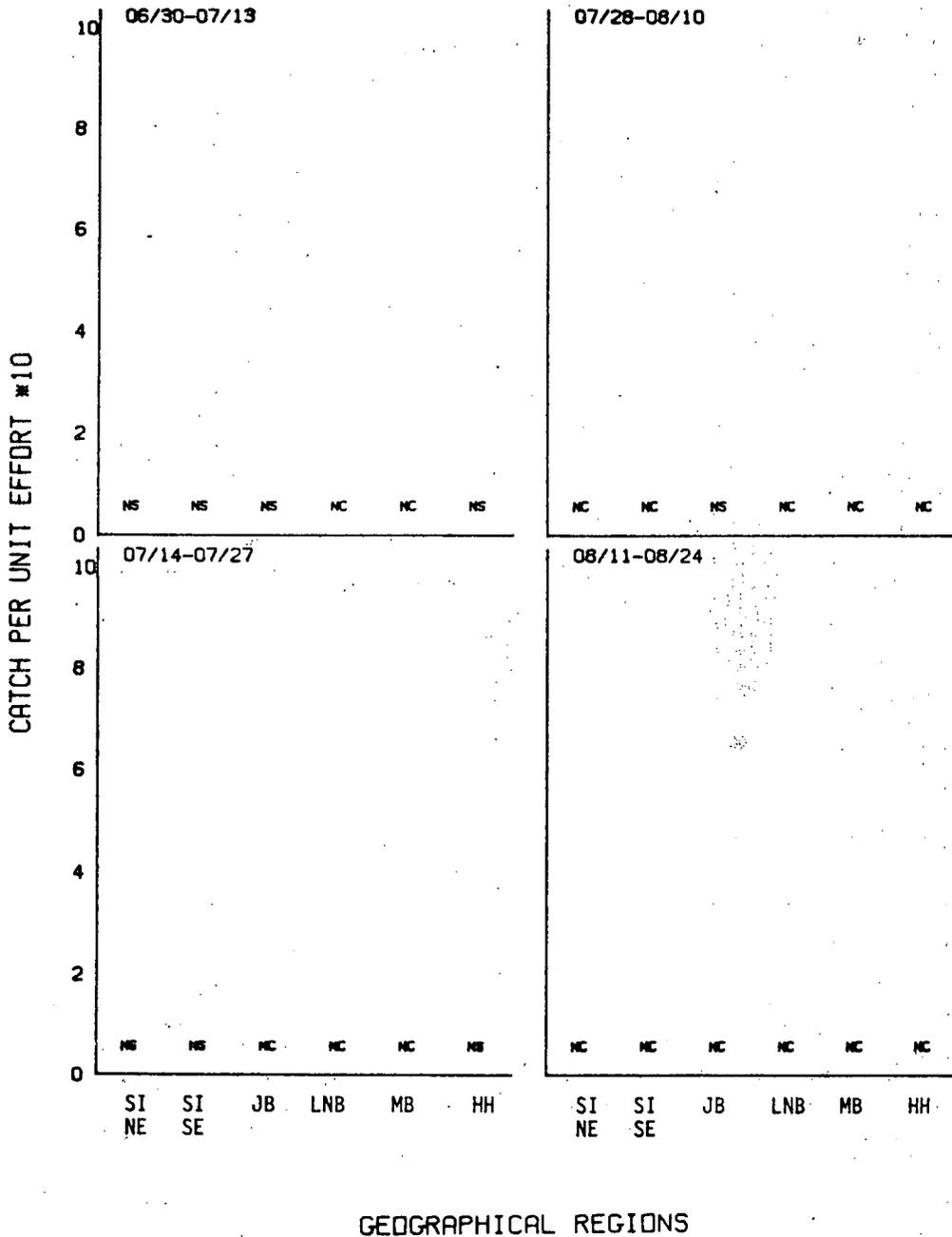
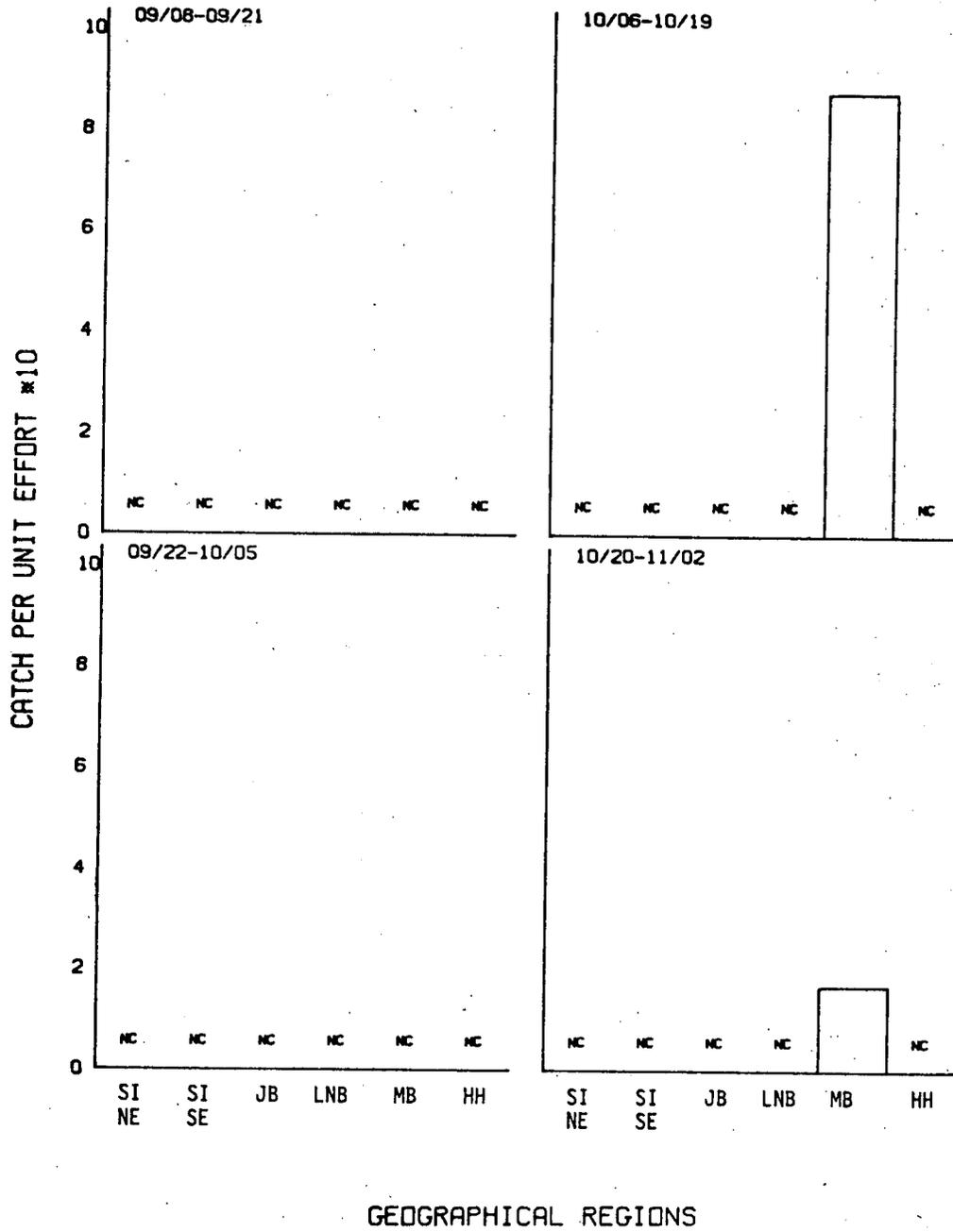


Figure IV-3. Yearling White Perch Catch per Unit Effort within Six Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1974 (Page 1 of 3) (Histograms based on data in Table A-11)



GEOGRAPHICAL REGIONS

Figure IV-3 (Page 2 of 3)

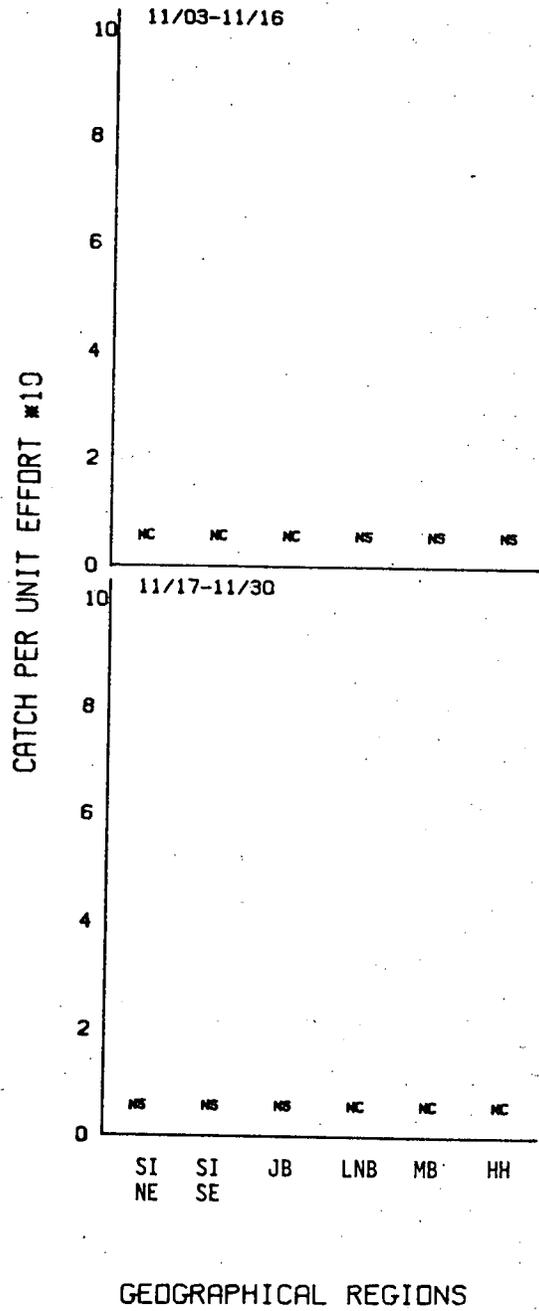


Figure IV-3 (Page 3 of 3)

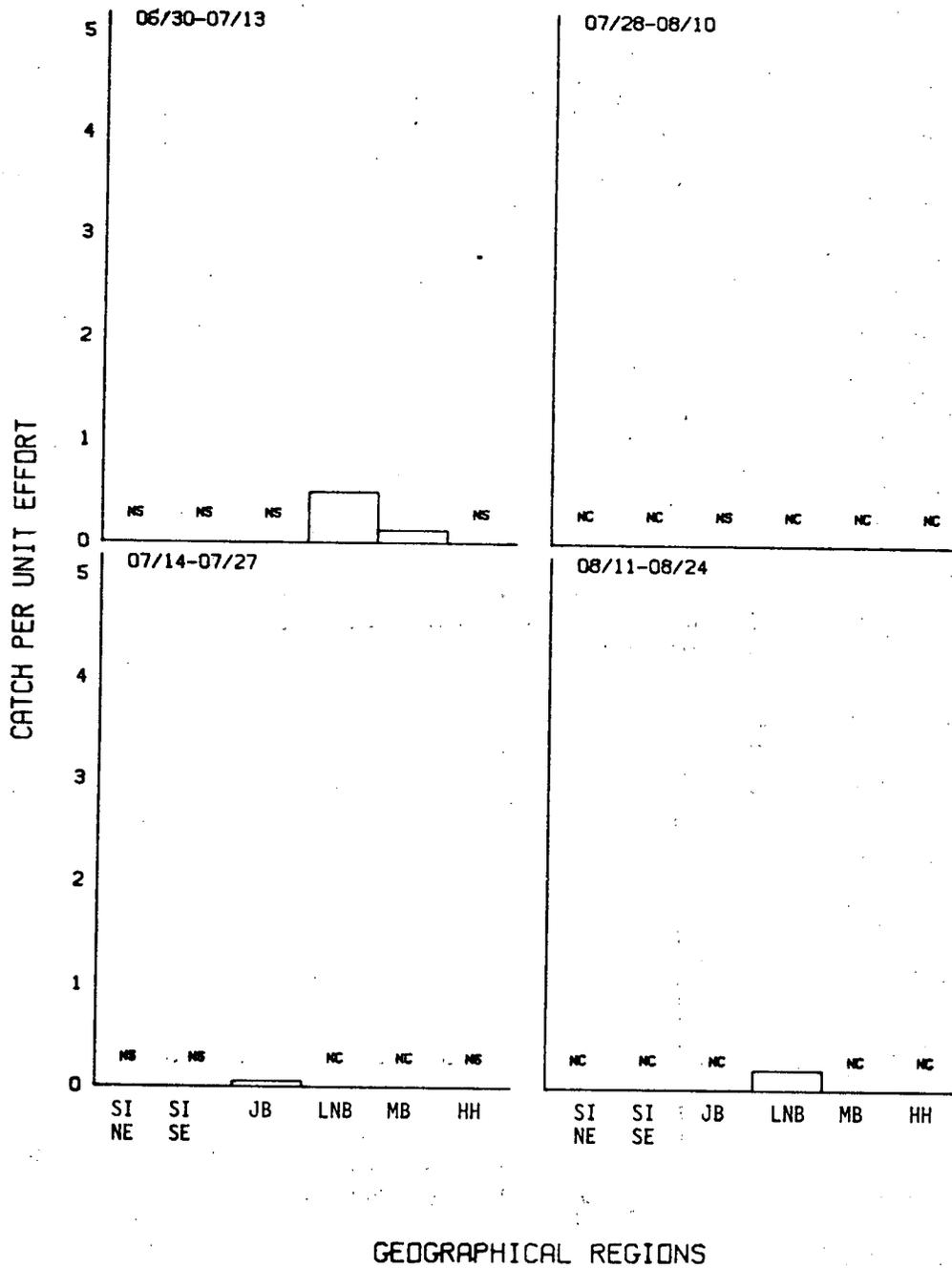


Figure IV-4. Adult White Perch Catch per Unit Effort within Six Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1974 (Page 1 of 3) (Histograms based on data in Table A-13)

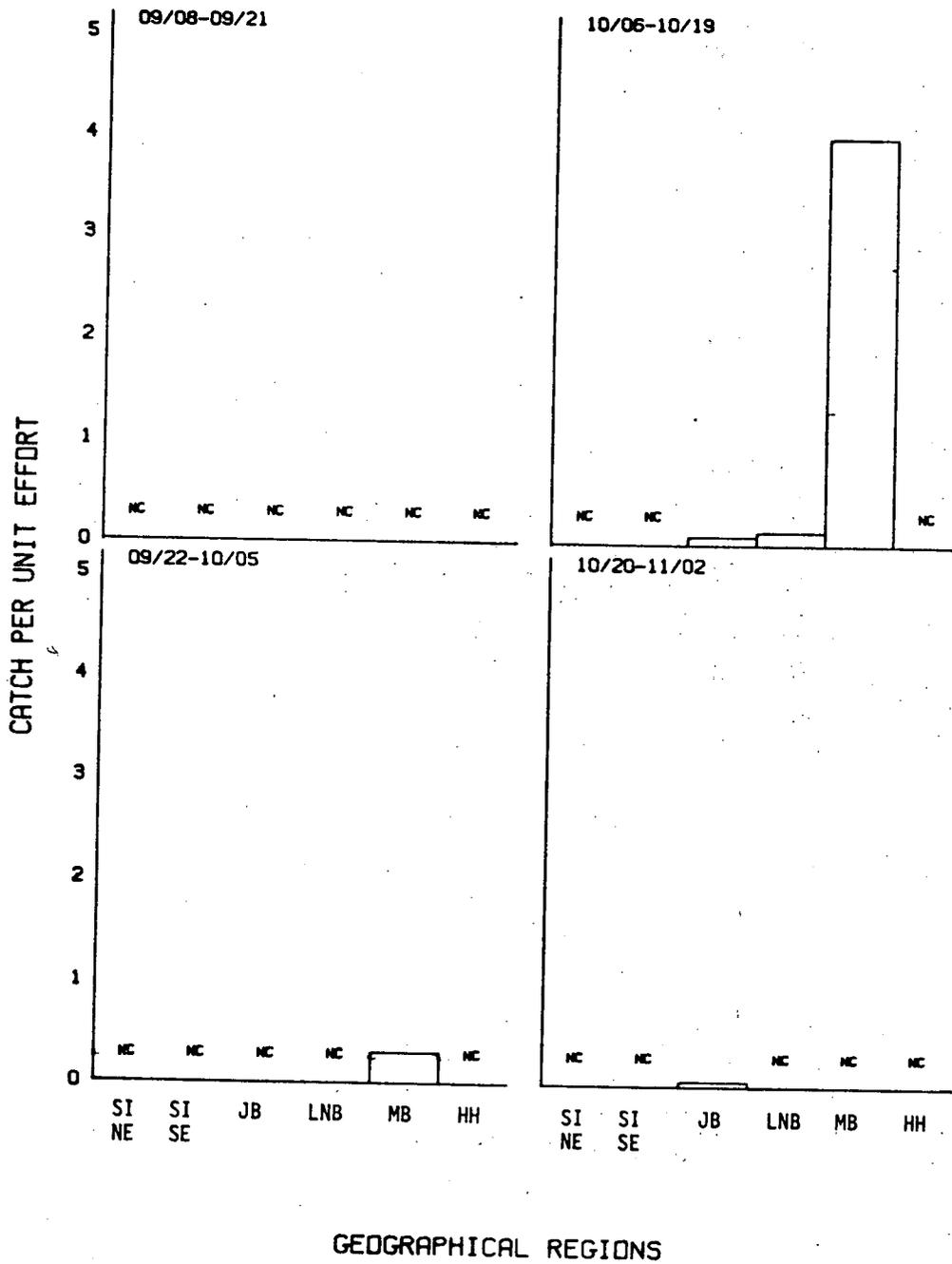
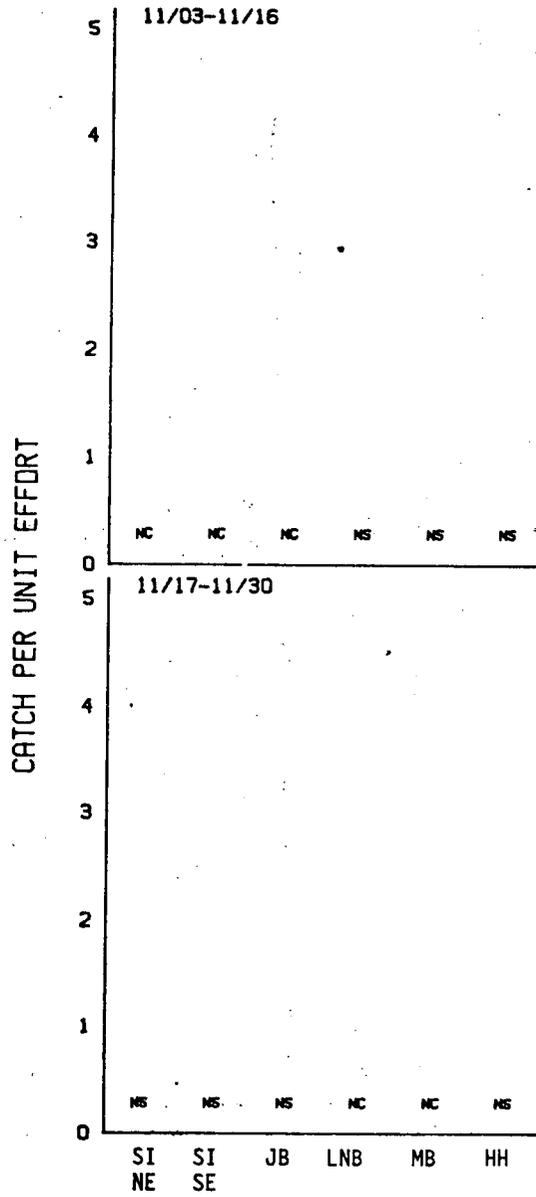


Figure IV-4 (Page 2 of 3)



GEOGRAPHICAL REGIONS

Figure IV-4 (Page 3 of 3)

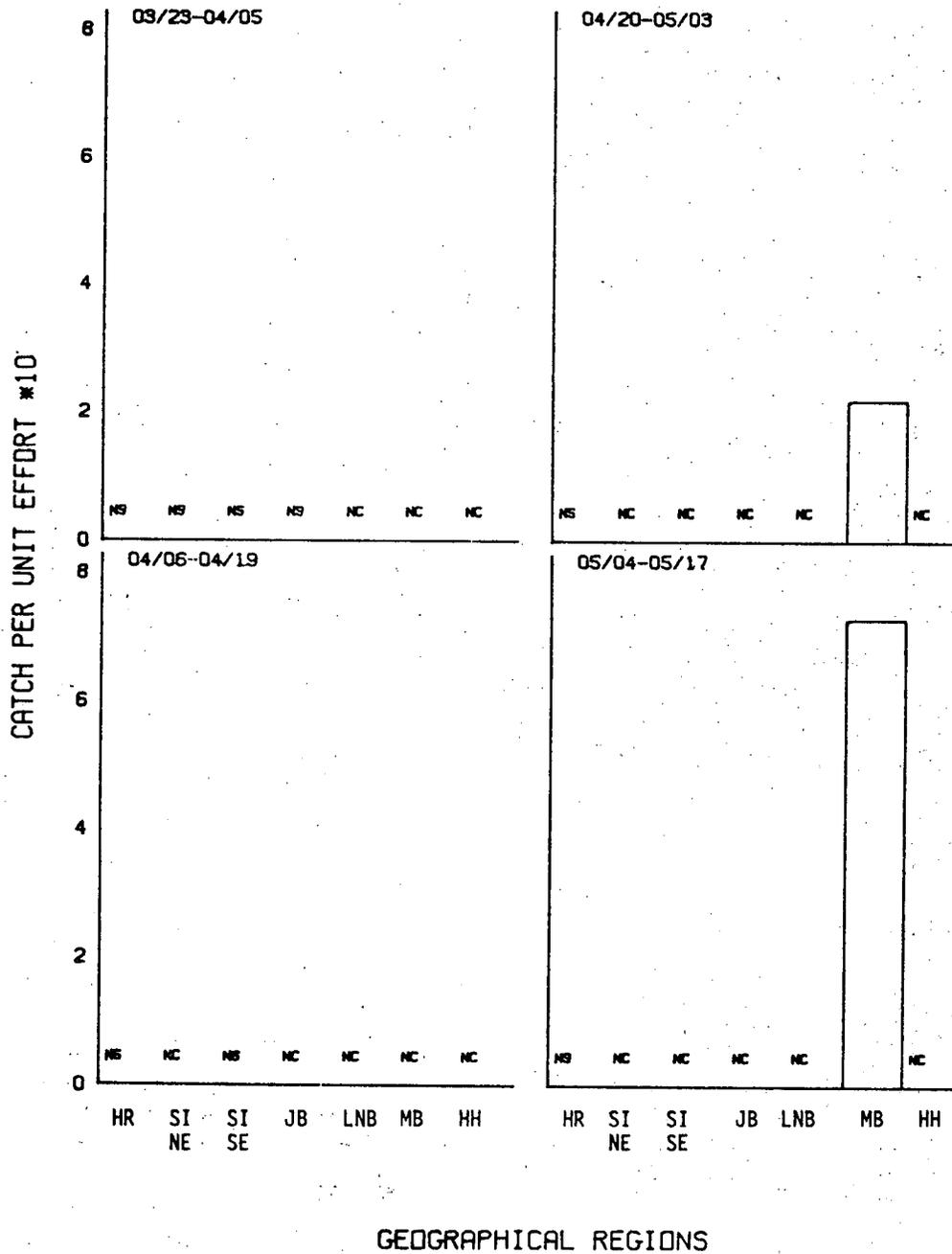


Figure IV-5. Yearling White Perch Catch per Unit Effort within Seven Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1975 (Page 1 of 2) (Histograms based on data in Table A-12)

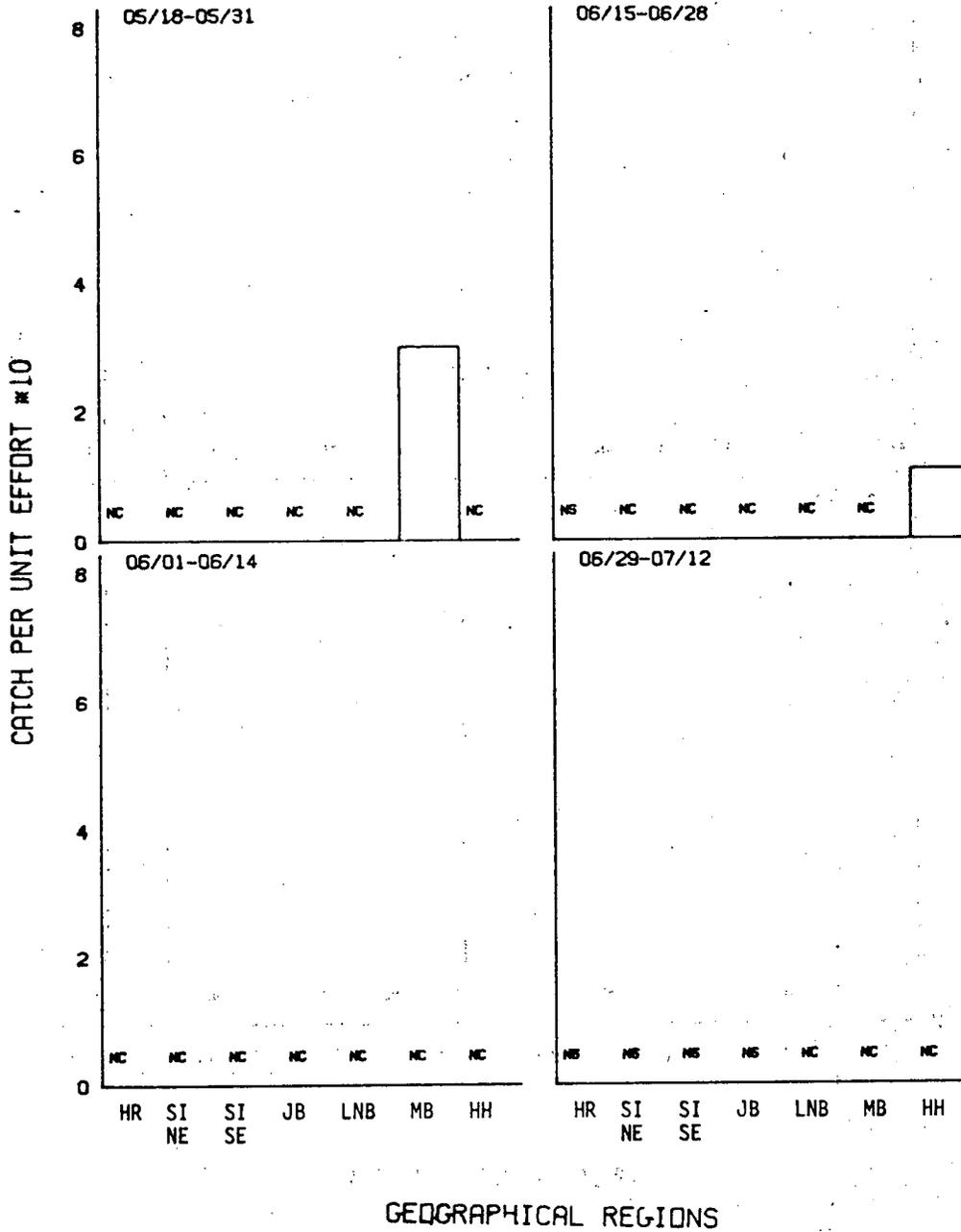


Figure IV-5 (Page 2 of 2)

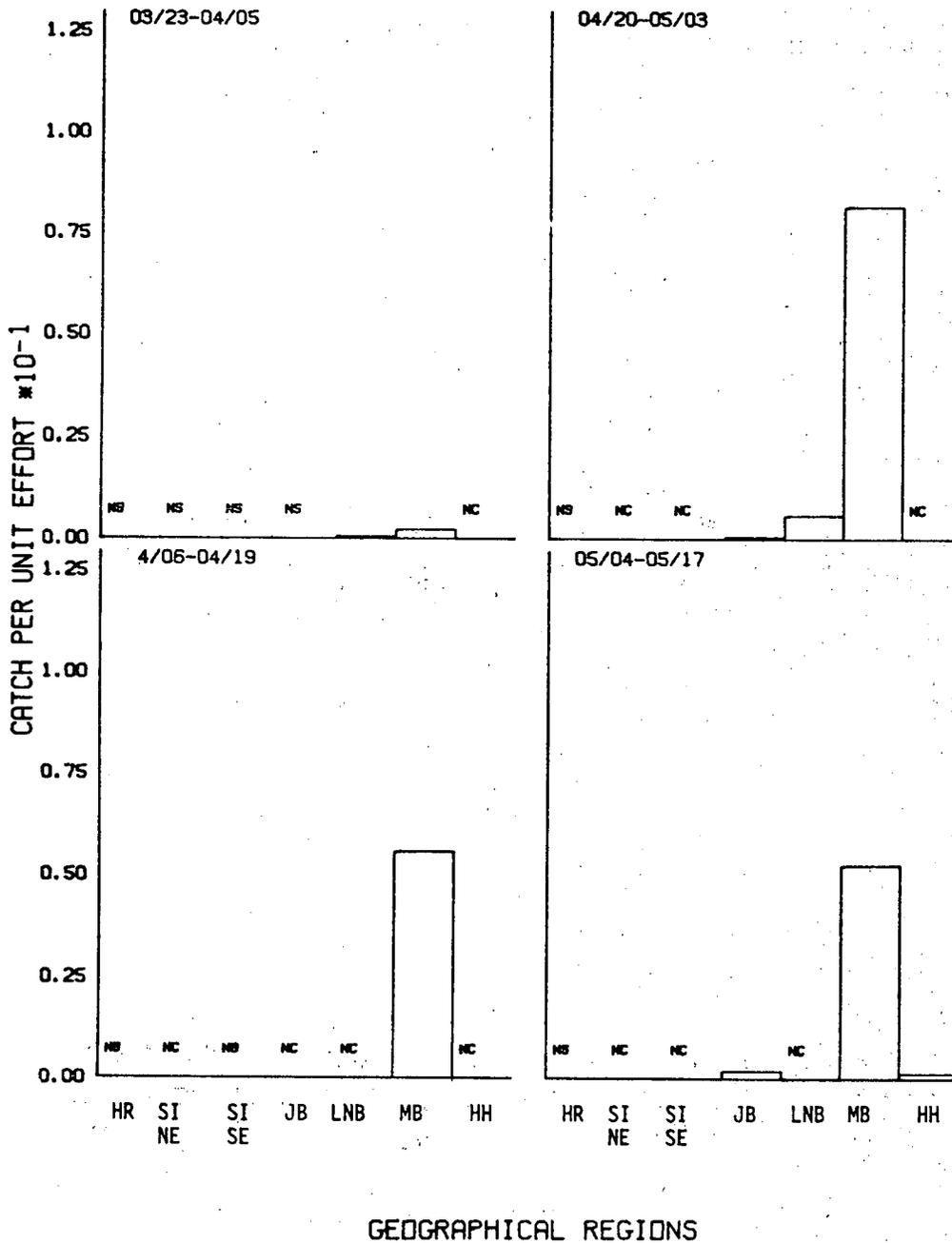


Figure IV-6. Adult White Perch Catch per Unit Effort within Seven Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1975 (Page 1 of 2) (Histograms based on data in Table A-14)

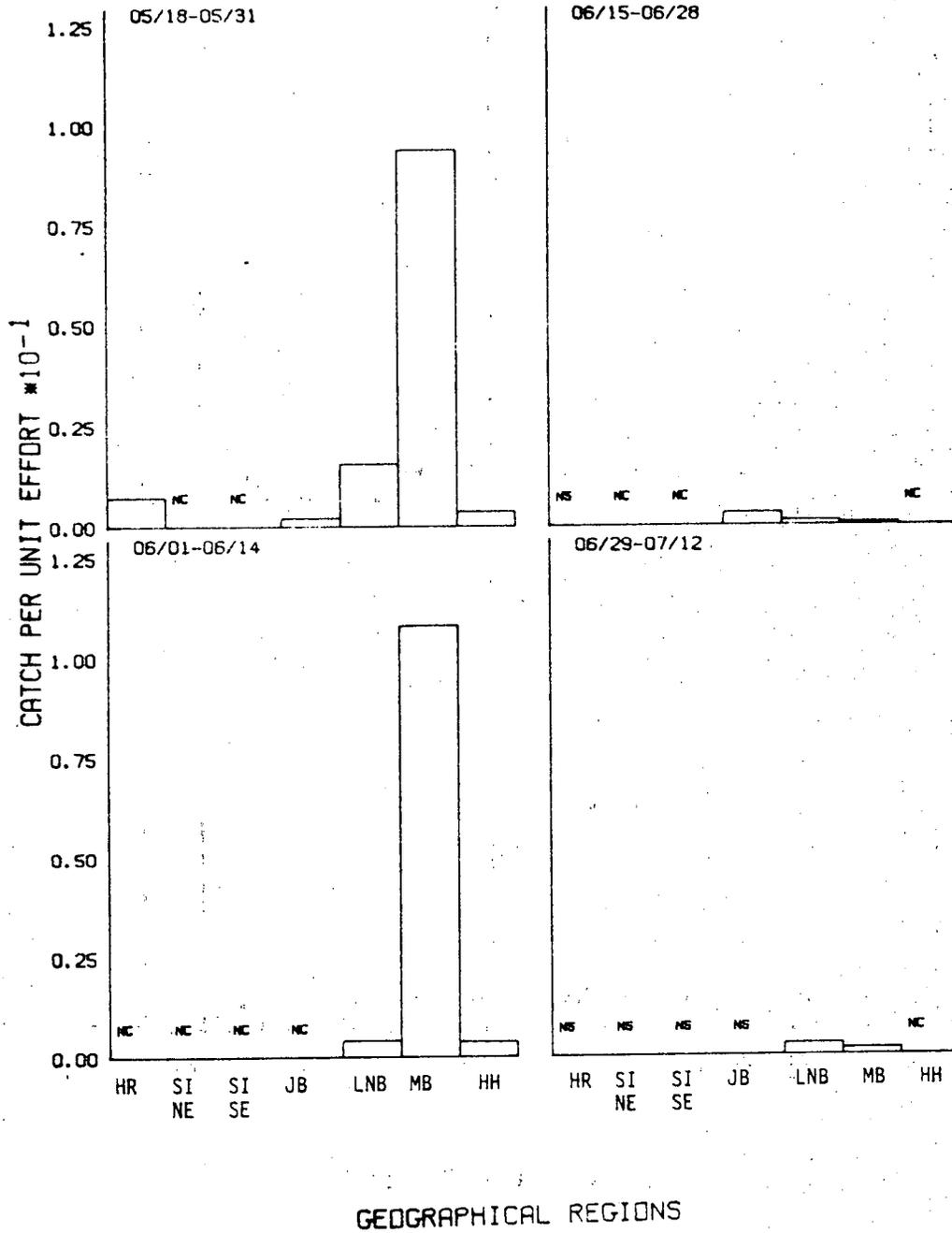


Figure IV-6 (Page 2 of 2)



2. 1975 Haul Seining

During 1975 sampling (late March to mid-July), yearling white perch (1974 year class) were found only in Manhasset Bay and Hempstead Harbor (Figure IV-5). They first appeared in Manhasset Bay in late April and peaked in early May. Yearlings were not caught in Hempstead Harbor until late June. No young-of-the-year white perch were caught during 1975 sampling.

Adult white perch were consistently caught during 1975 and appeared in all study areas except Staten Island (Figure IV-6). They were most abundant in Manhasset Bay, peaking in May and early June.

3. 1974 and 1975 Trawling and Supplemental Gear

No white perch were caught by trawls or gill nets during September-December 1974 and March 1975, but 11 adult white perch were caught in box traps set in Manhasset Bay during October 1974. In November 1974, one adult and one young-of-the-year were caught there (Table IV-20).

4. Mark/Recapture Operations

Since white perch found in the lower estuary may have had origins outside the Hudson River (Bigelow and Schroeder, 1953), marked white perch were used only to analyze movements. There were no confirmed recaptures of fin-clipped white perch in the lower estuary during 1974 and 1975.

All 17 recaptured tagged white perch were both marked and recovered within Manhasset Bay during April-June 1975 (Table A-101 in Volume II of this report). There was a multiple recapture of one fish: it had been tagged on 28 April in Manhasset Bay and was recaptured on 15 May and again on 30 May, always at the head of Manhasset Bay.

D. ATLANTIC TOMCOD

1. 1974 Haul Seining

The 1974 sampling revealed young-of-the-year tomcod (1974 year class) in the shore zone of all six major sampling areas during July-November



(Figure IV-7). They were most abundant from July to early August, particularly in Little Neck Bay and Manhasset Bay on the north shore of Long Island. After August, they did not appear again in haul seine catches until October when they were caught in Little Neck Bay and Hempstead Harbor. In November, they disappeared once again from the shore zone of the six major areas but were caught by haul seining Oyster Bay Harbor to the east (Table IV-8). No adult tomcod were caught by haul seining during 1974.

2. 1975 Haul Seining

Young-of-the-year tomcod (1975 year class) first appeared during early May 1975 in haul seines in Little Neck and Manhasset bays (Figure IV-8); by late May and early June, they had been frequently caught in both areas as well as on northeastern Staten Island from the Verrazano Narrows Bridge to Great Kills Harbor. They also occasionally were caught in southeastern Staten Island below Great Kills Harbor and in Jamaica Bay and Hempstead Harbor. No tomcod were caught in the Hackensack River. By late June and early July 1975, the catches had greatly decreased.

Haul seining caught one adult tomcod (243 mm TL) at the south end of Hempstead Harbor during 28 April-1 May 1975; no other adult tomcod were caught during 1975.

3. 1974 and 1975 Trawling and Supplemental Gear

Only one Atlantic tomcod was caught by trawling during September-December 1974 and March 1975; it was of the 1974 year class (adult) caught in December 1974 in Hempstead Harbor. No tomcod were caught in box traps set on southeastern Staten Island during September and October 1974 or in gill nets set in Manhasset Bay during October and November 1974.

4. Mark/Recapture Operations

No marked Atlantic tomcod were recaptured in the lower estuary by haul seines, trawls, box traps, or gill nets. Recaptures of adult tomcod tagged in the Hudson River during December 1974-February 1975 were made by sports fishermen in the Hudson River below the George Washington Bridge, in lower New York Bay at Brooklyn, and on Huckleberry Island in Long Island Sound (see Volumes I and II of this report).

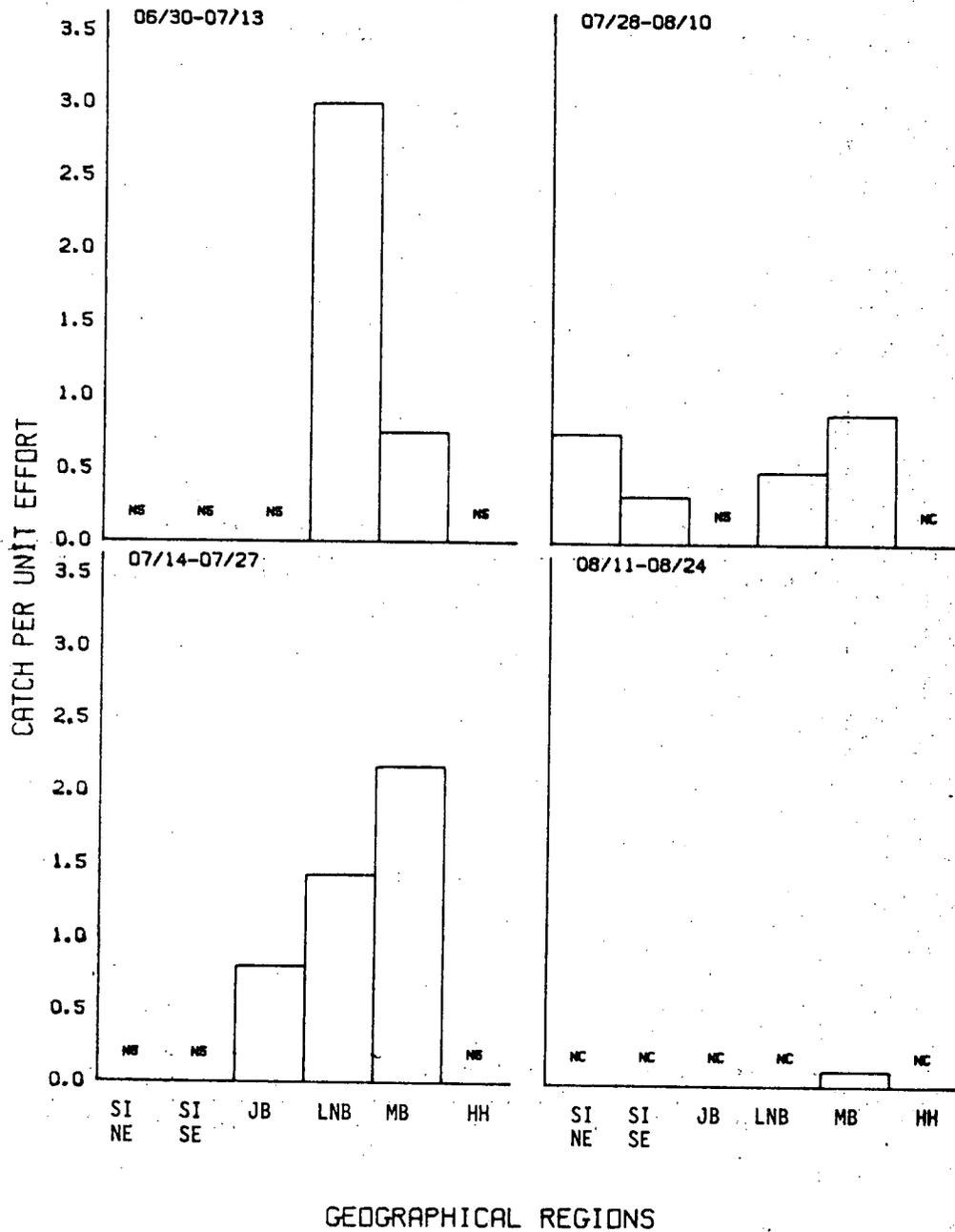
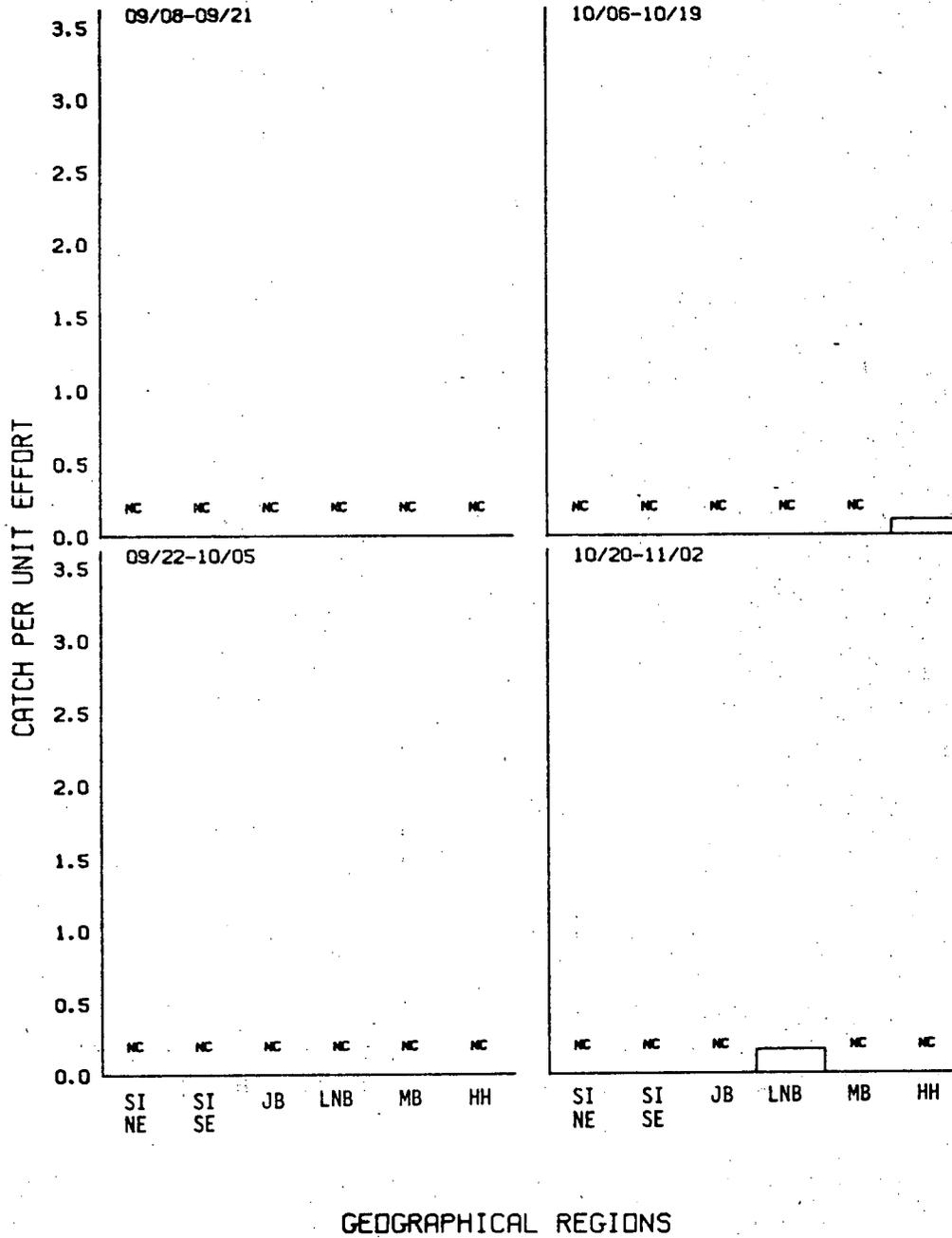


Figure IV-7. Young-of-the-Year Atlantic Tomcod Catch per Unit Effort within Six Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1974 (Page 1 of 3) (Histograms based on data in Table A-15)



GEOGRAPHICAL REGIONS

Figure IV-7 (Page 2 of 3)

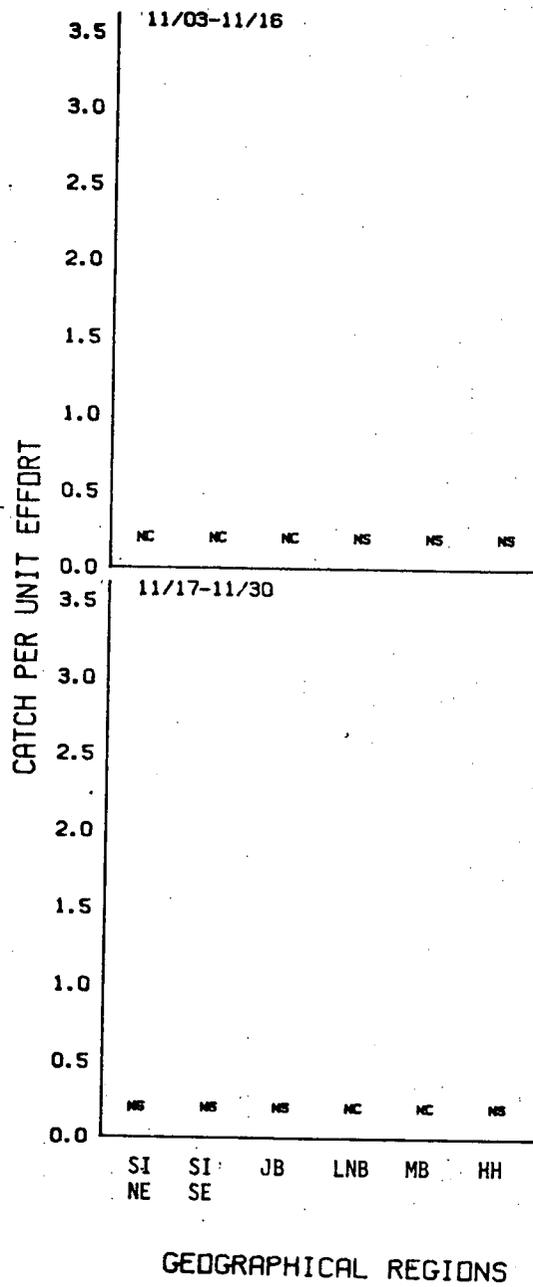


Figure IV-7 (Page 3 of 3)

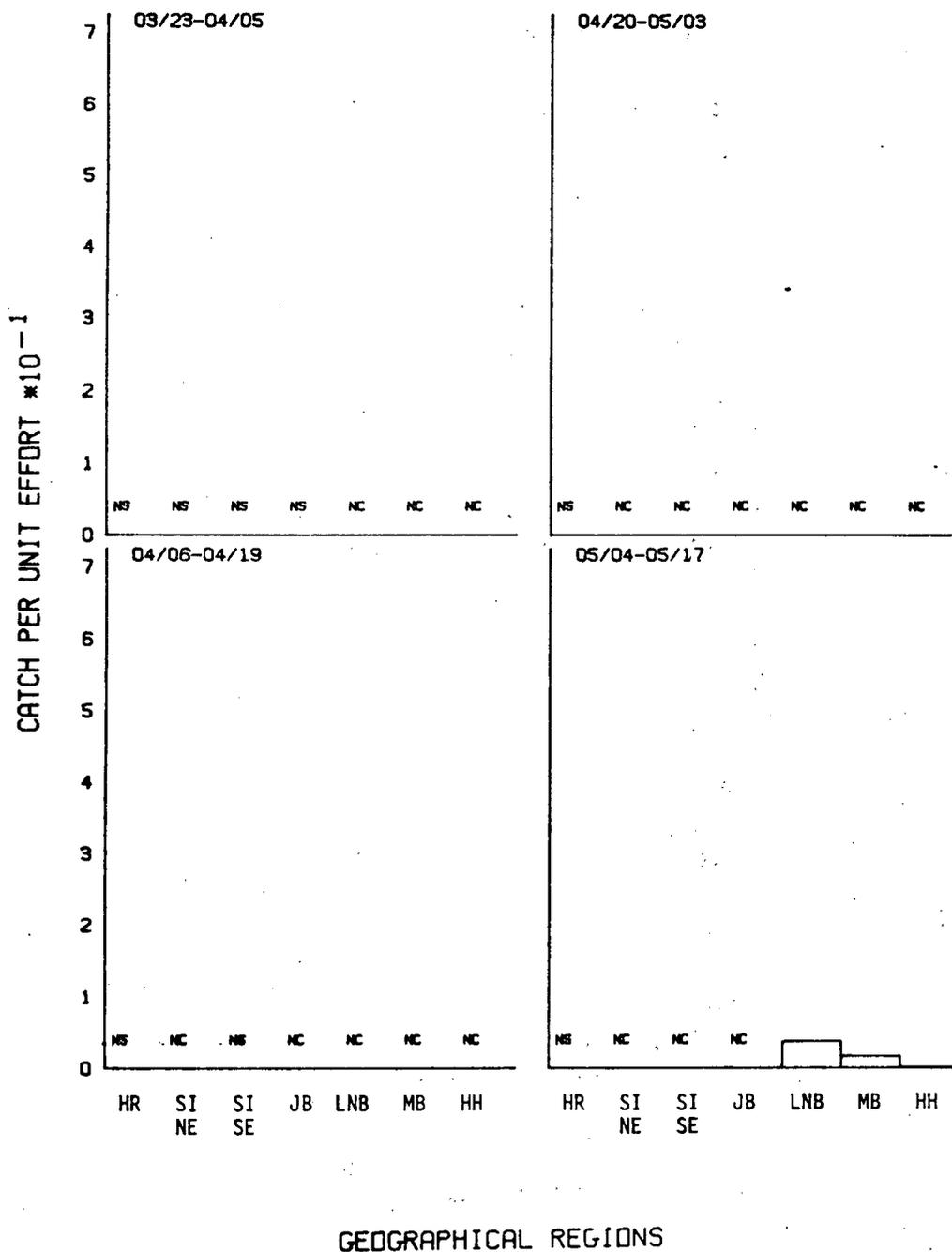


Figure IV-8. Young-of-the-Year Atlantic Tomcod Catch per Unit Effort within Seven Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1975 (Page 1 of 2) (Histograms based on data in Table A-16)

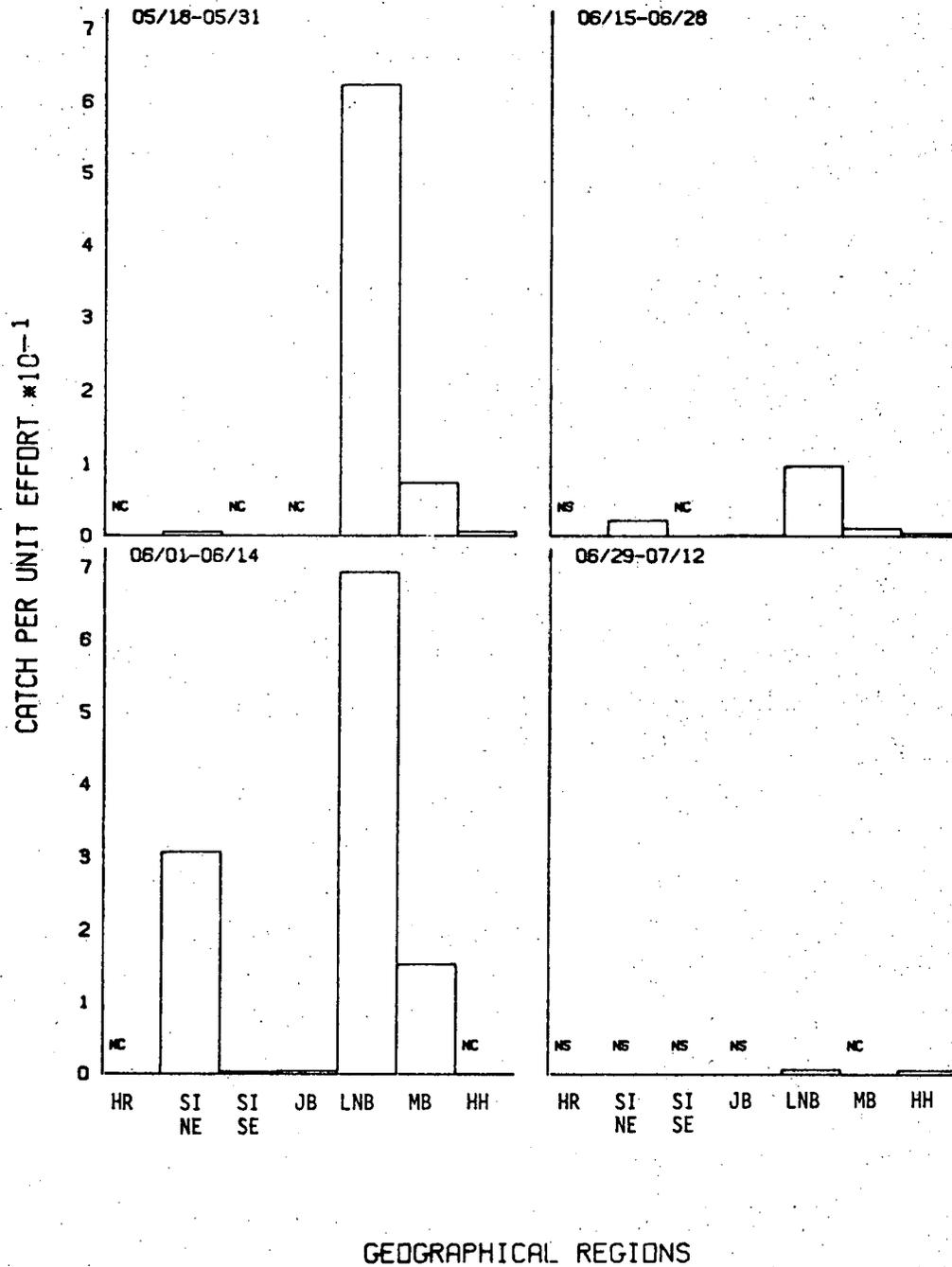


Figure IV-8 (Page 2 of 2)



E. OTHER SPECIES

In addition to the three key species just discussed, other fish species, including marine, anadromous, and even freshwater fishes, were caught in the lower estuary; they are typical for the more saline environment of the lower estuary in comparison with the Hudson River. A brief presentation of the species composition of the shore zone vs the shoals or channels of the study areas follows. The species discussed may not represent a complete list of the fishes which may be found in these areas.

1. Little Neck Bay

a. Shore Zone

Haul seining in the shore zone of Little Neck Bay collected 36 species (Table IV-2), which apparently included both permanent and temporary residents. Dominant permanent residents were forage species such as Atlantic silverside, bay anchovy, mummichog, and striped killifish and marine game fish or predators such as winter flounder and windowpane. Regular inshore summer residents included bluefish, American eel, northern pipefish, and oyster toadfish. Many other species were taken only infrequently, including the principally marine clupeids (Atlantic herring and Atlantic menhaden) and the anadromous clupeids (alewife and American shad). Blueback herring, a common clupeid found in the Hudson River, was also frequently taken in Little Neck Bay. Uncommon species in the shore zone included the grubby, seaboard goby, rainbow smelt, spot, fourspine stickleback, American sand lance, small-mouth flounder, rough silverside, red hake, and tidewater silverside.

b. Shoals and Channels

The dominant species caught by bottom trawling during the fall was the bay anchovy (Table IV-12). Only a few individuals of other



species were caught, most being those also found in the shore zone. However, two species were caught only by trawling: the butterfish and the round herring.

2. Manhasset Bay

a. Shore Zone

Haul seining in Manhasset Bay collected 39 species (Table IV-3) including some — Atlantic needlefish, northern searobin, hickory shad, planehead filefish, butterfish, pinfish, scup, and white mullet — not found in the shore zone of Little Neck Bay. Shore zone species in Little Neck Bay not found in Manhasset Bay were the rainbow smelt, red hake, rough silverside, smallmouth flounder, and spot. Uncommon or rare were subtropical or tropical species: the pinfish, which rarely ranges north of Delaware (Breder, 1948) and the planehead filefish, an uncommon species for Long Island (Alperin and Schaefer, 1965).

b. Shoals and Channel

Trawling in the vicinity of Manhasset Bay yielded many more species than it did in Little Neck Bay. As in Little Neck Bay, the bay anchovy was the dominant species in the catch during September-November (Table IV-13). Three species not found in the shore zone of Manhasset Bay — black sea bass, round herring, and white hake — were caught by trawling. Black sea bass and white hake also had not been caught in Little Neck Bay.

3. Hempstead Harbor

a. Shore Zone

Haul seining in Hempstead Harbor collected 32 species (Table IV-4), all but one of which had also been found either in Little Neck Bay or in Manhasset Bay. The additional species was the northern puffer. Species absent from the shore zone of Hempstead Harbor were also uncommon in the previous two areas.



b. Shoals and Channels

The dominant species caught by trawling during September-November in Hempstead Harbor was the bay anchovy (Table IV-14). Trawling collected many species not caught by haul seining; they included the cunner, black sea bass, seaboard goby, round herring, grubby, longhorn sculpin, striped searobin, white hake, silver hake, and fourbeard rockling. The fourbeard rockling was found only in Hempstead Harbor; the southern extent of its in-shore range is Long Island Sound (Thomson et al, 1971).

4. Jamaica Bay

Jamaica Bay was the only sampling area on the south shore of Long Island, but it had a more diverse fish fauna (50 species) than did areas on the north shore. Some species such as the bigeye scad, gag, inshore lizardfish, northern stargazer, smooth trunkfish, and spotted hake (Table IV-5) were exclusive to Jamaica Bay. The gag, inshore lizardfish, northern stargazer, spotfin butterflyfish, smooth trunkfish, and spotted hake were reported as rare or uncommon to the south shore of Long Island (Briggs, 1970; Alperin and Schaefer, 1965). The naked goby, northern kingfish, pollock, and spotfin butterflyfish caught in Jamaica Bay were found only in one other area - Staten Island.

5. Staten Island

a. Shore Zone

Haul seining along northeastern Staten Island from the Ver-ranzo Narrows Bridge to Great Kills Harbor collected 50 species (Table IV-6). Below Great Kills Harbor, 40 species (Table IV-7) were caught in the shore zone. The fish fauna of Staten Island were most similar to those of Jamaica Bay, but a few additional species were identified.

New species shared by both halves of the eastern shore of Staten Island were the crevalle jack, lookdown, northern sennet, and rock gunnel. The American eel, American sand lance, and black sea bass were caught on northeastern, but not southeastern, Staten Island. Uncommon species, or



other new species only caught on Staten Island during the Lower Estuary Study, included the banded killifish (a freshwater species), permit and pinfish (tropical species), striped burrfish, silver perch, and bluespotted cornetfish.

b. Shoals and Channels

Bay anchovies were the only fish caught by trawling off northeastern Staten Island (Table IV-15). They also predominated off southeastern Staten Island (Table IV-16), but young-of-the-year weakfish were particularly abundant in September.

6. Hackensack River

All seven of the species caught in the Hackensack River were either anadromous or freshwater (Table IV-11). The diversity of species was very low, with mummichogs being the only species commonly caught.

7. Oyster Bay Harbor

Haul seining during November and May collected 21 species (Table IV-8). The golden shiner, a freshwater species possibly from an inflowing pond or stream, was the only species not found elsewhere on the north shore of Long Island.



SECTION V
DISCUSSION

The following section presents a discussion of the distribution and abundance of striped bass, white perch, and Atlantic tomcod in the communities of the lower Hudson River estuary. Although these three species were rarely dominant in the areas sampled, a knowledge of their life history in the lower estuary (bays) is essential, particularly as it relates to their vulnerability to the impact of power plant operation in the Hudson River.

A. STRIPED BASS

In a review of the literature on the occurrence of juvenile (young-of-the-year) and yearling striped bass along Long Island, Alperin (1966) noted that there was little published information on the occurrence of these age groups in marine waters along the Atlantic coast. Striped bass up to 2 years of age have long been considered to inhabit the rivers and bays of the Atlantic coast that serve as spawning grounds. Many recent collections of striped bass eggs and larvae in the Hudson River by TI and others (review in TI, 1975a) have documented the utilization of the Hudson River as a spawning ground for striped bass. Also, there have been occasional records such as Alperin's (1966) of the existence of yearling striped bass in the Marine District of New York. It is assumed that juvenile and yearling striped bass found in this area originated from the Hudson River since this is the nearest major spawning ground for striped bass (Raney et al, 1954). The timing and range of their movement from the Hudson River are yet to be determined.

Data collected on the distribution of the 1973 and 1974 year classes of striped bass in the Hudson River (TI, 1975a; Vol. I and II of this report) show a downriver shift through time of the juvenile population as far as the George Washington Bridge by mid-fall. Since regular sampling by TI did not extend below the George Washington Bridge (RM 12), the full extent of the downriver movement was not known. In the areas below RM 12, only one young-of-the-year striped bass was found. Yearlings were caught in Little



Neck Bay during late March and by May had been found in all but one sampling area. Therefore, many young striped bass must enter the lower estuary during the winter months.

Despite the lack of winter sampling, there is evidence that young-of-the-year striped bass pass through the East River during late fall and early winter; young-of-the-year (60-170 mm) were impinged on the intake screens of the Astoria Generating Station in Queens, New York, during November 1971 and January 1972 (QLM, 1973) and continued to be impinged through March 1972 at Astoria; they did not appear again until December 1972. The single young-of-the-year caught by TI (Section IV of this volume) in September in Little Neck Bay (east of the Astoria plant) may have been indicative of the initial movement of juvenile striped bass out of the Hudson River, to be followed shortly afterward by a much larger group of migrants. The actual timing of movements may differ from year to year, perhaps depending on the physical environment or the size of the striped bass year class. Observation of a larger mean size of yearling striped bass in the lower estuary compared to the Hudson River (Section IV of this volume) may signify that larger fish are the first to leave the river. An alternate hypothesis is that young striped bass grow more rapidly in the lower estuary than do those remaining in the river.

As they leave the river, young striped bass appear to disperse in all directions: to the east through Long Island Sound, to the south along Staten Island and the south shore of Long Island, and to the west through the Kill van Kull and Newark Bay into the Hackensack River. Yearling striped bass have been reported also along the south shore of Long Island in the Swan River, emptying into Great South Bay (just east of Jamaica Bay), and in the Carll River at Babylon, New York (Alperin, 1966) and were collected during April-July 1972 and February and July 1973 in the lower portion of the Hackensack River at the intake screens of the Hudson Generating Station and by seining (Ichthyological Associates, 1974).

Recaptures of hatchery-reared striped bass during May and June 1975 have twofold importance. First, they were the only striped bass definitely marked as juveniles in the Hudson River that were recaptured in the lower



estuary. It may be deduced that wild striped bass also emigrate from the Hudson River to the lower estuary in the same manner as do the hatchery-reared fish. Second, their recapture confirmed that hatchery-reared striped bass will survive to reach the marine phase of their life cycle, thus increasing the possibility of hatchery rearing and stocking as a mitigating measure for the loss of striped bass through power plant operation. Most important, young striped bass that reach the lower Hudson River estuary will not likely return to the river until they grow to a size that enables them to avoid impingement; the sooner they migrate to the lower estuary, the less vulnerable they are to impact by power plants.

B. WHITE PERCH

The white perch is generally a freshwater or brackish-water species with a restricted seaward range (Bigelow and Schroeder, 1953). White perch that inhabit salt water return to fresh or slightly brackish water to spawn. It is unlikely, therefore, that they would leave the Hudson River to travel through the marine waters to the study areas of the lower estuary.

Yearling white perch, although found in the lower estuary, were restricted to Manhasset Bay and Hempstead Harbor. No white perch marked in the Hudson River were recaptured in these areas, nor was there any indication of movement between areas. Adult white perch were caught in most of the study areas at some time, but they were most abundant in Manhasset Bay. There apparently was no movement of an adult white perch out of Manhasset Bay, as evident from recaptures of marked fish.

There was no evidence to support the conclusion that white perch in the lower estuary were of Hudson River origin. Those found in the lower estuary may have belonged to locally spawned populations in each of the areas studied.



C. ATLANTIC TOMCOD

TI (1975a) and Volume I of this report present information on the habits of the tomcod in the Hudson River. Tomcod apparently spawn in the Hudson River at the end of their first year of life, but there is a time from late spring through fall in which many inhabit the lower Hudson River down to the George Washington Bridge, or possibly farther. Sampling in the Lower Estuary Study filled a void in the recent knowledge of the distribution of juvenile tomcod in marine waters.

Juvenile tomcod were plentiful in the lower estuary from late May through early August of 1974 and 1975, a time interval coinciding with a period during which they occupy the lower portions of the Hudson River. Since young-of-the-year tomcod were not marked in the river or the lower estuary until they became spawners, movements of marked juveniles could not be analyzed to determine if river fish had moved to the lower estuary.

D. CONCLUSIONS

The following represent general conclusions drawn from the 1974-1975 Lower Estuary Study:

- Yearling striped bass, probably of Hudson River origin, inhabit much of the shore zone of western Long Island, Staten Island, and the Hackensack River drainage, at least during May-October.
- Movement of young-of-the-year striped bass from the Hudson River to the extreme lower estuary apparently begins in late fall and early winter.
- Hatchery-reared striped bass stocked in the fall in the Hudson River appear to move in a manner similar to that of wild juveniles and can be found in much of the lower estuary by the following spring.



- Young white perch are uncommon in the lower Hudson River estuary and may originate from sources other than the Hudson River.
- Young-of-the-year tomcod of unknown origin frequently occupy the lower estuary from May through early August; adult tomcod are rare in the shore zone during the period sampled (March-November).
- The major study areas, except the Hackensack River, contain a diverse fish fauna of marine and anadromous species.



SECTION VI
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APPENDIX

WATER TEMPERATURE, CONDUCTIVITY, AND
CATCH PER UNIT EFFORT TABLES



Table A-1

Water Temperature and Conductivity in Little Neck Bay during
July-December 1974 and March-July 1975

Date	Temperature (°C)			No. of Meas.	Conductivity (umho/cm)			No. of Meas.
	Mean	Max.	Min.		Mean*	Max.	Min.	
7/07/74 - 7/13/74	22.2	25.0	19.4	6	34417	38220	28420	6
7/21 - 7/27	21.5	22.8	20.0	7	27314	28900	26800	7
8/04 - 8/10	23.2	25.6	21.1	5	37250	38400	36600	6
8/18 - 8/24	24.8	25.6	24.4	5	30040	31800	28900	5
9/15 - 9/21	20.0	21.1	17.2	4	29531	30400	28000	13
9/29 - 10/05	18.3	20.0	16.1	14	37964	40100	35300	14
10/06 - 10/12	16.1	17.8	14.4	16	38650	43000	32800	14
10/20 - 10/26	12.1	13.3	11.1	16	38931	40500	33000	16
11/03 - 11/9	14.0	15.0	13.3	10	39939	42750	38250	10
11/10 - 11/16	12.2	12.8	11.7	6	40133	42800	36000	6
11/17 - 11/23	11.3	11.7	11.1	8	38873	40000	38000	15
12/01 - 12/07	-	-	-	0	40000	40000	40000	1
3/09/75 - 3/15/75	2.8	2.8	2.8	9	36500	37900	33900	9
3/16 - 3/22	3.5	3.8	3.1	7	35057	36200	33400	7
3/23 - 3/29	7.1	8.3	5.6	8	32013	37600	29900	8
3/30 - 4/05	7.5	12.5	4.8	9	36200	38500	31500	9
4/13 - 4/19	7.8	9.0	7.0	5	34960	36000	34200	5
4/27 - 5/03	9.9	10.9	9.0	5	37400	39700	34800	5
5/11 - 5/17	15.5	17.0	14.0	6	34167	40500	31000	6
5/25 - 5/31	18.9	24.0	16.5	7	31543	32200	30500	7
6/08 - 6/14	16.9	19.0	15.5	7	30000	32000	27500	7
6/22 - 6/28	21.7	29.0	20.0	8	27075	29000	25400	8
7/06 - 7/12	21.3	24.0	20.5	12	27858	30000	24500	12

*Adjusted to 25°C

Table A-2

Water Temperature and Conductivity in Manhasset Bay during
July-December 1974 and March-July 1975

Date	Temperature (°C)			No. of Meas.	Conductivity (umho/cm)			No. of Meas.
	Mean	Max.	Min.		Mean*	Max.	Min.	
7/07/74 - 7/13/74	24.4	27.2	20.6	8	36435	39900	34020	8
7/21 - 7/27	19.4	20.0	18.9	6	26333	27500	25400	6
8/04 - 8/10	22.4	23.9	21.1	6	38567	41000	35900	9
8/18 - 8/24	24.9	25.6	23.3	9	29389	33000	28000	9
9/15 - 9/21	21.9	24.4	21.1	14	29116	31200	25000	25
9/29 - 10/05	17.6	19.4	13.3	26	36742	40300	11000	24
10/06 - 10/12	17.1	18.9	14.4	22	38700	42200	24000	21
10/20 - 10/26	11.5	13.3	10.0	20	39675	41800	36000	20
11/03 - 11/09	14.9	15.6	13.3	11	39786	41630	37130	11
11/10 - 11/16	13.0	14.4	12.2	8	41000	43000	40000	8
11/07 - 11/23	10.3	11.1	8.9	19	39568	41000	37100	19
12/01 - 12/07	5.0	5.0	5.0	2	38875	41000	36000	8
12/08 - 12/14	6.3	6.7	5.6	3	41050	41750	40750	5
3/09/75 - 3/15/75	2.9	3.0	2.8	10	36844	38200	35000	9
3/16 - 3/22	3.1	4.0	2.2	12	35417	37500	33000	12
3/23 - 3/29	4.5	7.2	2.2	10	35060	37600	32000	10
3/30 - 4/05	5.4	7.0	4.4	3	37033	40000	32000	3
4/13 - 4/19	8.1	11.0	6.5	17	34424	37900	18500	17
4/27 - 5/03	11.2	12.8	9.2	17	34983	38900	32100	18
5/11 - 5/17	14.3	16.0	12.0	11	34664	41000	18000	11
5/25 - 5/31	18.3	21.0	16.0	10	30591	34000	16000	11
6/08 - 6/14	17.6	20.0	16.0	12	29389	32000	26500	9
6/22 - 6/28	20.8	24.0	18.0	14	27586	29300	24000	14
7/06 - 7/12	21.9	23.5	21.0	6	27500	30500	23000	6

*Adjusted to 25°C



Table A-3

Water Temperature and Conductivity in Hempstead Harbor during August-December 1974 and March-July 1975

Date	Temperature (°C)			No. of Meas.	Conductivity (µmho/cm)*			No. of Meas.
	Mean	Max.	Min.		Mean	Max.	Min.	
8/04/74 - 8/10/74	23.9	24.4	23.3	2	36650	38500	34100	6
8/18 - 8/24	24.1	24.4	23.9	3	28700	29400	28000	2
9/15 - 9/21	22.0	22.2	21.7	4	30245	32400	29000	11
9/29 - 10/05	17.8	18.9	16.1	18	39337	40900	36100	19
10/06 - 10/12	16.4	19.4	15.0	26	39278	49000	34500	27
10/20 - 10/26	11.8	13.9	10.0	20	38860	42000	24600	20
11/03 - 11/09	14.2	15.0	12.8	16	39941	41630	36000	16
11/10 - 11/16	12.2	12.2	12.2	1	41000	41000	41000	1
11/17 - 11/23	10.2	10.6	10.0	12	40033	41200	35500	12
12/01 - 12/07				0	40455	42000	39000	11
12/08 - 12/14	5.7	6.7	5.6	14	41382	42000	40500	17
3/09/75 - 3/15/75	3.0	3.9	2.8	17	36725	38000	34900	16
3/16 - 3/22	3.7	3.7	3.6	2	36750	38000	35500	2
3/23 - 3/29	7.2	7.2	7.2	1	35300	35300	35300	1
3/23 - 4/05	9.5	11.8	7.6	8	37438	39500	31500	8
4/13 - 4/19	9.4	13.0	6.0	9	34175	37100	25000	8
4/27 - 5/03	12.0	12.8	10.4	9	35640	39000	25100	10
5/11 - 5/17	17.4	18.5	15.0	7	34533	38200	30000	6
5/25 - 5/31	21.9	24.0	20.0	10	31100	32400	27300	10
6/08 - 6/14	18.1	19.0	17.0	6	28600	30500	24000	5
6/22 - 6/28	20.9	22.0	19.0	9	26644	28100	24500	9
7/06 - 7/12	21.6	22.0	21.0	5	28920	29999	27500	5

*Adjusted to 25°C

Table A-4

Water Temperature and Conductivity in Jamaica Bay during July-November 1974 and April-June 1975

Date	Temperature (°C)			No. of Meas.	Conductivity (µmho/cm)*			No. of Meas.
	Mean	Max.	Min.		Mean	Max.	Min.	
7/14/74 - 7/20/74	24.6	28.3	22.2	16	37754	39060	36260	15
8/11 - 8/17	25.2	30.0	23.3	15	31733	34200	30400	15
9/08 - 9/14	22.4	22.8	22.2	3	37564	46200	33700	14
9/22 - 9/28	19.2	19.4	18.9	2	37233	38100	35600	3
10/13 - 10/19	13.8	14.4	12.2	11	37110	41000	18000	10
10/27 - 11/02	12.3	13.3	11.7	16	35313	36300	32600	16
11/10 - 11/16	12.1	12.8	11.1	10	41930	44000	40000	10
4/06/75 - 4/12/75	5.9	8.0	4.7	6	33017	33950	32100	6
4/20 - 4/26	11.6	16.9	9.9	16	35893	41000	13300	15
5/04 - 5/10	13.8	18.0	12.0	15	35713	38000	24000	15
5/18 - 5/24	20.5	23.0	19.0	13	30100	31900	28500	12
6/01 - 6/07	20.9	22.0	20.0	13	31158	33000	26500	12
6/15 - 6/21	23.1	25.0	22.5	6	28283	29000	26900	6

*Adjusted to 25°C



Table A-5

Water Temperature and Conductivity along Northeastern Staten Island during July-November 1974 and April-June 1975

Date	Temperature (°C)			No. of Meas.	Conductivity (µmho/cm)*			No. of Meas.
	Mean	Max.	Min.		Mean	Max.	Min.	
7/28/74 - 8/03/74	23.1	23.9	22.2	4	28050	29200	27300	4
8/11 - 8/17	23.2	23.3	22.8	4	29975	32100	29000	4
9/08 - 9/14	-	-	-	0	32250	36100	26900	6
9/22 - 9/28	19.0	20.6	16.1	9	35140	38000	32900	10
10/13 - 10/19	15.2	16.7	11.1	13	39669	42600	37000	13
10/27 - 11/02	12.2	13.3	10.6	10	34791	36800	33600	11
11/10 - 11/16	12.2	12.2	12.2	2	39600	41000	38200	2
4/06/75 - 4/12/75	6.7	7.0	6.0	3	29867	31100	29000	3
4/20 - 4/26	9.3	10.0	8.5	6	34633	36300	33100	6
5/04 - 5/10	12.1	12.5	11.5	7	29929	31900	28000	7
5/18 - 5/24	20.2	22.0	18.0	6	25250	26000	24000	6
6/01 - 6/07	21.0	21.0	21.0	4	28875	29500	27200	4
6/15 - 6/21	21.4	23.0	21.0	10	25020	27000	22500	10

*Adjusted to 25°C

Table A-6

Water Temperature and Conductivity along Southeastern Staten Island during July-November 1974 and April-June 1975

Date	Temperature (°C)			No. of Meas.	Conductivity (µmho/cm)*			No. of Meas.
	Mean	Max.	Min.		Mean	Max.	Min.	
7/28/74 - 8/03/74	23.5	23.9	23.3	3	26150	26200	26100	2
8/11 - 8/17	25.7	26.6	24.4	4	32075	34000	29800	4
9/08 - 9/14	22.7	23.3	22.2	9	29780	46200	24000	10
9/22 - 9/28	19.6	20.6	18.9	7	37771	39800	35000	7
10/13 - 10/19	16.4	17.2	15.6	7	36929	38000	35500	7
10/27 - 11/02	12.9	13.3	11.1	7	33900	34700	32900	7
11/10 - 11/16	13.8	15.0	12.8	4	40250	41000	39200	4
4/20/75 - 4/26/75	9.2	9.4	9.0	2	36400	36800	36000	2
5/04 - 5/10	11.8	12.3	11.4	3	31533	31600	31500	3
5/18 - 5/24	17.0	18.0	16.0	2	28200	28200	28200	1
6/01 - 6/07	19.0	19.0	19.0	3	32167	33000	31500	3
6/15 - 6/21	23.0	23.0	23.0	2	20750	21500	20000	2

*Adjusted to 25°C

Table A-7

Water Temperature and Conductivity in Hackensack River during May-June 1975

Date	Temperature (°C)			No. of Meas.	Conductivity (µmho/cm)*			No. of Meas.
	Mean	Max.	Min.		Mean	Max.	Min.	
5/18/75 - 5/24/75	22.0	22.0	22.0	4	11025	22000	6200	4
6/01 - 6/21	22.0	22.0	22.0	2	7625	8850	6400	2
6/15 - 6/21	23.0	23.0	23.0	2	6200	6800	5600	2

*Adjusted to 25°C



Table A-8

Water Temperature and Conductivity in Oyster Bay during
November 1974 and May 1975

Date	Temperature (°C)			No. of Meas.	Conductivity (µmho/cm)*			No. of Meas.
	Mean	Max.	Min.		Mean	Max.	Min.	
11/17/75 - 11/23/75	9.6	10.0	9.4	9	39589	41000	35000	9
5/11 - 5/17	17.9	20.0	16.0	8	36813	40000	30000	8

*Adjusted to 25°C.

Table A-9

Yearling Striped Bass Catch per Unit Effort within Six Geographical
Regions, Lower Hudson River Estuary, Based on Day Sampling
with 200-Ft (61-m) Haul Seine during 1974

Biweekly Period		Staten Island (Northeast)	Staten Island (Southeast)	Jamaica Bay	Little Neck Bay	Manhasset Bay	Hempstead Harbor
Jun 30-Jul 13	CPUE				15.50	Fish	
	SE				7.48	Not	
	Tows				6	Aged	
Jul 14-27	CPUE			0.81	2.71	1.00	
	SE			0.52	1.41	0.52	
	Tows			16	7	6	
Jul 28-Aug 10	CPUE	0	0		8.33	4.89	0
	SE	0	0		8.33	2.65	0
	Tows	4	3		6	9	6
Aug 11-24	CPUE	0	0	0.20	22.60	0.67	0
	SE	0	0	0.14	20.61	0.67	0
	Tows	4	4	15	5	9	3
Sep 8-21	CPUE	1.20	0	0.07	0.50	2.36	0
	SE	1.20	0	0.07	0.50	1.22	0
	Tows	5	4	14	6	14	4
Sep 22-Oct 5	CPUE	0	0	0	0	0.54	3.50
	SE	0	0	0	0	0.46	3.50
	Tows	3	3	2	6	13	4
Oct 6-19	CPUE	0	0	0.18	1.29	0.13	2.78
	SE	0	0	0.18	1.13	0.13	1.67
	Tows	7	1	11	7	8	9
Oct 20-Nov 2	CPUE	0	0	0	0	0	0
	SE	0	0	0	0	0	0
	Tows	5	1	16	6	6	7
Nov 3-16	CPUE	0	0	0			
	SE	0	0	0			
	Tows	2	4	10			
Nov 17-30	CPUE				0	0	
	SE				0	0	
	Tows				7	7	



Table A-10

Yearling Striped Bass Catch per Unit Effort within Seven Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1975

Biweekly Period	Hackensack River	Staten Island (Northeast)	Staten Island (Southeast)	Jamaica Bay	Little-Neck Bay	Manhasset Bay	Hempstead Harbor
Mar 23-Apr 5	CPUE				0.29	0	0
	SE				0.29	0	0
	Tows				17	13	9
Apr 6-19	CPUE	0		0	0	0	0
	SE	0		0	0	0	0
	Tows	3		6	5	17	8
Apr 20-May 3	CPUE	0	0	0	1.40	0.56	0
	SE	0	0	0	1.40	0.39	0
	Tows	5	2	16	5	18	10
May 4-17	CPUE	0.33	0	0.14	0.17	3.82	0
	SE	0.21	0	0.10	0.17	3.43	0
	Tows	6	3	14	6	11	7
May 18-31	CPUE	1.75	0.60	0	0.54	2.43	17.00
	SE	0.75	0.24	0	0.46	1.21	13.72
	Tows	4	5	2	13	7	10
Jun 1-14	CPUE	0	0	0	0.38	1.57	0.42
	SE	0	0	0	0.24	1.25	0.26
	Tows	2	4	3	13	7	12
Jun 15-28	CPUE		0.20	0	0	2.25	0.08
	SE		0.20	0	0	1.41	0.08
	Tows		10	2	6	8	13
Jun 29-Jul 12	CPUE				12.20	0	0
	SE				7.99	0	0
	Tows				10	6	5

Table A-11

Yearling White Perch Catch per Unit Effort within Six Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1974

Biweekly Period	Staten Island (Northeast)	Staten Island (Southeast)	Jamaica Bay	Little Neck Bay	Manhasset Bay	Hempstead Harbor
Jun 30-Jul 13	CPUE			0	0	
	SE			0	0	
	Tows			6	8	
Jul 14-27	CPUE		0	0	0	
	SE		0	0	0	
	Tows		16	7	6	
Jul 28-Aug 10	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	Tows	4	3	6	9	6
Aug 11-24	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	Tows	4	4	15	5	9
Sep 8-21	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	Tows	5	4	14	6	14
Sep 22-Oct 5	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	Tows	3	3	2	6	13
Oct 6-19	CPUE	0	0	0	0	0.88
	SE	0	0	0	0	0.88
	Tows	7	1	11	7	8
Oct 20-Nov 2	CPUE	0	0	0	0	0.17
	SE	0	0	0	0	0.17
	Tows	5	1	16	6	6
Nov 3-16	CPUE	0	0	0		
	SE	0	0	0		
	Tows	2	4	10		
Nov 17-30	CPUE				0	0
	SE				0	0
	Tows				7	7



Table A-12

Yearling White Perch Catch per Unit Effort within Seven Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1975

Biweekly Period		Hackensack River	Staten Island (Northeast)	Staten Island (Southeast)	Jamaica Bay	Little Neck Bay	Manhasset Bay	Hempstead Harbor
Mar 23-Apr 5	CPUE					0	0	0
	SE					0	0	0
	Tows					17	13	9
Apr 6-19	CPUE		0		0	0	0	0
	SE		0		0	0	0	0
	Tows		3		6	5	17	8
Apr 20-May 3	CPUE		0	0	0	0	0.22	0
	SE		0	0	0	0	0.10	0
	Tows		5	2	16	5	18	10
May 4-17	CPUE		0	0	0	0	0.73	0
	SE		0	0	0	0	0.63	0
	Tows		6	3	14	6	11	7
May 18-31	CPUE	0	0	0	0	0	0.30	0
	SE	0	0	0	0	0	0.21	0
	Tows	4	5	2	13	7	10	8
Jun 1-14	CPUE	0	0	0	0	0	0	0
	SE	0	0	0	0	0	0	0
	Tows	2	4	3	13	7	12	5
Jun 15-28	CPUE		0	0	0	0	0	0.11
	SE		0	0	0	0	0	0.11
	Tows		10	2	6	8	13	9
Jun 29-Jul 12	CPUE					0	0	0
	SE					0	0	0
	Tows					10	6	5

Table A-13

Adult White Perch Catch per Unit Effort within Six Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1974

Biweekly Period		Staten Island (Northeast)	Staten Island (Southeast)	Jamaica Bay	Little Neck Bay	Manhasset Bay	Hempstead Harbor
Jun 30-Jul 13	CPUE				0.50	0.13	
	SE				0.50	0.13	
	Tows				6	8	
Jul 14-27	CPUE			0.06	0	0	
	SE			0.06	0	0	
	Tows			16	7	6	
Jul 28-Aug 10	CPUE	0	0		0	0	0
	SE	0	0		0	0	0
	Tows	4	3		6	9	6
Aug 11-24	CPUE	0	0	0	0.20	0	0
	SE	0	0	0	0.20	0	0
	Tows	4	4	15	5	9	3
Sep 8-21	CPUE	0	0	0	0	0	0
	SE	0	0	0	0	0	0
	Tows	5	4	14	6	14	4
Sep 22-Oct 5	CPUE	0	0	0	0	0.31	0
	SE	0	0	0	0	0.24	0
	Tows	3	3	2	6	13	4
Oct 6-19	CPUE	0	0	0.09	0.14	4.00	0
	SE	0	0	0.09	0.14	3.12	0
	Tows	7	1	11	7	8	9
Oct 20-Nov 2	CPUE	0	0	0.06	0	0	0
	SE	0	0	0.06	0	0	0
	Tows	5	1	16	6	6	7
Nov 3-16	CPUE	0	0	0			
	SE	0	0	0			
	Tows	2	4	10			
Nov 17-30	CPUE				0	0	
	SE				0	0	
	Tows				7	7	



Table A-14

Adult White Perch Catch per Unit Effort within Seven Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1975

Biweekly Period		Hackensack River	Staten Island (Northeast)	Staten Island (Southeast)	Jamaica Bay	Little Neck Bay	Manhasset Bay	Hempstead Harbor
Mar 23-Apr 5	CPUE					0.06	0.23	0
	SE					0.06	0.23	0
	Tows					17	13	9
Apr 6-19	CPUE		0		0	0	5.59	0
	SE		0		0	0	4.46	0
	Tows		3		6	5	17	8
Apr 20-May 3	CPUE		0	0	0.06	0.60	8.17	0
	SE		0	0	0.06	0.40	5.02	0
	Tows		5	2	16	5	18	10
May 4-17	CPUE		0	0	0.21	0	5.27	0.14
	SE		0	0	0.21	0	4.19	0.14
	Tows		6	3	14	6	11	7
May 18-31	CPUE	0.75	0	0	0.23	1.57	9.40	0.38
	SE	0.25	0	0	0.17	1.41	4.98	0.18
	Tows	4	5	2	13	7	10	8
Jun 1-14	CPUE	0	0	0	0	0.43	10.83	0.40
	SE	0	0	0	0	0.30	9.24	0.24
	Tows	2	4	3	13	7	12	5
Jun 15-28	CPUE		0	0	0.33	0.13	0.08	0
	SE		0	0	0.33	0.13	0.08	0
	Tows		10	2	6	8	13	9
Jun 29-Jul 12	CPUE					0.30	0.17	0
	SE					0.21	0.17	0
	Tows					10	6	5

Table A-15

Young-of-the-Year Atlantic Tomcod Catch per Unit Effort within Six Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1974

Biweekly Period		Staten Island (Northeast)	Staten Island (Southeast)	Jamaica Bay	Little Neck Bay	Manhasset Bay	Hempstead Harbor
Jun 30-Jul 13	CPUE				3.00	0.75	
	SE				2.25	0.62	
	Tows				6	8	
Jul 14-27	CPUE			0.81	1.43	2.17	
	SE			0.52	1.43	1.64	
	Tows			16	7	6	
Jul 28-Aug 10	CPUE	0.75	0.33		0.50	0.89	0
	SE	0.75	0.33		0.50	0.65	0
	Tows	4	3		6	9	6
Aug 11-24	CPUE	0	0	0	0	0.11	0
	SE	0	0	0	0	0.11	0
	Tows	4	4	15	5	9	3
Sep 8-21	CPUE	0	0	0	0	0	0
	SE	0	0	0	0	0	0
	Tows	5	4	14	6	14	4
Sep 22-Oct 5	CPUE	0	0	0	0	0	0
	SE	0	0	0	0	0	0
	Tows	3	3	2	6	13	4
Oct 6-19	CPUE	0	0	0	0	0	0.11
	SE	0	0	0	0	0	0.11
	Tows	7	1	11	7	8	9
Oct 20-Nov 2	CPUE	0	0	0	0.17	0	0
	SE	0	0	0	0.17	0	0
	Tows	5	1	16	6	6	7
Nov 3-16	CPUE	0	0	0			
	SE	0	0	0			
	Tows	2	4	10			
Nov 17-Nov 30	CPUE				0	0	
	SE				0	0	
	Tows				7	7	



Table A-16

Young-of-the-Year Atlantic Tomcod Catch per Unit Effort within Seven Geographical Regions, Lower Hudson River Estuary, Based on Day Sampling with 200-Ft (61-m) Haul Seine during 1975

Biweekly Period	Hackensack River	Staten Island (Northeast)	Staten Island (Southeast)	Jamaica Bay	Little Neck Bay	Manhasset Bay	Hempstead Harbor
Mar 23-Apr 5	CPUE				0	0	0
	SE				0	0	0
	Tows				17	13	9
Apr 6-19	CPUE	0		0	0	0	0
	SE	0		0	0	0	0
	Tows	3		6	5	17	8
Apr 20-May 3	CPUE	0	0	0	0	0	0
	SE	0	0	0	0	0	0
	Tows	5	2	16	5	18	10
May 4-17	CPUE	0	0	0	3.83	1.73	0.14
	SE	0	0	0	1.82	1.63	0.14
	Tows	6	3	14	6	11	7
May 18-31	CPUE	0	0.60	0	62.43	7.40	0.63
	SE	0	0.60	0	41.46	6.52	0.42
	Tows	4	5	2	7	10	8
Jun 1-14	CPUE	0	30.75	0.33	69.43	15.42	0
	SE	0	12.79	0.33	56.78	13.99	0
	Tows	2	4	3	7	12	5
Jun 15-28	CPUE		2.20	0	9.75	1.08	0.44
	SE		0.99	0	9.61	0.59	0.34
	Tows		10	2	8	13	9
Jun 29-Jul 12	CPUE				0.70	0	0.60
	SE				0.30	0	0.40
	Tows				10	6	5

Table A-17

Striped Bass Tag Recoveries in Lower Hudson River Estuary during July 1974-July 1975

Recovery Period	Tag No.	Release			Recovery		
		Date	Location	Total Length	Date	Location	Total Length Recovery Gear
10/74	05-9180	9/19/74	Manhasset Bay	243	10/14/74	East River, Throggs Neck Bridge	- Sports fisherman
	09-21446	10/02/74	Hempstead Harbor	270	10/09/74	Hempstead Harbor	272 200-ft beach seine
1/75	09-21418	9/30/74	Manhasset Bay	573	1/?/75	Off Chincoteague Island, Va.	- Sports fisherman
5/75	09-31380	5/12/75	Manhasset Bay	263	5/12/75	Manhasset Bay	263 200-ft beach seine
	09-29114	5/12/75	Manhasset Bay	496	5/18/75	Manhasset Bay	- Sports fisherman
*09-31380	09-21448	5/12/75	Manhasset Bay	263	5/27/75	Manhasset Bay	268 200-ft beach seine
	09-21448	9/16/74	Manhasset Bay	462	5/30/75	Monmouth Beach, New Jersey	- Sports fisherman
6/75	05-17131	5/27/75	Manhasset Bay	223	6/09/75	Manhasset Bay	219 200-ft beach seine
	05-17181	5/27/75	Manhasset Bay	217	6/09/75	Manhasset Bay	222 200-ft beach seine
05-24662	05-20657	6/13/75	Manhasset Bay	221	6/13/75	Manhasset Bay	- Sports fisherman
	05-20687	6/09/75	Manhasset Bay	232	6/13/75	Manhasset Bay	232 200-ft beach seine
05-17031	05-17133	6/09/75	Manhasset Bay	187	6/13/75	Manhasset Bay	185 200-ft beach seine
	05-20615	5/12/75	Manhasset Bay	224	6/13/75	Manhasset Bay	248 200-ft beach seine
05-17067	05-20748	5/27/75	Manhasset Bay	243	6/13/75	Manhasset Bay	249 200-ft beach seine
	05-20748	5/30/75	Manhasset Bay	196	6/13/75	Manhasset Bay	206 200-ft beach seine
05-20748	05-20688	5/22/75	Jamaica Bay	232	6/19/75	Jamaica Bay	250 200-ft beach seine
	05-20688	6/10/75	Little Neck Bay	241	6/24/75	Little Neck Bay	244 200-ft beach seine
09-28530	09-28530	6/10/75	Little Neck Bay	204	6/27/75	Manhasset Bay	- Sports fisherman
	09-28530	6/09/75	Manhasset Bay	204	6/27/75	Western Long (Marmoroneck)	- Sports fisherman
09-31393	09-29325	4/30/75	Hudson River, RM 35E	660	6/27/75	Island Sound	333 200-ft beach seine
	09-31393	5/12/75	Manhasset Bay	315	6/9/75	Manhasset Bay	- Sports fisherman
09-29325	09-25377	5/14/75	Hudson River, RM 42W	535	6/10/75	Verrazano Bridge - Bklyn Span	- Sports fisherman
	09-25377	10/22/74	Little Neck Bay	498	6/10/75	Lower New York Bay	503 200-ft beach seine
09-36460	09-36431	6/09/75	Manhasset Bay	270	6/13/75	Little Neck Bay	266 200-ft beach seine
	09-36431	6/09/75	Manhasset Bay	286	6/13/75	Manhasset Bay	290 200-ft beach seine
09-35730	09-36625	5/27/75	Manhasset Bay	266	6/13/75	Manhasset Bay	272 200-ft beach seine
	09-36625	6/09/75	Manhasset Bay	271	6/13/75	Manhasset Bay	268 200-ft beach seine
09-29544	09-29544	6/12/75	Manhasset Bay	549	6/14/75	Little Neck Bay	- Sports fisherman
	09-29544	4/30/74	Hudson River, RM 55W	808	6/15/75	Gravesend Bay - Coney Island	- Sports fisherman
09-29537	09-36508	6/10/75	Little Neck Bay	630	6/16/75	Coney Island	- Sports fisherman
	09-36508	6/10/75	Little Neck Bay	472	6/24/75	Hempstead Harbor	472 200-ft beach seine
09-29543	09-32037	6/10/75	Little Neck Bay	549	6/27/75	Little Neck Bay	- Sports fisherman
	09-32037	5/14/75	Hempstead Harbor	586	6/01/75	Manhasset Bay	- Sports fisherman
09-29147	09-29147	5/13/75	Little Neck Bay	536	6/08/75	Hempstead Harbor	- Sports fisherman
	09-29147	5/13/75	Little Neck Bay	536	6/08/75	Falmouth, Maine	Sports fisherman
7/75	09-36569	6/10/75	Little Neck Bay	488	7/16/75	Manhasset Bay	- Sports fisherman

*2nd recapture